

BMJ Open HIV testing uptake and determinants among adolescents and young people in Burundi: a cross-sectional analysis of the Demographic and Health Survey 2016–2017

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To cite: Nshimirimana C, Vuylsteke B, Smekens T, *et al.* HIV testing uptake and determinants among adolescents and young people in Burundi: a cross-sectional analysis of the Demographic and Health Survey 2016–2017. *BMJ Open* 2022;**12**:e064052. doi:10.1136/bmjopen-2022-064052

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-064052>).

Received 21 April 2022
Accepted 04 October 2022



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ABSTRACT

Objectives To assess HIV testing uptake and its determinants among adolescents and young adults.

Design Cross-sectional design involving analysis of 2016 Demographic and Health Survey data.

Setting Nationally representative survey of Burundi.

Participants A total of 7218 young women and 2860 young men were included.

Primary and secondary outcome We estimated the proportion of adolescent (15–19 years) and young adult (20–24 years) women and men who had tested for HIV and received results in the 12 months preceding the survey. Multivariable logistic models for determining predictors of HIV testing uptake were fitted among respondents aged 15–24 regardless of sexual activity in the 12 months before the survey and separately among a subset that reporting having had sex in the 12 months preceding the survey.

Results An estimated 27.1% (95% CI 25.8% to 28.4%) women and 16.6% (95% CI 15.1% to 18.1%) men had tested for HIV and received results in the 12 months preceding the survey. The proportion was more than twice as high among those aged 20–24 years compared with 15–19 years, among both sexes. In multivariable analysis, older age (20–24 years) was associated with HIV testing (adjusted OR (aOR): 1.62, 95% CI 1.38 to 1.91) among women; (aOR: 1.78, 95% CI 1.32 to 2.40) among men. Higher educational level (aOR: 1.40, 95% CI 1.11 to 1.76) was significantly associated with HIV testing uptake among women. Male circumcision status, condom use, number of sex partners, history of STIs were not associated with HIV testing among the subset that reported having had sex in the 12 months preceding the survey.

Conclusion Despite the interventions implemented to reach the 90–90–90 UNAIDS goals, HIV testing among youth in Burundi was low. Youth-friendly health centres should be part of strategies to stimulate young people to increase uptake of HIV preventive services in Burundi.

BACKGROUND

Low-income and middle-income countries continue to carry a disproportionate burden of the HIV epidemic.¹ Sub-Saharan Africa (SSA) was home to 71% of all people living

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study used recent nationally representative data from Burundi.
- ⇒ The analysis was conducted both in the whole sample and among a subset reporting having had sex in the 12 months preceding the survey.
- ⇒ The study was limited by the variables that were collected in the Demographic and Health Survey 2016–2017.
- ⇒ Due to the cross-sectional nature of the study design, we cannot draw conclusions about temporality and causality.
- ⇒ The responses to the questions were self-reported and might be affected by social desirability bias.

with HIV (20.1 million), 75% of AIDS-related deaths and 65% of new infections occurred in this region in 2017.² Among the 3.9 million young people living with HIV worldwide, 78% were living in SSA.³ An estimated 37% of new HIV infections were among adolescents and young adults (15–24 years) in SSA. Young women in the countries with a high burden of HIV infection are twice as likely as young men to acquire HIV infection.⁴

HIV testing is key to ensuring people are diagnosed, start treatment early and receive social support. HIV testing is also the main strategy for reducing HIV-related illnesses and deaths, and new infection transmission. In addition, the success of the prevention of mother-to-child transmission (PMTCT) programme has been highlighting the role of the HIV testing service uptake in reducing HIV infection rates among children.^{5,6} Finally, a well-functioning HIV testing service ensures that people who are HIV negative are linked to effective prevention services.⁷

Since 2000, significant progress has been made in HIV testing coverage following strategies such as routine HIV counselling and

testing in health centres, provider-initiated HIV testing and counselling, expansion of HIV testing to all patients in health facilities, integration of HIV testing into antenatal care (ANC) and HIV self-testing. According to a modelling study, the proportion of individuals ever tested increased from 3.6% in 2000, through 30% in 2015 to 41% in 2017 among people aged 15 years or older in SSA.⁸

However, young people aged 15–24 years are still lagging behind.⁸ Only 25% of girls and 17% boys aged 15–19 years living in Eastern and Southern Africa know their HIV status, which makes it difficult to reach the 90-90-90 targets. The targets aimed that 90% of people should know their HIV status, 90% of people with a positive test should start antiretroviral therapy (ART) and 90% of people on ART should have suppressed viral load.⁹ Burundi is a country in SSA with a population of 10.8 million in 2017.¹⁰ Half of its population is under 17 years and two-thirds under 24 years, meaning that 2.3 million people were 15–24 years.

Burundi's HIV epidemic is characterised by a relatively low prevalence (0.9%) in the adult population (15–49 years) with considerable disparities by region, age group, gender and marital status.¹¹ Women are twice as likely to be infected than men (1.2% and 0.6%, respectively).¹¹ Higher HIV prevalence is observed among widowed people (8.2%) compared with those never married (0.5%) and currently married (0.9%). People living in rural areas (0.7%) are less likely to be HIV positive than those living in urban areas (2.5%). In addition, HIV prevalence is higher in the provinces of Bujumbura Mairie (2.6%), Gitega (2.0%), Mwaro (1.9%), Rumonge (1.2%), Kirundo (1.1%) and below or equal to the national average in other regions. Among young people aged 15–24, the prevalence of HIV infection among females is triple compared with the males (0.3% vs 0.1%).¹¹

In 2017, an estimated 25% of new infections were among young people aged 15–24 years.¹² Furthermore, annual statistics from 2019 showed 168 and 963 newly diagnosed infections among boys aged 15–19 years and among men aged 20–24 years, respectively, compared with 563 and 2089 new infections among girls aged 15–19 years and women aged 20–24 years, respectively.¹³ HIV testing interventions for young people have been prioritised in Burundi. The National Strategic Framework Plan 2012–2016 aimed at increasing HIV testing coverage among young people to 85%.¹⁴ In addition, the beneficiary-initiated or provider-initiated HIV counselling and testing is recommended for youth who seek care in health centres. Furthermore, community-based HIV testing and HIV self-testing strategies have been available since 2016 for adolescents and young adults from key populations (men who have sex with men, people who inject drugs, female sex workers) and for youth who do not routinely use health services or do not want to be tested at a health facility.¹⁵ Despite these efforts, only 27.3% of young people (15–24 years) reported to know their HIV status in 2017.¹¹ Understanding the predictors of HIV testing in this age group could support the national HIV

programme to update the current health policy for youth in order to increase HIV testing coverage.

The objective of this study was to estimate recent HIV testing uptake among men and women aged 15–24 years old in Burundi and to examine its determinants.

METHODS

Study design and data

This cross-sectional study used data from the Burundi Demographic and Health Survey (DHS) collected in 2016–2017. The Burundi DHS is a nationally representative household survey implemented by the National Institute of Statistics and Economics Studies (ISTEEBU), aiming to provide basic demographic and health indicators at the national and provincial levels. It used a stratified two-stage cluster sampling approach. A representative sample of 16 620 households was selected and from these households, 17 475 women aged 15–49 years and 7736 men aged 15–59 years were eligible for the individual interview. HIV/sexually transmitted infection (STI)-related data on the knowledge, attitudes and behaviour were collected.¹¹

Population

We included all female and male respondents aged 15–24 years at the time of survey, living in sampled households and who agreed to be interviewed.

Definitions

The outcome was defined as the respondent reporting having been tested for HIV in the 12 months preceding the survey and having received test results. The term 'recent testing' was used as a synonym for the main outcome.

The conceptual and analytical framework used to identify different determinants was based on Andersen's Behavioural Model of health services utilisation,¹⁶ previously applied to the study of HIV-related behaviours.^{17–19} The model included individual, societal and health system levels of analysis for studying health services use and its determinants.^{16 20 21} Our study focused on the first level to analyse determinants of HIV testing among youth in Burundi, with three components: (1) predisposing factors such as age and marital status; (2) enabling factors that would increase the opportunities for accessing HIV testing services, including wealth, being covered by health insurance or living in an urban area and (3) perceived need factors which affect (negatively or positively) an individual's care-seeking behaviour, such as the respondent's discriminatory attitudes towards people living with HIV and being sexually active. [Figure 1](#) shows the variables captured on the Burundi DHS according to this theoretical framework (the definitions of the variables are detailed in online supplemental table 1). Some variables were only available among a subset of the population who reported ever having had sex or having had sex in the 12 months preceding the survey.

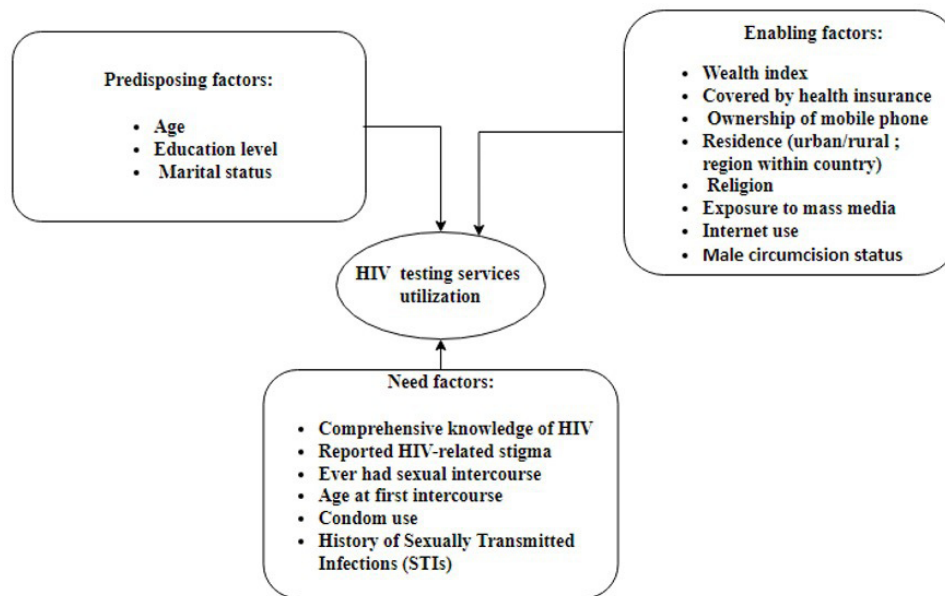


Figure 1 Adapted Anderson's behavioural model of HIV testing services utilisation among youth in Burundi.

Statistical analysis

We described the distribution of key variables in the sample, stratified by sex, using frequencies and percentages with 95% CIs. Next, we estimated recent HIV testing coverage (among respondents age 15–24 regardless of sexual activity in the 12 months before the survey and separately among a subset reporting having had sex in the 12 months preceding the survey).

Logistic regression was used to examine determinants of recent HIV testing, separately for males and females. We present two models: respondents age 15–24 regardless of sexual activity in the 12 months before the survey and a subset of those who reported having had sex in the 12 months before the survey, for whom additional variables were available. After conducting bivariate analysis and checking multicollinearity among the variables using variance inflation factor, all a priori variables of interest (age, education level, wealth index, marital status, residence, region, religion and covered by health insurance) and those associated with the outcome at $p < 0.05$ in bivariate association were included in adjusted logistic regression models. All analyses were conducted in R package V.0.5.²² We adjusted for clustering, stratification and individual sampling weight.

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

We included 7218 females and 2860 males aged 15–24 years in this study. [Table 1](#) shows the background characteristics of the sample. Adolescents (15–19 years) comprised slightly more than half of each group (54.3% of females and 58.8% of males). An estimated 93.0% of

females declared ever having heard of HIV and 85.9% among them knew a place to get an HIV test; this was 97.1% and 79.8% of males, respectively. An estimated 37.3% of females and 28.8% of males reported ever having had sex, and among them, 80.9% ($n=2066$) of females and 54.3% ($n=426$) of males reported having been sexually active in the 12 months before the survey. Among the latter, condom use during the last they had sex was reported by 6.7% of females and 24.3% of males. An estimated 10.1% of females and 8.6% of males reported ever heard of HIV self-test kits, and 52.4% of females and 54.9% of males demonstrated a comprehensive knowledge of HIV. Respondents with discriminatory attitudes towards people living with HIV disagreed that children with HIV should be allowed to attend school with children without HIV or that they would not buy vegetables from a vendor with HIV. This proportion was 26.5% of the females and 23.9% of males in the 15–24 years sample. We assessed stigma by asking if they think that people hesitate to take an HIV test because they are afraid of how other people will react to a positive result. The proportion that said 'yes' was 75.1% of females and 73.1% of males.

The proportion of respondents who reported having been tested for HIV in the 12 months preceding the survey and having received the result was 27.1% (95% CI 25.8% to 28.4%) among females and 16.6% (95% CI 15.1% to 18.1%) among males ([table 2](#)). The percentage was more than twice as high among those aged 20–24 years compared with 15–19 years, of both sexes. The HIV testing uptake was higher among females and males who were ever married or cohabiting: 53.1% and 43.1% vs 17.1% and 14.0% among those who were never married or cohabiting, for females and males, respectively. The HIV testing coverage was estimated at 13.5% of females and 11.7% of males among those who never had sexual intercourse. Among respondents who reported ever having

Table 1 Respondents characteristics of adolescents and young women (n=7218) and men (n=2860), Burundi DHS 2016–2017

	Women			Men		
	n	%	95% CI	n	%	95% CI
Age group (years)						
15–19	3968	54.3	53.0 to 55.6	1674	58.8	56.4 to 61.1
20–24	3250	45.7	44.4 to 47.0	1186	41.2	38.9 to 43.6
Education level						
No education	957	14.4	13.2 to 15.6	191	7.3	6.1 to 8.5
Primary	2960	43.4	41.7 to 45.1	1321	48.1	45.6 to 50.6
Secondary or higher	3301	42.2	40.2 to 44.2	1348	44.6	42.1 to 47.1
Marital status						
Never married/cohabiting	5358	72.2	70.6 to 73.9	2617	91.1	89.7 to 92.5
Ever married/cohabiting	1860	27.8	26.1 to 29.4	243	8.9	7.5 to 10.3
Wealth index						
Poorest	1059	16.4	14.9 to 17.8	345	13.9	12.0 to 15.8
Poor	1253	19.0	17.6 to 20.4	453	17.6	15.5 to 19.6
Middle	1359	20.5	19.1 to 21.9	506	19.0	16.9 to 21.2
Rich	1441	20.5	18.9 to 22.1	585	22.3	20.0 to 24.5
Richest	2106	23.6	20.6 to 26.6	971	27.3	24.2 to 30.3
Religion						
Catholic	3972	55.5	53.2 to 57.8	1718	61.1	58.3 to 63.9
Protestant	2598	36.2	34.0 to 38.5	835	29.1	26.5 to 31.7
Other	648	8.3	7.1 to 9.5	307	9.7	8.3 to 11.1
Residence						
Urban	1681	14.5	11.4 to 17.6	694	14.3	11.5 to 17.2
Rural	5537	85.5	82.4 to 88.6	2166	85.7	82.8 to 88.5
Region						
Bujumbura Mairie	520	8.5	5.9 to 11.1	203	7.7	5.6 to 9.8
West	1083	15.1	13.6 to 16.7	520	19.5	16.8 to 22.2
North	1683	28.9	27.1 to 30.8	657	27.5	25.0 to 29.9
South	1988	22.7	20.8 to 24.5	768	22.9	20.5 to 25.4
Centre-East	1944	24.7	23.1 to 26.4	712	22.4	20.3 to 24.5
Health insurance coverage						
No	6098	85.2	83.8 to 86.6	2546	89.3	87.6 to 91.0
Yes	1120	14.8	13.4 to 16.2	314	10.7	9.0 to 12.4
Exposure to mass media						
Less than once a week	4680	67.3	65.7 to 69.0	1255	45.1	42.3 to 47.8
Once a week or more	2538	32.7	31.0 to 34.3	1605	54.9	52.2 to 57.7
Frequency of using the internet last month						
Not at all	6798	95.0	93.8 to 96.2	2360	85.2	83.3 to 97.1
At least one time	420	5.0	3.8 to 6.2	500	14.8	12.9 to 16.7
Ownership of a mobile phone						
No	5547	79.0	77.4 to 80.6	1714	62.4	59.9 to 64.9

Continued

Table 1 Continued

	Women			Men		
	n	%	95% CI	n	%	95% CI
Yes	1671	21.0	19.4 to 22.6	1146	37.6	35.1 to 40.1
Circumcised						
No				1527	54.9	52.2 to 57.6
Yes				1333	45.1	42.4 to 47.8
Heard about STIs						
No	436	6.2	5.3 to 7.1	49	1.6	1.0 to 2.1
Yes	6782	93.8	92.9 to 94.7	2811	98.4	97.9 to 99.0
Had history of STIs						
No or don't know	7151	99.0	98.7 to 99.3	2848	99.5	99.2 to 99.9
Yes	67	1.0	0.7 to 1.3	12	0.5	0.1 to 0.8
Ever had sex						
No	4655	62.7	61.1 to 64.2	2058	71.2	69.0 to 73.4
Yes	2563	37.3	35.8 to 38.9	802	28.8	26.6 to 31.0
Age at first sex (years)*						
<15	233	8.6	7.4 to 9.8	229	28.7	25.4 to 32.1
≥15	2330	91.4	90.2 to 92.6	573	71.3	68.0 to 74.6
No of sex partners						
None/never had sex	5152	69.8	68.3 to 71.3	2434	84.4	82.6 to 86.1
One	2041	30.0	28.4 to 31.5	395	14.5	12.9 to 16.2
Two or more	25	0.2	0.1 to 0.4	31	1.1	0.6 to 1.6
Had sex in the 12 months preceding the survey*						
No	497	19.1	17.3 to 20.8	376	45.7	41.4 to 50.1
Yes	2066	80.9	79.2 to 82.7	426	54.3	49.9 to 58.6
No of sex partners in last 12 months if had sex in the 12 months preceding the survey†						
One	2041	99.1	98.8 to 99.5	395	92.9	89.9 to 96.0
Two or more	25	0.9	0.5 to 1.2	31	7.1	4.0 to 10.1
Condom used during last sex with most recent partner‡						
No	1898	93.3	91.8 to 94.8	316	75.7	70.7 to 80.8
Yes	168	6.7	5.2 to 8.2	110	24.3	19.2 to 29.3
During the last 12 months have given gifts or other goods for sex‡						
No				403	94.7	92.4 to 97.0
Yes				23	5.3	3.0 to 7.6
Ever heard of AIDS						
No	488	7.0	6.1 to 7.9	84	2.9	2.2 to 3.6
Yes	6730	93.0	92.1 to 93.9	2776	97.1	96.4 to 97.8
Know a place to get HIV test‡						
No	959	14.1	13.0 to 15.1	544	20.2	18.2 to 22.2
Yes	5771	85.9	84.9 to 87.0	2232	79.8	77.8 to 81.8
Ever heard of HIV self-test kit						
No	6520	89.9	88.7 to 91.1	2621	91.4	90.1 to 92.7
Yes	698	10.1	8.9 to 11.3	239	8.6	7.3 to 9.9
Comprehensive knowledge of HIV/AIDS						
No	3353	47.6	45.9 to 49.2	1259	45.1	42.8 to 47.4

Continued

Table 1 Continued

	Women			Men		
	n	%	95% CI	n	%	95% CI
Yes	3865	52.4	50.8 to 54.1	1601	54.9	52.6 to 57.2
Discriminatory attitudes						
No	5386	73.5	72.0 to 75.0	2192	76.1	74.0 to 78.1
Yes	1832	26.5	25.0 to 28.0	668	23.9	21.9 to 26.0
Reported stigma						
No	1788	24.9	23.5 to 26.2	771	26.9	25.0 to 28.8
Yes	5430	75.1	73.8 to 76.5	2089	73.1	71.2 to 75.0

*The frequency and percentage are restricted to respondents who reported prior sexual intercourse.

†The frequency and percentage are restricted to male respondents who reported having sex partners in the 12 months preceding the survey.

‡The frequency and percentage are restricted to respondents who reported having heard about AIDS.

DHS, Demographic and Health Survey; STI, sexually transmitted infection.

had sex, 49.9% of females and 28.7% of males have been tested of HIV and received results.

Online supplemental table 2 describes HIV testing coverage among a subset of respondents who reported having had sex in the 12 months preceding the survey. The proportion of HIV testing was 53.3% (95% CI 50.9% to 55.6%) of females and 35.0% (95% CI 30.0% to 40.1%) of males. Among adolescents (15–19 years), 50.6% of girls and 22.7% of boys were tested for HIV; this was 53.9% of women and 38.4% of men aged 20–24 years.

Table 3 shows the results of bivariate and multivariable logistic regression models examining determinants of recent HIV testing among females age 15–24 regardless of sexual activity in the 12 months before the survey in the sample. The multivariable model results show that uptake of HIV testing was significantly associated with older age (group 20–24 years compared with 15–19 years, (adjusted OR (aOR): 1.62, 95% CI 1.38 to 1.91)) and higher educational level (aOR: 1.40, 95% CI 1.11 to 1.76). The adjusted odds of a recent HIV test were nearly twice as high in ever married compared with never married women (aOR: 1.89, 95% CI 1.41 to 2.52). Females living in rural areas had 29% lower adjusted odds of reporting a recent HIV test compared with urban residents. Exposure to mass media and ownership of a mobile phone were also associated with higher uptake of HIV testing among females in the adjusted analysis. Household wealth quintile, religion, internet use and discriminatory attitudes towards people with HIV were not associated with HIV testing in the adjusted analysis.

In the adjusted analysis of the subset of females 15–24 years who reported having had sex in the 12 months preceding the survey, age group was no longer significantly associated with HIV testing (online supplemental table 3). Marital status, higher education, exposure to mass media, living in South Burundi (compared with Bujumbura) and reported stigma were the only determinants associated with HIV testing within this subset.

In the multivariable analysis of males aged 15–24 regardless of sexual activity in the 12 months before the survey

shown in table 4, age group 20–24 years was associated with higher odds of HIV testing (aOR 1.78, 95% CI 1.32 to 2.40) compared with adolescents. HIV testing uptake was significantly associated with being married or cohabiting (aOR 2.35, 95% CI 1.39 to 4.00), living in the wealthiest quintile of households compared with the poorest, being circumcised and not reporting HIV-related stigma attitudes. Factors including education level, ownership of a mobile phone, exposure to mass media, internet use, wealth index and region were not associated with HIV testing in the adjusted model.

The multivariable model of the subset of males aged 15–24 years who reported having had sex in the 12 months preceding the survey showed that being married/cohabiting, living in the wealthiest quintile of households and having comprehensive knowledge of HIV/AIDS were significantly associated with HIV testing uptake (online supplemental table 4). Age group, education level, region, exposure to mass media and circumcision status were not associated with HIV testing.

DISCUSSION

This study examined the uptake and determinants of recent HIV testing and receiving results among adolescents and young people aged 15–24 years in Burundi using DHS data collected in 2016–2017. The proportion of respondents who had a recent HIV test and received results was 27.1% among women and 16.1% among the men. When selecting only the subpopulation that had sex in the 12 months preceding the survey, HIV testing coverage was 53.3% in females and 35.0% among males. Factors associated with HIV testing uptake among both sexes included older age (20–24 years) and reported stigma.

The level of HIV testing in our study was similar to the results from a Nigeria DHS study using data collected in 2016–2017 (25.4% for women and 20.8% for men),²³ but lower when compared with the findings in Zambia (65% for women and 49% for men).¹⁹ The uptake in our study

Table 2 Coverage of HIV testing in the 12 months preceding the survey and receiving results among adolescents and young women (n=7218) and men (n=2860), Burundi DHS 2016–2017

	Women			Men		
	n	%	95% CI	n	%	95% CI
Overall	1937	27.1	25.8 to 28.4	490	16.6	15.1 to 18.1
Age (years)						
15–19	616	15.4	13.9 to 16.8	171	9.9	8.2 to 11.6
20–24	1321	41.1	39.1 to 43.0	319	26.1	23.2 to 29.0
Education level						
No education	326	35.6	32.4 to 38.9	37	17.5	11.9 to 23.1
Primary	764	26.3	24.4 to 28.2	201	15.0	12.9 to 17.1
Secondary or higher	847	25.0	23.1 to 26.9	252	18.2	15.8 to 20.6
Marital status						
Never married/cohabiting	939	17.1	15.6 to 18.6	383	14.0	12.6 to 15.5
Ever married/cohabiting	998	53.1	50.6 to 55.6	107	43.1	36.1 to 50.1
Wealth index						
Poorest	291	28.4	25.5 to 31.4	49	13.5	9.6 to 17.3
Poor	300	25.9	23.0 to 28.7	65	14.2	10.8 to 17.6
Middle	343	25.9	23.2 to 28.5	89	18.2	14.6 to 21.8
Rich	364	26.3	23.8 to 28.9	81	13.4	10.2 to 16.5
Richest	639	28.9	26.2 to 31.5	206	21.3	18.6 to 24.0
Religion						
Catholic	1046	27.1	25.4 to 28.8	298	17.4	15.4 to 19.4
Protestant	669	26.0	24.0 to 28.0	130	14.6	11.8 to 17.3
Other	222	31.9	27.9 to 35.8	62	17.9	13.2 to 22.5
Residence						
Urban	559	32.1	28.6 to 35.7	155	22.8	19.4 to 26.2
Rural	1378	26.2	24.8 to 27.7	335	15.6	14.0 to 17.2
Region						
Bujumbura Mairie	145	29.1	23.8 to 34.4	46	22.0	17.5 to 26.5
West	273	24.5	21.1 to 27.8	80	15.0	11.6 to 18.4
North	553	32.8	30.2 to 35.4	126	18.6	15.5 to 21.7
South	432	21.8	19.3 to 24.3	124	15.3	12.5 to 18.1
Centre-East	534	26.2	23.7 to 28.8	114	15.0	11.9 to 18.0
Health insurance coverage						
No	1605	26.7	25.3 to 28.0	415	15.9	14.4 to 17.4
Yes	332	29.6	26.2 to 33.0	75	22.5	17.0 to 27.9
Exposure to mass media						
less than once a week or not at all	1195	26.0	24.4 to 27.6	190	14.7	12.6 to 16.9
Once a week or more	742	29.4	27.3 to 31.5	300	18.2	16.2 to 20.1
Frequency of using the internet last month						
Not at all	1763	26.4	25.1 to 27.8	358	15.1	13.6 to 16.6
At least one time	174	39.9	33.8 to 46.0	132	25.3	20.7 to 29.8
Ownership of a mobile phone						
No	1309	24.4	23.1 to 25.8	225	12.9	11.1 to 14.6
Yes	628	37.1	34.0 to 40.2	265	22.8	20.1 to 25.6
Ever had sex						

Continued

Table 2 Continued

	Women			Men		
	n	%	95% CI	n	%	95% CI
No	634	13.5	12.1 to 14.9	253	11.7	10.1 to 13.3
Yes	1303	49.9	47.7 to 52.1	237	28.7	25.1 to 32.3
Age at first sex*						
<15	90	37.9	30.2 to 45.6	198	16.1	10.4 to 21.8
≥15	1213	51.0	48.7 to 53.4	39	33.8	29.5 to 38.1
Had sex in the 12 months preceding the survey*						
No	184	35.7	30.6 to 40.8	81	21.3	16.3 to 26.2
Yes	1119	53.3	50.9 to 55.6	156	35.0	30.0 to 40.1
No of sex partners						
None/never had sex	818	15.8	14.4 to 17.2	334	13.2	11.7 to 14.7
One	1106	53.4	51.0 to 55.7	147	35.5	30.2 to 40.9
Two or more	13	40.1	18.9 to 61.3	9	28.2	8.8 to 47.6
No of sex partners in last 12 months†						
One	1106	53.4	51.0 to 55.7	147	35.5	30.2 to 40.9
Two or more	13	40.1	18.9 to 61.3	9	28.2	8.7 to 47.6
Condom used during last sex with most recent partner†						
No	1022	52.8	50.4 to 55.3	118	35.9	30.0 to 41.7
Yes	97	59.4	51.5 to 67.3	38	32.4	22.9 to 42.0
Had history of STIs						
No or don't know	1899	26.8	25.5 to 28.2	486	16.6	15.1 to 18.1
Yes	38	51.6	36.8 to 66.4	4	20.8	4.6 to 46.2
Circumcised						
No				184	12.0	10.2 to 13.7
Yes				306	22.2	19.8 to 24.6
During the last 12 months have given gifts or others goods for sex†						
No				148	35.2	29.9 to 40.4
Yes				8	32.3	10.5 to 54.1
Ever heard of HIV self-test kit						
No	1849	28.7	27.3 to 30.1	443	16.3	14.7 to 17.8
Yes	88	13.1	9.9 to 16.3	47	20.4	14.6 to 26.1
Comprehensive knowledge of HIV/AIDS						
No	722	22.2	20.5 to 23.9	165	12.9	10.9 to 15.0
Yes	1215	31.5	29.7 to 33.4	325	19.6	17.6 to 21.7
Discriminatory attitudes						
No	1521	28.3	26.9 to 29.8	407	18.1	16.4 to 19.8
Yes	416	23.7	21.4 to 25.9	83	11.9	9.4 to 14.4
Reported stigma						
No	298	16.3	14.2 to 18.4	79	9.6	7.3 to 11.9
Yes	1639	30.7	29.2 to 32.2	411	19.2	17.3 to 21.0

*The frequency and percentage are restricted to respondents who reported prior sexual intercourse.

†The frequency and percentage are restricted to male respondents who reported having sex partners in the 12 months preceding the survey. DHS, Demographic and Health Survey; STI, sexually transmitted infection.

Table 3 Determinants of HIV testing uptake among females aged 15–24 years, Burundi DHS 2016–2017 (n=7218)

Respondent characteristics	Bivariate analysis			Multivariable analysis		
	Crude	95% CI	P value	aOR	95% CI	P value
Age (years)						
15–19	1.00			1.00		
20–24	3.84	3.37 to 4.37	<0.001	1.62	1.38 to 1.91	<0.001
Education level						
No education	1.00			1.00		
Primary	0.64	0.54 to 0.76	<0.001	1.11	0.91 to 1.36	0.293
Secondary or higher	0.60	0.51 to 0.71	<0.001	1.40	1.11 to 1.76	0.005
Marital status						
Never married/cohabiting	1.00			1.00		
Ever married/cohabiting	5.48	4.75 to 6.33	<0.001	1.89	1.41 to 2.52	<0.001
Wealth index						
Poorest	1.00			1.00		
Poor	0.88	0.71 to 1.08	0.219	0.98	0.77 to 1.24	0.851
Middle	0.88	0.73 to 1.06	0.169	1.01	0.81 to 1.27	0.921
Rich	0.90	0.74 to 1.09	0.283	1.12	0.88 to 1.43	0.364
Richest	1.02	0.84 to 1.24	0.833	1.13	0.85 to 1.49	0.409
Religion						
Catholic	1.00			1.00		
Protestant	0.95	0.83 to 1.08	0.408	0.91	0.78 to 1.05	0.185
Other	1.26	1.04 to 1.53	0.021	0.85	0.67 to 1.07	0.161
Residence						
Urban	1.00			1.00		
Rural	0.75	0.63 to 0.90	0.002	0.71	0.55 to 0.92	0.010
Region						
Bujumbura Mairie	1.00			1.00		
West	0.79	0.58 to 1.08	0.141	1.17	0.76 to 1.82	0.473
North	1.19	0.90 to 1.58	0.224	1.83	1.20 to 2.81	0.005
South	0.68	0.51 to 0.91	0.010	1.2	0.78 to 1.84	0.401
Centre-East	0.87	0.65 to 1.16	0.329	1.45	0.94 to 2.23	0.092
Health insurance coverage						
No	1.00			1.00		
Yes	1.16	0.98 to 1.37	0.093	1.16	0.95 to 1.41	0.145
Exposure to mass media						
Less than once a week or not at all	1.00			1.00		
Once a week or more	1.18	1.05 to 1.34	0.007	1.17	1.01 to 1.36	0.044
Frequency of using the internet last month						
Not all	1.00			1.00		
At least once time	1.85	1.42 to 2.40	<0.001	1.41	0.97 to 2.03	0.071
Ownership of a mobile phone						
No	1.00			1.00		
Yes	1.82	1.58 to 2.11	<0.001	1.49	1.21 to 1.82	<0.001
No of sex partners						
None/never had sex	1.00			1.00		
One	6.11	5.32 to 7.02	<0.001	3.35	2.60 to 4.31	<0.001

Continued

Table 3 Continued

Respondent characteristics	Bivariate analysis			Multivariable analysis		
	Crude	95% CI	P value	aOR	95% CI	P value
Two or more	3.57	1.47 to 8.69	0.005	3.27	1.25 to 8.58	0.016
Comprehensive knowledge of HIV/AIDS						
No	1.00			1.00		0.054
Yes	1.61	1.43 to 1.83	<0.001	1.15	1.00 to 1.32	
Discriminatory attitudes						
No	1.00			1.00		
Yes	0.78	0.68 to 0.90	<0.001	0.91	0.77 to 1.08	0.275
Reported stigma						
No	1.00			1.00		
Yes	2.27	1.93 to 2.66	<0.001	1.81	1.512 to 2.15	<0.001

aOR, adjusted OR; DHS, Demographic and Health Survey.

seems also low when considering the UNAIDS 90-90-90 targets, whereby 90% of young people are required to know their HIV status. Taking our results into consideration, the Burundi HIV preventive programme should strengthen initiatives in HIV counselling and testing among young people in order to eliminate the HIV epidemic by the end of 2030.

The difference in HIV testing uptake between young women and young men, which we found, is supported by findings in Nigeria and Zambia.^{19 23} The higher uptake of HIV testing among young women could be due to a difference in health care-seeking behaviour. In general, women are more likely to seek primary healthcare and visit health facilities than men.²⁴ Apart from ANC where HIV testing is mandatory, people visiting health centres are exposed to provider-initiated HIV counselling and testing services, which are part of the health policies currently implemented in Burundi.¹⁵ In addition, women who visit a health facility may increase their knowledge through general health education sessions and as a result be more favourable towards HIV testing. Furthermore, women in the reproductive age are generally more in need of reproductive health services such as ANC services. Young women attending ANC services or giving birth at a primary health facility should be tested for HIV according to national guidelines. The PMTCT programme package includes an HIV test at least three times during pregnancy and once after giving birth.¹⁵ Male partners usually have a limited role in these matters as suggested by a study in Africa that has shown that men believe that ANC services are women's affairs and their main role is to provide financial support.²⁵ Considering the proportion of young people having had sex, it was observed that far fewer young men had, implying that young women might have had sex with older men aged 25 years or above. This provides an additional argument for the high HIV testing uptake among young women through ANC services. Even though, interventions that involve young men into ANC

services should be promoted in order to address the missed opportunities for HIV testing in both pregnant women and their partners.

Educational level was found to be significantly associated with HIV testing uptake among all women and in the subset of adolescents or young adults women having had sex in the 12 months preceding the survey. The association between higher levels of education and HIV testing has been shown by others studies done in SSA.^{23 26} A higher education presumably exposes people to health information that empowers them to wanting to know their HIV status and their HIV risk. In that sense, education may stimulate young women to visit the health centres and use HIV testing services. Study using DHS data from Kenya, Malawi and Nigeria has demonstrated that education level is a powerful predictor of the number of visits and the quality of ANC.²⁷ It would be important, in the short term, to understand how the knowledge of HIV testing and importance of uptake can be communicated to the more marginalised groups of young men and women with lower levels of education in Burundi.

Even lower educated groups could be targeted with communication specific to HIV testing; we can see that exposure to media and phones increased the odds of being tested in multivariable analysis, independent of education or household wealth. As such, the media and mobile phones can be major tools to increase awareness about HIV, about the benefits of HIV testing or treatment, and to promote safer sexual behaviour or other HIV preventive interventions. Being circumcised was significantly associated with HIV testing uptake among males aged 15–24 regardless of sexual activity in the 12 months before the survey (aOR: 1.68, 95% CI 1.27 to 2.23) in our study. Given that this is one of the main interventions in Burundi, we need to be careful and reassess it, because it is not associated with HIV testing uptake in sexually active men. It could be that circumcision is misunderstood as complete protection, so men have unprotected sex and they do not feel the need to test.

Table 4 Determinants of HIV testing uptake among men aged 15–24 years (n=2860), Burundi DHS 2016–2017

Respondents characteristics	Bivariate analysis			Multivariable analysis		
	Crude	95% CI	P value	aOR	95% CI	P value
Age (years)						
15–19	1.00			1.00		
20–24	3.20	2.49 to 4.12	<0.001	1.78	1.32 to 2.40	<0.001
Education level						
No education	1.00			1.00		
Primary	0.83	0.55 to 1.25	0.372	1.18	0.74 to 1.83	0.498
Secondary or higher	1.05	0.68 to 1.61	0.824	1.30	0.76 to 2.22	0.339
Wealth index						
Poorest	1.00			1.00		
Poor	1.06	0.71 to 1.59	0.780	1.21	0.77 to 1.88	0.414
Middle	1.43	0.94 to 2.17	0.095	1.40	0.84 to 2.31	0.196
Rich	0.99	0.65 to 1.52	0.972	1.05	0.64 to 1.73	0.846
Richest	1.74	1.20 to 2.51	0.003	1.81	1.09 to 3.00	0.021
Marital status						
Never married/cohabiting	1.00			1.00		
Ever married/cohabiting	4.64	3.39 to 6.34	<0.001	2.35	1.39 to 4.00	0.001
Religion						
Catholic	1.00			1.00		
Protestant	0.81	0.62 to 1.06	0.125	0.70	0.52 to 0.95	0.020
Other	1.04	0.72 to 1.49	0.849	0.76	0.51 to 1.14	0.188
Residence						
Urban	1.00			1.00		
Rural	0.60	0.49 to 0.78	<0.001	0.98	0.62 to 1.49	0.863
Regions						
Bujumbura Mairie	1.00			1.00		
West	0.63	0.43 to 0.91	0.014	0.96	0.58 to 1.66	0.938
North	0.81	0.58 to 1.13	0.215	1.58	1.01 to 2.62	0.046
South	0.64	0.46 to 0.90	0.011	1.21	0.74 to 2.05	0.433
Centre-East	0.62	0.44 to 0.89	0.010	1.11	0.66 to 1.80	0.730
Health insurance coverage						
No	1.00			1.00		
Yes	1.53	1.09 to 2.16	0.014	1.31	0.89 to 1.98	0.160
Exposure to mass media						
Less than once a week or not at all	1.00			1.00		
Once a week or more	1.29	1.03 to 1.60	0.024	0.96	0.75 to 1.24	0.769
Frequency of using the internet last month						
Not at all	1.00			1.00		
At least once time	1.90	1.44 to 2.50	<0.001	1.23	0.86 to 1.76	0.250
Ownership of a mobile phone						
No	1.00			1.00		
Yes	2.00	1.59 to 2.53	<0.001	1.23	0.92 to 1.66	0.168
No of sex partners						
None/never had sex	1.00			1.00		
One	3.63	2.77 to 4.75	<0.001	1.84	1.19 to 2.87	0.007

Continued

Table 4 Continued

Respondents characteristics	Bivariate analysis			Multivariable analysis		
	Crude	95% CI	P value	aOR	95% CI	P value
Two or more	2.58	0.97 to 6.84	0.058	1.37	0.55 to 3.44	0.502
Circumcised						
No	1.00			1.00		
Yes	2.10	1.69 to 2.61	<0.001	1.68	1.27 to 2.23	<0.001
Comprehensive knowledge of HIV/AIDS						
No	1.00			1.00		
Yes	1.65	1.32 to 2.05	<0.001	1.32	1.03 to 1.69	0.026
Discriminatory attitudes						
No	1.00			1.00		
Yes	0.61	0.47 to 0.79	<0.001	0.82	0.62 to 1.09	0.168
Reported stigma						
No	1.00			1.00		
Yes	2.24	1.66 to 3.02	<0.001	1.85	1.33 to 2.56	<0.001

aOR, adjusted OR; DHS, Demographic and Health Survey.

This study showed that people aged 20–24 years had a higher HIV testing uptake than adolescents (15–19 years). Other findings from SSA also reported lower odds of HIV testing uptake among adolescents.^{19 28 29} The authors argue that the barrier could be the legal age of consent for independent HIV testing. Lower legal age of consent to independent HIV testing and counselling has been shown to be associated with an increase in HIV testing among adolescents.³⁰ In Burundi, the existing legal code on HIV testing, prevention and treatment do not indicate the legal age of consent for independent HIV testing.³¹ The existing health policies for HIV testing for adults (volunteer HIV testing, provider initiated HIV testing, self testing) are applicable to young people who have demand/need of HIV testing service. In our study, not having sex could be a key reason for the absence of HIV testing among adolescents, as our findings did not show a statistical difference in HIV testing uptake among adolescents and young adults who experienced sexual intercourse in the 12 months preceding the survey. In order to facilitate HIV testing among youth, the utilisation of existing youth-friendly HIV testing centres, among other strategies, should be evaluated and expanded based on the needs and health-seeking preferences of adolescents and young people, which are context appropriate to the country and cost-effective given the low HIV prevalence.

Females living in urban settings and both males and females living in the Northern region had higher uptake of HIV testing. When only looking at the females reporting sexual intercourse in the 12 months preceding the survey, HIV testing was higher in the Southern region. These results may reflect the concentration of more HIV testing centres or mobile-based volunteer counselling and testing in the area or subpopulation with a high prevalence of HIV. While the urgent interventions such focus

on geographic regions with higher HIV prevalence are important, the inequity in the distribution of healthcare could be limited.

Perceived stigma is an important barrier to appropriate HIV diagnosis or treatment services.^{32 33}

Surprisingly, reporting stigma was significantly associated with higher HIV testing uptake in our study, among both sexes. This finding could be due to the ambiguity of survey questions addressed to the respondents. The interpretation of the question ‘Do you agree with the statement that people hesitate to take an HIV test because they are afraid of how other people will react to a positive result’ has not been assessed in Burundi. In addition, responding in the affirmative to this statement might be partly a consequence of accessing HIV testing services, rather than a barrier. We suggest further qualitative research to get a better understanding of how they interpreted this, or to understand why stigma is linked to higher HIV testing uptake in this study. Contrary to our findings, other studies^{19 23 34 35} found that factors such as condom use, history of STIs and number of sexual partners were significant predictors of recent HIV testing. Further qualitative research should be conducted on how adolescents and young people in Burundi view HIV testing in general, and about the role of stigma and sexual-risk behaviour in HIV testing uptake in particular.

The findings reported in this study have some limitations. First, HIV testing is based on self-reporting and could be affected by social desirability bias. Adolescents and young people were interviewed in their households and might not have disclosed sensitive information about their sexual activity and behaviours to the DHS enumerators. Second, our analysis was limited by the variables that were collected in the DHS 2016–2017 and we could not take into account other variables which may affect HIV

testing uptake, such as sexual orientations. Third, associations reported in our study should not be interpreted as causal due to the cross-sectional study design. On the other hand, this study benefited from recent nationally representative data from Burundi and the analysis was conducted both in the whole sample and among a subset reporting having had sex in the 12 months preceding the survey. It provides much needed findings for strategic planning and programming to improve the health of young people in Burundi.

CONCLUSION

Our study using Burundi DHS data found a relatively low HIV testing uptake among adolescent and young females and males which may impact the UNAIDS targets—Zero new infections, Zero deaths—by the end of 2030. Therefore, the HIV prevention programme should strengthen the promotion of HIV testing services for adolescents or young adults in youth-friendly health centres and ANC services. Further qualitative research should be conducted on the role of stigma and sexual-risk behaviour in HIV testing uptake.

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Acknowledgements We thank the DHS programme for allowing us access to the Burundian Demographic and Health Survey 2016–2017. The first author benefited a scholarship from Directorate-General Development Cooperation and Humanitarian-aid (DGD) and then we would like to thank the Belgian Government. Finally, we thank Ritwik Dahake for English editing.

Contributors CN developed protocol, conducted data analysis, interpreted results and prepared manuscript. CN is responsible for the overall content as a guarantor. LB and BV contributed to the idea research and the study design. They provided also in put on the data analysis, results interpretation and then finalised manuscript. TS provided contribution in the statistical analysis. All authors had approved the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The original survey protocol and questionnaires were sent to the National Ethics Committee for analysis and approval. They obtained ethics approval from the Institutional Review Board of ICF and statistical approval No VS201505CNIS of the National Committee for Statistical Information of Burundi. Before starting an interview, each respondent was asked to provide informed consent. This study was a secondary analysis of the data with no identifying information, and therefore, did not require ethical approval.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Permission for accessing and analysing the data was obtained from DHS programme. All data and DHS-related materials are available on the website below: <https://dhsprogram.com/>.

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REFERENCES

- Dwyer-Lindgren L, Cork MA, Sligar A, *et al*. Mapping HIV prevalence in sub-Saharan Africa between 2000 and 2017. *Nature* 2019;570:189–93.
- GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:1789–858.
- UNAIDS. *Unaids data 2017*, 2017: 248. https://www.unaids.org/sites/default/files/media_asset/20170720_Data_book_2017_en.pdf
- UNAIDS. When women lead change happens, 2017. Available: https://www.unaids.org/sites/default/files/media_asset/when-women-lead-change-happens_en.pdf [Accessed 7 Feb 2022].
- Mushamiri I, Aduans M, Apat D, *et al*. Optimizing PMTCT efforts by repeat HIV testing during antenatal and perinatal care in resource-limited settings: a longitudinal assessment of HIV seroconversion. *PLoS One* 2020;15:e0233396.
- Hussen R, Zenebe WA, Mamo TT, *et al*. Determinants of HIV infection among children born from mothers on prevention of mother to child transmission programme of HIV in southern Ethiopia: a case-control study. *BMJ Open* 2022;12:e048491.
- World Health Organization. *Consolidated guidelines on HIV testing services: 5Cs: consent, confidentiality, counselling, correct results and connection*, 2015. https://apps.who.int/iris/bitstream/handle/10665/179870/9789241508926_eng.pdf?sequence=1&isAllowed=y
- Giguère K, Eaton JW, Marsh K, *et al*. Trends in knowledge of HIV status and efficiency of HIV testing services in sub-Saharan Africa, 2000–20: a modelling study using survey and HIV testing programme data. *Lancet HIV* 2021;8:e284–93.
- UNAIDS. *Fast track: ending the AIDS epidemic by 2030*. Geneva, 2014. http://www.unaids.org/sites/default/files/media_asset/JC2686_WAD2014report_en.pdf
- United Nations. *World population prospects 2017*. Population Division, 2017. <https://esa.un.org/unpd/wpp/Download/Standard/Population/>
- Ministère la Présidence chargé de la Bonne Gouvernance et du Plan [Burundi] (MPBGP), Ministère de la Santé Publique et de la Lutte contre le Sida [Burundi] (MSPLS), Institut de Statistiques et d'Études Économiques du Burundi (ISTEEBU), et ICF. *Troisième Enquête Démographique et de Santé. Bujumbura, Burundi*. ISTEEBU, MSPLS, et ICF. Individual recode and Men's recode files. DHS Program., 2017. Available upon request from: https://dhsprogram.com/data/dataset/Burundi_Standard-DHS_2016.cfm?flag=0
- Programme national de la lutte contre le SIDA et les infections sexuellement transmissibles (PNLS/IST). *Rapport annuel des activités de la lutte contre Le VIH/SIDA/IST dans Le secteur santé*. Bujumbura, 2017. [http://minisante.bi/wp-content/uploads/pnls/Rapport annuel PNLS-IST 2017.pdf](http://minisante.bi/wp-content/uploads/pnls/Rapport%20annuel%20PNLS-IST%202017.pdf)
- Ministère de la santé publique et de la lutte contre le SIDA. *Annuaire des statistiques sanitaires de Burundi*. Bujumbura, 2019. [http://minisante.bi/wp-content/uploads/annuaire_statistiques/Annuaire Statistique 2019.pdf](http://minisante.bi/wp-content/uploads/annuaire_statistiques/Annuaire%20Statistique%202019.pdf)
- Conseil National de la lutte contre le SIDA (CNLS). *Plan stratégique national de la lutte contre Le SidA 2012–2016*, 2012. Available: https://www.ilo.org/wcmsp5/groups/public/-ed_protect/-protrav/-ilo_aids/documents/legaldocument/wcms_202048.pdf [Accessed 15 Oct 2021].
- PNLS/IST. *Directives nationales d'utilisation des antirétroviraux pour la prévention et le traitement du VIH*. Bujumbura, Burundi: Programme national de la lutte contre le SIDA et les infections sexuellement transmissibles (PNLS/IST), 2016. [minisante.bi/wp-content/uploads/pnls/Nouvelles Directives 2016.pdf](http://minisante.bi/wp-content/uploads/pnls/Nouvelles%20Directives%202016.pdf)
- Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc* 1973;51:95–124.



- 17 Babitsch B, Gohl D, von Lengerke T. Re-revisiting Andersen's behavioral model of health services use: a systematic review of studies from 1998-2011. *Psychosoc Med* 2012;9:Doc11.
- 18 Seidu A-A. Using Anderson's Model of Health Service Utilization to Assess the Use of HIV Testing Services by Sexually Active Men in Ghana. *Front Public Health* 2020;8:512.
- 19 Heri AB, Cavallaro FL, Ahmed N, et al. Changes over time in HIV testing and counselling uptake and associated factors among youth in Zambia: a cross-sectional analysis of demographic and health surveys from 2007 to 2018. *BMC Public Health* 2021;21:456.
- 20 Béland F. Utilization of health services as events: an exploratory study. *Health Serv Res* 1988;23:295-310.
- 21 Da Silva RB, Contandriopoulos A-P, Pineault R, et al. A global approach to evaluation of health services utilization: concepts and measures. *Healthc Policy* 2011;6:e106-17.
- 22 R Core Team. *R: a language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing, 2021. <https://www.R-project.org/>
- 23 Ajayi AI, Awopegba OE, Adeagbo OA, et al. Low coverage of HIV testing among adolescents and young adults in Nigeria: implication for achieving the UNAIDS first 95. *PLoS One* 2020;15:e0233368.
- 24 Bertakis KD, Azari R, Helms LJ, et al. Gender differences in the utilization of health care services. *J Fam Pract* 2000;49:147-52.
- 25 Nkuoh GN, Meyer DJ, Tih PM, et al. Barriers to men's participation in antenatal and prevention of mother-to-child HIV transmission care in Cameroon, Africa. *J Midwifery Womens Health* 2010;55:363-9.
- 26 Bekele YA, Fekadu GA. Factors associated with HIV testing among young females; further analysis of the 2016 Ethiopian demographic and health survey data. *PLoS One* 2020;15:e0228783.
- 27 Babalola S, level Women's education. Women's education level, antenatal visits and the quality of skilled antenatal care: a study of three African countries. *J Health Care Poor Underserved* 2014;25:161-79.
- 28 Sanga Z, Kapanda G, Msuya S, et al. Factors influencing the uptake of voluntary HIV counseling and testing among secondary school students in Arusha City, Tanzania: a cross sectional study. *BMC Public Health* 2015;15:452.
- 29 Nwachukwu CE, Odimegwu C. Regional patterns and correlates of HIV voluntary counselling and testing among Youths in Nigeria. *Afr J Reprod Health* 2011;15:131-46.
- 30 McKinnon B, Vander Morris A. National age-of-consent laws and adolescent HIV testing in sub-Saharan Africa: a propensity-score matched study. *Bull World Health Organ* 2019;97:42-50.
- 31 Presidency of the Republic. *Burundi: law 1/018 of 12 may 2005 on the legal protection of people infected with HIV and of people suffering from AIDS*, 2005. https://www.ilo.org/wcmsp5/groups/public/-ed_protect/-protrav/-ilo_aids/documents/legaldocument/wcms_126632.pdf
- 32 Boyd FM, Simpson WM, Hart GJ, et al. What do pregnant women think about the HIV test? A qualitative study. *AIDS Care* 1999;11:21-9.
- 33 Gesesew HA, Tesfay Gebremedhin A, Demissie TD, et al. Significant association between perceived HIV related stigma and late presentation for HIV/AIDS care in low and middle-income countries: a systematic review and meta-analysis. *PLoS One* 2017;12:e0173928.
- 34 Ajayi AI, Abioye AO, Adeniyi OV, et al. Concerns about contracting HIV, knowing partners' HIV sero-status and discussion of HIV/STI with sexual partners as determinants of uptake of HIV testing. *J Biosoc Sci* 2019;51:549-61.
- 35 Gyasi RM, Abass K. Sexual risk behavior and uptake of HIV counseling and testing among youth in metropolitan Kumasi, Ghana. *J HIV/AIDS & Soc Serv* 2018;17:127-45.