Socio-economic Status and Associated Factors in the Uptake of HIV Testing: Findings from the South African Population-based National Household Survey Conducted in 2017

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Abstract

Background: Improved understanding of barriers to HIV testing is important for reaching the first of the UNAIDS 90-90-90 targets, which states that 90 percent of HIV positive individuals ought to know their HIV status. This study examined socioeconomic status (SES) factors and related covariates associated with HIV testing uptake in the general population in South Africa. Information on SES and HIV testing may impact the HIV treatment and care cascade and prevention of HIV transmission.

Methods: This study used data obtained from a national cross-sectional, population-based household survey conducted in 2017 using a multi-stage stratified random cluster sampling design. A composite SES score was created using multiple correspondence analyses of household assets; households were classified into wealth quintiles and dichotomized into low SES/poorest (lowest 3 quintiles) and high SES/less-poor (highest 2 quintiles). Bivariate and multivariate logistic regression models were fitted to analyse associations between the uptake of HIV testing and a set of socio-demographic and HIV-related variables.

Results: HIV testing uptake was 73.8% and 76.7% among low and high SES household, respectively, both of which were below the first 90 target. The findings showed increased uptake of HIV testing was associated with being female and having a higher educational level independent of SES. Decreased uptake of HIV testing was associated with being from White and Indian/Asian race groups, residing in rural formal areas, alcohol consumption, and high self-perceived risk of HIV infection.

Conclusions: We found that HIV testing uptake was similar for people from both low and high SES. However, interventions aimed at improving HIV testing in order to reach the first 90 target, should target males, all race groups, those with low education attainment, and those residing in rural formal areas. Reaching the first target will require efforts to improve community knowledge, and awareness about the negative impact of alcohol use and address HIV risk perception.

Background

Sub-Saharan Africa (SSA) bears the largest burden of the HIV epidemic with 53% of the world's 36.9 million [31.1–43.9 million] people living with HIV in 2018 [1]. The HIV epidemic in South Africa is the largest globally, with a national prevalence of 14%, which translated to an estimated 7.9 million people living with HIV in 2017 [2]. HIV testing uptake serves as the foundation for the Joint United Nations Programme on HIV/AIDS (UNAIDS) strategic framework in the fight against HIV [3]. This framework specifies that 90% of HIV-positive people should be aware of their status, 90% of those diagnosed should receive sustained antiretroviral therapy (ART), and that 90% of those on ART achieve viral suppression [3]. This framework was adopted in December 2014 by the South African government as the basis of its national response to the HIV/AIDS epidemic in the country. Achieving the UNAIDS and South African government targets hinges on reaching the key goal of identifying 90% of people living with HIV.

HIV testing is crucial as it provides a diagnosis for people living with HIV for linkage to care and treatment [4]. Globally, progress is being made, and at the end of 2017, three-quarters of people living with HIV knew their status [1]. Despite the excellent strides made with HIV testing in SSA, awareness of HIV status remains lower

than the rest of the world. Findings from 10 population-based studies conducted in 2012, identified that the average percentage of people living with HIV who know their status was below 40% [5].

In Southern Africa, despite the progress South Africa has towards reaching the 90-90-90 goals, there are still barriers to HIV testing [3]. Several barriers to HIV testing have been identified in studies that have been done in SSA. In the 2005 Demographic and Health Survey in Cote d'Ivoire, a low socio-economic status was related to lower proportions of individuals testing for HIV testing, which included lack of or lower educational attainment and employment status [6, 7]. Furthermore, cross-sectional surveys conducted as part of the Multi-country African Testing and Counselling for HIV (MATCH) study in Burkina Faso, Kenya, Malawi, and Uganda found that a higher SES was an indicator of the probability of HIV testing [8].

Other barriers identified from various studies included a perceived low risk of infection [5, 7, 9, 10] as well as fear of finding out ones' status and perceived stigma [10–13]. A cross-sectional study in 2011 in Ethiopia found that HIV testing was lower in rural communities with lower SES [14]. A household survey conducted in 2007 in ten countries in Southern Africa found that people living in urban areas are more likely to be tested [15].

Knowing one's HIV status should be independent of one's SES and where one resides [16]. Unless these barriers to testing are addressed, the final goal of the UNAIDS targets where 90% of people who are on treatment are virally suppressed will not be attained [3]. Improved understanding of testing barriers is important to allow interventions focused on reaching the first 90 target. This study examined SES factors and related covariates associated with self-reported history of ever testing for HIV using a national survey in South Africa.

Methods

Data

This analysis used data from a national cross-sectional, population-based household survey “South African national HIV prevalence, incidence, behaviour and communication survey” conducted in 2017 using a multi-stage stratified random cluster sampling approach, described in detail in the survey report [2]. In summary, a total of 1 000 small area layers (SALs) were sampled using the 2015 national population sampling frame of 103 000 SALs developed by Statistics South Africa [17]. The selection of SALs was stratified by province, locality type (urban formal, rural formal, and rural informal/tribal areas) and race groups in urban areas. A total of 15 visiting points (VPs) were randomly selected from each of the 1 000 SALs, targeting 15 000 VPs. Of these, 12 435 (82.9%) VPs were approached. Among these VPs, 11 776 (94.7%) were valid and a household response rate of 82.2% was achieved from the valid VPs. All members of the selected households were eligible to participate in the survey.

The survey collected data using a household questionnaire and three age-appropriate questionnaires were administered to consenting individuals. For those younger than 18 years of age, consent was given by parents/guardians and assent by the participant. The interview instruments solicited information among others on socio-demographic characteristics, HIV-related knowledge, attitudes, and behaviours, including questions on HIV testing. Questionnaire data were collected digitally using electronic tablets. Fieldworkers also collected dried blood specimen samples from participants using a finger prick. Samples were sent to a centralised

laboratory for HIV antibodies. The focus of the present study was on youth and adults 15 years and older who responded to the question on HIV testing.

Primary outcome variable

The dependent primary outcome variable 'HIV testing' was ascertained by the question: "Have you ever been tested for HIV? Yes=1 and No=0." Ever been tested was defined as having accessed HIV testing services at least once before the survey.

Explanatory variables

Independent variables included socio-demographic characteristics and socio-economic characteristics. Socio-demographic characteristics comprised age (15 to 24 years, 25 to 49 years, and 50+ years) sex (male and female), race (Black African, White, Coloured, and Indian/Asian), and current marital status (married and not married; which included divorced/separated and widowed/widow). Socio-economic characteristics included highest educational level completed (no education, primary, secondary, and tertiary), employment status (not employed and employed), locality type (urban formal, rural informal, rural formal), and asset-based SES which was constructed using multiple correspondence analyses (MCA), based on questions on the availability of essential services and ownership of a range of household assets [18]. MCA is a data reduction technique for categorical data, which calculates a composite indicator score computed by adding up all the weighted responses. The predicted score for each household was used to compute five quintiles (1st lowest, 2nd lower, 3rd middle, 4th higher and 5th highest) representing a continuum of household SES from the poorest to the least poor. The quintiles were then dichotomized into low SES or poorest (lowest 3 quintiles) high SES or less-poor (highest 2 quintiles).

HIV-related risk factors included age at sexual debut (less than 15 years and more than 15 years), age-disparate partnerships (partner older by 5 years, partner younger by 5 years, a partner within 5 years), multiple sexual partners in the last 12 months (one partner, and two or more sexual partners), condom use at last sex (no and yes), alcohol use risk score (abstainers, low, high, and hazardous risk drinkers) based on the Alcohol Use Disorder Identification Test (AUDIT) scale [19, 20], correct HIV knowledge and myth rejection (yes and no) based on responses from the following questions (Can AIDS be cured? Can a person reduce the risk of HIV by having fewer sexual partners? Can a healthy-looking person have HIV? Can a person get HIV by sharing food with someone who is infected? Can a person reduce the risk of getting HIV by using a condom every time he/she has sex?), self-perceived risk of HIV infection (no and yes).

Statistical analysis

All statistical analysis was done in STATA 15.0 (Stata Corporation, College Station, Texas, USA) software. The 'svy' command was used to introduce weights which take into account the complex design of the survey. Data descriptive statistics (unweighted frequencies and weighted percentages) were used to summarize socio-demographic characteristics and HIV-related risk factors of the study sample. The Pearson's chi-square test was used compare differences in proportions between categorical variables. Bivariate logistic regression was used

to assess the relationship between HIV testing uptake and the explanatory variable. Statistically significant variables were entered into a multivariate logistic regression model to examine the independent effects of covariates associated with the uptake of HIV testing. The analysis was stratified by asset-based SES (low and high). Crude and adjusted odds ratios (aORs) with 95% confidence intervals (CI) , and p-values less than 0.05 were reported for all statistically significant associations. Coefficient plots were used to display the results of the final models [21].

Results

Background characteristics of the study sample

Table 1 shows that over half of the sample was aged 25–49 years (53.5%), female (52.1%), Black African (79.0%), not married (70.8%), had completed secondary education (67.6%), and resided in urban areas (69.5%). There were significant differences in characteristics between participants with low and high socio-economic status with regards to age, sex, race, marital status, level of education, employment status, and locality type ($p < 0.001$).

Table 1
Background characteristics of the sample by SES among 15 years and older, South Africa 2017

Variable	Overall sample		Low SES		High SES		
	n	%*	n	%	n	%	p-values
Overall sample	21 075	100	8 504	100	12 571	100	
Age categories							
15–19 years	2 762	11.5	1 242	12.3	1 520	10.8	< 0.001
20–24 years	2 578	12.4	1 209	14.3	1 369	11.0	
25–49 years	9 715	53.5	4 021	54.9	5 694	52.4	
50 + years	6 020	22.6	2 032	18.6	3 988	25.8	
Sex							
Male	8 812	47.9	3 556	47.6	5 256	48.2	0.481
Female	12 263	52.1	4 948	52.4	7 315	51.8	
Race							
Black African	13 747	79.0	7 551	95.2	6 196	66.1	< 0.001
White	1 509	9.3	24	0.4	1 485	16.3	
Coloured	3 805	8.9	875	4.2	2 930	12.6	
Indian/Asian	2 014	2.9	54	0.2	1 960	5.0	
Current marital status							
Married	6 758	29.2	1 751	19.6	5 007	36.8	< 0.001
Not married	14 312	70.8	6 752	80.4	7 560	63.2	
Highest educational level obtained							
No education/primary	3 278	16.8	1 874	24.9	1 404	10.9	< 0.001
Secondary	10 263	67.6	3 889	70.4	6 374	65.5	
Tertiary	2 276	15.6	201	4.7	2 075	23.6	
Employment status							
Unemployed	13 432	63.8	6 053	71.7	7 379	57.6	< 0.001
Employed	7 352	36.2	2 355	28.3	4 997	42.4	
Locality type							
Urban	13 810	69.5	3 202	48.5	10 608	86.2	< 0.001

*Weighted percentages

Variable	Overall sample		Low SES		High SES	
Rural informal (tribal areas)	4 909	25.8	3 650	44.8	1 259	10.8
Rural (farms)	2 356	4.7	1 652	6.7	704	3.1
*Weighted percentages						

Table 2 shows the reported uptake of HIV testing among the population aged 15 years and older, by asset-based socio-economic status and socio-demographic characteristics of the study sample. Overall, people with a high SES reported significantly higher HIV testing uptake than those with a low SES, 76.7% vs 73.8% ($p < 0.001$). There were significant differences in HIV testing by SES among people aged 25–49 years, males, Black African, employed, and those residing in rural informal areas (all $p < 0.001$). HIV testing uptake for those aged 50 years and older, not married, residing in urban and rural formal areas were also significantly different between low and high SES (all $p < 0.05$).

Table 2
HIV testing socio-demographic characteristics by SES among 15 years and older, South Africa 2017

Variable	Total			Low SES			High SES			
	n	Tested	95% CI	n	Tested	95% CI	n	Tested	95% CI	p-value
Overall	21 075	75.4	74.2–76.6	8 504	73.8	72.0–75.6	12 571	76.7	75.3–78.1	< 0.001
Age categories										
15–19 years	2 762	41.9	38.9–45.0	1 242	42.0	37.7–46.4	1 520	41.9	38.2–45.7	0.958
20–24 years	2 578	74.1	71.6–76.5	1 209	73.2	69.9–76.2	1 369	75.1	71.6–78.4	0.271
25–49 years	9 715	85.2	83.8–86.6	4 021	83.0	80.8–85.0	5 694	87.1	85.4–88.6	< 0.001
50 + years	6 020	69.9	68.1–71.6	2 032	68.2	65.4–70.8	3 988	70.9	68.6–73.1	0.031
Sex of respondent										
Male	8 812	71.2	69.4–72.8	3 556	67.3	64.5–69.9	5 256	74.2	72.2–76.1	< 0.001
Female	12 263	79.4	78.0–80.6	4 948	79.8	77.8–81.6	7 315	79.0	77.4–80.6	0.283
Race										
African	13 747	76.7	75.2–78.1	7 551	74.0	72.1–75.8	6 196	79.7	77.9–81.4	< 0.001
White	1 509	69.7	66.0–73.2	24	64.5	43.5–81.1	1 485	69.8	66.1–73.3	0.575
Coloured	3 805	74.1	72.0–76.1	875	71.6	65.6–76.9	2 930	74.7	72.6–76.7	0.067
Indian/A	2 014	63.9	60.1–67.6	54	62.7	41.9–79.7	1 960	64.0	60.1–67.7	0.844
Current marital status										
Married	6 758	81.5	79.8–83.0	1 751	80.5	77.5–83.2	5 007	81.9	79.9–83.7	0.194
Not married	14 312	72.9	71.5–74.3	6 752	72.2	70.2–74.2	7 560	73.7	71.9–75.3	0.044
Highest level of education obtained										

Variable	Total		Low SES			High SES				
No education/primary	3 278	71.9	69.6– 74.1	1 874	72.6	69.4– 75.6	1 404	70.7	67.2– 74.0	0.232
Secondary	10 263	80.4	79.0– 81.8	3 889	81.0	79.0– 82.8	6 374	80.0	78.0– 81.8	0.216
Tertiary	2 276	86.1	83.7– 88.2	201	89.1	82.9– 93.2	2 075	85.7	83.2– 87.9	0.185
Employment status										
Unemployed	13 432	70.7	69.3– 72.2	6 053	71.0	69.0– 72.9	7 379	70.5	68.6– 72.3	0.526
Employed	7 352	84.0	82.3– 85.5	2 355	81.3	78.3– 83.9	4 997	85.5	83.6– 87.2	< 0.001
Locality type										
Urban areas	13 810	77.5	76.1– 78.9	3 202	78.7	76.1– 81.0	10 608	77.0	75.5– 78.5	0.044
Rural informal areas	4 909	70.5	68.2– 72.8	3 650	69.3	66.7– 71.7	1 259	74.7	70.6– 78.4	< 0.001
Rural formal areas	2 356	71.1	67.0– 75.0	1 652	69.4	64.0– 74.4	704	74.0	68.2– 79.1	0.025

Table 3 shows the reported uptake of HIV testing among the population aged 15 years and older by asset-based socio-economic status by HIV-related risk characteristics of the study sample. There were significant differences found in reported HIV testing between the people from low and high SES with for those with no self-perceived HIV risk and survey HIV status result (both $p < 0.001$). Differences were also found among people that ever had sex and those who did not have sex, differences with people that have a sexual partner five years and older than themselves, those that do not drink alcohol and risky alcohol drinkers, and correct knowledge of HIV prevention and transmission (all $p < 0.05$).

Table 3
HIV testing related risk characteristics by SES among 15 years and older, South Africa 2017

Variable	Total			Low SES			High SES			
Sexual activity	n	Tested	95% CI	N	Tested	95% CI	n	Tested	95% CI	p-value
Never had sex	3 142	42.3	39.3– 45.3	1 368	41.0	37.0– 45.1	1 920	45.1	41.3– 49.0	0.019
Had sex	15 741	81.2	80.0– 82.3	6 766	80.4	78.8– 81.9	9 895	82.1	80.5– 83.5	0.006
Sexual debut										
Sex before the age of 15 years	324	67.4	60.4– 73.7	169	65.6	56.6– 73.5	173	69.5	59.0– 78.3	0.441
Sex at 15 years and older	4 859	57.2	54.8– 59.6	2 269	58.0	54.7– 61.2	2 710	57.7	54.6– 60.7	0.831
Age of sexual partner										
Partner more than 5 years younger	1 971	82.2	79.6– 84.5	2 344	82.3	80.0– 84.4	3 908	85.2	83.2– 87.0	0.002
Partner within five years	5 849	84.3	82.7– 85.8	813	81.3	77.2– 84.8	1 179	83.2	79.8– 86.1	0.274
Partner more than 5 years older	2 308	89.8	88.1– 91.3	1 073	90.3	87.7– 92.4	1 414	90.0	87.6– 92.0	0.804
Number of sexual partners in the past 12 months										
1 sexual partner	9 289	85.2	84.0– 86.4	3 827	84.5	82.7– 86.1	6 024	85.7	84.1– 87.2	0.102
2 + or more sexual partners	892	82.5	78.8– 85.6	438	79.4	74.2– 83.8	504	86.2	81.5– 89.9	0.006
Condom use at last sex in the past 12 months										
No condom use	6 564	84.9	83.4– 86.2	2 445	83.8	81.3– 86.1	4 535	85.4	83.7– 87.0	0.075
Yes condom use	3 541	85.0	83.3– 86.6	1 817	84.1	81.7– 86.1	1 919	86.3	84.0– 88.3	0.058
AUDIT Score										
Abstainers	13 037	73.5	71.9– 75.1	5 974	72.9	70.7– 75.0	7 835	74.7	72.9– 76.5	0.017
Low risk (1–7)	3 537	77.9	75.6– 80.0	1 177	76.8	73.5– 79.8	2 532	78.7	75.7– 81.4	0.193

Variable	Total		Low SES			High SES				
Risky level (8–15)	1 257	79.2	75.5– 82.4	557	76.2	70.2– 81.3	761	81.4	76.8– 85.3	0.022
High risk/harmful (16–19)	209	74.9	64.5– 83.1	113	68.8	55.4– 79.7	112	81.5	65.0– 91.3	0.028
High risk/hazardous (20+)	226	70.6	61.1– 78.6	135	68.7	53.1– 80.9	104	72.9	58.5– 83.7	0.480
Correct HIV knowledge and myth rejection										
No knowledge	12 575	74.1	72.6– 75.5	5 760	73.0	70.9– 75.0	7 518	75.5	73.7– 77.2	0.001
Yes knowledge	7 337	77.1	75.3– 78.8	2 726	75.6	73.3– 77.9	5 034	78.6	76.5– 80.6	0.003
Self-perceived risk of HIV infection										
No risk	15 921	72.3	70.8– 73.8	6 089	69.3	67.0– 71.4	10 681	74.8	73.2– 76.4	< 0.001
Yes risk	2 378	79.4	76.8– 81.7	1 363	78.2	74.5– 81.5	1 186	80.8	77.5– 83.8	0.105
Survey HIV status										
HIV Positive	2 358	87.6	85.1– 89.7	1 449	85.9	82.4– 88.9	909	90.0	86.6– 92.6	0.003
HIV Negative	12 044	74.8	73.4– 76.1	4 889	72.7	70.6– 74.8	7 155	76.2	74.6– 77.8	< 0.001

Factors associated with uptake of HIV testing

Figure 1 shows the final adjusted model for multivariate regression analysis of statistically significant factors independently associated with the uptake of HIV testing by asset-based socio-economic status among respondents aged 15 years and older. Among respondents from low SES households, females were significantly more likely to test for HIV [adjusted odds ratio (aOR) = 3.09 (95% CI: 1.77–5.38), $p < 0.001$] than males. The increased likelihood of HIV testing uptake was significantly associated with respondents with secondary [aOR = 1.61 (95% CI: 1.07–2.41), $p = 0.023$] and tertiary [aOR = 3.62 (95% CI: 1.24–10.59), $p = 0.019$] level educational qualifications, compared to those with no education or with primary level education completed. The decreased likelihood of HIV testing uptake was significantly associated with respondents who engaged in low-risk drinking [OR = 0.60 (95% CI: 0.39–0.91), $p = 0.017$] and high-risk drinking [OR = 0.27 (95% CI: 0.10–0.70), $p = 0.007$] compared to those who abstained from alcohol. Respondents who perceived themselves as being at risk of HIV infection were also significantly less likely to test for HIV [OR = 0.66 (95% CI: 0.47–0.94),

$p = 0.022$] compared to their counterparts. The decreased likelihood of HIV testing uptake was significantly associated with respondents who resided in rural formal areas [OR = 0.60 (95% CI: 0.38–0.95), $p = 0.028$] compared to those from urban areas.

Among respondents from high SES households, females were significantly more likely to test for HIV [aOR = 5.23 (95% CI: 2.08–13.16), $p < 0.001$] than males. The decreased likelihood of HIV testing uptake was significantly associated with being White [aOR = 0.28 (0.08–0.92), $p = 0.036$], and Indian/Asian [aOR = 0.12 (95% CI: 0.03–0.39), $p < 0.001$] compared to being Black African. Respondents who were not married were significantly less likely to test for HIV [aOR = 0.03 (95% CI: 0.00–0.27), $p < 0.001$] compared to those who reported being married.

Discussion

This nationally representative population-based study undertaken to identify risk characteristics showed that people with a high socio-economic status reported significantly higher HIV testing uptake than those with a low SES, 76.7% vs 73.8%. The differences in HIV testing between high and low SES were found in certain demographic and HIV-related risk characteristics. Bivariate analysis showed that people from high SES that were aged 25 years and older, not married, females, Black African, employed, and residing in all locality types were more likely to have tested for HIV compared to those with a low SES. However, the 90% target for HIV testing has yet to be achieved. In addition, HIV-related risk characteristics that were significantly associated with HIV testing were self-perceived HIV risk perception, knew survey HIV status result, sexual activity, differences in age of sexual partner, alcohol consumption, and correct knowledge of HIV prevention and transmission.

Findings from the multivariate logistic regression models showed increased uptake of HIV testing was associated with being female and having a higher educational level, independent of SES. Higher levels of HIV testing among females is consistent with global statistics [22, 23]. The limited male participation in HIV testing observed in our study is worrisome since HIV positive men who are unaware of their status may continue to engage in unsafe behaviour [24]. These results highlight the importance of developing interventions to reach men and address gender disparities in HIV testing.

Our findings are consistent with other studies conducted in sub-Saharan Africa where HIV testing was associated with educational attainment [25–27]. Those with higher educational attainment may be more knowledgeable about HIV and understand the benefits of testing and the importance of knowing one's HIV status and have greater control over the decision to test [28]. Interventions are needed to improve testing rates among the less educated population group.

Similar to other studies, HIV testing uptake was higher in the older age group than among adolescents [29]. Young people report significant psychological barriers to HIV testing including a lack of community support and perceived negative attitudes of health care workers [29, 30]. For adolescents in high SES households, addressing their age-specific concerns is important. HIV testing is the first step into both the HIV prevention and treatment cascade, and can positively influence one's sexual risk behaviour and reduce the likelihood of future

HIV acquisition or further transmission [31]. Addressing this age gap in HIV testing is crucial for improving the awareness of HIV status among young people and to ensure that HIV positive youth receive sustained treatment and are virally suppressed to save lives and curtail the transmission of HIV.

In agreement with other studies, our findings showed that uptake of HIV testing in the rural informal areas was low compared to the urban areas [32]. This demonstrates that this rural-urban gap in testing persists in the modern era of effective HIV therapy when early diagnosis and linkage to care as part of the UNAIDS 90–90–90 targets is even more essential. Some overarching factors include poverty in many rural areas, limited resources, and structural barriers that pose challenges to accessing HIV testing services [33]. This accentuates the need for scaling up effective models for delivering HIV testing in remote areas, such as mobile and home-based testing [34]. Provider-initiated modes of testing may also be more accessible to lower socio-economic groups than traditional HIV counselling and testing. Testing through the prevention of mother-to-child transmission services has proven to minimise the socio-economic hurdles faced [8]. Context-based strategies are therefore crucial to improve access to HIV testing services [4, 14], and cognisance needs to be taken of those who do not interact with the health system often [15].

Consistent with current findings, other studies also showed that married women were more likely to undergo HIV testing than unmarried women [35, 36]. This may be reflective of marriage as a supportive relationship that motivates couples to seek HIV testing [36]. Couples are also more likely to undergo HIV testing when they are planning their marriage to know their HIV serostatus, than those who have never been married [35]. Targeted interventions are needed to increase HIV testing among those that are not married.

The results showed that Whites and Indians/Asians were less likely to test for HIV compared to Black Africans who form the majority in the South African context. This is because of the underlying evidence-based narrative that suggests Black Africans are at greater risk of HIV infection for historical reasons, which account for both the economic inequality and the poverty that pervade this racial group. Elsewhere, racial differences in HIV testing have been attributed to the health services utilization model [37]. HIV testing was associated generally with the self-perceived risk of HIV among minority groups. There is a need to improve current practices to reduce health disparities generally, and disparities in HIV testing in particular. [37]. In line with other studies, the findings also revealed that not being married was associated with low uptake of HIV testing [25, 35]. This is worrying given that not knowing one's HIV status is a major impediment to accessing appropriate HIV prevention, care, and treatment [38]. Individuals in non-marital relationships may be more fearful of HIV positive test results. This raises serious public health concerns when considering that the majority of these individuals may be engaging in unprotected sex and would benefit from being aware of their HIV status [38]. There is a need to devise alternative approaches to create demand for the uptake of HIV testing services among non-married individuals with no prior exposure to HIV testing.

Low and high risk alcohol drinking was associated with low HIV testing uptake, independent of SES. Elsewhere, alcohol consumption has also been observed as a barrier to prior HIV testing in a population-based study [39]. Alcohol use has been consistently associated with risky sexual behaviour [40, 41]. This highlights the importance of addressing social risk behaviours such as alcohol consumption, towards improving uptake of HIV testing and the prevention of HIV transmission.

High self-perceived risk of HIV infection was associated with low uptake of HIV testing. This implies that individuals might refuse HIV testing even if they know that they are at high risk of HIV infection. This differs from the view that people who refuse HIV testing commonly do so because they do not perceive themselves to be at risk [42]. Either way self-perceived risk is an important factor in the uptake of HIV testing. This emphasizes a need to assess whether an individual's self-perception of their HIV risk is accurate - to encourage testing, make the diagnosis, and link patients to care and treatment services [43].

The study has some limitations. Due to the cross-sectional design of the current study, causal inferences cannot be drawn, and the analysis can only identify associations. Additionally, the strength of the association was limited by wide confidence intervals in some instances. Furthermore, the analysis is based on self-report of HIV testing and risk factors, which are prone to social desirability and recall bias. Despite these limitations, this study used a nationally representative sample, and the findings are generalizable to the entire country.

Conclusions

The findings from this study show that socio-demographic factors such as gender, race, locality, and including socio-behavioural factors such as alcohol consumption and self-perceived risk of HIV infection, have different outcomes for HIV testing. Interventions to improve HIV testing should target these barriers to increase HIV testing uptake. Reaching the first 90 of the 90-90-90 targets will require efforts to increase the uptake of HIV testing by addressing the issues, among others, HIV risk perception, accessibility of services, community knowledge, and awareness.

List Of Abbreviations

AIDS Acquired Immune Deficiency Syndrome

ART Antiretroviral therapy

CI Confidence Interval

HIV Human Immunodeficiency Virus

MCA Multiple correspondence analysis

SAL Small area layer

SES Socioeconomic status

SSA Sub-Saharan Africa

UNAIDS Joint United Nations Programme on HIV/AIDS

VP Visiting Point

Declarations

Ethics approval and consent to participate

The survey protocol was approved by the HSRC Research Ethics Committee (REC: 4/18/11/15), and the Associate Director for Science, Center for Global Health, Centers for Disease Control and Prevention (CDC)). Ethical clearance was also obtained from the University of KwaZulu-Natal's Biomedical Research Ethics Committee (BE 646/18). Informed consent was obtained before undertaking both the behavioural data and specimen collection.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

SJ drafted of the manuscript. SJ and MM performed the statistical analysis. SJ, MM, AN, YS, MT and LS participated in the implementation of the survey that provided the data for the manuscript. All authors contributed to the review of draft manuscript and approved the final manuscript.

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Figures

Figure 1

Factors associated with HIV testing by SES among 15 years and older, South Africa 2017

Figure 1