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Title: Uptake of HIV testing among 15-19 year old adolescents in Zambia

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Abstract

Despite the burden of HIV in adolescents in Africa, HIV testing rates remain low and many are unaware of their status. In order to improve testing uptake, it is important to understand factors that influence HIV testing among adolescents. This study explored such factors among Zambian adolescents aged 15-19 years. This study uses data from the most current country representative Zambian Demographic Health Survey 2013-14 and used a two-stage stratified cluster sample design to collect information from a countrywide representative sample of females and males of reproductive age. Chi-square tests, t-tests and logistic and multivariate regression models were conducted to assess factors associated with HIV testing and sample differences by testing status. The sample consisted of 7030 adolescents of which 42% reported ever testing for HIV. There were significant associations between testing for HIV and age, gender, education, marital status, age at first sex and HIV knowledge. As the age of a respondent increased so did their odds of testing (aOR=1.26; 1.21-1.32); females had higher odds of testing than males (aOR=1.719; 1.53-1.92); those with secondary or higher education (aOR=3.64; 2.23-5.96) and those with primary education (aOR=1.97; 1.21-3.19) had higher odds of testing than those with no education; those who were formerly married or living with a partner (aOR= 4.99; 2.32-10.75) and those who were currently married or living with a partner (aOR= 4.76; 3.65-6.21) had higher odds of testing than those who were never married or lived with a partner; as the age at first sex increased so did the odds of testing (aOR=1.07; 1.06-1.08); and as HIV knowledge increased so did the odds of testing (aOR=1.13; 1.06-1.19). Factors associated with uptake of testing were similar for groups who reported sex compared to groups not yet sexually active. The data points to population level social determinants that may be targeted to increase testing among adolescents. The data suggests increasing HIV knowledge among adolescents and specifically targeting males who are found to have lower testing levels. The study also highlights the importance of HIV testing during antenatal care as 20% of females reported testing as part of their antenatal care visits. Findings support the global prioritization of adolescents in HIV/AIDS policy and programming which must continue with a focus on appropriate interventions to increase HIV testing, especially among adolescents in Sub-Saharan Africa.

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Key words: HIV testing; adolescents; Sub-Saharan Africa; Zambia Demographic Health Survey

Introduction

HIV continues to be a major global health problem, especially among adolescents. Adolescents are severely affected by the epidemic and make up an increasing share of new HIV infections, currently accounting for 16% of all new HIV infections globally (UNICEF, 2019). Without intervention, new cases will steadily increase and amount to about 3.5 million new infections in this population by 2030 (UNICEF, 2017).

Much has been done in the fight to end HIV/AIDS and there has been significant progress in access to antiretroviral therapy (ART) treatment for people living with HIV (PLWH) worldwide. This has led to a significant reduction in the morbidity and mortality associated with HIV. However, this has not been the case among adolescents who experienced a 50% increase in AIDS-related deaths between 2005 and 2012 despite reductions among other populations (Bekker & Hosek, 2015; UNICEF, 2016). The situation is especially critical in Sub-Saharan Africa where 85% of adolescents living with HIV (ALHIV) reside (UNICEF, 2019) and 9 in 10 AIDS-related deaths occurred in this region in 2016 (UNICEF, 2016, 2017).

Despite the high burden of HIV among adolescents HIV testing rates are low, with many adolescents unaware of their status (Folayan, Odetoyinbo, Brown, & Harrison, 2014; Idele et al., 2014). For instance, in eastern and southern Africa only 19% of females and 14% of males were tested for HIV and received their results in the last 12 months (UNICEF, 2019). Low uptake of HIV testing and counselling (HTC) services has severe implications for controlling the adolescent epidemic. As the entry point to the cascade of care, HTC is crucial to identifying, linking and retaining adolescents in treatment. Timely access to treatment is also associated with better health outcomes, as late diagnosis and treatment initiation has been found to result in increased morbidity and mortality (Anglemyer et al., 2014; Belay, Fessahaye Alemseged, Hintsa, & Abay, 2017). Furthermore early testing and treatment initiation affects rates of onwards transmission (Wong, Murray, Phelps, Vermund, & McCarraher, 2017). Several studies have found that youth aged 15-24 have worse treatment outcomes compared to younger and older populations. Specifically, adolescents have been found to be less likely to be enrolled in care upon diagnosis, more likely to be lost to follow-up and less likely to adhere to treatment (Bygrave et al., 2012; Koech et al., 2014; Lamb et al., 2014; Nachega et al., 2009).

Studies examining barriers to HIV testing among adolescents in Sub-Saharan Africa have found that fear of a positive result; low perception of risk; lack of HIV/AIDS knowledge; lack of awareness of available services; concerns over confidentiality; fear of discrimination and stigma; fear of negative reactions from family and friends and current/future partners; negative experiences with health staff, age of consent laws and the psychological burden of living with HIV affect testing uptake (Aluzimbi, Lubwama, Muyonga, & Hladik, 2017; Qiao, Zhang, Li, & Menon, 2018; Sam-Agudu, Folayan, & Ezeanolue, 2016; Strauss, Rhodes, & George, 2015).

In spite of the high burden of HIV and poor outcomes among adolescents, there are few studies examining the determinants of HIV testing among adolescents in high-burden countries and to our knowledge no such study has been conducted in Zambia. It is important that we understand the factors affecting HTC uptake in order to facilitate access to HIV testing and improving treatment outcomes and prevention strategies in this population. This study aimed to assess the factors affecting HTC uptake among adolescents aged 15-19 in Zambia.

Methods

Data source

This study uses data from the Zambian Demographic Health Survey (ZDHS) 2013-14 which was collected between April 2013 and August 2014 (Central Statistical Office [Zambia], 2014). The ZDHS is a nationally representative survey of men and women of reproductive age and provides information on fertility trends, maternal and child health, sexual and reproductive health and HIV among others (Central Statistical Office [Zambia], 2014). The survey uses a two-stage stratified cluster sample design in which enumeration areas taken from the 2010 Population and Housing Census were selected followed by the selection of households (Central Statistical Office [Zambia], 2014). This study uses data from the individual male and female datasets, selecting a subset of data of all within the relevant age bands and combining for analysis.

Participants

Eligible participants for the survey were women aged 15-49 and men aged 15-59 that were usual residents of the household or slept in the household the night before the survey was

administered (Central Statistical Office [Zambia], 2014). All data entries for participants aged 15-19 were selected.

Measures

Measures were drawn from existing variables within the DHS survey and include sociodemographic variables, sexual behaviour/health variables and HIV-related variables. See Table 1 for included variables and their measurement. The following variables were generated using pre-existing variables: history of STI and HIV knowledge. Respondents were classified as having a suspected STI if they answered 'yes' to the following questions: 'During the last 12 months have you had a disease which you got through sexual contact?', 'During the last 12 months have you had a bad smelling abnormal genital discharge?' and 'During the last 12 months have you had a genital sore or ulcer?'. Respondents were classified as not having a suspected STI if they answered 'no' to all three questions. 'Don't know' responses were coded as 'no'. HIV knowledge index was created using five questions corresponding to UNICEF's Comprehensive Knowledge of HIV measure. The measure includes correctly identifying two major ways of preventing the sexual transmission of HIV ('Can people reduce their chances of getting the AIDS virus by using a condom every time they have sex?' and 'Can people reduce their chances of getting the AIDS virus by having just one uninfected sex partner who has no other partners?'), rejecting of two common local misconceptions about HIV transmission ('Can people get the AIDS virus from mosquito bites?' and 'Can people get the AIDS virus by sharing food with a person who has AIDS?') and acknowledging that a healthy looking person can have HIV ('Is it possible for a healthy looking person to have the AIDS virus?' (UNICEF, n.d). The variable is measured on a scale of 1-5, with higher scores indicating greater HIV knowledge. Antenatal care information was obtained from women who had given birth within the last 5 years, with questions focusing on the most recent birth (Central Statistical Office [Zambia], 2014).

Statistical Analysis

Descriptive statistics were compared by gender and by HIV testing status. Chi-square tests were used to assess categorical variables and were described using frequencies and percentages. Logistic regression and independent sample t-tests were used to assess continuous variables and were presented using means and standard deviations. Multivariate logistic regression was performed to assess the factors associated HIV testing uptake. Significant bivariate associations were entered into the regression model which adjusted for

the effects of place of residence, wealth index, education and ever heard of AIDS. Statistical significance was set at $p<0.05$ and all data analysis were performed using SPSS version 22 (IBM corp., Armonk, NY, USA).

Ethical approval

DHS surveys are approved by ICF International's Institutional Review Board and permission to access the data was obtained from the DHS. Additionally, this secondary data analysis was reviewed and approved by University College London's Research Ethics Committee [13329/001].

Results

The study sample consisted of 7030 adolescents with an average age of 17. Females made up 52.4% of the sample. About half of the sample (51.4%) lived in rural areas. Most of the participants were from the richest index (24.7%) and 58% attended secondary or higher education. The average age at first sex was 15 (SD=1.78) and over half of the sample (62.3%) reported having had no sexual partners over the last 12 months. The average HIV knowledge score was 4.05 (SD=1.03) and 58% reported never testing for HIV. Gender was significantly associated with place of residence, education, wealth index, marital status and number of sex partners and there were significant differences in number of sex partners, age at first sex and HIV knowledge between male and female respondents. These results are presented in Table 2.

Uptake of HIV testing

Overall 42% of the sample reported testing for HIV at least once in their lives and 56.8% among those who reported having had sex. Table 3 presents the results of the associations between sociodemographic, sexual reproductive health and HIV-related variables and HIV testing uptake. HIV testing was significantly associated with place of residence, gender, education, wealth index, number of sex partners, marital status, suspected STI history, ever heard of AIDS, and knowing a place to get an HIV test. Those living in urban areas (44.6%) reported a greater proportion of testing than those living in rural areas (39.5%) [$X^2(1)=18.69$, $p<0.001$]. Less males (33.4%) reported HIV testing compared to females (49.8) [$X^2(1)=192.97$, $p<0.001$]. Those with secondary or higher education (48.3%) had a greater proportion of respondent's reporting HIV testing than those with primary (33.3%) and no education (32.5%) [$X^2(2)=157.26$, $p<0.001$]. Those in higher wealth indexes were more likely

to test for HIV compared to those in lower indexes [$X^2(4)=16.53$, $p<0.001$]. For instance, respondents in the richer index (45.9%) reported a greater proportion of HIV testing than those in the poorer wealth index (38.8%). Those reporting one sexual partner (59.9%) over the last 12 months had a greater proportion of HIV testing compared to those reporting none (32.1%) or two or more (46.6%) [$X^2(2)=484.44$, $p<0.001$]. Those currently in a union/living with a man or woman (84.2%) and those formally in a union/lived with a man or woman (82.3%) had a greater proportion of HIV testing than those who were never in a union/lived with a man or woman (37.6%) [$X^2(2)=533.65$, $p<0.001$]. Those with a suspected STI (57.1%) reported more testing than those without (41.7%) [$X^2(1)=14.14$, $p<0.001$] and of those who had heard of AIDS, 42.6% had tested for HIV [$p<0.001$] and of those who knew a place to get an HIV test 46.9% had tested for HIV [$p<0.001$]. Additionally, HIV testing was also significantly associated with age (OR=1.56; 1.50-1.62, $p<0.001$), age at first sex (OR=1.09; 1.08-1.10, $p<0.001$), number of sex partners (OR=1.85; 1.70-2.00, $p<0.001$) and HIV knowledge (OR=1.19; 1.13-1.25, $p<0.001$).

There were also significant differences in age, age at first sex, number of sex partners and HIV knowledge between adolescents who had tested for HIV and those who did not. Those who tested for HIV tended to be older (M=17.50, SD=1.330) than those who did not (M=16.67, SD=1.354) ($t(7026)=-25.629$, $p<0.001$); had their first sexual intercourse at an older age (M=15.22, SD=1.746) than those that had not tested (M=14.91, SD=1.820) ($t(3512)=-5.089$, $p<0.001$); reported lower numbers of sexual partners in the last 12 months (M=1.13, SD=0.517) than those who had not tested (M=1.23, SD= 0.830) ($t(1704.64)=3.786$, $p<0.001$) and had higher HIV knowledge scores (M=4.15, SD= 0.965) compared to those who had not tested for HIV (M=3.97, SD= 1.076) ($t(6614.817)= -7.268$, $p<0.001$). These results are presented in Table 4.

Testing for HIV as part of ANC was significantly associated with education, place of residence, wealth index and number of sex partners in the last 12 months. There were also significant differences in HIV knowledge between those who were tested as part of ANC and those who were not. These results are presented in Table 5.

Results from the multivariate model suggest that HIV testing uptake is significantly associated with gender, age, education, age at first sex, marital status and HIV knowledge. Females had higher odds of testing for HIV than males [aOR=2.844; 95%CI: 2.411-3.355; $p<0.001$]. As the age of a respondent increased so did their odds of testing [aOR=1.388;

95%CI: 1.299-1.482; p<0.001]. Respondents with primary education [aOR=2.202; 95%CI: 1.283-3.779; p=0.004] and secondary or higher education [aOR=4.142; 95%CI: 2.388-7.186; p<0.001] had higher odds of testing than those with no education. As the age at first sex of respondents increased so did their odds of testing [aOR=0.897; 95%CI: 0.856-0.941; p<0.001]. Respondents who were currently in a union or living with a man or woman [aOR=3.804; 95%CI: 2.876-5.031; p<0.001] and respondents who were formerly in a union or living with a man or woman [aOR=3.776; 95%CI: 1.743-8.183; p=0.001] had higher odds of testing than those who were never married or lived with a man or woman. As the score of participants on the HIV index increased so did their odds of testing [aOR=1.136; 95%CI: 1.048-1.230; p=0.002].These results are presented in Table 6.

A sub-analysis was conducted on 3,516 participants who reported having had sex to assess factors associated with uptake of testing among this group as being sexually active is an acknowledged risk factor for HIV. Among those reporting having had sex 17.49 was the average age, 15.09 was the average age at first sex and 65.7% reported having one sexual partner in the last 12 months. The multivariate model found that age, gender, education, marital status, age at first sex and HIV knowledge remained significantly associated with HIV testing uptake within this sub-sample. As the age of a respondent increased so did their odds of testing [aOR=1.388; 95%CI: 1.299-1.482; p<0.001]. Sexually active females had higher odds of testing than sexually active males [aOR=2.844; 95%CI: 2.411-3.355; p<0.001]. Respondents with primary education [aOR=2.202; 95%CI: 1.283-3.779; p=0.004] and secondary and higher education [aOR=4.142; 95%CI: 2.388-7.186; p<0.001] had higher odds of testing than those with no education. As the age at first sex of a respondent increased so did their odds of testing [aOR=0.897; 95%CI: 0.856-0.941; p<0.001]. Respondents who were currently in a union or living with a man or woman [aOR=3.804; 95%CI: 2.876-5.031; p<0.001] and respondents who were formerly in a union or living with a man or woman [aOR=3.776; 95%CI: 1.743-8.183; p=0.001] had higher odds of testing than those who were never married or lived with a man or woman. As the score of participants on the HIV index increased so did their odds of testing [aOR=1.136; 95%CI: 1.048-1.230; p=0.002]. These results are presented in Table 7.

Discussion

Less than half of the sample (42%) reported having ever tested for HIV, which is below the UNAIDS 90% target but progress is being made. Our study found that gender, age,

education, age at first sex, marital status and HIV knowledge were significantly associated with uptake of HIV testing. Females had higher odds of testing than males. This finding is consistent with findings from similar studies in Sub-Saharan Africa (Asaolu et al., 2016; Gazimbi & Magadi, 2017; Sanga, Kapanda, Msuya, & Mwangi, 2015; Ssebunya et al., 2018). Higher rates of testing in females could be explained by routine testing offered as part of ANC visits (Asaolu et al., 2016; Gazimbi & Magadi, 2017; Mahande, Phimemon, & Ramadhani, 2016). For instance, a study based in Congo, Mozambique, Nigeria and Uganda found that 60.7% of females were tested as part of ANC (Gunn et al., 2016) and in this sample, 20% of females reported having been tested for HIV as part of ANC. Testing as part of ANC is an important avenue for HIV testing for women. However, more has to be done to increase testing uptake among males as studies have shown that in addition to having lower rates of testing uptake, they also tend to access treatment at later stages of disease progression and experience higher rates of mortality (Hensen, Taoka, Lewis, Weiss, & Hargreaves, 2014; Takarinda et al., 2016). Reaching out to male partners at antenatal care sites may be a strategy to improve testing uptake among males.

Older adolescents had higher odds of testing than younger adolescents. This confirms findings from other studies that found increasing age associated with testing. Possible explanations include older adolescents being more knowledgeable about the risks and importance of testing, especially since they are more likely to be sexually active or have more sexual experience than younger adolescents and age of consent to testing laws (Nwachukwu & Odimegwu, 2011; Ssebunya et al., 2018). Additionally, older adolescents may be more likely to be pregnant and thus in contact with the HIV testing provision in antenatal care. Similarly, having first sexual intercourse at an older age was also associated with testing. This confirms similar findings in other studies (Asaolu et al., 2016; Mandiwa & Namondwe, 2019). Possible explanations include sexual maturity and experience and greater knowledge. However, it also highlights the specific loss to testing of the younger adolescents with less knowledge and experience. To encourage adolescent HIV testing uptake, Age of consent to HTC laws should be examined, and lowering the age to test without parental consent considered. In Zambia the current age of consent to HTC is 16 (Ministry of Health Zambia, 2011). However, some countries are lowering the age of consent to HTC or removing it all together. For instance, South Africa, Lesotho and Uganda have lowered the age of consent to HTC to 12 years old (Fox et al., 2013).

Currently being in a union or cohabiting and formerly being in a union or cohabiting was associated with testing, with those who were never in a union or cohabited having lower odds of testing. Other studies have found similar findings among married individuals or those who were formally married (Mahande et al., 2016; Venkatesh et al., 2011). Possible explanations include those who were never married or cohabited having lower perceptions of risk (Gazimbi & Magadi, 2017), possibly due to testing communication/messaging and those who are currently in unions/cohabiting and formerly in unions/cohabiting having opportunities to test through ANC (Theuring et al., 2009). It could also demonstrate the success of couples counselling interventions (Matovu et al., 2005). However, it is important that adolescents who have never been in a union and/or cohabited are reached with the message that testing for HIV is for all. Using increasingly widespread communication strategies, e.g. social media/mobile communication to target adolescents could increase HIV testing uptake in this population (Ssebunya et al., 2018).

Education was associated with testing, with respondents with no education having lower odds of testing than those with primary or secondary or higher education. This confirms findings from similar studies finding increasing education positively associated with testing (Isingo et al., 2012; Mahande et al., 2016; Obermeyer et al., 2013). Possible explanations include those with more education being more knowledgeable about HIV and/or having better access to health information and services (Gazimbi & Magadi, 2017; Muyunda, Musonda, Mee, Todd, & Michelo, 2018).

Individuals with greater HIV knowledge had higher odds of testing. This confirms findings from other studies illustrating the importance of HIV testing (Gunn et al., 2016; Ssebunya et al., 2018). However, many youth lack correct knowledge of HIV. Surveys from countries with generalized epidemics found that less than 50% of older adolescents (aged 15-19) had a basic understanding of HIV (Idele et al., 2014). DHS knowledge measures are limited as the questions do not ask about diagnosis or causation, largely ignore other modes of transmission and do not differentiate between HIV and AIDS which can perpetuate incorrect information and conflation of the two. Current efforts to improve HIV knowledge among adolescents must be scaled up in order to increase HIV testing uptake in this population, e.g. health education in schools, media campaigns/messaging, peer education interventions, etc.

The factors associated with HIV testing uptake were similar for the full sample and for those who had experienced sex - who may be considered at specific risk. However, it is narrow to

only focus on those who have had sex as it excludes individuals who are infected through other means, e.g. MTCT, drug use, etc. Also, sexual activity may be underreported in this sample. It is also imperative that adolescents who have not had sex are specifically targeted for HIV testing due to the potential for perinatal exposure (Ssebunya et al., 2018).

It was evident in this study that HIV testing as part of ANC is an important point of access to testing. In this sample 20% of females reported testing as part of ANC visits, illustrating the successes of routine HIV testing during ANC.

This study has a few limitations. It is cross-sectional so causality cannot be assessed and relies on self-report data which is subject to recall and social-desirability bias. The data is confined to the last DHS round (2014) and current testing patterns of older adolescents may have evolved. However at the time of analysis it was the most recent available data (Asaolu et al., 2016) and provides a countrywide representative sample. The analysis is unweighted therefore the results may not be truly representative at the national level (unweighted analysis similar results). The standard DHS dataset does not provide respondent HIV status therefore, the relationship between the factors associated with testing uptake and HIV status could not be determined.

Despite its limitations our study adds to the literature on the determinants of HIV testing among adolescents, confirms similar findings from other studies and expands the literature from Sub-Saharan Africa. It highlights the importance of increasing testing rates among adolescents, as less than half of the sample reported testing for HIV which is below the UNAIDS 90-90-90 treatment goals and increasing male testing. It also emphasizes the importance of increasing testing among never married or cohabiting individuals, as HIV testing is important for all. And it demonstrates the importance of HIV knowledge and scaling up efforts to educate youth. More research is needed into the barriers to HIV testing and how they operate in order to develop targeted interventions to increase testing among adolescents. Adolescents face unique barriers and have different needs to other populations and it is important that interventions reflect that (Mannell et al., 2019; Wong et al., 2017).

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The authors declare that they have no competing interests.

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List of tables

Table 1: Variables and measurement

Variable	**Type of measurement/ response categories**
Socio-demographic variables	
Gender	Male/Female
Age	Numerical
Place of residence	Urban/Rural
Education attained	None/Primary/Secondary/Higher
Wealth Index	Poorest/Poorer/Middle/Richer/Richest
Marital status	Never in union/Currently in union/Formerly in union
Sexual behavior/health measures	
Age at first sex	Numerical
Number of sex partners	None/1/2 or more
Suspected STI	No/Yes
HIV-related measures	
Ever heard of AIDS	No/Yes
Knowledge of a place to test	No/Yes
Ever tested for HIV	No/Yes
HIV knowledge	Score (out of 5)
Antenatal variable	
HIV test as part of ANC visit	No/Yes

Table 2: Associations between respondent characteristics and gender

	Total N (%)	Female		Male		
		n	% [col %]	n	% [col %]	p-value
Place of Residence						0.006*
Urban	3419 (48.6)	1850	54.1 [50.2]	1569	45.9 [46.9]	
Rural	3611 (51.4)	1836	50.8 [49.8]	1775	49.2 [53.1]	
Education attained						
None	120 (1.7)	69	57.5 [1.9]	51	42.5 [1.5]	0.017*
Primary	2811 (40)	1418	50.4 [38.5]	1393	49.6 [41.7]	
Secondary or higher	4094 (58.2)	2197	53.7 [59.6]	1897	46.3 [56.8]	
Wealth Index						0.003*
Poorest	957 (13.6)	540	56.4 [14.7]	417	43.6 [12.5]	
Poorer	1204 (17.1)	603	50.1 [16.4]	601	49.9 [18]	
Middle	1557 (22.1)	772	49.6 [20.9]	785	50.4 [23.5]	
Richer	1574 (22.4)	830	52.7 [22.5]	744	47.3 [22.2]	
Richest	1738 (24.7)	941	54.1 [25.5]	797	45.9 [23.8]	
Marital status						
Never in union	6362 (90.5)	3058	48.1 [83]	3304	51.9 [98.8]	<0.001*

Currently in union/living with a man or woman	606 (8.6)	572	94.4 [15.5]	34	5.6 [1]	
Formerly in union/living with a man or woman	62 (0.9)	56	90.3 [1.5]	6	9.7 [0.2]	
Sex partners (last 12 months)						<0.001*
None	4378 (62.3)	2200	50.3 [59.7]	2178	49.7 [65.2]	
1	2336 (33.3)	1422	60.9 [38.6]	914	39.1 [27.3]	
2+	313 (4.5)	63	20.1 [1.7]	250	79.9 [7.5]	
Suspected STI History						0.319
Yes	147 (2.1)	83	56.5 [2.3]	64	43.5 [1.9]	
No	6824 (97.9)	3570	52.3 [97.7]	3254	47.7 [98.1]	
Ever heard of AIDS						0.115
Yes	6934 (98.6)	3628	52.3 [98.4]	3306	47.7 [98.9]	
No	96 (1.4)	58	60.4 [1.6]	38	39.6 [1.1]	
Know a place to get an HIV test						0.098
Yes	6299 (89.6)	3317	52.7 [91.5]	2982	47.3 [90.3]	
No	630 (9)	310	49.2 [8.5]	320	50.8 [9.7]	
Ever tested for HIV						<0.001*
Yes	2953 (42)	1835	62.1 [49.8]	1118	37.9 [33.4]	
No	4075 (58)	1849	45.4 [50.2]	2226	54.6 [66.6]	
	Total		**Female**		**Male**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Age	17.02	1.405	17.01	1.422	17.03	1.387	0.598

Age at first sex[a]	15.09	1.784	15.42	1.539	14.73	1.957	<0.001*
Number of sex partners[b]	1.17	0.668	1.05	0.254	1.33	0.942	<0.001*
HIV Knowledge 5-item score	4.05	1.034	4.01	1.064	4.09	0.999	0.003*

Table 3: Uptake of HIV testing and respondent characteristics

	Tested		Untested		
	n	**% [col %]**	**n**	**% [col %]**	**p-value**
Gender					<0.001*
Female	1835	49.8 [62.1]	1849	50.2 [45.4]	
Male	1118	33.4 [37.9]	2226	66.6 [54.6]	
Place of Residence					<0.001*
Urban	1526	44.6 [51.7]	1893	55.4 [46.5]	
Rural	1427	39.5 [48.3]	2182	60.5 [53.5]	
Education attained					<0.001*
None	39	32.5 [1.3]	81	67.5 [2]	
Primary	936	33.3 [31.7]	1873	66.7 [46]	
Secondary or higher	1976	48.3 [67]	2118	51.7 [52]	
Wealth Index					0.002*
Poorest	391	40.9 [13.2]	566	59.1 [13.9]	
Poorer	467	38.8 [15.8]	736	61.2 [18.1]	
Middle	635	40.8 [21.5]	921	59.2 [22.6]	
Richer	723	45.9 [24.5]	851	54.1 [20.9]	
Richest	737	42.4 [25]	1001	57.6 [24.6]	
Marital status					<0.001*
Never in union	2392	37.6 [81]	3968	62.4 [97.4]	
Currently in union/cohabiting	510	84.2 [17.3]	96	15.8 [2.4]	
Formerly in union/cohabiting	51	82.3 [1.7]	11	17.7 [0.3]	
Sex partners (last 12 months)					<0.001*

	Tested		Untested		
	n	**% [col %]**	**n**	**% [col %]**	**p-value**
None	1407	32.1 [47.7]	2971	67.9 [72.9]	
1	1398	59.9 [47.4]	936	40.1 [23]	
2+	146	46.6 [4.9]	167	53.4 [4.1]	
Suspected STI History					<0.001*
Yes	84	57.1 [2.9]	63	42.9 [1.6]	
No	2843	41.7 [97.1]	3979	58.3 [98.4]	
Ever heard of AIDS[a]					<0.001*
Yes	2953	42.6 [100]	3979	57.4 [97.6]	
No	0	0 [0]	96	100 [2.4]	
Know a place to get an HIV test[a]					<0.001*
Yes	2953	46.9 [100]	3345	53.1 [84.2]	
No	0	0 [0]	630	100 [15.8]	

Notes:

[a]Fisher's exact test result

*significant results at a level <.05

Table 4: Associations between testing uptake and respondent characteristics

	Total		Tested		Untested		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Age	17.02	1.41	17.50	1.330	16.67	1.354	<0.001 *
Age at first sex[a]	15.09	7.65	15.22	1.746	14.91	1.820	<0.001 *
Number of sex partners[b]	1.17	0.668	1.13	0.517	1.23	0.830	<0.001 *
HIV Knowledge 5-item score	4.05	1.03	4.15	0.965	3.97	1.076	<0.001 *

Notes:

[a] Excludes those who had not had sex for accurate mean calculation

[b] Excludes those who reported no sex partners for accurate mean calculation

Table 5: Associations between ANC testing and respondent characteristics

	Total	Tested for HIV		Not tested for HIV		
	n (%)	n	% [col%]	n	%[col%]	p-value
Place of Residence						0.004*
Urban	301 (37.6)	291	96.7 [39]	10	3.3 [18.9]	
Rural	499 (62.4)	456	91.4 [61]	43	8.6 [81.1]	
Education attained						<0.001*
None	31 (3.9)	23	74.2 [3.1]	8	25.8 [15.1]	
Primary	375 (46.9)	342	91.2 [45.8]	33	8.8 [62.3]	
Secondary or higher	393 (49.2)	381	96.9 [51.1]	12	3.1 [22.6]	
Wealth Index						0.015*
Poorest	191 (23.9)	172	90.1 [23.0]	19	9.9 [35.8]	
Poorer	174 (21.8)	158	90.8 [21.2]	16	9.2 [30.2]	
Middle	197 (24.6)	185	93.9 [24.8]	12	6.1 [22.6]	
Richer	168 (21)	165	98.2 [22.1]	3	1.8 [5.7]	
Richest	70 (8.8)	67	95.7 [9.0]	3	4.3 [5.7]	
Marital status						0.107
Never in union	364 (45.5)	347	95.3 [46.5]	17	4.7 [32.1]	
Currently in union/living with a man	398 (49.8)	366	92 [49]	32	8 [60.4]	
Formerly in union/living with man	38 (4.8)	34	89.5 [4.6]	4	10.5 [7.5]	
Sex partners (last 12 months)						0.028*
None	177 (22.2)	173	97.7 [23.3]	4	2.3 [7.5]	
1	613 (76.7)	565	92.2 [75.7]	48	7.8 [90.6]	

2+	9 (1.1)	8	88.9 [1.1]	1	11.1 [1.9]	
Suspected STI[a]						0.263
Yes	32 (4)	32	100 [4.3]	0	0 [0]	
No	762 (96)	709	93 [95.7]	53	7 [100]	
Know a place to test for HIV[a]						<0.001*
Yes	793 (99.1)	747	94.2 [100]	46	5.8 [86.8]	
No	7 (0.9)	0	0 [0]	7	100 [13.2]	

	Total		**Tested for HIV**		**Not tested for HIV**		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p-value**
Age	17.01	1.422	18.06	1.060	18.11	0.974	0.711
Age at first sex[b]	15.42	1.539	15.32	1.378	15.20	1.2	0.518
Number of sex partners[c]	1.05	0.254	0.78	0.440	0.94	0.305	0.717
HIV Knowledge 5-item score	4.01	1.064	3.95	1.050	3.64	1.076	0.04*

Notes:

[a]Fisher's exact test results

[b] Excludes those who had not had sex for accurate mean calculation

[c]Excludes those who reported no sex partners for accurate mean calculation

*significant results at a level <.05

Table 6: Factors associated with HIV testing uptake

	aOR (95% CI)	p-value
Age	1.388 (1.299-1.482)	<0.001*
Sex		
Male	Ref	
Female	2.844 (2.411-3.355)	<0.001*
Place of residence		
Urban	Ref	
Rural	0.846 (0.698-1.027)	0.90
Education		
None	Ref	
Primary	2.202 (1.283-3.779)	0.004*
Secondary or higher	4.142 (2.388-7.186)	<0.001*
Wealth Index		
Poorest	Ref	
Poorer	0.967 (0.744-1.256)	0.799
Middle	0.924 (0.714-1.196)	0.548
Richer	1.007 (0.755-1.343)	0.961
Richest	0.948 (0.681-1.320)	0.753
Marital status		
Never in union	Ref	
Currently in union/living with man or woman	3.804 (2.876-5.031)	<0.001*
Formerly in union/living with a man or woman	3.776 (1.743-8.183)	0.001*

Age at first sex[a]	0.897 (0.856-0.941)	<0.001*
Number of sex partners	0.971 (0.883-1.067)	0.534
Suspected STI		
No	Ref	
Yes	0.961 (0.659-1.402)	0.838
HIV knowledge	1.136 (1.048-1.230)	0.002*

Notes:

Adjusted multivariate logistic regression model controls for the effects of place of residence, wealth index, education and ever heard of AIDS.

[a] Excludes those who had not had sex

*Significant results at a level <.05

Table 7: Factors associated with HIV testing uptake among those who have had sex

	aOR (95% CI)	**p-value**
Age	1.388 (1.299-1.482)	<0.001*
Sex		
Male	Ref	
Female	2.844 (2.411-3.355)	<0.001*
Place of residence		
Urban	Ref	
Rural	0.846 (0.698-1.027)	0.09
Education		
None	Ref	
Primary	2.202 (1.283-3.779)	0.004*
Secondary or higher	4.142 (2.388-7.186)	<0.001*
Wealth Index		
Poorest	Ref	
Poorer	0.967 (0.744-1.256)	0.799
Middle	0.924 (0.714-1.196)	0.548
Richer	1.007 (0.755-1.343)	0.961
Richest	0.948 (0.681-1.320)	0.753
Marital status		
Never in union	Ref	
Currently in union/living with man or woman	3.804 (2.876- 5.031)	<0.001*
Formerly in union/living with a man or woman	3.776 (1.743-8.183)	0.001*

Age at first sex	0.897 (0.856-0.941)	<0.001*
Number of sex partners	0.971 (0.883-1.067)	0.534
Suspected STI		
No	Ref	
Yes	0.961 (0.659-1.402)	0.838
HIV knowledge	1.136 (1.048-1.230)	0.002*

Notes:

Adjusted multivariate logistic regression model controls for the effects of place of residence, wealth index, education and ever heard of AIDS.

*Significant results at a level <.05