

HIV self-testing uptake and associated factors among the general population of Botswana: Insights from the 2021 Botswana AIDS Impact Survey V (BAIS V)

Naomi Setshegetso

tlotlegonaomi10@gmail.com

University of Botswana

Onkokame Mothobi

University of Botswana

Mpho Keetile

University of Botswana

Research Article

Keywords: HIV, demand, self-test kit, uptake, Botswana

Posted Date: September 25th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10971347/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Low HIV testing, stigma and lack of knowledge about an individual's HIV status are barriers to HIV prevention, diagnosis and care. Self-testing for HIV using self-test kits (HIVST) offers the potential benefit to increase access to and utilization of health services, address supply constraints related to waiting times, stigma and subsequently improve health inequalities and end AIDS. To achieve and sustain high utilization rates of HIVST requires an understanding of the facilitators and barriers of HIVST. This study examines the uptake of, and the factors associated with HIVST among the general population aged 15 to 64 years in Botswana.

Methods

The study uses secondary data obtained from the Fifth Botswana AIDS Impact Survey (BAIS V) conducted in 2021. BAIS V used two stage sampling where enumeration areas were sampled in the first stage and households in the second stage. A binary Logistic regression model was used to examine the influence of household and individual characteristics on HIVST. Stata 14.2 was used for data analyses.

Results

The uptake of HIVST was found to be low (2.2 percent) among the general population. The odds of using HIVST were found to be 5.3 times [AOR = 5.35, 95% CI = 1.39–20.61] higher among individuals with higher education level compared to those with no schooling. Furthermore, the odds of using HIVST were significantly lower [AOR = 0.56, 95% CI = 0.33–0.92] among individuals who were not aware of their partner's HIV seropositive status but higher [AOR = 2.10, 95% CI = 0.87–5.04] among those who reported having more than one sexual partner.

Conclusion

Findings indicate a low uptake of HIVST. Moreover, it was found that affordability (as proxied by wealth status) has a significant influence on whether individuals access health facilities to purchase self-testing kit for HIV. Considering recent government efforts to achieve universal health coverage through the envisaged National Health Insurance (NHI), policymakers should include HIV self-testing kits in the NHI benefit package to ensure financial protection and reduce potentially burdensome out-of-pocket expenditure.

Contributions to the Literature

- This study provides valuable insights on the uptake of HIVST and identifies the factors associated with enhancing its use, a topic with limited empirical evidence in developing countries such as Botswana.
- Demonstrates that patterns of health utilization as displayed by low prevalence of HIVST uptake, are affected by a fee for service and this hamper the achievement of universal health coverage.
- Offers evidence on how health services with potential to increase access such as HIVST can be integrated in health financing policies for possible implementation.

Introduction

HIV is a public health challenge in Botswana with an estimated prevalence rate of 20.8 percent among adults aged 15 to 64 years [1]. The socio-economic determinants associated with this HIV prevalence are education, geographical place of residence and gender dynamics [1, 2, 3, 4]. Furthermore, several people still remain unaware of their HIV status due to stigma, fear of discrimination and limited health care services [1]. This has a direct implication on the achievement of the first 95% of the Joint United Nations Programme on HIVAIDS (UNAIDS) 95-95-95 targets.

HIVST is an innovative HIV testing service which allows an individual to self-test for HIV by collecting their sample (either blood sample or oral) using an HIV self-test kit, conduct a test and interpret the results privately [5, 6]. It has the potential to expand access to health care to hard-to-reach population, reduce barriers associated with stigma, address individuals' perceptions around waiting times that is often associated with utilization of traditional HIV testing services and increase access to HIV testing. Consequently, using HIVST may promote frequent testing and lead to increased awareness of an individual' HIV status and ultimately enhance diagnosis and treatment [6, 7, 8]. Thus, HIVST acts as a supplement with varied potential benefits, to existing HIV traditional testing and counselling services that are facility-based [5, 9].

In SSA, evidence points to high feasibility and acceptability of HIVST among adolescents, high risk population and couples but, low utilization and uptake rates [10–17]. Some of the contributing factors for the low uptake include limited evidence on determinants of demand for HIVST in resource-limited settings and poorly developed regional and national regulatory systems for HIVST [6, 10]. Having knowledge on determinants of demand for HIVST can provide information which could guide policy-makers on how to design and package policies that stimulate demand of HIVST and subsequently, increase HIVST scale-up and uptake [5, 6, 18].

The positive attitudes towards acceptability and feasibility of HIVST that are documented in SSA, also exist in Botswana [19–22]. However, there is limited empirical evidence on the uptake of HIVST in Botswana using nationally representative data amidst existing health system challenges. In 2021, Botswana achieved 95 percent of adults living with HIV being aware of their HIV positive status (95-98-98) and thus exceeding 95-95-95 UNAIDS targets [1]. Despite these achievements, there is still about 15 percent of young people aged 15 to 24 years who tested positive and were unaware of their HIV status

(85-99-92) in 2021. This finding shows that HIV awareness and testing inequities in Botswana persist by age and subsequently, necessitates an assessment of what could be the barriers and facilitators of the inequities associated with HIV testing particularly in an environment where innovative testing services that reduce stigma such as HIVST exists. Health service delivery in Botswana is skewed towards curative than preventive care, primary health care is under-resourced and health financing is fragmented resulting in poor health outcomes [23, 24]. To address these challenges, there are continued programmatic reviews to strengthen the health system and increase access to health care through an updating of HIV testing guidelines to incorporate new innovations, technologies and approaches [25–28]. HIVST, index contact testing and the integration of HIV with syphilis and hepatitis screening are among some of the latest reviews to be conducted with emphasis on closing the knowledge gaps and increase equity of access to and uptake of HIV services among key and vulnerable populations particularly in underserved geographic areas [25, 29].

There are also ongoing policy debates to introduce NHI in order to offer financial protection and increase health access and achieve universal coverage [23]. As HIVST is offered at a fee, this can hamper demand and result in catastrophic health expenditures when it is financed out-of-pocket as it has direct financial implication on household budgets than when HIVST is financed through a health financing mechanism (such as NHI) that decouples health consumption from direct health payment. As such, consideration must be made on whether to include HIVST on the benefit package of the NHI to improve its use in Botswana. However, before a decision to include HIVST on the benefit package of the NHI can be taken, it is imperative to examine the determinants of HIVST uptake in order to understand which factors inhibit or increase its use so as to develop and strengthen policies that address these factors in order to scale-up HIVST use and increase HIV testing coverage. Studies conducted on the uptake of HIVST in Botswana have focused on sub-group populations (see Bogart et al, 2021). Against this background, this study uses a nationally representative BAIS V data to assess the uptake and factors influencing HIVST among adult population aged 15 to 64 years in Botswana. It complements existing studies in Botswana whose focus has been on feasibility and acceptability of HIVST and thus, only establishing whether individuals have knowledge about HIVST and subsequently whether individuals will utilize HIVST should it be provided. Our study addresses the knowledge gap around demand creation which is a factor vital in building existing knowledge necessary to scale-up HIVST and increase equity of access to and uptake of HIV testing and counselling services.

Methods

Study design and sampling procedure

The study uses BAIS V, a nationally representative cross-sectional survey conducted from March 2020 to August 2021 to measure the impact of the national HIV response. BAIS V collected data among adults aged 15 to 64 years and children aged 6 weeks to 14 years and the survey offered HIV counselling and testing with the return of results to the participants and collected information about the uptake of HIV care and treatment services [1]. BAIS V was based on a two-stage stratified random sampling technique

and, the sample was drawn from the 2011 population and housing census. The first stage involved sampling of primary sampling units (enumeration areas) while the second stage involved sampling of households. In the first stage, 385 enumeration areas (EA) were selected constituting an average of 35 households per EA which resulted in a total of 13,560 households. Of the 13,560 households, about 11,478 households occupied eligible households which had 19,914 eligible adults aged 15 to 64 years from which 17,205 (males, females) participated in the individual interview after consenting. Among the 17,205 consenting individuals interviewed, about 14,763 individuals (8,675 females and 6,088 males) had their blood sample drawn under BAIS V. for this study, after data cleaning, the sample size that was used for analysis was 12,698 individuals aged 15 to 64 years.

Statistical Analysis

Stata 14.2 version was used to compute weighted means with 95% confidence interval (CI) for prevalence of HIVST as well as prevalence of HIV testing in the sampled population. Binary Logistic regression model was used to examine the association between HIVST and the explanatory variables while controlling for individual and household-level factors. HIVST is the dependent variable which was derived from the question which asked respondents “Have you ever tested yourself for HIV using a self-test kit?”. The final variable was binary, coded as 1 for “Yes” and 0 for “No.”

A total of eight variables were included as independent variables and these comprised of either individual-level factors (age, gender, employment status, number of sexual partners, awareness by an individual of their sexual partner’s HIV sero-status, condom use during last sexual encounter) and contextual factors (geographical place of residence and wealth index).

These variables were coded as follows: age (15–24 = 1, 25–34 = 2, 35–44 = 3, 45–54 = 4 & 55–64 = 5), education [no schooling, primary, secondary, tertiary or higher], geographical place of residence (urban = 1; rural = 0), condom use during last sexual encounter (yes = 1, no = 0), employment status (employed = 1, unemployed = 0), the number of sexual partners (none, one partner, more than one partner), awareness of an individual to their sexual partner’s HIV sero status [which we considered as HIV risk status] (low status = 1, high status = 0). Household wealth index was coded in the survey as (poorest = 1, poor = 2, middle = 3, rich = 4 and richest = 5) and we used this information to depict the distribution of HIVST by wealth. For analyzing the determinants of HIVST we re-coded wealth index into [poor = 1 and non-poor = 0] by cumulating poorest quintile and poor quintile together to depict poor, and cumulated middle quintile, richest quintile and rich quintile to depict non-poor. The selection of independent variables was based on their established associations with HIV self-testing (HIVST) as reported by Akweh et al (2024), Muendo et al (2024), Muwanguzi et al (2021) amongst others.

Results

Characteristics of study population

A total of 12,698 participants were included in the analysis. 95% of respondents reported having ever tested for HIV, while 5.1% reported that they had never tested (Table 1). HIV testing varied by age, with 86% of participants aged 15–24 years reporting having ever tested, compared with 94% among those aged 55–64 years, 97% among those aged 25–34 and 45–54 years, and 98% among those aged 35–44 years. The proportion of males who had ever tested for HIV was approximately 3 percentage points lower than that of females, while the proportion among participants from poor households was about 1 percentage point lower than among those from non-poor households.

Table 1
Characteristics of participants by ever testing for HIV, 2021

Characteristics	Overall (weighted %) (95% CI)	Total	Yes (weighted %) (95% CI)	Total	No (weighted %) (95% CI)	Total
Total	100.0	12,698	94.9 (94.4–95.5)	12,071	5.1 (4.5–5.6)	627
Age (in years)						
15–24 years	18.3 (17.3–19.2)	2,249	86.0 (84.0–87.9)	1,927	14.0 (12.1–16.0)	322
25–34 years	28.5 (27.3–29.6)	3,425	96.9 (96.1–97.8)	3,325	3.1 (2.2–3.9)	100
35–44 years	26.0 (24.9–27.2)	3,403	98.1 (97.4–98.8)	3,346	1.9 (1.2–2.6)	57
45–54 years	16.7 (15.8–17.7)	2,246	97.2 (96.2–98.2)	2,181	2.8 (1.8–3.8)	65
55–64 years	10.5 (9.8–11.2)	1,375	93.6 (91.8–95.5)	1,292	6.4 (4.5–8.2)	83
Gender						
Male	46.1 (44.9–47.4)	4,966	92.3 (91.3–93.3)	4,569	7.7 (6.7–8.7)	397
Female	53.9 (52.6–55.1)	7,732	97.2 (96.7–97.7)	7,502	2.8 (2.3–3.3)	230
Geographical place of residence						
Urban	65.0 (64.2–65.7)	7,109	95.2 (94.4–95.9)	6,791	4.8 (4.1–5.6)	318
Rural	35.0 (34.3–35.8)	5,589	94.5 (93.8–95.2)	5,280	5.5 (4.8–6.2)	309
Education level						
No Schooling	7.0 (6.5–7.6)	1,048	91.3 (89.0–93.6)	960	8.7 (6.4–11.0)	88
Primary	14.4 (13.6–15.2)	2,033	96.2 (95.1–97.3)	1,955	3.8 (2.7–4.9)	78
Secondary	54.4 (53.2–55.7)	6,926	94.5 (93.8–95.2)	6,538	5.5 (4.8–6.2)	388
Tertiary or Higher	24.1 (22.9–25.3)	2,691	96.2 (95.0–97.4)	2,618	3.8 (2.6–5.0)	73

Characteristics	Overall (weighted %) (95% CI)	Total	Yes (weighted) (95% CI)	Total	No (weighted) (95% CI)	Total
Employment in the past 12 months						
No	58.9 (57.6–60.1)	7,878	94.1 (93.3–94.8)	7,430	5.9 (5.2–6.7)	448
Yes	41.1 (39.9–42.4)	4,820	96.1 (95.3–96.9)	4,641	3.9 (3.1–4.7)	179
Wealth quintile						
Poor	40.1 (38.9–41.2)	5,832	93.5 (92.6–94.4)	5,477	6.5 (5.6–7.4)	355
Non-Poor	59.9 (58.8–61.1)	6,866	95.9 (95.2–96.6)	6,594	4.1 (3.4–4.8)	272
Used condom at last sexual encounter in the past 12 months						
No	34.9 (33.6–36.2)	3,757	95.9 (95.1–96.8)	3,595	4.1 (3.2–4.9)	162
Yes	65.1 (63.8–66.4)	6,849	95.0 (94.2–95.7)	6,523	5.0 (4.3–5.8)	326
Number of sexual partners in the past 12 months						
No partner	15.7 (14.8–16.6)	2,092	92.9 (91.3–94.6)	1,953	7.1 (5.4–8.7)	139
One Partner	71.0 (69.8–72.1)	9,141	95.8 (95.2–96.3)	8,752	4.2 (3.7–4.8)	389
More than One Partner	13.4 (12.5–14.3)	1,465	92.8 (90.9–94.6)	1,366	7.2 (5.4–9.1)	99
HIV Risk Status						
Low risk	82.4 (81.3–83.5)	8,532	98.3 (97.9–98.7)	8,392	1.7 (1.3–2.1)	140
High risk	17.6 (16.5–18.7)	1,636	82.6 (80.1–85.1)	1,344	17.4 (14.9–19.9)	292

Table 2 presents the proportion of individuals who reported self-testing for HIV using an HIV self-test kit. Overall, 2.2% of participants reported having self-tested for HIV. The proportion was higher among those aged 15–24 years (3.3%), females (2.4%), urban residents (2.6%), and those with higher education (5.1%). HIV self-testing was also relatively higher among those who were employed (2.7%), had more than one sexual partner (4.2%), did not use a condom during their last sexual encounter (2.5%), and were aware of their partner’s HIV serostatus (2.7%).

Table 2
Characteristics of participants self-testing for HIV using a self-test kit

Characteristics	Overall weighted % (95% CI)	Total	Yes weighted % (95% CI)	Total	No weighted % (95% CI)	Total
Total	100.0	12,698	2.2 (1.8–2.6)	255	97.8 (97.4–98.2)	12,443
Age (in years)						
15–24 years	18.3 (17.3–19.2)	2,249	3.3 (2.2–4.4)	63	96.7 (95.6–97.8)	2,186
25–34 years	28.5 (27.3–29.6)	3,425	2.8 (2.0–3.6)	95	97.2 (96.4–98.0)	3,330
35–44 years	26.0 (24.9–27.2)	3,403	2.0 (1.4–2.7)	65	98.0 (97.3–98.6)	3,338
45–54 years	16.7 (15.8–17.7)	2,246	1.4 (0.6–2.2)	25	98.6 (97.8–99.4)	2,221
55–64 years	10.5 (9.8–11.2)	1,375	0.7 (0.0–1.5)	7	99.3 (98.5–100.0)	1,368
Gender						
Male	46.1 (44.9–47.4)	4,966	2.1 (1.5–2.7)	96	97.9 (97.3–98.5)	4,870
Female	53.9 (52.6–55.1)	7,732	2.4 (1.9–2.9)	159	97.6 (97.1–98.1)	7,573
Geographical place of residence						
Urban	65.0 (64.2–65.7)	7,109	2.6 (2.1–3.2)	181	97.4 (96.8–97.9)	6,928
Rural	35.0 (34.3–35.8)	5,589	1.5 (1.1–1.9)	74	98.5 (98.1–98.9)	5,515
Education level						
No Schooling	7.0 (6.5–7.6)	1,048	0.3 (0.0–0.7)	4	99.7 (99.3–100.0)	1,044
Primary	14.4 (13.6–15.2)	2,033	0.7 (0.3–1.2)	15	99.3 (98.8–99.7)	2,018
Secondary	54.4 (53.2–55.7)	6,926	1.6 (1.2–2.0)	108	98.4 (98.0–98.8)	6,818
Tertiary or Higher	24.1 (22.9–25.3)	2,691	5.1 (3.8–6.3)	128	94.9 (93.7–96.2)	2,563
Employment in the past 12 months						

Characteristics	Overall weighted % (95% CI)	Total	Yes weighted % (95% CI)	Total	No weighted % (95% CI)	Total
No	58.9 (57.6–60.1)	7,878	1.9 (1.4–2.3)	127	98.1 (97.7–98.6)	7,751
Yes	41.1 (39.9–42.4)	4,820	2.7 (2.1–3.4)	128	97.3 (96.6–97.9)	4,692
Wealth quintile						
Poor	40.1 (38.9–41.2)	5,832	1.1 (0.7–1.4)	57	98.9 (98.6–99.3)	5,775
Non-Poor	59.9 (58.8–61.1)	6,866	3.0 (2.4–3.6)	198	97.0 (96.4–97.6)	6,668
Used condom at last sexual encounter in the past 12 months						
No	34.9 (33.6–36.2)	3,757	2.5 (1.8–3.2)	92	97.5 (96.8–98.2)	3,665
Yes	65.1 (63.8–66.4)	6,849	2.4 (1.9–3.0)	145	97.6 (97.0–98.1)	6,704
Number of sexual partners in the past 12 months						
No partner	15.7 (14.8–16.6)	2,092	1.0 (0.4–1.6)	18	99.0 (98.4–99.6)	2,074
One Partner	71.0 (69.8–72.1)	9,141	2.1 (1.7–2.6)	188	97.9 (97.4–98.3)	8,953
More than One Partner	13.4 (12.5–14.3)	1,465	4.2 (2.6–5.7)	49	95.8 (94.3–97.4)	1,416
HIV Risk Status						
Low risk	82.4 (81.3–83.5)	8,532	2.7 (2.1–3.2)	203	97.3 (96.8–97.9)	8,329
High risk	17.6 (16.5–18.7)	1,636	1.7 (0.9–2.5)	27	98.3 (97.5–99.1)	1,609

Uptake of HIV Self-Testing

Figure 1 presents the distribution of HIV self-testing (HIVST) uptake by household wealth status among the general population. The results show that HIVST uptake increases with household wealth, with individuals from the poorest households accounting for only 8.4% of those who had self-tested, compared with 38.0% among those from rich households. This suggests a pro-rich distribution in HIVST uptake. In contrast, among individuals who had ever tested for HIV, testing was more concentrated among those from poorer households, indicating a pro-poor distribution.

Figure 2 shows that self-testing for HIV using a self-test kit was prevalent in urban areas (71.3 percent) compared to rural areas. It was also observed that of those who self-tested for HIV using a self-test kit, about 28.6 percent were unaware of their positive HIV seropositive status while 71.4 percent were aware of their HIV seropositive status (Fig. 3).

Determinants of self-testing for HIV using self-testing Kit

The results reveal that higher educational attainment was significantly associated with increased odds of HIV self-testing using a self-test kit, with individuals who had higher education [AOR = 5.35, 95% CI: 1.39–20.61] having greater odds of HIVST compared with those with no formal education (Table 3). Household wealth status was another factor associated with the uptake of HIV self-testing. In particular, the odds of using an HIV self-test kit were higher among individuals from richer households [AOR = 1.96, 95% CI: 1.06–3.63] and richest households [AOR = 2.75, 95% CI: 1.46–5.19] compared with those from the poorest households.

Having more than one sexual partner was also associated with higher odds of HIV self-testing [AOR = 2.10, 95% CI: 0.87–5.04]. Additionally, being unaware of a partner's HIV seropositive status, which was considered an indicator of high risk of HIV exposure, was significantly associated with HIV self-testing, with odds significantly lower among individuals who were not aware of their partners HIV seropositive status [AOR = 0.56, 95% CI: 0.33–0.92].

When considering individuals who had ever tested for HIV, the results show significant associations with age, employment status, number of sexual partners, and various household wealth categories. Compared with the respective reference categories, individuals aged 15–24 years [AOR = 0.24, 95% CI: 0.17–0.34] and those aged 55–64 years [AOR = 0.53, 95% CI: 0.31–0.92] had lower odds of ever testing for HIV. In contrast, employed individuals had higher odds of ever testing for HIV [AOR = 1.39, 95% CI: 1.07–1.82]. Having one sexual partner [AOR = 0.55, 95% CI: 0.38–0.79] and more than one sexual partner [AOR = 0.53, 95% CI: 0.33–0.84] were also significantly associated with lower odds of ever testing for HIV. There was no statistically significant association between gender, geographic place of residence, condom use during the last sexual encounter, and HIV self-testing using a self-test kit.

Table 3
Adjusted Odds Ratio for HIV self-testing using self-testing kit and for those who ever tested for HIV

Variables	HIV self-testing using self-testing kit	Ever tested for HIV
Age (in years)	AOR (95% C.I.)	AOR(95% C.I.)
15–24	1.41	0.24***
	(0.87–2.30)	(0.17–0.34)
35–44	0.73	1.38
	(0.46–1.16)	(0.86–2.20)
45–54	0.57	1.00
	(0.29–1.14)	(0.61–1.65)
55–64	0.44	0.53**
	(0.10–1.81)	(0.31–0.91)
25–34	1.00	1.00
Gender		
Male	0.83	0.39***
	(0.57–1.20)	(0.30–0.50)
Female	1.00	1.00
Geographical place of residence		
Urban	1.06	0.89
	(0.73–1.53)	(0.69–1.16)
Rural	1.00	1.00
Education level		
Primary	2.06	1.44
	(0.55–7.75)	(0.92–2.28)
Secondary	2.30	1.19
	(0.62–8.52)	(0.76–1.87)
Higher	5.35**	1.26
	(1.39–20.61)	(0.69–2.30)
C.I.= Confidence Interval, *** p < 0.01, ** p < 0.05, * p < 0.1, 1.00 is the reference category		

Variables	HIV self-testing using self-testing kit	Ever tested for HIV
No schooling	1.00	1.00
Employment status in the past 12 months		
Employed	1.20	1.39**
	(0.81–1.79)	(1.07–1.82)
Unemployed	1.00	1.00
Wealth index		
Poorest	1.00	1.00
Poorer	1.12	1.66***
	(0.56–2.23)	(1.16–2.38)
Middle	1.26	2.04***
	(0.65–2.44)	(1.38–3.01)
Richer	1.96**	1.94***
	(1.06–3.63)	(1.31–2.87)
Richest	2.75***	1.76**
	(1.46–5.12)	(1.08–2.87)
Condom used during last sexual encounter		
No	0.95	1.01
	(0.64–1.39)	(0.75–1.38)
Yes	1.00	1.00
Number of sexual partners past 12 months		
One partner	1.11	0.55***
	(0.49–2.52)	(0.38–0.79)
More than one partner	2.10*	0.53***
	(0.87–5.04)	(0.33–0.84)
None	1.00	1.00
HIV Risk status		
High risk	0.56**	0.13***
C.I.= Confidence Interval, *** p < 0.01, ** p < 0.05, * p < 0.1, 1.00 is the reference category		

Variables	HIV self-testing using self-testing kit	Ever tested for HIV
	(0.33–0.92)	(0.10–0.17)
Low risk	1.00	1.00
C.I.= Confidence Interval, *** p < 0.01, ** p < 0.05, * p < 0.1, 1.00 is the reference category		

Discussion

This study assessed the uptake of HIV self-testing (HIVST) using a self-test kit and examined the factors associated with its uptake. Overall, HIVST uptake was low, at 2.2%. This finding is consistent with several studies that have reported low uptake of HIVST, with plausible explanations including limited awareness, cost, unavailability of self-test kits, and misinformation [30, 31]. HIVST uptake was found to be more prevalent among individuals from wealthier households, those who were aware of their HIV status, and those residing in urban areas. These findings suggest that socioeconomic status, knowledge of HIV status, and place of residence not only influence HIV-related outcomes [1, 32–34], but also remain important determinants of access to and utilization of HIV testing services [14, 17, 35–37]. For those who ever tested, testing was more prevalent among individuals from poorer households. A plausible explanation is that the “ever tested” measure includes individuals who accessed conventional HIV testing and counselling services, which are widely available free of charge, unlike HIV self-testing kits, which may involve out-of-pocket costs.

Wealth status was found to significantly influence the uptake of HIV self-testing (HIVST). Individuals from relatively wealthier households were more likely to use HIVST than those from poorer households. This suggests that individuals from wealthier households may have greater financial resources and are therefore better able to afford, access, and utilize HIV self-testing kits than individuals with limited financial resources from poorer households. HIV self-testing kits are available at a fee and at selected facilities [31, 38], implying that their use may involve both direct and indirect costs. Therefore, the observed association between wealth status and HIVST utilization suggests that affordability plays a crucial role in access to and demand for HIV self-testing services. This finding is consistent with evidence from previous studies [14].

The probability of using HIV self-testing (HIVST) increases with educational attainment. In particular, individuals with higher levels of education were more likely to use HIVST than those with no formal education. Similar findings have been reported in previous studies [30; 36–40]. The positive influence of education on HIVST uptake may be attributed to greater knowledge and health literacy, which can enhance individuals’ ability to make informed decisions regarding the demand for and utilization of health services such as HIVST. The findings further show that exposure to HIV risk, reflected by being unaware of a partner’s HIV status, as well as the number of sexual partners, was associated with HIVST uptake. This suggests that individuals who perceive themselves to be at greater risk of HIV infection may be more inclined to use HIV self-testing as a convenient and private means of determining their HIV

status. Previous studies have similarly reported associations between these HIV risk-related factors and the uptake of HIVST [41–45].

We also found that individuals residing in urban areas were more likely to use HIV self-testing (HIVST) kits than those in rural areas. A plausible explanation is that rural areas may have fewer facilities where HIV self-testing kits can be obtained or purchased, potentially reflecting limited availability and accessibility of HIVST kits [46–47]. This finding is consistent with existing empirical evidence showing that health facilities and services are often unevenly distributed in rural areas. Such disparities in access may influence individuals' decisions to use HIV self-testing kits, as opposed to accessing public health facilities where conventional HIV testing services are generally available.

Strengths and Limitations

In examining the uptake of HIVST and the associated factors, this study complements existing evidence on HIV testing, prevention and care by providing insights into some aspects of health system strengthening around demand and supply factors. Particularly, our finding that the uptake of HIVST is low may be due to supply-side effects such as unavailability of self-test kit or lack of facilities selling HIV self-testing kit in rural areas, for instance. From the demand side, the factors could be associated with less or no advertising and promotion of HIVST, community perceptions and lack of awareness of HIVST. BAIS V did not collect data on these variables and this limited our study to examine the possible barriers and facilitators to explain the observed low uptake of HIVST in Botswana. Despite this, by including wealth status variable (as a proxy for affordability) in our study, we can draw inference on how wealth status (as a key determinant of demand) influences HIVST. From the supply side particularly with regard to availability, our study included geographical place of residence (urban/rural) upon which inference can be drawn from.

The choice to include geographical place of residence variable is premised on the fact that empirical evidence that exist has shown that health facilities are unevenly distributed in rural areas and this is likely to influence the availability (supply) of health care as well as the decisions to use health facilities to access services including HIVST. Availability of health services partly explains low utilization rates as well as inequalities in health outcome. This study used cross-section data and not panel data hence, it is limited in depicting whether the consumption choices taken by individuals change over time between utilizing traditional HIV testing services and HIVST. There have been intensified efforts by government in recent years, to address both supply (access and availability) and demand side effects (affordability) through an envisaged mandatory NHI [23]. Self-testing for HIV using a self-test kit is among the existing initiatives in Botswana targeted at ensuring access to improve HIV response and end AIDS. Therefore, in using cross-sectional data our study has allowed us to establish the pattern and characteristics of self-testing. This provides scientific evidence that will guide policy decisions to address inequities in the access, demand and utilization of self-testing for HIV using self-test kit. To the best of our knowledge, this study is among the few studies conducted in Botswana on the uptake of self-testing for HIV using a self-test kit and associated factors.

Conclusion

This paper examined the uptake of HIV self-testing (HIVST) using self-test kits and the factors associated with its utilization. Overall, the study found that HIVST uptake was low among the general population and varied by wealth status, educational attainment, number of sexual partners, gender, and geographical place of residence. Furthermore, the findings indicate that factors such as age, education, and geographical place of residence, which have been documented elsewhere as important determinants of HIV-related outcomes, also remain important factors associated with the uptake of HIVST. Among other interventions, it is crucial for policymakers to consider including HIV self-testing kits in the benefit package of the envisaged National Health Insurance (NHI). Such inclusion could improve the affordability of and access to HIVST, thereby increasing its demand and uptake. Increased uptake of HIVST could subsequently contribute to expanding HIV testing coverage, which is critical for achieving national and global HIV prevention and treatment targets.

Declarations

Ethics approval and consent to participate:

This study uses secondary data that is publicly available upon request from Statistics Botswana. The authors requested for data from Statistics Botswana website (<https://microdata.statsbots.org.bw/index.php/catalog/?page=1&ps=15>) and permission was granted to use the data.

Consent for publication:

Not applicable

Competing Interest:

The authors declare that they have no competing interests.

Funding:

No funding was received.

Author Contribution

NS and MK conceptualized this manuscript. NS and OM are responsible for data analysis and prepared figures 1-3, writing and editing the first draft. All authors reviewed and edited the manuscript.

Data Availability

BAIS V data is publicly available from Statistics Botswana website:

<https://microdata.statsbots.org.bw/index.php/catalog/?page=1&ps=15>

References

1. Government of Botswana. Botswana AIDS Impact Survey V 2021 Report. National AIDS and Health Promotion Agency; 2023.
2. Simela SR, Kelepile M, Sebobi TI. Spatial Analysis and Associated Risk Factors of HIV Prevalence in Botswana: Insights from the 2021 Botswana AIDS Impact Survey (BAIS V). *BMC Infectious Diseases*. 2025; 25(69).
3. Kapoor A, Mussa A, Diseko M, Mayondi G, Mabuta J, Mmalane M, Makhema J, Morroni C, Lockman S, Zash R, Shapiro R. Cross- Sectional Trends in HIV Prevalence among Pregnant Women in Botswana: An Opportunity for PrEP? *J Int AIDS Soc*. 2022;25:e25892.
4. Matlho K, Randell M, Lebelonyane R, Kefas J, Driscoll T, Negin JHIV. Prevalence and Related Behaviours in Botswana – Secondary Analysis of the Botswana AIDS Impact Survey V. *Afr J AIDS Res*. 2019;18(1):18–26.
5. World Health Organization. Guidelines on HIV self-testing and partner notification: supplement to consolidated guidelines on HIV testing services. In. France: World Health Organization, Geneva 27, Switzerland: 2016: 1-104. [<https://iris.who.int/items/09beed7d-192a-4f66-97ff-2e2f5841e7a5>].
6. Johnson C, Baggaley R, Forsythe S, van Rooyen H, Ford N, Mavedzenge S, Corbett E, Natarajan P, Taegtmeier M. Realising the Potential for HIV Self-Testing. *AIDS Behav*. 2014: 18.
7. Njau B, Damian DJ, Abdullahi L, Boulle A, Matthews C. The Effects of HIV Self-Testing on the Uptake of HIV Testing, Linkage to Anti-Retroviral Treatment and Social Harms among Adults in Africa: A Systematic Review and Meta-Analysis. *PLoS ONE*. 2021.
8. Indravudh PP, Choko AT, Corbett EL. Scaling up HIV Self-Testing in sub-Saharan Africa: A Review of Technology, Policy and Evidence. *Current Topics in Infectious Diseases*; 2018.
9. Kebede B, Abate T, Mekonnen DHIV. Self-Testing Practices among Health Workers: Feasibility and Options for Accelerating HIV Testing Services in Ethiopia. *Pan Afr Med J*. 2013;15:50.
10. Zeleke EA, Stephens JH, Gesesew HA, Gello BM, Ziersch A. Acceptability and Use of HIV Self-Testing among Young People in sub-Saharan Africa: A Mixed Methods Systematic Review. *BMC Prim Care*. 2024.
11. Njau B, Lisasi E, Damian DJ, Mushi DL, Boulle A, Matthews C. Feasibility of an HIV Self-Testing Intervention: A Formative Qualitative Study among Individuals, Community Leaders and HIV Testing Experts in Northern Tanzania. *BMC Public Health*. 2020;20:490.
12. Ortblad K, Chanda M, Musoke D, Ngabirano T, Mwale M et al. Acceptability of HIV Self-Testing to Support Pre-Exposure Prophylaxis Among Female Sex Workers in Uganda and Zambia: Results from

- two Randomized Controlled Trials. *BMC Infect Dis.* 2018;18(1).
13. Choko AT, Desmond N, Webb EL, Chavula K, Napierala-Mavendgenge S, Gaydos CA, Makombe SD, Chunda T, Squire SB, French N, et al. The Uptake and Accuracy of Oral Kits for HIV Self-Testing in High HIV Prevalence Setting: A Cross-Sectional Feasibility Study in Blantyre, Malawi. *PLoS Med.* 2011;8(10):e1001102.
 14. Akweh TY, Adoku E, Mbiba F, Teyko F, Brinsley, Theodora. Yayra., Boakye Jr, Bright. Atta., Aboagye, Richard. Gyan., Hubert. Amu. Prevalence and factors associated with knowledge of HIV Self-Test kit and HIV-Self Testing among Ghanaian women: multi-level analyses using the 2022 Ghana demographic and health survey. *BMC Public Health.* 2025: 25:1161.
 15. Terefe B, Jembere MM, Reda GB, Asgedom DK. Assefa, Solomon. Keflie., Lakew, Ayenew. Molla. Knowledge, and utilization of HIV self-testing, and its associated factors among women in sub-Saharan Africa: evidence from 21 countries demographic and health survey. *BMC Public Health.* 2024: 24:1960.
 16. Awopegba OE, Ologunowa TO, Ajayi AI. HIV testing and self-testing coverage among men and women in South Africa: an exploration of related factors. *Trop Med Int Health.* 2021;26(2):214–27.
 17. Ekholuenetale M, Okonji, Osaretin C, Nzoputam CI, Barrow. Amadou. Uptake and factors associated with HIV self-testing among women in South Africa. *J Colleges Med South Afr.* 2024;10(1):21.
 18. Wong V, Jenkins E, Ford N, Ingold H. To Thine Own Test be True: HIV Self-Testing and the Global Reach for the Undiagnosed. *J Int AIDS Soc.* 2019;22(S1):25256.
 19. Kgotlaetsile K, Bogart L, Phaladze N, Klein D, Mosepele M. Feasibility and acceptability of human immunodeficiency virus self-Testing for men of middle-To-upper socioeconomic status in botswana: A pilot study at 4 worksites in the financial sector. *Open Forum Infect Dis.* 2024.
 20. Kyegombe N, Agibola G, Sakoi-Mosetlhi M, Rebatenne T, Tsholofelo., Anderson MM, Gaseitsewe S, Makhema J, Ngwenya U, Moyo S, Sikhulile., Sauzet O. Mupfumi, Lucy. Youth and Healthcare Workers' Perspectives on the Feasibility and Acceptability of Self-Testing for HIV, Syphilis among Young People: Qualitative Findings from a Pilot Study in Gaborone. *Botsw PLoS ONE.* 2023;18(7):e0288971.
 21. Shava E, Bogart L, Manyake K, Mdluli C, Maribe K, Monnapula N, Nkomo B, Mosepele M, Moyo S, Mmalane M, Bärnighausen T, Makhema J, Lockman S. Feasibility of oral HIV self-testing in female sex workers in Gaborone, Botswana. *PLoS ONE.* 2021;16(11):e0259508.
 22. Oduetse OK, Nkomo B, Majingo N, Mashalla Y, Seloilwe E. Perceptions and attitudes towards acceptability of HIV self-testing among female sex workers in Selibe-Phikwe, Botswana. *African Journal of AIDS Research.* 2019. 2019: 18(3).
 23. Government of Botswana. National Health Insurance Policy. Botswana: Ministry of Health, Gaborone; 2026.
 24. Government of Botswana. National Health Policy. Towards a Healthier Botswana. Botswana: Ministry of Health, Gaborone; 2011.

25. UNAIDS. Sustainability of HIV Services in Botswana: Health System Integration and Financing Review. Joint United Nations Programme on HIV/AIDS; 2021.
26. UNAIDS. An Evaluation of the Contribution of the UNAIDS Joint Programme to Strengthening HIV and Primary Health Care Outcomes. Country Case Studies: Botswana.; 2023.
27. Makhema KE, Wirth M, Pretorius H, Gaolathe TMD, Mmalane M, Etienne-Kadima MD, et al. Universal Testing, Expanded Treatment and Incidence of HIV Infection in Botswana. *N Engl J Med*. 2019;381(3):230–42.
28. Ministry of Health and Wellness. Botswana National HIV and AIDS Strategic Framework (NSF) 2018–2023. Gaborone, Botswana: Ministry of Health and Wellness; 2017.
29. Bogart L, Kgotlaetsile K, Phaladze N, Mosepele MHIV. Self-Testing may Overcome Stigma and other Barriers to HIV Testing among Higher Socio-economic Status Men in Botswana: A Qualitative Study. *Afr J AIDS Res*. 2021;20:4.
30. Aloni MS. Drivers of HIV Self-Test Kit Among Tanzanian Men Aged 15–49: Findings from the 2022 TDHS-MIS Cross-Sectional Study. *AIDS Res Therapy*. 2025: 22(3).
31. Mukashyaka R, Kaberuka G, Favina A, Lutasingwa D, Mulisa F, Turatsinze E, Karanja A, Kansime D et al. Enhancing HIV Self-Testing Uptake Among University Students in Rwanda: The Proportion, Barriers and Opportunities. *BMC Public Health*. 2025: 25(1).
32. Allorant A, Kuchukhidze S, Stannah J, Xia Y, Masuku SS, Ekanmian GK et al. Socio-demographic and Geographic Disparities in HIV Prevalence, HIV Testing and Treatment Coverage: An Analysis of 108 National Household Surveys in 38 African Countries. *J AIDS Int Soc*. 2025: 28e70024.
33. Obiedzu-Umeh C, Gbajabiamila T, Ezechi O, Nwaozuru U, Idigbe I, Oladele D, Musa A, Uzoaru F et al. Young People's Preferences for HIV Self-Testing Services in Nigeria: A Qualitative Analysis. *BMC Public Health*. 2021: 21(1).
34. Qiao S, Zhang Y, Li X, Menon JA. Facilitators and Barriers for HIV Testing in Zambia: A Systematic Review of Multi-Level Factors. *PLoS ONE* 2018: 13(2).
35. Jung MS, Dlamini NS, Cui X, Cha K. Prevalence of HIV Testing and Associated Factors among Adolescents in Eswatini: A Secondary Data Analysis. *BMC Pediatr*. 2022: 22659).
36. Ekholuenetale M, Chimezie I, Nzoputam CI, Okonji OC. Association between socio-economic factors and HIV self-testing knowledge amongst South African women. *South Afr J HIV Med*. 2022: 23(1).
37. Menna T, Ali A, Worku A. Factors Associated with HIV Counselling and Testing and Correlations with Sexual Behaviours of Teachers in Primary and Secondary Schools in Addis Ababa, Ethiopia. *HIV/AIDS- Research and Palliative Care*. 2015: 7(2015).
38. Agyekum M, Appiah M, Kyei-Arthur F, Afrifa-Anane G, Kyei-Gyamfi S, Yeboah I, Abdulai M. Prevalence and Factors Associated with Awareness and Use of HIV Self-Testing Kits among Young Women aged 15–24 in Ghana. *AIDS Research and Therapy*. 2025: 22:72 (2025).
39. Mason S, Ezechi OC, Obiezu-Umeh C, Nwaozuru U, BeLue R, Airhihenbuwa C, Gbaja-Biamila T et al. Understanding Factors that Promote Uptake of HIV Self-Testing among Young People in Nigeria: Framing Youth Narratives using PEN-3 Cultural Model. *PLoS ONE*. 2022: 17(6).

40. Sonko I, Chung MH, Hou WH, Chen WT, Chang PC. Predictors of HIV Testing among Youth Aged 15–24 years in the Gambia. *PLoS ONE*. 2022: 17(2).
41. Muendo N, Thigiti J, Tembu O, Mohamed A, Audi S, Karanja M. Exploring HIV Self-Testing: Barriers and Facilitators Among Undergraduate Students in Nairobi, Kenya. *Ann Fam Med*. 2024: 22(6).
42. Muwanguzi PA, Bollinger RC, Ray SC, Nelson LRE, Kiwanuka N, Bauermeister JoséA, Sewankambo NK. Drivers and barriers to workplace-based HIV self-testing among high-risk men in Uganda: A Qualitative study. *BMC Public Health*. 2021: 21:1002 (2021).
43. Worku MG, Tesema GA, Teshale AB. Prevalence and associated factors of HIV testing among reproductive-age women in eastern Africa: multilevel analysis of demographic and health surveys. *BMC Public Health*. 2021: 21: 1262(2021).
44. Sibiya MN, Anyiam FE, Oladimeji O. Empowering Vulnerable Communities Through HIV Self-Testing: Post-COVID-19 Strategies for Health Promotion in Sub-Saharan Africa. *Int J Environ Res Public Health*. 2025: 22(16).
45. Osborne A, Bangura C, Williams SMT, Koroma AH, Fornah L, Yillah RM, Ahinkorah BO. Spatial Distribution and Factors Associated with HIV Testing among Adolescent Girls and Young Women in Sierra Leone. *BMC Infect Dis*. 2024: 24(192).
46. Wang Y, Kinsler J, Kiwuwa-Muyingo S. Factors Associated with HIV Testing among Youth in Tanzania based on the 2016–2017 Tanzania HIV Impact Survey (THIS). *PLOS Global Health*. 2022: 2(11).
47. Hatzold K, Gudukeya S, Mutseta MN, Chilongosi R, Nalubamba M, Nkhoma C, Munkombwe H et al. HIV Self-Testing: Breaking the Barriers to Uptake of Testing among Men and Adolescents in sub-Saharan Africa, experiences from STAR demonstration Projects in Malawi, Zambia and Zimbabwe. *Journal of the International AIDS Society*. 2019: 22(S1).

Figures

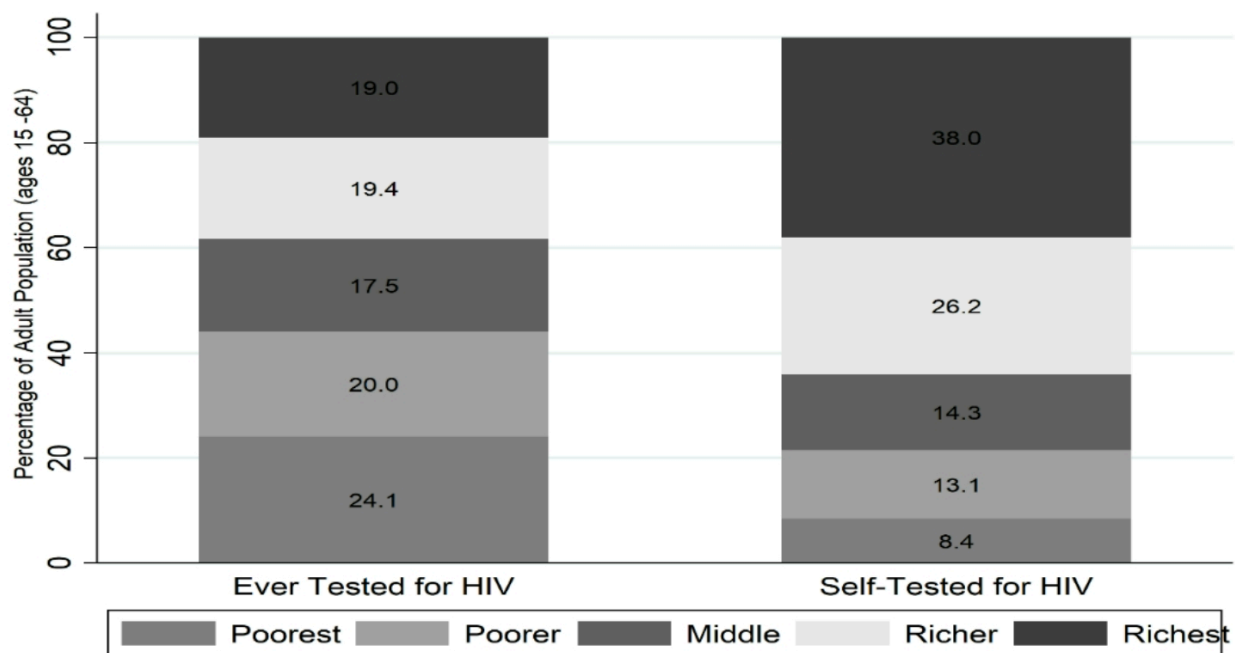


Figure 1

Distribution of uptake of HIV Testing using HIVST Kit Uptake & Ever Tested for HIV by Wealth Index, 2021

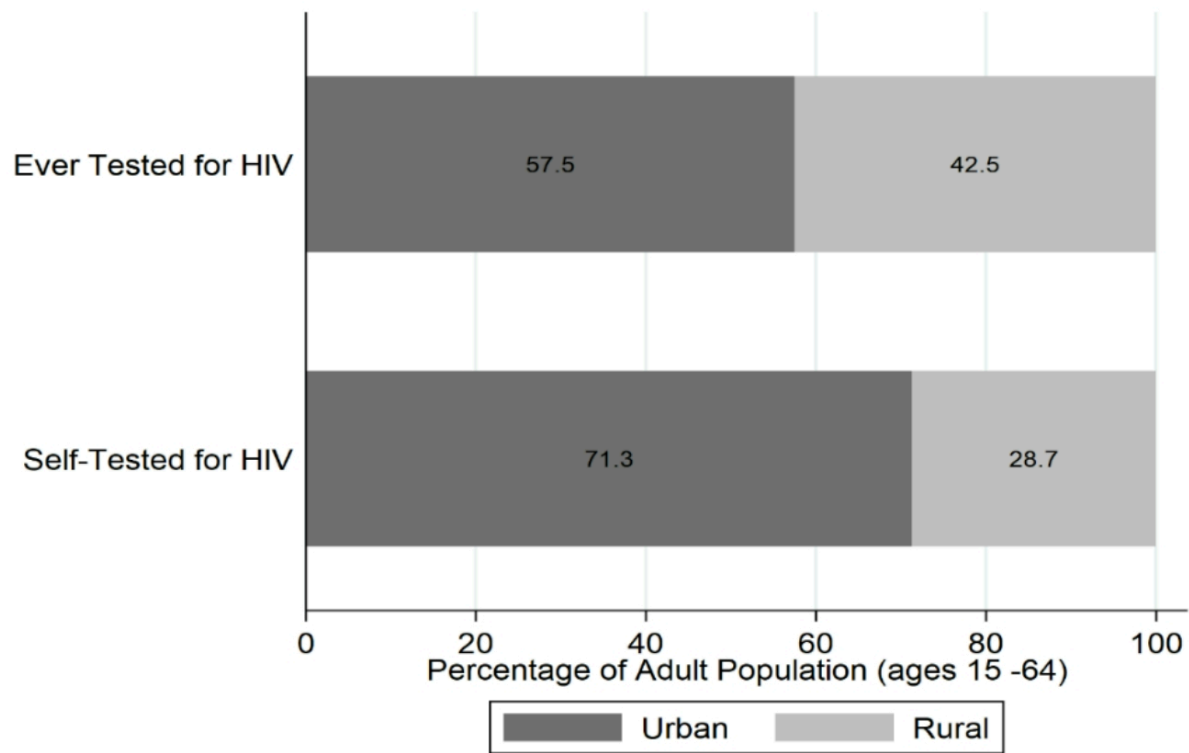


Figure 2

HIV Self-Testing Uptake & Ever Tested for HIV Outcomes by Place of Residence

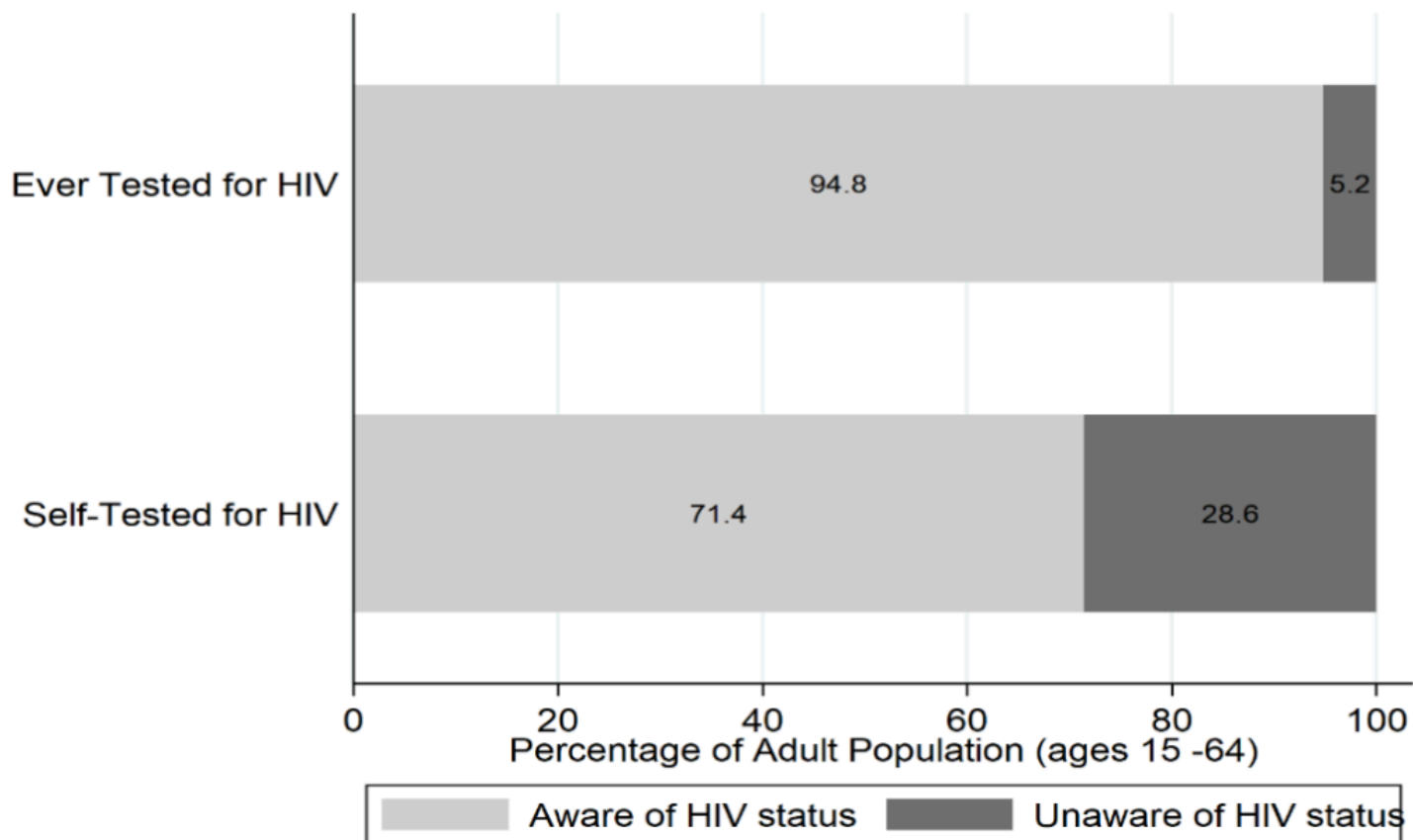


Figure 3

HIV Self-Testing Uptake & Ever Tested for HIV Outcomes by Respondent’s Awareness of HIV Seropositive Status