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Drivers of HIV self-test kit among Tanzanian men aged 15–49: findings from the 2022 TDHS-MIS cross-sectional study

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Abstract

Introduction The introduction of the HIV self-test kit in the early 2000s was a major breakthrough in combating HIV. This study determines the social demographic and sexual behaviour driving the use of HIV self-test kits.

Method The study used secondary data obtained from Tanzania DHS-MIS 2022. The survey uses a stratified two-stage sample design. The first stage involved the selection of clusters consisting of enumeration areas, and in the second stage of sampling, 26 households were selected from each cluster.

Results The mean age = 28.6 years. Usage of HIV self-test kits was found to be low (3.9%). The odds of using HIV self-test kits were 2.2 and 6.6 times more likely among those with primary (aOR = 2.2, 95%CI = 2.2–2.3) and secondary (aOR = 6.6, 95%CI 6.6–6.7) education compared to those without education respectively. As age increases, the odds of using HIV self-test kits increases. Men residing in rural areas were about 40% less likely to use HIV self-test kits compared to those dwelling in urban areas (aOR = 0.6, $P < 0.0001$).

Conclusion Significant demographic and sexual behaviour factors associated with the usage of HIV self-test kits include sex of household head, education level, marital status, wealth status, age, ever heard of sexually transmitted infection and condom use during sexual intercourse. HIV self-test kits were used more in urban areas than in rural areas. It is essential to raise awareness and improve access to HIV self-test kits for less informed populations, such as those living in rural areas.

Keywords HIV self-test kit, Tanzania, Men, Logistic regression, Usage, Demographic factors, Sexual behaviour factors

Introduction

Human Immunodeficiency Virus (HIV) remains a significant global health issue impacting millions of people worldwide. The pandemic is a severe public health concern, having killed about 40 million people to date and continuing to spread throughout the nations [1]. About 39 million people were estimated to be HIV positive by the end of the year 2022, with two-thirds of them residing

in the African region [2, 3]. Early diagnosis and treatment are crucial for managing the human immunodeficiency virus, improving health outcomes and preventing its spread [4, 5]. Despite advances in HIV prevention, treatment, care and support services, there exist several people who remain unaware of their HIV status due to barriers such as stigma, lack of access to healthcare and fear of discrimination. Other reported barriers to HIV testing include low perceived risk of infection, the stress of waiting for results and fear of a positive outcome [6], cost of HIV testing [7], poor awareness of HIV testing locations, cultural stigmatisation associated with HIV diagnoses and fear of judgement by health care providers [8]. The statistics show about 5.4 million people in the

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world did not know that they had HIV and still needed access to HIV testing services [9] to reach the global target of HIV status awareness of 95% by 2025 [10–13].

The development of HIV self-test kits in the early 2000s marked a significant milestone in the fight against the HIV/AIDS pandemic [14]. These innovative tools have the potential to revolutionise the way individuals access and monitor their HIV status, empowering them to take control of their health and contributing to broader efforts to combat the spread of the virus. The advent of self-testing kits has been driven by a desire to address the persistent challenges in HIV testing, particularly in reaching high-risk populations and overcoming barriers such as stigma, accessibility and cost [15, 16]. Over the years, the availability of these kits expanded globally, driven by initiatives from organisations such as the World Health Organization (WHO) and the joint United Nations Programme on HIV/AIDS (UNAIDS), which recognised their potential to increase testing rates to their member states through their political declaration. The declaration calls on a member state to ensure that 95% of people living with HIV/AIDS know their HIV status. Continuous advancements in technology and reductions in cost have further improved the accuracy and accessibility of HIV self-test kits, making them a vital tool in the global fight against HIV/AIDS. The traditional approach to HIV/AIDS testing has been severely medicalised by requiring visiting healthcare facilities that undergo counselling and laboratory-based testing [17]. This trend has been and productive in some areas. Still, it has also been criticised for its restrictions in reaching certain populations, such as those in remote places or underserved areas.

The World Health Organization included the HIV self-test kit agenda in its 2021 Consolidated Guidelines on HIV prevention, testing, treatment, service delivery and monitoring [18]. The Guidelines advocate for distributing HIV self-test kits through various communities and health facility-based models. They also recommend distribution to private practitioners, including pharmacies, in workplaces and on social events. A study has shown that delivering HIV self-test kits through innovative distribution channels is both feasible and acceptable [19]. However, using HIV self-test kits comes with several challenges, including concerns over test accuracy as improper use or interpretation can result in false results, lack of pre and post-test counselling to support users, the need for linkage to care among those testing positive, the need for confirmatory testing and the window period [20]. Without immediate access to professional counselling and support, a positive result may leave individuals feeling isolated and uncertain about the appropriate next steps. Regulatory barriers and inconsistent availability of HIV self-tests across different regions can also limit

access to these essential testing tools [21]. Addressing these challenges requires comprehensive education, clear instructions, robust support systems and widespread availability to maximise the effectiveness of HIV self-test kits. Despite the mentioned challenges in using HIV self-test kits, many countries, including Kenya and the United Kingdom, have implemented national policies governing their HIV self-test kits usage, and other countries have policies making HIV self-test kits illegal. However, there exist countries like India with no laws governing the use of HIV self-test kits [20], [22].

Several studies conducted in specific areas, such as on regions and districts with high-income countries [23, 24] and those done in sub-Saharan countries [25–27], have shown more significant usability and acceptability of HIV self-test kits. Other studies conducted in specific areas of Tanzania have shown a significant association between the usage of HIV self-test kits and knowledge of HIV testing, awareness of HIV testing, attitude and social and economic factors. Studies that examine the demographic and sexual behaviour drivers that affect the usage of HIV self-test kits based on national data and device population are relatively new in the literature. Thus, this study employed national and large-scale data to examine social demographic and sexual behaviour factors affecting men's usage of HIV self-test kits, evidenced by the Tanzania DHS-MIS, 2022.

Method and data

The study used the secondary data obtained from the Tanzania DHS-MIS 2022. The 2022 Tanzania DHS-MIS was conducted by the National Bureau of Statistics (NBS) and the Office of the Chief Government Statistician Zanzibar (OCGS) in collaboration with the Ministries of Health of the United Republic of Tanzania and Zanzibar. The primary purpose of the 2022 Tanzania DHS-MIS was to provide current data needed to monitor and evaluate population, health, and nutrition programmes regularly.

The 2022 Tanzania DHS-MIS used a stratified two-stage sample design. The first stage involved the selection of clusters consisting of enumeration areas (EAs). The EAs were selected with a probability proportional to their size within each sampling stratum. A total of 629 clusters were selected. Among the 629 EAs, 211 were from urban areas, and 418 were from rural areas. In the second sampling stage, 26 households were selected systematically from each cluster. During the household listing operation, field staff visited each of the selected EAs to draw location maps and detailed sketch maps and to list all residential households found in each EA with addresses and the names of the heads of the households. The resulting list of households served as a sampling frame for selecting households in the second stage. The study targeted all

adult men aged 15 to 49, and a total of 5,763 men were selected for the sample. The sample design for the 2022 Tanzania DHS-MIS provides estimates at the national level, for urban and rural areas, for the nine zones, and for each of Tanzania's 31 regions, 26 regions from Tanzania Mainland and five regions from Zanzibar provinces [28].

Objective of the study

The current study explores the socio-demographic and sexual behaviour drivers of HIV self-test kits among Tanzanian adult men aged 15–49 years.

Variables

Outcome variable

The outcome variable for this study is the usage of an HIV self-test kit. This variable was assessed using the men's knowledge and usage of HIV self-test kits. This variable was initially categorised into three categories: the first category consisted of men who claimed to have never heard of HIV self-test kits, second was those men who had ever tested HIV using self-test kits, and the last category was men who reported knowing the self-test kit but never tested using the HIV self-test kits. Respondents who had never heard of HIV self-test kits and those who knew the HIV self-test kits but had never used them were considered as never used the HIV self-test kits. In contrast, those who had ever tested using HIV self-test kits were considered as ever used the HIV self-test kits. The two categories were assigned the values of "0" and "1" for never-used HIV self-test kits and ever-used HIV self-test kits, respectively, for computational purposes only as similar done by [3]. This is presented mathematically as follows;

$$\text{Usage of HIV Self - test kits} = \begin{cases} 0 & \text{Never used,} \\ 1 & \text{Ever used.} \end{cases}$$

Predictor variable

The predictor/independent variables were categorised into two main groups, which are social-demographic variables (Age, education, residence, marital status, wealth status and sex of household head) and sexual activities (recent sexual activities, number of sex partners, including a spouse in the last 12 months number ever heard of a sexually transmitted infection (STI) and condom use).

Data analysis

The analysis focused on the usage of HIV self-test kits for adult men aged 15–49 years. Data analysis was performed in STATA version 14.1 using survey procedures to account for the complexity clustering, stratification

and weighting. The analysis involved weighting of the variables under the study. Although the weighting resulted in the expansion of the standard error measure, possibly associated with the imputation of the non-response rate in the calculation of the estimates. This procedure tends to reproduce the calculation of the estimates in complex samples more accurately [29]. The weighted binary analysis reported using crude odds ratio (cOR) was conducted to examine the association between the usage of HIV self-test kits and each explanatory variable. Explanatory variables were selected for the multivariable model to assess the effect of confounding variables over usage of HIV self-test kits when either it was significant (P -value < 0.2) in the bivariate logistic regression analysis or revealed to be statistically significant in earlier published studies [30–32].

Ethical approval

The ethical approval for the Tanzania Demographic and Health Survey and Malaria Indicator Survey (Tanzania DHS-MIS) 2022 was acquired from the Institutional Review Board (IRB) of ICF International and the National Institute of Medical Research in Tanzania (NIMR). Researchers secured informed agreement from all eligible respondents before they participated in the survey. The author received authorisation to use the secondary data through online registration on the website (<https://www.dhsprogram.com>). No further consent from participants was necessary to use this secondary data in this study.

Distribution of respondents by usage of HIV self-kit

Table 1 presents variable characteristics of the 5,763 adult male respondents aged 15 to 49 with mean age = 28.63 and standard error = 0.13. The majority (83.5%) of the household heads were males. Those with primary education constituted more than half (51.7%) of the respondents, followed by 38% with secondary education, and the rest had no education. Concerning marital status, the majority (50.1%) were married, and only 5.3% reported being ever married. Regarding wealth status, 45.9% were found to be in the wealthiest class, 32.1% were in the lowest class, and the rest were in the middle class of wealth status. At least two third (68.5%) of respondent reported to have zero number of sexual partners in the last 12 month preceding the TDHS-MIS 2022 survey. Regarding district of residence, 67.3% lived in rural areas. Moreover, the percentage of respondents who reported using condoms was only 16.2, while 83.8 reported having the last sexual intercourse without a condom. Concerning bivariate analysis, all predictor variables were statistically significant to the outcome variable except the sex of the household head.

Table 1 Univariate and bivariate logistic regression model of social demographic and sexual behaviour variables by the use of HIV self-test kits (n = 5763)

Variable	Univariate analysis (Unweighted)		Bivariate analysis (Weighted)		
	Category	Frequency "n" Percentage (%)	cOR	95% CI	P-value
Usage of HIV self-test kit	No	5536 (96.1)			
	Yes	227 (3.9)			
Sex of household head	Male	4812 (83.5)	1	–	–
	Female	951 (16.5)	1.1	1.1–1.2	<0.0001
Highest level of Education	No education	597 (10.4)	1	–	–
	Primary education	2978 (51.6)	2.3	2.3–2.31	<0.0001
	Secondary and higher	2188 (38.0)	6.5	–	–
Marital status	Single	2573 (44.6)	1	–	–
	Married	2885 (50.1)	2.4	2.4–2.5	<0.0001
	Ever married	305 (5.3)	3.0	3.0–3.1	<0.0001
Wealth status	Lowest	1850 (32.1)	1	–	–
	Middle	1266 (22.0)	1.3	1.3–1.4	<0.0001
	Richest	2647 (45.9)	4.2	4.2–4.3	<0.0001
Recent sexual activity	Never had sex	1278 (22.2)	1	–	–
	Active in last 4 weeks	3067 (53.2)	6.5	6.5–6.6	<0.0001
	Not active in last 4 weeks	1418 (24.6)	4.7	4.7–4.8	<0.0001
Number of sex partners, including a spouse, in the last 12 months	Zero (0)	3795 (68.5)	1	–	–
	≥ 1	1968 (34.2)	1.7	1.7–1.8	<0.0001
Age in 5—year groups Mean = 28.63, SD = 10.03, Min = 15, Max = 49	15–19	1457 (25.3)	1	–	–
	20–24	959 (16.6)	3.7	3.7–3.8	<0.0001
	25–29	846 (14.7)	6.3	6.3–6.5	<0.0001
	30–34	722 (12.5)	8.5	8.5–8.6	<0.0001
	35–39	686 (11.9)	6.9	6.9–7.0	<0.0001
	40–44	621 (10.8)	5.5	5.5–5.6	<0.0001
Place of residence	Urban	1883 (32.7)	1	–	–
	Rural	3880 (67.3)	0.3	0.3–0.4	<0.0001
Ever heard of a sexually transmitted infection	No	1428 (24.8)	1	–	–
	Yes	4335 (75.2)	2.7	2.7–2.8	<0.0001
A condom was used during the last sex with the most recent partner	No	3484 (83.8)	1	–	–
	Yes	675 (16.2)	1.4	1.4–1.5	<0.0001

cOR = Crude odds ratio, CI = Confidence interval

The relationship between the outcome variable and each explanatory variable was analysed using the binary logistic regression models, as shown in Table 1. The analysis indicated that: female household head (cOR = 1.1, 95% CI, 1.1–1.2, $P < 0.0001$), respondents with primary education (cOR = 2.3, 95% CI, 2.3–2.31, $P < 0.0001$), respondents with secondary education (cOR = 6.5, 95% CI, 6.5–6.6, $P < 0.0001$), married men (cOR = 2.4, 95% CI, 2.4–2.5, $P < 0.0001$), ever married men (cOR 3.0 95% CI, 3.0–3.1, $P < 0.0001$), respondent with middle income (cOR = 1.3, 95% CI 1.3–1.4,

$P < 0.0001$), those with richest wealth status (cOR = 4.2, 95% CI 4.2–4.3, $P < 0.0001$) and number of sexual partners were positively correlated with usage of HIV self-test kits. Other explanatory variables that increase the odds of HIV self-test kits were the age of respondents in 5-year groups, ever heard of sexually transmitted infection and the use of a condom during the last sexual intercourse with the most recent partner. Men residing in rural areas were significantly 70% less likely to test their HIV status using the HIV self-test kits (cOR = 0.3, 95% CI, 0.3–0.4, $P < 0.0001$).

Multivariable logistic regression results

Adjusted factors associated with the usage of HIV self-test kits among 15–49 adult men in 31 regions of Tanzania mainland and five regions from Zanzibar provinces are presented in Table 2. The odds ratio of using the HIV self-test kits was significantly 1.387 times higher among female household heads compared to male household heads (OR=1.387, $P<0.0001$). In terms of education level, as the level of education increases, the odds ratio of using HIV self-test kits increases about 3 times higher. Thus, the odds ratio was 2.345 and 6.923 times more likely to use HIV self-test kits to men with primary education (OR=2.345, $P<0.0001$) and to those with secondary education and higher (OR=6.923, $P<0.0001$) as compared to men without education, respectively. The odds ratio was 2.058 and 1.684 times higher among married and ever-married men on the use of HIV self-test kits as compared to single men.

Similarly, the use of HIV self-test kits increases significantly among those with middle to richer incomes. For instance, the odds ratio of men with middle and richer wealth status were about 1.167 and 1.17 times higher than that of poorer men. Respondent who had not been sexually active in the past four weeks showed a 0.824 increase in the Log odds of using HIV self-test kits compared to those who reported no recent sexual activity (OR=0.824, $P<0.0001$). The odds ratio was 1.635 times more likely to use HIV self-test kits among respondents reported to have at least one sex partner, including spouse, compared to those reported having zero sex partner, including spouse (OR=1.635, $P<0.0001$). In terms of age, the odds of using HIV self-test kits increased with an increase in age up to men aged 35–39, then declined at those aged 40–44 and peaked at 45–49 years compared to those aged 15–19. Type of residence was also found to be a significant attribute to the use of HIV self-test

Table 2 Multivariable logistic regression model of social demographic and sexual behaviour variables by the use of HIV self-test kits (n = 5763)

Factors affecting the use of HIV self-test kit	Category	Odds ratio	P-value	[95% C I]
Sex of household head	Male	1	–	–
	Female	1.387	<0.0001	1.387–1.388
Highest level of Education	No education	1	–	–
	Primary education	2.345	<0.0001	2.34–42.348
	Secondary and higher	6.923	<0.0001	6.9176–6.930
Marital status	Single	1	–	–
	Married	2.058	<0.0001	2.057–2.059
	Ever married	1.684	<0.0001	1.683–1.686
Wealth status	Poorer	1	–	–
	Middle	1.167	<0.0001	1.166–1.168
	Richer	1.17	<0.0001	1.816–1.819
Recent sexual activity	Never had sex	1	–	–
	Not active in last 4 weeks	0.824	<0.0001	0.824–0.825
Number of sex partners, including a spouse, in the last 12 months	Zero (0)	1	–	–
	> = 1	1.635	<0.0001	1.634–1.636
Age in 5—year groups Mean = 28.63, SD = 10.03, Min = 15, Max = 49	15 – 19	1	–	–
	20 – 24	3.267	<0.0001	3.264–3.271
	25 – 29	4.284	<0.0001	4.280–4.289
	30 – 34	5.685	<0.0001	5.679–5.691
	35 – 39	5.869	<0.0001	5.863–5.876
	40 – 44	5.232	<0.0001	5.226–5.238
	45 – 49	7.112	<0.0001	7.105–7.121
Place of residence	Urban	1	–	–
	Rural	0.667	<0.0001	0.667–0.668
Ever heard of a sexually transmitted infection	No	1	–	–
	Yes	1.274	<0.0001	1.273–1.275
A condom was used during the last sex with the most recent partner	No	1	–	–
	Yes	1.379	<0.0001	1.379–1.381

OR odds ratio, CI confidence interval

kits. For instance, men residing in rural areas of Tanzania were found to be about 33% less likely to use HIV self-test kits as compared to those living in urban areas (OR=0.667, $P<0.0001$). The odds of respondent who reported having ever heard of sexually transmitted infection was about 1.274 times higher as compared to their counterparts on the use of HIV self-test kits (OR 1.274, $P<0.0001$). Concerning respondents who used a condom during their last sexual intercourse, the odds of using an HIV self-test kit were about 1.4 times higher compared to those who had sexual intercourse without a condom (OR=1.379, $P<0.0001$).

Discussion

The current study sought to assess the social demographic and sexual behaviour factors affecting the usage of HIV self-test kits among 15–49 year adult men in Tanzania mainland and Zanzibar using Tanzania DHS-MIS data collected in 2022. In general, usage of HIV self-test kits was observed to be as low as 3.9% in the current study as compared to other studies [33–35]. The observed variations may have been attributed to the difference in methodological approaches as the current study utilised a national survey representing a broad geographical area in both urban and rural areas of Tanzania's 31 regions and a diverse population.

The sex of the household head was significantly associated with the usage of HIV self-test kits in bivariate and multivariable logistic regression. Upon controlling other variables, the odds of female household heads reported using HIV self-test kits was about 1.4 times higher compared to male household heads. The observed higher likelihood of female household heads using HIV self-test kits may have been attributed to women's greater awareness of health issues, higher prioritisation of health concerns among women who are heads of household or greater access to health-related resources. Men have poorer seeking behaviour than women due to masculine behaviour inculcated in men from birth [36]. Women's health-seeking decision-making ability has been shown to improve knowledge and access to health services [37]. Men who had not been sexually active in the past for weeks were about 18% less likely to use HIV self-test kits compared to those with no recent sexual activity. This may suggest that men with recent sexual inactive perceive a lower risk of HIV infections which is likely to reduce their motivation to self test for HIV. However, literature on HIV testing across sexually inactive men has been limited.

The findings further show the influence of education on using an HIV self-test kit. As the level of education increases from those with no education to those with secondary and higher, the odds ratio of testing the HIV

status using the HIV self-test kit increases. The findings are consistent with several others, which have similarly shown that the usage of HIV self-test kits was significantly higher among more educated men as compared to those with primary education or less [13, 14]. The positive relationship may have been attributed to several factors, including educated people had better access to health information, which resulted in an understanding of the importance of testing HIV using medical tools like HIV self-test kits.

Married and ever-married men (divorced or widowed) were significantly more likely to use HIV self-test kits compared to single men. The observed higher likelihood of HIV self-test kits among married and ever-married men may have been attributed to the higher risk of HIV exposure due to their past or present relationship, which motivates them to engage in more proactive health behaviour, including HIV self-testing. In marital relationships, the concern for the health of a partner may also heighten the sense of responsibility for monitoring one's HIV status, which could increase the use of self-test kits [38]. On the other hand, single men may perceive themselves as being at lower risk for acquiring HIV, mainly if they are not engaged in sexual relationships, as they assume they have not been exposed to the primary mode of HIV transmission as reported by [39–41]. Men's wealth status was observed to influence the usage of HIV self-test kits significantly. The richest men in the study were more likely to use HIV self-test kits rather than poorer men. This suggested that men with the wealthiest wealth quintile capacity may have the ability to travel to access HIV self-test kits compared to those with limited income. This indicated that financial readiness influences the use of HIV self-test kits, as also reported by another study in rural Malawi [42].

The likelihood of using the HIV self-test kits tends to increase as the age of respondents in the current study increases. This positive significant relationship may have been attributed to the fact that those with higher ages have had more exposure and knowledge of educational campaigns concerning the utilisation of HIV self-test kits, as consistently reported by [43] in their study that involved young adults aged 18–22 living in Kenya informal urban settlements. The likelihood of using HIV self-test kits was found to be higher in urban as compared to rural areas. Contributing factors to the lower usage of HIV self-test kits in rural areas may include inaccessibility of HIV self-test kits in rural areas, variation in cultural norms and differentials in access to information and thus become unaware of HIV self-test kits [44].

Conclusion

The current cross-sectional study was based on men aged 15–49 from the 2022 Tanzania DHS-MIS. The study examines the social demographic and sexual behaviour factors affecting the usage of HIV self-test kits in Tanzania. Usage of HIV self-test kits was found to be as low as 3.9% in the current study. Significant demographic factors with HIV self-test kit include sex of household head, education level, marital status, wealth status, age and type of place of residence. Contributing sexual Behavior factors to the usage of an HIV self-test kit include: recent sexual activities, number of sex partner, ever heard of a sexually transmitted infection and condom use during the last sexual intercourse with the most recent partner. The study highlight the need for targeted public health messaging on the importance of regular HIV testing regardless of recent sexual activity. The study highlights more the need for targeted public health interventions to improve awareness and accessibility of HIV self-testing, particularly among less informed groups such as those residing in rural areas.

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Author contributions

The author envisioned the problem, performed data analysis and wrote the final manuscript.

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Data availability

Data that support the findings of this study have been requested from 2022 Tanzania demographic and health survey and malaria indicator survey.

Declarations

Competing interests

The authors declare no competing interests.

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