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Exploring the relationship between sexual risk behaviours and HIV Status awareness among men in South Africa: analysis of data from the 2017 South African National house-based HIV Prevalence, Incidence and Behaviour survey

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Part 0: PREAMBLE

Declaration

I, *...Zanele Precious Nhlabatsi, student number NHLZAN020.*, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Dissertation Abstract

South Africa has one of the highest HIV prevalence rates globally, with men being a key population at risk due to risky sexual behaviours and lower HIV status awareness compared to women. This study explores the relationships between sexual risk behaviours and self-reported status among 1,630 sexually active South African men (≥15 years, median age 34 years, interquartile range IQR 24-44) using data from the 2017 South African National House-based HIV Prevalence, Incidence, and Behaviour Surveys (SABSSMV).

Overall, 13.5% of men self-reported living with HIV (srHIV+), and there was a high concordance between self-reported and laboratory-confirmed HIV status, at 92.0% (95% CI: 84.1% - 96.1%). Among those self-reporting not living with HIV (srHIV-), 88.0% (95% CI: 85.5% - 90.2%) were laboratory confirmed as well.

In total, 68.3% (95% CI: 64.6% - 71.8%) of men reported having casual sexual partners, with 48.2% (95% CI: 39.0% - 57.5%) among srHIV+ men, compared to 71.4% (95% CI: 67.4% - 75.2%) among srHIV- men. Additionally, 4.9% of men (95% CI: 3.6% - 6.7%) reported having two or more sexual partners, with 2.6% (95% CI: 1.1% - 6.2%) among srHIV+ and 5.3% (95% CI: 3.8% - 7.4%) among srHIV-.

Furthermore, 26.5% (95% CI: 23.4% - 29.9%) of men reported inconsistent condom use at their last sexual encounter within the past year: 23.3% (95% CI: 16.0% - 32.7%) for srHIV+ men and 27.0% (95% CI: 23.6% - 30.8%) for srHIV-. Finally, 14.2% (95% CI: 11.8% - 17.1%) of men reported alcohol use at their last sexual encounter, with 16.9% (95% CI: 10.9% - 25.1%) among srHIV+ men and 13.8% (95% CI: 11.3% - 16.9%) among srHIV-.

Some sexual risk behaviours differed by demographic characteristics. Compared to men with

secondary education or tertiary education, those with primary education were less likely to report having casual partners (74.0% vs 66.7% vs 51.1%). Multiple sexual partners was high among men living in urban settings, inconsistent condom use was higher among men with tertiary education (32.1%), and alcohol use was highest among young men aged 15-19 (21.6%).

In logistic regression models, men (srHIV+) were less likely to report engaging in casual sex compared to men (srHIV-) (OR: 0.37; 95% CI: 0.24 to 0.57), the adjusted model showed an attenuated but statistically significant association (aOR: 0.51 95% CI: 0.27–0.97). This was the only statistically significant association observed. Age appeared to modify the association between reported HIV status and some risk behaviours, with younger men more likely to report engaging in casual partnerships and having >=2 sexual partners compared to older men, ≥ 45 years), while older men use condoms inconsistently during sexual encounters.

The findings demonstrate impact of self-reported HIV status on risky sexual behaviour. They highlight the importance of HIV testing and counselling services (HTC), safe sex education and the integration of both behavioural and structural approaches in existing health services. Intervention should be tailored to accommodate the unique needs and challenges of different age groups, educational levels, HIV statuses, and geographic, setting. For instance, targeted messaging for different age groups that include age-specific, and accessible educational content, preventative measures that ensures access to condoms and Pre-Exposure Prophylaxis (PrEP), youth friendly solutions that leverage on technology-based programs that provide online counselling or mobile apps, and public awareness campaigns that promote the continuous education on safe sexual practices. These outcomes are crucial to reduce HIV transmission and improve health outcomes.

Key words: Self-reported HIV status, population-based survey, Sexual risk behaviour, HIV-

prevalence, South African men.

List of abbreviations

AIDS	Acquired immunodeficiency syndrome
aOR	Adjusted Odds Ratio
ART	Antiretroviral therapy
COVID-19	Coronavirus disease 2018
DBS	Dried Blood Samples
DREAMS	Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe
GBD	Global Burden of Disease
GBV	Gender-based violence
HIV	Human immunodeficiency virus
HTS	HIV Testing services
HPV	Human papillomavirus
HSRC	Human Science Research Council
HSV	Herpex Simplex Virus
HREC	Human Research Ethics Committee
LMICs	Low-and-Middle income countries
MSPs	multiple sexual partnerships
NDoH	National Department of Health
OR	Unadjusted odds ratio
PMTCT	Prevention of mother-to child transmission
SABSSMV	South African National house-based HIVPrevalence, Incidence and Behaviour surveys
STIs	Sexually transmitted infections
srHIV+	men self-reported living with HIV
srHIV-	men self-reported not living with HIV
TasP	Treatment as Prevention
WHO	World Health Organisation
UNAIDS	United Nations Programme on HIV/AIDS

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Part 1: MANUSCRIPT

Exploring the relationship between sexual risk behaviours and HIV Status awareness among men in South Africa: analysis of data from the 2017 South African National house-based HIV Prevalence, Incidence and Behaviour survey

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Abstract

South Africa has one of the highest HIV prevalence rates globally, with men being a key population at risk due to risky sexual behaviours and lower HIV status awareness compared to women. This study explored the relationships between sexual risk behaviours and self-reported HIV status among 1,630 sexually active South African men (≥15 years, median age 34 years, interquartile range 24-44) using data from the 2017 South African National House-based HIV Prevalence, Incidence, and Behaviour Surveys (SABSSMV).

Overall, 13.5% of men self-reported living with HIV (srHIV+) and there was high concordance between self-reported and laboratory confirmed HIV status with 92.0% (95% confidence interval [CI] 84.1% - 96.1%) and 88.0% (95% CI 85.5% - 90.2%); p<0.001, of men srHIV+ and those self-reporting not living with HIV (srHIV-) being laboratory confirmed, respectively. In total, 68.3% (95% CI 64.6% - 71.8%) of men reported casual sexual partners (48.2% [95% CI 39.0% - 57.5%] among men srHIV+ vs. 71.4% [95% CI 67.4% - 75.2%] among men srHIV-); p<0.001, 4.9% (95% CI 3.6% - 6.7%) reported ≥2 sexual partners (2.6% [95% CI 1.1% - 6.2%] vs. 5.3% [95% CI 3.8% - 7.4%]); p = 0.116, 26.5% (95% CI 23.4% - 29.9%) reported inconsistent condom use at last sex with all partners in the past year (23.3% [16.0% - 32.7%] vs. 27.0% [95% CI 23.6% - 30.8%]); p = 0.430, and 14.2% (95% CI 11.8% - 17.1%) reported alcohol use at last sex (16.9% [95% CI 10.9% - 25.1%] vs. 13.8% [11.3% - 16.9%]); p = 0.431, with values in brackets showing the proportion among those (srHIV+) versus (srHIV-), respectively.

In logistic regression models, men (srHIV+) were less likely to report engaging in casual sex compared to men (srHIV-) ((adjusted odds ratio 0.51 95% CI: 0.27–0.97). Variations in sexual risk behaviours were observed by demographic characteristics, and age appeared to modify the association between self-reported HIV status and some risk behaviours.

The findings highlight the impact of self-reported HIV status on risky sexual behaviour, emphasizing the need for comprehensive HIV testing and counselling (HTC), safe sex education, and integrated behavioural and structural approaches in healthcare. Tailored interventions such as age-specific messaging, accessible educational content, ensuring condom and PrEP availability, youth-friendly tech-based solutions like online counselling or mobile apps, and public campaigns promoting safe sexual practices, will be essential to address the unique needs of different age groups, education levels, HIV statuses, and geographic settings.

Key words: Self-reported HIV status, population-based survey, Sexual risk behaviour, HIV-prevalence, South African men.

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Statements and Declarations

Competing Interests: The authors declare no competing interests.

Availability of data and material

Data can be made available to researchers if the request is deemed reasonable and valid.

Code availability

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Introduction

South Africa has one of the highest HIV prevalence rates globally, with an estimated 14.75% of the population, approximately 8.5 million individuals, living with HIV in 2022 (1). HIV prevalence in South Africa is driven by distal (e.g., poverty, migration), proximal (e.g., sexual behavior, condom use), and transmission-related factors (e.g., coexisting infections, genital inflammation) (2,3). Heterosexual intercourse is the primary mode of transmission, with high prevalence among sex workers (58%) and young women in age-disparate relationships (4,5). Intimate partner violence, affecting about one-third of women, hinders HIV testing and treatment, while men exhibit lower engagement with HIV services (6). Stigma remains a challenge, with 17% holding discriminatory views, though lower than in other regional nations (7). Although men are not regarded as representing a particularly disproportionately affected group they face significant risks for HIV acquisition, transmission and poorer outcomes. These risks are largely attributed to lower HIV testing rates and limited awareness of their status compared to women (8). Findings from the 2017 SABSSMV survey revealed that only about 45% of men underwent HIV testing, compared to 59% of women (9).

As a result, the lower rates of HIV testing among men hinder their HIV status awareness, delaying treatment initiation and long-term adherence for those living with the virus. This gap unfortunately increases the risk of men experiencing AIDS-related illnesses and deaths, including tuberculosis (8), a pattern that endangers the health outcomes and livelihood of both men and their partners (6). Sexual risk behaviors, including inconsistent condom use, multiple partnerships, and transactional sex, increase HIV transmission risks (7,10). Men engage in higher-risk behaviors and have lower HIV status awareness, with 25.5% reporting multiple

sexual partnerships compared to 9.0% of women (5). Studies in South Africa highlight men's vulnerability due to rapid partner turnover, low testing rates, and high viral loads, emphasizing the need for targeted interventions (11). HIV status awareness is critical for prevention and treatment, as individuals unaware of their HIV status may unknowingly transmit the virus (12). The 2017 National survey shows 75.2% of the population has undergone HIV testing, with females (79.3%) testing more than males (70.9%) (9). Lack of awareness is linked to higher-risk behaviors, such as multiple partners and inconsistent condom use (11). A few South African studies have explored the association of sexual risk behaviours and awareness of HIV status. Studies show that individuals unaware of their HIV-positive status are more likely to engage in behaviors that increase transmission risks. Kalichman et al. (2017) found that men with multiple sexual partners in Cape Town had lower HIV testing rates and higher transmission risks. Similarly, Huerga et al. (2017) reported high-risk behaviors and unawareness of HIV status among men in KwaZulu-Natal, emphasizing the need for targeted interventions (13). Their findings showed that men unaware of their HIV status were twice as likely to have multiple sexual partners and had 16-fold higher odds of reporting inconsistent condom use(13).

Perceptions and knowledge about HIV significantly influence HIV status awareness and sexual behavior, though misconceptions and stigma remain barriers (14). In South Africa, HIV knowledge has fluctuated, with a slight improvement in 2017, but still low levels of understanding (5). Prevention programs focus on behavioral, biomedical, and structural interventions to enhance awareness and reduce risky behaviors (15). However, significant knowledge gaps persist, especially in rural areas, highlighting the need for continued educational efforts (15). The significant HIV prevalence in South Africa has far-reaching societal, economic, and health consequences emphasizing the need to examine and address the root causes of HIV

transmission. HIV infection rates are strongly linked to poverty, increasing risky sexual behaviors like transactional sex and age-disparate relationships (16). Economic disadvantage, particularly among youth, exacerbates these behaviors despite awareness of HIV prevention (29). Data consistently show higher HIV prevalence among females compared to males (9). Socioeconomic factors, including food insecurity, also significantly contribute to risky behaviors and HIV infection (17).

Access to healthcare and HIV testing services significantly affects HIV status awareness and sexual risk behaviors (18). In South Africa, men have historically been less likely to access testing services, though recent data shows improvements (5,19). Despite progress, challenges remain in reaching underserved populations, especially young men (20).. Previous studies revealed a substantial gender disparity in voluntary counseling and testing (VCT) services, with men being far less likely than women to utilize these services. For example, only 21% of VCT clients in a South African national review were men (21). However, the 2017 SABSSMV demonstrated progress, reporting that HIV testing rates among men had risen to 66.2%, closely approaching the 67.3% observed in women. While access to HIV testing services has expanded, testing rates remained stable between 2012 and 2017 (22,23). Johnson et al. (2015) noted that sustaining these rates could support South Africa's goal of diagnosing 90% of adults with HIV by 2020 (24), yet the nation continues to fall short of the ambitious 95-95-95 targets (25).There is limited data regarding sexual risk behaviours of those who are and are not aware of their status highlighting the need for more research to be done to understand these factors.

HIV prevention programs in South Africa combine biomedical, behavioral, and structural strategies, including PMTCT, safe sexual practices, and addressing socio-economic

vulnerabilities (4,26). The Serostatus Approach to Fighting the Epidemic (SAFE) and Treatment as Prevention (TasP) have been central to these efforts, expanding ART coverage and reducing transmission risks (13). South Africa has made significant progress in HIV testing, with 76% of HIV-positive individuals aware of their status, aiming for 90% awareness (13). Modeling studies, such as those by Johnson et al. (2022), show that interventions like ART and VMMC have substantially reduced HIV incidence, particularly among men (26). However, targeted interventions for men, especially youth and those in rural areas, remain a critical need to further reduce transmission (5). The complex relationship between HIV status awareness, sexual risk behaviors, and related factors among South African men remains a critical issue. Despite progress, challenges such as limited healthcare access, misconceptions, and socioeconomic disparities persist.

The 2017 SABSSMV provides comprehensive data on HIV risky sexual behaviours (5,22), HIV status awareness, and other drivers of HIV in South Africa. Existing results from SABSSMV (2017) have documented the prevalence and trends of sexual risk behaviours (5,22), however analyses to date have not specifically examined how these behaviours relate to men's awareness of their HIV status in South Africa. The aim of this study is to assess the prevalence and determinants of sexual risk behaviours and their association with self-reported HIV status among men (≥15 years) in South Africa using the SABSSMV (2017) data. This will include examining variations in sexual risk behaviours across provinces, demographic groups, and age categories within this population. This work will provide insights to inform targeted interventions aimed at reducing HIV transmission, improving perceived HIV status awareness, and ultimately enhancing health outcomes among South African men.

METHODS

Study Design

This study involved a secondary analysis of cross-sectional data derived from the 2017 SABSSMV (22). This survey, conducted by the Human Sciences Research Council (HSRC), used a multistage, stratified sampling design to provide nationally representative data on HIV prevalence, sexual behaviours, and related health indicators in South Africa. The original survey targeted a nationally representative population, including males and females across all age groups. This secondary analysis is focused exclusively on male participants to explore sexual risk behaviours and self-reported HIV status.

Study Population

The analysis included males aged 15 years and older who reported any sexual activity in the past 12 months and who had complete data for the relevant variables, described in detail (Supplementary Information **Figure SI 1**, and **Table SI 1 - 6**).

Data Collection and Measures

As described elsewhere (22,27) data collection for the SABSSMV survey was conducted through standardized, interviewer-administered questionnaires and dried blood spot (DBS) samples (these are small drops of blood that were collected on special cards and allowed to dry, they are easily transported and stored) for laboratory HIV testing. Participants were provided with detailed information about the study objectives, procedures, risks, and benefits, and written informed consent was obtained prior to data collection. In the case of participants under 18 years of age, consent was obtained from their legal guardians, with additional assent from the minors

themselves. Laboratory-confirmed HIV status was established using three enzyme-linked immunosorbent assays [this is a test that detects antibodies (comprised of proteins that fight infections) to detect if a person has HIV] conducted on DBS samples following standard protocols (27).

The HSRC received ethical clearance for the SABSSMV survey from its institutional ethics committee (REC: 4/18/11/15), the CDC Division of Global HIV and TB (DGHT) and CDCs Center for Global Health (CGH). This secondary analysis was approved by the University of Cape Town Human Research Ethics Committee (847/2023).

Key Measures in this analysis

The following measures were extracted from the original SABSSMV datasets: Sexual risk behaviours, self-reported HIV status (positive, negative, or unknown) and socio-demographic factors including age, gender, marital status, employment status, level of education, and locality type. Laboratory-confirmed HIV status was also included.

Sexual risk behaviours were assessed through four indicators. Sexual partner type in the past 3 months was categorized as consistent (combining married, cohabiting, or in a stable relationship) or casual (reporting occasional or transactional partners). The number of sexual partners in the last 12 months was categorized as reporting one partner and reporting two or more. Consistent condom use was categorized as consistent or inconsistent based on participants who reported condom use at last sexual encounter with all partners in the past 12 months. Finally, alcohol consumption before sex was categorized as yes or no based on whether participants reported consuming alcohol before their most recent sexual encounter.

Self-reported HIV status was determined by asking participants whether they had ever been tested for HIV and what the result of that test result was. Based on their responses, participants were classified into three categories: those who self-reported a positive HIV test result (srHIV+), those who self-reported a negative result (srHIV-), and those who either had never been tested or were unsure of their status because they did not receive a confirmatory result. Individuals with detectable antiretroviral drugs in their bloodstream were assumed to know they were living with HIV, regardless of how they self-reported.

Laboratory-confirmed HIV status based on DBS was classified as positive, negative and unknown.

Data Management and Statistical Analyses

All analyses were conducted using StataCorp. (2015). *Stata 15 for Mac OS*. College Station, TX: StataCorp LP. All analyses were adjusted for clustering and survey design by incorporating appropriate survey weights provided in the dataset to provide accurate population-level estimates. Continuous variables were summarized using means with standard deviations or medians with interquartile ranges, while categorical variables were described as frequencies and proportions with 95% confidence intervals (CIs). We calculated frequencies and proportions of sexual risk behaviours, stratified by self-reported HIV status (positive, negative, and unknown). We also calculated frequencies and proportions for sexual risk behaviours across various regions and demographic groups. Chi-squared tests and t-tests were conducted for categorical and continuous variables respectively to assess differences variance due to high correlation (multicollinearity) between two independent variables which is calculated as 1/Tolerance (28). In addition, the chi-squared tests of independence (**Table SI 8**), and stratified analyses by HIV

status (**Table SI 9**) were conducted to further understand the high odds ratios and wide confidence intervals observed for marital status and partner type.

Results

Demographic characteristics of men overall and by self-reported HIV status

Among 1,630 men aged between 15 and 60 years (median 34 interquartile range (IQR) 24-44), 13.4% self-reported as living with HIV (srHIV+), 86.1% not living with HIV (srHIV-) and less than 0.1% reported unknown HIV status (**Table 1**). Gauteng and Kwa-Zulu Natal had the greatest representation at (32.6%; 95% CI 27.6% - 38.0%) and (17.0%; 95% CI 14.1% - 20.4%), respectively. Most of the sample came from urban areas (71.1%; 95% CI 66.9% - 75.0%) and had completed secondary education (76.4%; 95% CI 73.0% - 79.4%).

Compared to those who srHIV-, those srHIV+ were more likely to be in the age group of 35-44 years (39.8%; 95% CI 31.3% - 48.8% vs. 24.1%; 95% CI 21.0% - 27.6%; $p < 0.001$) to be unemployed (54.6%; 95% CI 46.0% - 63.0% vs. 46.1%; 95% CI 42.6% - 49.6%; $p = 0.057$) and to be married (31.1%;95% CI 23.2% - 40.3% vs. 19.7%;95% CI 16.7% - 23.1%; $p = 0.018$). There were no substantial differences in rural vs. urban location.

Table 1 The demographic characteristics of men in the 2017 South African HIV survey data, stratified by self-reported HIV status (HIV+, HIV-, and Unknown) (N=1630).

Characteristic	Overall N = 1630			2017 Self-reported HIV status									p-value
				HIV+ n =220			HIV- n=1405			Unknown n=5			
	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	
Age group (years)													
15-19	50	2.1	1.3-3.2	0	0.0	-	50	2.4	1.6-3.6	0	0.0	-	<0.001***
20-24	314	14.2	12.1-16.6	8	2.4	1.0-5.7	305	16.0	13.6-18.8	1	11.6	1.4-54.3	
25-34	608	42.1	38.7-45.5	52	25.8	18.8-34.2	553	44.6	41.0-48.3	3	66.3	23.5-92.7	
35-44	378	26.2	23.3-29.4	84	39.8	31.3-48.8	293	24.1	21.0-27.6	1	22.0	3.0-72.2	
45-54	204	12.1	10.1-14.1	60	26.4	19.1-35.2	144	9.8	7.9-12.2	0	0.0	-	
=>55	76	3.4	2.3-5.0	16	5.7	3.0-10.6	60	3.0	1.9-4.8	0	0.0	-	
Province													
Western Cape	93	8.0	6.2-10.4	6	6.3	2.2-16.9	87	8.3	6.3-10.8	0	0.0	-	0.292
Eastern Cape	93	8.7	7.1-10,7	15	14.0	7.8-23.9	78	7.9	6.4-9.8	0	0.0	-	
Northern Cape	71	1.3	1.0-1.8	4	0.5	0.2-1.4	67	1.4	1.0-2.0	0	0.0	-	
Free State	105	7.5	5.7-9.8	24	13.6	8.3-21.6	81	6.6	4.7-9.1	0	0.0	-	
Kwa-Zulu Natal	462	17.0	14.1-20.4	74	18.8	12.6-27.0	386	16.7	13.6-20.4	2	29.1	6.3-71.7	
North-West	154	9.4	7.9-11.2	18	7.8	4.2-14.0	136	9.7	8.0-11.6	0	0.0	-	
Gauteng	361	32.6	27.6-38.0	46	26.4	17.6-37.7	313	33.5	28.3-39.2	2	42.8	10.7-82.4	
Mpumalanga	184	7.5	6.3-8.9	24	7.2	4.4-11.7	159	7.5	6.2-9.1	1	28.1	4.1-78.0	
Limpopo	107	7.9	6.5-9.6	9	5.3	2.6-10.5	98	8.3	6.9-10.1	0	0.0	-	
Employment													
Unemployed	802	47.3	43.9-50.6	120	54.6	46.0-63.0	678	46.1	42.6-49.6	4	79.2	29.3-97.2	0.057
Employed	796	51.2	47.8-54.5	98	44.3	35.9-53.1	697	52.3	48.7-55.8	1	20.8	2.8-707	
Student	24	1.3	0.7-2.4	0	0	-	24	1.5	0.8-2.8	0	0.0	-	
Other	8	0.3	0.1-0.7	2	1.0	0.2-5.3	6	0.1	0.1-0.4	0	0.0	-	
Locality type													
Urban	920	71.1	66.9-75.0	116	69.9	60.8-77.6	800	71.3	66.9-75.3	4	82.5	34.0-97.7	0.919
Rural informal (tribal farms	523	23.8	20.3-27.8	77	24.2	17.4-32.6	445	23.8	20.1-27.9	1	17.5	2.3-66.0	
Rural (farms)	187	5.1	3.7-6.9	27	5.9	3.1-11.2	160	5.0	3.6-6.8	0	0.0	-	
Education													

No education/Primary	210	10.8	8.8-13.2	68	27.7	19.8-37.4	139	8.2	6.4-10.3	3	51.2	14.4-86.7	<0.001***
Secondary	1224	76.4	73.0-79.4	142	67.5	57.9-75.7	1080	77.8	74.3-80.9	2	48.8	13.3-85.6	
Tertiary	196	12.8	10.4-79.4	10	4.8	2.0-11.0	186	14.1	11.3-17.3	0	0.0	-	
Marital status													
Married	305	21.3	18.3-24.6	62	31.1	23.2-40.3	242	19.7	16.7-23.1	1	22.0	3.0-72.2	0.018**
Never married	1248	73.4	69.9-76.7	140	60.6	51.4-69.1	1104	75.4	71.7-78.8	4	78.0	27.8-97.0	
Divorced/separated	58	4.1	2.9-5.6	13	6.3	3.2-11.8	45	3.7	2.6-5.4	0	0.0	-	
Widower/widow	19	1.2	0.7-2.1	5	2.0	0.6-6.3	14	1.1	0.6-2.1	0	0.0	-	

Note: Data includes 1630 participants. 95%CI = 95% Confidence Interval, Statistical significance: *p<0.05, **p<0.01, and ***p<0.001

Concordance between self-reported status and laboratory confirmed HIV status

There was largely agreement between self-reported and laboratory confirmed HIV status (**Table 2**). Of the 13.5% men identifying as living with HIV, 92.0% (95% CI 84.1% - 96.1%) were confirmed positive through laboratory tests, p<0.001. For 0.3% individuals who self-report an unknown HIV status, result comes with a wide confidence interval of 14.0% - 86.1%, reflecting a high degree of uncertainty in this small subset.

Table 2 Differences between men with self-reported status and laboratory confirmed HIV status from the South African HIV survey data 2017 stratified by self-reported HIV status (HIV+, HIV-, and Uknown) (N=1630).

				2017 Self-reported HIV status									
Characteristic	Overall n (%) N =1630			HIV+ n (%) N =220			HIV- n (%) N=1405			Unknown n (%) N=5			p-value
	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	
Positive	372	22.8	20.0-25.9	204	92.0	84.1-96.1	166	12.0	9.8-14.5	2	40.0	14.0-86.1	<0.001***
Negative	1258	77.2	74.1-80.0	16	8.0	3.9-15.9	1239	88.0	85.5-90.2	3	60.0	13.9-86.0	

Note: Data includes 1630 participants. 95%CI = 95% Confidence Interval, Statistical significance: *p<0.05, **p<0.01, and ***p<0.001

Prevalence of Sexual Risk Behaviours by Self-Reported HIV Status

The prevalence of sexual risk behaviours by self-reported HIV status are shown in **Table 3**. Among men srHIV+, 48.2% (95% CI 39.0 - 57.5) reported having casual sexual partners compared to 71.4% (95% CI 67.4 - 75.2) srHIV-, p<0.001. Overall, 4.9% (95% CI 3.6 - 6.7) of men reported two or more sexual partners in the past year, 26.5% (95% CI 23.4 - 29.9) reported inconsistent condom use at last sexual encounter with all partners in the past 12 months and 14.2% (95% CI 11.8 - 17.1) reported alcohol use at last sexual encounter. There were no

differences in these behaviours by self-reported HIV status, p = 0.116, 0.431 and 0.430 respectively.

Table 3 The sexual risk behaviour characteristics of men from the South African survey data 2017 stratified by self-reported HIV status (HIV+, HIV-, and Unknown) (N=1630).

Characteristic	2017 Self-reported HIV status												
	Overall N = 1630			HIV+ N =220			HIV- N=1405			Unknown N=5			p-value
	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	
Sexual partner type													
Consistent	466	31.7	28.2-35.4	109	51.8	42.5-61.0	356	28.6	24.8-32.6	1	22.0	21.2-35.4	<0.001***
Casual	1164	68.3	64.6-71.8	111	48.2	39.0-57.5	1049	71.4	67.4-75.2	4	78.0	27.8-97.0	
Number of sexual partners in the last 12 months													
1 partner	1543	95.1	93.3-96.4	211	97.4	93.8-98.9	1327	94.1	92.6-96.2	5	100.0	93.3-100.0	0.116
2 or more partners	87	4.9	3.6-6.7	9	2.6	1.1-6.2	78	5.3	3.8-7.4	0	0.00	0.0	
Consistent condom use													
Yes	1211	73.5	70.1-76.6	169	76.7	67.3-84.0	1039	73.0	69.2-76.4	3	66.3	23.5-92.7	0.431
No	419	26.5	23.4-29.9	51	23.3	16.0-32.7	366	27.0	23.6-30.8	2	33.7	7.3-76.5	
Alcohol use													
No	1406	85.8	82.9-88.2	186	83.1	74.9-89.1	1215	86.2	83.1-88.7	5	100.0	82.9-100.0	0.430
Yes	224	14.2	11.8-17.1	34	16.9	10.9-25.1	190	13.8	11.3-16.9	0	0.0	0.0	

Note: Data includes 1630 participants. 95%CI = 95% Confidence Interval, Statistical significance: *p<0.05, **p<0.01, and ***p<0.001

Sexual behaviour variation across provinces and demographic groups

The distribution of partner type varied substantially by education level, age group, marital status, and employment (**Figure 1**). Among those with secondary and tertiary education, 74.0% and 66.7% report engaging in casual partnerships, respectively, compared to 51.1% among those with only primary education. Younger age groups overwhelmingly reported casual partnerships (over 90% of those aged 15-19 and 20-24). Only 5.8% of married men reported casual partners compared to over 80% in all other groups. Student (93.3%) and the unemployed (79.0%) also a reported casual partners more often than those employed (62.2%)

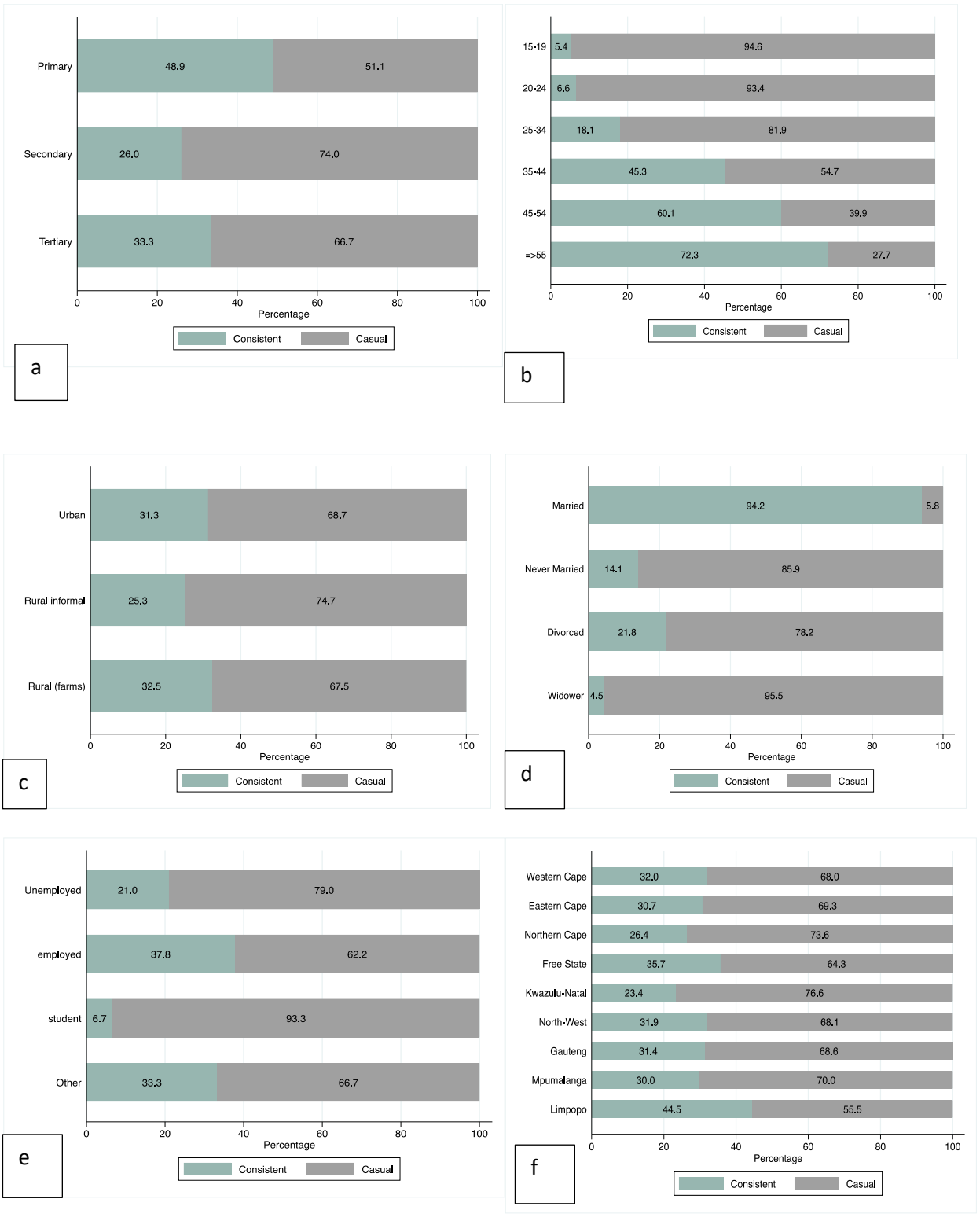

Figure 1 Stacked Bar plots showing the distribution of partner type by sociodemographic factors. a) education level, b) age group (years), c) locality type, d) marital status, d) employment, e) province

Figure 2 presents the distribution of sexual partners (1 vs. 2 or more partners) in the last 12 months across demographic subgroups. The results reveal that over 19.0% of men with secondary and tertiary education report having two or more partners, compared to 13.0% among those with primary education. The highest proportion of men reporting multiple partners is among those aged 15-19 (31.1%), followed by the 20-24 age group (25.3%). Additionally, men living in the urban areas reported the highest proportion of multiple partners (22.3%) compared to men living in the rural informal (tribal areas) (15.6%), with the lowest proportion reported by men living in rural (farms) (12.8%). Students were amongst the second highest proportion (23.3%) after the "other" category (33.3%) that reported multiple sexual partners in the last 12 months. There was slight variation by region, with the highest prevalence of over 25.0% among men living in Gauteng and Northern Cape.

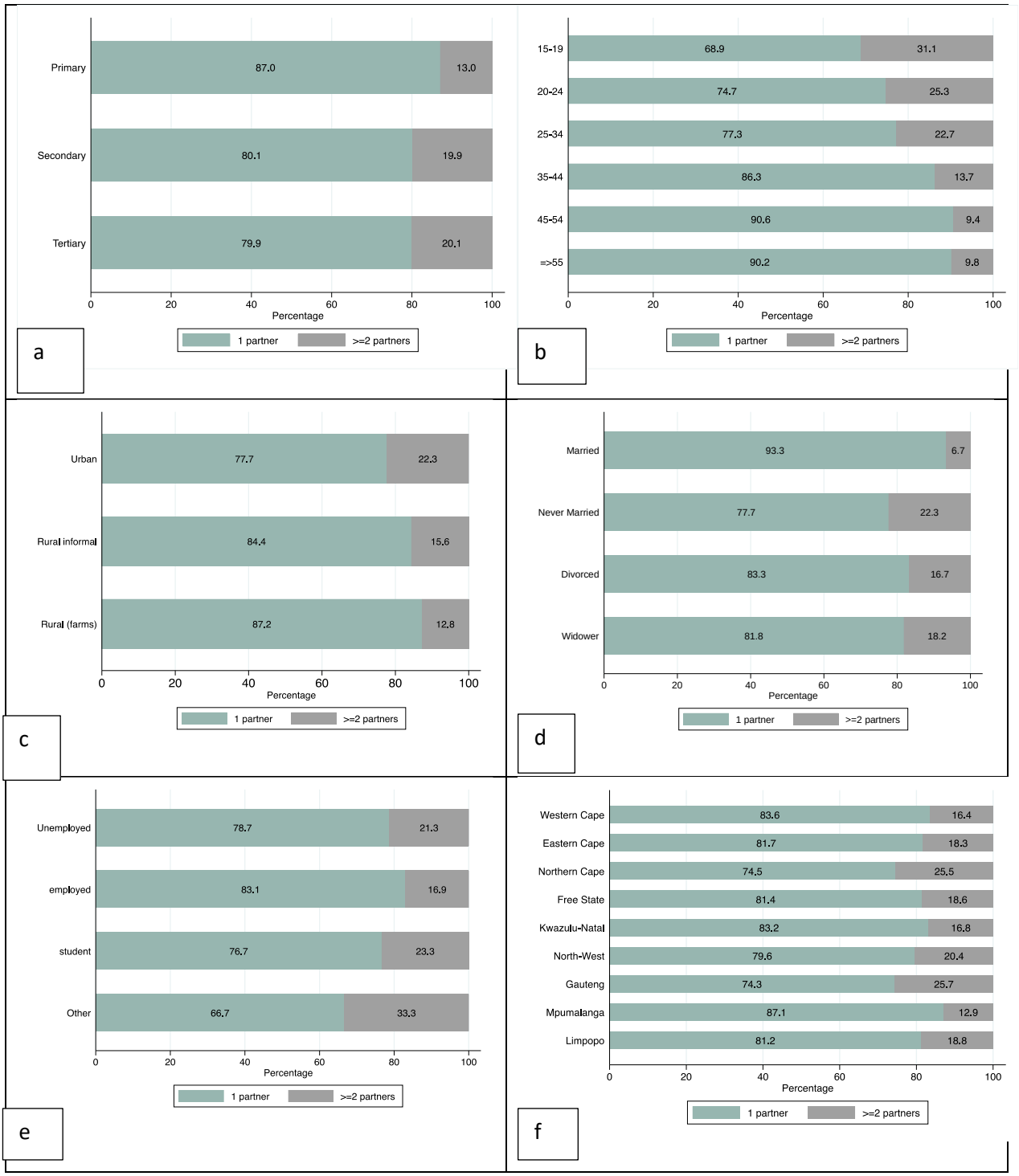

Figure 2 Stacked Bar plots showing the distribution of number of sexual partners by sociodemographic factors. a) education level, b) age group (years), c) locality type, d) marital status, d) employment, e) province

Figure 3 presents the distribution of condom use at last sexual encounter with all partners in the past 12 months across demographic subgroups. Men with tertiary education report the highest rates of inconsistent condom use (32.1%), while those who are employed also show high levels of inconsistent condom use (28.9%). The older age groups =>55 (36.6%), and 45-54 (32.3%) reported the highest proportion of inconsistent condom use, compared to the youngest 20-24 (19.3%) and 15-19 (10.8%).

Prevalence was similar in all geographical locations and provinces with over 20.0% of men reporting inconsistent condom use at last sexual encounter with all partners in the past 12 months in all groups.

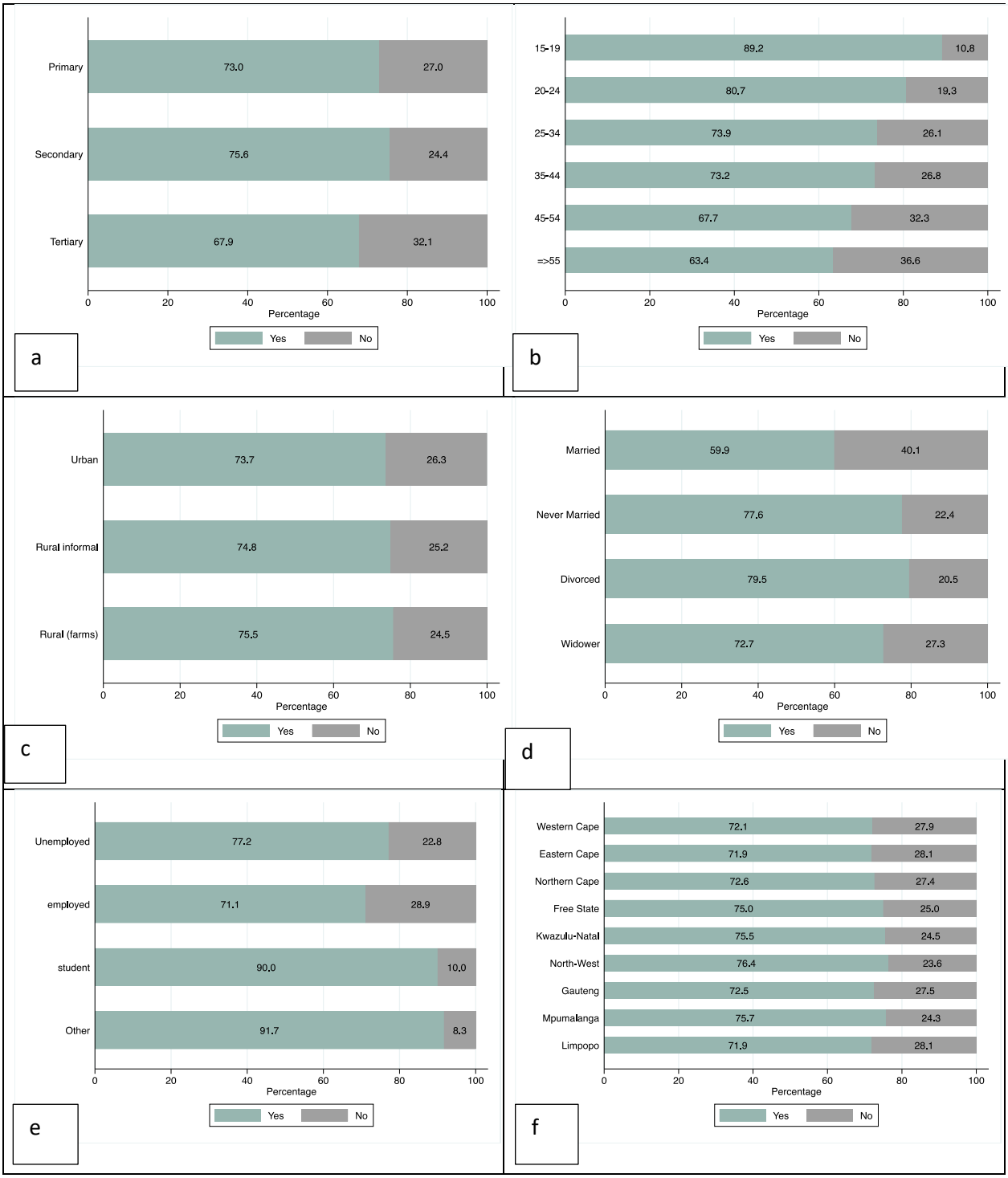

Figure 3 Stacked Bar plots showing the distribution of consistent condom use by sociodemographic factors. a) education level, b) age group (years), c) locality type, d) marital status, d) employment, e) province

Alcohol use before the most recent sexual encounter (**Figure 4**) was highest among students (16.7%), the young men aged 15-19 (21.6%), and men who are widowers (18.2%). Regionally, the Northern Cape Province (21.7%) and Free State (20.7%) report the highest proportions of individuals who consumed alcohol before their most recent sexual encounter.

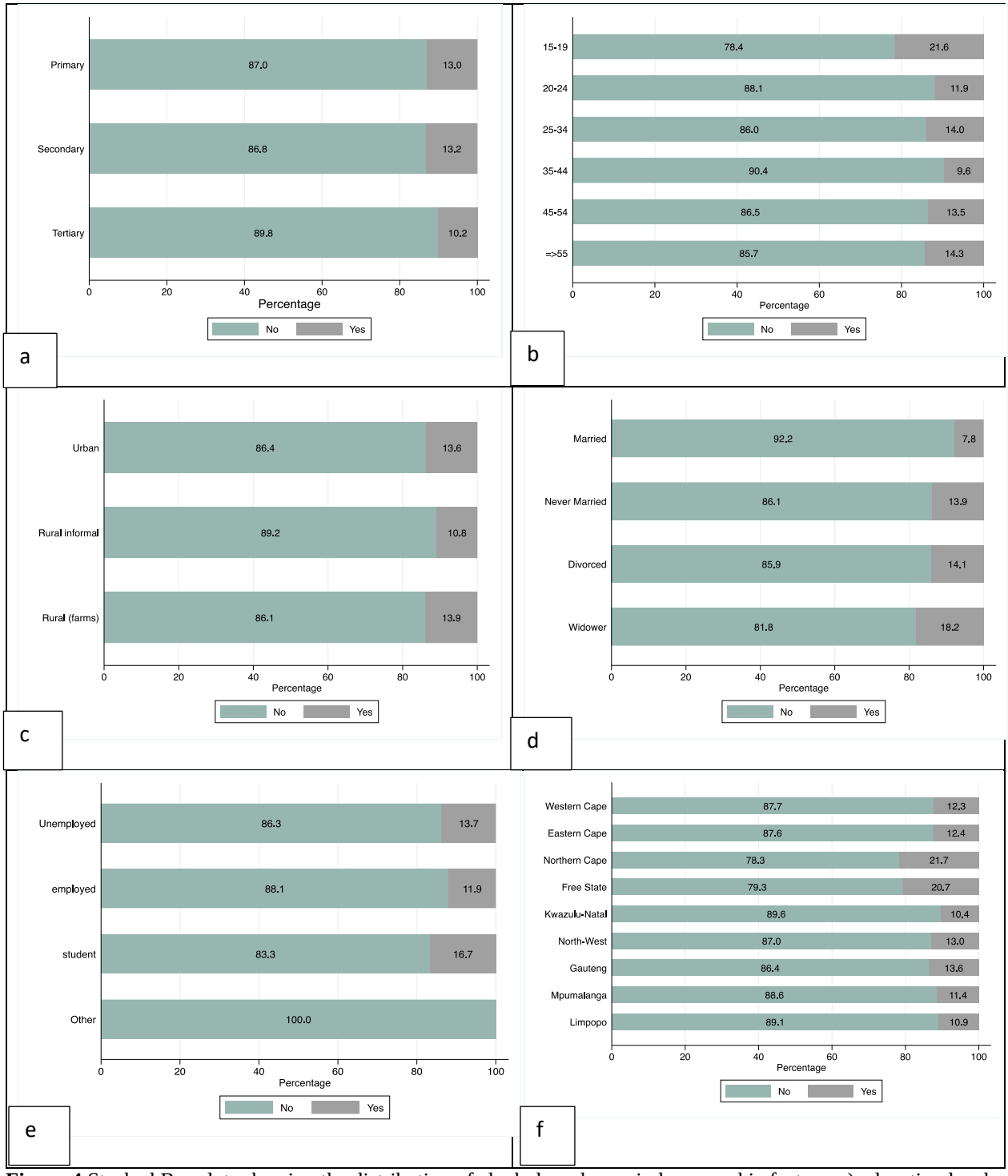

Figure 4 Stacked Bar plots showing the distribution of alcohol use by sociodemographic factors. a) education level, b) age group (years), c) locality type, d) marital status, d) employment, e) province

The relationship between self-reported HIV status and sexual risk behaviour

In unadjusted logistic regression models (**Table 4**), only partner status was associated self-reported HIV status : men who self-reported as living with HIV were 63.0% less likely to report having casual partners compared to those who identified as not living with HIV (OR: 0.37; 95% CI: 0.24 - 0.57). This association was attenuated but still statistically significant in the adjusted model (**Table 5**), (aOR: 0.51 95% CI: 0.27 - 0.97). Other sexual risk behaviours did not show any statistically significant association with self-reported HIV status in crude or adjusted models. Men with secondary (aOR: 2.06; 95% CI: 1.10 - 3.84) or tertiary education (aOR: 2.75, 95% CI: 1.13 - 6.70) were also more likely to engage in casual relationships compared to those with no or primary education. Students had substantially increased odds of reporting casual partners compared to employed men (aOR: 9.22; 95% CI: 2.95 - 28.82).

Table 4 Results of univariable regression model of the relationship between HIV status and sexual risk behaviour (number of sexual partners type: 0= 1 partner, 1= >= 2 partners) among men residing in South Africa aged 15 years and above for 2017 national survey (n=1625).

Sexual Risk Behaviour	HIV self-reported status	OR	95% CI
Number of Sexual Partners (0= 1 partner, 1= >= 2 partners)	HIV negative	reference	
	HIV positive	1.26	0.18-1.27
Partner Type (0=consistent, 1=casual)	HIV negative	reference	
	HIV positive	0.37	0.24-0.57
Consistent Condom Use (0=Yes, 1=No)	HIV negative	reference	
	HIV positive	0.82	0.50-3.35
Alcohol Use (0=No, 1=Yes)	HIV negative	reference	
	HIV positive	1.26	0.73-2.18

Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status. OR = unadjusted odds ratio, 95% CI =95% Confidence Intervals

In the adjusted models predicting of the number of sexual partners, consistent condom use, alcohol use (**Table 5**) never-married men had considerably higher odds of having multiple

partners (aOR: 4.42; 95% CI: 1.92 - 10.16), were significantly less likely to use condoms consistently (aOR: 0.40, 95% CI: 0.24 - 0.67), and were more likely to consume alcohol before their most recent sexual encounter (aOR: 3.52 95% CI :1.62 - 7.66) compared to married men. Additionally, men living in rural informal (tribal) areas were less likely to have multiple partners compared to those in urban areas (aOR: 0.40; 95% CI: 0.18 - 0.85). Similarly, living in certain provinces increased the odds of having more than one sexual partner. Men from Gauteng had more than three times the likelihood of having multiple sexual partners compared to men from the Western Cape (aOR: 3.46; 95% CI: 1.56 - 7.69). Likewise, men from Limpopo had nearly four times higher odds of reporting multiple sexual partners compared to those from the Western Cape (aOR: 3.84; 95% CI: 1.48 - 9.97).

Table 5 Multivariable Logistic Regression Analysis of Factors Associated with sexual risk behaviours among men in South Africa (N=1625).

Variable	A) **Partner Type (0=consistent, 1=casual)**	B) **No. of sexual partners (0= 1 partner, 1= >= 2 partners)**	C) **Consistent Condom Use (0=Yes, 1=No)**	D) **Alcohol use ((0=No, 1=Yes)**
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
HIV Self-reported status				
HIV negative	Reference	Reference	Reference	Reference
HIV positive	0.51 (0.27–0.97)	0.67 (0.38–1.25)	0.75 (0.41-1.39)	1.20 (0.63-2.30)
Education				
No/Primary	Reference	Reference	Reference	Reference
Secondary	2.06 (1.10–3.84)	1.87 (1.02–3.43)	0.96 (0.58-1.59)	1.19 (0.62-2.28)
Tertiary	2.75 (1.13–6.70)	1.11 (0.49–2.51)	1.37 (0.67-2.79)	0.65 (0.26-1.60)
Province				
Western Cape	Reference	Reference	Reference	Reference
Eastern Cape	1.21 (0.32–4.63)	2.05 (0.69–6.06)	1.02 (0.39-2.67)	1.24 (0.49-3.12)
Northern Cape	1.13 (0.25–5.25)	2.17 (0.82–5.72)	1.20 (0.36-4.00)	2.00 (0.71-5.70)
Free State	1.47 (0.46–4.71)	1.27 (0.49–3.29)	0.57 (0.21-1.61)	1.24 (0.51-3.01)
Kwazulu-Natal	1.33 (0.46–3.82)	1.90 (0.79–4.58)	0.86 (0.36-2.06)	0.85 (0.33-2.23)
North-West	1.10 (0.38–3.17)	1.85 (0.80–4.26)	0.85 (0.34-2.14)	1.14 (0.46-2.84)
Gauteng	0.96 (0.32–2.85)	3.46 (1.56–7.69)	0.94 (0.40-2.22)	1.06 (0.46-2.41)
Mpumalanga	0.79 (0.26–2.45)	1.79 (0.73–4.37)	1.10 (0.46-2.61)	0.92 (0.40-2.16)
Limpopo	1.66 (0.48–5.67)	3.84 (1.48–9.97)	0.58 (0.22-1.55)	0.92 (0.32-2.64)
Employment				
Unemployed	Reference	Reference	Reference	Reference
Employed	0.96 (0.55–1.67)	1.20 (0.82–1.77)	0.94 (0.64-1.38)	0.74 (0.44-1.25)
Student	9.22 (2.95–28.82)	1.23 (0.30–4.95)	2.83 (0.57-13.99)	0.82 (0.21-2.02)
Other	5.13 (0.19–141.15)	0.55 (0.09–3.35)	0.99 (0.12-8.40)	1.00 (-)
Age Category				
15-19	Reference	Reference	Reference	Reference
20-24	1.18 (0.18–7.71)	0.69 (0.22–2.16)	1.54 (0.45-5.29)	0.43 (0.14-1.28)
25-34	0.41 (0.07–2.45)	0.56 (0.17–1.81)	1.89 (0.59-6.06)	0.64 (0.21-2.02)
35-44	0.20 (0.03–1.35)	0.36 (0.09–1.45)	1.92 (0.54-6.78)	0.59 (0.17-2.06)
45-54	0.15 (0.02–0.96)	0.52 (0.13–2.10)	1.68 (0.45-6.21)	1.14 (0.32-4.06)
≥55	0.17 (0.01–2.21)	0.38 (0.07–2.03)	1.07 (0.25-4.64)	1.54 (0.36-6.56)
Location				
Urban	Reference	Reference	Reference	Reference
Rural (informal)	0.90 (0.52–1.54)	0.59 (0.36–0.97)	0.94 (0.63-1.39)	1.02 (0.60-1.76)
Rural (farms)	0.75 (0.42–1.37)	0.40 (0.18–0.85)	1.30 (0.76-2.24)	0.88 (0.45-1.72)
Marital Status				

Married	Reference	Reference	Reference	Reference
Never Married	96.05 (35.98–256.44)	4.42 (1.92–10.16)	0.40 (0.24-0.67)	3.52 (1.62-7.66)
Divorced/Separated	104.64 (27.95–391.81)	1.71 (0.47–6.15)	0.50 (0.19-1.29)	1.74 (0.59-5.13)
Widower	939.00 (94.87–9293.82)	3.77 (0.48–29.95)	1.51 (0.43-5.27)	2.21 (0.44-11.11)

Note: Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status. aOR = Adjusted odds ratio, 95% CI =95% Confidence Intervals

Relationships between age and sexual risk behaviour, by self-reported HIV status

Stratified analysis of the association between each sexual risk behaviour and age, revealed distinct age-related patterns (**Table 6**). Overall, men aged 45 years and older consistently exhibited fewer sexual risk behaviours compared to younger men. Specifically, older men were significantly less likely to report to engage in casual partnerships (OR: 0.04, 95% CI: 0.03 - 0.07) model 1, having multiple sexual partners (OR: 0.15, 95% CI: 0.06 - 0.36) model 2, compared to men 15-29 years of age. Among men reporting living with HIV, the likelihood of engaging in casual partnerships decreased with age (OR: 0.22, 95% CI: 0.07 - 0.70,), while men reporting not living with HIV aged 45 and above were less likely to report multiple sexual partners (OR: 0.18, 95% CI: 0.07 - 0.47).

Table 6 Results of showing the association between age group and each sexual risk behaviour, stratified by self-reported HIV status among men residing in South Africa aged 15 years and older in SABSSMV 2017 (N=1625).

	Overall	Self-reported HIV positive	Self-reported HIV negative
Model 1: Partner Type (0=consistent, 1=casual)			
15-29	Reference	Reference	Reference
30-44	OR: 0.15; 95% CI: 0.10 - 0.24,	OR: 0.22; 95% CI: 0.07 - 0.70,	OR: 0.16; 95% CI: 0.10 - 0.26
>=45	OR: 0.04; 95% CI: 0.03 – 0.07	OR: 0.08; 95% CI: 0.02 – 0.26	OR: 0.04; 95% CI: 0.02 – 0.08
Model 2: Number of Sexual Partners (0= 1 partner, 1= >= 2 partners)			
15-29	Reference	Reference	Reference
30-44	OR: 0.81; 95% CI: 0.39 - 1.68,	OR: 0.26; 95% CI: 0.03 - 2.15	OR: 0.92; 95% CI: 0.42 - 1.99
>=45	OR: 0.15; 95% CI: 0.06 – 0.36	OR: 0.06; 95% CI: 0.06 – 0.36	OR: 0.18; 95% CI: 0.07 – 0.47
Model 3: Consistent Condom Use (0=Yes, 1=No)			
15-29	Reference	Reference	Reference
30-44	OR: 1.59; 95% CI: 1.12 - 2.26	OR: 0.60; 95% CI: 0.20 - 1.75	OR: 1.80; 95% CI: 1.23 - 2.61
>=45	OR: 1.23; 95% CI: 0.74 – 1.74	OR: 0.37; 95% CI: 0.10 – 1.38	OR: 1.44; 95% CI: 0.88 – 2.34
Model 4: Alcohol Use (0=No, 1=Yes)			
15-29	Reference	Reference	Reference
30-44	OR: 0.95; 95% CI: 0.57 – 1.56	OR: 0.68; 95% CI: 0.17 - 2.66	OR: 0.93; 95% CI: 0.53 - 1.64
>=45	OR: 1.04; 95% CI: 0.61 – 1.77	OR: 0.65; 95% CI: 0.16 – 2.66	OR: 1.03; 95% CI: 0.55 – 1.95

Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status. OR = unadjusted odds ratio, 95% CI =95% Confidence Intervals

Discussions

This study aimed to examine the prevalence and drivers of sexual risk behaviours and their association with self-reported HIV status among South African men aged 15 and older using the 2017 SABSSMV survey data. The analysis revealed a nuanced view of sexual behaviours and associated risks among South African men. The prevalence of casual sexual partnerships was high, with nearly 68.3% of participants overall and 71.4% of men who self-reported not living with HIV engaging in such relationships. While these findings highlighted risk, they also pointed to protective behaviours. Men who self-reported living with HIV were notably less likely to engage in casual sexual relationships (63.0%). Younger age and higher education levels were also associated with engaging in casual partnerships. Other sexual risk behaviours—such as having multiple sexual partners, consistent condom use, and alcohol use—did not differ significantly by self-reported HIV status although some difference by demographic characteristics were observed.

Regionally, men from Gauteng and Limpopo were more likely to engage in multiple sexual partners, and this pattern was also prominent in never married men and men residing in urban settings. Interestingly, inconsistent condom use was more common among older men, those with higher education levels, those who were employed and those who were never married. Other risk factors offered deeper insight into the social and cultural landscape. Alcohol use before the most recent sexual encounter was a notable concern, particularly among never married men, and was more common in Northern Cape and Free State. Older men, particularly those over 45 years, were also less likely to report engaging in sexual risk behaviours.

The analysis revealed that self-reported HIV status was an important determinant of sexual risk behaviours. Men self-reporting living with HIV had lower engagement in risky

sexual behaviours compared to those self-reporting not living with HIV. For instance, prevalence of casual relationships 48.2% (95% CI 39.0% - 57.5%) vs. 71.4% (67.4% - 75.2%), multiple sexual partners 2.6% (95% CI 1.1% - 6.2%) vs. 5.3% (95% CI 3.8% - 7.4%), and inconsistent condom use 23.3% (16.0% - 32.7%) vs. 27.0% (95% CI 23.6% - 30.8%) respectively. This is consistent with research showing that people living with HIV tend to adopt safer practices post-diagnosis (29–33). The findings suggest a need for interventions like behavioural change communication (BCC) and community mobilization programs to promote monogamy and promote safer practices that reduce casual partnerships among HIV-negative men (34). Behavioral Change Communication (BCC) strategies, such as targeted awareness campaigns and peer-led education, can promote safer sexual behaviors. Messaging should be tailored to men who self-report as HIV-negative, considering their socioeconomic and cultural contexts while addressing social norms that perpetuate risk. Trusted community members can enhance credibility, and messages should emphasize testing using clear, simple language (35).

Community mobilization programs engaging men in discussions on HIV prevention and partner reduction have been effective in reshaping social norms. Research shows that male-centered initiatives improve prevention outcomes by fostering peer support and reducing stigma. Integrating these strategies into existing HIV programs, especially in high-risk areas, can strengthen national efforts to reduce HIV incidence and drive long-term behavior change among South African men (36).

In this study we observed high concordance between self-reported and laboratory-confirmed HIV status, however some gaps persist that highlight the need for targeted interventions that focus more on perceived HIV status awareness and encouragement in HIV testing. Misclassification of those living with HIV may occur due to truly being unaware of one's status or fear of stigma (37). These findings underscore the ongoing need to improve

access to and uptake of HIV testing and counselling services (HTC) that includes couples HIV testing and counselling (CHTC) and HIV prevention measures through voluntary medical male circumcision (VMMC) (29,33,37) can help reduce the risk of HIV transmission. Our findings emphasize the need for the expansion and strengthening of these services, particularly among men, through BCC programs mentioned above, and using mobile testing services to enhance accessibility, and reduce barriers to uptake to assist in improving early diagnosis and improve risky sexual behaviours that can finally reduce transmission (35,36).

Risky sexual behaviours also differed significantly by age group. Younger men were more likely to report casual partnerships compared to older men (45 years and above) andthis trend was observed among both men srHIV+ and those srHIV-, indicating that older men may be more inclined to maintain stable, monogamous relationships.(38,39). Moreover an analysis of modification shows that never married men mostly from the younger age groups- engage in higher risky sexual behaviours – a trend that is evident in broader literature on risk taking. Tendencies may vary by both age and marital status and showing that younger men often engage in casual partnership while older men have difficulties in consistently using condoms during sexual encounters (35,40,41). These findings suggest that tailored interventions are required to address these age-related patterns to target younger, unmarried men, with a focus on comprehensive sexual education and access to preventative resources and improving condom use among older men, these can be combined with youth-friendly sexual health services. Technology-based intervention programs such as online counselling or mobile apps and gamified learning modules and AI-driven chatbots could be more accessible, improve interest and provide confidential support, while for older men, having targeted community-driven campaigns that involve peer-education models can be done to improve the consistency of condom use (42,43).

Evidence in differences in sexual risk behaviours by locality type and regionally were demonstrated in the data. Higher levels of casual partnerships and multiple sexual partnerships were reported by men residing in urban areas, while rural residents reported reduced condom use. Men in Gauteng and Limpopo reported higher levels of risky sexual practices than men from other provinces which may suggest differences in access to sexual health education and healthcare services, as well as sociocultural norms that influence sexual behaviour. The findings underscore the need for geographically targeted interventions that address the unique risk profiles of urban and rural populations and these should prioritize urban areas like Gauteng while expanding efforts to provinces with larger underserved rural areas like Limpopo to address the prevalence of multiple sexual partners and encourage safer practices. Proven effective interventions for reducing multiple sexual partnership include comprehensive education on safe sex practices, and promoting sexual health awareness and decision-making skills (29,33).

The high prevalence of alcohol use at last sex in all men (16.9% [95% CI 10.9% - 25.1%] for men srHIV+ and. 13.8% [11.3% - 16.9%] for men srHIV- emphasize the importance of implementing integrated alcohol harm-reduction strategies (44). Screening and brief interventions (SBI) for alcohol use, when incorporated into sexual health services, have demonstrated effectiveness in reducing alcohol-related risky behaviours (45). Furthermore, the substantial rates of alcohol use prior to sexual activity in the Northern Cape (21.7%) and Free State (20.7%) highlight the need for region-specific interventions. Such initiatives may include public awareness campaigns via local media, enhancing the availability of alcohol counselling services, and educating the public about the connection between alcohol consumption and risky sexual behaviour. Moreover, collaboration with provincial governments and local health departments will be crucial in ensuring that resources are directed toward these efforts.

Education and employment were closely linked to differences in sexual risk behaviours. Lower levels of education and employment were associated with safer sexual practices, while higher education and employment was correlated with higher engagement in risky behaviours. For instance, casual partnership engagements were more likely in secondary (aOR: 2.06; 95% CI: 1.10 - 3.84) and tertiary (aOR: 2.75, 95% CI: 1.13 - 6.70) compared to those with no or primary education, and inconsistent condom use was higher among those with tertiary education (32.1%) and employed individuals (28.9%) compared to secondary (24.4%) and unemployed (22.8%) respectively. These patterns suggest that socioeconomic factors significantly influence risk profiles. The integration of behaviour change campaigns through peer-led initiatives tailored aimed at addressing assumptions of reduced risk among men with secondary and tertiary education is essential in reducing transmission risks and encourage behaviours. that focuses on reinforcing the importance of consistent condom use and Pre-Exposure Prophylaxis (PrEP) (32,46). Partnering with employers to create workplace wellness programs that address sexual health, provide access to condoms, and facilitate STI testing could help reduce inconsistent condom use among the employed population.

These results should be interpreted with the following limitations in mind. Although our analysis included 1,630 complete cases without systematic differences between those with and without missing data, several limitations remain. The exclusion of incomplete cases may still result in the loss of valuable information and reduced sample size in key subgroups, limiting the ability to detect meaningful differences. Notably, reduced statistical power and precision were observed in analyses of age groups and marital status with very small numbers of people in some groups, leading to high odds ratios and very wide 95% confidence intervals. Additionally, inherent challenges in survey data, such as potential sampling and response biases, question design flaws, and measurement error, remain relevant and could impact the generalizability of our findings, and further research is required to confirm the results.

In summary, the findings emphasize the association between self-reported HIV status and risky behaviours, which were more common among men srHIV-. The differences in risky behaviors between srHIV+ and srHIV- individuals may be complex and influenced by multiple factors. Men who are srHIV+ may be more aware of their HIV status, leading to a greater sense of responsibility in protecting others. This could result in more consistent condom use and a reduction in the number of sexual partners as protective measures. Additionally, this group may have received more targeted sexual health education and guidance on safer sexual practices for HIV prevention and transmission compared to those who have perceived srHIV- (47).This underscores the need for comprehensive HIV testing and counselling services (HTC), safe sex education and the integration of both behavioural and structural approaches in existing health services to mitigate transmission HIV. They also emphasize the need for targeted interventions addressing socio-economic and demographic disparities, including age, education, and geographical location (48,49). The combination of condom use and multiple sexual partners increase the overall risk of HIV transmission or acquisition. When condoms are used consistently and correctly during every sexual encounter, the risk is significantly reduced. However, inconsistent condom use in the context of multiple partners increases the likelihood of both HIV and other STI transmissions (47). Potential interventions should focus on improving HIV testing and awareness, particularly among younger, unmarried men, and those in rural areas. Geographic-specific programs that address urban and rural disparities, combined with education campaigns tailored to younger demographics, could significantly reduce risk behaviours. Socioeconomic interventions, such as education and employment programs, could also play a key role in reducing HIV transmission risk by addressing the underlying determinants of risky behaviours(31). Our findings are in agreement with behavioural theories like the Health Belief Model that states that perceived susceptibility and barriers influence behaviour (50). It can be suggested that younger man underestimate the risk of HIV infection which results in the engagement in

casual partnership while older man encounter barriers around decreased risk perception around condom use. Incorporation of these insights into the South Africa's National Strategic Plan on HIV as policy-level intervention, highlighting targeted messaging and structural support for the different age groups is crucial. While HIV status affects behaviours like partner type, risky behaviours remain consistent across both HIV-positive and HIV-negative men (37). These targeted efforts are essential to reduce HIV transmission and improve sexual health outcomes (51).Ongoing education and testing, particularly for individuals unaware or uncertain of their HIV status, will be critical to achieving comprehensive prevention goals.

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Part C: APPENDICES

Appendix A: Manuscript: Supplementary Information

Flow diagram showing how we got to the number included in the analysis

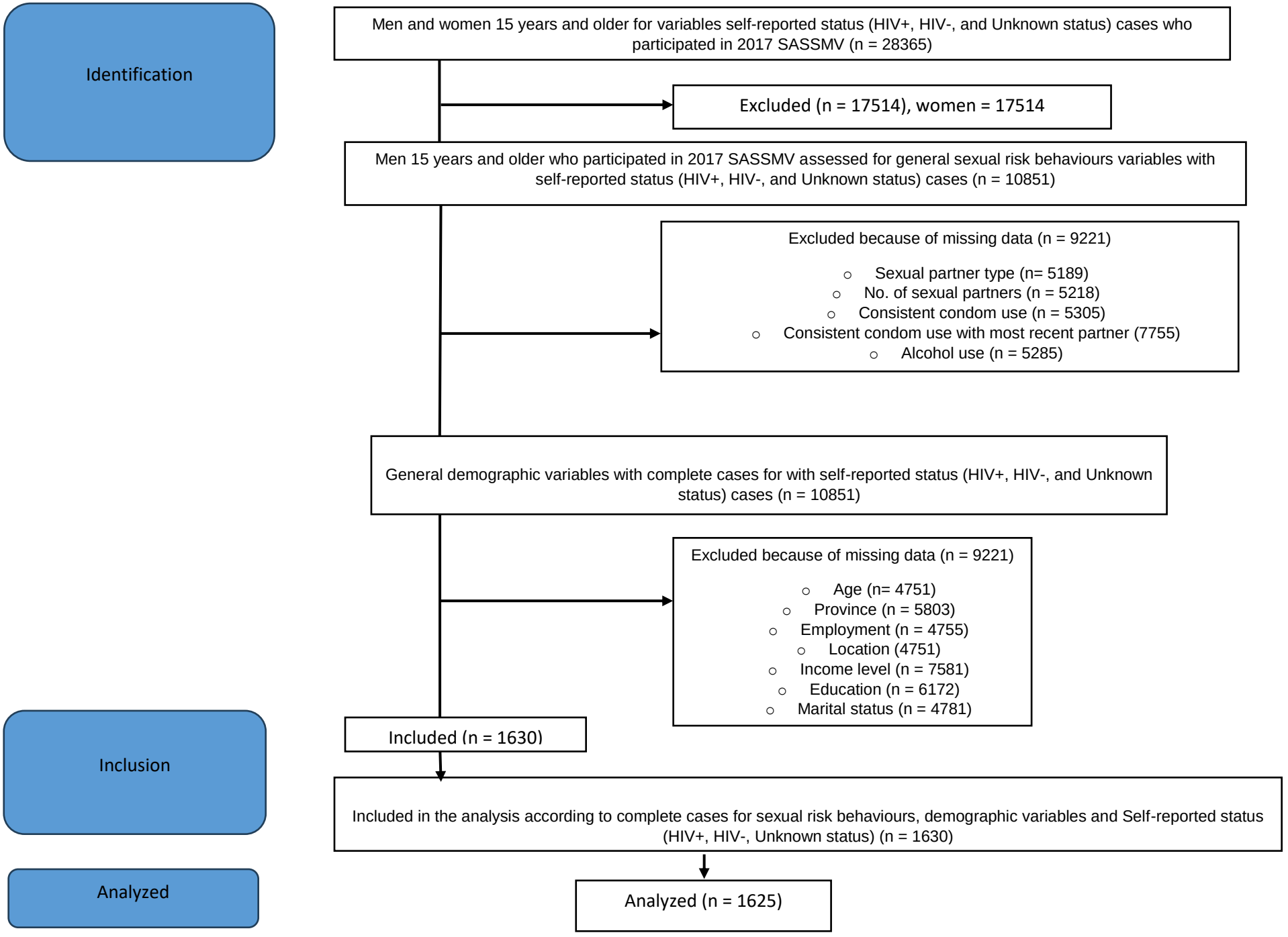
Identification
Men and women 15 years and older for variables self-reported status (HIV+, HIV-, and Unknown status) cases who participated in 2017 SASSMV (n = 28365)
Excluded (n = 17514), women = 17514
Men 15 years and older who participated in 2017 SASSMV assessed for general sexual risk behaviours variables with self-reported status (HIV+, HIV-, and Unknown status) cases (n = 10851)
Excluded because of missing data (n = 9221)
Sexual partner type (n= 5189)
No. of sexual partners (n = 5218)
Consistent condom use (n = 5305)
Consistent condom use with most recent partner (7755)
Alcohol use (n = 5285)
General demographic variables with complete cases for with self-reported status (HIV+, HIV-, and Unknown status) cases (n = 10851)
Excluded because of missing data (n = 9221)
Age (n= 4751)
Province (n = 5803)
Employment (n = 4755)
Location (4751)
Income level (n = 7581)
Education (n = 6172)
Marital status (n = 4781)
Inclusion
Included (n = 1630)
Included in the analysis according to complete cases for sexual risk behaviours, demographic variables and Self-reported status (HIV+, HIV-, Unknown status) (n = 1630)
Analyzed
Analyzed (n = 1625)

Figure SI 1 Flow chart of data inclusion criteria

Decision made based on proportion similarities between complete and incomplete cases in step 4: Table 4.

Step 4: Table SI 4: show that analysis of proportions indicates several areas of both similarity and difference between complete and incomplete cases. While there are significant differences in age distribution and marital status, with younger respondents and married individuals more likely to have incomplete data, other characteristics show more similarity. Employment status, location, and certain income levels have relatively close proportions, suggesting that these characteristics are similarly distributed among both groups.

Using complete cases is advantageous because they offer a more comprehensive and accurate dataset. The larger and more consistent the dataset, the more reliable the analysis and conclusions drawn from it. Despite some differences, the similarity in many characteristics indicates that complete cases can still provide valuable insights that are representative of the overall population, particularly in key areas like employment and location. Therefore, focusing on complete cases for analysis can lead to robust and actionable insights.

Decision made based on proportion similarities between complete and incomplete cases in step 5: Table 5.

Step 5: Table SI 5: indicates that there are more complete case 1630 compared to 864 in step 6: Table 6, therefore for increased statistical power, and better representation of the data, the 1630 complete cases was used for the analysis.

In addition, age at sexual debut variable was left out because it was only asked to specific participants (18-24) and therefore did not include the age spectrum of our analysis.

Table SI 1 Comparison of Key Sexual Risk Behaviours Between Respondents with and without Self-Reported HIV Status ((HIV+, HIV-, and Unknown) (N = 10851)

Characteristic	Overall n (%)			2017 Self-reported HIV status: HIV+ n (%)			HIV- n (%)			Unknown n (%)		
	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI
Sexual partner type												
Consistent	1889	49.1	46.5-51.8	178	55.1	47.3-62.7	1704	48.7	45.9-51.5	7	21.3	7.2-48.6
Casual	2085	50.9	48.2-53.5	157	44.9	37.3-52-7	1919	51.3	48.5-54.1	9	78.7	51.4-92.8
Total	3974			335			3623			16		
Number of sexual partners in the last 12 months												
1 partner	3808	96.2	94.6-974	322	97.9	95.3-99.1	3471	96.1	94.3-97.3	15	96.1	94.3-99.1
2 or more partners	145	3.8	2.6-5.4	11	2.1	0.9-4.7	133	3.9	2.7-5.7	1	3.6	0.4-23.8
Total	3953			333			3604			16		
Consistent condom use												
Yes	1209	30.7	28.6-32.8	159	53.4	45.6-61.0	1048	28.7	26.6-30.9	2	34.2	6.7-78.9
No	2690	69.3	67.2-71.4	171	46.6	39.0-54.4	2505	71.3	69.1-73.4	14	65.8	21.1-93.3
Total	3899			530			3553			16		
Condom use with most recent partner												
Yes	1622	74.6	71.6-77.4	206	78.5	70.2-85.1	1411	74.0	70.8-76.9	5	92.2	60.0-98.9
No	514	22.6-28.4	22.6-28.4	54	21.5	14.9-29.8	458	26.0	23.1-29.2	2	7.8	1.1-40.0
Total	2136			260			1869			7		
Alcohol use												
No	3411	86.3	84.5-87.9	281	84.0	77.4-89.0	3117	86.5	84.6-88.2	13	78.3	41.4-94.8
Yes	506	13.7	12.1-15.5	50	16.0	11.0-22.6	453	13.5	11.8-15.4	3	21.7	5.2-58.6
Total	3917			331			3570			16		
Age of sexual debut												
=<15	1139	24.3	22.4-26.3	101	24.9	19.9-30.8	1033	24.1	22.2-26.2	5	56.5	27.1-81.9
15-19	2698	52.3	50.1-54.4	249	53.5	47.3-59.6	2439	52.3	49.9-54.6	10	28.1	10.5-56.6
20-34	1230	23.1	21.3-25.0	108	21.3	16.6-26.9	1125	23.3	21.4-24.3	5	15.3	4.9-38.8
35-59	18	0.3	0.1-0.5	2	0.3	0.1-1.1	16	0.3	0.1-0.6	0	0.0	-
>=60	1.0	0.1	0.0-0.4	0	0.0	0.1-1.1	0	0.1	0.0-0.4	0	0.0	-
Total	5094			460			4614			20		

Note: Data from 10851 participants. 95% CI =95% Confidence Intervals

Table SI 2 Comparison of Key Sexual Risk Behaviours Between Respondents with and without Self-Reported HIV Status (HIV+, HIV-, Unknown and Missing) (N = 10851)

	2017														
	Self-reported HIV status														
Characteristic	Overall n(%) N =10851			HIV+ n(%) N =504			HIV- n(%) N=5574			Unknown n(%) N=22			Missing n(%) N=4751		
	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI	n	%	95%CI
Sexual partner type															
Consistent	2509	24.6	22.8-26.6	178	38.6	32.3-45.3	1704	35.0	32.8-37.3	7	12.0	4.9-29.3	620	11.3	9.6-13.2
Casual	3153	30.0	27.9-32.1	157	31.4	25.9-37.5	1919	36.8	20.5-39.2	9	47.4	20.5-76.0	1068	21.9	19.0-25.0
Missing	5189	45.4	42.3-48.5	169	30.0	24.6-36.0	1951	28.1	26.2-30.1	6	39.8	15.7-70.1	3068	66.8	62.6-70.8
Number of sexual partners in the last 12 months															
1 partner	5416	52.4	49.3-55.4	322	68.3	62.4-73.7	3471	69.0	28.4-82.9	15	58.1	28.4-82.9	1608	31.6	27.8-35.8
2 or more partners	217	2.1	1.6-2.8	11	1.5	0.7-3.3	133	2.8	1.9-4.1	1	2.2	0.3-14.8	72	1.4	1.0-1.9
Missing	5218	45.5	42.5-48.6	171	30.2	24.9-36.2	1970	28.2	26.3-20.2	6	39.0	15.7-70.1	3071	67.0	62.7-71.0
Total	10			504											
Consistent condom use															
Yes	1741	17.1	15.7-18.6	159	36.9	30.8-43.6	1048	20.3	30.8-43.6	2	20.6	18.7-22.0	532	11.4	9.6-13.4
No	3805	36.5	34.3-38.8	171	32.2	26.8-38.2	2505	50.4	48.5-52.4	14	39.6	17.0-67.8	1115	21.0	18.3-24.0
Missing	5305	46.4	43.3-49.4	174	30.8	25.4-36.8	2021	29.2	27.3-31.2	6	67.7	63.5-71.6	3104	67.7	63.5
Condom use with most recent partner															
Yes	2357	23.0	21.3-24.8	206	46.4	40.0-52.9	1411	27.5	25.6-29.5	5	26.1	6.6-63.8	735	15.5	13.3-17.9
No	739	7.4	6.5-8.3	54	12.7	8.7-18.1	458	9.7	8.4-11.1	2	2.2	0.5-9.9	225	4.2	3.3-5.2
Missing	7755	69.6	67.4-71.7	244	40.9	34.9-47.3	3705	62.8	60.6-65.0	15	71.7	35.7-92.0	3791	80.4	77.4-83.0
Alcohol use															
No	4840	46.2	43.5-48.9	281	58.0	51.7-64.1	3117	61.4	59.3-63.5	13	47.2	20.4-75.6	1429	27.5	24.1-31.2
Yes	726	7.5	6.7-8.6	50	11.0	7.6-15.8	453	9.6	8.3-11.0	3	13.1	3.3-40.1	220	4.9	3.8-6.2
Missing	5285	46.3	43.2-49.3	173	30.9	25.5-37.0	2004	29.0	27.1-31.0	6	39.8	15.7-70.1	3102	67.7	63.4-71.6
Age of sexual debut															
=<15	1705	16.7	15.3-18.1	101	23.0	18.4-28.4	1033	20.8	19.1-22.7	5	45.8	19.1-75.1	566	11.6	9.5-13.0

15-19	4019	35.5	33.3-37.7	249	49.4	43.5-55.4	2439	45.1	43.0-47.2	10	22.8	8.7-47.7	1321	23.2	20.2-26.4
20-34	1838	16.0	14.8-17.4	108	19.7	15.3-25.0	1125	20.1	18.4-21.9	5	12.4	4.1-32.2	600	11.1	9.5-12.9
35-59	21	0.1	0.1-0.3	2	0.2	0.1-1.0	16	0.2	0.1-1.0	0	-	-	3	0.0	0.0-0.1
>=60	2.0	0.0	0.0-0.2	0	-	-	0	-	-	0	-	-	0	0.0	-
Missing	3266	31.6	28.1-35.3	44	7.6	5.1-11.1	960	13.8	12.3-15.3	2260	54.6	49.2-59.9	2260	54.6	49.2-59.9

Note: Data from 10851 participants showing complete cases. 95% CI =95% Confidence Intervals

Table SI 3 Comparison of Key Demographic Characteristics Between Respondents with and without Self-Reported HIV Status (HIV+, HIV-, Unknown) (N = 10,851)

Characteristic	Complete cases n(%)			Incomplete cases n(%)		
Self-report	n	%	95% CI	n	%	95% CI
Age						
15-19	707	7.3	6.5-8.2	1224	17.6	15.5-20.0
20-24	881	12.3	11.5-14.0	731	13.4	11.7-15.4
25-34	1472	30.7	28.9-32.6	902	24.6	22.3-27.0
35-44	1078	22.4	20.8-24.0	577	17.3	14.5-20.5
45-54	860	14.3	12.9-15.8	449	10.6	10.2-19.0
=>55	1102	12.6	10.8-14.6	868	16.4	14.2-19.0
	6100			4751		
Province						
Western Cape	496	12.1	10.5-14.0	438	13.0	11.2-16.6
Eastern Cape	455	9.4	8.0-10.9	408	11.5	8.6-15.4
Northern Cape	322	1.5	1.3-1.9	355	2.7	1.8-4.0
Free State	381	6.9	5.7-8.4	191	3.2	2.5-4.0
Kwa-Zulu Natal	1704	16.1	14.0-18.4	1391	17.1	14.2-20.6
North-West	501	8.0	6.8-9.3	250	5.8	3.6-9.3
Gauteng	1189	30.9	27.3-14.6	654	26.6	20.5-33.7
Mpumalanga	654	7.0	6.0-8.0	700	9.1	6.9-11.7
Limpopo	398	8.2	7.0-9.6	364	10.3	7.5-13.9
	5048					
Employment						
Unemployed	2793	42.0	39.8-44.2	1968	47.0	44.3-49.7
Employed	2471	47.4	45.1-49.8	1130	30.7	28.1-33.5
Student	763	9.6	10.7	970	21.0	19.1-23.1
Other	69	1.0	0.7-1.4	53	1.3	0.8-2.0
	6096					

Location						
Urban	3537	71.8	68.7-74.8	2360	63.4	57.6-68.9
Rural informal (tribal farms	1811	22.3	19.7-25.2	1632	26.4	22.0-31.3
Rural (farms)	752	5.9	4.4-7.7	759	10.2	6.5-15.6
	6100					
Income level						
Below R500	237	7.3	5.8-9.2	258	13.9	11.6-16.5
501-1000	187	5.7	4.7-7.0	106	5.7	4.3-7.4
1001-5000	1931	53.1	49.9-56.2	1203	61.5	57.6-65.4
5001-10000	425	14.7	12.6-17.0	158	8.9	6.8-11.4
10001-20000	259	10.4	8.5-12.7	71	4.1	2.7-6.2
More than E20000	231	8.7	7.1-10.7	68	6.0	4.2-8.4
	3270					
Education						
Primary	889	14.4	12.8-16.2	654	20.5	18.2-22.9
Secondary	3201	67.8	65.1-70.4	1698	67.7	64.6-70.7
Tertiary	586	17.8	15.2-20.6	217	11.0	9.4-14.8
	4679					
Marital status						
Married	1946	34.6	32.2-37.0	871	20.7	18.9-22.7
Never married	3814	60.6	58.2-63.0	3053	74.4	72.3-76.4
Divorced/separated	178	3.0	2.4-3.7	83	2.5	1.8-3.5
Widower/widow	161	1.9	1.5-2.3	117	2.3	1.8-3.0
	6099					

Note: Data from 10851 participants showing complete cases. 95% CI =95% Confidence Intervals.

Table SI 4 Comparison of Demographics and Sexual Risk Behaviours (Excluding Condom use with recent partner) by Self-Reported HIV Status (HIV+, HIV-, Unknown) (N = 10,851)

Characteristic	Complete cases n(%)			Incomplete cases n(%)		
Self-report	n	%	95% CI	n	%	95% CI
Age						
15-19	212	6.9	5.6-8.3	1719	13.2	12.0-`14.5
20-24	450	17.8	15.6-20.1	1162	11.7	10.6-13.0
25-34	671	38.1	35.2-41.1	1703	25.3	23.7-27.0
35-44	413	23.3	20.8-26.1	1242	19.2	17.4-21.0
45-54	225	10.6	8.9-12.5	1084	13.3	11.8-14.0
=>55	100	3.4	2.4-4.7	1870	17.2	15.4-19.2
Total	2071			8780		
Province						
Western Cape	111	7.8	5.9-10.3	823	14.2	12.3-16.2
Eastern Cape	124	9.2	7.5-11.4	739	10.6	8.7-12.9
Northern Cape	83	1.2	0.9-1.7	594	2.3	1.7-3.0
Free State	137	7.5	5.8-9.5	435	4.7	3.9-5.5
Kwa-Zulu Natal	575	17.1	14.2-20.4	2520	16.4	14.2-18.9
North-West	186	8.6	7.2-10.3	565	6.6	5.1-8.5
Gauteng	462	32.4	27.8-37.4	1381	28.0	24.0-32.4
Mpumalanga	251	7.7	6.4-9.1	1103	7.9	6.7-9.5
Limpopo	142	8.5	7.1-10.1	620	9.3	7.6-11.4
Total	2071			8780		
Employment						
Unemployed	908	42.4	39.5-45.3	3853	44.2	42.1-46.3
Employed	875	45.7	42.6-48.7	2726	40.1	37.9-42.4
Student	275	11.5	9.7-13.5	1458	14.3	13.2-15.5
Other	11	0.5	0.2-1.1	111	1.3	1.0-1.7
Total	2069			8148		
Location						

Urban	1179	71.4	67.4-75.1	4718	67.2	63.3-70.9
Rural informal (tribal farms	675	23.9	20.5-27.7	2768	24.1	21.1-27.5
Rural (farms)	217	4.7	3.4-6.5	1294	8.6	6.2-11.9
Total	2071			8780		
Income level						
Below R500	79	5.8	4.2-7.8	416	10.5	8.9-12.5
501-1000	74	7.1	5.2-9.8	219	5.3	4.4-6.4
1001-5000	606	59.9	55.0-64.7	2528	54.5	51.6-57.4
5001-10000	139	13.9	11.0-17.5	444	12.5	10.7-14.5
10001-20000	68	8.2	5.8-11.5	262	8.5	6.8-10.5
More than E20000	43	5.0	3.3-7.5	256	8.7	7.2-10.6
Total	1009			4125		
Education						
Primary	210	10.9	8.8-13.2	1333	18.2	16.6-20.0
Secondary	1225	76.4	73.0-79.4	3674	64.8	62.3-67.2
Tertiary	196	12.8	10.3-15.7	607	19.7	14.5-19.7
Total	1631			5614		
Marital status						
Married	343	18.7	16.2-21.5	2474	33.2	31.1-35.4
Never married	1645	76.9	73.9-79.7	5222	61.8	59.7-64.0
Divorced/separated	63	3.4	2.5-4.7	198	2.6	2.1-3.3
Widower/widow	20	1.0	0.6-1.7	258	2.4	2.0-2.8
Total	2071			8152		

Note: Data from 10851 participants showing complete cases. 95% CI =95% Confidence Intervals

Table SI 5 Comparison of Demographics (Excluding Income level) and Sexual Risk Behaviours (Excluding Condom use with recent partner) by Self-Reported HIV Status (HIV+, HIV-, Unknown) (N = 10,851)

Characteristic	Overall n(%) N =	Complete cases n(%) **N =1630**			Incomplete cases n(%) N =		
Self-report		n	%	95% CI	n	%	95% CI
Age							
15-19		50	2.1	1.3-3.2	1881	13.9	12.7-15.2
20-24		314	14.2	12.1-16.6	1298	12.8	11.6-14.0
25-34		608	42.1	38.7-45.5	1766	25.2	23.6-26.8
35-44		378	26.2	23.3-29.4	1277	18.9	17.1-20.8
45-54		204	12.1	10.1-14.4	1105	12.8	11.4-14.4
=>55		76	3.4	2.3-5.0	1894	16.5	14.8-18.4
Total		1630			9221		
Province							
Western Cape		93	8.0	6.2-10.4	841	13.8	12.0-15.9
Eastern Cape		93	8.7	7.1-10.7	770	10.6	8.8-12.8
Northern Cape		71	1.3	1.0-1.8	606	2.2	1.7-2.9
Free State		105	7.5	5.7-9.8	467	4.8	4.0-5.7
Kwa-Zulu Natal		462	17.0	14.1-20.4	2633	16.5	14.3-18.9
North-West		154	9.4	7.9-11.2	597	6.5	5.1-8.4
Gauteng		361	32.6	27.6-38.0	1482	28.2	24.3-32.5
Mpumalanga		184	7.5	6.3-8.9	1170	8.0	6.7-9.5
Limpopo		107	7.9	6.5-9.6	655	9.4	7.7-11.4
Total		1630			9221		
Employment							
Unemployed		802	47.3	43.9-50.6	3959	42.9	40.9-45.0
Employed		796	51.2	47.8-54.5	2805	39.1	37.0-41.3
Student		24	1.3	0.7-2.4	1709	16.6	15.5-17.9
Other		8	0.3	0.1-0.7	114	1.3	1.0-1.7
Total		1630			8587		
Location							

Urban	920	71.1	66.9-75.0	4977	67.5	63.7-71.1
Rural informal (tribal farms	523	23.8	20.3-27.8	2920	24.2	21.1-27.5
Rural (farms)	187	5.1	3.7-6.9	1324	8.3	6.0-11.5
Total	1630			9221		
Education						
Primary	210	10.8	8.8-13.2	1333	18.2	16.6-20.0
Secondary	1224	76.4	73.0-79.4	3675	64.8	62.3-67.2
Tertiary	196	12.8	10.4-15.7	607	17.0	14.5-19.7
Total	1630			5615		
Marital status						
Married	305	21.3	18.3-24.6	2512	31.7	29.7-33.8
Never married	1248	73.4	69.9-76.7	5619	63.6	61.5-65.6
Divorced/separated	58	4.1	2.9-5.6	203	2.5	2.0-3.1
Widower/widow	19	1.2	0.7-2.1	259	2.2	1.9-2.7
Total	1630			8593		

Note: Data from 10851 participants showing complete cases. 95% CI =95% Confidence Intervals

Table SI 6 Comparison of Demographics (Including Income level) and Sexual Risk Behaviours (Excluding Condom use with recent partner) by Self-Reported HIV Status (HIV+, HIV-, Unknown) (N = 10,851)

Characteristic	Overall n(%) N =	Complete cases n(%) **N =864**			Incomplete cases n(%) N =		
Self-report		n	%	95% CI	n	%	95% CI
Age							
15-19		10	0.6	0.3-1.3	1921	13.0	12.0-14.2
20-24		116	7.4	5.6-9.8	1496	13.6	12.4-14.8
25-34		324	43.2	38.3-48.2	2050	26.5	25.0-28.0
35-44		238	30.8	26.2-35.9	1417	19.0	17.4-20.8
45-54		119	12.7	10.0-16.0	1190	12.7	11.4-14.1
=>55		57	5.3	3.4-8.3	1913	15.2	13.6-17.6
Total		864			9987		
Province							
Western Cape		61	10.3	7.6-13.7	873	13.1	11.4-15.6
Eastern Cape		49	8.2	6.4-10.5	814	10.5	8.7-12.6
Northern Cape		41	1.4	1.0-2.0	636	2.1	1.6-2.7
Free State		66	8.1	6.1-10.8	506	5.0	4.1-6.0
Kwa-Zulu Natal		205	14.0	10.9-17.9	2890	16.8	14.6-19.2
North-West		87	9.0	7.4-11.0	664	6.8	5.4-8.5
Gauteng		177	31.4	26.0-37.4	1666	28.7	25.0-32.8
Mpumalanga		115	9.4	7.8-11.4	1239	7.7	6.6-9.1
Limpopo		63	8.1	6.7-9.8	699	9.2	7.6-11.1
Total		864					
Employment							
Unemployed		146	16.5	13.3-20.3	4615	47.0	45.0-49.0
Employed		702	82.3	78.5-85.6	2899	36.7	34.7-38.8
Student		11	0.8	0.4-1.6	1722	15.2	14.1-16.3
Other		5	0.4	0.1-1.3	117	1.2	0.9-1.5
Total		864					
Location							

Urban	487	70.9	66.6-75.3	5410	67.8	64.1-71.3
Rural informal (tribal farms	237	22.1	18.2-26.5	3206	24.3	21.3-27.5
Rural (farms)	140	7.0	5.0-9.8	1371	7.9	5.7-10.8
Total	864			9987		
Income level						
Below R500	51	4.4	3.0-6.3	444	10.7	9.1-12.6
501-1000	56	6.0	4.3-8.5	237	5.6	4.7-6.7
1001-5000	541	62.4	57.2-67.3	2593	54.1	51.2-56.9
5001-10000	126	15.0	11.7-19.0	457	12.3	10.5-14.2
10001-20000	58	8.1	5.6-11.7	272	8.5	6.9-10.4
More than E20000	32	4.1	2.6-6.3	267	8.8	7.3-10.7
Total	864					
Education						
Primary	131	12.4	9.7-15.7	1412	17.0	15.5-18.6
Secondary	610	72.4	67.7-76.7	4289	67.0	64.8-69.2
Tertiary	123	15.2	11.8-19.4	680	16.0	13.8-18.4
Total	864			6381		
Marital status						
Married	210	27.4	23.1-32.3	2607	29.9	28.0-31.8
Never married	601	65.8	60.7-70.6	6266	65.5	63.5-67.4
Divorced/separated	42	5.4	3.6-7.9	219	2.5	2.0-3.1
Widower/widow	11	1.4	0.7-2.8	267	2.5	1.8-2.5
Total	864			9359		

Note: Data from 10851 participants showing complete cases. 95% CI =95% Confidence Intervals

Collinearity assessment

The analyses (**Table 5 -manuscript**) of marital status for partner type shows high odds ratios and very wide 95% confidence intervals. Therefore, to enhance the interpretability and validity of the multivariable model and draw more robust conclusions, collinearity was assessed through separate survey-weighted regression analyses, where age was regressed on marital status and other covariates such as self-reported HIV status, education, employment, and geographic location. This analysis was reciprocated by regressing marital status on age. The important metrics used for diagnosing multicollinearity were R-squared values obtained from each regression and these were then utilized to compute Tolerance ($1 - R^2$) and the Variance Inflation Factor (VIF), which is calculated as 1/Tolerance (28). A high VIF value, specifically greater than 10, suggests the presence of significant collinearity issues among the two variables in the model. They assist in determining how much the variance of an estimated regression coefficient increases due to collinearity with other predictors and clarifies the VIF and its implications in regression analysis.

Collinearity results in **Table 1** indicate that Tolerance for age is 0.60 and the VIF = 1.68, while Tolerance for marital status is 0.90 and the VIF is 1.11. These values indicate low multicollinearity between age and marital status.

Table SI 7 Collinearity results between age and marital status (N = 1625)

Predictor variable	Tolerance	Variance Inflation Factor
Age	0.60	1.68
Marital status	0.90	1.11

Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status.

Chi – squared independent test

The chi- squared independent test was also to assess whether there is a statistically significant association between marital status and partner type (**Table 8**).

Table SI 8 Chi-squared results association between partner type and marital status (N = 1625)

Statistic	**Value**
Chi-Squared ($\chi 2$)	1200
Degrees of freedom	2
p value	<0.001
Significance	Yes ($p<0.05$)

Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status.

Stratified analysis

Stratified analysis by HIV status was also conducted to identify potential differences between marital status and partner type across different types of HIV statuses. This was done to assist in identifying potential confounding or effect modification by HIV status. Stratifying by HIV status allows us to examine how the association between marital status and partner type varies across

different HIV statuses. This can help identify potential confounding or effect modification by HIV status, and results are shown in (**Table 3**).

The analysis reveals a consistent pattern for self-reported HIV-positive and HIV-negative groups, revealing similar trends in the association between marital status and partner type. Men who are never married, divorced/separated, and widowed are more likely to report casual partners compared to married men. The overall direction of the effect remains consistent even though there is a variation of the magnitude of the associations across HIV status groups. The wider confidence intervals in the stratified results (Table 3), specifically for the men who self-reported living with HIV may be due to the smaller sample sizes within these categories/subgroups which leads to estimates that are less precise with increased uncertainty. Though the results show that HIV status seem to influence the magnitude of the association, it does no necessary change the direction of the effect qualitatively.

Table SI 9 Association Between Partner Type, Marital Status, and other Demographics Stratified by Self-Reported HIV Status (HIV+, HIV-) (N = 1,625)

	Overall	Self-reported HIV positive	Self-reported HIV negative
Marital Status			
Married	Reference	Reference	Reference
Never Married	OR: 93.32; 95% CI: 35.96 - 242.24,	OR: 66.20; 95% CI: 22.27 - 196.78,	OR: 131.05; 95% CI: 47.51 - 361.47
Divorced/Separated	OR: 117.54; 95% CI: 33.52 – 412.15	OR: 153.51; 95% CI: 22.98 - 842.25	OR: 135.09; 95% CI: 36.52 – 499.78
Province			
Western Cape	Reference	Reference	Reference
Eastern Cape	OR: 1.27; 95% CI: 0.32 - 5.00,	OR: 38.77; 95% CI: 2.56 – 587.17	OR: 0.51; 95% CI: 0.12 – 2.14
Northern Cape	OR: 0.63; 95% CI: 0.12 – 3.11	OR: 53.84; 95% CI: 3.00 – 966.06	OR: 0.27; 95% CI: 0.05 – 1.33
Free State	OR: 1.38; 95% CI: 1.12 - 2.26, p = 0.010**	OR: 13.70; 95% CI: 0.77 – 243.27,	OR: 0.92; 95% CI: 0.28 – 3.05, p = 0.002**
Kwazulu-Natal	OR: 1.23; 95% CI: 0.40 – 4.76	OR: 23.36; 95% CI: 1.64 – 331.66	OR: 1.44; 95% CI: 0.88 – 2.34
North-West	OR: 1.02; 95% CI: 0.33 – 3.17, p = 0.010**	OR: 14.60; 95% CI: 0.58 – 370.03, p = 0.346	OR: 0.59; 95% CI: 0.19 – 1.90, p = 0.002**
Gauteng	OR: 0.97; 95% CI: 0.30 – 3.16	OR: 11.15; 95% CI: 0.70 – 178.34	OR: 0.58; 95% CI: 0.19 – 1.82
Mpumalanga	OR: 0.77; 95% CI: 0.24-2.49, p = 0.010**	OR: 0.60; 95% CI: 0.20 - 1.75, p = 0.346	OR: 0.50; 95% CI: 0.15 – 1.67, p = 0.002**
Limpopo	OR: 1.60; 95% CI: 0.43 – 5.92	OR:29.65; 95% CI: 1.20 – 731.16	OR: 0.81; 95% CI: 0.19 – 3.37
Employment			
Unemployed	Reference	Reference	Reference
Employed	OR: 0.96; 95% CI: 0.56 – 1.66	OR: 0.58; 95% CI: 0.19 - 1.77	OR: 1.00; 95% CI: 0.52 - 1.93
Student	OR: 10.57; 95% CI: 0.39 – 32.94	-	OR: 10.47; 95% CI: 3.17 – 34.59
Other	OR: 3.27; 95% CI: 0.14 – 74.81	-	OR: 0.57; 95% CI: 0.09-3.72
Age Category			
15-19	Reference	Reference	Reference

20-24	OR: 1.12; 95% CI: 0.17 – 7.27,	-	OR: 1.50; 95% CI: 0.21 – 10.57
25-34	OR: 0.36; 95% CI: 0.06 – 2.17	OR: 4.26; 95% CI: 0.33 – 55.49	OR: 0.38; 95% CI: 0.06 – 02.45
35-44	OR: 0.17; 95% CI: 0.03 – 1.09 p = 0.010**	OR: 1.13; 95% CI: 0.11 – 12.03, p = 0.346	OR: 0.22; 95% CI: 0.03 – 1.68, p = 0.002**
45-54	OR: 0.13; 95% CI: 0.02 – 0.79	OR: 0.83; 95% CI: 0.07 – 9.63	OR: 0.16; 95% CI: 0.01– 0.97
≥55	OR: 0.16; 95% CI: 0.02 – 1.64, p = 0.010**	OR: 5.31; 95% CI: 0.06 – 444.98, p = 0.346	OR: 0.11; 95% CI: 1.23 - 2.61, p = 0.002**
Location			
Urban	Reference	Reference	Reference
Rural (informal)	OR: 0.93; 95% CI: 0.55 – 1.56	OR: 0.43; 95% CI: 0.12 – 1.46	OR: 1.03; 95% CI: 0.56 - 1.88
Rural (farms)	OR: 0.77; 95% CI: 0.43 – 1.36	OR: 0.89; 95% CI: 0.22 – 3.57	OR: 0.69; 95% CI: 0.36 – 1.33
Education			
No/Primary	Reference	Reference	Reference
Secondary	OR: 1.94; 95% CI: 0.99 – 3.80,	OR: 5.53; 95% CI: 1.74 – 17.54	OR: 1.18; 95% CI: 0.52 – 2.70
Tertiary	OR: 2.37; 95% CI: 0.97 – 5.82	OR: 153.51; 95% CI: 27.98 – 842.25	OR: 1.56; 95% CI: 0.58 – 4.21

Note: Data includes 1625 participants excluding the 5 participants with Unknown HIV status. OR = unadjusted odds ratio, 95% CI =95% Confidence Intervals)

Sample size

A small sample size can lead to less precise estimates and wider confidence intervals. This is because a smaller sample is more susceptible to random variation. The sample size for each marital status category can influence the precision of the estimates. Larger sample sizes would provide more reliable results. The substantial difference in sample sizes across categories can influence the statistical power and precision of the estimates. Dominant categories with larger sample sizes, like "Never Married," might have a more significant impact on the overall analysis.

Therefore interpretation for results with high odds ratios and wide confidence intervals will be cautiously done in this study especially those observed in (Table 5 of the manuscript) as they suggest that the estimates are less precise and further research is required to confirm the results. However, our finding do suggest interventions that should be tailored for safer sexual behavioural changes considered for needs and challenges for marital status subgroups particularly men that are never married, separated/divorced and widowed.

Appendix B: Protocol

Introduction

Background

South Africa is amongst the countries with the highest HIV prevalence rates globally, with an estimated 14.75% of its population living with HIV, translating to approximately 8.5 million individuals affected by the virus (1). Men, in particular, have emerged as a key population group at risk due to their elevated rates of engaging in risky sexual behaviours and relatively lower levels of HIV status awareness compared to women (2). Data from 2017 indicated that men were less inclined to undergo HIV testing, with only around 45% getting tested, in contrastto 59% of women (3). Consequently, this lower testing rate results in reduced awareness of HIV status among men, leading to delayed treatment initiation and sustained adherence to HIVtreatment among those living with the virus. Unfortunately, this disparity contributes to a higherlikelihood of men succumbing to AIDS-related morbidity and mortality, including tuberculosis(2). Thus, understanding the intricacies of sexual risk behaviours and HIV status awareness among South African men is essential for tailoring prevention strategies and reduce HIV transmission. The high HIV prevalence in South Africa carries substantial societal, economic,and health implications, and underscores the necessity to investigate and address the underlyingfactors driving HIV transmission.

While four national HIV surveys (4–7) have shown that the epidemic has a more pronounced impact on women than men in South Africa, a substantial body of other research indicates thatmen are less likely to be aware of their HIV status, more prone to engage in multiple sexual partnerships (MSPs) (7,8), and less inclined to access healthcare services compared to women(8)."Risky sexual behaviours, such as inconsistent condom use, having multiple sexual partners,engaging in transactional sex, and substance abuse during sexual encounters, are well- established risk factors for HIV transmission. HIV status awareness, which involves knowing one's own HIV status, is a critical step in HIV prevention and

treatment. Individuals who are aware that they are living with HIV can seek timely healthcare and make informed decisions to reduce transmission risk (9–11). However, many individuals, especially men, remainunaware of their status, highlighting a significant gap in the continuum of care (10,12). Furthermore, a noticeable void exists in the global HIV response, including in South Africa, particularly in terms of the significant disparities in HIV service utilization and coverage for men and boys (12,13). This issue underscores the need for urgent attention and intervention inaddressing the healthcare needs of this population.

The South African National House-based HIV Prevalence, Incidence, and Behaviour Surveys conducted in 2012 and 2017 provide a comprehensive and nationally representative dataset (6,7). These surveys gathered information on various modules, but those that pertain to sexual behaviours, HIV status awareness, and related factors included "Sexual history," "Male circumcision," "Condoms," "HIV testing and risk perception," "Drug and alcohol use," and "Violence in relationships". This dataset serves as a valuable resource for studying the complex relationship between sexual risk behaviours and HIV status awareness among men over time (6,7). This dataset is essential for informing evidence-based interventions and policies aimed at reducing HIV transmission and improving the overall health and well-being of South African men in the context of the HIV/AIDS epidemic.

Given the persistence of the HIV epidemic in South Africa and the specific vulnerabilities of men, research that explores the interplay between sexual risk behaviours and HIV status awareness is critical. This understanding can inform evidence-based strategies to reduce HIV transmission rates, increase awareness of HIV status, and ultimately contribute to the goal of controlling the HIV/AIDS epidemic in South Africa.

1.1 Purpose of the study

The purpose of the study is to assess sexual risk behaviours that are known to be associated withHIV acquisition and transmission among men in South Africa. The findings of the study will provide the South African National Department of Health (NDoH) with much-needed evidenceand a better understanding of key behaviours and associations that could impact the spread of HIV and assist in identifying targeted strategies for HIV prevention, treatment, and care as well as educational initiatives that will promote safer sexual practices within this population.

Literature review

Introduction

HIV/AIDS continues to pose a substantial public health challenge in South Africa, where it maintains one of the highest HIV prevalence rates worldwide (10,14). Among the diverse demographic groups affected, men in South Africa have emerged as a group particularly vulnerable to this epidemic. Consequently, gaining insight into the determinants of HIV transmission, especially among men, holds paramount importance for the development of efficacious prevention and intervention strategies (7). This literature review aims to synthesis the available evidence on the connection between sexual risk behaviours and HIV status awareness among men in South Africa. It is not intended to be an exhaustive review but will provide an overview of this critical issue.

HIV in South Africa

Sub-Saharan Africa bears a disproportionately heavy burden of the global HIV/AIDS epidemic,accounting for only 12% of the world's population but harboring over 70% of the global infection burden, signifying the highest prevalence rates worldwide. Estimates of HIV prevalence at the country level, as derived from both the Global Burden of Disease (GBD) study and UNAIDS, emphasize the marked disparities in HIV rates across sub-Saharan African nations (15). Within this region, South Africa stands out as a country deeply affected by the

HIV/AIDS epidemic. South Africa had an HIV prevalence of 14.75%, equating to a population of 7.5 million individuals living with HIV (14).

The significant HIV prevalence in South Africa results from various factors, and comprehending the drivers behind the HIV epidemic in the country is intricate (16). These factors can be categorized into three groups: distal like poverty, marriage, gender-based violence, education, migration, parental loss due to AIDS, and substance use, proximal including sexual debut age, partner's HIV status and treatment, partner change rate, partner age, circumcision status, and condom use, and transmission-related such as host biology, coexisting infections like HSV2 and HPV, STIs, genital inflammation, and intra-vaginal substance use (16,17). These factors, which contribute to the high HIV prevalence, span a wide spectrum of biological, socio-behavioural, contextual, and structural elements and their combined impact shapes the epidemic (16,18). The primary mode of new HIV infections in South Africa is thought to be heterosexual intercourse, which also includes commercial sex. Notably, approximately 58% sex workers in the country are estimated to have HIV (19). Additionally, HIV transmission occurs through men who have sex with other men, with a significant portion of these infections occurring before the age of 25, particularly among women (3,7). The survey's results highlighted that age-disparate relationships involving young women and older

men play a crucial role in driving the elevated HIV prevalence in the nation, especially amongindividuals aged 15–24 years (3,7).

Also, approximately one-third of women in South Africa are at risk of encountering intimate partner violence, and this risk has risen in recent times, partly due to the repercussions of the COVID-19 pandemic (19). The prevalence of violence against women and girls poses a significant challenge as it can deter women from undergoing HIV testing, initiating and adhering to treatment, and contributes to the spread of the virus. Conversely men exhibit lower utilization of HIV services, which encompasses HIV testing as well as initiating and maintaining antiretroviral treatment, in comparison to women. A pattern that poses a threat to the well-being and lives of both men and their partners (20). Notably, HIV testing rates are diminished among men, individuals from economically disadvantaged backgrounds, and those residing in rural areas. Moreover, HIV-related stigma continues to be a concern, with approximately 17% of individuals holding discriminatory views towards those living with HIV, as indicated by UNAIDS data (1,10). However, it's noteworthy that this percentage is relatively lower in comparison to other nations within the region (10).

Sexual Risk Behaviours

Sexual risk behaviours are behaviours that increase the likelihood of HIV transmission (12,13). Various studies involving men and women who have tested positive for HIV antibodies indicates that a substantial proportion of them continue engaging in sexual behaviours that pose significant risks for both their partners and themselves, increasing the likelihood of transmission of HIV and other sexually transmitted infections (16). Sexual risk behaviours encompass inconsistent condom use, engaging in multiple sexual partnerships, participating in transactional sex, and substance abuse during sexual encounters (10,21). Men, in particular, have been identified as a key population group at risk due to their higher rates of risky sexual behaviours and lower levels of HIV status awareness compared to women. The 2017 National survey revealed that males (25.5%) self-report engaging in multiple sexual partnerships(MSPs),

defined as having more than one sexual partner within the previous 12 months, compared to females (9.0%) (7). Additionally, a substantial proportion of the population (75.2%) reported having undergone HIV testing at some point, with a slightly higher percentage of females (79.3%) having done so compared to males (70.9%) (7). Research has shown that men who engage in these risky behaviours are at a higher risk of contracting and transmitting HIV (12). Understanding the dynamics of sexual risk behaviours and HIV status awareness among South African men is essential to tailor prevention strategies and reduce HIVtransmission.

A study by Kalichman et al. (22) conducted in Cape Town, South Africa, revealed a high incidence of rapid partner turnover among men with multiple recent sexual partners. These findings highlight men's vulnerability to HIV infection, with men more likely to engage in multiple partnerships, less likely to undergo HIV testing, and less likely to have a positive HIV test result (22). This behaviuor were associated with factors such as, employment status, age, education, and perceptions of friends' sexual behaviours, emphasizing the importance of targeted interventions (22). Moreover, in a 2017 South African study by Huerga et al. in KwaZulu Natal (23), men displayed higher levels of risky sexual behaviour. Unawareness of HIV status and high viral loads were also more common in men (23). These findings emphasize the need for targeted interventions to address men's proclivity for engaging in risky sexual behaviours, which have substantial implications for HIV prevention and testing initiatives.

HIV Status Awareness and viral suppression

HIV status awareness refers to an individual's knowledge of their own HIV status. Sexual transmission of HIV can originate from two distinct groups: individuals living with HIV who are unaware of their infection and those who are aware of their HIV-positive status (13). According to the 2017 National survey, 75.2% of the population reported having undergone HIV testing, with a higher testing rate observed among females (79.3%) compared to males (70.9%) (3). This overall testing rate was particularly elevated among females aged 25 years and older (66.9%), as well as among black Africans (65.4%) and individuals of mixed race (coloureds) (61.7%) (7). Limited information is available regarding the comparative distinctions between these two groups in South Africa in terms of the risk they pose to uninfected sexual partners for HIV transmission. Awareness of one's HIV status is a critical step in HIV prevention and treatment. Individuals who are aware of their HIV-positive status can access appropriate care and treatment, reduce risky behaviours, and take measures to prevent HIV transmission to others (10). Conversely, individuals who are unaware of their status may unknowingly transmit the virus to sexual partners.

In addition, the study conducted by Huerga et al. in 2013 demonstrated that lack of HIV awareness was linked to multiple sexual partners (aOR: 2.1), and inconsistent condom use was more common among those with multiple partners (aOR: 16.6) and those unaware of their HIV status (aOR: 3.7) (23). This highlights the risk of HIV transmission associated with high-risk sexual behaviour and HIV unawareness among men.

Moreover, the success of the Treatment as Prevention (TasP) strategy is contingent upon a range of elements, including individuals' inclination to undergo testing and commence treatment, as well as considerations related to viral load and sexual behaviour (24). Huerga et al's study found that lack of awareness regarding one's HIV-positive status was found to be closely linked to specific factors, even after accounting for age and sex. Individuals who reported having multiple sexual partners within the past year and had a high viral load were

more likely to be unaware of their HIV-positive status. Among those who indicated having more than one sexual partner, a significant 45.5% were unaware of their HIV status, in contrast to 22.1% among individuals with fewer partners ($p < 0.001$) (24). A compelling requirement exists to direct HIV prevention efforts, encompassing initiatives such as HIV testing campaigns and treatment programs, toward specific target populations.

Perceptions and Knowledge on HIV

Perceptions and knowledge regarding HIV are essential determinants of HIV status awareness.The link between the perception of the risk of contracting HIV and one's sexual behaviour remains relatively unclear, even though recognizing this risk is commonly regarded as the initial step toward transitioning from risky behaviours to safer practices (25). Studies have suggested that misconceptions, stigma, and misinformation continue to hinder efforts to increase awareness. In South Africa, there have been varying results regarding knowledge about HIV(26,27). The 2008 survey revealed a significant decrease in accurate knowledge about HIV transmission and prevention across age groups compared to previous 2005 survey (4,5). Additionally, awareness of other HIV risk-reduction measures like faithfulness, partner reduction, and abstinence was reported as relatively low (5).

In South Africa, HIV prevention programs comprise three main categories: behavioural interventions emphasizing informed sexual decision-making, including condom use and addressing risky behaviours; biomedical interventions like Prevention of Mother-to-Child Transmission (PMTCT) and Pre-Exposure Prophylaxis (PrEP) for high-risk individuals; and structural interventions that tackle social, economic, and environmental factors contributing to HIV vulnerability. Central to these efforts is the promotion of awareness and knowledge about HIV transmission, condom use, and risky behaviours, empowering individuals to make informed choices and practice safer sex. Furthermore, structural interventions often encompass awareness campaigns addressing HIV-related stigma, discrimination, or gender-based violence, with the aim of fostering a safer environment for all.

In the 2017 survey, there was a slight improvement in knowledge regarding sexual transmissionand HIV prevention, with 36.3% of respondents rejecting misconceptions about HIV transmission (7). This marks an improvement compared to the decline observed in 2012, whereonly 26.8% did so (6). However, these figures still indicate a relatively low level of knowledge among the population. It's worth noting that previous surveys have examined knowledge about HIV transmission and prevention but did not specifically explore how knowledge impacts the relationship between sexual risk behaviours and HIV status awareness among men, which the current study aims to address.

Despite some progress due to public education campaigns by the South African government, challenges remain. A study conducted by Shamu and colleagues (28) focused on the Nkangalaand OR Tambo districts identified a notable gap in HIV prevention knowledge, with only 44.7% of participants demonstrating adequate knowledge (28). Disparities in knowledge were observed across districts and genders, revealing that women generally possessed less knowledge compared to men, with the most significant difference found in the OR Tambo district (28). The prevalent rural character and high poverty rates among the surveyed participants may account for the limited HIV knowledge observed. Various studies have previously established a correlation between HIV knowledge, infection rates, and socioeconomic status, underscoring the impact of poverty and underdevelopment on these outcomes (25,26). The lower knowledge levels in the OR Tambo district could be attributed to the predominantly rural environment of the surveyed clusters (28). Therefore, ongoing research should continue to monitor these perceptions to inform educational strategies.

Socioeconomic Status

Elevated rates of HIV infection are closely linked to impoverished socioeconomic conditions,heightening susceptibility to risky sexual behaviours, including transactional sex and age- disparate relationships (18). This vulnerability persists even when individuals possess knowledge of HIV prevention, as the practical application of this knowledge is often hindered

by the economic and social disadvantages prevalent among youth in impoverished nations. Among young populations, engaging in risky sexual behaviour remains a significant risk factor for HIV (29). Notably, relative economic disadvantage has been found to substantially increase the likelihood of participating in various unsafe sexual activities.

These disparities are glaringly evident in the data, consistently showing higher prevalence ratesamong females (17.7%) than males (12.8%). This trend continued in subsequent surveys: 2005(females 13.3%, males 8.2%), 2008 (females 17.3%, males 11.6%), 2012 (females 14.4%, males 9.9%),(20) and 2017 (females 17.3%, males 10.6%) (3), further underscoring the disproportionate impact of HIV on women in the country.

Moreover, low socioeconomic status doesn't solely increase the likelihood of engaging in riskysexual behaviours for both males and females. Pillay et al.'s study among university students inKwaZulu-Natal, South Africa, revealed a strong connection between socioeconomic status andHIV infection. Food insecurity was associated with a higher likelihood of participating in riskysexual behaviours, while accessing government education financing and sharing it with family members increased the risk of HIV infection among participants. This highlights the critical role of socioeconomic factors in shaping both risky behaviours and HIV prevalence in the region(30).

Nkosi et al.'s research in 2020 suggests that economic empowerment programs may offer a potential solution to address these challenges (31). To tackle the high HIV rates among adolescent girls and young women in southern and eastern Africa, including South Africa, the Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe (DREAMS) program was introduced. It aimed to achieve a 40% reduction in HIV incidence from 2016 to 2018 through youth-friendly reproductive health care, community mobilization, and various interventions, including HIV testing, treatment, and social support. However, it's worth noting that the program primarily targets girls and women, potentially leaving a gap in HIV prevention efforts

for men (17). Further research is needed to gain a deeper understanding of the intricate relationship between socioeconomic factors and HIV transmission.

Access to Healthcare and Testing Services

Access to healthcare and testing services greatly influences how individuals perceive their HIVstatus and engage in sexual risk behaviours. Individuals who can easily access HIV testing are more likely to be aware of their status, influencing their sexual behaviours (32). Those aware ofbeing HIV-positive tend to practice safer sex to protect their partners. Conversely, those unaware of their status might engage in riskier behaviours. Regular healthcare access raises overall HIV awareness, promoting safer sexual practices. Conversely, limited access, due to stigma or lack of facilities, hinders awareness and may lead to higher-risk behaviours (33).

In South Africa, prior data revealed a substantial gender gap in the utilization of voluntary counseling and testing (VCT) services for HIV/AIDS, with men significantly less inclined to access them compared to women (8). A nationwide investigation of VCT services, reported a merely 21% of the total clients receiving VCT were men. A comprehensive study conducted in Soweto, involving over 2,500 individuals, highlighted this gender disparity, revealing that only 29% of men sought HIV testing services compared to 54% percent of women (34). Nonetheless, the 2017 National survey showcased enhancements in HIV testing rates among males, with their testing rates (66.2%) nearly aligning with those of females (67.3%). The nation has indeed achieved notable progress in broadening access to HIV testing services (HTSs) as documented by Johnson et al (2017) (35,36). However, it’s noteworthy the 2017 survey showed stable HIV testing rates compared to 2012. Gender-specific data revealed a similar percentage of males getting tested, with 25% of South African males not using HIV testing services (HTS), leaving only 75% tested. This emphasizes the need for the National Department of Health to review and innovate HTS delivery models for this underserved population (7).

The consistently moderate HIV testing rates can be partly attributed to ongoing HTS campaignsby SANAC and NDoH since 2010. Although there hasn't been a significant increase

in testingrates between 2012 and 2017 (7), Johnson et al.'s 2015 analysis, based on 2012 data, suggested that maintaining these rates could help South Africa achieve its goal of diagnosing 90% of adults with HIV by 2020 (37), though the country is falling short of the 95-95-95 targets (14). Chimbindi et al.'s 2017 research highlighted the need to expand testing and treatment access, especially in rural areas, to enhance awareness and reduce risky behaviours (38). Despite youngwomen having the highest HIV incidence, the reluctance of young men to get tested poses a challenge in reaching the first 95 goal of UNAIDS' 95-95-95 targets in South Africa. Thus, interventions targeting young adult communities are vital to bolster HIV prevention, testing, and treatment efforts.

Impact of Intervention Programs

HIV prevention programs in South Africa utilize a comprehensive approach that combines biomedical, behavioural, and structural strategies to combat HIV transmission. Biomedical interventions, like Prevention of Mother-to-Child Transmission (PMTCT), target clinicalmethods to reduce transmission risks. Behavioural interventions focus on promoting safe sexual practices and condom use, while structural interventions address broader social, economic, andhealthcare factors contributing to vulnerability. This multifaceted approach is essential for effective HIV prevention (19,39). South Africa's efforts in HIV prevention have increasingly emphasized specific interventions aimed at heightening awareness of one's HIV status, a strategy known as the Serostatus Approach to Fighting the Epidemic (SAFE). Concurrently, there has been a concerted drive to expand antiretroviral (ART) coverage through Treatment as Prevention (TasP)(24).

Despite facing challenges, South Africa's HIV testing program has achieved substantial progress, conducting an estimated 9.5 million tests each year. Notably, 76% of individuals diagnosed as HIV-positive are now aware of their condition, with a national target set to elevate this awareness to 90% by 2020 (24). TasP has demonstrated remarkable effectiveness in reducing the risk of HIV transmission within couples, and population-level studies have shown

its potential to curtail HIV incidence. Furthermore, several modeling studies have gone a step further, suggesting that the widespread implementation of TasP could ultimately result in the elimination of HIV transmission in South Africa (24).

Johnson et al. (2022) conducted a study building upon previous modeling research, utilizing the Thembisa model, an integrated HIV and demographic model tailored for South Africa, to estimate HIV incidence trends from 2000 to 2019 (39). The model categorized the adult population into two primary risk groups: "high-risk" individuals, characterized by concurrent partnerships and/or engagement in commercial sex, and "low-risk" individuals primarilyengaged in serial monogamous relationships without commercial sex involvement. The modelwas also validated against HIV incidence estimates from national surveys. While the model estimates of HIV incidence in adults aged 15–49 years were mostly consistent with survey estimates, the estimate for 2016–2017 was 1.01% (95% CI: 0.91% to 1.13%), higher than the corresponding survey estimate of 0.79% (95% CI: 0.67% to 0.91%) (39).

These findings from the Thembisa model revealed substantial progress in reducing HIV incidence in South Africa over the past two decades. While the 47% decline in HIV incidence from 2010 to 2019 falls short of the UNAIDS 75% reduction target for the same period, it closely aligns with the 43% regional average reduction and exceeds the global average reduction of 31% from 2010 to 2020 (39). The incidence-to-prevalence ratio of 0.032 in 2019 also approaches the UNAIDS-defined threshold of 0.03, indicating a potential transition in the epidemic. These results highlight condom promotion and antiretroviral therapy (ART) as primary drivers of HIV incidence reduction in South Africa, with additional contributions from increased HIV testing and voluntary medical male circumcision (VMMC) programs. Remarkably, these reductions were more pronounced in men, primarily due to the significant impact of VMMC and ART interventions in this demographic (39).

In recent years, South Africa has made significant strides in HIV testing, successfully

achievingthe 2020 target of ensuring that 90% of individuals living with HIV were aware of their status by 2018 (14). Nevertheless, the country grapples with challenges related to expanding access to HIV treatment, primarily stemming from an overwhelming demand for treatment services that surpasses that of any other nation globally. While the Thembisa model unveiled more substantial reductions in HIV incidence among men, the 2017 National survey underscores thenecessity for heightened focus on interventions, particularly tailored to males. This encompasses initiatives targeting men across all age groups, with special attention to male youths aged 15–24 years, men residing in rural areas, and those in specific provinces such as the Western Cape, Eastern Cape, Northern Cape, Limpopo, and North West. Moreover, specific districts, including Gert Sibande and Ehlanzeni in Mpumalanga, as well as Uthukela and Uthungulu in KwaZulu-Natal, call for more effective, male-tailored interventions (7).

Conclusion

The intricate interplay between HIV status awareness, sexual risk behaviours, and associated factors in South African men remains a significant concern. Despite advancements, obstacles such as restricted healthcare access, misconceptions, and socioeconomic inequalities endure. While the South African National House-based HIV Prevalence, Incidence, and Behaviour surveys (2012 and 2017) primarily aim to assess the prevalence and trends of sexual risk behaviours like multiple sexual partnerships and inconsistent condom use, it does not specifically explore the link between these behaviours and HIV status awareness among men in South Africa—a gap this study aims to fill. Understanding the factors contributing to HIV transmission, especially among men, is imperative for the development of tailored prevention and intervention strategies and educational initiatives that can effectively address these obstacles.

Study aim and objectives

Study aim

The overall aim of this study is to investigate the HIV prevalence, and drivers of sexual

risk behaviour among men aged 15 and older in South Africa during the years 2012 and 2017 usingdata from South African National house-based HIV Prevalence, Incidence and Behaviour surveys. This includes examining variations in sexual behaviours across different regions and demographic groups within the population, as well as differences by age group. We will compare self-reported HIV status to laboratory-confirmed HIV status and examine the relationship between self-reported HIV status and sexual risk behaviours among men living in South Africa. We will also explore whether associations are influenced by age group.

Study objectives

The main objectives of the study are:

1. To estimate the prevalence of different sexual risk behaviours among men 15 years andolder living in South Africa for the years 2012 and 2017.To examine differences in sexual risk behaviour across diverse regions and demographic groups within the population among men living in South Africa.
2. To compare self-reported and laboratory confirmed HIV status among men 15 years and older living in South Africa for the years 2012 and 2017
3. To examine the relationship between HIV status awareness and sexual risk behaviour among men residing in South Africa aged 15 years and above for 2012 and 2017, and explore modification of these relationships by age group.

Hypothesis

The study hypothesizes that men reporting risky sexual behaviour are less likely to know that they are living with HIV.

Research questions

4. What is the prevalence of sexual risk behaviour among men 15 year and older living inSouth Africa for the years 2012 and 2017?
5. How does the prevalence of sexual behaviours in men living in South Africa varyacross different regions and demographic groups?
6. What are the differences between individual's self-reported HIV status and laboratory

confirmed HIV status among men 15 years and older living in South Africa for the year 2012 and 2017?

7. What is the relationship between HIV status awareness and sexual risk behaviour among men residing in South Africa aged 15 years and above for 2012 and 2017, and is this relationship modified by age?

Methodology

Study design

To answer the specific objectives, the proposed research study will take the form of secondarydata analysis using data from the 2012 and 2017 South African National house-based HIV Prevalence, Incidence and Behaviour surveys (SABSSM surveys). The details of the methodology for these surveys have been described in detail but relevant details for this proposed analysis are included here (6,7).

Background to the SABSSMV surveys

The main aims of the South African National HIV Prevalence, Incidence, Behaviour and Communication Survey (SABSSM) are to maintain surveillance of HIV infection and behaviour in South Africa, and to obtain a better understanding of factors driving the HIV epidemic, the collection data to evaluate the South African National HIV, AIDS and STI Strategic Plan for 2012–2016(the 5th SABSSM series) and to collect data to monitor the HIV indicators required for preparing the country reports to submit to various international bodies. Validated surveys are conducted by HSRC and methods are consistently maintained across the different survey waves allowing the comparison of temporal trends (7). The methodology of these surveys includes use of a household questionnaire and three age-appropriate individual questionnaires (for children 0-11 years, adolescents 12- 15 years and adults 15 years and older) and collection of dried blood spot specimens for HIV related biomarker testing. The adolescent and adult questionnaires solicit information on key HIV behavioural indicators and include modules on consistency of condom use, HIV status awareness, multiple sexual partners,

perception of risk of HIV infection, attitude related to people living with HIV (PLHIV), HIV transmission and prevention knowledge, alcohol and substance use, and general health-related characteristics. In addition, the 2017 survey added new modules about tuberculosis (TB), exposure to various HIV communication campaigns and intimate partner violence (IPV). The IPV module was administered to only one eligible randomly selected respondent per household, who was aged 15 years and older.

Dried blood spot (DBS) samples are collected from eligible respondents after consenting to take part in the survey. The DBS are collected by figure-prick, or heel-prick in infants, and thesamples are anonymously linked for HIV testing in accredited laboratories of collaboration institutes. In the current study, the analysis will focus on sexual risk behaviour profiles among men 15 years and older living in South Africa, categorized based on their HIV status (positive, HIV negative, and unknown)

Study population

While previous surveys randomly sampled a maximum of 3 (2002 and 2005) (4), and 4 (2008) (5) household members from each household, a more robust and comprehensive approach wasused in 2012 and 2017 that included every household member in the survey (6,7).

For both surveys, 38 431(2012) (6) and 36 609 (2017) (7) eligible individuals participated in the survey, among them, 11 603 and 10 603 males responded to HIV risk associated questionnaires for 2012 and 2017 surveys, respectively (6,7).

Inclusion criteria for the proposed study

• All men who were 15 years and older who participated in the 2012 and 2017 South African National HIV Prevalence, Incidence and Behaviour Survey, (SABSSM surveys);

Exclusion criteria

The SABSSM survey excluded people staying in educational institutions, old-age homes, hospitals, and uniformed-service barracks or prisons. The exclusion criteria were based on whether people were able to provide clear consent according to their understanding and comprehension of the consent process and the information provided.

Therefore, the following participants will be excluded from this analysis:

• All men less than 15 years who participated in the different SABSSM surveys including 2012 and 2017.

• Women of all ages who participated different SABSSM surveys including 2012 and 2017;

Men reporting no sexual partners in the past 12 months will be excluded.

Sampling

The two surveys (2012 and 2017) employed a multistage, stratified cluster sampling approachdescribed elsewhere in detail (3,6,7). However, the 2017 survey sampling method differed from the previous surveys because it used small area layers (SAL) as primary sampling units (PSU) instead of the enumeration areas (EAs) (7). The steps are described in Figure 1. The 2017 used a cluster sampling complex stratified cluster randomized cross-sectional design to stratify sample by province and geo-type. The geo-type involved classifying geographical areasaccording to the Statistics South Africa which included categorizing the sample into urban formal, urban informal, rural formal and rural informal (i.e. squatter camps, farms, traditional tribal areas and rural villages), however, the former approach in the other surveys including 2012 survey of classifying urban areas into various categories was simplified into a single "urban" category in 2017 survey (7). A stratified master sample of 1000 SAL was randomly selected from a national sampling frame based on probability proportional to size. The number of households or visiting points (VPs) within each SAL determined its size (7). For this survey,a systematic probability sample of 15 households was selected within each SAL, and for both surveys, every household member was eligible to participate (6,7).

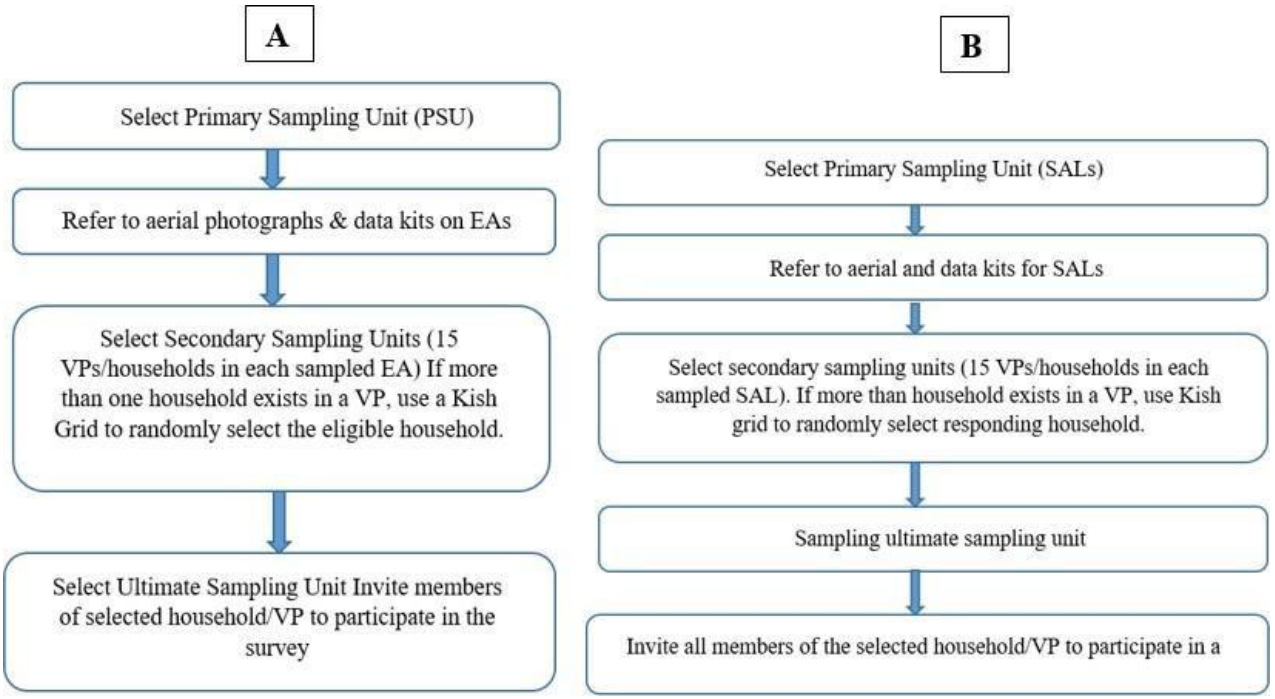

Figure S 1 Steps in drawing the samples in the field for A. (2012) and B. (2017) surveys (6,7)

Procedures and Data collection methods

Fieldworkers and supervisors of the surveys underwent effective training in three separate 13-day sessions facilitated by HSRC researchers (6,7). Training sessions focusing on educating participants about the proper collection of DBS specimens were conducted with the collaboration of personnel from the Global Clinical and Viral Laboratory, the South African Medical Research Council (SAMRC), and the National Institute for Communicable Diseases, along with HSRC trainers. Every eligible individual who took part in the two distinct surveys (conducted in 2012 and 2017) provided individual consent prior to their participation (6,7). This consent was obtained before the administration of questionnaires or the collection of blood samples. Interviewers conducted face-to-face interviews with those eligible after consenting.

The two surveys used age-appropriate questionnaires to solicit information on socio demographic characteristics, sexual practices and behaviour, knowledge, attitudes, and perceptions, testing for tuberculosis and HIV, exposure to HIV media campaigns, alcohol and substance use, and general health-related characteristics. Details on the questions included in

this proposed study are described in section 4.5.1 on study key variables measurements. Interview data were entered directly into tablet computers (Mirus Innovations, Mississauga, Ontario, Canada) (7). DBS specimens were collected by finger prick from consenting respondents. Spots from each respondent were collected onto barcoded Whatman cards. These DBS specimens were tested to determine HIV sero-status, HIV incidence, exposure to antiretroviral (ARV) drugs, viral load, and HIV drug resistance (elaborated in more detail in other sources (6,7).

Questionnaire data collection

All variables that will be included in this analysis, are variables collected from specific sectionsof the 2012 and 2017 SABSSM survey data derived from specific sections of the survey questionnaires. These will include information on socio demographic characteristics (age, sex, gender, marital status, employment status, income status, and education), sexual practices and behaviour, knowledge, attitudes, and perceptions, HIV counselling and testing. The sexual practices and behaviour questions in the SABSSM survey are divided into two different categories, comprising sexual history of the respondent, and their partner(s) and partner characteristics. Knowledge and perceptions questions relating to HIV/AIDS including transmission, prevention, treatment, stigma, general questions on HIV/AIDS policies etc. HIV counselling and testing questions involve knowledge on nearby testing sites, and HIV testing and counselling, uptake and history of antiretroviral treatment.

Laboratory methods

DBS samples were tested at multiple facilities, including Global Clinical & Viral Laboratories, the National Institute for Communicable Diseases, and the Pharmacology Laboratory at the University of Cape Town. Three enzyme immunoassays (EIAs) were used to determine HIV status:-two fourth-generation HIV-1 (enzyme immunoassays) EIAs, Roche Elecys HIV Ag/Abassay (EIA 1) (Roche Diagnostics, Mannheim, Germany) and Genescreen Ultra HIV Ag/Ab assay (EIA 2) (Bio-Rad Laboratories, Hercules, CA, USA) and all HIV-positive samples weresubjected to a nucleic acid amplification test (COBAS AmpliPrep/Cobas

Taqman HIV-1 Qualitative Test, v2.0, Roche Molecular Systems, Branchburg, NJ, USA) to confirm HIV status. Testing for exposure to antiretroviral drugs (ARVs) was performed by means of High-Performance Liquid Chromatography (HPLC) coupled with Tandem Mass Spectrometry for Nevirapine, Efavirenz, Lopinavir, Atazanavir, and Darunavir. Viral load measurements were conducted using the Abbott platform (Abbott m2000 HIV Real-Time System, Abbott Molecular Inc., Des Plaines, IL, USA) (7).

Key variables in the proposed study

The proposed study will focus its analysis on the assessment of sexual risk behaviour profiles categorized based on self-reported HIV status (positive, HIV negative, and unknown) among male living in South Africa who are 15 years and older who participated in the two surveys conducted in 2012 and 2017.

Study Variable Measurements

Dependent variables: Sexual risk behaviour (e.g., condom use, alcohol consumption. and number of sexual partners in the last 12 months, and sexual partner type) to identify subpopulations that are at highest risk of acquiring and transmitting HIV infection categorized by their self-reported HIV status (positive, negative, and unknown).

Independent variables

Socio-demographic variables (age, sex, gender, marital status, employment status, income status, education, and geographic locations), HIV status (self-reported and laboratory confirmed), knowledge and perception, access to health services, VL suppression, and antiretroviral treatment in blood will be evaluated.

Sexual risk behaviour: The following key sexual behaviuors will be assessed based on participant's self-reported sexual activity.

- Mutliple sexual partners in the last 12 months regardless of the type of partner (1partner vs 2 or more partners)

- For participants who have reported having at least 1 or more sexual partners, this Nature of partnership (consistent partner (married/cohabiting/girlfriend/boyfriend) or casual partner (occasional partner or someone whom you paid for concurrency of sexual partners).
- Condom use with most recent partner: yes or no“yes response” for condom use will be considered if the affirmative answer is provided for the last recent sexual encounterwith all sexual partners in the last 3 months, and no if otherwise stated.
- Consistent condom use: if participants reported the use of condoms during their last sexual encounter with all partners in the past year, considering it inconsistent if this criterion was not met.
- Age of sexual debut: Participants were asked about their age at the time of their initial sexual experience, with the question framed as follows: " How old were you when you had sex for the first time?" (Provide specific years of sexual debut). For this analysis, age will be categorized into (15 years or less, 16-19, 20-34, 35-59 and >60)
- Alcohol consumption before at last sex: (alcohol use, yes/no), we will consider alcohol use before sex as yes if participant declares having consumed alcohol before sex in the last sexual encounter, and no if they have not.

Self-reported HIV status: A self-reported HIV status will be established by examining participant answers to two questions: **“**Have you ever had an HIV test?” (yes/no)" and "What was the result of that HIV test? (Positive/negative/unknown)." Subsequently, participants will be grouped into three self-reported HIV status categories: (1) Individuals who reported having a positive HIV test result, (2) Individuals who reported having a negative HIV test result, and (3) Individuals who reported either never having an HIV test or having an unknown test result. The analysis will involve the differentiation between participants who self-reported as HIV-positive and those who self-reported as HIV-negative or having an unknown status. Individuals

who received a positive result on the rapid HIV test or opted for anonymous HIV testing were interviewed regarding their antiretroviral treatment status. For men who had detectable antiretroviral drugs in their bloodstream, they would be categorized as having awareness of their HIV status, irrespective of their self-reported knowledge.

Laboratory confirmed HIV status: The SABSSM surveys established HIV lab confirmatoryresults via confirmatory HIV enzyme-linked immunosorbent assays, employing standardlaboratory procedures on the prepared DBS (6). Laboratory-confirmed HIV status will be compared with self-reported data, to further evaluate the recognition of a positive HIV status among participants who were confirmed as HIV-positive.

Other variables:

Sociodemographic factors: Key sociodemographic factors including age, sex, gender, maritalstatus, employment status, income status, education and location/geographic areas will be examined to determine relationships between sexual risk behaviour and demographic factors across diverse regions and demographic groups.

Knowledge and perceptions questions relating to HIV/AIDS: transmission, prevention, treatment, stigma, general questions on HIV/AIDS policies will be assessed using questions having “Yes”, “No” and “I don’t know” responses. For knowledge and perception scores, the most appropriate practice will be given a score of 2 and the least appropriate practice will be given a 0. Participants’ total practice scores will be graded out of the total possible score. A

rate score of 0-50% will recommended as poor, 51-75% reported as good and 76-100% reported as excellent.

HIV risk perception: To evaluate the perceptions of participants towards HIV/AIDS, questions will be related to personal risk for HIV infection will be assessed. The answering scoring system is in the form of yes, no, and I don't know. Correct answers will allocate 3 points, while incorrect questions are allocated 1 point. A "I don't know" answer is allocated 2 points. A composite score of the risk perception will be computed to measure the risk perception level of participants towards HIV and HIV risk perception, categorized into(yes/no). A rate score of 0-50% will recommended as "no", 51-100% reported as "yes".

Access to HIV testing: HIV counselling and testing questions involving access to nearby testing sites, and HIV testing and counselling services, HIV treatment and care having (yes/no) responses.

Virally suppression: Laboratory viral load results will be included for all men living with HIV. All individuals having a viral load of >1000 copies/ml will be classified as virally unsuppressed and those having <1000 copies/ml as suppressed. For the 2012 survey, this will only apply to men who underwent the Recent Infection Testing Algorithm (RITA).

Presence of ARVs: Participants who tested positive on the rapid HIV test or chose anonymousHIV testing were tested for antiretroviral drugs in the blood. Men with antiretroviral drugs in their blood will be considered being aware of their HIV status, regardless of their self-reportedawareness.

Table S 1 List of variables and categories

Variable	Categories and description	Data type
Sexual risk behaviour variables		
Sexual partner type	Consistent Casual	Categorical: nominal
Number of sexual partners in the last 12 months	1 partner 2 or more partners	Categorical: ordinal
Condom use with most recent partner	Yes No	Categorical: binary
Consistent condom use	Yes No	Categorical: binary
Alcohol use	Yes No	Categorical: binary
Age of sexual debut	=<15 15-19 20-34 35-59 >60	Categorical: ordinal
Sociodemographic		
Age	15-19 20-34 35-59	Categorical: ordinal

	>60	
Province	Western Cape Eastern Cape Free State Gauteng Kwa-Zulu Natal Limpopo Mpumalanga Northern Cape North-west	Categorical: nominal
Geographical location	Urban , Rural formal Rural informal	Categorical: nominal
Race/Ethnicity group	Black Colored Indian/White	Categorical: nominal
Income level	≤1000 1001-5000 5001-10000 10001-15000 ≥15000	Categorical: ordinal
Education	Tertiary Secondary Primary	Categorical: ordinal
Employment status	Employed Unemployed Student Other	Categorical: nominal
Marriage status	Married Never Married Cohabiting Divorced/separated widowed	Categorical: nominal
HIV status		
Self-reported	HIV+ HIV- Unkown	Categorical: nominal
Laboratory confirmed	HIV+ HIV- Unkown	Categorical: nominal
Other variables		
Knowledge of HIV/AIDS	Poor (0-50%) Good (51-75%) Excellent (76-100%)	Categorical: ordinal
HIV risk perception	Yes (0-50%) No (51-100%)	Categorical: binary/ordinal

VL Suppression	Suppressed (<1000 copies/mL) Not suppressed (>= 1000 copies/mL)	Categorical: ordinal
Presence of ARVs	Yes No	Categorical: binary

Data analysis

All statistical analysis will be adjusted for clustering by using survey weights to account for the complex survey design and ensure that our findings provide accurate population-level estimates. Continuous variables will be described as means (standard deviation) or median (interquartile range), while categorical variables will be presented as frequencies and percentages and will be presented with 95% confidence intervals (CI).

To achieve objective 1, descriptive statistics will be used to calculate frequencies and proportions for sexual risk behaviour variables, (condom use, alcohol consumption. and number of sexual partners in the last 12 months, and sexual partner type) for the surveys (2012 and 2017) categorized by self-reported HIV status (positive, negative, and unknown). The Chi-square test will be used compare sexual risk behaviour prevalence for 2012 and 2017 and determine any statistically significant differences.

To achieve objective 2, descriptive statistics for each region and demographic group will be used to calculate means, medians, standard deviations, and frequency distributions. These statistics will provide a summary of sexual risk behaviour within each group.

To obtain objective 3, descriptive statistics will be conducted to calculate frequencies and proportions of men who self –reported to be HIV status compared to the laboratory confirmed HIV statuses.

Lastly, to obtain objective 4, five multivariable log binomial regression models will be

built toexamine factors associated with each binary outcome sexual risk behaviour variable, (e.g., condom use, alcohol consumption. number of sexual partners in the last 12 months, and sexualpartner type, and age of sexual debut). Separate analyses will be performed for self-reported HIV status (positive, negative, and unknown). The models will include sociodemographic factors (e.g., age, sex, marital status, employment status, income status, education, andlocation/geographic area, HIV status; laboratory confirmed, knowledge: rate score of 0-50% recommended as poor, 51-75% reported as good and 76-100% reported as excellent and HIV risk perception; with a rate score of 0-50% recommended as "no", 51-100% reported as "yes", access to health services; with categories (yes/no) and VL suppression; < 1000 copies/Ml defined as virally supressed, and >=1000 copies/mL as virally unsuppressed). The analysis willbe done for both 2012 and 2017 survey data and the changes in sexual risk behaviour prevalencebetween the two years will be assessed. The Wald test will be used as a criterion to remove variables from the model using the backward stepwise method, but HIV status and age will beincluded in the final model as an a priori decision with variables $p<0.05$. Interaction analysis will be performed to assess if the relationship between indicators of sexual behaviour and HIVstatus awareness differs by age group.

Interaction analysis will be performed to assess if the relationship between indicators of sexual behaviour and HIV status awareness differ by age group. The analysis will be done for both 2012 and 2017 survey data and the changes in sexual risk behaviour prevalence between the two years will be assessed. The prevalence ratio at 95% CI will be computed to show the strength of the association between the outcome and the independent variables. Characteristics associated in univariate analyses associated with sexual risk behaviour at a significance level of 5% ($p<.05$) will be considered to indicate a statistically significant association between the independent and dependent variables and entered into multiple logistic regression. Data will be analysed using R version 1.2 (R Foundation for Statistical Computing, Austria) (40).

Data Management

Data obtained from the SABSSM surveys study will be accessed through the HSRC Researchdata service managed using established standard operating procedures that have been in previous studies (6,7). All electronic records will be stored in firewall-protected UCT servers and will be shared with the investigator of this proposed study. All encrypted data will be accessible only to necessary project investigators. Soft copies will be kept in a single file on a laptop and protected by an encrypted password that will be known by the PI only. In addition, the researcher has signed a data confidentiality form to assure confidentiality of all HSRC research data.

Ethical considerations

Ethical approval for this study will be sought from the University of Cape Town, School of Family Medicine and Public Health, the Health Sciences Human Research Ethics committee While Ethical approval of the parent 2012 and 2017 survey protocols was granted by the HSRC Research Ethics Committee (REC: 4/18/11/15), the CDC Division of Global HIV and TB (DGHT) and CDC's Center for Global Health (CGH). The purposes study using anonymized data from these surveys and there will be no additional contact with participants or additional data collected.

Informed consent in the parent survey

The ethical principles of voluntary participation and protecting the participants from harm areformalized in the concept of 'informed consent (Brink, et al 2007). The survey adhered to international ethical standards and complied with the South African Children's Act of 2007. Fieldwork staff were employed by the HSRC and trained in research ethics and how to implement informed-consent procedures, to ensure that voluntary informed consent was obtained for all respondents before the interviews. Written or verbal consent or assent was obtained from every person who participated, in line with the survey protocol.

Anonymity

Anonymity means that subject's identity cannot be linked, even by the researcher, with his or her responses (41)(Burns & Grove, 2001). It requires that an individual be able to understand what is required, make a reasoned judgment about the effect participation is to have on them and make a choice to participate free from coercive influence. In this study, anonymity will bemaintained in that no personal identifiers were collected during the survey. Instead, unique anonymously linked barcodes were scanned onto the electronic questionnaires after they wereattached to blood specimens. The data that will be accessed for this study will be anonymous.

Risk and benefits of this proposed study

The main risk of any study is loss of confidentiality, however, in this proposed study, we willbe is minimised risk because data received from the HSRC is anonymized ensure that the identity of participants and information collected are kept safe and not accessed by anyoneother than the investigators and that all data will be de-identified before sharing with the studyteam. Where necessary, codes or fake names will be used.

There are no direct benefits for participants involved in the two SABSSM surveys. However, findings of this analysis may provide an enhanced comprehension of essential sexual risk behaviours and associations related to HIV transmission and acquisitions. This can assist in thedevelopment of targeted strategic approaches for HIV prevention, treatment, and support and educational initiatives aimed at promoting safer sexual practices for this specific group.

Reimbursement in the parent study

Participants in the SABSSM survey were not paid to participate in the study.

Privacy and Confidentiality

In this study, one-on-one interviews were conducted at the home of each respondent, either inside or outside the dwelling. Every effort was made to safeguard the confidentiality of respondents. In this secondary analysis only anonymised data will be accessed.

Beneficence

In this national survey, the SABSSM team ensured that no personal identifiers such as names were used during the survey. Instead, unique anonymously linked barcodes were scanned onto the electronic questionnaires after they were attached to blood specimens. Furthermore,consentforms were kept separately from the data and are only accessed by Human Science Research Council (HSRC) Core Leadership Team.

Justice

The survey ensured justice in the study was maintained by treating all collected data as equallyimportant.

Voluntary participation& right to withdraw

As part of the informed consent process, participants were informed of their rights to voluntaryparticipation, not to respond to questions they are uncomfortable with and they can withdraw from the study anytime they feel like doing so, without any consequences.

Dissemination of study findings

Findings of the study will be compiled into a report, will be submitted as partial fulfilment of the requirement for the Master of Public Health in Epidemiology and Biostatistics degree, andshared with the University of Cape Town, School of Public Health and the Health Sciences Human Research Ethics committee (HREC). Furthermore, the presentation and publication of study findings will be agreed upon in consultation with Human Science Research Council (HSRC) core team.

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Appendix C: Study timelines

Study timelines

	Sep 2023	Oct 2023	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024
Conceptualization of the study												
Develop study proposal												
Ethical approval												
Data management												
Data Analysis												
Results												
Discussions												
Final write-up of minor dissertation												
Submission of minor dissertation												

Appendix D: Ethics Approval

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/home/human-research-ethics

04 December 2023

HREC REF: 847/2023

Dr T Phillips
Division of Epidemiology and Biostatistics
5th Floor, Falmouth Building-FHS
Email: Tammy.phillips@uct.ac.za
Student: nhlzan020@myuct.ac.za

Dear Dr Phillips

PROJECT TITLE: EXPLORING THE RELATIONSHIP BETWEEN SEXUAL RISK BEHAVIORS AND HIV STATUS AWARENESS AMONG MEN IN SOUTH AFRICA IN 2012 AND 2017: ANALYSIS OF DATA FROM SOUTH AFRICAN NATIONAL HOUSE-BASED HIV PREVALENCE, INCIDENCE AND BEHAVIOUR SURVEYS-
(MASTERS CANDIDATE-DR ZANELE NHLABATSI)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study,

Approval is granted for one year until the 30 December 2024.

Please submit a progress form, using the standardised Annual Report Form (FHS016) or FHS017 if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Zanele Nhlabatsi will also be involved in this study.

Please quote HREC REF 847/2023 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

HREC/ref 847.2023

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC/ref 847.2023

Appendix E: Questionnaire for persons aged 15 years and older

(Flesch-Kincaid Reading Ease Score= 63.8)

Questionnaire number | Barcode

THE FIFTH SOUTH AFRICAN NATIONAL HIV, BEHAVIOUR, AND HEALTH SURVEY, 2016

A	GEOGRAPHIC AND INTERVIEW PARTICULARS	
Province		
Small area layer		
Household questionnaire number		
Person number of respondent		

B INTERVIEW DETAILS

	Year	Month	Day	Time code	Response code
First visit	1				
Second visit	1				
Third visit	1				
			Final response code		

Time code
1 = Morning till 12:00
2 = 12:01-16:00
3 = 16:01-18:00
4 = 18:01-20:00
5 = 20:01 and later

Response code
1 = Interview completed and sample taken
2 = Interview completed but sample not taken
3 = Appointment made for interview and/or sample4 = Selected respondent not at home
5 = Refusal by head of household6 = Refusal by respondent
7 = Other ----------

INTERVIEW STARTING TIME: :

INTERVIEWER: NAME AND EMPLOYEE NUMBER
……..……..

C REFUSAL PARTICULARS (IF APPLICABLE)

At what point did the respondent refuse?

SPECIFY ----------

1 = At the gate or door

2 = After explanation of the survey and the process

3 = After the first respondent has been identified (before interview)4
= During the individual interview

5 = After the individual interview when requested to do the test6 =
Other

Do you wish to tell me why you don't want to take part? You don't have to tell me.

SPECIFY .....

Upfront refusals

01 = Too busy to grant interview02

= Not available now

03 = Too late in the evening

04 = Not willing to participate in any survey/interview05 =
Objected to the topic of the survey (HIV/AIDS)

06 = Objected to being interviewed by the specific interviewer07 =
Afraid

08 = Fear a breach of confidentiality

09 = Government is not doing enough for him/her10 =
Discovered it was for the HSRC

11 = Violence and gangsterism in area

12 = Enumerated in the recent population census13 =
Other

Refusals during individual interview

20 = Objected to providing any/some information on the topic21 =
Objected to providing personal/confidential information22 = Unable
to provide requested information

23 = Refused to continue because he/she got irritated/bored24 =
Refused to continue because he/she got angry

25 = Refused to continue because he/she lost interest or got tired26 =
Refused to continue because he/she was in a hurry

27 = Other

Refusal to provide a blood sample

40 = Apprehensive of blood sample being taken

41 = Against religious beliefs to provide a blood sample42 =
Did not want to know HIV status

43 = Fear a breach of confidentiality44

= Did not trust the interviewers 45 =
Recently had an HIV test

46 = Other

GENERAL INSTRUCTION	CIRCLE THE CODE NEXT TO THE APPROPRIATE ANSWER. IF INDICATED READ THE ANSWER OPTIONS.

SECTION 1	RESPONDENT'S BIOGRAPHICAL DATA

Commented [A1]: Sociodemographic data

1.1	How old were you on your last birthday? (*Age of the respondent*)		
1.1.1	What is your date of birth?		

Year		Month		Day	

INSTRUCTION 1.2	DO NOT ASK; RECORD SEX	Male	Female
	Sex of the respondent	1	2

INSTRUCTION	READ EACH OPTION

INSTRUCTION 1.3	How would you describe yourself in terms of gender?	Male	Female	Transgender	Intersex
		1	2	3	4

INSTRUCTION	*I am now going to ask you about your marital status*

1.4a	What is your current marital status? (Marital status referring to legal, traditional or common-law)	
	Married	1
	Not married	2
	Divorced / separated	3
	Widower / Widow	4

1.4b	What is your current living arrangement?	
	Living with husband/wife	1
	Living on own or other arrangement but not living with husband / wife	2
	Living together with boyfriend/girlfriend/civil union partner /other partner	3
	Single/divorced/widowed – in a steady relationship but not living together	4
	Single; not in a steady relationship	5

1.4c	Are you in a polygamous union? (the practice or custom of having more than one wife or husbandat the same time)	Yes	No
		1	2
			GO TO 1.5

1.4d	Altogether, how many wives do you have / or how many wives does your husband have?		

INSTRUCTION	ONLY ASK THOSE WHO WERE EVER MARRIED

1.5	How old were you when you were married for the first time?		

1.6	~~How important is religion to you?~~

Not important at all	1
Slightly important	2
Somewhat important	3
Important	4
Very important	5
Not applicable (e.g., atheist)	6

INSTRUCTION	***The following set of questions are about children that are dependent on you***		
1.7a	**How many children do you have of your own who are still alive?** (i.e., by birth)		**IF "00", GO TO 1.8d**
1.7b	**How many of these children are dependent on you?**		

1.7c	**Do you have any other dependants who are not your biological children?**	Yes 1	No 2 ***GO TO 1.8***
1.7d	**How many other dependants do you have?**		

INSTRUCTION	**ORPHANHOOD STATUS**
RESPONDENTS 15 TO 19 YEARS OF AGE ☐↓	**RESPONDENTS 20 YEARS AND OLDER** ☐→ **1.10**

1.8a	**Is your biological mother alive?**	Yes 1	No 2 ***GO TO 1.8d***	Don't know 3 ***GO TO 1.9***
1.8b	**Does your biological mother live in this household?**	Yes 1	No 2 ***GO TO 1.9***	
INSTRUCTION 1.8c	**WHAT IS THE PERSON NUMBER OF THE BIOLOGICAL MOTHER OF THIS CHILD?** (Get the person number from the household schedule in the visiting point questionnaire) Ifthe biological mother does not stay in the household or has died, leave blank		***GO TO 1.9***	
1.8d	**How old were you when she passed away? (*Age in years*)**			

1.9a	**Is your biological father alive?**	Yes	No	Don't know
		1	2	3
			GO TO 1.9d	***GO TO 1.10***
1.9b	**Does your biological father live in this household?**		Yes	No
			1	2
				GO TO 1.10
INSTRUCTION 1.9c	**WHAT IS THE PERSON NUMBER OF THE BIOLOGICAL FATHER OF THIS CHILD?** (Get the person number from the household schedule) If the biological father does not stay in the household or has died, leave blank			
				GO TO 1.10
1.9d	**How old were you when he passed away? (*Age in years*)**			

INSTRUCTION ***I am now going to ask about your employment situation***

Commented [A2]: Sociodemographic data

1.11	**How would you describe your present employment situation?**
Housewife, homemaker, not looking for work	1
Housewife, homemaker, looking for work	2
Unemployed, looking for work	3
Unemployed, not looking for work	4
Work in informal sector, looking for permanent work	5
Work in informal sector, *not* looking for permanent work	6
Sick/disabled and unable to work	7
Student/pupil/learner	8
Self-employed - full time (40 hours or more per week)	9
Self-employed - part time (less than 40 hours per week)	10
Employed part time (if none of the above) (less than 40 hours per week)	11
Employed full time (40 hours or more per week)	12
Other	13

1.11	**Did you receive any income from any source in the last month?**	Yes	No
		1	
			GO TO 1.13

1.12	**What was your main source of income in the last month?**
Formal salary/earnings on which you pay income tax	1
Salary/earnings on which you pay no income tax	2
Contributions by **adult** family members or relatives	
Contributions by **younger** family members or relatives (<18 years)	
Government pensions/grants (e.g., old age pension, CSG disability grant)	
Grants/donations by private welfare organizations	
Other sources	

1.13	**What is your gross monthly income? R**							

1.14	Do you have a disability?	Yes	No	Unsure
		1	2	3
			GO TO 1.17	***GO TO 1.17***

1.15	How long have you had the disability?	Years	
	FILL IN '00'IF LESS THAN ONE YEAR		

INSTRUCTION	**DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

1.16	What is the disability?	
a	Physical (spinal injury, loss of a limb, etc.)	1
b	Sight	2
c	Hearing	3
d	Communication/speech	4
e	Mental or psychiatric illness	5

INSTRUCTION	**SCHOOL ATTENDANCE**

1.17	Have you ever attended school?	Yes	No
		1	2
			GO TO 2.1

1.18a	Are you currently attending school/post-school?	Yes	No
		1	2
			GO TO 1.18c

1.18b	What grade are you attending this year?	
	Pre-school/ Gr R	0
	Grade 1/Sub a/ Class 1	1
	Grade 2/Sub b/ Class 2	2
	Grade 3/Standard 1/Abet 1	3
	Grade 4/Standard 2/Abet 2	4
	Grade 5/Standard 3/Abet 2	5
	Grade 6/Standard 4/Abet 3	6
	Grade 7/Standard 5/Abet 3	7
	Grade 8/Standard 6/Abet 3	8
	Grade 9/Standard 7Abet 3	9
	Grade 10/Standard 8/Ntc 1	10
	Grade 11/Standard 9/Ntc 2	11
	Grade 12/Standard 10/Ntc 3	12
	Post-school	14

1.18c	What is the highest educational level that you obtained?

Pre-school/ Gr R	0
Grade 1/Sub a/Class 1	1

Grade 2/Sub b/Class 2	2
Grade 3/Standard 1/Abet 1	3
Grade 4 /Standard 2/Abet 2	4
Grade 5 /Standard 3/Abet 2	5
Grade 6 /Standard 4/Abet 3	6
Grade 7/Standard 5/Abet 3	7
Grade 8 /Standard 6/Abet 3	8
Grade 9 /Standard 7/Abet 3	9
Grade 10/Standard 8/Ntc 1	10
Grade 11/Standard 9/Ntc 2	11
Grade 12/Standard 10/Ntc 3	12
Further studies incomplete	13
Diploma/other post school completed	14
Further degree completed	15
Don't know	98

RESPONDENTS 15-18 YEARS ☐↓	**RESPONDENTS 19 YEARS AND OLDER** ☐→ **SECTION 2**

INSTRUCTION DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

1.19	Why are you not attending school?	
a	My family does not have enough money	1
b	I don't like school	2
c	I have to look after my younger brothers/sisters	3
d	I have to look after a sick family member	4
e	I failed	5
f	I was expelled	6
g	I became pregnant (if female)	7
h	Completed grade 12	8
i	School is far from where I live	8
j	Other	10
		GO TO SECTION 2

INSTRUCTION READ EACH STATEMENT

1.20	At your school, how often do	Always	Often	Some times	Never	Don't know
a	Educators attend classes?	1	2	3	4	5
b	Educators and other staff watch children at break time?	1	2	3	4	5
c	Educators and other staff watch children comingto school?	1	2	3	4	5
d	Educators and other staff watch children leaving school?	1	2	3	4	5
e	Educators and other staff monitor the toilets?	1	2	3	4	5
f	Educators and other staff make sure no unauthorized person can enter the school?	1	2	3	4	5

1.20	At your school, how often do	Always	Often	Some times	Never	Don't know
g	Boys sexually harass girls by touching, threatening or making rude remarks to them?	1	2	3	4	5
h	Girls sexually harass boys by touching, threatening or making rude remarks to them?	1	2	3	4	5
i	Male educators propose relationships with girl pupils?	1	2	3	4	5
j	Female educators propose relationships with boy pupils?	1	2	3	4	5
k	Teachers propose relationships with pupils of thesame sex?	1	2	3	4	5
l	Teachers hit children?	1	2	3	4	5

1.21	In the last month, have you missed school on the days that you were supposed to be at school?	Yes	No
		1	2
			GO TO SECTION 2

1.22	In the **last month**, how many days have you missed school?		

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

1.23	Why have you missed school?	
a	I have been sick	1
b	I don't feel safe going to school	2
c	I don't feel safe at school	3
d	I don't like school	4
e	I have to look after my younger brothers/sisters	5
f	I have to look after a sick family member	6
g	I don't have enough money to go to school everyday	7
h	Exams were done	8
i	Got a temporary job	9
k	Other	10

SECTION 2 KNOWLEDGE AND PERCEPTIONS OF HIV/AIDS

Commented [A3]: Knowledge & perceptions of HIV/AIDS

1)

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
2.1	**Can you tell me all the ways that you know that HIV infection can be prevented?**	
a	It can't be prevented	1
b	Using condoms	2
c	Sticking to one sex partner	3
d	Being faithful to one sex partner who is also faithful to you	4
e	Reducing number of sex partners	5
f	Abstaining from sex	6
g	Avoiding contact with blood	7
h	Using drugs to prevent HIV transmission from mother to child	8

i	Male circumcision (as an HIV prevention method)	
j	Microbicides (gel/ring inserted into the vagina to prevent HIV infection)	10
k	PrEP (taking ARVs to prevent HIV infection)	11
l	Other (specify)	12
m	I don't know	13

2)

INSTRUCTION 2.2	*I am now going to ask you a number of questions about knowledge and perceptions of HIV and AIDS*	Yes	No	Don't know
a	Can AIDS be cured?	1	2	3
b	Can a person reduce the risk of HIV by having fewer sexual partners?	1	2	3
c	Can a healthy-looking person have HIV?	1		
d	Can HIV be transmitted from a mother to her unborn baby?	1		
e	Can the risk of HIV transmission be reduced by having sex with only one uninfected partner who has no other partners?	1	2	3
f	Can a person get HIV by sharing food with someone who is infected?	1	2	3
g	Can a person reduce the risk of getting HIV by using a condom every time he/she has sex?	1	2	3
h	Can medical male circumcision reduce the risk of HIV infection in males?	1	2	3
i	Can the risk of HIV transmission through sex be reduced by a HIV-positive partner consistently taking drugs that treat HIV?	1	2	3

2.3.1	**Can a woman infected with HIV have an HIV-negative baby?**	**Yes**	**No**	**Don't know**
		1	2	3
			Go to 3.4.1	

	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
2.3.2	**Can you tell me all the ways to prevent an HIV-positive pregnant woman from passing on HIV to her baby?**	
a	There is no way to prevent transmission	1
b	Drugs, medicine, pills, or ARV's	2
c	Traditional medicine	3
d	Homeopathic treatment	4
e	Immune boosters	5
f	Giving breast milk only, no formula	6
g	Giving formula instead of breast milk	7
h	Caesarean section	8
i	Other (specify)	9
j	Don't Know	10

2.4.1	**Is there a treatment for HIV infection and AIDS?** **NOTE: READ OUT DEFINITION** [Treatment being something to keep people healthyfor a long time & not a cure for the disease]	**Yes**	**No**	**Don't know**
		1	2	3

Go to 3.5

	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
2.4.2	**What is that treatment?**	
a	Antiretroviral drugs/treatment (ARVs/ART)	1
b	Other drugs, medicine, pills	2
c	Traditional medicine	3
d	Homeopathic treatment	4
e	Immune boosters	5
f	Prayers	6
g	Other (specify)	7
h	Don't Know	8

2.4.	How long do people have to stay on that treatment for HIV/AIDS?	
	For the rest of their lives	1
	As long as they want	2
	Until they feel better	3
	Until they are cured	4
	Don't know	5
	Other (specify)	6

INSTRUCTION 2.5	*Now I want to ask you some questions relating to people living with HIV/AIDS*	Yes	No	Not sure
a	If you knew that a shopkeeper or food seller had HIV, would you buy food from them?	1	2	3
b	Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had HIV?			
c	Would you be willing to care for a family member with AIDS?			
d	If a teacher has HIV but is not sick, should he or she be allowedto continue teaching?			
e	Is it a waste of money to train or give a promotion to someonewith HIV/AIDS?	1	2	3
f	Would you want to keep the HIV-positive status of a family member a secret?	1	2	3
g	Are you comfortable talking to at least one member of your familyabout HIV/AIDS?	1	2	3
i	A person would be foolish to marry a person who is living with HIV/AIDS	1	2	3
j	If a pupil has HIV but not sick, should he or she be allowed to continue to go to school?	1	2	3
k	Do you think children living with HIV should be able to attend school with children who are HIV negative?			

INSTRUCTION	READ EACH STATEMENT

3)

2.6	Do you agree or disagree with the following statements:	Agree	Not Sure	Disagree
a	People who have AIDS are dirty			
b	People who have AIDS are cursed			
c	People who have AIDS should be ashamed			
d	It is safe for people who have AIDS to work with children			
e	People with AIDS must expect some restrictions on their			
f	A person with AIDS must have done something wrong and deserves to be punished	1	2	3
g	People who have HIV should be isolated.	1	2	3
h	I do not want to be friends with someone who has AIDS	1	2	3
i	People who have AIDS should not be allowed to work	1	2	3
j	Parents are talking to their children about sex and HIV prevention	1	2	3
k	Parents are encouraging their children to use condoms	1	2	3
l	It is okay for young women to have children before they are married	1	2	3
m	It is okay for young men to have children before they aremarried	1	2	3
n	Young women can have older male sexual partners for money, other necessities, or luxuries	1	2	3
o	Young men can have older female sexual partners for money, other necessities, or luxuries	1	2	3
p	Women can have two or more sexual partners at the sametime	1	2	3
q	Men can have two or more sexual partners at the sametime	1	2	3

2.7	Do you agree or disagree with the following statements:	Agree	Disagree
a	A man is expected to pay the bills in a family.		
b	A man always deserves the respect of his wife and children.		
c	A man will lose respect if he talks about his problems.		
d	It is just part of human nature for men to force women to havesex.		
e	There are times when a man should hit his woman because ofthings she has done.	1	2
f	A woman who talks disrespectful to a man in public should expect trouble.	1	2
g	A man who lets a woman speak disrespectfully to him is not aman.	1	2
h	It is understandable that a man will hit his women if she is disrespectful of him.	1	2
i	A woman who teases a man sexually and doesn't finish what shestarted, deserves what she gets.	1	2

INSTRUCTION	*Now I'm going to ask some questions regarding your general perceptions related to HIV/AIDS policies*

2.8	*Please tell me whether you agree or disagree with the following statements*	Agree	Disagree	Don't know
a	Political leaders are committed to controlling HIV/AIDS in South Africa	1	2	3

2.8	*Please tell me whether you agree or disagree with the following statements*	Agree	Disagree	Don't know
b	Political leaders publicly recognise the importance of HIV/AIDS	1	2	3
c	The government allocates sufficient funds to control thespread of HIV infections	1	2	3
d	There are enough community-based organizations helping with HIV/AIDS in my community	1	2	3
e	The government supports people and families livingwith HIV/AIDS	1	2	3
f	The government supports children affected by HIV/AIDS	1	2	3

SECTION 3	KNOWLEDGE, ATTITUDES, AND PERCEPTIONS OF TUBERCULOSIS (TB)

INSTRUCTION	*I am now going to ask you about tuberculosis (TB). Please remember that there are no correct or wrong answers*

3.1	Do you agree or disagree with the following statements	Agree	Disagree	Don't Know
a	People living with HIV can get TB	1	2	3
b	People who are/or have been in prison can get TB	1	2	3
c	People who smoke can get TB	1	2	3
d	Anybody can get TB	1	2	3
e	People without HIV cannot get TB	1	2	3

3.2	Do you agree or disagree with the following statements	Agree	Disagree	Don't Know
a	A person can prevent getting TB by avoiding shaking hands	1	2	3
b	A person can prevent getting TB by covering the mouth when coughing or sneezing	1	2	3
c	A person can prevent getting TB by avoiding sharing dishes with others	1	2	3
d	A person can prevent getting TB by washing hands after touching items in public places	1	2	3
e	A person can prevent getting TB by opening windowsat home and in public areas	1	2	3
f	A person can prevent getting TB by avoiding close contact with people who have TB	1	2	3
g	A person can prevent getting TB through religious or traditional practices	1	2	3
h	A person living with HIV can prevent getting TB by using a specific medication to prevent TB that is given by health professionals	1	2	3

3.3	Can TB be cured?	Yes	No	Don't know
		1	2	3

GO TO 4.6

3.4	*Now I want to ask you some questions relating to how TB can be cured*	Yes	No	Don't Know
a	Can TB be cured by herbal remedies?	1	2	3
b	Can someone with TB be cured by home rest withoutany medicine?	1	2	3
c	Can TB be cured by traditional or religious practices?	1	2	3
d	Can TB be cured by specific drugs given by a health professional that are taken for the entire recommended duration	1	2	3

3.5	Are people with TB always also HIV positive?	Yes	No	Don't know
		1	2	3

3.6	Can TB be cured in people with HIV?	Yes	No	Don't know
		1	2	3

INSTRUCTION READ EACH STATEMENT AND CHECK ONE ANSWER

3.7	In your community, how is a person who has TB usually regarded/treated?	
	Most people reject him or her	1
	Most people are friendly but they generally try to avoid him or her	2
	The community mostly supports him or her	3
	Other (please explain):	4

3.8	Have you ever been told by a doctor or other health professional that you had TB?	Yes	No	Don't know
		1	2	3
		GO TO 3.10		

INSTRUCTION DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

3.9a	What would be your reaction if you found out that you have TB?	
a	Fear	1
b	Surprise	2
c	Shame	3
d	Embarrassment	4
e	Sadness/hopelessness	5
f	Other (specify)	6

INSTRUCTION ONCE YOU HAVE ASKED QUESTION 3.9 SKIP TO 3.14

3.10		MONTH		

What month and year did a doctor or other health professional last tell you thatyou have (had) TB? **IF "DON'T KNOW" MONTH, THEN RECORD '88'** **IF "DON'T KNOW" YEAR, THEN RECORD '8888'**	**YEAR**	

Were you tested for HIV at the TB clinic?

Yes	No	Don't know
1	2	3

Did you complete your TB treatment, i.e., were you informed by a nurse or doctor that you no longer needed to take treatment for TB?

Yes	No	Still on treatment
1	2	

When you fell sick with TB, were you:	**Yes**	**No**
Teased, insulted or sworn at?	1	2
Gossiped about?	1	2
Did you feel unclean or dirty because of your TB?	1	2
Did you tell anyone outside your household about your TB diagnosis?	1	2

Would you like to have more information about TB?

Yes	No
1	2

Commented [A4]: Sexual behaviour

I now have to ask you sensitive questions on sex and other sex-related matters. Please remember that your name will not be recorded anywhere in this questionnaire and the information you give will be kept confidential.

		Yes	No	No response
4.1	**Have you ever had sexual intercourse? [***For the purposes of this survey, "sexual intercourse" is defined as penetrative vaginal/anal sex.***]**	1	2	3
		Go to 4.3		***Go to 7.1***

WHO NEVER HAD SEX

MEN AND WOMEN

25 YEARS AND OLDER

WHO NEVER HAD SEX

7.1

DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

4.2 Could you please tell me why you have not had sex yet?

a	ot ready			1
b	am too young			2
c	ot interested			3

SECTION 4 SEXUAL HISTORY

h	Avoiding pregnancy	4
g	Avoiding STDs, including HIV	5
f	Religious grounds	6
e	Cultural grounds	7
d	Don't have a partner	8
i	No response	9
j	Other	10

Go to 8.1

4.3	**How old were you when you had sex for the first time? _____yrs old**		Cannot remember the age 1

4.4	**In total, with how many different people have you had sexual intercourse in your lifetime?**		

4.5	**Did you use a condom the first time you had sex?**	Yes	No	Cannot remember
		1	2	3

SECTION 5 PARTNER(S) AND PARTNER CHARACTERISTICS

I am now going to ask you questions on partner(s) and partner characteristics.

5.1	**Have you had sex during the past 12 months?**	Yes 1	No 2 ***Go to 7.1***	No response 3 ***Go to 7.1***

5.2	**Overall, how many sexual partners did you have during the past 12 months?**		
INSTRUCTION	**IF '00', CLARIFY THE ANSWER IN Q5.1**		
5.3	**How many male sexual partners did you have during the past 12 months?**		
5.4	**How many female sexual partners did you have during the past 12 months?**		
5.4 INSTRUCTIO	**Sum answers to 5.3 and 5.4 and enter TOTAL**		

5.5 **Just to make sure that I have this right: you have had in TOTAL_____sexual partners during the past 12 months. Is that correct?**

Yes 1

No 18 2

Probe and correct

INSTRUCTION	*Now I would like to talk with you about your sexual activity in general*

5.5a	Have you ever received money, gifts, or favours in exchange for sex?	Yes	No	Don't know
		1	2	3
			GO TO 5.5d	

5.5b	In the last 12 months, have you received money, gifts, or favours in exchange for sex?	Yes	No
		1	2
			GO TO 5.5d

5.5c	The last time you received money, gifts, or favours in exchange for sex, was a condom used?	Yes	No	Don't know
		1	2	3

5.5d	Have you ever given money, gifts, or favours in exchange for sex?	Yes	No	Refused
		1	2	3
			GO TO 5.6	

5.5e	In the last 12-months, have you given money, gifts, or favours in exchange for sex?	Yes	No	Refused
		1	2	3
			GO TO 5.6	

5.5f	The last time you gave money, gifts, or favours in exchange for sex, was a condom used?	Yes	No	Don't know
		1	2	3

5.5g	Have any of these sexual partner(s) had other sexual partners in the past twelve months?	Yes	No	Don't Know
		1	2	3

INSTRUCTION	SEXUAL PARTNERS FILTER		
More than one sexual partner	☐ ↓	One sexual partner	☐ → 5.9a

5.6	Did any of these relationships mentioned above overlap with each other?	Yes	No	No response
		1	2	3

5.7	Do you have two or more sexual partners at the moment?	Yes	No	No response
		1	2	3

5.8a	Overall, how many different sexual partners did you have during the past 3 months?		

5.8f	**Have you used a condom with any of your partners in the last 3 months?**		

5.8c	**In the last 3 months when you had sexual intercourse, did the condom ever break/leak during sex or while pulling out?**	Yes	No	Don't Know
		1	2	3

5.8d	**In the last 3 months when you had sexual intercourse, did the condom ever slip off during sex or while pulling out?**	Yes	No	Don't Know
		1	2	3

INSTRUCTION	***Now I would like to ask you some questions about sexual health***

INSTRUCTION	***The next section deals with infections related to the urinary tracts***	
FEMALES	**MALES**	**Q5.8gg**

5.8e	**During the last 12 months have you had an abnormal discharge from your vagina? This may include an unusual smell, colour, or texture.**	Yes	No	Don't Know
		1	2	3

5.8i	**During the last 12 months, have you had an ulcer or sore on or near your vagina?**	Yes	No	Don't Know
		1	2	3

INSTRUCTION	**F EITHER 5.8 e OR f = '1'YES, THEN GO TO Q5.8i. ELSE GO TO Q5.9**

5.8g	**During the last 12 months, have you had an abnormal discharge from your penis?**	Yes	No	Don't Know
		1	2	3

5.8h	**During the last 12 months, have you had an ulcer or sore on or near your penis?**	Yes	No	Don't Know
		1	2	3

5.8i	**During the last 12 months have you experienced pain when passing urine?**	Yes	No	Don't Know
		1	2	3

INSTRUCTION	**IF EITHER 6.9g OR 6.9h OR 6.9i '1'YES, GO TO Q6.9j. OTHERWISE GOT TO Q6.10**

5.8j	**Did you visit a health facility or see a healthcare provider because of these problems?**	Yes	No
		1	2

		GO TO 5.9

5.8k	**Did you get treatment because of these problems?**	Yes	No
		1	2

INSTRUCTION	**CHECK 5.2 (NUMBER OF PARTNERS LAST 12-MONTHS):** **IF LESS THAN 3:** **INTERVIEWER SAY:** ***Now I would like to ask you some questions about the____partners you have had sexual intercourse with in the last 12 months.*** **IF 3 OR GREATER:** **INTERVIEWER SAY:** ***Now I would like to ask you some questions about the LAST 3 partners you have had sex with in the past 12 months.*** **INTERVIEWER SAY TO ALL:** ***Let me assure you again that your answers are completely confidential and will not be told to anyone. If we should come to any question that you don't want to answer, just let me know and we will go to the next question.***

INSTRUCTION	**IN THE NEXT SECTION, ONLY RECORD UP TO A MAXIMUM OF THREE PERSONS WITH WHOM THE RESPONDENT HAD A SEXUAL RELATIONSHIP WITHIN THE PAST 12 MONTHS** If applicable, this will include their spouse/regular partner and any other persons

SEXUAL PARTNER MATRIX INTRO: **INTERVIEWER SAY:** **"*Before we start, can I get the initials of your last partner(s) so I can keep track? You don't have to give me exact initials."***	INITIALS (1) _____	INITIALS (1) _____	INITIALS (1) _____
INTERVIEWER SAY: ***Thank you. Let's start with questions only about (INITIALS).*** **IF MORE THAN ONE PARTNER ALSO SAY:** ***I will ask you about the others afterwards.***			

Commented [A5]: Sexual behaviour

		Most recent person with whom you had sex	*Second most recent person with whom you had sex*	*ird most recent person with who you had sex*
5.9a	**Can you describe this partner?**	Husband / Wife ..... 1 Live-in partner ..... 2 Girlfriend / Boyfriend not living with you..... 3 Casual partner ..... 4 Someone whom you paid for sex..... 5 Other..... 6	Husband / Wife ..... 1 Live-in partner ..... 2 Girlfriend / Boyfriend not living with you .....3 Casual partner .....4 Someone whom you paid for sex .....5 Other 6	Husband / Wife ..... 1 Live-in partner ..... 2 Girlfriend / Boyfriend not living with you .....3 Casual partner.....4 Someone whom you paid for sex .....5 Other 6
5.9b	**Is (INITIALS) a male or a female?**	Male ..... 1 Female 2	Male..... 1 Female 2	Male.....1 Female 2
5.9 c	**What is the highest level of school this partner has completed?**	Primary level ..... 1 Secondary level.....2 Grade 12/ Standard 10/Ntc 3. .....3 Further studies incomplete.....4 Diploma/other post school completed 5 Further degree completed.....6 Don't know.....98 No schooling 99	Primary level.....1 Secondary level ..... 2 Grade 12/ Standard 10/Ntc 3.....3 Further studies incomplete ..... 4 Diploma/other post school completed 5 Further degree completed ..... 6 Don't know.....98 No schooling.....99	Primary level .....1 Secondary level..... 2 Grade 12/ Standard 10/Ntc 3. ..... 3 Further studies incomplete .....4 Diploma/other post school completed.5 Further degree completed.....6 Don't know..... 98 No schooling.....99
5.10f 5.10 d 5.10e 5.10e	**What is the employmentstatus of (INITIALS)?** **Where does(INITIALS) reside?**	**Householdnumber of partner, if applicable** **What is the approximateage of (INITIALS)?**	Employed ..... 1 Unemployed .....2 Student.....3 Don't know..... 98 In same town ..... 1 In another town.....2

In same household…3

Employed … 1

Unemployed 2

Student…… 3

Don't know…… 98

In same town ……. 1

In another town ……. 2

In same household…3

Don't know ……. 88

GO TO 5.10h

Employed ……. 1

Unemployed ……. 2

Student…… 3

Don't know…… 98

In same town ……. 1

In another town ……. 2

In same household…3

Don't know…… 88

GO TO 5.10h

Don't know ……. 88

GO TO 5.10h

		Most recent person with whom you had sex	*Second most recent person with whom you had sex*	*ird most recent person with who you had sex*
5.10h	**Is (INITIALS) older than you, younger than you, or about the same age?**	Older ..... 1 Younger ..... 2 GO TO 5.10j Same age ..... 3 Don't know ..... 4 GO TO 5.14	Older ..... 1 Younger ..... 2 GO TO 5.10j Same age ..... 3 Don't know ..... 4 GO TO 5.14	Older ..... 1 Younger ..... 2 GO TO 5.10j Same age ..... 3 Don't know ..... 4 GO TO 5.14
5.10i	**Would you say (INITIALS) is five or more years older than you, or less than five years older than you?**	Five or more years older ..... 1 GO TO 5.131 Less than five years older ..... 2 GO TO 5.141 Older, unsure how much 3 GO TO 5.14	Five or more years older ..... 1 GO TO 5.131 Less than five years older ..... 2 GO TO 5.141 Older, unsure how much 3 GO TO 5.14	Five or more years older ..... 1 GO TO 5.131 Less than five years older ..... 2 GO TO 5.141 Older, unsure how much 3 GO TO 5.14
5.10j	**Would you say (INITIALS) is five or more years younger than you, or less than five years younger than you?**	Five or more years younger ..... 1 GO TO 5.121 Less than five years younger ..... 2 GO TO 5.141 Younger, unsure how much ..... 3 GO TO 5.13	Five or more years younger ..... 1 GO TO 5.121 Less than five years younger ..... 2 GO TO 5.141 Younger, unsure how much ..... 3 GO TO 5.13	Five or more years younger ..... 1 GO TO 5.121 Less than five years younger ..... 2 GO TO 5.141 Younger, unsure how much ..... 3 GO TO 5.13
INSTRUCTION		_____ Insert age of respondent to assist If the partner is younger than five years ***GO to 5.11*** If the partner is older than five years ***GO to 5.12*** If the age gap is less than five years ***GO to 5.13***		

Commented [A5]: Sexual behaviour

		Most recent person with whom you had sex	*Second most recent person with whom you had sex*	*Third most recent person with whom you had sex*
5.11	**What is the MOST important reason for having a sexual partner younger than yourself?**	Younger partner is less STI/HIV… e infected with 1 Younger partner will give a sexual boost ..... 2 It is sexually more exciting than having an older or same-age partner ..... 3 Fear of getting old; younger partner rejuvenates. ..... 4 A younger partner will cure me of HIV/AIDS. 5 It is easier to seduce a younger person.....6 Age is not important…7 Other 8	Younger partner is less STI/HIV… e infected with 1 Younger partner will give a sexual boost ..... 2 It is sexually more exciting than having an older or same-age partner .....3 Fear of getting old; younger partner rejuvenates..... 4 A younger partner will cure me of HIV/AIDS. 5 It is easier to seduce a younger person ..... 6 Age is not important…7 Other 8	Younger partner is less likely to be infected with STI/HIV..... 1 Younger partner will give a sexual boost ..... 2 It is sexually more exciting than having an older or same-age partner .....3 Fear of getting old; younger partner rejuvenates .....4 A younger partner will cure me of HIV/AIDS. 5It is easier to seduce a younger person ..... 6 Age is not important…7 Other 8
5.12	**What is the MOST important reason for having a sexual partner older than yourself?**	Feeling secure. .....1 He/she can give financial support.....2 He/she does not cheat .3 He/she is experienced and satisfies my sexual needs.....4 Age is not important .....5 Other 6	Feeling secure.....1 He/she can give financial support .....2 He/she does not cheat. 3 He/she is experienced and satisfies my sexual needs. .....4 Age is not important .... 5 Other 6	Feeling secure. ..... 1 He/she can give financial support.....2 He/she does not cheat. 3 He/she is experienced and satisfies my sexual needs. ..... 4 Age is not important .....5 Other 6
5.13				
5.14				

Commented [A5]: Sexual behaviour

5.15	**How long ago did you first have sex with (INITIALS)?**	A year ago .....1 Below a year .....2 More than a year ago 3 Can't remember…99	A year ago.....1 Below a year.....2 More than a year ago 3 Can't remember…99	A year ago .....1 Below a year.....2 More than a year ago 3 Can't remember…99
	When last did you have sex with (INITIALS)?	Months ago [____|____] Days ago [____|____] Can't remember…99	Months ago [____|____] Days ago [____|____] Can't remember…99	Months ago [____|____] Days ago [____|____] Can't remember…99
	What type of sex do have with (INITIALS)?	Yes….No Vaginal…….1 2 Anal……1…… 2 Oral sex……1…… 2	Yes….No Vaginal…….1 2 Anal……1……2 Oral sex……1 ……2	Yes….No Vaginal…….1 2 Anal……1…… 2 Oral sex……1…… 2

		Most recent person with whom you had sex	*Second most recent person with whom you had sex*	*ird most recent person with who you had sex*
5.16	**Are you still sexually active with (INITIALS)?**	Yes…..1 No 2	Yes… ..... 1 No..... 2	Yes… ..... 1 No 2
5.17	**Do you expect to have sex with (INITIALS) again?**	Yes…..1 No ..... 2 Do not know.....3	Yes… ..... 1 No..... 2 Do not know 3	Yes… ..... 1 No .....2 Do not know 3
5.18	**How many times during the last 30 days did you have penetrative sexual intercourse with (INITIALS)?**	_____	_____	_____
5.19	**How often do you use a condom with (INITIALS)?**	Every time .....1 Almost every time.....2 Sometimes…..3 Never .....4 GO TO 5.241	Every time.....1 Almost every time .....2 Sometimes… .....3 Never.....4 GO TO 5.241	Every time..... Almost every time ..... Sometimes….. Never ..... 4 GO TO 5.241
5.20	**Did you use a condom at last sex?**	Yes…..1 No .....2 GO TO 5.241	Yes… .....1 No.....2 GO TO 5.241	Yes… .....1 No ..... 2 GO TO 5.241
5.21	**Was it a male or female condom?**	Male..... 1 Female 2	Male .....1 Female.....2	Male ..... 1 Female 2
5.22	**Who suggested using a condom?**	Yourself..... 1 Your partner .....2 Mutual agreement…3	Yourself .....1 Your partner..... 2 Mutual agreement…3	Yourself ..... 1 Your partner .....2 Mutual agreement…3

Comm ented [A5]: Sexual behaviour

Commented [A5]: Sexual behaviour

		Most recent person with whom you had sex	Second most recent person with whom you had sex	ird most recent person with who you had sex
5.23	If you used a condom, what were your reasons for doing so?	Concern about HIV infection ..... 1 People are urged to use condoms..... 2 Want to prevent STI's .....3 Want to prevent pregnancy 4	Concern about HIV infection .....1 People are urged to use condoms... .....2 Want to prevent STI's ..... 3 Want to prevent pregnancy.....4	Concern about HIV infection ..... 1 People are urged to use condoms... .....2 Want to prevent STI's .....3 Want to prevent pregnancy 4
5.24	If you did not use a condom, what were your reasons for not doing so?	Did not have a condom .....1 Partner objected.....2 Used other contraceptive. ..... 3 Don't like them 4	Did not have a condom ..... 1 Partner objected ..... 2 Used other contraceptive. ..... 3 Don't like them..... 4 Didn't think it was necessary..... 5 I am married..... 6 I am faithful/trust them 7 I was drunk/high..... 8 Other 9	Did not have a condom .....1 Partner objected .....2 Used other contraceptive. .....3 Don't like them.....4 Didn't think it was necessary ..... 5 I am married..... 6 I am faithful/trust them 7 I was drunk/high.....8 Other 9
	The last time you had sex with (INITIALS), did you drink alcohol before	Yes... ..... 1 No.....2 Can't remember 3		

5.25

5.26	Is it easy to get a condom if you need one? (Male and/female condoms)	Yes	No	No response
		1	2	3

INSTRUCTION	NON CONDOM USE FILTER (CHECK Q. 5.19)
SEXUALLY ACTIVE RESPONDENT	SEXUALLY ACTIVE

WHO EVER USED A CONDOM	RESPONDENT WHO HAS NEVER USED A CONDOM BEFORE

DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

5.27	Where do you normally obtain condoms? (Male and/female condoms)	

	Government clinic or hospital
	Private clinic or hospita l
	Pharmacy/chemist
	Shop/supermarket/café
	Garage/ station
	Spaza shop
	Shebeen/tavern/hotel
	Other

5.28	Did you or your partner pay for the last condom you used or did you get it for free? (Male and/female condoms)		
Paid for	Free	Not sure/don't know	
1	2	3	

SECTION 6 REPRODUCTION

INSTRUCTION	SEX FILTER
WOMEN 15 TO 54 YEAR OF AGE **Check Q1.1 to confirm age of respondent**	**ALL MEN AGED 15 YEARS AND OLDER AND WOMEN AGED 55 YEARS AND OLDER**

6.1	Have you been pregnant in the last 24 months?	Yes	No
		1	2

6.2	Are you pregnant now?	Yes	No	Unsure
		1	2	3
			GO TO 8.1	

6.3	Have you visited an antenatal clinic during this pregnancy?	Yes	No
		1	2
			Go to 6.8

6.4	At what stage of this pregnancy did you visit an antenatal service/clinic?(How many weeks)	

6.5	During this current pregnancy, was an HIV test offered to you during any of your antenatal care clinic visits?	Yes	No	Don't know
		1	2	3

6.6	During this current pregnancy, have you been tested for HIV during any of your antenatal care clinic visits?	Yes	No
		1	2
		Go to 7.1	

INSTRUCTION **DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

6.7	Can you tell me the main reason you have not tested for HIV during antenatal care with your current pregnancy?	
a	I tested HIV positive previously and already knew my status	1
b	I did not want an HIV test done	2
c	HIV test kit was not available	3
d	HIV test was not offered to me	4
e	Don't need to test/low risk	5
f	Don't want to know my status	6
g	Afraid others will know about my test results	7
h	Test cost too much	8
i	Can't get treatment if have HIV/AIDS	9
j	Other	10
		Go to 7.1

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

6.8	Can you tell me the main reason you have not attended an antenatal care clinic during your current pregnancy?	
a	The clinic is too far away	1
b	I can't take time off work/too busy	2
c	I can't afford to pay for the visit	3
d	I know all i need to give birth	4
e	I will ask friends/family who can tell me about giving birth	5
f	My culture/religion doesn't allow	6
g	I don't trust the clinic staff	7
h	I'm receiving care at home	8
i	I just found out I am pregnant	9
j	I do not want an HIV test done	10
k	Other	11

SECTION 7 CONTRACEPTION

INSTRUCTION	I am now going to ask you about methods to prevent pregnancy

	a). Have you heard about?			b). Have you or your main partner ever used (METHOD)		c). Are you or your main partner currently using (METHOD)		
		Yes	No	Yes	No	Yes	No	N
7.1	**FEMALE STERILISATION** Women can have an operation to avoid having any more children.	1	2	1	2	1	2	3
7.2	**MALE STERILISATION (Vasectomy)** Men can have an operation to avoid having any more children.	1	2	1	2	1	2	3
7.3	**PILL** Women can take a pill every day to avoid becoming pregnant.	1	2	1	2	1	2	3

Commented [A6]: Contraception

	a). Have you heard about?			b). Have you or your main partner ever used (METHOD)		c). Are you or your main partner currently using (METHOD)		
		Yes	No	Yes	No	Yes	No	NA
7.4	**IUD** Women can have a loop or coil placed inside them by a doctor or a nurse.	1	2	1	2	1	2	3
7.5	**INJECTABLES** Women can have an injection by a health provider that stops them from becoming pregnant for two or more months	1	2	1	2	1	2	3
7.6	**HORMONAL IMPLANTS**	1	2	1	2	1	2	3
7.7	**MALE CONDOM**	1	2	1	2	1	2	
7.8	**FEMALE CONDOM**	1	2	1	2	1	2	3
7.9	**EMERGENCY CONTRACEPTION** As an emergency measure after unprotected sexual intercourse, womencan take special pills as soon as possible, within three days, to prevent pregnancy.	1	2	1	2	1	2	3
7.10	**ANY OTHER METHOD** Have you heardof any other ways or methods that women or men can use to avoid pregnancy? (i.e., breastfeeding, rhythm)	1	2	1	2	1	2	3

C **mmented [A7]:** Contraception

INSTRUCTION **IF NO CURRENT CONTRACEPTION ASK Q 7.11. DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

7.11	Can you say why you (or your partner) are not currently using any method to delay or avoid getting pregnant?	
a	I/my partner/we want to have a baby	1
b	I'm not having sex	2
c	I am not/my partner is not able to have children	3
d	My period hasn't returned from my last pregnancy	4
e	I am breastfeeding	5
f	I leave it to fate/god/god's will	6
g	I'm opposed	7
h	My partner is opposed	8
i	I'm not aware of any method to use	9
j	I have concerns about side effects	10
k	Inconvenient to use	11
l	Interferes with body's normal processes	12
m	Currently Pregnant	13
n	Unable to obtain birth control	14
o	Other	15

INSTRUCTION **ONCE YOU HAVE ANSWERED Q7.11 GO TO Q8.1**

7.12 **Where did you obtain (CURRENT METHOD/s) the last time?**

Government hospital	1
Day hospital/clinic/community health centre	2
Mobile clinic	3
Family planning clinic	4
Private hospital/clinic	5
Pharmacy	6
Private doctor	7
Other private medical	8
Other	9

INSTRUCTION *The next section deals with circumcision*

Commented [A8]: Circumcision

MALES	FEMALES

SECTION 8 MALE CIRCUMCISION

INSTRUCTIO *I am now going to ask you a few questions on male circumcision.*

8.1 Some men are circumcised. Are you been circumcised?	Yes	No
	1	2
		GO TO 8.12

INSTRUCTION *I am now going to ask you a sensitive question, please remember that your responses are confidential* SHOW PICTURE

8.2 What type of circumcision did you have? SHOW PICTURE	
Partial	1
Full/complete (foreskin is totally removed)	2
Don't know	3

8.3 How old were you when you were circumcised? (in years)		

8.4 Did you receive any explanation or counselling about the circumcision before it was done?	Yes	No	Too young	Don't remember
	1	2	3	4
		GO TO 8.6		

INSTRUCTIO DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

8.5 What were you advised to do after the circumcision about having sex again?	
Nothing	1
Wait to have sex until the wound is completely healed	2
You still have to use a condom even after circumcision	3
Have one sex partner	4
Other	5

8.6 Where were you circumcised?	
At home	1

In hospital/clinic	2
In the mountain/ in the bush/initiation school	3
Circumcision camps	4
Mobile clinic circumcision clinic	5
Other	6
Don't know	7

8.7	What method was used for circumcision?	
Forceps guided method		1
Other device……		2
Don't know		3

8.8	Who performed the circumcision?	
Medical Doctor/nurse		1
Spiritual or religious leader		2
Traditional circumciser		3
Other		4
Don't know		5

8.9	What was your <u>main</u> reason for being circumcised?	
Traditional practice such as initiation		1
Religious reasons		2
My parents decided for me		3
Health reasons		4
Prevent HIV and other STIs		5
Other		6

8.10	Did you experience complications following circumcision?	Yes	No	Don't know
		1	2	3

8.11	Would you recommend circumcision?	Yes	No
		1	2

INSTRUCTION	ASK MALES WHO ARE NOT CIRCUMCISED	Yes	No
8.12	Would you consider being circumcised?	1	2
		GO TO 8.14	

8.13	Why would you not consider male circumcision?	
Personal reasons		1
Religious reasons		2
Health reasons		3
Other		4
INSTRUCTION	ONCE YOU HAVE ANSWERED Q8.14 GO TO Q9.15	

INSTRUCTION	READ EACH OPTION

8.14	Are you planning to be circumcised in the next 12 months?	
	Definitely will	1
	Probably will	2
	Probably will not **SKIP TO Q8.16**	3
	Definitely will not **SKIP TO Q8.16**	4
	Unsure **SKIP TO Q8.16**	5

INSTRUCTION	READ EACH OPTION

8.15	Would this circumcision be	
	Medical only-doctor or nurse	1
	Traditional only	2
	Medical circumcision followed by a traditional initiation ceremony	3

INSTRUCTION	ASK BOTH MALES AND FEMALE

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

8.16	What do you think are the benefits that men get from being medically circumcised?	
a	No benefits	1
b	Reduce the risk of getting HIV	2
c	Reduces the risk of getting STI's	3
d	Keeps men clean	4
e	Reduces female partner's chance of getting cervical cancer	5
f	Makes sex more pleasurable for him	6
g	Makes sex more pleasurable for her	7
h	Other	8
i	Don't know	9

8.17	How long should a man wait to have sex after he is circumcised?	
	0 weeks (they shouldn't wait);	1
	1 week	2
	2 weeks	3
	3 weeks	4
	4 weeks	5
	6 weeks	6
	Other (Specify)	7
	Don't know	8

INSTRUCTION	ASK RESPONDENTS WHO HAVE SEXUAL PARTNER

8.18	Is your current or main sex partner circumcised?	
	Yes	1
	No	2
	Don't have a main sex partner	3

Don't know	4

8.19	**Would you be supportive of your current, main, or future sex partner getting circumcised now or in the future?**	Yes	No	Don't know
		1	2	3

SECTION 9 HIV COUNSELLING AND TESTING

Commented [A9]: HIV Counselling and testing

9.1	**Do you know of a place nearby where you can get an HIV test?**	Yes	No
		1	2

9.2	**Have you ever had an HIV test?**	Yes	No	No response
		1	2	3
			GO TO 9.19	***GO TO 9.19***

9.3	**How long ago did you have your most recent HIV test?**	
	0 to 3 months	
	4 to 6 months	
	7 to 11 months	
	Less than a year ago	
	Between 1-2 years ago	
	Between 2-3 years ago	
	Three or more years ago	

INSTRUCTION ***Please note that you should not tell me about the actual result. I am only interested whether you have been told/informed of the result of the test.***

9.4	**Have you been told/informed of the result of your most recent test?**	Yes	No
		1	2

9.5	**Where did you get your most recent HIV test?**	
	Public hospital	1
	Private hospital	2
	Public clinic or doctor	3
	Private clinic or doctor	4
	Mine hospital	5
	Traditional healer	6
	LoveLife clinic	7
	Youth-Centre	8
	HIV testing centre	9
	Workplace	10
	Health Jamboree event	
	Other	11

9.6	**During your most recent HIV test, did you have counselling before the HIV test?**	Yes	No
		1	2

9.7	**During your most recent HIV test, did you have counselling after the HIV test?**	Yes	No
		1	2

9.8	What was the main reason for going for your last HIV test?	
	My partner asked me to go for testing	
	My employer requested it	
	I was pregnant	10
	Workplace campaign	11
	Other	12

9.9	You indicated that you were previously tested for HIV. Are you willing to tell me the last HIV test result you received?	Yes	No
		1	2
			GO TO 9.18

9.10a	What was the result of that HIV test?	Positive	Negative	Indeterminate	receive result
		1	2	3	4
			GO TO 9.18		

9.10b	What was the month and year of yourfirst HIV positive test? **IF "DON'T KNOW" MONTH, THEN RECORD '88'** **IF "DON'T KNOW" YEAR, THEN RECORD '8888'**	**MONTH**					
		YEAR					

9.11	Are you currently taking ARVS, that is, antiretroviral medications, daily?	Yes	No
		1	2
			GO TO 9.17a

9.12	How long have you been taking daily ARVs? RECORD THE ANSWER IN MONTHS IF LESS THAN ONE YEAR. RECORD '00' IF LESS THAN ONE MONTH.	Number of months		
		Number of years		

9.13	Have you ever missed ARV treatment?	Yes	No
		1	2
			GO TO 9.18

9.14	In the past 30 days, have you missed taking any of your ARV pills?	Yes	No

INSTRUCTION **DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

9.15	Why did you miss your ARV treatment?	
a	Forgotten to take ARVs	1
b	I travelled away from my clinic and could not go to another one	2
c	Health reasons	3
d	I had no money to go to the clinic to pick up my treatment	4
e	Health facility had no stock	5
f	Transport problems	6
g	I decided to stop taking treatment because the treatment makes me sick	7
x	Other reasons	8

9.16	How long were you not taking the treatment?			
		Days		
		Months		

9.17a	Can you tell me the <u>main</u> reason why you are not taking ARVs daily?	
	Have trouble taking a tablet everyday/can't remember	1
	I don't think I need it; I don't feel sick	2
	I fear people will know that I have HIV if I take it	3
	Forgotten to take ARVs	4
	I travelled away from my clinic and could not go to another one	5
	Health reasons	6
	I had no money to go to the clinic to pick up my treatment	7
	Health facility had no stock	8
	Transport problems	9
	I decided to stop taking treatment because the treatment makes me sick	10
	ART makes me fat	
	Other reasons	11

INSTRUCTION	SEXUAL ACTIVITY FILTER (CHECK Q6.1)
HAD SEXUAL PARTNER(S) IN LAST 12 MONTHS	**NO SEXUAL PARTNERS IN LAST 12 MONTHS**

9.18	Now that we have discussed your HIV status, I want you to remember your last sexual partner in the last 12 months that we had discussed earlier. Did you tell this person the results of your last HIV test?	Yes	No	Don't know
		1	2	3

9.19	Have you told all your current sex partner or partners about this test result?	Yes	No	No partner
		1	2	3

9.20	In the past six months, how many sex partners have you had whose HIV status you did not know at the time that you had sex?		
9.21	In the past six months, how many sex partners have you had who did not know your HIV status when you had sex with them?		

9.22	Have you ever taken an HIV test with any of your sex partners where you both received the test results together?	Yes	No
		1	2
		GO TO 9.24	

9.23	What was the main reason why haven't you tested for HIV as couple?	
	Never discussed it	1
	Never discussed it, but decided not to do it	2
	My partner refused to allow me to go for a test	3
	I did want to be tested although my partner wanted to do so	4
	My partner and I already know our status	5
	Don't know where to get couples testing	6
	Other (Specify)	7

INSTRUCTION	HIV TESTING FILTER
NEVER HAD AN HIV TEST	**HAD AN HIV TEST**

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
9.24	What were your reasons for not going for an HIV test?	
a	Do not know where to get tested	
b	Do not think that I have HIV	
c	Not at risk for HIV	
d	Trust partner	
e	Afraid to find out that he/she might be HIV positive	
f	Not ready to have an HIV test	
g	Concerned about CONFIDENTIALITY	
h	Concerned about STIGMA, DISCRIMINATION, or REJECTION	
i	Concerned about LOSING MY JOB	
j	Concerned about the STANDARD OF SERVICE	10
k	Haven't got around to do it	11
l	Other	12

SECTION 10 HIV RISK PERCEPTION

Commented [A10]: HIV Risk Perception

INSTRUCTION	*I am now going to ask you some questions on how you perceive your risk to HIV infection*

INSTRUCTION	READ EACH STATEMENT

10.1	On a scale of 1 to 4 (with 1 being low and 4 being high), how would you rate yourself in terms of risk of becoming infected with HIV?		
	You are definitely going to get infected with HIV	Go to 10.3	4
	You are probably going to get infected	Go to 10.3	3
	You probably won't get infected		2
	You definitely will not get infected with HIV		1

INSTRUCTION	**DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**	
10.2	**What are your reasons for believing so?**	
a	Never had sex before	1
b	Abstain from sex	2
c	Faithful to his/her partner	3
d	Trust his/her partner	4
e	Use condoms	5
f	Know his/her HIV status	6
g	Know the HIV status of his/her partner	7
h	Do not have sex with sex workers/prostitutes	8
i	Protected by ancestors	9
j	Protected by God	10
k	I am not at risk for HIV	11
l	Other	12

INSTRUCTION	**ONCE YOU HAVE ASKED QUESTION 10.2 SKIP TO Q10.4**

INSTRUCTION	**DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**	
10.3	**What are your reasons for believing so?** *(Respondents who answered 3 or 4 in Q10.1)*	
A	Sexually active	1
		2
B	Had many sexual	3
C	Don't use condoms	4
D	Don't always use	5
E	Don't trust his/her	6
F	I am sick	7
G	My partner is sick	8
H	My partner died of AIDS	9
I	Had an accident/cuts	10
	I am is HIV positive	11
J	Othe	

10.4	**Scientists are now studying a medication where, if taken orally every day, can reduce a person's chances of getting HIV infection. If such a medication was available, would you want to take it?**	Yes	No	Don't know
		1	2	3
10.5	**An HIV self-test kit is a method where people can test for HIV in private or at home. If such a kit was available to you, would you be willing to use it to test yourself?**	Yes	No	Don't know
		1	2	3

ALCOHOL USE

Commented [A11]: Alcohol use

The next section contains questions on the use of alcohol

INSTRUCTION	USE THE EXAMPLE BELOW TO HELP YOU UNDERSTAND WHAT A STANDARD UNIT OR A STANDARD DRINK IS:

One standard drink:

A single tot of spirits (like brandy)

(e.g., 25ml at 43%)

A small glass of liqueur or aperitif (e.g., 25ml at 30%)

1 glass of wine (e.g., 120ml at 12%)

Carton of ordinary commercial sorghum beer (e.g., 500ml at 3%)

1 can of ordinary beer (e.g., 340ml at 5%)

11.1	**Have you ever had a drink containing alcohol?**	Yes	No
		1	2
			GO TO 12.1

11.2	**How often did you have a drink containing alcohol in the past 12 months?**				
	Not in the past 12 months	Once a month or less	2-4 times a month	2-3 times a week	4 or more timesa week
	1	2	3	4	5
	GO TO 11.5				

11.3	**How many drinks containing alcohol do you have on a typical day when you are drinking?**				
	1 or 2	3 or 4	5 or 6	7 to 9	14 or more
	1	2	3	4	5

INSTRUCTION 11.4	**READ EACH QUESTION**	**Never**	**Less than monthly**	**Monthly**	**Weekly**	**Daily or almost daily**
a	How often do you have (***for men***) five or more and (***for women***) four or more drinks on one occasion?	1	2	3	4	5
b	How often during the past 12 months were you not able to stop drinking once you had started?	1	2	3	4	5
c	How often during the past 12 monthsdid you fail to do what was normally expected of you because of drinking?	1	2	3	4	5
d	How often during the past 12 months did you need a first drink in the morning to get yourself going after a heavy drinking session?	1	2	3	4	5
e	How often during the past 12 monthsdid you feel guilt or remorse after drinking?	1	2	3	4	5
f	How often during the past 12 months were you unable to remember what happened the night before because of your drinking?	1	2	3	4	5

11.5	Have you or someone else been injured as a result of your drinking?	
No	**Yes,** but not in the past 12 months	**Yes**, during the past 12 months

11.6	As a result of your drinking, have you and others been involved in violence actions and aggression?		
No	**Yes,** but not in the past 12 months	**Yes**, during the past 12 months	
1	2	3	

11.7	Has a concerned relative, friend, doctor, or other health worker ever suggested that you should cut down on your drinking?		
No	**Yes,** but not in the past 12 months	**Yes**, during the past 12 months	
1	2	3	

SECTION 12 USE OF OTHER SUBSTANCES

Commented [A12]: Use of other substances

INSTRUCTION **The next section deals with the use of drugs. I once again want to assure you that the information you give us is combined with all the respondents and we do not analyse the information of one person. I once again want to confirm my earlier guarantee of confidentiality. As**

about the interviews I conduct.

12.1	*In the past three months, how often have you used any of the following substances?*	Never	Once or twice	Monthly	Weekly	Almost daily
a	Cannabis (dagga, marijuana, pot, grass, hash, etc.)	1	2	3	4	5
b	Cocaine (coke, rocks, crack, etc.)	1	2	3	4	5
c	Amphetamine-type stimulants (speed, ecstasy, tik, etc.)	1	2	3	4	5
d	Inhalants (nitrates, glue, petrol, paint thinners, etc.)	1	2	3	4	5
e	Sedatives or sleeping pills (Valium, Mandrax, Serepax, Rohypnol, etc.)	1	2	3	4	5
f	Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)	1	2	3	4	5
g	Opiates (heroin, morphine, methadone, codeine, etc.)	1	2	3	4	5
h	Whoonga (mixture of heroin, dagga and ARVs), Nyaope	1	2	3	4	5
i	Other	1	2	3	4	5

12.2	Some people inject drugs with a needle and syringe for pleasure. Have you ever injected drugs for pleasure?	Yes	No
		1	2

12.3	Besides drugs prescribed by a health professional, have you ever used a drug by injection?		
No, never	**Yes,** in the past 3 months	**Yes**, but not in the past 3 months	
1	2	3	

GO TO 13.1

12.4	Have you ever shared injection needles?		
No, never	**Yes,** in the past 3 months	**Yes**, but not in the past 3 months	
1	2	3	

SECTION 13 HEALTH QUESTIONS

Commented [A13]: Health questions

INSTRUCTION *The next section deals with some questions pertaining to your own health as well services you received in clinics/hospitals or elsewhere. Please remember that your name is not written anywhere and everything you tell me is confidential.*

13.1	In general, would you say that your health is excellent, good, fair, or poor?	
Excellent		
Good		
Fair		
Poor		

13.2	When was the last time you went to see a health professional (doctor, nurse, traditional healer, etc.)?	
Within the past six months		
More than six months but not more than a year ago		
More than one year ago		
Never		

13.3	Where do you usually obtain health care?	
Government hospital	1	
Day hospital/clinic/community health centre	2	
Mobile clinic	3	
Family planning clinic	4	
Private hospital/clinic	5	
Pharmacy	6	
Private doctor	7	
Other private medical	8	
Other	9	

13.4	In the past 12 months, have you been hospitalised for any illness?	Yes	No
		1	2
			GO TO 13.7

13.5	How many times have you been admitted to hospital during the past 12 months?		

13.6	What was the total time you spent in hospital during the past 12 months? (In days)			

13.7	Do you currently have any of the following illnesses?	i. Diagnosed with illness		ii. Are you currently taking medicines for this disease?	
		Yes	No	Yes	No
a	Hypertension/high blood pressure	1	2	1	2
b	Diabetes	1	2	1	2
c	Tuberculosis (TB)	1	2	1	2
d	Cancer	1	2	1	2
e	HIV	1	2	1	2
f	Heart disease	1	2	1	2

13.8	Have you heard about drug treatments that can help reduce the risk of HIV infection if a person has been raped?	Yes	No
		1	2

13.9	Are you covered by a Medical Aid or Medical Benefit Scheme?	Yes	No
		1	2
			GO TO 14.1

13.10	Are your visits to clinic, hospital, or doctor paid for by medical aid?	Yes	No
		1	2

SECTION 14 MENTAL HEALTH

INSTRUCTION ***The next set of questions concern how you have been feeling over the past 30 days***

		None of the time	A little of the time	Some of the time	Most of the time	All of the time
14.1	During the last 30 days, about how often did you feel tired out for no good reason?	1	2	3	4	5
14.2	During the last 30 days, about how often did you feel nervous?	1	2	3	4	5
14.3	About how often did you feel so nervous that nothing could calm you down?	1	2	3	4	5
14.4	About how often did you feel hopeless?	1	2	3	4	5
14.5	During the last 30 days, about how often did you feel restless or fidgety?	1	2	3	4	5
14.6	About how often did you feel so restless you could not sit still?	1	2	3	4	5
14.7	About how often did you feel depressed?	1	2	3	4	5
14.8	During the last 30 days, about how often did you feel that everything was an effort?	1	2	3	4	5

		None of the time	A little of the time	Some of the time	Most of the time	All of the time
14.9	**About how often did you feel so sad that nothing could cheer you up?**	1	2	3	4	5
14.10	**About how often did you feel worthless?**	1	2	3	4	5

INSTRUCTION	***The next set of questions concern how you have been feeling over the past 30 days***

		Not at all	A little	A moderate amount	Very much	An extreme amount
14.11	**How much do you enjoy life?**	1	2	3	4	5
14.12	**How well are you able to concentrate?**	1	2	3	4	5

14.13	**Are you able to accept your bodily appearance?**	Not at all	A little	Moderately	Mostly	Completely
		1	2	3	4	5

14.14	**How satisfied are you with yourself?**	Very dissatisfied	dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
		1	2	3	4	5

14.15	**How often do you have negative feelings such as blue mood, despair, anxiety, depression?**	Never	Seldom	Quite often	Very often	Always
		1	2	3	4	5

SECTION 15	**HOUSEHOLD RELATIONS**

INSTRUCTION	**ONLY ADMINISTERED TO ONE HOUSEHOLD MEMBER** ***READ TO THE RESPONDENT*** ***Now I would like to ask you questions about some other important aspects. You may find some of these questions very personal. However, your answers are crucial for helping us to understand the the condition household relations in South African. Let me assure you that your answers are completely confidential and will not be told to anyone and no one else in your household will know that you were asked these questions.***

15.1a	**Has a sexual partner ever hit you?**	Yes	No
		1	2
			GO TO 15.1c

15.1b	**In the past 12 months, did a sexual partner hit you (with a fist or slap or something else that could hurt you)**	Yes	No
		1	2

15.1c	**Have you ever hit a sexual partner?**	Yes	No
		1	2
			GO TO 15.1e

15.1d	**n the past 12 months, did you hit a sexual partner (with a fist or slap or something else that could hurt them?)**	Yes	No
		1	2

15.1e	**In the past 12 months, did a sexual partner force you to have sex against your wishes by using violence or threatening violence?**	Yes	No
		1	2

15.1f	**In the past 12 months, did you force a sexual partner to have sex with you when he/she didn't want it?**	Yes	No
		1	2

15.1g	**In the past 12 months, was a partner violent towards you when he/she was drunk?**	Yes	No
		1	2

15.1h	**n the past 12 months, did a sexual partner refuse to use a condom during sex, even when you said you wanted to use one?**	Yes	No
		1	2

15.1i	**In the past 12 months have you been to a doctor, hospital or clinic for treatment because you have been injured by a sexual partner?**	Yes	No
		1	2

15.1j	**Do you currently think of yourself as a victim of physical violence by a sexual partner?**	Yes	No
		1	2

SECTION 16 MEDIA, COMMUNICATION AND NORMS

INSTRUCTION ***I am now going to ask you a number of questions about different sources of information and what you think of them***

INSTRUCTION **READ EACH STATEMENT**

16.1	**How often do you do the following?**	**Never**	**Once a week**	**2-6 days a week**	**Every day of the week**
a	Listen to the radio	1	2	3	4
b	Watch television	1	2	3	4
c	Read a print magazine	1	2	3	4

d	Read a print newspaper	1	2	3	4	
e	Use the internet to go onto news sites	1	2	3	4	
f	Use cell phone or the internet to go onto Facebook	1	2	3	4	
g	Use cell phone or the internet to go onto Twitter	1	2	3	4	
h	Use the cell phone or internet to go onto MXit	1	2	3	4	
i	Use cell phone or the internet to go Instagram	1	2	3	4	
j	Use a cell phone to send sms	1	2	3	4	
k	Read leaflets or booklets	1	2	3	4	
l	Downloaded Apps					

Brothers for Life Exposure

16.2	**In the past 12 months have you seen this logo?** ***[Show*** **~~BROTHERS FOR LIFE~~** ***logo]***	Yes	No
		1	2 ***GO TO Q16.4***

16.3	**What does this logo stand for (represent)?**	
	Brothers for Life	1
	Others: (specify)	2
	Don't know	3

INSTRUCTION	**DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

16.4	**Can you tell me all the places where you have heard about or seen BROTHERS FOR LIFE?**	
a	Never heard of it - **SKIP to Q16.6**	1
b	Television	2
c	Radio	3
d	Facebook	4
e	Twitter	5
f	Posters/billboards	6
g	Pamphlets/booklets	7
h	Community event	8
i	Friend or relative	9
j	From an HIV & AIDS organisation	10
k	Clinic or hospital	11
l	Daily Sun newspaper	12

m	Don't remember	13
n	Other (specify)	14

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.6	In the last 12 months have you seen this picture before?	Yes	No
	SHOW SCREEN GRAB OF ZING ADVERT	1	2
			GO TO Q16.8

16.7.	In this advert, what is meant by "get the upgrade that counts"?	
	Circumcise	1
	Circumcise and condomise	2
	Don't know	3

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.8	What is the main message of this advert	
a	Women should talk to men about medical male circumcision.	1
b	Women should talk to other women about encouraging their partners to getcircumcised.	2
c	Women should support their men when they get circumcised	3
d	Men should get circumcised	4
e	Circumcision means getting better sex	5
f	Men who are circumcised should still use condoms	6
g	Healthy relationship.	7
h	People who are circumcised should wait for six weeks before having sex	8

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.9	Why do the women in the advert want their men to get circumcised?	
a	To reduce the risk of HIV	1
B	To reduce the risk of cervical cancer	2
C	To improve their sex life	3
D	Circumcision is more hygienic	4

ZAZI Exposure

16.10	In the past 12 months have you seen this logo?	Yes	No
	[Show pic of ZAZI logo]	1	2
			GO TO Q16.12

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.11	What does this logo stand for (represent)?	
a	ZAZI	1
b	Other: (specify)	2
c	Don't know	3

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.12	Can you tell me all the places where you have heard about or seen ZAZI?	
a	Never heard of it - **SKIP to q16.23**	1
b	Television	2
c	Radio	3
d	Facebook	4
e	Twitter	5
f	Posters/billboards	6
g	Pamphlets/booklets	7
h	Community event	8
i	Friend or relative	9
j	From an HIV & AIDS organisation	10
k	Clinic or hospital	11
l	Daily Sun newspaper	12
m	Don't remember	13
n	Other: (specify)	14

16.13	In the past 12 months have you seen this on television?	Yes	No
	[show picture of Zonke walking with girls following her]	1	2
			GO TO Q16.16

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.14	What do you think was the main message of the television spot? What else?	
a	When you are a (young) woman you must know yourself and stand up foryourself	1
b	Sugar daddies/older men can give young girls HIV and young women must stay away from them	2
c	Young women must use contraceptives and condoms to protect themselvesfrom pregnancy and HIV	3
d	Young women must say no to peer pressure and do the right things for themselves	4
e	Education comes before friends	5
f	Young women must leave men who are abusive to them	6
g	Other (specify)	7

16.15	In the past 12 months have you seen this on television?	Yes	No
	[Show picture of granny and girl at the clinic]	1	2
			GO TO Q16.23

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	

16.17	In this advert, what is going on with the girl at the clinic?	
a	Girl is at the clinic to seek contraception and condoms	1
b	Clinic Sister is showing girl contraceptive methods and condoms	2
c	Clinic Sister is giving girl contraceptive pills and condoms	3
d	Granny sees girl at the clinic with contraceptives and condoms	4
e	Granny affirms girl by tying green scarf around her neck	5
f	Girl shows that she cares about her own future	6
g	Refused/Do not know	7

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	

16.18	What is the main message(s) of this advert?	
a	Girls should get contraceptives if they are sexually active	1
b	Grandmothers/mothers should support their grandchildren to get contraceptives	2
c	Young women have the right to get contraceptives from the clinic	3
d	Young women should use both contraceptives and condoms to prevent pregnancy, STIs, and HIV	4
e	Other	5

16.19	After what you saw in the ZAZI television adverts, who did you talk to?	
a	No one **SKIP to q16.23**	0
a	Friend	1
b	My sexual partner	2
c	A sister	3
d	A daughter or granddaughter	4
e	Other family members	5
f	Other (specify)	6

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
16.20	What did you talk to them about?	
a	The importance of loving oneself and being strong	1
b	Using contraception and condoms to prevent pregnancy and HIV	2
c	Staying away from older men	3
d	Being focused on one's dreams and ignoring peers	4
e	Staying away from or leaving abusive men	5
f	Other (specify)	6

16.21	Please complete the following slogan:
ZAZI, know your……..……..	
16.22	Please complete the following slogan:

My responsibility, my choice, Our……

Siyayinqoba Beat it!

16.23	**In the past 12 months have you heard of "Siyayinqoba Beat it!"?**	Yes 1	No one 2 ***GO TO Q16.27***

INSTRUCTION **DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

	16.24 Can you tell me all the places where you have heard about or seen "Siyayinqoba Beat it!"?	
a	Don't remember	1
b	Television	2
c	Radio	3
d	Branded taxis	4
e	Newspapers	5
f	At a community event / door to door campaign	6
g	At a training	7
h	From a clinic or hospital	8
i	Branded condoms	9
j	Information pamphlets	10
k	Web or mobile media	11
l	Other (specify)	12

16.25	**In the past 12 months have you watched any episodes of *Siyayinqoba Beat It!* on television?**	Yes 1	No 2
16.26	**In the past 12 months have you listened to any episodes of *Siyayinqoba Beat It!* on radio?**	Yes 1	No 2
16.27	**In the past 12 months have you seen this logo?** ***[Show picture 2.29: Siyayinqoba Beat It! logo –]***	Yes 1	No 2
16.28	**In the past 12 months have you seen this?** ***[Show picture 2.30: Siyayinqoba Beat It!* branded taxi *]***	Yes 1	No 2
16.29	**In the past 12 months, have you seen this in a newspaper?** ***[Show picture 2.31: Siyayinqoba Beat It!* newspaper banner *]***	Yes 1	No 2
16.30	**In the past 12 months, have you seen this?**	Yes	No

	[Show picture 2.32: Siyayinqoba Beat It! Branded Condom]	1	2

16.31	**In the past 12 months, have you seen this?**	Yes	No
	[Show picture 2.33: Siyayinqoba Beat It! Information pamphlets]	1	2

16.32	**Can you complete the following slogan? "Protect yourself…." [Correct answer: Protect yourself. Protect others]**	**Able to complete**	**Unable to complete**
		1	2

Inside Story

16.33	**In the past 12 months, have you seen this?**	Yes	No
	[Show pic card for Inside Story]	1	2

16.34	**Have you watched movie Inside Story?**	Yes	No	No sure
		1	2	3
			Go to 16.38	

INSTRUCTION **DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

16.35	**Where did you watch it?**	
a	Television	1
b	At a cinema/film theatre	2
c	At a *World AIDS Day* event	3
d	At a clinic/health centre	4
e	At an event in my community	5
f	At school/university/college	6
g	At work	7
h	I have the DVD/I have borrowed the DVD	8
i	Don't remember	9
j	Other (specify)	10

INSTRUCTION **READ EACH STATEMENT**

16.36	For each of the following statements, tell me whether you think it's true about Inside Story.	True	False	Not sure
a	A young thief goes to prison and has to learn how to survive and turn his life around	1	2	3
b	A young man learns he has HIV	1	2	3
c	A young woman falls pregnant and is forced to leave schooland return to her rural home	1	2	3
d	A young soccer player falls in love with his coach's daughter	1	2	3
e	HIV is shown inside the human body -- how it grows and multiplies and how the immune system and medication fight the infection	1	2	3
f	A young couple have a child and decide whether to marry	1	2	3

16.36	For each of the following statements, tell me whether you think it's true about Inside Story.	True	False	Not sure
g	A young woman learns that she got HIV from her first and only sexual partner	1	2	3
h	Four migrant workers contract drug-resistant tuberculosiswhile working in a goldmine	1	2	3

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.37	From what happens in the story, what do you think was the main message/s of the film?	
a	Having many sexual partners increases one's risk of getting HIV	1
b	It is important to get tested for HIV when you meet a new sexual partner	2
c	It is important to know your HIV status	3
d	Use condoms every time you have sex	4
e	You can be HIV positive and still be successful/happy	5
f	Knowledge is power	6
g	Other (specify)	7
h	Other (specify)	8
i	Other (specify)	9

Soul City

16.38	Have you ever watched Soul City TV?	Yes	No
		1	2 ***GO TO 16.43***

16.39	Have you ever talked to your sexual partner about what you saw on Soul City TV?	Yes	No	No sexual partner
		1	2	3

16.40	Have you ever talked to your peers or friends about what you saw on Soul City TV?	Yes	No
		1	2

16.41	Have you ever talked to your children about what you saw on Soul City TV?	Yes	No	No children
		1	2	3

16.42	In the past 12 months, have you watched Soul City Television	Yes	No
		1	2

16.43	Have you ever watched Rise TV Talk Show?	Yes	No
		1	2

			GO TO 16.46
16.44	Have you ever talked to your sexual partner about what you saw on Rise TV Talk Show?	Yes 1	No 2
16.45	Have you ever talked to your peers or friends about what you saw on Rise TV Talk Show?	Yes 1	No 2
16.46	Are you a member of a Rise Club?	Yes 1	No 2
16.47	Have you ever been a member of a Rise club	Yes 1	No 2
16.48	Have you participated or followed Rise, SoulCity, or SoulCityItsReal on Facebook?	Yes 1	No 2
16.49	Have you participated or followed Rise, SoulCity, or SoulCityItsReal on twitter?	Yes 1	No 2
16.50	Have you participated or followed SoulCity or SoulCityItsReal on MXIT?	Yes 1	No 2
16.51	Have you ever listened to Soul City or Soul City radio talk shows?	Yes 1	No 2
15.52	In the past 12 months, have you seen this logo? [Show pic 10.6.23: Rise logo]	Yes 1	No 2

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE	
16.53	Have you read any of the following booklets in the past 12 months?	
a	Never read	1
b	Phuza Wize	2
c	Dual Contraception	3
d	Soul Sex	4
e	HIV-free babies	5
f	Alcohol and you	6
g	Parenting and alcohol	7
h	Circumcision for Life	8
i	Rise Magazine any edition	9
j	HeartBeat	10
k	Onelove	11
i	Positive Living any edition	12

16.54	Have you ever belonged to a Soul Buddyz Club?	Yes	No

		1	2
			GO TO Q16.56

16.55	**How long were you a member of the Soul Buddyz Club**	1 yr	2 yr	3 yr
		1	2	3

16.56	**Have you participated in a Soul City community dialogue about HIV or other health issues?**	Yes	No
		1	2

16.57	**Have you ever heard of the Thuthuzela Care Centres (TCCs)?**	Yes	No
		1	2

16.58	**Have you participated in any community dialogue about violence against women and the TCCs?**	Yes	No
		1	2

16.59	**Have you participated in any community dialogue about positive living?**	Yes	No
		1	2

INSTRUCTION **READ EACH STATEMENT**

16.60	**In the past 12 months, from where or from whom have you received HIV/AIDS information that has been useful to you personally?**	**Received useful information**	**Did not receive information**
a	A child or learner of school-going age	1	2
b	Faith-based organisation, e.g., church, mosque, synagogue	1	2
c	Workplace	1	2
d	Community meeting	1	2
e	Traditional healer	1	2
f	Peer educator		
g	AIDS or welfare organisation, local NGO or CBO	1	2
h	Government clinic or hospital	1	2
i	Private doctor		
j	Telephone helpline	1	2
k	Pharmacy or chemist	1	2
l	Parent/family member or caregiver	1	2
m	Friend(s)	1	2
n	Television	1	2
o	Radio	1	2
p	Billboards	1	2
q	Signs on taxis/buses/trains	1	2
r	Workplace	1	2
INSTRUCTION	**Only for children at school**	1	2
s	As part of life orientation at school	1	2
t	From a teacher but not as part of life orientation	1	2
u	From Soul Buddyz Club		

16.61	**In the past 12 months, which apply to you?**	**Yes**	**No**

a	Attended a training workshop on HIV/AIDS	1	2
b	Attended a community meeting about HIV/AIDS	1	2
c	Attended play or dialogue or educational event on HIV/AIDS	1	2
d	Attended a clinic discussion on HIV	1	2
e	Know someone who is on ART	1	2
f	Been told by someone you know that they are HIV positive	1	2
g	Helped care for a child whose parents have died of AIDS	1	2

loveLife

16.62	Have you heard about loveLife?	Yes	No
		1	2
			GO TO Q16.67

16.63	Where did you hear about loveLife?	
a	Radio	1
b	TV	2
c	loveLife groundBREAKERs/mpintshis	3
d	School	4
e	Adolescent and Youth Friendly Clinic	5
f	UNCUT	6
g	Y-Centre Academy	7
h	Contact Centre	8
i	ilovelife	9
j	Newspaper/Mmagazine article	10
k	Website	11
i	Sport events	12

16.64	What is loveLife?	
a	South Africa's national HIV prevention programme for young people	1
b	South Africa's youth leadership development organisation	2

16.65	In the past 12 months, have you seen this logo? *(Show Pic no..: loveLife logo)*	Yes	No
		1	2
			If 'No', go *Q16.67*

16.66	What does the logo stand for?	
a	loveLife	1
b	Other (specify)	2
c	Don't Know	3

16.67	Have you read any editions of UNCUT in the last 12 months? In the past 12 months, have you seen this logo? SHOW Pic no. …: :UNCUT PICTURE]	Yes	No
		1	2

		If 'No'. go
16.68	**What do you like about UNCUT?** ***[INSTRUCTION TO INTERVIEWER: More than one response possible] Probe: What else?***	
a	Nothing	1
b	To get information about sex	2
c	To get information about relationships	3
d	To get information about HIV	4
e	To get information on teenage pregnancy	5
f	News about fashion	6
g	Stories about sport	7
h	Stories about popular youth culture	8
i	Hearing other young people's voices	9
j	The pictures	10
i	The book, CD, and DVD reviews	11
k	The puzzles and games	12
l	The pull-out poster	13
m	To access opportunities such as competitions and learnerships	14
n	Other (please specify) ……..	15

16.69	**Where do you usually get your copy of UNCUT?** ***[INSTRUCTION TO INTERVIEWER: More than one response possible] Probe: What else?***	
a	It comes with the newspaper	1
b	I get it from the loveLife clinic/franchise/Y-Centre/Outlet	2
c	From my parent/guardian/older relative	3
d	From my teacher	4
e	From my peers/friends	5
f	Other (please specify)	6

16.70	**Did you discuss what you read with anyone?**	Yes	No
		1	2

16.71	**Have you listened to a loveLife talk show on the radio in the last 12 months?**	Yes	No
		1	2
			Q16.79

16.72	**On which radio stations have you listened to loveLife radio talk shows?** ***INTERVIEWER: [More than one response possible] Probe: What else?***	
a	Ikwekwezi FM	1
b	Lesedi FM	2
c	Ligwalagwala FM	3
d	Motsweding FM	4
e	Munghana Lonene FM	5
f	Phalaphala FM	6

g	Thobela FM	7
h	Ukhozi FM	8
i	Umhlobo Wenene	9
j	Tru FM	10
k	Other (please specify)	11

16.73	On which radio stations have you listened to loveLife radio talk shows? *INTERVIEWER: [More than one response possible] Probe: What else?*		
a	Western Cape:	Valley FM	1
b	Northern Cape:	Radio Riverside	2
c	Northern Cape:	Radio Teemaneng Stereo	3
d	Eastern Cape:	Inkonjane	4
e	Eastern Cape:	Khanya Community Radio	5
f	Eastern Cape:	Lukhanji	6
g	Eastern Cape:	Unique FM	7
h	Eastern Cape:	Unitra Community Radio	8
i	Eastern Cape:	Vukani Community Radio	9
j	Free State:	Karabo FM	10
k	Free State:	Lentswe Community Radio	11
l	Free State:	Mosupatsela FM Stereo	12
m	Free State:	Mozolo FM	13
n	Free State:	Naledi FM	14
o	KwaZulu Natal :	Icora FM	15
p	KwaZulu Natal :	Radio Sunny South	16
q	KwaZulu Natal :	Ugu Youth Radio FM	17
r	KwaZulu Natal :	Zululand FM	18
s	Mpumalanga:	Emalahleni FM	19
t	Mpumalanga:	Radio Bushbuckridge	20
u	Limpopo:	Makhado FM	21
v	Limpopo:	Moutse Community Radio	22
w	Gauteng:	EK FM	23
x	Gauteng:	Mogale FM	24
y	Gauteng:	Thetha FM	25
z	Gauteng:	Voice of Wits (VOWFM)	26
aa	North West:	Radio Mafisa	27
ab	Other (please specify)		28

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.74	What do you like about loveLife Radio Content? [Probe: What else?	
a	Nothing	1
b	To get information about sex	2
c	To get information about relationships	3
d	To get information about HIV	4
e	To get information on teenage pregnancy	5

f	To get information on Youth Unemployment	6
g	Stories about sport	7
h	Stories about popular youth culture	8
i	Hearing other young people's voices	9
j	To get information about medical topics (MMC, etc.)	10
k	The Foxy Chix	11

16.75	How often do you listen to loveLife talk shows on the radio?	
Never		1
Once a week		2
Once a month		3
Once or twice a year		4
Never		5

16.76	Have you ever discussed what you heard on radio with anyone?	Yes	No
		1	2

16.77	Would you listen to loveLife Radio on the internet?	Yes	No
		1	2

16.78	Do you feel loveLife Radio content on SABC stations are too short?	Yes	No
		1	2

16.79	In the last year, have you heard about the loveLife groundBREAKER or Mpintshi programmes?	Yes	No
		1	2
			GO TO 16. 84

16.80	Have you interacted with a groundBREAKER or Mpintshi in any loveLife Programmes in the last year?	Yes	No
		1	2
			GO TO 16.84

INSTRUCTION	DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE

16.81	What are the two greatest benefits for young people in participating in these programmes by groundBREAKERS and Mpintshi	
a	Stipend	1
b	Increasing chances of getting a job after the programme	2
c	Building your confidence	3
d	Passing time and having fun while you wait for the next bog opportunity	4
e	Increasing skills through all the offered trainings	5
f	Don't know	6

16.82	If you are under the age of 25, would you consider becoming a loveLife groundBREAKER and Mpintshi?	
Yes		1

No	2
Above 25	3

16.83	If you are above the age of 25, would you recommend that your friend, younger sibling or child become a loveLife groundBREAKER and Mpintshi?	
	Yes	1
	No	2
	Less than 25	3

16.84	Have you participated in a loveLife programme in the past 12 months?	Yes	No
		1	2
			GO TO 16.86

16.85	Which loveLife programmes have you participated in, in the past 12 months (*MULTIPLE RESPONSES POSSIBLE*)	
a	Don't know	1
b	love4Life	2
c	Living my Life	3
d	Born Free Dialogues	4
e	loveLifeYouth Festivals	5
f	love4life challenge	6
g	loveLife Debates	7
h	iloveLife	8
i	Cyber Ys	9
j	loveLife Games	10
k	Sports	11
l	Gender Based Violence Programme	12
m	Site Events	13
n	Other (specify)	14

16.86	Have you ever called the loveLife Call Centre's Youth line?	Yes	No
		1	2

16.87	Have you ever called the loveLife Call Centre's Parent line?	Yes	No
		1	2

16.88	Have you ever sent a Plz Call Me to loveLife?	Yes	No
		1	2

16.89	IF answered YES to question 1.21, 1.22 & 1.23: How did you feel about your conversation with the loveLife Call Centre?	
	I got the help I needed	1
	I did not get the help I needed	2
	I am not sure	3

16.90		Yes	No

	Have you ever used any other communication channels to contact loveLifes Call Centre, e.g., Mxit, Mizz B, live Webchats etc.	1	2

16.91	**Would you recommend the loveLife Call centre to your family and friends?**	Yes	No
		1	2
		1	2

16.92	**Have you heard of loveLife's Mizz B?**	Yes	No
		1	2

16.93	**Would you like to know more about loveLifes Mizz B and the other Call centre communication channels?**	Yes	No

16.94	**Are you following loveLife on social media?**	Yes	No
		1	2
			Go to Section 17

16.95	**Which platform do you check for updates?**	
a	Facebook	1
b	Twitter	2
c	YouTube	3
d	Mxit	4
e	Instagram	5

16.96	**How much data do you use per month?**	
> 1 Gig		1
500 MB		2
< 300 MB		3

INSTRUCTION	**DO NOT READ OUT OPTIONS. MULTIPLE RESPONSES POSSIBLE**

16.97	**When on the loveLife social media pages, would you like to see updates on:**	
a	Sexual health and reproduction	1
b	Upcoming events	2
c	Job opportunities	3
d	Celebrity news and entertainment	4
e	Youth activism	5
f	Other	6

16.98	**Have you heard of loveLife's mobile website iloveLife.mobi?**	Yes	No
		1	2
			Go to Section 17

16.99	**From which channels did you hear of iloveLife.mobi?**	
Radio		1
groundBREAKERs/ Mpintshi		2

Social Media (Facebook, Twitter, etc.)	3
Via a friend	4
None of the above	5

16.100	**What is your favourite part of iloveLife.mobi?**	
Completing your profile		1
The quizzes		2
Earing points for attending loveLife events		3
Entering competitions		4
Share to Facebook and Twitter		5
None of the above		6

16.101	**Would you recommend other young people register to iloveLife.mobi?**	Yes	No
		1	2

SECTION 17	**MIGRATION**

INSTRUCTION	***The last section contains some questions abourt the geographic mobility and migration of respondents***

17.1	**How long have you been living continuously in (NAME OF CURRENT PLACE OF RESIDENCE)? <u>Record in years</u>** IF LESS THAN ONE YEAR, RECORD '00' IF 'ALWAYS LIVED' RECORD '95' IF 'VISITOR' RECORD '96'		

17.2	**In the past 12 months have you been away from your usual residence for more than one month?**	Yes	No
		1	2

17.3	**In the past week, how many nights have you stayed away from home?**							
	0	1	2	3	4	5	6	7

17.4	**What is your country of birth?**	
South Africa		1
Zimbabwe		2
Lesotho		3
Botswana		4
Swaziland		5
Mozambique		6
Other Southern African country		7
Central African country (e.g., Congo, Cameroon)		8
West African country (e.g., Nigeria)		9\
North African country (e.g. Morocco, Algeria)		10
South Asian country (India, Pakistan, Bangladesh)		11
East Asian country (China, Taiwan)		12
Country in the Americas (US, Canada, Argentina)		13
Country in Europe (UK, Netherlands, Portugal, Italy)		14
Other		15

17.5	If not born in South Africa, how long have you been living in South Africa?
Number of years?	……..yrs
If born in South Africa, write "99"	

17.6a	What is your current nationality? By that I mean which country issued your passport of ID document.
South Africa	01
Other	02
If Other, write down the name of the country …….	

17.6b	If not born in South Africa, what kind of international migrant do you consider yourself to be?
Documented migrant	1
Undocumented migrant	2
Asylum seeker	2
Refugee	4
Other	5

INSTRUCTION 17.7	Which of the following describes your race?			
African	White	Coloured	Indian/Asian	Other
1	2	3	4	5

THANK YOU VERY MUCH FOR AGREEING TO PARTICIPATE AND ASSIST US IN THIS IMPORTANT RESEARCH PROJECT.

INTERVIEW ENDING TIME:			:	

INSTRUCTION 18.1	WHAT IS THE PERSON NUMBER OF THE PARTNER OF THIS PERSON? (Get the person number from the VP questionnaire)?		

INSTRUCTION 18.2	WHAT IS THE QUESTIONNAIRE NUMBER OF THE PARTNER OF THIS PERSON? (Get the number from the individual questionnaire)?					

Appendix F: Approval letter for 2012 National survey

Human Sciences Research Council

Lekgotla la Dinyakisišo tša Semahlale tša Setho
Raad vir Geesteswetenskaplike Navorsing
Umkhandlu Wezokucwaninga Ngesayensi Yesintu
Ibhunga Lophando Ngenzulu-Lwazi Kantu

RESEARCH ETHICS COMMITTEE
ADMINISTRATION

Room 1418 –
HSRC Building134
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PretoriaGauteng,
South Africa

Tel: 27 12 3022006/2012 - Fax: 27 12 3022005

Email: jebotha@hsrc.ac.za - Website: www.hsrc.ac.za

REC tollfree no 0800 212 123

10 December

2010 Prof

Thank you for your application for ethics approval of the above study. This was considered bythe Research Ethics Committee at its meeting on 17 November 2010. Provisional ethics clearance of the study was granted, pending only the receipt of letters of permission from relevant stakeholders:

Principal investigator: Prof Leickness Simbayi

Organisation: Human Sciences Research Council**FWA**

number: 0000 6347

IRB number: 0000 3962

Cooperative agreement name: "Improve Capacity of an Indigenous Institute to Enhance M&E of HIV/AIDS in South Africa"

Cooperative agreement number: U2G/PS00570-04

Protocol title: The Fourth South African National HIV, Behaviour and Health Survey, 2011 (SABSSM IV)

Protocol version: 3.0

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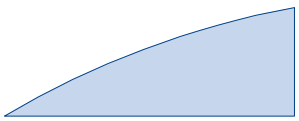

Additional materials reviewed and approved by the REC:

Consent forms:

a. Head of Household

b. 18 years and older

c. Parent/guardian of children 17 years and younger

Assent forms:

a. Children aged 12 to 17 years of age

b. Children aged 7 to 11 years of age

Questionnaires:

a. Household questionnaire

b. 18 years and older

c. 12 to 14 year olds

d. Parents/guardians of children aged 11 years and younger

Protocol approval date: 10 December 2010

Date of expiry of protocol approval: 31 December 2011

The Committee wishes you success in your research.

Yours sincerely,

Signed by candidate

Prof. D R Wassenaar PhD
Chairperson: HSRC REC

Appendix G: Approval letter for 2017 National survey

Human Sciences Research Council

Lekgotla la Dinyakisišo tša Semahlale tša Setho
Raad vir Geesteswetenskaplike Navorsing
Umkhandlu Wezokucwaninga Ngesayensi Yesintu
Ibhunga Lophando Ngenzulu-Lwazi Kantu

Research Coordination, Ethics and Integrity (ReCEI)

RESEARCH ETHICS COMMITTEE ADMINISTRATION

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Gauteng, South Africa
Tel: 27 12 3022012 - Fax: 27 12 3022005

Email: ksithole@hsrc.ac.za - Website: research.ethics@hsrc.ac.za

REC toll free no 0800 212 123

17 April 2017

To: Prof Leickness Simbayi

Deputy Chief Executive Officer for Research
Human Sciences Research Council

Private Bag X41
Pretoria,

0001

South Africa

Dear Prof Simbayi

Renewal and Amendment to Protocol No REC 4/18/11/15: THE FIFTH SOUTH AFRICAN NATIONAL HIV PREVALENCE, INCIDENCE AND BEHAVIOUR SURVEY, 2016

Thank you for your application for ethics approval of the amendments to the above study. The HSRC REC has considered and noted your application dated 12 April 2017.

The amendments to accommodate other HIV viral load testing platforms are approved; the study is given full ethics Approval and may begin as from 17 April 2017.

Principal investigator: Prof Leickness Simbayi

Organisation: Human Sciences Research Council

FWA number: 0000 6347

IRB number: 0000 3962

Cooperative Agreement number: 1U2GGH001629-02

Pretoria Office: 134 Pretorius Street, Pretoria, 0002, South Africa. Private Bag X41, Pretoria, 0001, South Africa.

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Pietermaritzburg Office: Old Bus Depot, Mbubu Road, Sweetwaters. PO Box 90, Msunduzi, 3200, South Africa.

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www.hsrc.ac.za

Protocol title: THE FIFTH SOUTH AFRICAN NATIONAL HIV PREVALENCE, INCIDENCE AND BEHAVIOUR SURVEY, 2016 (SABSSM V)

Protocol version: 3.1

Protocol date: 12 April 2017

Protocol approval date: 17 April 2017

Date of expiry of protocol approval: 12 April 2018

The Committee wishes you success in your research.

Yours sincerely,

Signed by candidate

Prof. D R Wassenaar PhD
Chairperson: HSRC REC

Appendix H: Household information sheet and consentform

(Flesch-Kincaid Grade level 8.7)

THE SOUTH AFRICAN NATIONAL HIV, BEHAVIOUR, AND HEALTH SURVEY, 2016

Dear Head of Household

Hello. My name is .....

I would like to tell you about study called: *HIV, Behaviour and Health Survey*, which is conducted by a group of research organisations that are led by the Human Sciences Research Council (HSRC). Thisis the fifth study; the other four were done in 2002, 2005, 2008 and 2012. Now we are contacting people from your community to answer some questions, which we hope will assist with coming up with effective ways to improve the health of South Africans.

We are unable to visit all the houses in the country and therefore we have selected 15,000 houses fromdifferent areas in the country.

We would like to talk all the people in your house and this means we will visit your home several times, depending on the number of people and their availability.

The purpose of this first visit is:

- To tell you what the study is about and to ask your go-ahead to talk to your family members
- If you agree to take part in the study I will ask you some questions about your house and there is a set of questions for each person in the house including yourself.
- The general questions about your house will take about 45 minutes to complete.

You and your family will decide on the best day and time for us to talk to your family members at your house. It will take 45 and 90 minutes to complete by each person in the house.

After the interview, all people aged 2 years and older will be asked by a nurse to allow her to take a few drops of blood from a finger prick on a special paper. Babies under 2 years of age will provide a few drops of blood from a heel prick. Some people might feel uncomfortable, but the tests do not cause anydanger. The nurses will use clean and safe instruments. The drops of blood will be dried on the specialpaper which will be sent to a laboratory to test for HIV. There will be some discomfort and possible bruising at the site where the blood was obtained but the test is not dangerous.

Family members who want to know their HIV status will be tested using rapid HIV tests. They will also be provided with pre-test and post-test counselling. If any family member test HIV positive he/she will be referred to nearby community clinics for another test and assessment to see if they are ready for HIVtreatment.

Family members who agree to take part will be asked to give us permission to use the blood sample for the current and ongoing research.

If you or any of your family members is interested in knowing their HIV test result and do not want to have them by using our on-site HIV counselling services, we will give you or them a voucher to take to

the nearest community clinic. This voucher will have a special participant number that will assist clinic staff to correctly link the HIV results to the voucher. Also this voucher will include the sex and age of participant, date of result collection, and the name and address of selected clinic. The clinic staff is aware of the study and will gladly assist you or someone within the household, all that needs to be done is to present the voucher at the clinic

Please understand that you are not being forced to take part in this study. You may refuse to answer specific questions that make you feel uncomfortable and you may also ask us to stop with the interview at any time.

You may also decide to stop to answering the questions at any time during the interview.

Your answers will remain confidential and there will be no after-effects related to your answers. Your name will not be written down or recorded in any way.

If I ask you a question which makes you feel sad or upset, we can stop and talk about it a little. There are also people from..... (*this will be adapted based on organizations operating in the area.*)

who have said they are happy to talk with you about those things that upset you, if you need any assistance later.

Are there any questions that you have regarding the study and consent process?

Who to contact if you have been harmed or have any concerns

This research has been approved by the HSRC Research Ethics Committee (REC). If you have any complaints about how the study was conducted or feel that you have been harmed in any way by taking part in this study, please call the HSRC's toll-free ethics hotline 0800 212 123 (when phoned from a landline from within South Africa) or contact the Human Sciences Research Council REC Administrator, on Tel 012 302 2012 or send an e-mail to research.ethics@hsrc.ac.za

If you have any questions about the research you may call the project leaders Mr Sean Jooste at 021466 7942, Ms Alicia North at 021 466 7954 or Mr Shandir Ramlagan at 012 302 2635.

Your contribution and that of your family members is highly valued.

Thank you for your time.

Yours sincerely

Prof Leickness Simbayi
Overall Principal Investigator
Cape Town

Tel: (021) 466 7920

Fax: (021) 466 7831

CONSENT

I agree to take part in the HIV, Behaviour and Health study. . I have not been forced to take part in this study. I know that I can stop part taking at any point if I feel so and that will not put me or my family in danger. I know that I am not going to receive anything from the interviewers but

I understand that the answers that I provide will be stored electronically and will be used forresearch purposes now or at a later stage. I also had a chance to ask questions and share my concerns about the study

……..

Signature of participant **Date**:……..

……..

Signature of witness **Date:……**

The extra copy of the consent form is for you to

Appendix I: Information Sheet and Consent Form:Participants aged 18 years and older

(Flesch-Kincaid Reading Grade level 8.7)

THE SOUTH AFRICAN NATIONAL HIV, BEHAVIOUR, AND HEALTH SURVEY, 2016

Dear Participant

Hello. My name is .....

I would like to tell you about the study called: *South African National HIV, Behaviour and Health Survey*, which is conducted by a group of research organisations that are led by the Human Sciences Research Council (HSRC). This is the fifth study; the other four were done in 2002, 2005, 2008 and 2012. We are contacting people from your community to answer some questions, which we hope will assist with coming up with effective ways to improve the health of South Africans.

Due to the nature of the study we are unable to visit all the houses in South Africa and therefore we have selected 15, 000 homes from different areas in the country. You are not being forced to take part in this study but we would really appreciate it if you can share your thoughts with us. You may refuse to answer specific questions that make you feel uncomfortable and you may also ask us to stop with theinterview at any time.

Your answers will remain confidential and there will be no after-effects related to your answers. Your name will not be written down or recorded in any way.

Although the head of this house/parent has given us a go-ahead to talk to the all members, we also needyou to agree to take part in the study. The interview will take between 45 and 90 minutes to complete.

Some questions can make you feel uncomfortable. You can decide not to answer them, but we would really like to get as many true answers as we can. There are no right and wrong answers, so feel free tosay that which you know.

If I ask you a question which makes you feel sad or upset, we can stop and talk about it. There are also people from .....(*this will be adapted based on organizations operating in the area.*) Who

have said they are happy to talk with you about those things that upset you, if you need any assistance later.

After the interview I will ask you to allow me to take a few drops of blood from a finger prick on a special paper. Collecting the blood drops will take about 10 minutes. You will feel some minor discomfort and possible bruising at the site where the blood was obtained but the test is not dangerous.The interviewers have been properly trained to obtain a sample and they use clean and safe instruments.The drops of blood will be dried on this special paper which will be sent to a laboratory to test for HIV.

If you want to know your HIV status we will give you a chance to take the HIV test. You will also l receive pre-test and post-test counselling. If you test HIV positive, you will be referred to your community clinic to make sure that the HIV test result you received is correct. If HIV test result is positive, health care workers will check if you are ready to take HIV medication or not.

If you are interested in knowing their HIV test result and do not want to have them by using our on-site HIV counselling services, we will give you the HIV Results Request Voucher to take to the nearest community clinic. This voucher will have a special participant number that will assist clinic staff to correctly link the HIV results to the voucher. Additionally information on the voucher will include thesex and age of participant, date of result collection, and the name and address of selected clinic. The clinic staff is aware of the study and will gladly assist you or someone within the household, all that needs to be done is to present the voucher at the clinic

I would also like to request your permission that your blood sample be used for the current and ongoing research. Testing the dried blood drops will assist us to establish the following:

- Number of people that are recently infected with HIV
- Number of people that are already living with HIV
- Number of people that are taking HIV treatment
- How many people have possible resistance to HIV treatment
- What other illness that people already have that could make it difficult for them to cope with HIV treatment
- Possible future testing for chronic diseases

Are there any questions that you have regarding the study and consent process?

Who to contact if you have been harmed or have any concerns

This research has been approved by the HSRC Research Ethics Committee (REC). If you have any complaints about how the study was conducted or feel that you have been harmed in any way by taking part in this study, please call the HSRC's toll-free ethics hotline 0800 212 123 (when phoned from a landline from within South Africa) or contact the Human Sciences Research Council REC Administrator, on Tel 012 302 2012 or send an e-mail to research.ethics@hsrc.ac.za .

If you have any questions about the research you may call the project leaders Mr Sean Jooste at021 466 7942, Ms Alicia at 021 466 7954 or Mr Shandir Ramlagan at 012 302 2635.

We value your participation in this

study.Thank you for your time.

Yours sincerely

Prof Leickness Simbayi
Principal Investigator
Cape Town

Tel: (021) 466 7920

Appendix J: Author Guidelines for submission to AIDS and Behaviour journal

AIDS and Behaviour

Instructions for Authors

Manuscript Submission

Manuscript Submission

Submission of a manuscript implies: that the work described has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities – tacitly or explicitly – at the institute where the work has been carried out. The publisher will not be held legally responsible should there be any claims for compensation.

Permissions

Authors wishing to include figures, tables, or text passages that have already been published elsewhere are required to obtain permission from the copyright owner(s) for both the print and online format and to include evidence that such permission has been granted when submitting their papers. Any material received without such evidence will be assumed to originate from the authors.

Online Submission

Please follow the hyperlink "Submit manuscript" and upload all of your manuscript files following the instructions given on the screen.

Source Files

Please ensure you provide all relevant editable source files at every submission and revision. Failing to submit a complete set of editable source files will result in your article not being considered for review. For your manuscript text please always submit in common word processing formats such as .docx or LaTeX.

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Title Page

Please make sure your title page contains the following information.

Title

The title should be concise and informative.

Author information

- The name(s) of the author(s)

- The affiliation(s) of the author(s), i.e. institution, (department), city, (state), country
- A clear indication and an active e-mail address of the corresponding author
- If available, the 16-digit ORCID of the author(s)

If address information is provided with the affiliation(s) it will also be published.

For authors that are (temporarily) unaffiliated we will only capture their city and country of residence, not their e-mail address unless specifically requested.

Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript. The use of an LLM (or other AI-tool) for "AI assisted copy editing" purposes does not need to be declared. In this context, we define the term "AI assisted copy editing" as AI-assisted improvements to human-generated texts for readability and style, and to ensure that the texts are free of errors in grammar, spelling, punctuation and tone. These AI-assisted improvements may include wording and formatting changes to the texts, but do not include generative editorial work and autonomous content creation. In all cases, there must be human accountability for the final version of the text and agreement from the authors that the edits reflect their original work.

Abstract

Please provide an abstract of 150 to 250 words. The abstract should not contain any undefined abbreviations or unspecified references.

Please note: For some articles (particularly, systematic reviews and original research articles), 250 words may not be sufficient to provide all necessary information in the abstract. Therefore, the abstract length can be increased from the 250-word limit (to up to 450 words) if the topic dictates, and to allow full compliance with the relevant reporting guidelines.

For life science journals only (when applicable)

- Trial registration number and date of registration for prospectively registered trials
- Trial registration number and date of registration, followed by “retrospectively registered”, for retrospectively registered trials

Keywords

Please provide 4 to 6 keywords which can be used for indexing purposes.

Acknowledgements

An Acknowledgment section may be included to acknowledge, for example, people who have assisted with aspects of the work (but who do not qualify as authors), disclaimers, collaborations, etc.

Statements and Declarations

The following statements should be included under the heading "Statements and Declarations" for inclusion in the published paper. Please note that submissions that do not include relevant declarations will be returned as incomplete.

- **Competing Interests:** Authors are required to disclose financial or non-financial interests that are directly or indirectly related to the work submitted for publication. Please refer to “Competing Interests and Funding” below for more information on how to complete this section.

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Text

Text Formatting

Manuscripts should be submitted in Word.

- Use a normal, plain font (e.g., 10-point Times Roman) for text.
- Use italics for emphasis.
- Use the automatic page numbering function to number the pages.
- Do not use field functions.
- Use tab stops or other commands for indents, not the space bar.
- Use the table function, not spreadsheets, to make tables.
- Use the equation editor or MathType for equations.
- Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).

Headings

Please use no more than three levels of displayed headings.

Abbreviations

Abbreviations should be defined at first mention and used consistently thereafter.

Footnotes

Footnotes can be used to give additional information, which may include the citation of a reference included in the reference list. They should not consist solely of a reference citation, and they should never include the bibliographic details of a reference. They should also not contain any figures or tables.

Footnotes to the text are numbered consecutively; those to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data). Footnotes to the title or the authors of the article are not given reference symbols.

Always use footnotes instead of endnotes.

Acknowledgments

Acknowledgments of people, grants, funds, etc. should be placed in a separate section on the title page. The names of funding organizations should be written in full.

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References

Citation

Reference citations in the text should be identified by numbers in square brackets. Some examples:

1. Negotiation research spans many disciplines [3].

2. This result was later contradicted by Becker and Seligman [5].

3. This effect has been widely studied [1-3, 7].

Reference list

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text.

The entries in the list should be numbered consecutively.

If available, please always include DOIs as full DOI links in your reference list (e.g. “https://doi.org/abc”).

- Journal article

Smith JJ. The world of science. Am J Sci. 1999;36:234–5.

- Article by DOI

Slifka MK, Whitton JL. Clinical implications of dysregulated cytokine production. J Mol Med. 2000; https://doi.org/10.1007/s001090000086

- Book

Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

- Book chapter

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. pp. 251–306.

- Online document

Doe J. Title of subordinate document. In: The dictionary of substances and their effects. Royal Society of Chemistry. 1999. http://www.rsc.org/dose/title of subordinate document. Accessed 15 Jan 1999.

Always use the standard abbreviation of a journal's name according to the ISSN List of Title Word Abbreviations, see

ISSN.org LTWA

If you are unsure, please use the full journal title.

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Tables

- All tables are to be numbered using Arabic numerals.
- Tables should always be cited in text in consecutive numerical order.
- For each table, please supply a table caption (title) explaining the components of the table.
- Identify any previously published material by giving the original source in the form of a reference at the end of the table caption.
- Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

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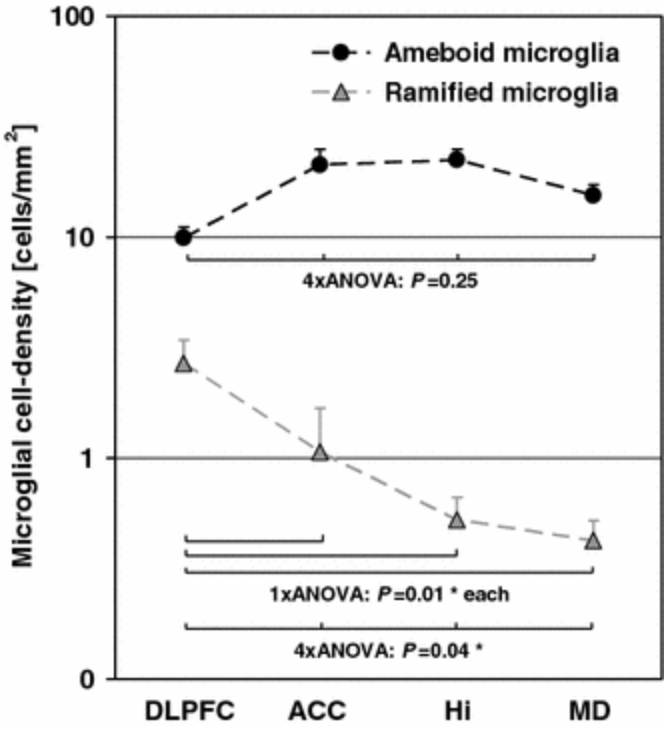
Artwork and Illustrations Guidelines

Electronic Figure Submission

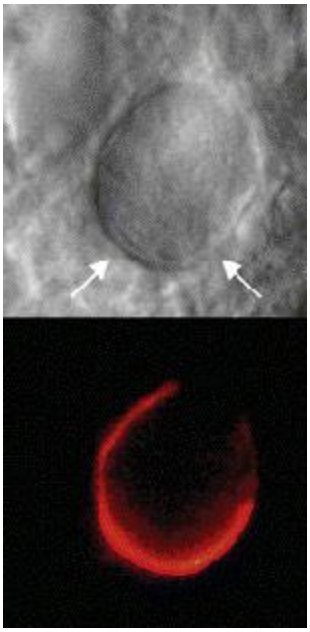
- Supply all figures electronically.
- Indicate what graphics program was used to create the artwork.
- For vector graphics, the preferred format is EPS; for halftones, please use TIFF format. MSOffice files are also acceptable.
- Vector graphics containing fonts must have the fonts embedded in the files.
- Name your figure files with "Fig" and the figure number, e.g., Fig1.eps.

Line Art



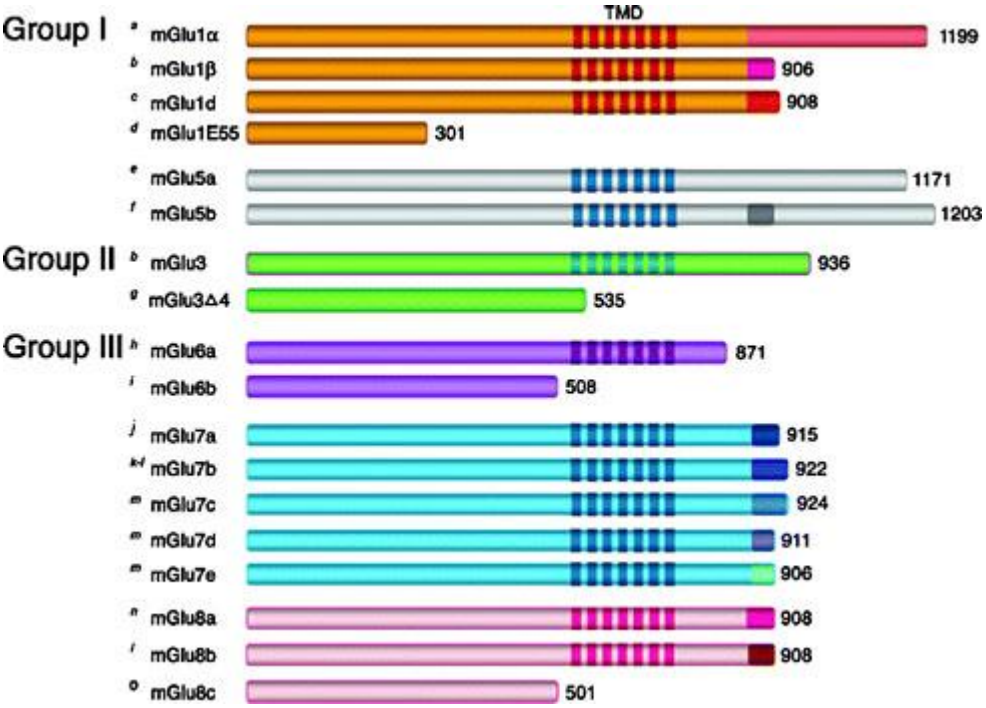
- Definition: Black and white graphic with no shading.
- Do not use faint lines and/or lettering and check that all lines and lettering within the figures are legible at final size.
- All lines should be at least 0.1 mm (0.3 pt) wide.
- Scanned line drawings and line drawings in bitmap format should have a minimum resolution of 1200 dpi.
- Vector graphics containing fonts must have the fonts embedded in the files.

Halftone Art



- Definition: Photographs, drawings, or paintings with fine shading, etc.
- If any magnification is used in the photographs, indicate this by using scale bars within the figures themselves.
- Halftones should have a minimum resolution of 300 dpi.

Combination Art



- Definition: a combination of halftone and line art, e.g., halftones containing line drawing, extensive lettering, color diagrams, etc.
- Combination artwork should have a minimum resolution of 600 dpi.

Color Art

- Color art is free of charge for online publication.
- If black and white will be shown in the print version, make sure that the main information will still be visible. Many colors are not distinguishable from one another when converted to black and white. A simple way to check this is to make a xerographic copy to see if the necessary distinctions between the different colors are still apparent.
- If the figures will be printed in black and white, do not refer to color in the captions.
- Color illustrations should be submitted as RGB (8 bits per channel).

Figure Lettering

- To add lettering, it is best to use Helvetica or Arial (sans serif fonts).
- Keep lettering consistently sized throughout your final-sized artwork, usually about 2–3 mm (8–12 pt).
- Variance of type size within an illustration should be minimal, e.g., do not use 8-pt type on an axis and 20-pt type for the axis label.
- Avoid effects such as shading, outline letters, etc.
- Do not include titles or captions within your illustrations.

Figure Numbering

- All figures are to be numbered using Arabic numerals.
- Figures should always be cited in text in consecutive numerical order.
- Figure parts should be denoted by lowercase letters (a, b, c, etc.).
- If an appendix appears in your article and it contains one or more figures, continue the consecutive numbering of the main text. Do not number the appendix figures,"A1, A2, A3, etc." Figures in online appendices [Supplementary Information (SI)] should, however, be numbered separately.

Figure Captions

- Each figure should have a concise caption describing accurately what the figure depicts. Include the captions in the text file of the manuscript, not in the figure file.
- Figure captions begin with the term Fig. in bold type, followed by the figure number, also in bold type.

- No punctuation is to be included after the number, nor is any punctuation to be placed at the end of the caption.
- Identify all elements found in the figure in the figure caption; and use boxes, circles, etc., as coordinate points in graphs.
- Identify previously published material by giving the original source in the form of a reference citation at the end of the figure caption.

Figure Placement and Size

- Figures should be submitted within the body of the text. Only if the file size of the manuscript causes problems in uploading it, the large figures should be submitted separately from the text.
- When preparing your figures, size figures to fit in the column width.
- For large-sized journals the figures should be 84 mm (for double-column text areas), or 174 mm (for single-column text areas) wide and not higher than 234 mm.
- For small-sized journals, the figures should be 119 mm wide and not higher than 195 mm.

Permissions

If you include figures that have already been published elsewhere, you must obtain permission from the copyright owner(s) for both the print and online format. Please be aware that some publishers do not grant electronic rights for free and that Springer will not be able to refund any costs that may have occurred to receive these permissions. In such cases, material from other sources should be used.

Accessibility

In order to give people of all abilities and disabilities access to the content of your figures, please make sure that

- All figures have descriptive captions (blind users could then use a text-to-speech software or a text-to-Braille hardware)
- Patterns are used instead of or in addition to colors for conveying information (colorblind users would then be able to distinguish the visual elements)
- Any figure lettering has a contrast ratio of at least 4.5:1

Generative AI Images

Please check Springer's policy on generative AI images and make sure your work adheres to the principles described therein.

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Supplementary Information (SI)

Springer accepts electronic multimedia files (animations, movies, audio, etc.) and other supplementary files to be published online along with an article or a book chapter. This feature can add dimension to the author's article, as certain information cannot be printed or is more convenient in electronic form.

Before submitting research datasets as Supplementary Information, authors should read the journal's Research data policy. We encourage research data to be archived in data repositories wherever possible.

Submission

- Supply all supplementary material in standard file formats.
- Please include in each file the following information: article title, journal name, author names; affiliation and e-mail address of the corresponding author.
- To accommodate user downloads, please keep in mind that larger-sized files may require very long download times and that some users may experience other problems during downloading.
- High resolution (streamable quality) videos can be submitted up to a maximum of 25GB; low resolution videos should not be larger than 5GB.

Audio, Video, and Animations

- Aspect ratio: 16:9 or 4:3
- Maximum file size: 25 GB for high resolution files; 5 GB for low resolution files
- Minimum video duration: 1 sec
- Supported file formats: avi, wmv, mp4, mov, m2p, mp2, mpg, mpeg, flv, mxf, mts, m4v, 3gp

Text and Presentations

- Submit your material in PDF format; .doc or .ppt files are not suitable for long-term viability.
- A collection of figures may also be combined in a PDF file.

Spreadsheets

- Spreadsheets should be submitted as .csv or .xlsx files (MS Excel).

Specialized Formats

- Specialized format such as .pdb (chemical), .wrl (VRML), .nb (Mathematica notebook), and .tex can also be supplied.

Collecting Multiple Files

- It is possible to collect multiple files in a .zip or .gz file.

Numbering

- If supplying any supplementary material, the text must make specific mention of the material as a citation, similar to that of figures and tables.
- Refer to the supplementary files as “Online Resource”, e.g., "... as shown in the animation (Online Resource 3)", “... additional data are given in Online Resource 4”.
- Name the files consecutively, e.g. “ESM_3.mpg”, “ESM_4.pdf”.

Captions

- For each supplementary material, please supply a concise caption describing the content of the file.

Processing of supplementary files

- Supplementary Information (SI) will be published as received from the author without any conversion, editing, or reformatting.

Accessibility

In order to give people of all abilities and disabilities access to the content of your supplementary files, please make sure that

- The manuscript contains a descriptive caption for each supplementary material
- Video files do not contain anything that flashes more than three times per second (so that users prone to seizures caused by such effects are not put at risk)

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Please check Springer’s policy on generative AI images and make sure your work adheres to the principles described therein.