MBONGOLWANE & ESHOWE HIV IMPACT IN POPULATION SURVEY

(2nd survey) 2018

Survey Report

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired immunodeficiency syndrome
ANC	Ante Natal Care
ART	Antiretroviral therapy
ARV	Antiretroviral drug
CCMDD	Central Chronic Medication Dispensing and Distribution
CD4	Cluster of Differentiation 4
CDC	Centre for Disease Control
CHAPS	Community Health Agent Programme
CI	Confidence Interval
CLS	Clinical Laboratory Services
DEFF	Design Effect
DHS	Demographic and Health Survey
DOH	Department of Health
DR	Drug Resistant
EIA	Enzyme-Immuno-Acid
FRR	False Recent Rate
GPS	Global Positioning System
HCT	HIV counselling and testing
HIV	Human immunodeficiency virus
HIV-RNA	Human immunodeficiency virus – Ribonucleic acid
HREC	Human Research Ethics Committee Capital R on Research
HSA	Health Service Areas
IQR	Interquartile range
KZN	KwaZulu-Natal
LAg-Avidity	Limiting Antigen Avidity

LIMS	Laboratory Information Management Systems
MDRI	Mean Duration of Recent Infection
MMC	Medical Male Circumcision
MSF	Médecins Sans Frontières
NICD	National Institute for Communicable Diseases
ODn	Normalized Optical Density
OST	Oral Self Testing
PI	Principal Investigator
PLHIV	People living with HIV
PMTCT	Prevention mother-to-child transmission
PuP	Pick up Points
PY	Persons-Year
RITA	Recent Infection Testing Algorithm
RNA	Ribonucleic acid
SAL	Small area layer
STI	Sexually Transmitted Infections
TB	Tuberculosis
UCT	University of Cape Town
UNAIDS	Joint United Nations Programme on HIV/AIDS
UTT	Universal Test and Treat
VL	Viral Load
VLS	Viral Load Suppression
WB	Western Blot
WHC	Wits Health Consortium
WHO	World Health Organization

DEFINITIONS

Avidity tests	Test for strength of antibody response to HIV antigens (weaker response is evidence of recent HIV infection)
HIV positive/negative	HIV status defined by serological rapid HIV test algorithm
Head of household	Person who is running a household and looking after the dependents
Household	Group of people who live together and provide themselves jointly with food and/or other essentials for living, or a single person who lives alone
Household representative	Person willing to answer to the household questionnaire in case the head of household is absent, who is validated by the other members of the household
Incidence assays	Assays which determine whether HIV seropositive individuals likely acquired infection recently or have long term infection
Mean RITA duration	The average length of time that people with newly acquired infection in the population are to be classified by the RITA as having recently acquired infection
Regular resident member of the household	A person who belongs to the household and lived within it for an average of 4 or more nights a week in the last month
Non-regular resident member of the household	A person who belongs to the household and did not live within it for an average of 4 or more nights a week in the last month
Long-standing infection	Cases classified as non-recently infected through the RITA with a ODn > 2.0 and HIV-RNA VL > 75.copies/ml OR HIV-RNA VL ⩽ 75 copies/ml
Place of usual residence	The place where the person spent 4 nights a week on average in the last 2 weeks
Recent infection	Cases classified as recently infected through the RITA with a ODn ⩽ 2.0 and HIV-RNA VL > 75 copies/ml
Visitor	Person who slept in the house the night preceding the interview but who is not a regular resident. He can be therefore a member of the household or not.

COLLABORATIVE INSTITUTIONS, SURVEY INVESTIGATORS AND ROLES

Epicentre Cape Town, South Africa and Paris, France	**Nolwenn Conan** Principal Investigator	Survey oversight Substantial input into survey design, protocol development and implementation, data management and analysis, report writing and publications.
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	Erica Simons Field study coordinator	Coordination of the study in the field
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SUMMARY

Despite a major increase in the South Africa's antiretroviral treatment (ART) coverage and a reduction in mortality of AIDS-related causes since 2010, the overall national prevalence among 15-49 year olds is 21%. It reaches 27% in the province of KwaZulu Natal which is more than two fold higher than the corresponding HIV prevalence rates in the Western Cape and the Northern Cape provinces. In 2013, Médecins sans Frontières (MSF), Epicentre, and the Department of Health (DoH) implemented a population based survey to assess parameters of the HIV epidemic in the sub-districts of Eshowe/Mbongolawne, where MSF has been working since 2011. The findings of that survey helped MSF and the DoH to implement activities and adapt strategies in the sub-districts. In a context where "Universal Test and Treat" (UTT) strategy has been implemented since 2016 and following five years of implementation activities, it was expected that the HIV positive status awareness, ART coverage and viral load (VL) suppression would have improved in this setting, leading to a decreased HIV-transmission and consequently a reduction in HIV incidence. Consequently a similar survey was implemented five years after the first one, as part of an evaluation of the changes in the HIV epidemic and the cascade of care since 2013.

A cross-sectional population survey using a two- stage cluster sampling design was implemented in Eshowe/Mbongolwane, KwaZulu Natal, South Africa. Eligible individuals were resident of Eshowe/Mbongolwane or a visitor of the household, aged between 15 and 59 years. Consenting participants were interviewed and tested for HIV at home. For individuals who tested HIV positive at the time of the survey, a VL test, CD4 count and HIV Lag-avidity assay (that allowed for estimation of the HIV incidence) were conducted. Outcomes were calculated with corresponding 95% CI and stratified by age group and sex. We used as the viral load suppression (VLS) definition a VL result <1000 copies/ml. Advanced-HIV was defined as CD4 <200 cells/µl.

In the 2018 survey, 4,109 individuals (62% women) living in 1,795 houses were eligible and 3,286 (66% women) were included. The overall inclusion rate was 80% compared to 84.5% in 2013.

The overall sex ratio (M/F) was 0.51 in the 2018 survey and 0.60 in the 2013 survey. This ratio was lower from 25 years of age and upwards, as in 2013, probably due to migration of men to urban areas for job seeking. Socio-demographic characteristics of the household in 2018 were similar to those of the 2013 survey. The majority

of the participants were never married, and were unemployed. More than 85% of the participants in both surveys had not changed residence in the previous 10 years. The proportion of visitors was 4% in 2013 and 2% 2018.

In 2018, HIV testing coverage was very high overall (96.7% (95%CI: 96.1- 97.3)), and by sex (98.1% (95%CI: 97.4- 98.6) and 94.2% (95%CI: 92.7- 95.4) (p<0.001) among women and men respectively, even among the participants who tested HIV negative: (96.0% (95%CI: 95.1- 96.7)) overall, 97.3% (95%CI: 96.4- 98.0) among women and 93.7% (95% CI: 92.0- 95.1) among men (p<0.001).

HIV testing coverage (regardless of HIV status) increased by 15% points overall (p<0.001), 10% points among women (p<0.001) and 24% points among men (p<0.001) between 2013 and 2018. The groups with the greatest improvement were youth aged 15 to 29 years (by 16%, p<0.001), specifically among men who increased their testing coverage by 27% points (p<0.001).

HIV prevalence was similar across the 2013 and 2018 surveys, 25.2% (95%CI: 23.6- 26.9) and 26.4% (95%CI: 24.9- 27.9) respectively (p=0.23); among women HIV prevalence was 30.9% (95%CI: 29.0- 32.9), in 2013 and 30.5% (95%CI: 28.6- 32.5) in 2018 (p=0.77) ; among men it was 15.9% (95%CI: 14.0- 18.0) in 2013 and 18.4% (95%CI: 16.2- 20.8) in 2018 (p=0.07). These trends suggest that the HIV program is working well in the area, and that a majority of HIV-positive individuals are tested, in care, on ART, and virologically suppressed. The prevalence curve among women shifted toward older age groups between 2013 and 2018 while remaining similar in 2013 and 2018 amongst men. Incidence estimates were lower in 2018 compared to 2013, overall and by sex, even though the difference was not statistically significant. HIV incidence halved among women aged 15-29 years although it was still high (1.2 new cases per 100 persons). HIV-incidence among men aged 15-29 years was 0.9 new cases per 100 persons in 2013 and 0.8 new cases per 100 persons in 2018.

The proportion of advanced HIV disease decreased between 2013 and 2018, overall: 9.8% (95%CI: 8.0- 11.9) vs 4.6% (95%CI: 3.3- 6.2), (p<0.001); among women: (7.4% (95%CI: 6.0- 9.1) vs 3.0% (95%CI: 1.9- 4.6); p=0,001; and among men: 17.0% (95%CI: 12.5- 22.7) vs. 9.6% (95%CI: 6.2- 14.6); p=0.04. The main difference was among participants on ART with a decrease between 2013 and 2018 from 7.0% to 2.8% (p<0.001). This suggests that, with increased testing and ART coverage, people are being started earlier on treatment. In 2018 the proportion of advanced-HIV was still higher among men than women and about 13% of those not on ART had still a CD4 count less than 200 cells/µl.

In 2018 HIV-positive status awareness was high: 89.9% (95%CI: 87.7- 91.8) overall, 92.1% (95%CI: 89.8- 93.2) among women, and 82.9% (95%CI: 77.1- 87.5) among men. These mark an important increase between surveys of 15% points overall (p<0.001), 14% points among women (p<0.001), and 16% points among men (p<0.001). Women and men aged 15-29 years progressed best in HIV-positive status awareness between 2013 and 2018 (+ 19% points (p<0.001) and + 16 % points (p=0.1) respectively). However, in 2018 awareness was still low in men aged 15 to 29 years (61%). Even though the implementation of community activities seemed to have influenced the HIV testing coverage in this group of men, it did not seem to have an impact on diagnosing people with HIV in this group.

ART coverage amongst all HIV-positive in 2018 was 84.3% (95%CI: 81.7- 86.5) overall, 88.1% (95%CI: 85.4- 90.4) among women and 71.9% (95%CI: 65.3- 77.7) among men. ART coverage among HIV-positive individuals increased between 2013 and 2018 (+31% points overall; (p<0.001) +32% points among women, (p<0.001) and +25% points among men, (p<0.001). The group that displayed the greatest improvement in ART coverage was individuals aged 15-29 years with a difference of nearly 37% points between 2013 and 2018 (36.7% in 2013 vs. 74.1% in 2018); (p<0.001). This suggests that the implementation of "Universal Test & Treat" was successful in this setting, specifically among the young individuals.

In 2018 VLS among HIV infected participants was 83.8% (95%CI: 81.1- 86.1) overall, 87.2% (95CI%: 84.3- 89.5) among women and 72.9% (95CI%: 66.3- 78.6) among men. Between 2013 and 2018 VLS among HIV infected participants increased by 27% points overall (p<0.001), by 27% points among women (p<0.001), and by 25% points among men (p<0.001). Similarly to the ART coverage, HIV- positive youth aged 15 -29 years showed the highest improvement in VLS between 2013 and 2018 (+31% points; p<0.001).

In 2018, the majority of the unsuppressed were women (60%), aged between 25 and 39 years (54%) and unaware of their HIV-positive status (48%).

The overall 90-90-90 coverage target was confirmed to have been achieved by the 2018 survey results. The first two 90 coverages increased between 2013 and 2018 (+15% points, (p<0.001), and +23% points (p<0.001) respectively) while the third 90 coverage was similar (+1% points p=0.28). The first 90 coverage improved by about +16% points in men (p<0.001) vs. +14% points in women (p<0.001); second 90 coverage improved by +18% points in men (p<0.001) vs +25% points in women (p<0.001); and the third 90 coverage remained high (>90%), but did not significantly improve among neither men (p=0.9) nor women (p=0.4).

This survey was conducted five years after the first survey in 2013. It highlights very high viral suppression among all people living with HIV in line with a trend towards incidence reduction between 2013 and 2018. It also highlights a substantial progress in the cascade of care and HIV testing coverage between 2013 and 2018. The 90-90-90 objectives were reached overall and among women including the youngest group, but men did not achieve the first two 90s. Changes in the national guideline such as Universal Test and Treat as well as MSF support of community and clinical services may have played a role in this progress.

Nevertheless, a proportion of young women remain unsuppressed and specific strategies are needed to improve coverage of status awareness and treatment among men aged 15-29 years.

In summary, this combination prevention, treatment and care project demonstrated that it is feasible to achieve the 90-90-90 targets and a high level of viral suppression in the community within a public sector setting in South Africa, with additional support for community services and clinical support at primary care.

Photo credit: Scholars & Gentlemen

1. INTRODUCTION

1.1 BACKGROUND & SETTING

1.1.1. Human immunodeficiency virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) in South Africa

The 5th South African National Human Immunodeficiency Virus (HIV) Prevalence, Incidence, Behaviour and Communication Survey was conducted in 2017. The overall HIV prevalence among people aged 15- 49 years was estimated at 20.6% (19.2-22.0) reaching 27.0% (23.9-30.4) in the Province of KwaZulu Natal (1) more than two folds higher than the Western Cape or Northern Cape provinces. In 2016, an estimated 7.1 million (6.4- 7.8) South Africans were living with HIV, among whom 56% (50% - 61%) were accessing antiretroviral therapy (ART) (2). The same year an estimated 110,000 people died from HIV-related illnesses (3). Since 2010, new HIV infections have decreased by 49% and AIDS-related deaths have decreased by 29% (2). Among people living with HIV (PLHIV) on ART aged 15 to 64, 87.5% had HIV-RNA viral load <1,000copes/ml in 2018 (1).

In 2016, the country adopted the "Universal Test and Treat" (UTT) strategy, following the World Health Organisation (WHO) recommendations of initiating ART regardless of CD4 count (4). Since then all HIV positive children, adolescents and adults are offered ART treatment regardless of CD4 count.

The Joint United Nation Programme on HIV/AIDS (UNAIDS) endorsed the 90-90-90 targets as key indicators against which to measure the progress in the global HIV response. These targets have been included in South Africa's National Strategic Plan for HIV, TB and sexually transmitted infections (STIs) 2017 – 2022 (5). Therefore, by 2020, 90% of all PLHIV would know their HIV status (1st 90), 90% of people aware of their HIV-positive status would receive sustained ART (2nd 90), and 90% of all people receiving ART would have viral load suppression (VLS, 3rd 90).

1.1.2 HIV Treatment as prevention

In the last decade, progress in HIV prevention research transformed the scope of HIV programs, raising hopes of epidemic control by increasing ART coverage. The clinical trial HPTN 052, which studied the impact of early ART treatment among HIV-positive individuals on HIV incidence in their sero-discordant partner, showed a 96% reduction in

transmission of HIV for people who were on ART (6). Correspondingly, mathematical models have suggested that HIV incidence reduction would be feasible if HIV infected clients would be diagnosed and start ART early (7,8).

Between 2013 and 2018, the Population Effects of Antiretroviral Therapy to Reduce HIV Transmission (PopART, HPTN 071), a cluster-randomized trial of the impact of a combination prevention intervention on HIV incidence, was implemented in 21 communities in the Western Cape of South Africa and in Zambia. The prevention interventions included universal voluntary HIV counselling and testing (HCT) at household level, linkage of HIV infected individuals to care and early initiation of ART. The preliminary findings showed a significant reduction in new HIV infections with a prevention strategy where HIV treatment was started according to in-country guidelines (9).

1.1.3 Médecins Sans Frontières in South Africa

1.1.3.1 General

Médecins Sans Frontières (MSF) has been working with local health authorities in South Africa since 1999 to pilot, implement, and support scale-up of HIV and TB management and care. In 2001, MSF, working in partnership with the Provincial Government of the Western Cape and the City of Cape Town municipality, started the first public sector ART programme in the country in Khayelitsha (10), a large township in the Cape Town area of the Western Cape Province. The Khayelitsha project demonstrated the feasibility of implementing a public sector ART programme in South Africa, and helped to pave the way for the national ART programme which began in 2004 (11,12). Building on the successful implementation of the Khayelitsha ART programme, MSF initiated an ART programme in Lusikisiki in 2003, in the Eastern Cape Province, in partnership with the Eastern Cape Department of Health (DOH). The Lusikisiki project demonstrated that a public sector ART programme was also feasible in a resource-poor rural area (13). Since then, MSF has piloted, documented and promoted activities for TB and HIV in different projects.

1.1.3.2 Mbongolwane and Eshowe Health Service Areas

+ **The Setting**

KwaZulu-Natal (KZN) is one of the nine provinces of South Africa, and borders Mozambique, Lesotho and Swaziland, as well as Mpumalanga, Free State, and Eastern Cape provinces. KZN province has eleven districts including King Cetshwayo (previously uThungulu District). Umlalazi Municipality, one of the five municipalities of King Cetshwayo district, is situated on the KwaZulu-Natal northern coast. Administratively, uMlalazi Municipality has a catchment population of 213,601 and is divided into 26 Electoral Wards (14). The main town in the municipality is Eshowe, located about 140km north of Durban. MSF supports HIV activities in wards 1 to 14 with an estimated catchment population of 114,490 (14).

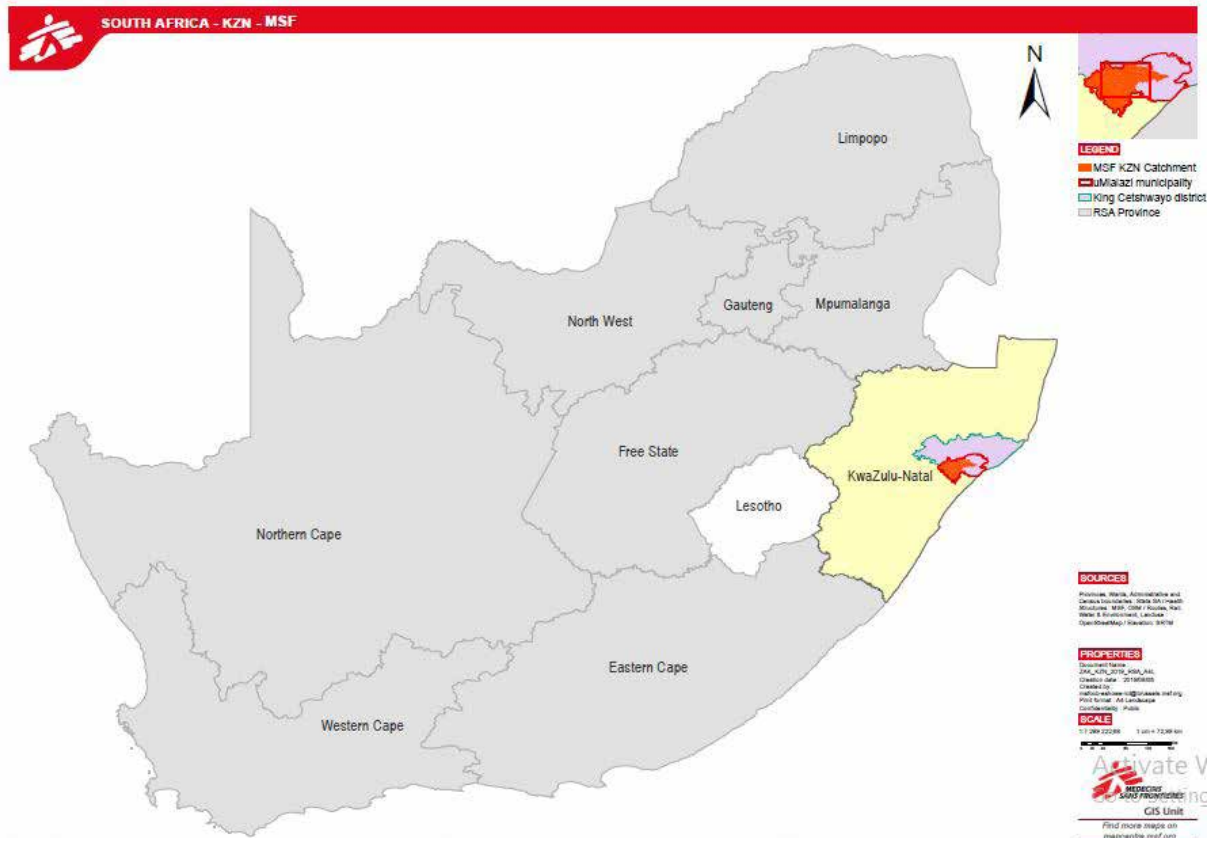


Figure 1 - South Africa – KwaZulu Natal, King Cetshwayo District and uMlalazi Municipality map

+ **MSF activities**

In 2011, MSF, in partnership with the KZN DOH and other stakeholders, started the "Bending the Curves" combination prevention project, with the aim to decrease HIV and TB incidence, morbidity and mortality by increasing access to, and coverage of, HIV- and TB-related services, and implementing a comprehensive prevention, diagnosis and treatment package of interventions at each step of the HIV cascade of care (15).

The project included the following activities: 1) **prevention** through health promotion, community mobilisation and awareness, condom distribution, medical male circumcision (MMC), prevention of mother to child transmission (PMTCT) and an HIV prevention package for students, all starting in 2012; 2) **HIV counselling and testing (HCT)** including expanded community testing at fixed community testing sites, through a mobile van at schools and at events, and door-to-door testing (through Community Health Agents Programme (CHAPS)), starting in 2012 until beginning of 2018 which was then replaced by Luyanda sites (that offer HIV testing and other HIV services); 3) **linkage to care and early ART initiation** through follow up of HIV infected people and defaulter tracing by CHAPS since 2012, conducting clinics in the Technical College in Eshowe and a mobile clinic focussing on the high risk populations at the farms, and a vertical male clinic Philandoda was established in the Eshowe Taxi Rank offering HCT, MMC, ART initiation and follow-up, STI screening and treatment of minor illnesses; 4)

retention in care and adherence for HIV-infected people through HIV initiation and adherence counselling conducted by lay counsellors, differentiated models of care (community and facility clubs, community ART support groups (CAGs), fast lane or community pick up points (PuP)) and mentoring on implementation of the national adherence guidelines.

In 2013, an HIV population based survey was conducted by MSF/Epicentre in order to assess the baseline parameters of the HIV epidemic in the area where MSF had operational activities. The findings of the survey directed the activities of the project and the focus on the most at risk populations, particularly young women aged 15-29 years (16). Complementing the comprehensive program outlined above, MSF also started an activity of advanced HIV care at the supported facilities in 2017, and started working on decentralisation of drug resistant (DR)-TB care to Mbongolwane and Eshowe hospitals (DR-TB management was previously done only in Catherine Booth Hospital). MSF is currently supporting two hospitals and ten Health Centres (HCs) in Mbongolwane and Eshowe HSAs.

1.2 SURVEY RATIONALE

The findings of the 2013 survey helped the DOH and MSF with planning and defining priority interventions concerning HIV diagnosis and care in the area. It was expected that the implementation of these new HIV prevention strategies would result in increased ART coverage and VLS among those on ART leading to lowered infectivity and a reduction in HIV incidence.

MSF and Epicentre conducted a second survey five years after the first survey in order to evaluate the differences in the HIV epidemic, and cascade of care results between 2013 results and 2018 in the area.

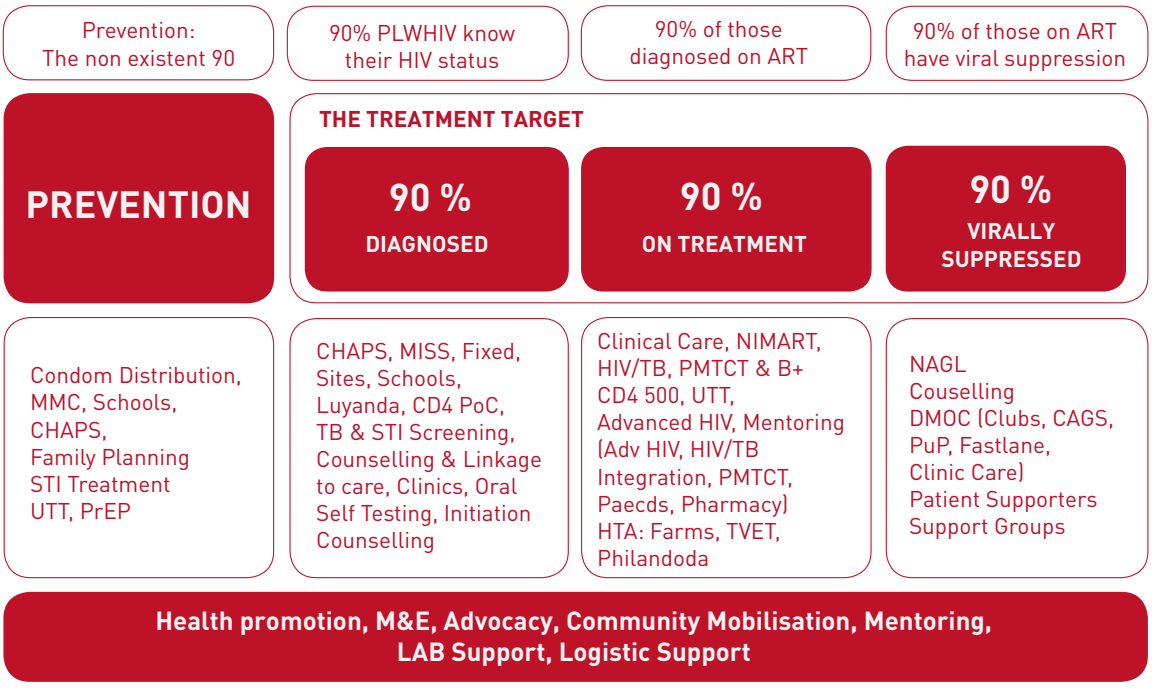


Figure 2 - MSF KZN project HIV 90-90-90 cascade and activities

Photo credit: Peter Casaer

2. SURVEY OBJECTIVES

2.2 PRIMARY OBJECTIVE

+ To estimate population viral load suppression (VLS) among HIV-infected men and women

2.3 SECONDARY OBJECTIVES

+ To estimate coverage at each step of the cascade of care among individuals (HIV status awareness, Linkage to care, Retention in care, Antiretroviral Therapy (ART) coverage)
+ To estimate HIV prevalence
+ To estimate HIV incidence
+ To estimate HIV testing coverage and assess use of HIV counselling and testing (HCT) services
+ To describe the proportion of HIV facilities where HIV-positive individuals are followed up
+ To estimate male circumcision coverage

Photo credit: Scholars & Gentlemen

3. SURVEY DESIGN AND METHODOLOGY

3.1 SURVEY DESIGN AND POPULATION

The survey was a cross-sectional population survey using two-stage cluster sampling targeting individuals aged 15 years and above.

To allow the comparison with the 2013 results, the report shows results for those 15-59 years of age only.

3.1.1 Source population

According to the 2011 census, the population in uMlalazi Municipality was of 213,601 people living in 45,062 households (4.74 persons per household) (14). The Eshowe and Mbongolwane HSAs correspond to wards 1-14 with a catchment population of 114,490. Among these, about 56 % were females and about 53% were aged 15 to 59 year (14).

3.1.2 Inclusion criteria

+ Age 15-59 years (see above under the section A: Survey design and population)
+ Living in Mbongolwane and Eshowe health service areas (Administrative Wards 1 to 14 of uMlalazi Municipality) at the time of the survey
+ Resident member of the household visited by the survey team or visitor to this household
+ Able and willing to provide informed consent

3.1.3 Exclusion criteria

+ Unable or refused to provide informed consent

3.2 SAMPLING

3.2.1 Sample size

The sample size was calculated based on men (as they are less numerous than women) to have enough precision to assess if there was a difference of VLS stratified by sex between 2013 and 2018.

To assess a VLS of 55% among male 15-59 years old, with a 95 % confidence interval (CI), a precision of +/-6 %, assuming a design effect (DEFF) of 1.2 (the DEFF value was informed by previous HIV population based surveys), a response rate of 80% based on the previous survey (16) and an estimated prevalence among males of 15.9 % (16), 2,492 males aged 15-59 years were needed to evaluate a difference in VLS among men between 2013 and 2018 (VLS among men in 2013 was 41.1% (95% CI: 35.2- 47.3)(16)). In total 2,167 households were planned to be visited (assuming an average of 1.15 eligible males age 15- 59 per household) (14).

3.2.2 Sampling method

Two-stage cluster sampling (first stage= small area layer (SAL) (cluster), second stage= house) with probability proportional to size was used for the selection of participants. Clusters were previously

selected with the sampling frame based on the South African Population and Housing Census, provided by Statistics Bureau of South Africa. The SAL from the Electoral Wards 1-14 of uMlalazi Municipality were used to select the number of clusters per area with probability proportional to population size. Within each cluster (or SALs), 25 dwellings were randomly selected using spatial random sampling (17). We used Google Earth Software to pinpoint all residential structures included in the cluster. When the list of households was drawn, numbers were randomly drawn in order to identify the households to be visited. A reserve household list was drawn using spatial random sampling in case a household was not found or destroyed. A total of 87 clusters were selected from the enumeration areas in the Electoral Wards 1-14 of uMlalazi Municipality.

3.3 PROCEDURES

3.3.1 Community mobilization and participant recruitment

Mobilization was conducted through several channels prior to starting the survey.

The survey team held consultative meetings with local community leaders (chiefs, assistant chiefs and councillors) religious leaders and health facility workers. Dialogue continued with the stakeholders to maintain community engagement during the course of the survey as well as to facilitate good feedback of the survey's findings.

The communication and awareness strategy included radio slots, meetings with community leaders and health facility workers, information at schools, and announced via loudspeakers during the days prior to the survey. Leaflets were also created and distributed to individuals living in the selected SAL to explain the purpose of the survey, the survey procedures, and how participants would be selected.

3.3.2 Interviews

Face-to-face interviews were carried out with the help of a standardized questionnaire.

3.3.2.1 Households questionnaires

Interviewers first introduced the survey to the head of household or if not present, to a household representative. Following the consent process, the interviewers completed the household questionnaire which listed: household members and visitors, their age, sex, relation to the head of household, whether they were a resident of the household or not, and if they slept in the home the night before the interview in order to determine potentially eligible participants.

Information about household members who died in the previous 12 months was also collected, including the deceased's age and sex.

3.3.2.2 Individual questionnaires

For any household member or visitor who was eligible and interested in participating, the interviewer obtained individual written informed consent to participate in the survey. Following the consent process, the

interviewer conducted individual face-to-face interviews in a private area within the dwelling or nearby. In order to reach a maximum of eligible individuals, the survey teams visited the houses from Tuesday to Sunday as was done in the 2013 survey. Time slots from early morning to evening were covered on different days of the week in order to maximize the possibility of finding eligible participants at home. If one or more individuals living in the selected household was absent when the survey team visited, the survey team asked for the help of household members (or the neighbours if all household members were absent) to trace the absentee(s), and they re-visited the household later in the day or the day after. If during the third visit the occupant(s) was not found, he/she was not included in the survey. Missing occupants who lived in the selected household, as well as participants who refused to be part of the survey, were not replaced.

As the interviews during the implementation were held in two different languages (i.e. isiZulu and English, as best suited), questionnaires were translated into isiZulu, and back-translated into English to ensure the validity of questions and results (18). The same procedure was used to translate the consent forms.

The survey was conducted based on questionnaires adapted from model survey instruments developed for the DHS Program to reflect the population and health issues relevant to South Africa (19).

Items asked in the questionnaire included:

+ **Background demographic characteristics:** Sex, date of birth, age, place of birth, education, marital status, occupation.
+ **HIV Testing:** HIV testing history, knowledge of HIV status, place of testing, date of testing, knowledge of HIV testing centres.
+ **HIV treatment:** HIV treatment history, date of initiation, linkage and retention in care.
+ **HIV prevention (for men):** circumcision (Y/N), method for circumcision, place of circumcision.

3.3.3 Laboratory procedures

Following the interview, the interviewer proposed a rapid HIV test with pre- and post-counselling according to the National guidelines for HCT (20). Counselling was provided to individuals who tested positive and were not previously aware of their HIV-positive status or who knew their positive status but were not active in care. They were provided with a referral letter and information about the closest referral centre. During this session the counsellor provided the participants key messages on prevention methods as well as on how HIV is transmitted following South African and World Health Organization (WHO) recommendations (20,21).

For individuals found to be HIV-positive who wished to continue the interview, the option of postponing or temporarily stopping the interview was proposed by the counsellor. If the participants agreed to continue the interview, a nurse proceeded to administer the rest of the questionnaire that included questions on HIV care and ART: date of first positive HIV test, place of follow-up, ART intake and date of start, etc.

Participants willing to participate in the

survey but not willing to receive the HIV test on site (and therefore not to know their HIV test results), indicated their choice on the consent form. However, they were still eligible to answer the questionnaire and to participate in the survey. In that specific case, they had blood collected in order to conduct the additional tests (HIV status, CD4, HIV-RNA VL, and limiting antigen avidity EIA (LAg-Avidity EIA) assay) in the laboratory, but did not receive their results.

HIV testing was done either on site at the participants' dwelling as described below, or at laboratory level for participants willing to participate in the survey but not willing to conduct an HIV test on site. A qualified nurse collected a total of 8ml of venous blood (two 4ml EDTA tubes) from all participants reported HIV-positive or indeterminate who accepted to be part of the survey and from participants who did not wish to conduct an HIV test on site.

Two plasma aliquots of 1ml each were constituted in case further exams were needed for the HIV-RNA VL, or in case the samples sent to the laboratories were unusable. They were stored at laboratory level until the analysis of the samples was conducted, the results generated and then they were destroyed.

3.3.3.1 HIV testing

Among participants who elected to have HCT in order to learn their HIV status, HIV testing was conducted by certified counsellors using whole blood obtained by finger-prick at the participant's house. Rapid testing was done following a serial algorithm using Determine Rapid HIV-1/2 Antibody as a screening test. If the first test was positive, a confirmatory test was carried out, using Unigold Rapid HIV test kit (Figure 3). Evaluation of the Determine Rapid HIV-1/2 Antibody and the Unigold Rapid HIV test have shown both have good sensitivity and specificity in different settings including South Africa (22,23).

Those who tested positive with both tests were considered positive (20). Those with discordant results (Determine positive, Unigold negative) had a third "tiebreaker" test using HIV-1 western blot (Bio-Rad GS HIV-1 Western Blot run on the Autoblot 3000, MedTec Biolabequipment). Western-blot tests were conducted at the National Institute for Communicable Diseases (NICD) laboratory in Johannesburg. Results were made available at the HIV care facility indicated by the participant. For quality control purposes a serological test was performed on 10 percent of randomly selected participants found HIV-positive to check the validity of the HIV rapid tests.

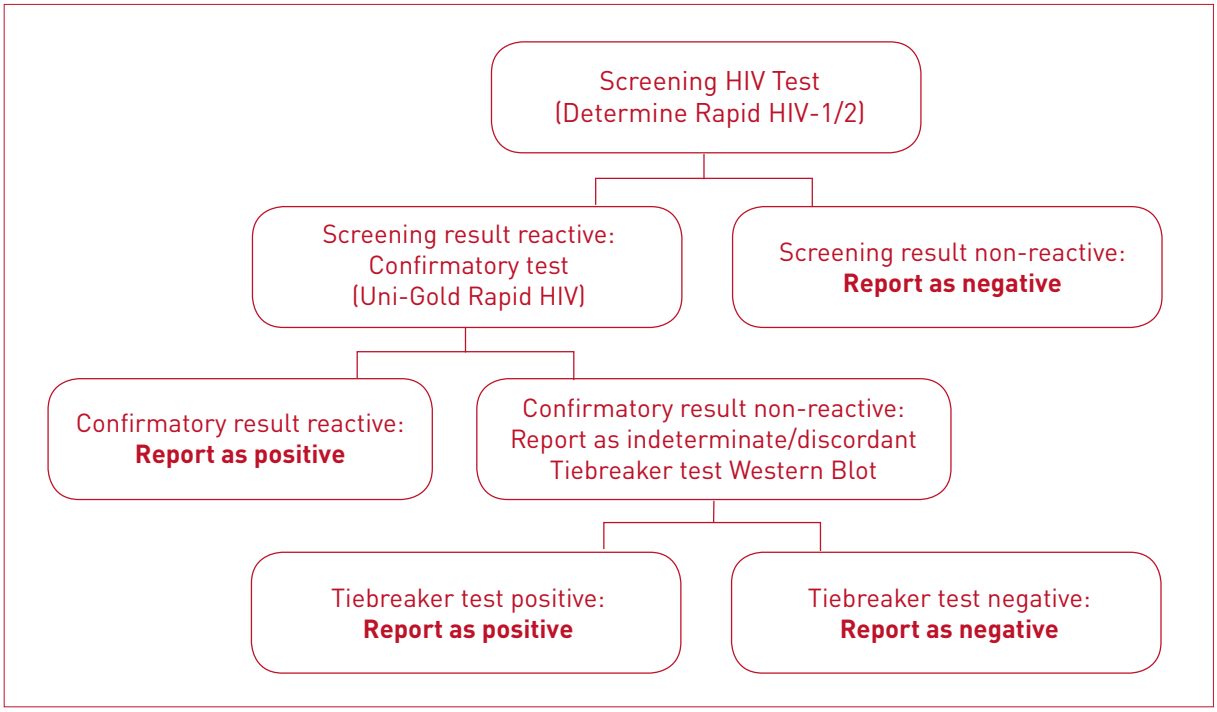


Figure 3 - Serial HIV testing algorithm, HIV counselling and testing policy guidelines, South Africa, 2010

3.3.3.2 CD4 count determination and plasma separation

Venous blood samples were transported in a cooler box to the MSF/Epicentre office in Eshowe and from there transported to the Clinical Laboratory Services (CLS), a division of the Wits Health Consortium (WHC) of the University of Witwatersrand›s School of Pathology in Johannesburg. CD4 counts were performed using the dual platform method in a Beckman Coulter FC 500 MPL analyser on samples reported as HIV positive.

3.3.3.3 HIV-RNA Viral Load

Viral load assessment was performed on all participants testing HIV positive, regardless of ART status. HIV-RNA VL was quantified on plasma at the CLS laboratory in Johannesburg (South Africa) using the Abbott RealTime HIV-1 platform. Individuals with a VL<1,000 copies/ml were considered as suppressed.

3.3.3.4 Recent Infection

LAg-Avidity EIA testing was conducted as described in detail by Duong et al (24) following the CDC protocol. Specimens from HIV-positive participants, with a HIV-RNA VL > 75 copies/ml, were further tested to determine recent versus long-term HIV infection, using the single-well LAg-Avidity EIA assay.

Recent infection was defined as LAg-Avidity normalised optical density (ODn) ⩽ 2.0 **and** HIV-RNA VL >75 copies/ml.

Long-standing infection was defined as ODn > 2.0 **and** HIV-RNA VL > 75.copies/ml **OR** HIV-RNA VL ⩽ 75 copies/ml of plasma. Figure 4 shows the recent infection testing algorithm (RITA).

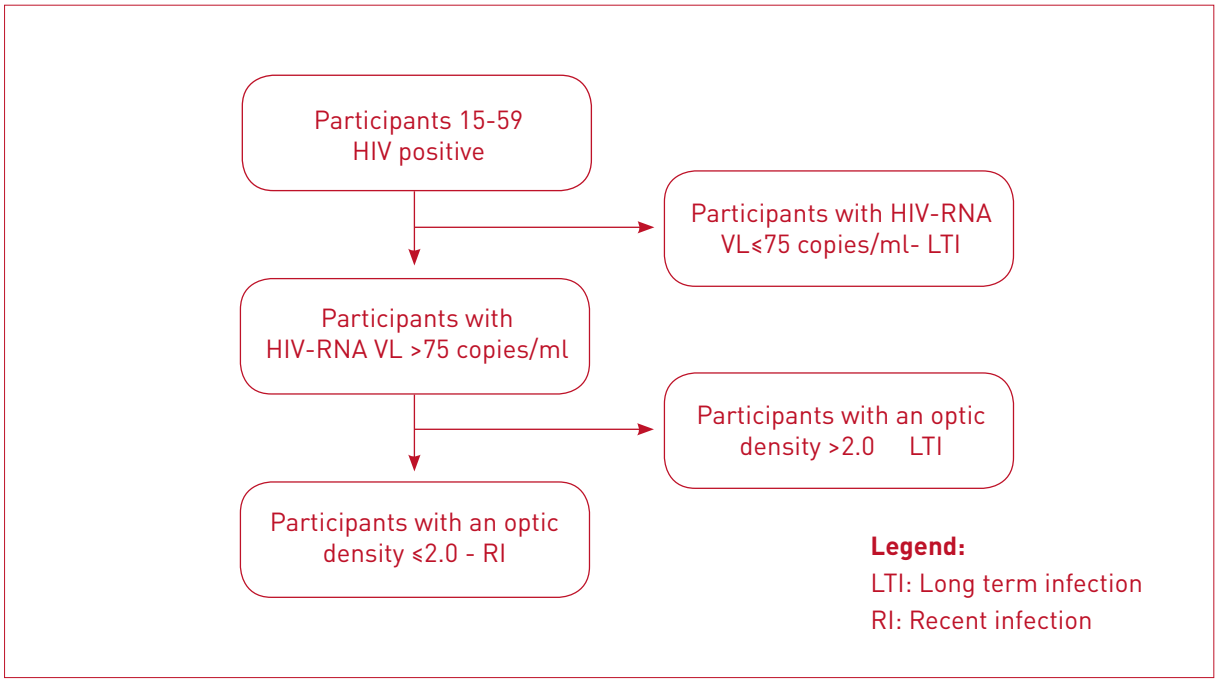


Figure 4 - Recent infection testing algorithm for HIV-positive participants, KZN, South Africa, 2018

3.4 ETHICAL CONSIDERATIONS

3.4.1 Protocol Review

This protocol, informed consent forms and questionnaires were approved by the University of Cape Town (UCT) Human Research Ethics Committee (HREC reference: 320/2018, approval on the 13th July 2018), MSF Ethics Review Board (ERB reference: 1842; approval on the 23rd July 2018) and the Provincial Health Research Unit of the KZN Department of Health (NHRD Ref: KZ_201807_26 approved on 8th August 2018) with respect to ethical and scientific compliance with applicable research and human subject regulations.

3.4.2 Informed consent

Written informed consent was sought after the complete explanation of survey procedures and implications of survey participation (risks/benefits). The informed consent process was carried out in English or isiZulu by a counsellor, depending on the preference of the potential participant, and in a private area chosen by the potential participant either inside or outside their home prior to starting the enrolment procedure. A written consent in local language was received from the individuals with signature or a finger print (in case of illiterate individuals).

Informed consent was obtained in a two part process.

1/Consent for the Household questionnaire was obtained prior to starting the questionnaire from the head of the household or the person willing to answer the household questionnaire.

2/Consent from each individual found eligible for the survey was sought. This

included consent for the questionnaire, HIV testing, drawing blood samples and performing the laboratory tests. HIV testing was proposed on site (result given to the participant) or at the laboratory (for participants who did not wish to receive their HIV result). Potential participants who did not consent for HIV testing and other biological tests were not included in the survey. Minors aged 15-17 years did not need guardian consent to participate in the survey as the South African guidelines for HCT considered them mature and able to give consent to HIV testing from the age of 12 years (20). However minors aged 15-17 years were advised to disclose their status, regardless of result, to their parent/ guardian.

The participants, if functionally illiterate, signed the consent by marking with a thumbprint on the signature line in the presence of a witness. The witness was selected by the participant but could not belong to the survey team.

3.4.3 Confidentiality

All survey -related information was stored securely at Epicentre/MSF facilities and files were kept in a locked room. survey forms were linked through unique survey numbers assigned to survey participants. The personal identifier information, the first page of the individual questionnaire and the household questionnaire sheet were stored in locked file cabinets. Only the data clerks, survey coordinator and PI had access to that room.

All laboratory specimens, reports, data collection instruments, process logs, and administrative forms were solely identified with the patients survey ID number to maintain participant confidentiality.

All databases were password-protected for security of access. Forms, lists, logbooks and any other listings that link participant ID numbers to other identifying information were stored in separate locked filling cabinets accessible only to the data manager and principal investigator or appropriate designee. No survey documents, either electronic or paper based, other than the first page of the individual questionnaire and the household questionnaire sheet, contained participants' names(18).

During the household listing, field staff used Global Positioning System (GPS) receivers to establish the location of each of the clusters and selected households. For confidentiality reasons, no data on individual household geographic coordinates were kept after the end of the survey.

All survey records will be retained for at least five years after the completion of the survey. Survey records include administrative documentation, all reports and correspondence relating to the survey, documentation related to each participant screened and enrolled into the survey including informed consent forms, cluster information forms, questionnaires, notes of all contacts with the participant and all other source documents.

3.5 DATA MANAGEMENT, STORAGE AND DISPOSAL

3.5.1 Data Management and data collection tools

Paper based questionnaires and laboratory forms were used for collection of socio-demographic, HIV testing and HIV care information. Laboratory registers, laboratory information management systems (LIMS) or other electronic laboratory data were used to capture laboratory data, depending on the standard procedures of each laboratory.

3.5.2 Data Analysis

Data were double entered into EpiData 3•1 (EpiData Association, Odense, Denmark) and checked. The statistical analysis was performed using STATA 14 (StataCorp, College station, Texas, USA). Programs were recorded so that all analysis can be fully checked and replicated in the future.

The household questionnaire allowed the description of the household composition in terms of members of the household and visitors. This questionnaire was also used to define the list of all eligible subjects within each household. Thus, descriptive analyses were provided on the included population and on non-responders.

Analysis was done by age and sex and then compared with reference data when available (census data and 2013 survey results). Descriptive statistics were weighted and adjusted for the sampling design and accounted for the probability of selection of the cluster by our sampling procedure. These are presented with their corresponding 95% CI. Outcomes were calculated with corresponding 95% CI and stratified by age group and sex. Categorical variables were compared with chi-square or fisher exact test, as appropriate, and proportions with z-proportion test. Continuous variables were categorized as binary or ordinal before testing. P values below 0.05 were considered to be statistically significant.

Proportions with corresponding 95% CI were calculated by excluding any missing values from the denominator.

+ *HIV testing coverage:* proportion of individuals who had ever been tested prior to the survey (at least once)

+ *HIV cascade* of care was evaluated as follows:

The first four stages were self-reported by participants:

1. HIV-positive status awareness (stage 1), was defined as a history of at least one positive HIV test prior to the survey;

2. Linkage to care (stage 2) was defined as at least one medical consultation for HIV care after an HIV-positive test result received prior to the survey.

3. Participants in care (Stage 3) was defined as still receiving HIV-related medical care from a health facility at the time of the survey;

4. ART coverage (Stage 4) was defined as still being on ART at the time of

the survey. It was confirmed when available with documentation from the individual health book; 5) VLS (stage

5. was defined as a HIV-RNA VL <1000 copies/ml among all HIV-positive participants.

+ *90-90-90 coverage* was calculated following the UNAIDS definitions (25) :

First 90: Proportion of participants tested HIV-positive during the survey who knew their HIV status.

Second 90: Proportion of participants on ART among the HIV-positive who knew their HIV status.

Third 90: Proportion of participants with a VL<1,000 copies/ml among the ones on ART.

+ *HIV incidence estimation:*

HIV incidence was estimated cross-sectionally in the survey population using the RITA results, according to the method of Kassanjee et al. (26). We used the mean duration of recent infection (MDRI) of 130 days (95%CI: 117.26- 142.74) and false-recent rate (FRR) of 1.0% (95%CI: 0.41-1.59) as it was used in the 2013 report in order to have comparable results.

+ *Medical Male circumcision (MMC)*

Participants were considered as medically circumcised if they self-declared as circumcised and declared having been circumcised by a health professional. Participants who declared having been circumcised but did not meet the medical circumcision criteria above were considered as non- medically circumcised participants. Participants declaring not being circumcised were classified as not circumcised.

Photo credit: Scholars & Gentlemen

4. RESULTS (15-59 YEARS)

4.1 HOUSEHOLD POPULATION

4.1.1 Demographic characteristics of the household population

Overall 2,450 households were visited and 2,170 households (88.6 %) were eligible. The inclusion rate among eligible households was 82.7 % (1,795/2,170) and the refusal rate was 11.3% (245/2,170). The outcomes of the households visited are presented in Figure 5.

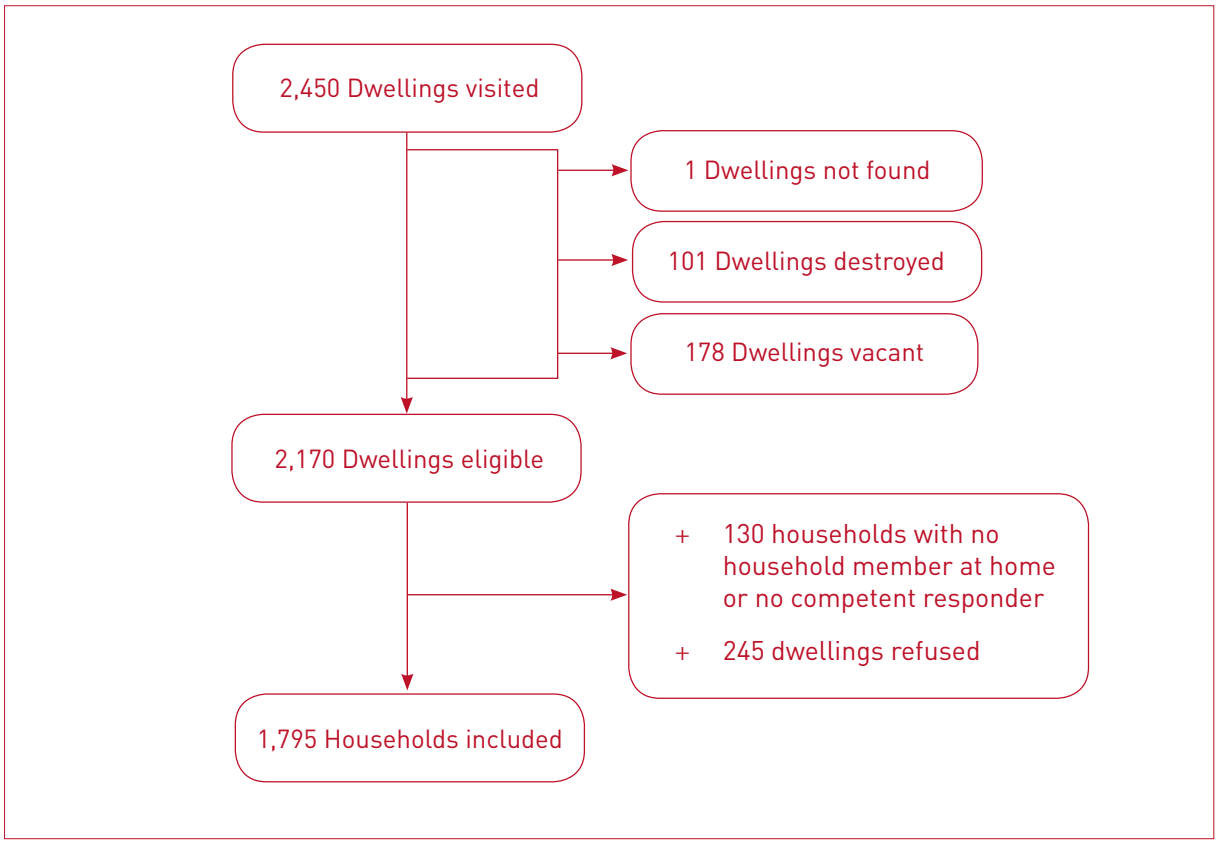


Figure 5- Household inclusion flowchart, KZN, South Africa, 2018

Among the 1,795 households included in the survey, 11,735 individuals were listed by the head of the household. The median number of family member residents in the household was 4 [IQR: 3-7]. The range varied from 1 to 20 people with a median age of 18 years [IQR: 9-40].

Among the 11,735 individuals listed, 6,456 (55%) individuals were aged 15 to 59 years, including 6,381 (98.8%) family members and 75 (1.2%) visitors (Figure 6).

Of the 6,456 individuals aged 15-59 years listed, 4,109 (63.7%) were eligible (4,034 residents and 75 visitors).

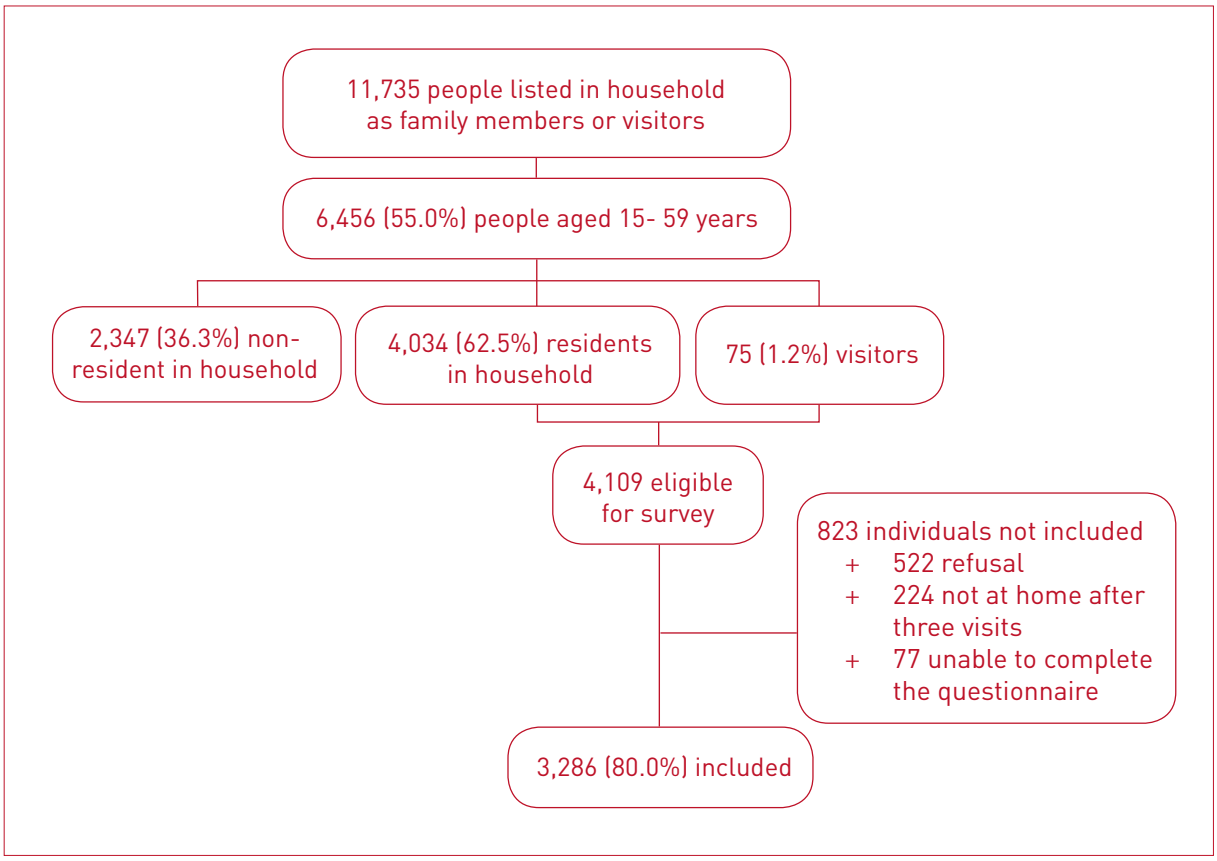


Figure 6 - Flow chart of eligibility and inclusion among participants, KZN, South Africa, 2018

Among the eligible individuals, those aged 15 to 19 years were the most represented in the sample, both among women and men. The age group the least represented was 45 to 49 years among women and 50 to 54 years among men (Table 1).

Table 1 - Age group distribution of eligible individuals of the survey, KZN, South Africa, 2018

Age group	Women		Men		Total	
	n	%	n	%	n	%
15-19yrs	441	17.3	432	27.8	873	21.3
20-24yrs	406	15.9	267	17.2	673	16.4
25-29yrs	299	11.7	194	12.5	493	12.0
30-34yrs	310	12.1	154	9.9	464	11.3
35-39yrs	231	9.0	146	9.4	377	9.2
40-44yrs	202	7.9	115	7.4	317	7.7
45-49yrs	196	7.7	93	6.0	289	7.0
50-54yrs	229	9.0	77	5.0	306	7.5
55-59yrs	243	9.5	74	4.8	317	7.7
Total	2,557	100.0	1,552	100.0	4,109	100.0

4.1.2 Mortality of the household population

Among all residents, 128 had died in the 12 months prior to the survey (since August 2017). The mortality rate was 12.1/1,000 persons-year (PY) overall, 9.6/1,000 PY for women and 15.5/1,000 PY for men. The age distribution of the deceased is shown in Table 2.

The median age of those who had died was 57 years [IQR: 36-70], 50 years [IQR: 33-65] among men and 66 years [IQR: 47-86] among women.

The mortality rate among the 15- 59 years was 12.4/1,000 per PY overall, 7.4/1,000 PY for women and 20.6/1,000 PY for men.

Table 2 - Age distribution of the deceased people in the year prior to the survey, KZN, South Africa, 2018

Age group (years)	Women		Men		Total	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
0-14	4	6.8 (1.9-16.5)	7	10.1 (4.2-19.8)	11	8.6 (4.4-14.9)
15-29	4	6.8 (1.9-16.5)	5	7.3 (2.4-16.1)	9	7.0 (3.3-12.9)
30-44	5	8.5 (2.8-18.7)	16	23.2 (13.9-34.9)	21	16.4 (10.5-24.0)
45-59	13	22.0 (12.3-34.7)	17	24.6 (15.1-36.4)	30	23.4 (16.4-31.7)
>60	33	55.9 (42.4-68.8)	24	34.8 (23.7-47.2)	57	44.5 (35.7-53.6)
Total	59	100	69	100	128	100

4.1.3 Individuals eligible and included

Out of the 11,735 listed household members, 4,109 individuals were eligible for the survey and 3,286 (80.0%) participated (Table 3). Among them, 3,227 (98.2%) were residents and 59 (1.8%) were visitors

Inclusion rate was 84.7% among women and 72.2% among men (Table 3).

Table 3 - Sex distribution of eligible and included individuals, KZN, South Africa 2018

Sex	Eligible		Included	
	n	%	n	%
Women	2,557	62.2	2,165	65.9
Men	1,552	37.8	1,121	34.1
Total	4,109	100	3,286	100

4.1.4 Sociodemographic characteristics of the participants

The median age of eligible individuals and included individuals was similar (30 years [IQR: 21-43] vs 30 years [IQR: 20-44] respectively).

The most numerous age group amongst participants was the 15-19 years (22.1%).

A majority of participants included in the survey were never married (71.9%), attended secondary school (47.8%) and were unemployed (51.5%).

The socio-demographic characteristics of the surveyed participants are presented in Table 4.

Table 4 - Sociodemographic characteristics of Participants, KZN, South Africa, 2018

	Women	Men	Total
	n (%)	n (%)	n (%)
Age group	2,165	1,121	3,286
15-19	381 (17.6)	345 (30.8)	726 (22.1)
20-24	345 (15.9)	190 (17.0)	535 (16.3)
25-29	236 (10.9)	124 (11.1)	360 (11.0)
30-34	259 (12.0)	96 (8.6)	355 (10.8)
35-39	184 (8.5)	94 (8.4)	278 (8.5)
40-44	171 (7.9)	81 (7.2)	252 (7.7)
45-49	166 (7.7)	67 (6.0)	233 (7.1)
50-54	201 (9.3)	66 (5.9)	267 (8.1)
54-59	222 (10.3)	58 (5.2)	280 (8.5)
Marital Status (n)	2,163	1,120	3,284
Married/Living Together	547 (25.3)	176 (15.8)	724 (22.1)
Never Married	1,441 (66.6)	921 (82.2)	2,362 (71.9)
Divorced/Separated	33 (1.5)	16 (1.4)	49 (1.5)
Widowed	142(6.6)	7 (0.6)	149 (4.5)
Education (n)	2,164	1,121	3,286
No schooling	204 (9.4)	54 (4.7)	258 (7.9)
Primary Grade <7	259 (12.0)	101 (9.0)	360 (11.0)
Primary Grade >7	586 (27.1)	392 (35.0)	978 (29.8)
Secondary	1,018 (47.0)	551 (49.2)	1,569 (47.8)
Tertiary	97 (4.5)	24 (2.1)	121 (3.7)
Occupation (n)	2,165	1,121	3,286
Farmer, Forestry, Fishing	37 (1.7)	22 (2.0)	60 (1.8)
Salaried employment	252 (11.6)	177 (15.8)	429(13.1)
Student	391 (18.1)	360 (32.1)	751 (22.9)
Housewife/Husband	193 (8.9)	16 (1.4)	209 (6.4)
Unemployed	1,216 (56.2)	477 (42.6)	1,693 (51.5)
Other	76 (3.5)	68 (6.1)	144 (4.4)

Of all included participants, 89.9% (2,902/3,228) of all participants and 90.0% (2,902/3,226) of the residents had not changed their residence in the 10 years prior to the survey.

Out of the 59 visitors included in the survey, 50.9% lived in Umlalazi Municipality, and 56.9% visited the household included in the survey at least once a month (Table 5).

Table 5 - Residence and frequency of visits of the participants who were visitors, KZN, South Africa, 2018

	Women	Men	Total
	n (%)	n (%)	n (%)
Place of residence (n)	40	19	59
Umlalazi Municipality	20 (50.0)	10 (52.6)	30 (50.9)
Other municipality within KZN	17 (42.5)	7 (36.8)	24 (40.7)
Province other than KZN	3 (7.5)	2 (10.5)	5 (8.5)
Country other than South Africa	0	0	0
Frequency of household visit	39	19	58
<1 year	4 (10.3)	2 (10.5)	6 (10.3)
1 to 2 times a year	9 (23.1)	5 (26.3)	14 (24.1)
More than twice a year but less than once a month	4 (10.3)	1 (5.3)	5 (8.6)
At least once a month	22 (56.4)	11 (57.9)	33 (56.9)

4.2 HIV

4.2.1 HIV testing

Among the 3,286 survey participants, 3,178 (96.7% (95%CI: 96.1- 97.3)) reported having at least one HIV test prior to the survey and 3,152 (99.2% (95%CI: 98.8- 99.5) reported to have received the results of the test.

The proportion of individuals who had received an HIV test prior to the survey (regardless of whether they had received the result of their HIV test or not) was higher among women than men: 98.1% (95%CI: 97.4- 98.6) vs. 94.2% (95%CI: 92.7- 95.4) (p<0.001) (Table 6). In each age group the coverage was higher than 90% except amongst males aged 50 to 54 years (89.4%) (Figure 7). The proportion of students ever tested prior to the survey was 94.5% (95%CI: 92.7- 96.0).

HIV testing coverage was still high when restricting the analysis to those who tested negative for HIV (96.0% (95%CI: 95.1- 96.7)) and was higher among women than men: 97.3% (95%CI: 96.4- 98.0) vs. 93.7% (92.0- 95.1) (p<0.001).

Table 6 - HIV testing status of participants at the time of the survey, KZN, South Africa, 2018

HIV testing status	Women*		Men**		Total	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Tested at least once prior to the survey (with results)	2,110	97.5 (96.8- 98.1)	1,042	93.0 (91.4- 94.4)	3,152	96.0 (95.3- 96.6)
Tested at least once prior to the survey (no results)	12	0.6 (0.3- 1.0)	13	1.2 (0.7- 2.0)	25	0.8 (0.5- 1.1)
Never tested	42	1.9 (1.4- 2.6)	65	5.8 (4.6- 7.3)	107	3.3 (2.7- 3.9)
Total	2,164	100	1,120	100	3,284	100

*1 missing value of HIV testing status; ** 1 missing value of HIV test results status

The median age was 30 years [IQR: 20- 44] among all participants tested at least once prior to the survey (32years [IQR: 22-46] among women and 25 years [IQR: 18- 39] among men).

The median age was 25 years [IQR: 16-48] among all participants who never tested for HIV prior to the survey (19 years [IQR: 16- 53] among women and 27 years [IQR: 16- 42] among men).

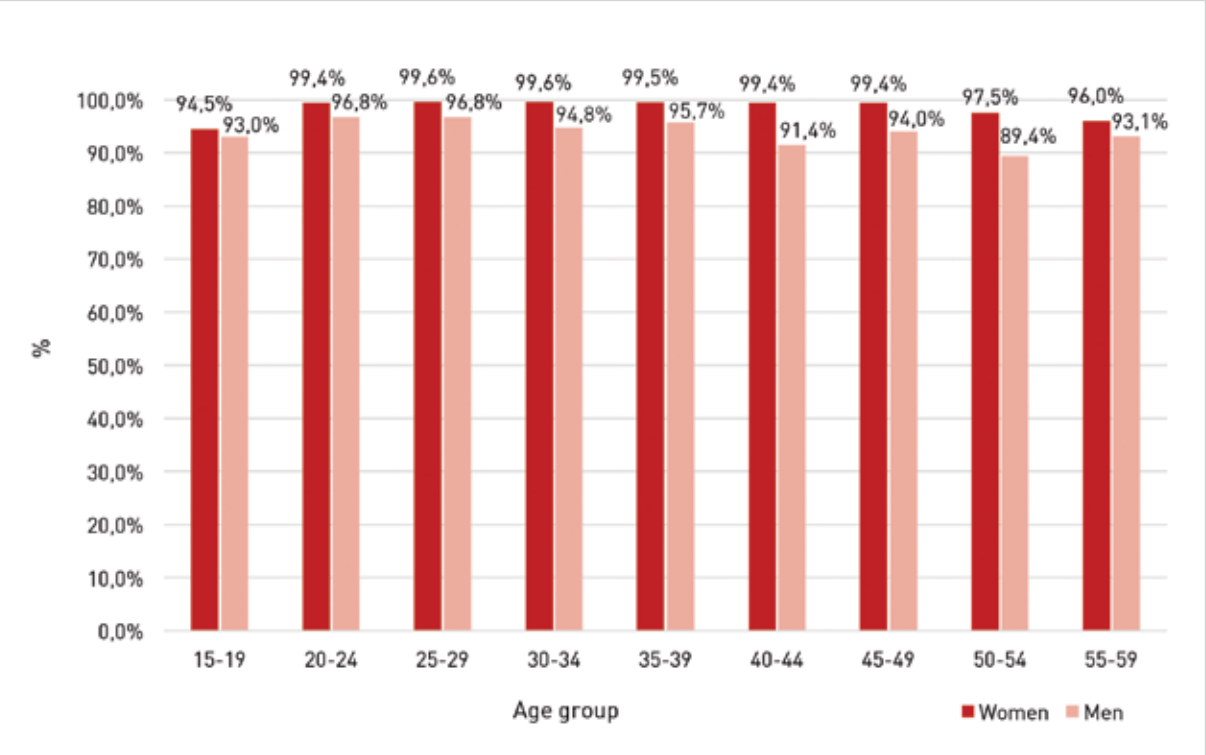


Figure 7 - Testing coverage among participants, by sex and age group, KZN, South Africa, 2018

The median number of HIV tests conducted by all participants prior to the survey was 4 [IQR: 2-7] and it was 5 [IQR: 3-8] among women vs. 3 [IQR: 2-5] among men. When restricting to the participants HIV-negative, the median number of HIV tests was 5 [IQR: 3-8].

When including all participants who had previously tested HIV-positive or HIV-negative, 36.1% (1,148/3,179) tested for HIV less than 6 months prior to the survey and 50.1% (1,592/3,179) less than 12 months prior to the survey (Table 7).

HIV-positivity rate amongst all participants who tested for HIV less than 6 months prior to the survey was 44.9% (706/1,571) overall, 53.8% (548/1,019) among women and 28.6% (158/552) among men.

Table 7- Delay since last HIV test for all participants tested prior to the survey, KZN, South Africa, 2018

Delay since last HIV test	Women		Men		Total	
	n	%	n	%	n	%
≤6 months	821	38.7	327	31.0	1,148	36.1
>6 -12 months	273	12.9	171	16.2	444	14.0
>12 -24 months	370	17.4	225	21.3	595	18.7
>24 months	649	30.6	327	31.0	976	30.7
Don't know	10	0.5	6	0.6	16	0.5

When restricting the analysis to participants HIV-negative at the time of the survey, 45.2% (1,054/2,311) received their last HIV test less than 6 months prior to the survey, and 62.3% (1,439/2,311) less than 12 months prior to the survey (Table 8). Among the 861 participants HIV-negative who were tested more than 12 months prior to the survey, 365 (42.4%) were aged less than 24 years.

Table 8 - Delay since last HIV test for participants HIV negative tested prior to the survey, KZN, South Africa, 2018

Delay since last HIV test	Women		Men		Total	
	n	%	n	%	n	%
≤6 months	747	51.3	298	34.9	1,045	45.2
>6 -12 months	236	16.2	158	18.5	394	17.1
>12 -24 months	285	19.6	201	23.5	486	21.0
>24 months	184	12.6	191	22.4	375	16.2
Don't know	5	0.3	6	0.7	11	0.5

+ **Places of having HIV test**

In total 79.8% (2,537/3,178) of the participants received their last HIV test at a fixed site and/or health facility, 6.3% (201/3,178) through mobile clinics, 7.0% (221/3,178) through door-to-door testing (CHAPS) and 219/3,178 (6.9%) received their last HIV test through other modalities.

+ **Untested participants**

Among the 3,286 participants, 107 (3.3%) participants had never tested for HIV before the survey. Out of these, 65/107 (60.8%) were men and 53/107 (49.5%) were individuals aged less than 24 years. Distribution by age and sex of the untested participants is presented Table 9.

82/107 (76.6%) of the participants who never tested for HIV knew a place where to have an HIV test, while 25/107 (23.4%) did not.

Table 9 - Distribution of participants who were never tested, by sex and age, KZN, South Africa, 2018

	Women		Men		Overall	
	n	%	n	%	n	%
15-19	21	50.0	24	36.9	45	42.1
20-24	2	4.8	6	9.2	8	7.5
25-29	1	2.4	4	6.2	5	4.7
30-34	1	2.4	5	7.7	6	5.6
35-39	1	2.4	4	6.2	5	4.7
40-44	1	2.4	7	10.8	8	7.5
45-49	1	2.4	4	6.2	5	4.7
50-54	5	11.9	7	10.8	12	11.2
55-59	9	21.4	4	6.2	13	11.2
Total	42		65		107	

The main reason for not previously testing for HIV was not believing themselves to be HIV-positive (Table 10).

Table 10 - Reason not to be tested, KZN, South Africa, 2018

Reasons not to be tested	n (%)
Do not think to be HIV-positive	28 (26.2)
Afraid of learning to be HIV-positive	23 (21.5)
No time to be tested for HIV	7 (6.5)
Do not like needles/ testing procedures	15 (14.0)
Do not know	30 (28.0)
Other	4 (3.7)
Total	107 (100)

4.2.2 HIV prevalence

In total, 862 participants were HIV-positive, 2,408 were HIV-negative and 16 did not have an HIV result. The reasons for not having an HIV result were:

+ Refused to have an HIV test (n=10)

+ Other (n=6): 2 participants had an indeterminate result on both HIV test on-site and Western Blot test; 2 participants gave their blood anonymously and had an indeterminate result with the Western Blot test, 1 participant gave his blood anonymously and did not receive a result with the Western Blot test; and 1 participant was negative on site although he was previously diagnosed positive and on ART and he did not receive result with the Western Blot.

The overall HIV prevalence was 26.4 % (95%CI: 24.9- 27.9). Prevalence in women was higher than in men: 30.5% (95%CI: 28.6- 32.5) vs. 18.4% (95%CI: 16.2- 20.8); (p<0.001). The highest prevalence was found in women aged 35-39 years: 50.5% (95%CI: 43.4- 57.7) and the lowest among men aged 19-20 years: 2.6% (95%CI: 1.1- 6.2).

Figure 8 shows HIV prevalence by sex and age group.

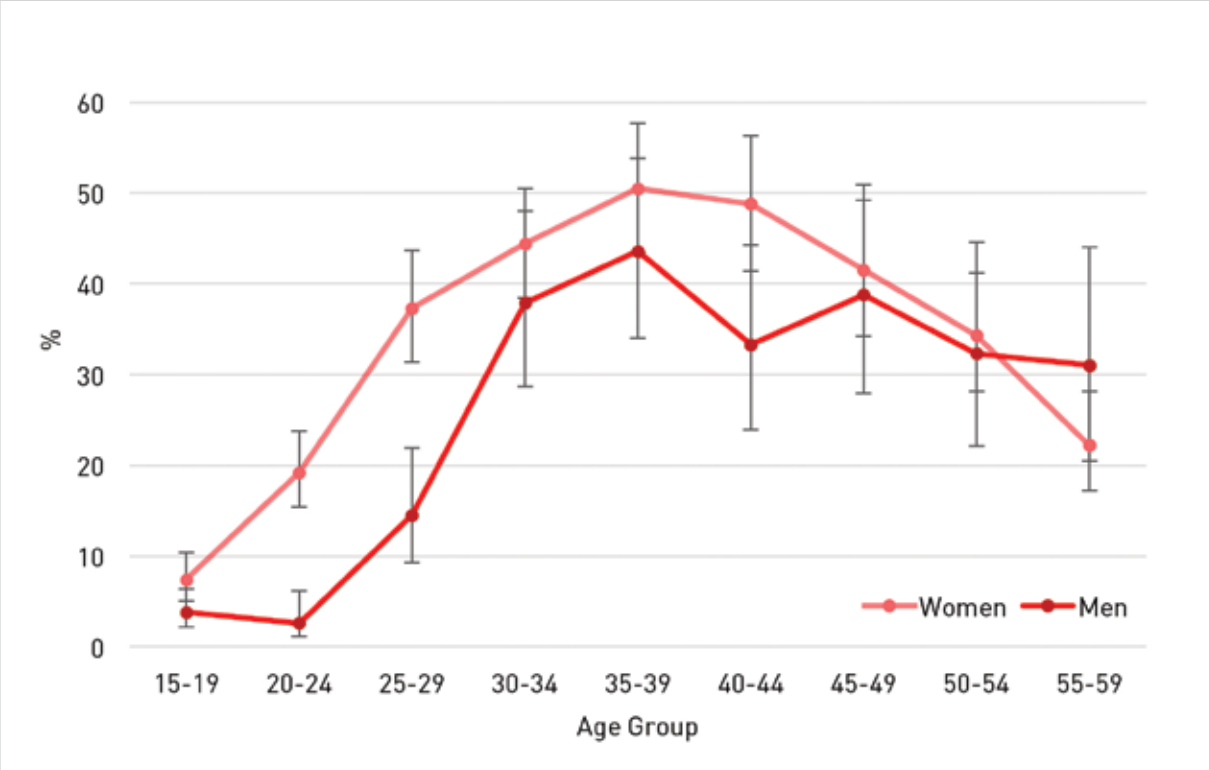


Figure 8 -HIV prevalence by age group among men and women, KZN, South Africa, 2018

The median age of HIV-positive participants was 36 years [IQR: 29-46] and it was similar between women and men: 36 years [IQR: 28-46] vs. 38 years [IQR: 32- 46].

Among women, the HIV prevalence was lower among those 15 to 19 years compared to other age groups ($p<0.001$). Among men, HIV prevalence was lower among those 15 to 24 years compared to other age groups ($p<0.001$). HIV prevalence among divorced or separated women was higher than among married women ($p<0.01$). There were no major differences in the HIV prevalence by level of education in women ($p=0.05$), while among men there was a trend towards lower prevalence with increasing level of education ($p<0.001$). HIV prevalence among pregnant or breastfeeding women was lower compared to women who were neither pregnant nor breastfeeding ($p<0.001$). HIV prevalence was lower among men who were circumcised compared to men who were not ($p<0.001$) (Table 11).

Photo credit: Scholars & Gentlemen

Table 11 - HIV prevalence by socio-demographic characteristics among participants, KZN, South Africa, 2018

	Women		Men		Overall	
	n	% 95%CI	n	% 95%CI	n	% 95%CI
Age group (N)	657		205		862	
15-19	28	7.4 (5.1- 10.4)	13	3.8 (2.2- 6.4)	41	5.7 (4.2- 7.6)
20-24	66	19.2 (15.4- 23.8)	5	2.6 (1.1- 6.2)	71	13.3 (10.7- 16.5)
25-29	87	37.3 (31.4- 43.7)	18	14.5 (9.3- 21.9)	105	29.4 (24.9- 34.4)
30-34	114	44.4 (38.4- 50.5)	36	37.9 (28.7- 48.0)	150	42.6 (37.5- 47.8)
35-39	93	50.5 (43.4- 57.7)	41	43.6 (34.0- 53.8)	134	48.2 (42.4- 54.1)
40-44	83	48.8 (41.4- 56.3)	27	33.3 (23.9- 44.3)	110	43.8 (37.8- 50.0)
45-49	68	41.5 (34.2- 49.2)	26	38.8 (27.9- 50.9)	94	40.7 (34.5- 47.2)
50-54	69	34.3 (28.1- 41.2)	21	32.3 (22.1- 44.6)	90	33.8 (28.4- 39.7)
55-59	49	22.2 (17.2- 28.1)	18	31.0 (20.5- 44.0)	67	24.0 (19.4- 29.4)
Marital Status (N)	656		205		861	
Married/ Living Together	149	27.4 (23.8- 31.3)	54	30.7 (24.3- 37.9)	203	28.2 (25.0- 31.6)
Never married	449	31.3 (29.0- 33.8)	143	15.6 (13.4- 18.1)	592	25.2 (23.5 - 27.0)
Divorced/ Separated	17	51.5 (34.9- 67.8)	5	31.3 (13.6- 56.7)	22	44.9 (31.7- 58.9)
Widowed	41	28.9 (22.0- 38.9)	3	42.9 (14.3- 77.1)	44	29.5 (22.8- 37.3)
Education (N)	657		205		862	
No education	58	28.4 (22.7- 35.0)	18	34.6 (23.0- 48.4)	76	29.7 (24.4- 35.6)
Primary	95	36.8 (31.2- 42.9)	30	29.7 (21.6- 39.3)	125	34.8 (30.1- 39.9)
Primary 2	188	32.3 (28.6- 36.2)	70	17.9 (14.4- 22.0)	258	26.5 (23.8- 29.4)
Secondary	295	29.1 (26.4- 32.0)	84	15.3 (12.5- 18.6)	379	24.3 (22.2- 26.5)
Tertiary	21	22.1 (14.9- 31.6)	3	12.5 (4.1- 32.4)	24	20.2 (13.9- 28.3)
Occupation (N)	657		205		862	
Farming, Forestry, Fishing	16	43.2 (28.4- 59.4)	7	31.8 (16.0- 53.4)	23	39.0 (27.5- 51.9)
Salaried employment	96	38.1 (32.3- 44.3)	47	26.6 (20.6- 33.6)	143	33.3 (29.0- 37.9)
Student	30	7.7 (5.4- 10.8)	12	3.4 (1.9- 5.8)	42	5.6 (4.2- 7.5)
Housewife/ husband	54	28.0 (22.1- 34.7)	1	6.3 (0.9- 33.6)	55	26.3 (20.8- 32.7)
Unemployed	434	36.0 (33.3- 38.7)	26	23.6 (20.0- 27.7)	546	32.5 (30.3- 34.8)
Other	27	36.0 (26.0- 47.4)	112	38.2 (27.5- 50.3)	53	37.1 (29.6- 45.3)
Change of residency in the last 10 years (resident members) (N)	650		203		853	
Yes	70	34.3 (28.1- 41.1)	23	19.2 (13.1- 27.2)	93	28.7 (24.0- 33.9)
No	580	30.4 (28.4- 32.5)	180	18.4 (16.1- 21.0)	760	26.3 (24.8- 28.0)
Pregnant or breastfeeding women (N)	650				650	
Yes	56	22.5 (17.7- 28.1)	N/A	N/A	56	22.5 (17.7- 28.1)
No	594	31.7 (29.6- 33.9))	N/A	N/A	594	31.7 (29.6- 33.9))
Circumcised men (N)			205		205	
Yes	N/A	N/A	53	9.5 (7.3- 12.3)	53	9.5 (7.3- 12.3)
No	N/A	N/A	152	27.1 (23.6- 30.9)	152	27.1 (23.6- 30.9)

4.2.3 CD4 characteristics

Of the 834 CD4 count results collected in the survey among all HIV-infected participants, 38 (4.6%) had a CD4 count below 200 cells/µl (Table 12) including 20 (52.6%) on ART and 17 (44.7%) not on ART (the information of ART status was missing for one participant).

The median CD4 count in the survey was 604 cells/µl [IQR: 440- 806]. The median CD4 was 655 cells/µl [IQR: 483- 838.5] among women and 487.5 [IQR: 329- 675] among men.

Table 12 - CD4 count among HIV positive participants, by sex, KZN, South Africa, 2018

CD4 count (cells/µl)	Women			Men			Overall		
	n	%	95%CI	n	%	95%CI	n	%	95%CI
<200	19	3.0	1.9- 4.6	19	9.6	6.2- 14.6	38	4.6	3.3- 6.2
200/349	55	8.7	6.7- 11.1	32	16.2	11.7- 22.0	87	10.4	8.5- 12.7
350/ 499	99	15.6	13.0- 18.6	50	25.3	19.7- 31.8	149	17.9	15.4- 20.6
≥500	463	72.8	62.9- 76.1	97	49.9	42.1- 55.9	560	67.2	63.9- 70.3
Total	636	100.0	_____	198	100.0	_____	834	100.0	_____

The proportion of participants with a CD4 count less than 200 cells/ µl among the 15-29 years was similar compared to the 30-44 years (7.3% (95%CI: 4.5- 11.8) vs. 4.2% (95%CI: 2.6- 6.7); p=0.12) and higher compared to the 45-59 years (7.3% (95%CI: 4.5- 11.8) vs. 2.8% (95%CI: 1.4- 5.8); p=0.04).

The proportion of participants with a CD4 count less than 200 cells/ µl was lower among those on ART compared to those not on ART (p<0.001) (Table 13).

Table 13 - Proportion of participants with CD4 cell count<200 cells/µl, KZN, South Africa, 2018

ART status	Women		Men		Overall	
	n/N	%	n/N	%	n/N	%
On ART	12/562	2.1	8/142	5.6	20/704	2.8
Not on ART	7/73	9.6	10/54	18.5	17/127	13.4
Missing ART status	0/1	0	1/2	50	1/3	33.3

Among the 38 participants with CD4 count less than 200 cells/µl, 27 (71.5%) were virologically unsuppressed, while among 560 participants with a CD4 count of >500 cells/µl, 45 (8.0%) were virologically unsuppressed (p<0.001)) (Table 14).

Table 14 - Proportion of HIV positive participants / ml by CD4 count, KZN, South Africa, 2018

CD4 count (cells/µl)	HIV-RNA VL<1,000 copies/ml*		HIV-RNA VL≥1,000 copies/ml	
	n	%	n	%
<50	2	33.3	4	66.7
51 – 100	1	11.1	8	88.9
101 – 200	8	34.8	15	65.2
201-350	50	57.5	37	42.5
350 - 499	122	81.9	27	18.1
≥500	515	92.0	45	8.0
Total	698	83.7	136	16.3

*1missing value on CD4 count; ** 2 missing values on ART status; *** 3 missing values on ART status; **** 3 missing values

4.2.4 Cascade of care

4.2.4.1 General

1. Cascade of care

Table 15 and Figure 9 show the distribution of participants along the cascade of care. At the time of the survey, of the 862 HIV infected participants, 89.9% were already aware of their HIV status, 88.6% were linked to care, 84.6% were in care, 84.3% were on ART, and 83.8% were virologically suppressed at a threshold of <1,000 copies/ml (Figure 9).

Table 15 - Distribution of participants along the cascade of care, KZN, South Africa, 2018

	Overall	Women	Men
Number of HIV-positive participants	862	657	205
Number of participants aware of their HIV positive status at the time of the survey	775	605	170
Number of HIV-positive participants reported to be linked to care at the time of the survey	759	596	163
Number of HIV-positive participants reported to be in care at the time of the survey	725	579	146
Number of HIV-positive participants on ART at the time of the survey	722	576	146
Number of HIV-positive participants with a VL<1,000 copies/ml at the time of the survey	701	556	145

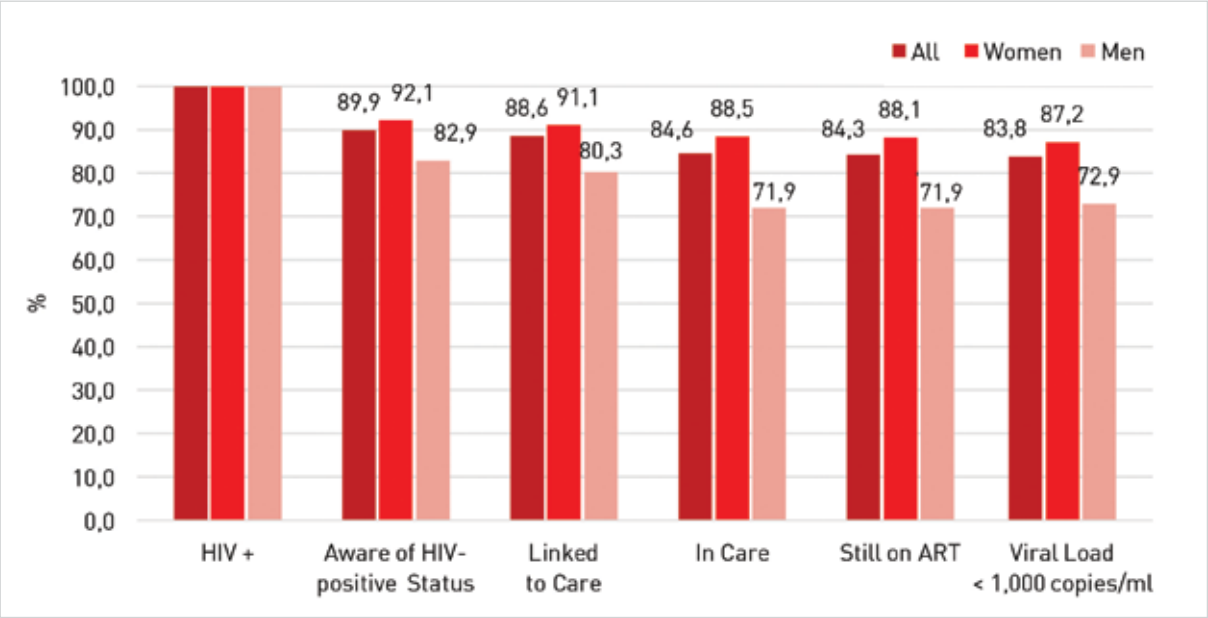


Figure 9 - Steps of the cascade of care among HIV participants, KZN, South Africa, 2018

2 - 90-90-90

Overall 775/862 (89.9% (95%CI: 87.7- 91.8)) were aware of their HIV-positive status, 722/770 (93.8% (95%CI: 91.8- 95.3)) of those aware of their status were on ART and 668/707 (94.5% (95%CI: 92.5- 96.0)) of those on ART were virally suppressed. There was a difference between sexes in the two first "90" coverages, but not in the third "90" coverage: women were more aware of their status than men 92.1% (95%CI: 89.8- 93.2) vs. 82.9% (95%CI: 77.1- 87.5); (p<0.001); ART coverage was higher among women compared to men: 95.7% (95%CI: 93.7- 97.1) vs 86.9% (95%CI: 81.0- 91.2); (p<0.001); and VLS was similar among women and men: 95.0% (95CI%: 92.9- 96.6) vs 92.3% (95CI%: 86.6- 95.7); p=0.2.

Lowest coverage amongst all 90's was in men aged 15 to 29 years (Figures 10 and 11).

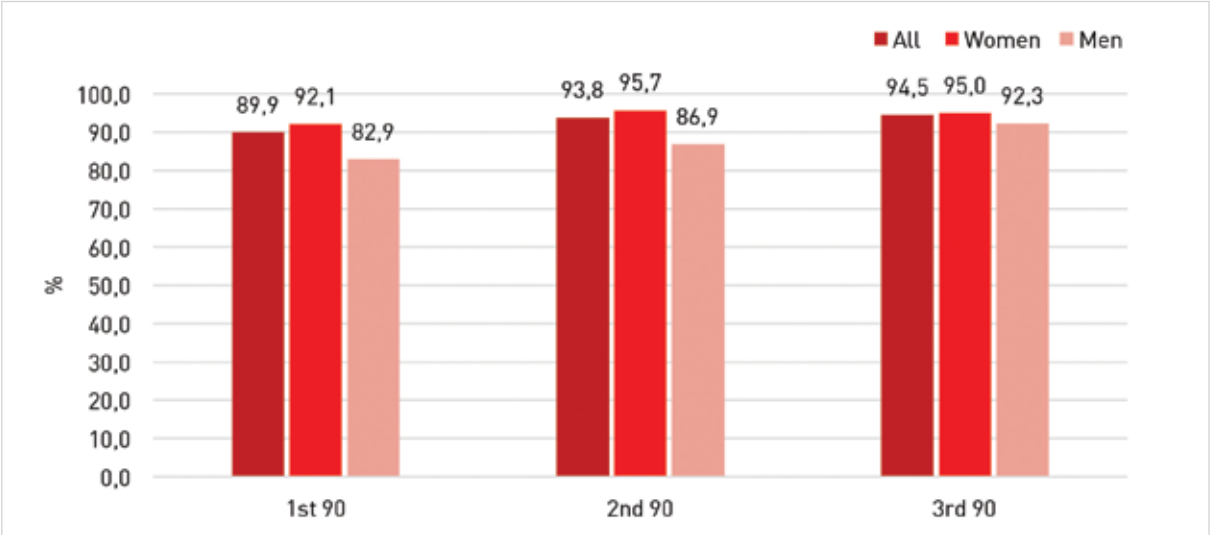


Figure 10 - 90-90-90-coverage among participants, KZN, South Africa, 2018

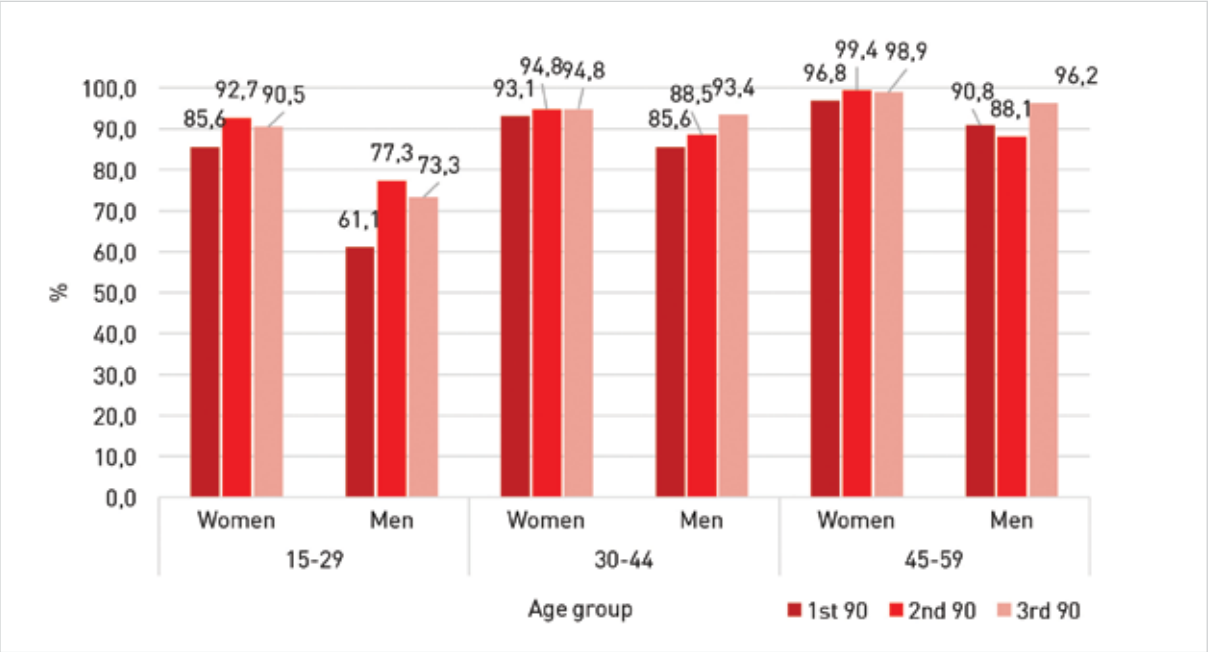


Figure 11 - 90-90-90-coverage among participants, by sex and age group, KZN, South Africa, 2018

4.2.4.2 Awareness of HIV-positive status

Out of the 862 participants who tested HIV-positive at the time of the survey, 775 participants were aware of their HIV-positive status before the survey and 87 were not aware.

The overall HIV-positive awareness ratio was 89.9% (95%CI: 87.7- 91.8). Women were more aware of their status than men 92.1% (95%CI: 89.8- 93.2) vs. 82.9% (95%CI: 77.1- 87.5), (p<0.001).

Men aged 15 to 29 years were the least aware of their HIV-positive status (22/36, 61.1%, 95%CI: 44.4- 75.5) followed by men 30-44 years of age (89/104, 85.6%, 95%CI: 77.4- 91.2), then those 45-59 years of age (59/65, 90.8%, 95%CI: 80.8- 95.8); (p<0.001) (Figure 12). In terms of absolute numbers, the group that accounted for the largest proportion unaware of their status was women aged 20 to 34 years, 37.9% (33/87) of all unaware. In total 52/87 (59.7%) of the unaware were women. (Figure 13).

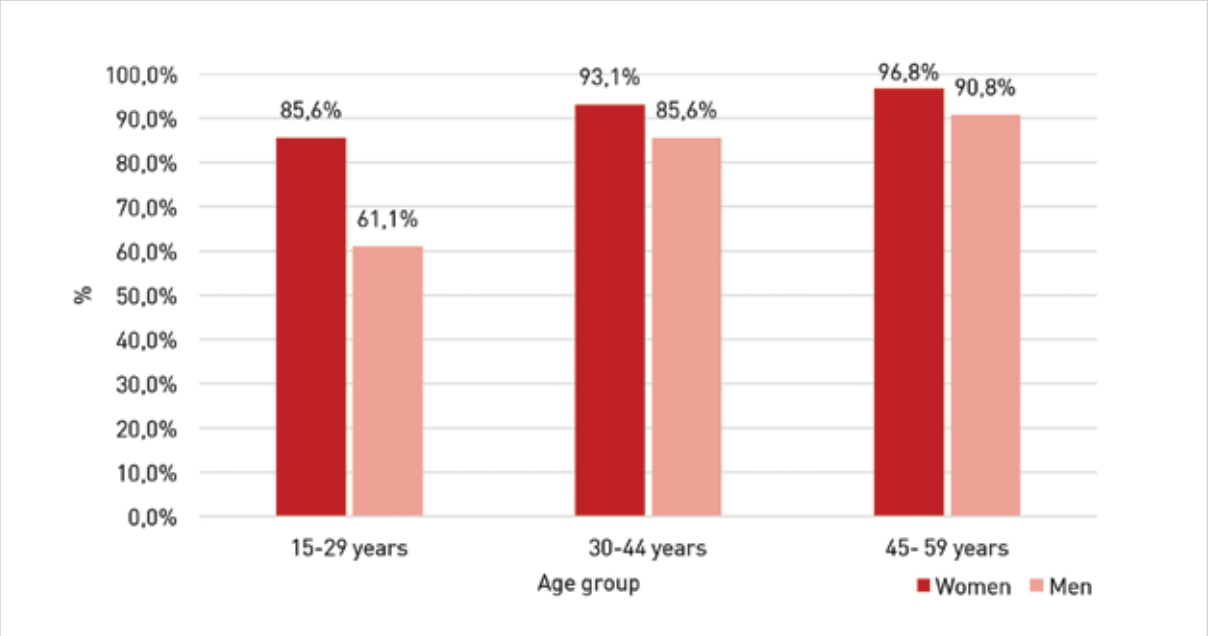


Figure 12 - HIV-positive status awareness among HIV participants, by sex and age group, KZN, South Africa, 2018

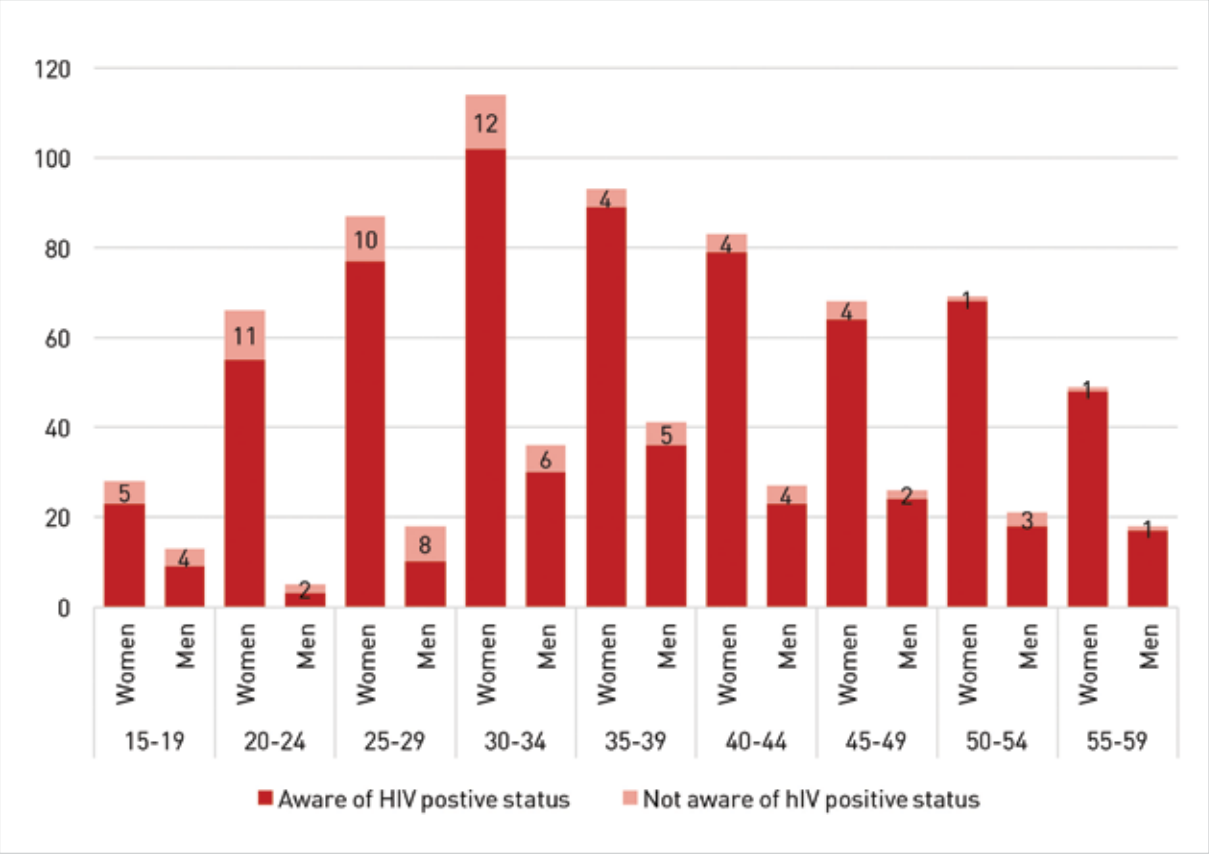


Figure 13 - HIV-positive status awareness among HIV participants, by sex and age group, KZN, South Africa, 2018

HIV-positive status awareness was 89.3% (95%CI: 77.7- 95.2) (50/56) among women who were pregnant or breastfeeding at the time of the survey and 92.6% (95%CI: 90.2- 94.5) (550/594) among women who were neither pregnant nor breastfeeding (p=0.38).

Among participants who were not aware of their HIV-positive status at the time of the survey (n=87), 24 (27.6%) had received their last HIV test less than 6 months prior to the survey, 14 (16.1%) between 7 and 12 months prior, 41 (47.1%) more than 12 months prior and 8 (9.2 %) had never been tested. All participants who were not aware of their HIV-positive status and had never tested for HIV were men (n=8). All men aged 15 to 19 years who learnt their HIV-positive status at the time of the survey (n=4) had also never tested before (Figure 14).

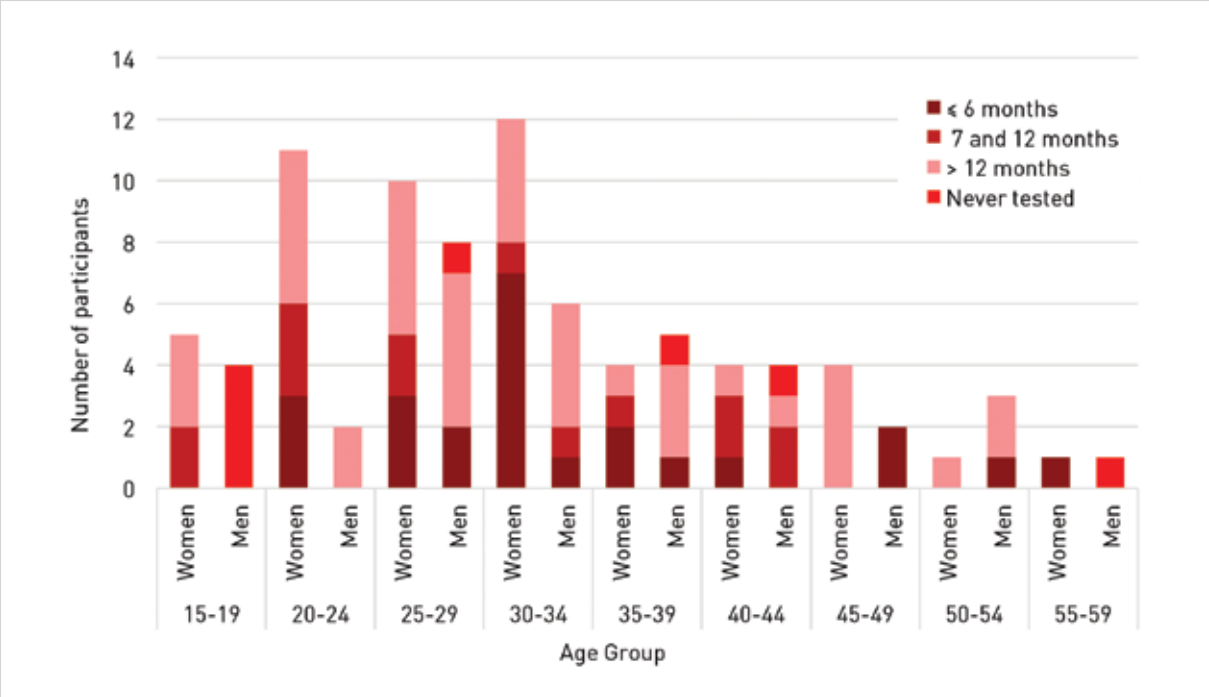


Figure 14 - Number of HIV-positive individuals who were unaware of their status at the time of the survey by prior testing behaviour, by sex and age group, KZN, South Africa, 2018

4.2.4.3 Linkage to care

Among the 862 participants who tested HIV-positive, 759 were linked to care, 98 never linked to care and for 5 linkage information was unknown.

The overall linkage to care was 88.6% (95%CI: 86.3- 90.5). Linkage to care was higher among women than men overall (91.1% (95%CI: 88.7- 93.1) vs. 80.4 (95%CI: 74.2- 85.2); (p<0.01) and in each age group (Figure 15). Among participants aware of their HIV-positive status, linkage to care was similar among women and men (99.0% (95%CI: 97.8- 99.6) vs. 97.0% (95%CI: 93.0- 98.8); p=0.05) (Figure 15).

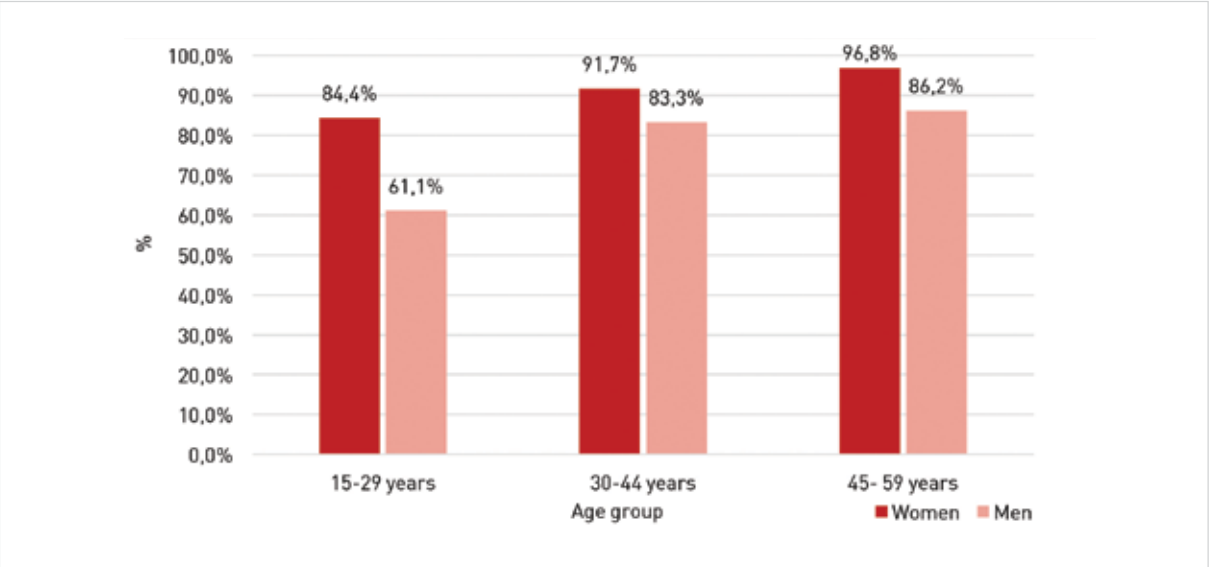


Figure 15 - Proportion of HIV participants linked to care, by sex and age group, KZN, South Africa, 2018

4.2.4.4 In care

Among the 862 participants who tested HIV-positive on-site, 725 (84.1%) were in care at the time of the survey, 132 (15.3%) were not in care and for 5 (0.6%) information on retention in care was unknown. The overall HIV in care ratio was 84.6% (95%CI: 82.0- 86.9). Proportion of participants in care at the time of the survey was higher among women than men: 88.5% (95%CI: 85.9- 90.8) vs. 71.9 (95%CI: 65.3- 77.7); (p<0.001).

Among participants linked to care, retention in care was higher among women than men (97.2 % (95%CI: 95.5- 98.2) vs. 89.6% (95%CI: 83.9- 93.4); (p<0.001) (Figure 16).

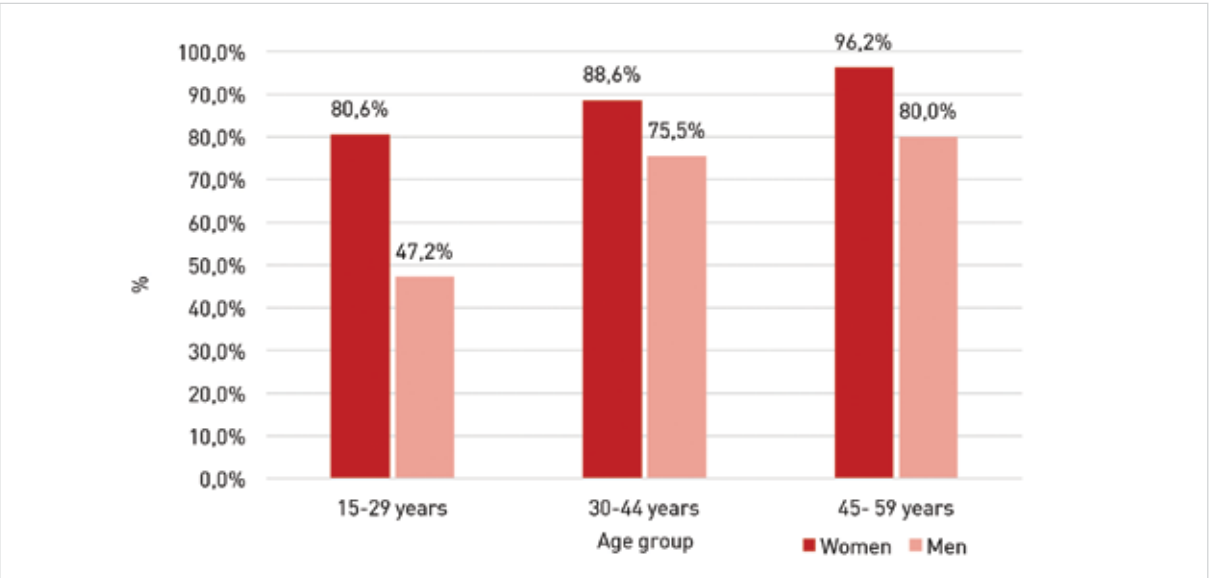


Figure 16 - Proportion of HIV-positive participants in care, by sex and age group, KZN, South Africa. 2018

4.2.4.5 ART initiation & ART coverage

+ **ART initiation**

Overall 745/862 (86.4%) of the HIV-positive participants had ever initiated ART and 722 of them (96.9 %) answered that they were still on ART at the time of the survey (576 (98.3%) of women and 146 (91.8%) of men). All participants who ever initiated ART and ever stopped their treatment were not in care at the time of the survey.

The median time of being on ART was 62.8 months (5 years and 3 months) [IQR: 28.9-104.4].

516 (70%) participants who ever initiated ART were initiated in 2011 or later (Figure 17).

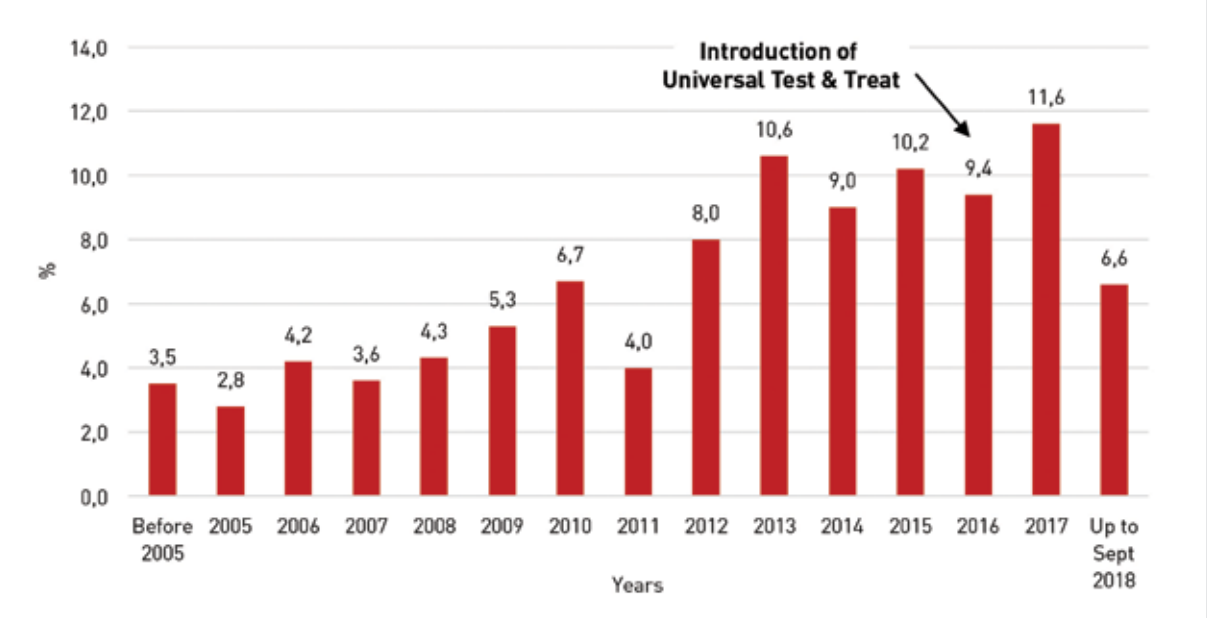


Figure 17 - Proportion of HIV participants who initiated ARV treatment by year, KZN, South Africa, 2018

Of the participants who initiated ART (whether or not they were still on ART at the time of the survey), 50% or more reported they would prefer to receive their treatment at home and/or at the health facility level (Table 16)

Table 16 - Distribution of Preferred places to receive ART treatment, KZN, South Africa, 2018

Place of preference to receive ART*	Women		Men		Total	
	n	%	n	%	n	%
At home	290	49.9	86	54.1	376	50.5
At hospital level	126	21.5	35	22	161	21.6
At health facility level	352	60.1	73	45.9	425	57.1
At a community venue	148	25.3	37	23.3	185	24.8

* Participants could answer to multiple choices

+ **ART coverage**

In total, 722/862 participants were on ART, 135/862 were not on ART and 5 values were missing. ART coverage among HIV-positive participants was 84.3% (95%CI: 81.7- 86.5). Of the total HIV-infected population, ART coverage was higher in women than in men: 88.1% (95%CI: 85.4- 90.4) vs 71.9% (95%CI: 65.3- 77.7); (p<0.001) (Figure 18).

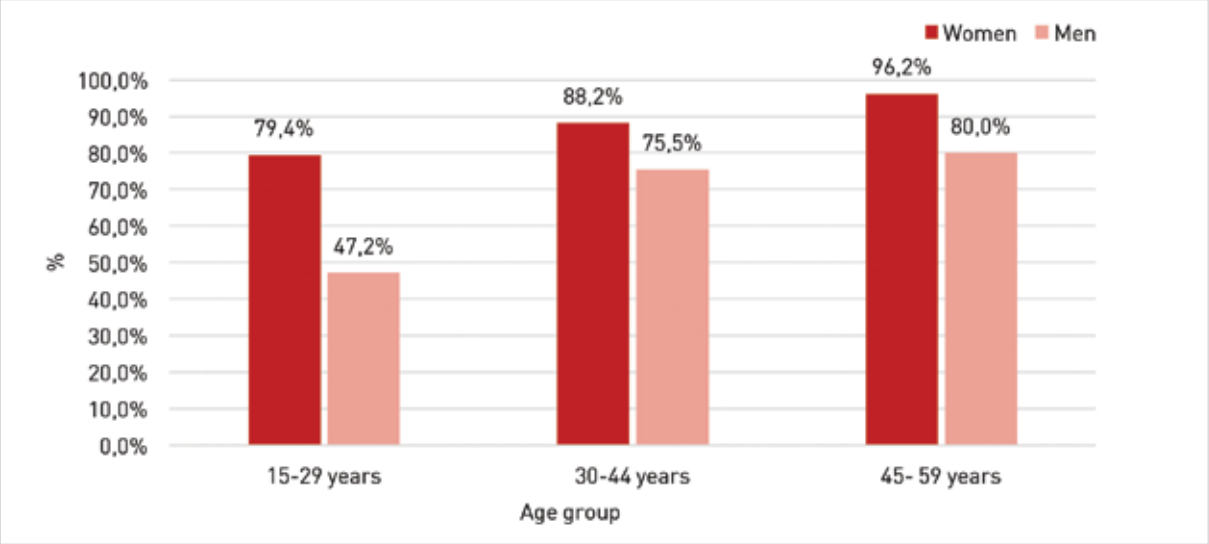


Figure 18 - Proportion of HIV-positive participants on ART, by sex and age Group, KZN, South Africa, 2018

In absolute numbers, the groups least likely to be on ART were women aged 20 to 24, 25 to 29 and 30 to 34 years (48 participants in total) and men aged 25 to 29 years (13 in total). In total 78 (57.8%) of those not on ART were women. (Figure 19).

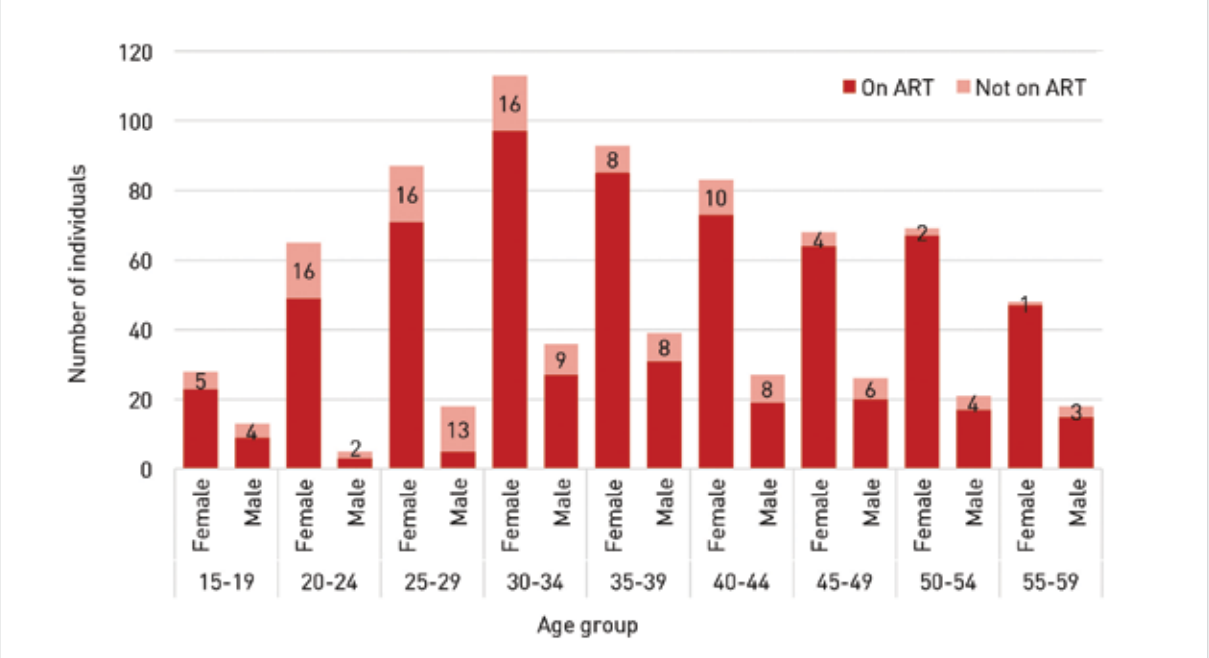


Figure 19 - ART coverage among participants, by sex and age group, KZN, South Africa, 2018

The median age of the participants on ART was 38 years [IQR: 30- 47], 37 [IQR: 30- 47] among women, and 39 years [IQR: 33-48] among men.

Three of the participants in care were not on ART: all three were women aged 21, 25 and 40 years; two of whom had recently tested HIV positive (about two weeks before the survey).

The majority of the participants (565/722, 78.3% (95%CI: 75.1- 81.1)) received their ART through the public sector. The proportion of individuals receiving their treatment through the public sector was similar among women and men: 446/ 576, 77.4% (95%CI: 73.8- 80.7) vs 119/146, 81.5% (95%CI: 74.4- 87.0); p=035.

Of the 132/722 (18.3% (95%CI: 15.6- 21.3) when excluding the missing values) participants who received their ART through a differentiated model of care, 48 (36.4%) received it through a club, 13 (9.9%) received through a CAG, 28 (21.2%) received it through fast lane, 42 (31.8%) received it through community PuP and 1 (0.8%) received it through Central Chronic Medication Dispensing and Distribution (CCMDD) (Figure 20).

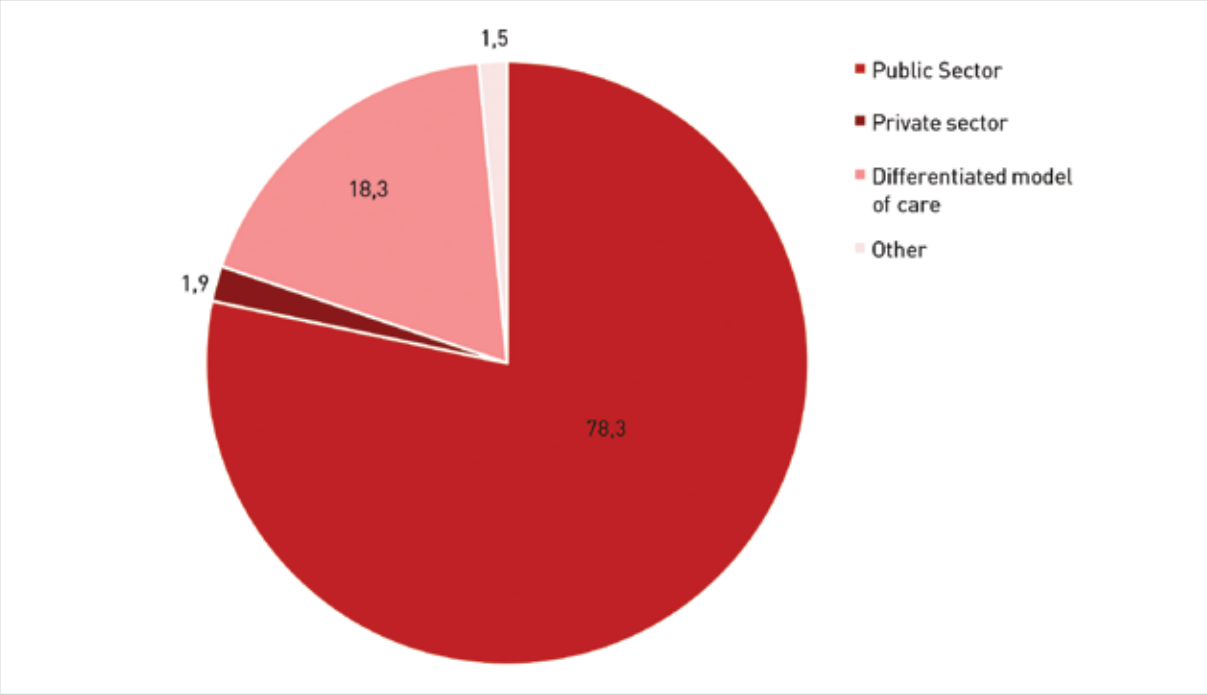


Figure 20 - Place where participants on ART receive their treatment, KZN, South Africa, 2018

In total, 36/722 (5%) of participants on ART reported that, prior to the survey, they had already interrupted their treatment for a period of time. The main reason was because they could not refill their treatment when travelling (n=18, 50.0%). The other reasons reported during the survey were forgetting to take the treatment (n=4, 11.1%), financial issues (n=4, 11.1%) and that they were sick and could not got to the health facility (n=3, 8.3%) (Table 17).

Table 17- Distribution of the reasons for interrupting ART, KZN, South Africa, 2018

Reason for interrupting ARV treatment	Initiated on ART (N=36)
Travel to another place with impossibility to refill ART	18
Sickness that impedes ability to go to the health facility to refill ART	4
Forgetting to take ART	3
Other	10
No reason stated	1

The main reason of stopping ART among 23/ 745 (3.1%) participants who ever initiated was because they moved away (Table 18).

Table 18 - Distribution of the reasons for stopping ART, KZN, South Africa, 2018

Reasons to stop ART treatment	Initiated on ART (N=23)
(N=23)	0
Advised to stop by a family member	1
Thought to be cured/ felt good/ side effect	1
Moved away	7
Transport cost	2
Stopped PMTCT	0
Stigmatised when going to refill the ARV treatment	1
Treatment fatigue	0
Other	9
Missing reason	2

4.2.4.6 Viral suppression

+ **Viral suppression in HIV infected participants**

Of all (862) HIV-positive participants, 701 (81.3%) were virally suppressed at a threshold of <1,000 copies/ml, 136 (15.8%) were not virally suppressed, and for 25 (2.9%) results were missing (participants refused to have additional tests).

Overall, among the HIV positive participants with a VL result (N=837), VLS (<1,000 copies/ml) was found among 701 participants (83.8% (95%CI: 81.1- 86.1)) and was higher among women than men: 87.2% (95CI%: 84.3- 89.5) vs.72.9% (95CI%: 66.3- 78.6); (p<0.001).

+ **Unsuppressed**

Among participants with HIV-RNA VL≥ 1,000 copies/ml, 82/136 (60.3%) were women, and 74/136 (54.4%) were aged between 25 to 39 years (Figure 21). Overall, 106/136 (77.9 (95%CI: 70.1- 84.2)) were never married vs 26/136 (19.1% (95%CI: 13.3- 26.7) who were married or living with a partner (p<0.001). Overall 81/136 (59.6% (95%CI: 51.0- 67.6)) were unemployed vs 13/136 (9.6% (95%CI: 5.6- 15.9)) who were students; (p<0.001).

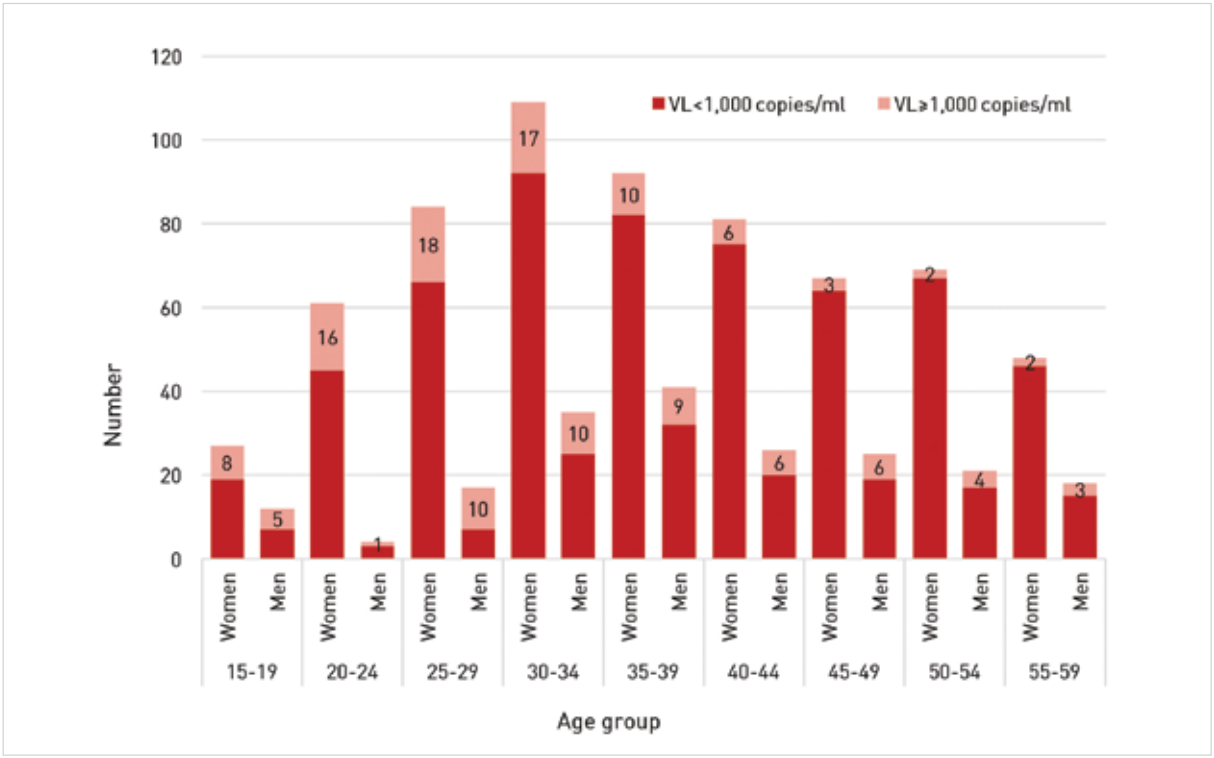


Figure 21 - Distribution of viral load≥ 1,000 copies/Ml, by sex and age, KZN, South Afrcia, 2018

Among participants with HIV-RNA VL≥ 1,000 copies/ml, n=65/136 (47.8%) were not aware of their HIV-positive status, 32/136 (23.5%) were aware of their HIV-positive status but not on ART, and 39/136 (28.7%) were on ART (Figure 22).

Among the unsuppressed unaware of their HV-positive status, 59/65 (90.8% (95%CI: 80.6- 95.9)) received at least one HIV test prior to the survey. 29 of those (49.2% (95%CI: 36.4- 62.1)) had their last HIV test within the last year prior to the survey.

Among those unsuppressed participants, 62/136 (45.6%) have been linked to care.

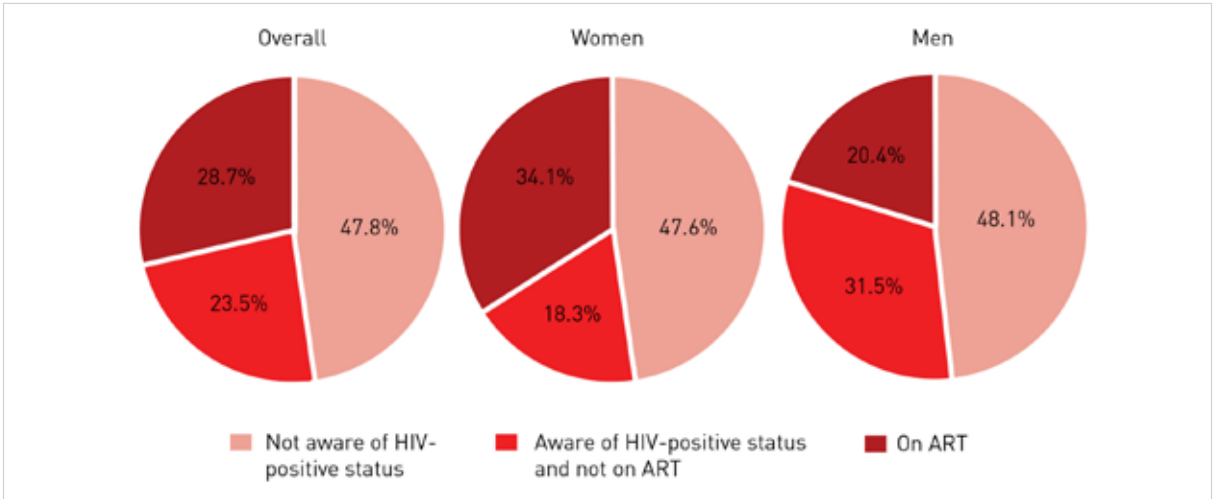


Figure 22 - Proportion of HIV-positive participants with HIV-RNA viral load ≥1,000 Copies/Ml, by HIV positive status awareness and treatment status, KZN, South Africa, 2018

Among the 82 women unsuppressed, 11 were pregnant or breastfeeding at the time of the survey, 47 were not, and 24 values were missing. The proportion of pregnant or breastfeeding unsuppressed women was lower than the proportion of unsuppressed women who were not pregnant nor breastfeeding: 19.0% (95%CI: 10.8- 31.2) vs 81.0% (95%CI: 68.9- 89.2); (p<0.001).

+ **Virological suppression in participants on ART**

Virological suppression was achieved among 94.5% (95%CI: 92.5- 96.0) of the 707 participants who reported being on ART (3rd 90), and was similar among women and men: 95.0% (95CI%: 92.9- 96.6) vs 92.3% (95CI%: 86.6- 95.7); p=0.2 (Table 19).

Among participants with a VL test result who reported to be on ART for more than 6 months (N= 676), virological suppression was 94.8% (95%CI: 92.9- 96.3) overall (n=641), 95.4% (95%CI: 93.2- 96.9) among women (516/541) and 92.6% (95%CI: 86.8- 96.0) among men (125/135). VLS did not differ according to sex or duration of ART intake (Table 19).

Table 19 - Virological suppression distribution among HIV infected participants, KZN, South Africa, 2018

	HIV-RNA VL<1000 copies/ml)		
	n/N	**%**	**(95%CI)**
Sex			
Women	556/638	96.4	92.9- 96.6
Men	145/199	92.3	86.6- 95.7
Duration of ART	N = 837		
>6 m to 12 m	23/26	88.5	67.9- 96.5
>12 m to 24 m	79/82	96.3	89.0- 98.8
>24 m	539/568	94.9	92.7- 96,4
Unknown time on ART	60/158	36.1	29.0-43.9

+ **Virological suppression in participants not on ART**

30 of the 127 participants (23.6%, 95%CI: 17.0- 31.9), who reported not being on ART and who had a VL result were virologically suppressed. The proportion was similar among women and men: 26.0% (95CI%: 17.2- 37.4) vs 20.4% (95CI%: 11.6- 33.4); p=0.46.

+ **Virological suppression among pregnant and breastfeeding women**

Among HIV positive women who were breastfeeding and/or pregnant at the time of the survey (N=56), 78.6% (n=44) were virologically suppressed and 19.6 % (n=11) had a HIV-RNA VL of 1,000 copies/ml or more. One result was missing.

+ **Virological suppression among men who are circumcised or not**

Of the 558 men who were circumcised (medically and non-medically) (see results section (4.2.6),

53 (9.5%) were HIV-positive. Two male participants did not have a VL result. Out of those who had a viral load result, 36/51 (70.6% (95%CI: 56.3- 81.7)) were virologically suppressed.

Among the 563 men who were not circumcised, 152 (27.1%) were HIV-positive. Out of those who had a VL result, 109/148 (73.7% (95%CI: 65.9- 80.2)) were virologically suppressed.

4.2.5 HIV incidence

The overall incidence was 0.2 (95%CI: 0.0- 1.1) new cases per 100 persons-year (PY). In the 15-29 age group, incidence was 1.2 (95%CI: 0.0- 2.9) new cases per 100 PY among women and 0.8 (95%CI: 0.0- 2.1) new cases per 100 PY among men (Table 20).

Table 20 - Incidence estimation overall, by sex and age group, KZN, South Africa, 2018

	Overall		15-29 years		30-59 years	
	Annual incidence (new cases per 100 persons-year)	95% CI	Annual incidence (new cases per 100 persons-year)	95% CI	Annual incidence (new cases per 100 persons-year)	95%CI
Overall	0.2	0.0- 1.1	1.0	0.0- 2.1	0.0	0.0- 0.5
Women	0.1	0.0- 1.3	1.2	0.0- 2.9	0.0	0.0- 0.5
Men	0.3	0.0- 1.4	0.8	0.0- 2.1	0.0	0.0- 1.5

4.2.6 Circumcision

Of the 1,121 men included in the survey, 558 (49.8%) were circumcised and 508/558 (91.0%) medically circumcised by a health professional. Distribution of the circumcision coverage is presented in Figure 23. The median age of circumcision was 16 years [IQR: 14-20] for the participants who reported circumcision after the age of 5 years

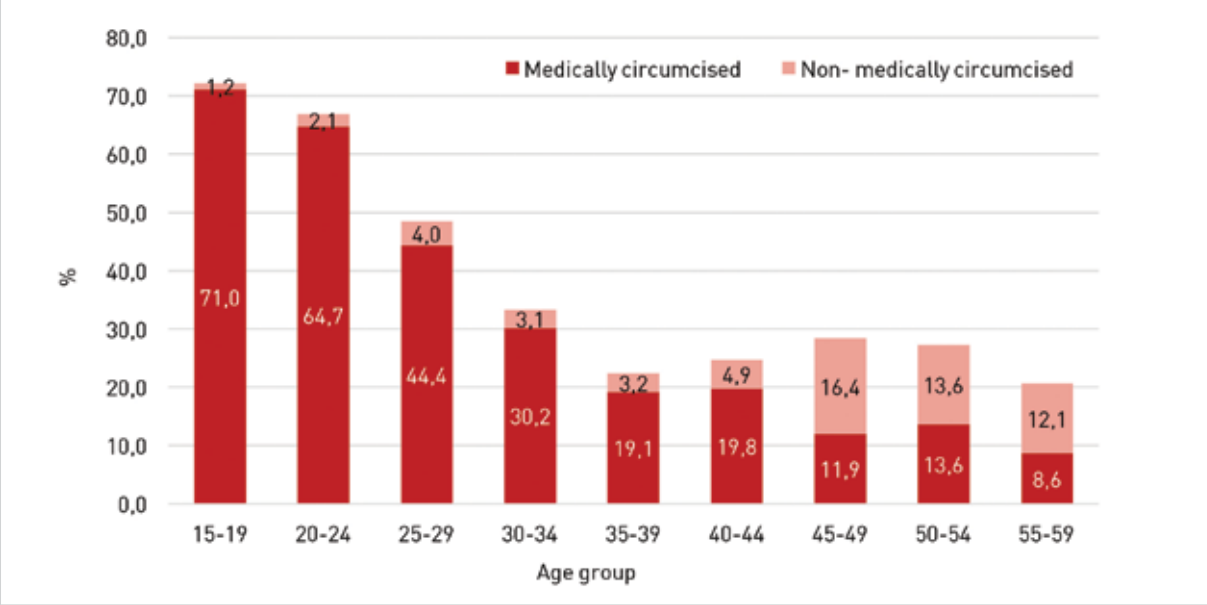


Figure 23 - Proportion of men circumcised by age group, KZN, South Africa, 2018

75.5% of the men who reported to be circumcised were circumcised at hospital level, clinic or MMC centres.

Only 4.5% were circumcised at home (Figure 24).

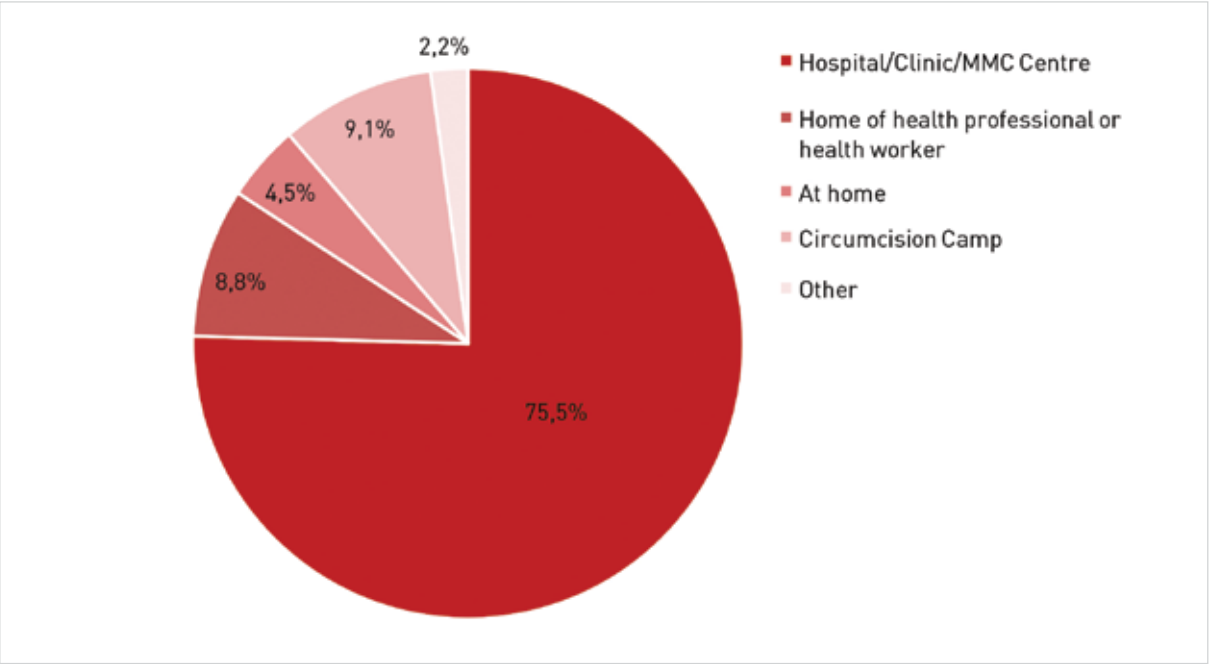


Figure 24 - Place of circumcision for the men who declared having been circumcised (medically or not medically), KZN, South Africa, 2018

Photo credit: Scholars & Gentlemen

4.2.7 Knowledge about prevention and care

Overall, 3,213 participants (97.8%) knew a location to have an HIV test. Places known by the participants are listed in Table 21.

Table 21 - Distribution of places known as HIV testing providers by sex, KZN, South Africa, 2018

Places known as HIV testing providers*	Women		Men		Total	
	n	%	n	%	n	%
Public Sector						
Government Hospital	2,051	95.9	988	92.0	3,039	94.6
Government Clinic	2,110	98.6	998	92.9	3,108	96.7
Government Stand-alone voluntary HIV counselling and testing centre	1,184	55.4	487	45.3	1,671	52.0
Government Family Planning Clinic	1,397	65.3	274	25.5	1,671	52.0
Government Mobile Clinic	1,712	80	751	69.9	2,463	76.7
Government Home by Community Care Givers	1,018	47.6	441	41.1	1,459	45.4
Government School based Clinic	1,190	55.6	573	53.4	1,763	54.9
Antenatal Clinic	1,408	65.8	300	27.9	1,708	53.2
Private Sector						
Private Hospital / Clinic / Doctor	1,109	51.9	491	45.7	1,600	49.8
Pharmacy	540	25.3	201	18.7	741	23.1
MSF activities						
MSF Fixed testing site	1,662	77.7	773	72.0	2,435	75.8
MSF Mobile sites (M1SS)	1,725	80.7	828	77.1	2,553	79.5
MSF CHAP (at home)	1,736	81.2	802	74.7	2,538	79.0
MSF HCT School	1,380	64.5	698	65.0	2,078	64.7
Oral self-testing outside of a facility	138	6.5	57	5.3	195	6.1
Other	3	0.1	0	0	3	0.1

** Participants could select multiple answers

The majority of participants (94.0%) said that they preferred to be tested at home (Table 22).

Table 22- Distribution of preferred places to receive an HIV test by sex, KZN, South Africa, 2018

Place of preference to be tested for HIV*	Women		Men		Total	
	n	%	n	%	n	%
At home	2,012	95.0	988	92.0	3,020	94.0
At hospital level	1,999	93.5	951	88.6	2,950	91.8
At health facility level	1,978	85.5	918	85.5	2,896	90.1
At a community event/ outreach	1,372	64.1	663	61.7	2,035	63.3
At a mobile testing in the community	1,549	72.4	725	67.5	2,274	70.8
At fixed site in the community	1,460	68.3	689	64.2	2,149	66.9

Overall, 94.8% of the participants knew at least one preventative method of contracting HIV (Table 23).

Table 23 - Knowledge of methods protecting from contracting HIV, KZN, South Africa, 2018

Methods known as protective from contracting HIV	N (%)
Condom use	2,311 (52.6)
Taking ART	56 (1.3)
Abstinence	570 (13.0)
Circumcision (men only)	374 (8.5)
Wearing gloves	1,033 (23.5)
Other	53 (1.2)

** Participants could provide multiple answers

4.3 COMPARISON OF MAIN CONCLUSIONS FROM 2013 AND 2018 HIV SURVEY RESULTS

In total, 6,688 individuals (60% female) living in 2,377 houses were eligible and 3,518 (62.3% female) were included in 2013. The overall inclusion rate was 84.5%. The median age of the participants was 26 years [IQR: 19-40].

Overall, sex ratio (M/F) was 0.60 in the 2013 and 0.51 in the 2018. Similarly to the 2013 survey (27), the majority of participants had attended secondary school (46.3% in 2013 vs 47.8% in 2018), were never married (75.0% in 2013 vs 71.9% in 2018), and were unemployed (36.3% in 2013 vs. 51.5% in 2018) though in both cases, more so in the latest survey.

In both surveys, a large majority of participants had been living in their household for more than 10 years (86.5% in 2013 vs. 89.9% in 2018); there were fewer visitors in 2018 than 2013 (2 % vs. 4% respectively); (p<0.001).

HIV testing coverage was high in 2013, regardless of sex or age group: 81.4% (95%CI: 80.4- 82.4) overall, 88.4% (95%CI: 86.8- 89.9) among women and 69.8% (95%CI: 67.8- 71.7) among men. Between 2013 and 2018, testing coverage increased overall by 15% points: 81.4 % in 2013 vs 96.7% in 2018 (p<0.001); among women by 10% points: 88.4% in 2013 vs 98.1% in 2018 (p<0.001); and among men by 24% points: 69.8% in 2013 vs 94.2% in 2018 (p<0.001). The groups with the greatest improvement were youth aged 15 to 29 years (+ 16% points; p<0.001), specifically among men who increased their testing coverage by +27%; points: 67.2% in 2013 vs. 94.8% in 2018, (p<0.001).

The proportion of HIV-negative participants who received an HIV test 12 months prior to the survey also increased between surveys (57% in 2013 vs. 62% in 2018 (p<0.001).

HIV prevalence in 2013 was 25.2% (95%CI: 23.6- 26.9), 30.9% (95%CI: 29.0- 32.9) among women and 15.9% (95%CI: 14.0- 18.0) among men (p<0.001). Overall and stratified by sex, HIV prevalence was similar across survey years (overall: p=0.23; among women p=0.77; among men p=0.07).

Overall, HIV incidence was 1.2 (95% CI: 0.2-2.1) new cases per 100 PY in 2013 and 0.2 (95%CI: 0.0- 1.1) new cases per 100 PY in 2018. Among youth aged 15 to 29 years, HIV incidence was 2.0 (95%CI: 0.9- 3.0) new cases per 100 PY in 2013 and 1.0 (95%CI: 0.0- 2.1) new cases per 100 PY in 2018.

Median CD4 count among HIV infected was 483 cells/µl [IQR: 332-665] in 2013. The proportion of advanced-HIV decreased significantly between 2013 and 2018 overall: 9.8% vs. 4.6%; (p<0.001); among women: 7.4% vs. 3.0%; p=0.001; and among men: 17.0% vs. 9.6%; p=0.04. The main difference was among participants in ART with a decrease between 2013 and 2018 from 7.0% to 2.8% (p<0.001).

HIV-positive status awareness in 2013 was 75.2% (95%CI: 72.9- 77.4) overall, 77.7% (95%CI: 75.1- 80.1) among women and 67.3% (95%CI: 62.1- 72.1) among men (p<0.001). Overall HIV-positive status awareness increased from 75.2% in 2013 to 89.9% in 2018; (p<0.001). HIV positive status awareness increased 1) by sex: 77.7% vs 92.1% (p<0.001) among women and 67.3% vs 82.9% (p<0.001) among men; and 2) by age group: 62.1% vs 81.6% (p<0.001) among the 15-29 years; 81.5% vs 91.1% among the 30-44 years (p<0.001); and 84.8% vs 95.2% among the 45- 59 years (p<0.001).

ART coverage in 2013 was 53.6% (95%CI: 51.0- 56.2) overall, 55.7% (95%CI: 52.7- 58.6) among women and 46.8% (95%CI: 41.4- 52.2) among men (p=0.005). ART coverage among HIV-positive individuals increased between 2013 and 2018 by 31% points overall (p<0.001); by 32% points among women (p<0.001); and by 25% points among men (p<0.001). ART coverage among HIV-positive individuals increased by 37% points among individuals aged 15- 29 years (36.7% in 2013 vs 74.1% in 2018; (p<0.001), 24% points among individuals aged 30 to 44 years (61.1% in 2013 vs. 84.9% in 2018); (p<0.001) and 25% points among individuals aged 45 to 59 years (66.8% in 2013 vs. 92.0% in 2018); (p<0.001)

VLS in 2013 was 57.1% (95%CI: 54.4- 59.6) overall, 60.0% (95%CI: 57.0- 62.9) among women, and 47.7% (95%CI: 42.4- 53.1) among men (p<0.001). VLS increased between 2013 and 2018 overall and among women by 27% points and by 25% points among men (p<0.001 in each group). As with ART coverage, HIV-positive individuals aged 15 -29 years showed the highest improvement in VLS between 2013 and 2018: 40.9% in 2013 vs 71.7% (p<0.001), while individuals aged 30-44 years increased VLS from 63.5% to 84.9% (p<0.001); and individuals aged 45 – 59 years increased VLS from 71.2% in 2013 to 91.4% in 2018, (p<0.001). VLS among those not on ART was similar across 2013 and 2018: 16.5% (13.8- 19.6) vs to 23.6%, (95%CI: 17.0- 31.9); p= 0.05.

In 2013 the majority of unsuppressed participants were women (426/599; 71.1%) as in 2018 and 397/599 (66.3%) were individuals aged less than 35 years.

The proportion of unsuppressed not aware of their HIV status was similar between 2013 and 2018 (48.1% vs 47.8%, p=0.95), while the proportion of unsuppressed aware of their status but not on ART was higher in 2013 compared to 2018 (43.2% vs 23.5%, p<0.001), and the proportion of the unsuppressed on ART was lower in 2013 compared to 2018 (8.7% vs 28.7%, p<0.001). In 2013, 464/599 participants (77.5% (95%CI: 73.9- 80.6)) were never married vs 111/599 participants (18.5% (95%CI: 15.6- 21.9) who were married or living with a partner (p<0.001). Those proportions were similar to those of 2018 (p =0.9 and p=0.3 respectively).The proportion of students among the unsuppressed was similar in 2013 compared to 2018 (7.0% vs. 9.6% respectively; p=0.31 Overall in 2013 78.0% (95%CI: 72.8- 82.5) of the unsuppressed unaware of their HV-positive status, received at least one HIV test prior to the survey compared to 90.8% (95%CI: 80.6- 95.9); p=0.03. In 2013, 54.6% (95%CI: 47.9- 61.1) of the unsuppressed unware of their status and ever tested had their most recent HIV test less than 1 year prior to the survey compared to 49.2% (95%CI: 36.4- 62.1) in 2018; p=0.46.

In 2013, the proportion of pregnant or breastfeeding unsuppressed women was lower than the proportion of unsuppressed women who were not pregnant nor breastfeeding: 8.9% (95%CI: 6.5- 12.1) vs 91.1% (95%CI: 88.0- 93.5); (p<0.001) as in 2018.

Overall progress towards the 90–90-90 targets in 2013 was as follows: 75.2% (95%CI: 72.9- 77.4) knew their status, 70.4% (95% CI: 67.5–73.1) of those who knew their status were on ART and 93.1% (95% CI: 91.0–94.7) of those on ART were virally suppressed. By sex, progress towards the 90–90-90 targets was: 78%–71%–93% among women; and 67%–69%–92% among men (p<0.001; p=0.7; p=0.6 respectively). By age, progress was: 62- 58- 89 among individuals aged 15–29 years, 81- 74- 93 among individuals aged 30–44 years and 85- 78- 97 among those aged 45-59 years.

The three "90s" increased between 2013 and 2018 (by 15% points (p<0.001), 23% points (p<0.001) and 1% points (p=0.28), respectively). The first 90 coverage improved by 14% points among women (p<0.001) vs. 16% among men (p<0.001); second 90 coverage improved by 25% points among women (p<0.001) vs 18% among men (p<0.001); and the third 90 coverage improved by 2% among women (p=0.4) but not in men (p=0.9).

Detailed comparisons between the 2013 and 2018 surveys appear in the Annex.

Photo credit: Scholars & Gentlemen

5. DISCUSSION

We found high coverage of the HIV cascade of care among HIV-positive female and HIV-positive male participants living in Mbongolwane and Eshowe. The UNAIDS 90-90-90 targets were surpassed at 90-94-95. Coverage was better among women than men in every step of the cascade. HIV prevalence was high overall and almost double among women compared to men. Viral suppression (<1,000 copies/ml) among HIV-positive participants was 84% and was higher among women than men (p<0.001). High rates of viral suppression have been correlated with incidence reduction and although not statistically significant, compared to the previous survey, we found a sharp decrease in overall incidence and in incidence among young women (see Annex-section 7). VLS reached almost 95% among those who were on ART at the time of the survey with no significant difference observed by sex. About half of HIV-positive participants with an unsuppressed VL were not aware of their HIV status.

Socio-demographic characteristics of the household differed from the latest census conducted in 2011 as we found less eligible men aged 15-59 years per household than in the census (14).The sex ratio (M/F) was 0.51 in the 2018 survey, 0.60 in 2013 and 0.78 in the 2011 census. The M/F ratio in the 2018 survey was lower from 25 years of age and upwards, as in 2013, probably due to migration of men to urban areas for job seeking; an alternative explanation would be a greater increase of life expectancy among women than men. A large majority of participants had not changed residence in the previous 10 years, which was similar to 2013 results (27).

HIV testing coverage was very high in the 2018 survey, regardless of sex or age group, even among the participants who tested HIV-negative. Implementation of specific strategies such as home testing and mobile HIV testing approaches, which have shown to attract a significant proportion of men, new testers or/and young individuals to HIV testing in different settings (including in South Africa) (28,29) may partly explain the positive changes in the HIV testing coverage across sex and age groups. Indeed HIV testing coverage, specifically among men, was higher in our survey compared to other settings in Malawi (2016) and Zimbabwe (2016) (30,31), but similar to those seen in Ndhiwa (Kenya 2018) (32), where the same intervention approaches were implemented.

Nonetheless, women had higher HIV testing coverage than men. Access to HIV testing through ante-natal care (ANC) and higher attendance to health facilities among women may have played a role in this difference.

The largest improvement in HIV testing coverage between 2013 and 2018 occurred among men (27). The age group with the greatest improvements were youth aged 15 to 29 years (78.6% vs. 94.4%), specifically among men aged

15 to 29 years (increase of about +27%) as they were targeted by the MSF project activities. Implementation and improvement of HIV testing strategies, such as school testing (with 95% of students previously tested in 2018 compared to 74% in 2013 (p<0.001) (16) may be part of this progress, and may have been beneficial specifically to the younger population.

HIV testing sites seem to be well known in the population and reach all the groups irrespective of sex and age group. Almost 98% of the participants could name a location to have an HIV test.

The majority of the participants (80%) had had their most recent HIV test at a fixed site or health facility, while 7% did so through the door-to door strategy and 6% through a mobile clinic.

The proportion of HIV-negative participants tested 12 months prior to the survey was lower in 2018 compared to 2013. In addition, in 2018, approximately 28% of participants who did not know their HIV-positive status at the time of the survey had received a negative HIV test result less than six months prior to the survey and about 44% less than 12 months prior to the survey. This suggests that those participants may have important high risk factors, including a potential mind-set of false reassurance from previous negative test results. Counselling high risk individuals who test negative on strategies to remain negative could be pertinent in this setting.

Participants reporting never having had an HIV test were predominantly men or younger than 24 years of age, a trend also observed in 2013 (16.). Most untested participants were afraid of learning their HIV-status or did not think they were HIV-positive.

HIV prevalence was still very high in this setting and was similar to that of 2013, regardless of age group and sex (27). Given the observed low incidence and mortality, this suggests that the HIV program is working well in the area, and that a majority of HIV-positive individuals are tested, in care, on ART and virologically suppressed. In 2018, HIV prevalence among women was higher than in men for the age group 20-29 years, with a rapid increase in prevalence starting from 15 years, and peaking at 35-39 years; more than half of the participating women aged 35–39 years were HIV infected. In 2013, HIV prevalence among women was higher than that of men from 15-34 years and increased quite rapidly in women from the age of 20 years with the peak in their 30s. The prevalence curve was similar in 2013 and 2018 in men (see Annex), although we found the prevalence higher among divorced and/or separated individuals.

Incidence estimates were lower in 2018 compared to 2013, overall and by sex, even though the difference was not statistically significant. HIV incidence among women aged 15-29 years decreased from 2.9 to 1.2 new cases/100 PY, as MSF activities targeted this group after the first survey, although it was still high in 2018 (1%).

Median CD4 count among HIV-positive people increased from 483 cells/µl [IQR: 332-665] in 2013 to 604 cells/µl [IQR: 440- 806] in 2018 (27). The proportion of advanced HIV disease (participants with a CD4 count below to 200 cells/µl) (28) decreased between 2013 and 2018, overall and by sex. A possible reason for this is that with increased testing and ART coverage, people are being started earlier on treatment; it is also possible that with increased community services people who disengaged from care are being restarted on treatment.

The proportion of advanced HIV disease in 2018, which was higher among men than women, suggests that either men were more likely to

disengage from the health system, or initiated their treatment at later stage than women. Given that more than half of the participants with advanced HIV disease were on ART, one hypothesis is that individuals started their ARV treatment with advanced HIV disease or another hypothesis is that individuals experienced ART failure with or without prior disengagement to care. Three different studies implemented in South Africa have shown similar results (33-35).

Overall HIV-positivity awareness (first stage of the cascade or 1st 90) reached 90%. HIV-positive status awareness among the 15-29 age group increased from 63.0% to 81.6% (p=0.03) which may suggest that the strategies implemented in this setting after the first survey succeeded to reach this age group. However, awareness was still low in specific sex and age groups particularly men aged 15-29 years, although their HIV testing coverage was high. Results of low HIV-positive status awareness are consistent with some other studies implemented in South Africa and elsewhere (36-39). Even though the implementation of community activities seemed to have influenced the HIV testing coverage in this group of men aged 15-29 years, it did not seem to have an impact on diagnosing people with HIV in this group.

Linkage to care coverage (second stage of the cascade) was high in this setting and we did not see major decreases between the first stage and the second stage of the cascade of care. The least linked to care were males aged 15-29 years which is in line with the HIV status awareness results. However the group with the largest decrease from 2013 to 2018 between the first stage and the second stage of the cascade was men aged 45-59 years. Even though this group represented a small number, we may endeavour to understand the reasons and adapt strategies accordingly.

In each age group except women aged 45-59 years, we found a difference between the second stage and the third stage (in care) of the cascade of care. The highest drop between linkage to care and in care was among men aged 15-29 years with almost 14% of the participants previously linked to care who were not in care at the time of the survey. Overall, women were more likely to be in care than men, whilst they were similarly linked to care once they knew their HIV status. The results show that even though people were successfully linked to care in this setting the difficulty was to retain them in care, specifically men aged 15-29 years. Strategies to improve retention in care for men of this age group would be recommended to improve gender equity in health care access (and subsequently ART coverage) in this setting. The proportion of HIV-positive participants in care increased from 61% in 2013 to 85% in 2018.

Nonetheless, we found a high ART coverage among HIV infected participants with almost all participants who reported to be in care to also be on ART. The group that displayed the greatest improvement in ART coverage were youth aged 15-29 years with a difference of about 37% between 2013 and 2018 (p<0.001) (16), although the coverage was still low among men aged 15 to 29 years (47%). Similarly, youth who knew their HIV-positive status presented the greatest progress in ART coverage, although the coverage was still low among men aged 15-29 years (77%) in 2018. This suggests that the implementation of "Universal Test & Treat" was successful in this setting.

Among the participants who acknowledged that they had interrupted their treatment in the past, or who had stopped completely to take their treatment, most reported that it was due to travel.

We found encouraging results for VLS, specifically among the participants on ART, showing that participants responded to their treatment regardless of how long they had been on it. Men performed equally well compared to women in VLS once they were on ART. Percentage point estimates suggested that men on ART aged 15 to 29 were the least likely to be virologically supressed, but differences were not statistically significant with this sample size.

VLS among HIV-positive participants increased between 2013 and 2018 (+27%; p<0.001). HIV-positive individuals aged 15 -29 years showed the highest improvement in VLS between 2013 and 2018 (p<0.001) (16), although VLS among this age group was the lowest compared to other age groups and VLS among men aged 15-29 years was still low (51.5%) . These results, which are consistent with those of ART coverage, highlight the importance of access to treatment toward achieving VLS. Moreover VLS results are in line with a trend towards incidence reduction, and the substantial progress in the cascade of care, and HIV testing coverage between 2013 and 2018.

In 2013 and 2018 the majority of the unsuppressed were women and individuals and aged less than 35 years. The proportion of unsuppressed who did not know their HIV status was similar between 2013 and 2018 surveys, while the proportion of unsuppressed on ART increased between 2013 and 2018.

The overall 90-90-90 coverage was surpassed in 2018. The first two 90 coverages increased between 2013 and 2018, overall, amongst both women and men, while the third 90 coverage did not improve, neither among women nor men.

The results of the survey showed an improvement of the circumcision coverage overall, most especially among young men aged 15 to 19 years who almost tripled their circumcision coverage between 2013 and 2018 (16).

Strengths of the survey include the population-based design. Limitations were, first, the cross-sectional design which does not allow for assessing causality. Second, self-reporting bias may also have occurred. For instance, awareness of HIV positivity may have been underestimated among participants who falsely reported not knowing their HIV positive status. Moreover after seven years of MSF intervention in the area, participants may have been more open to acknowledge their HIV-positive status in 2018 than in 2013. This may have had an impact on the reporting of the HIV-positive status and overestimated the progression between 2013 and 2018. Third, ART coverage may have been overestimated or underestimated, even though it has been demonstrated in this setting that there was no major difference between using ART self-reporting tools or the ARV blood detection test to estimate the ART coverage (40). Nevertheless we found a large proportion of participants not on ART with VLS, similar to that seen in 2013 and in other settings, which may suggest that ART coverage was underestimated. Finally, the participation rate was lower in 2018 compared to 2013, specifically among men; this may have led to underestimating the prevalence and the cascade of care results if we assume that the participants absent at the time of the survey, or who refused to participate, did not contribute as they knew their HIV-positive status. On the other hand, it may have overestimated the prevalence if those individuals knew they were HIV-negative. However, the overall participation rate was 80%, with 85% among women, which suggests a high likelihood of representativeness of the population (18).

6. CONCLUSION

This survey was conducted five years after the first survey in 2013. It highlights high viral suppression among all people living with HIV, in line with a trend towards incidence reduction and substantial progress in the cascade of care and HIV testing coverage between 2013 and 2018. The 90-90-90 objectives were achieved overall and among women including the youngest age group, but men did not achieve the two first 90s. Changes in the national guidelines such as "Universal Test and Treat", as well as MSF support of community and clinical services, may have played a role in this progress.

Notably a proportion of young women remain unsuppressed and specific strategies are needed to improve coverage of status awareness and treatment among men aged 15-29.

In summary, this combination prevention project demonstrated that it is feasible to achieve the 90-90-90 targets, and a high level of viral suppression in the community, within a public sector setting in South Africa, with additional support for community services and clinical support at primary care.

Photo credit: Scholars & Gentlemen

ANNEX: COMPARISON 2013 AND 2018 RESULTS

1. Distribution of eligible and included individuals KZN, South Africa, 2013 and 2018

	Number of eligible		Inclusion rate (%)	
	2013	2018	2013	2018
Women	4,008	2,557	87.8%	84.7%
Men	2,680	1,552	79.5%	72.2%
Total	6,688	4,109	84.5%	80.0%

2. Socio-demographic characteristic of participants

The median age of the participants was 26 years [IQR: 19-40] in 2013 vs. 30 years [IQR: 20-44] in 2018

Distribution of women and men aged 15-59 by selected background characteristics, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2013	2018	2013	2018	2013	2018
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Age group (years)	3,518	2,165	2,131	1,121	5,649	3,286
15-19	774 (22.0)	381 (17.6)	679 (31.9)	345 (30.8)	1,453 (25.7)	726 (22.1)
20-24	623 (17.7)	535 (16.3)	436 (20.5)	190 (17.0)	1,059 (18.8)	535 (16.3)
25-29	497 (14.1)	360 (11.0)	295 (13.8)	124 (11.1)	792 (14.0)	360 (11.0)
30-34	306 (8.7)	355 (10.8)	180 (8.5)	96 (8.6)	486 (8.6)	355 (10.8)
35-39	283 (8.0)	278 (8.5)	134 (6.3)	94 (8.4)	417 (7.4)	278 (8.5)
40-44	251 (7.1)	252 (7.7)	117 (5.5)	81 (7.2)	368 (6.5)	252 (7.7)
45-49	259 (7.4)	233 (7.1)	93 (5.5)	67 (6.0)	352 (6.2)	233 (7.1)
50-54	282 (8.0)	201 (9.3)	101 (4.7)	66 (5.9)	383 (6.8)	267 (8.1)
55-59	243 (6.9)	222 (8.5)	96 (4.5)	58 (5.2)	339 (6.0)	280 (8.5)
Marital Status (n)	3515	2,163	2129	1,120	5644	3,284
Never Married	2448 (69.6)	1,441 (66.6)	1786	921 (82.2)	4234 (75.0)	2,362 (71.9)
Married/Living Together	905 (25.8)	547 (25.3)	294 (13.8)	176 (15.8)	1199 (21.2)	724 (22.1)
Divorced/Separated	65 (1.9)	33 (1.5)	39 (1.8)	16 (1.4)	104 (1.8)	49 (1.5)
Widowed	97 (2.8)	142(6.6)	10 (0.5)	7 (0.6)	107 (1.9)	149 (4.5)
Education (n)	3518	2,164	2130	1,121	5648	3,286
No schooling	319 (9.1)	204 (9.4)	112 (5.3)	54 (4.7)	431 (7.6)	258 (7.9)
Primary	1448 (41.2)	845 (39.0)	963 (45.2)	493 (44.0)	2411 (42.7)	1,338 (40.7)
Secondary	1625 (46.2)	1,018 (47.0)	988 (46.4)	551 (49.2)	2613 (46.3)	1,569 (47.8)
Tertiary	126 (3.6)	97 (4.5)	67 (3.2)	24 (2.1)	193 (3.4)	121 (3.7)
Occupation (n)	3518	2,165	2131	1,121	5649	3,286
Farmer, Forestry	176 (5.0)	37 (1.7)	141 (6.6)	22 (2.0)	317 (5.6)	60 (1.8)
Salaried employment	495 (22.9)	252 (11.6)	426 (38.0)	177 (15.8)	921 (28.0)	429(13.1)
Student	876 (24.9)	391 (18.1)	756 (35.5)	360 (32.1)	1632 (28.9)	751 (22.9)
Housewife/husband	439 (12.5)	193 (8.9)	26 (1.2)	16 (1.4)	465 (8.2)	209 (6.4)
None	1418 (40.3)	1,216 (56.2)	631 (29.6)	477 (42.6)	2049 (36.3)	1,693 (51.5)
Other	114 (3.2)	76 (3.5)	151 (7.1)	68 (6.1)	265 (4.7)	144 (4.4)
Other	76 (3.5)		68 (6.1)		144 (4.4)	

3. Mobility: Time of residence among the 15-59 years, KZN, South Africa, 2013 and 2018

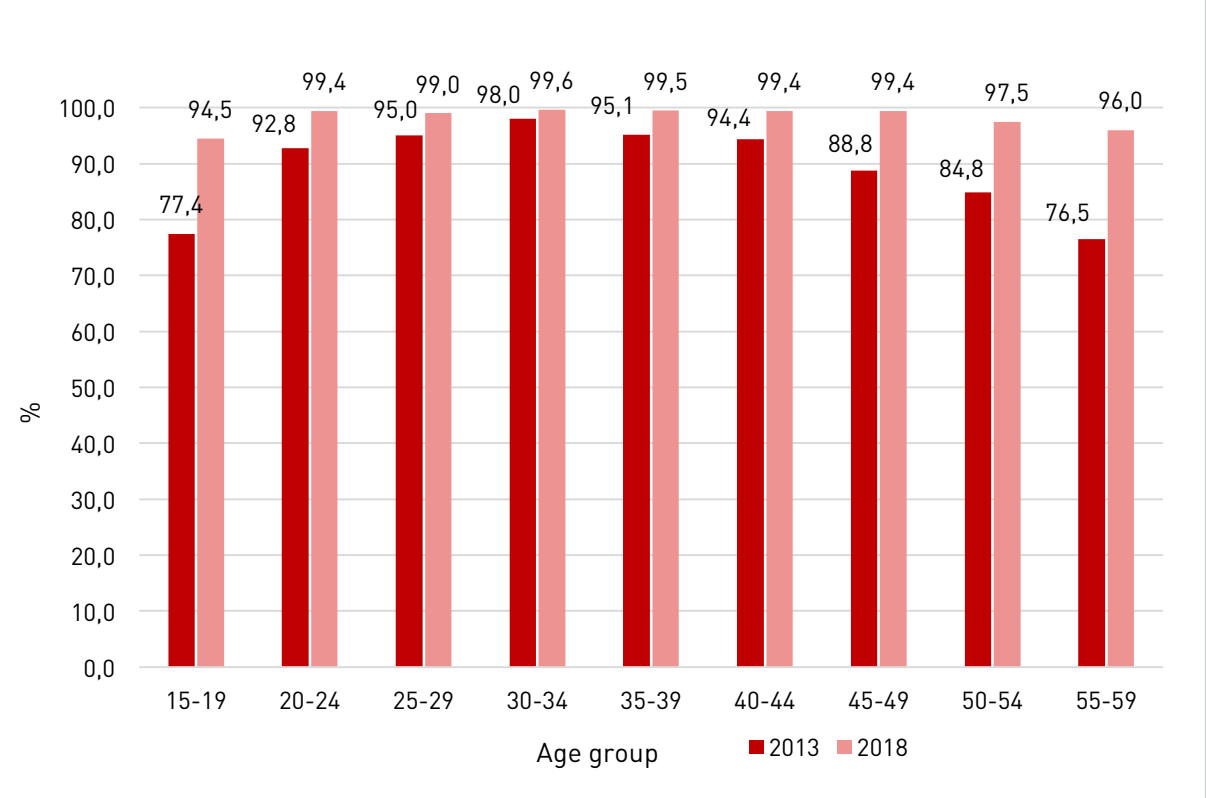
	Women		Men		Total	
	2013	2018	2013	2018	2013	2018
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Moved residence in 10 year (n)	3,518	2,126	2,131	1,102	5,649	3,286
Yes	457 (13.0)	206 (9.7)	304 (14.3)	120 (10.9)	761 (13.5)	326 (10.1
No	3,061 (87.0)	1,920 (90.3)	1,827 (85.7)	982 (89.1)	4,888 (86.5)	2,902 (89.9)

4. HIV testing coverage

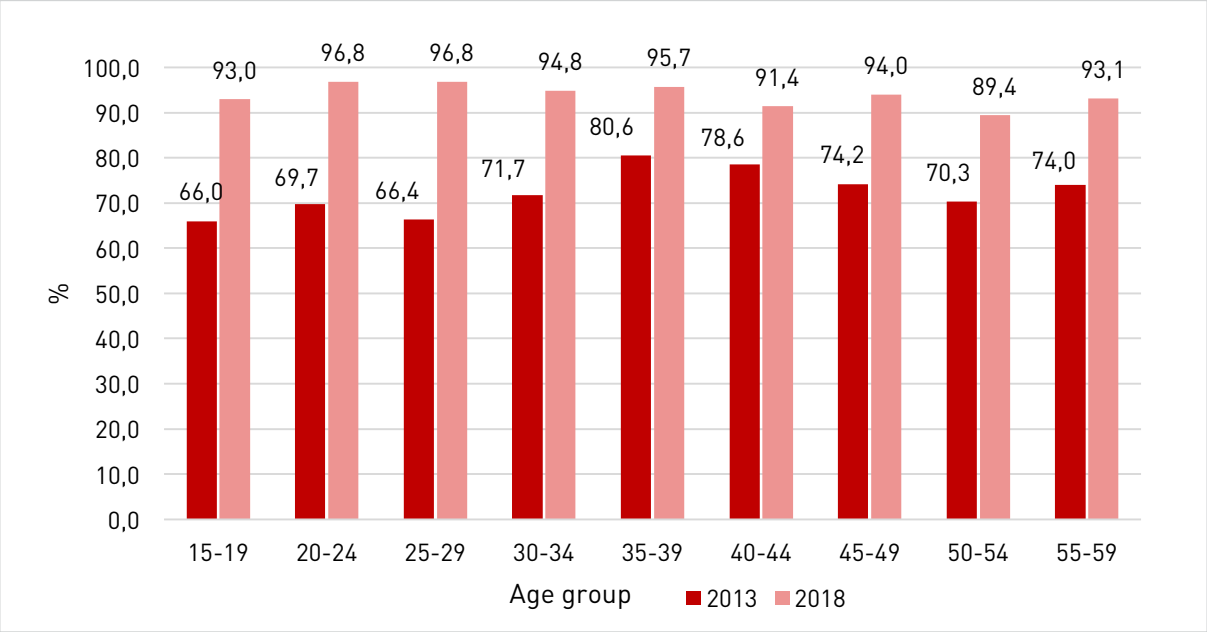
Testing coverage among all participants (HIV-positive and HIV-negative), by sex, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2018	2018	2018	2018	2013	2018
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
HIV testing coverage	88.4 (87.3--89.4)	98.1 (97.4- 98.6)	69.8 (67.8- 71.7).	94.2 (92.7- 95.4]	81.4 (80.4- 82.4)	96.7 (96.1- 97.3)

Testing coverage among all women (HIV-positive and HIV-negative), by age group, KZN, South Africa, 2013 and 2018



Testing coverage among all men (HIV positive and HIV-negative), by age group, KZN, South Africa, 2013 and 2018

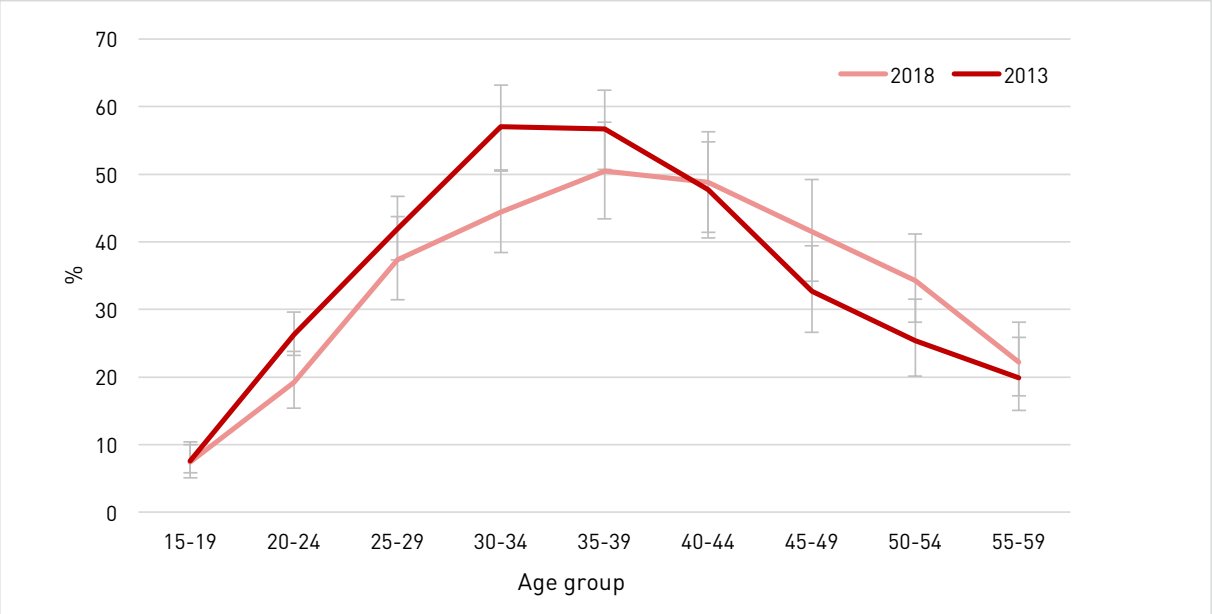


5. HIV prevalence

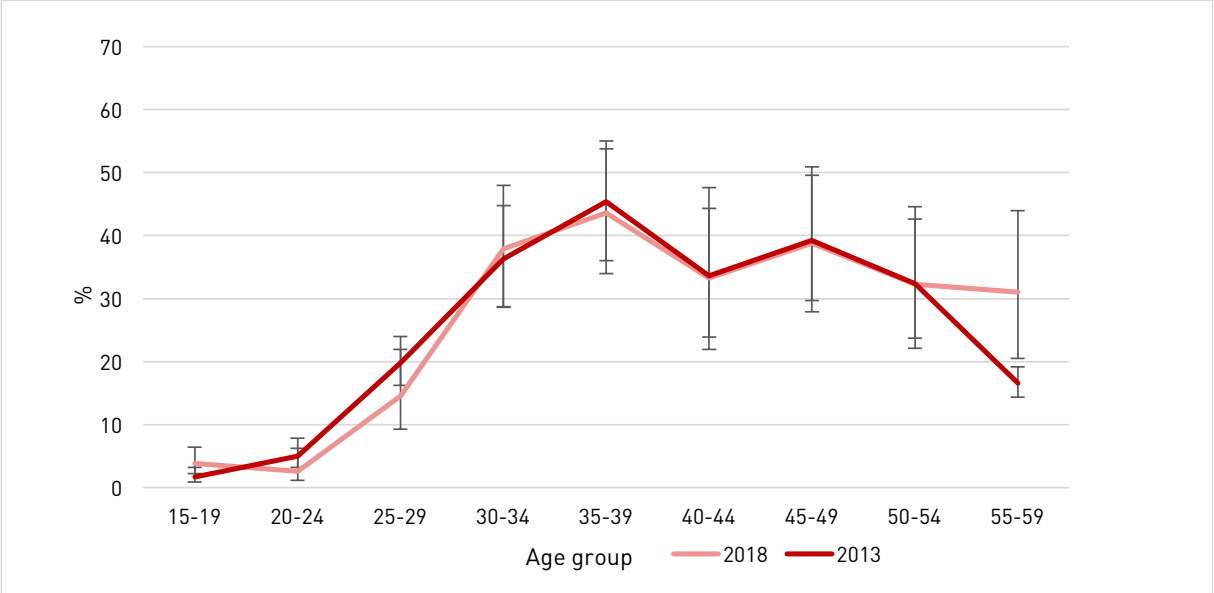
HIV prevalence overall and by sex, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2013	**2018**	**2013**	**2018**	**2013**	**2018**
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
HIV prevalence	30.9 (29.0- 32.9)	30.5 (28.6- 32.5)	15.9 (14.0- 18.0)	18.4 (16.2- 20.8)	25.2 (23.6- 26.9)	26.4 (24.9- 27.9)

HIV Prevalence by five years age group among women, KZN, South Africa, 2013 and 2018



HIV Prevalence by five years age group among men, KZN, South Africa, 2013 and 2018



6. HIV incidence, KZN, South Africa, 2013 and 2018

Age	Overall		15-29 years		30-59 years	
	2018	2018	2018	2018	2013	2018
Sex	New cases per 100 persons-year (95%CI)	New cases per 100 persons-year (95%CI)	New cases per 100 persons-year (95%CI)	New cases per 100 persons-year (95%CI)	New cases per 100 persons-year (95%CI)	New cases per 100 persons-year (95%CI)
Overall	1.2 (0.2-2.1)	0.2 (0.0- 1.1)	2.0 (0.9- 3.0)	1.0 (0.0- 2.1)	0.0 (0.0- 1.1)	0.0 (0.0- 0.5)
Women	1.6 (0.2- 3.0)	0.1 (0.0- 1.3)	2.9 (1.2- 4.7)	1.2 (0.0- 2.9)	0.0 (0.0- 1.3)	0.0 (0.0- 0.5)
Men	0.6 (0.0- 1.5)	0.3 (0.0- 1.4)	0.9 (0.0- 1.9)	0.8 (0.0- 2.1)	0.0 (0.0- 1.6)	0.0 (0.0- 1.5)

7. CD4 characteristic

Proportion of participants 15-59 years with CD4 cell count<200 cells/µl, KZN, South Africa, 2013 and 2018

	2013		2018	
	n/N	% (95%CI)	n/N	% (95%CI)
Women	77/1,068	7.4 (6.0- 9.1)	19/632	3.0 (1.9- 4.6)
Men	53/332	17.0 (12.5- 22.7)	19/198	9.6 (6.2- 14.6)
Overall	130/1,400	9.8 (8.0- 11.9)	38/830	4.6 (3.3- 6.2)

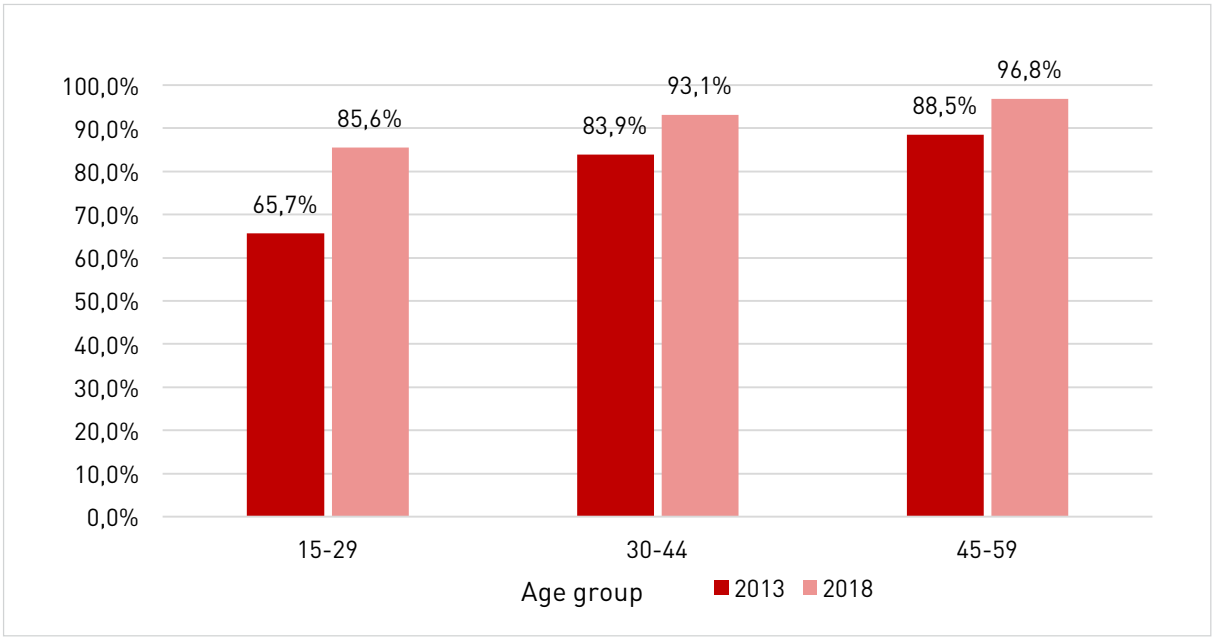
Proportion of participants with CD4 cell count<200 cells/µl, KZN, South Africa, 2013 and 2018

	2013		2018	
	n/N	% (95%CI)	n/N	% (95%CI)
On ART	52/741	7.0	20/704	2.8
Not on ART	78/655	11.9	17/ 127	13.4

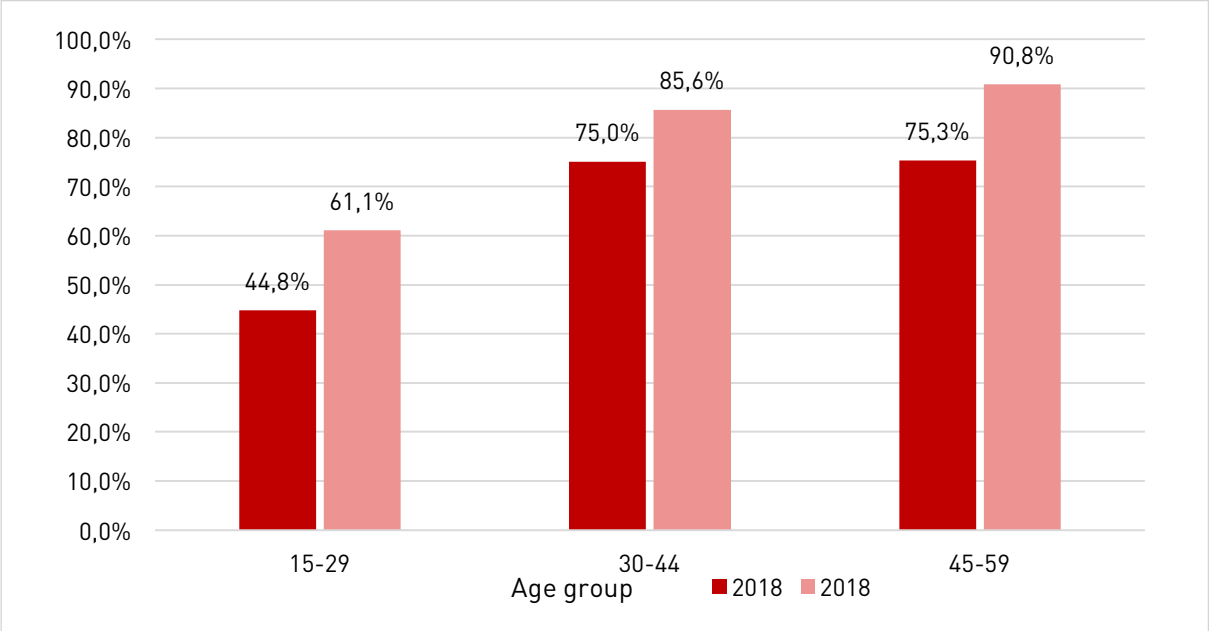
8. HIV positive status awareness
HIV-positive status awareness, overall and by sex, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2013	2018	2013	2018	2013	2018
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Status awareness	77.7 (75.1- 80.1)	92.1 (89.8- 93.2)	67.3 (62.1- 72.1)	82.9 (77.1- 87.5)	75.2 (72.9- 77.4)	89.9 (87.7- 91.8)

HIV positive status awareness among women by age groups, KZN, South Africa, 2013 and 2018



HIV positive status awareness among men by age group, KZN, South Africa, 2013 and 2018

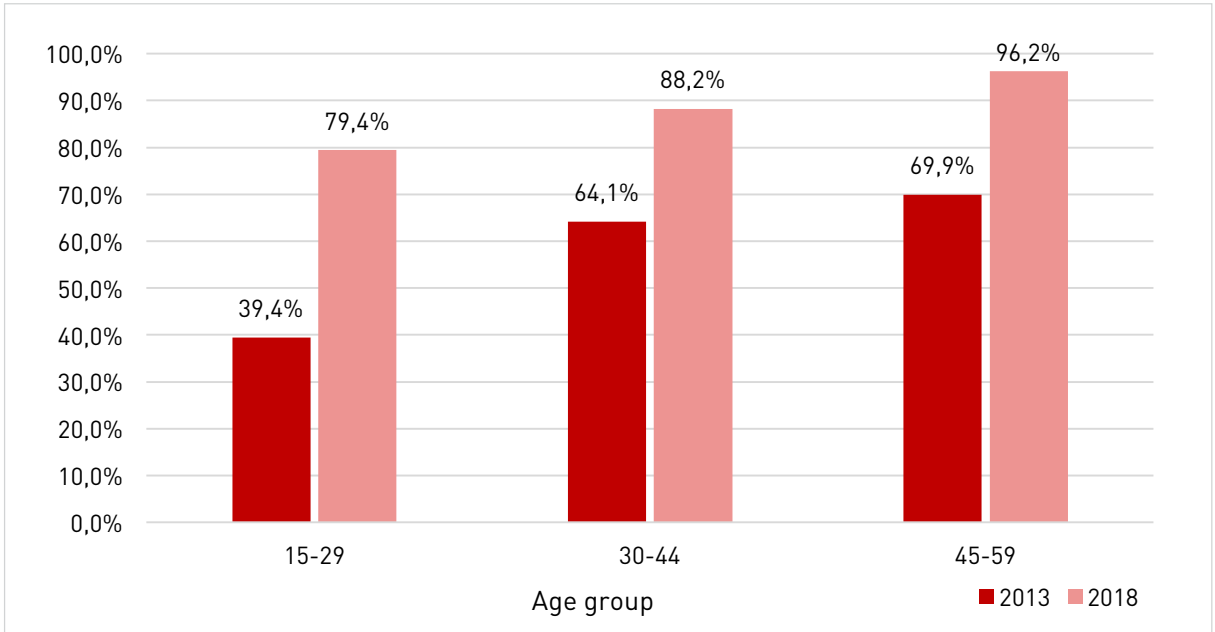


9. ART coverage

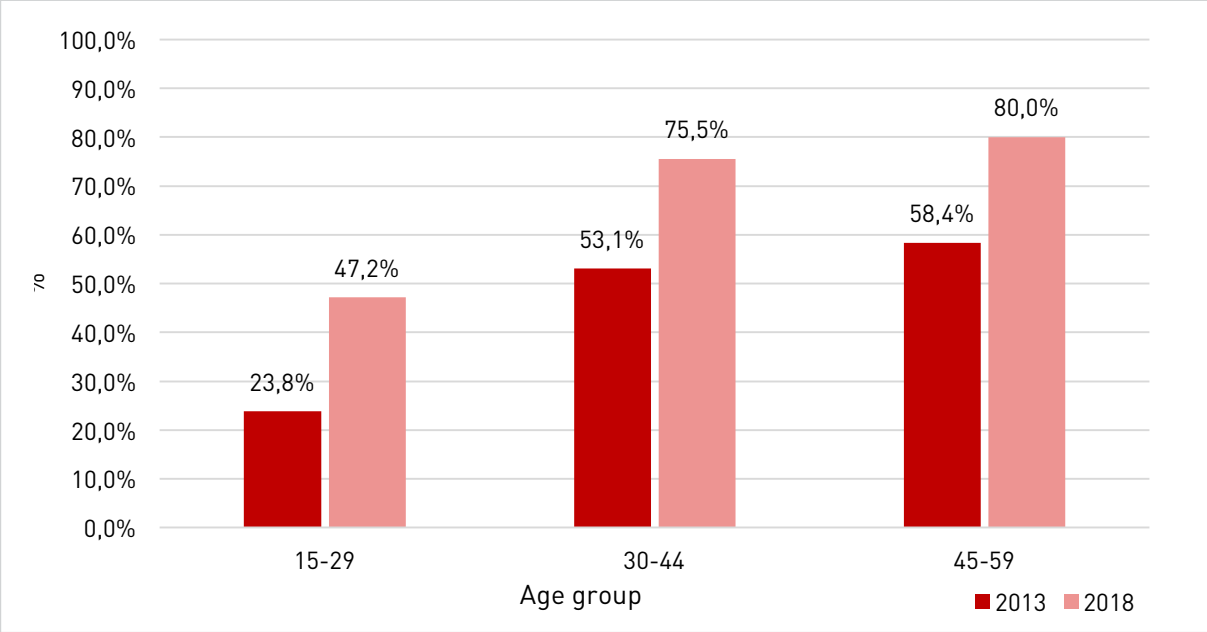
ART coverage among all infected HIV-participants, overall and by sex, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2013	2018	2013	2018	2013	2018
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
ART overage	77.7 (75.1- 80.1)	88.1 (85.4- 90.4)	46.8 (41.4- 52.2)	71.9 (65.3- 77.7)	53.6 (51.0- 56.2)	84.3 (81.7- 86.5)

Proportion of HIV-positive participants on ART among women, by age group, KZN, South Africa, 2013 and 2018



Proportion of HIV positive participants on ART among men, by age group, KZN, South Africa, 2013 and 2018

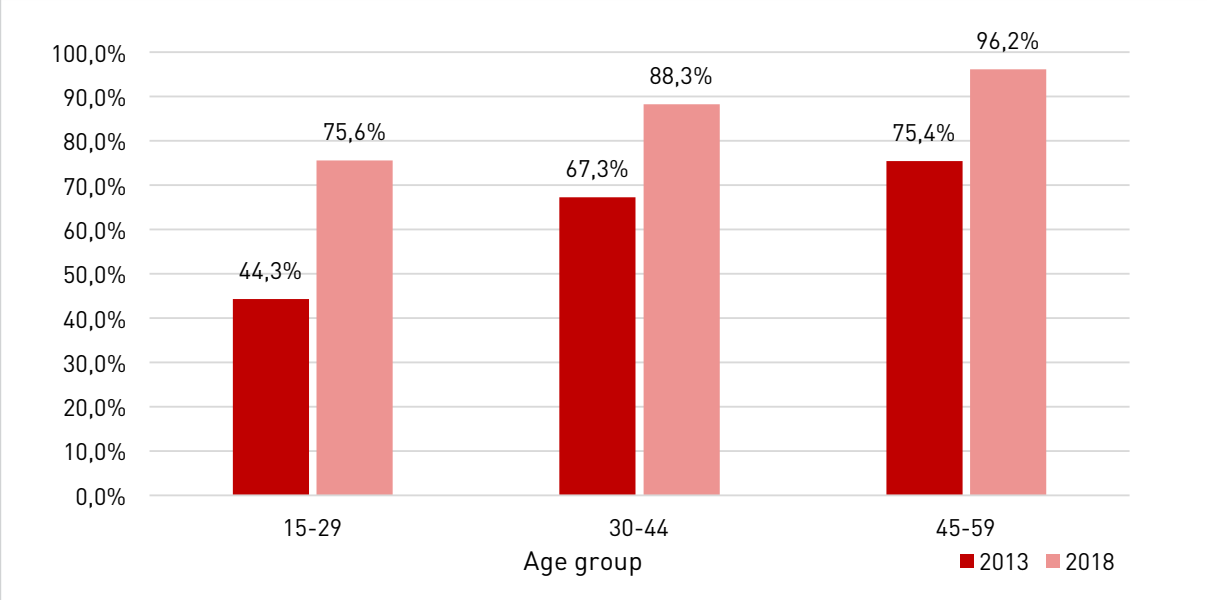


11. 90-90-90- results

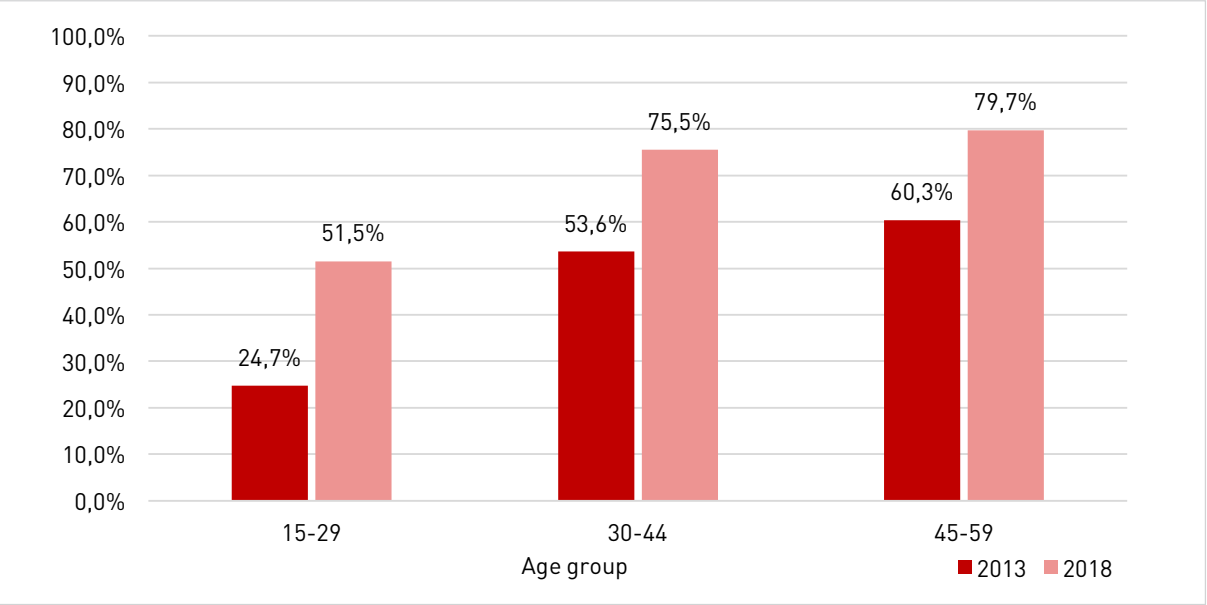
Overall results of 90-90-90 results, KZN, South Africa, 2013 and 2018

	Women		Men		Total	
	2013	2018	2013	2018	2013	2018
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
VL<1,000 copies/ ml	60.0 (57.0- 62.9)	87.2 (84.3- 89.5)	47.7 (42.4- 53.1)	72.9 (66.3- 78.6)	57.1 (54.4- 59.6)	83.8 (81.1- 86.1)

Proportion of HIV participants with a VL<1,000 copies/ml among women, by age group, KZN, South Africa, 2013 and 2018



Proportion of HIV participants with a VL<1,000 copies/ml among men, by age group, KZN, South Africa, 2013 and 2018

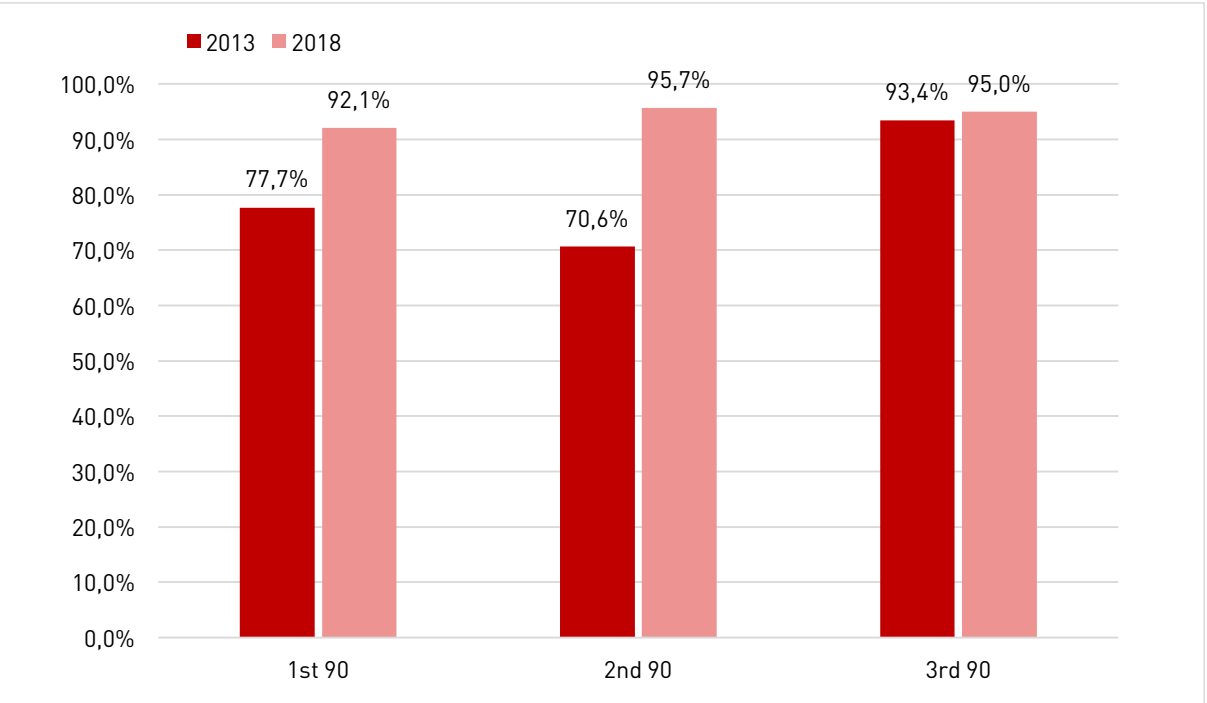


11. 90-90-90- results

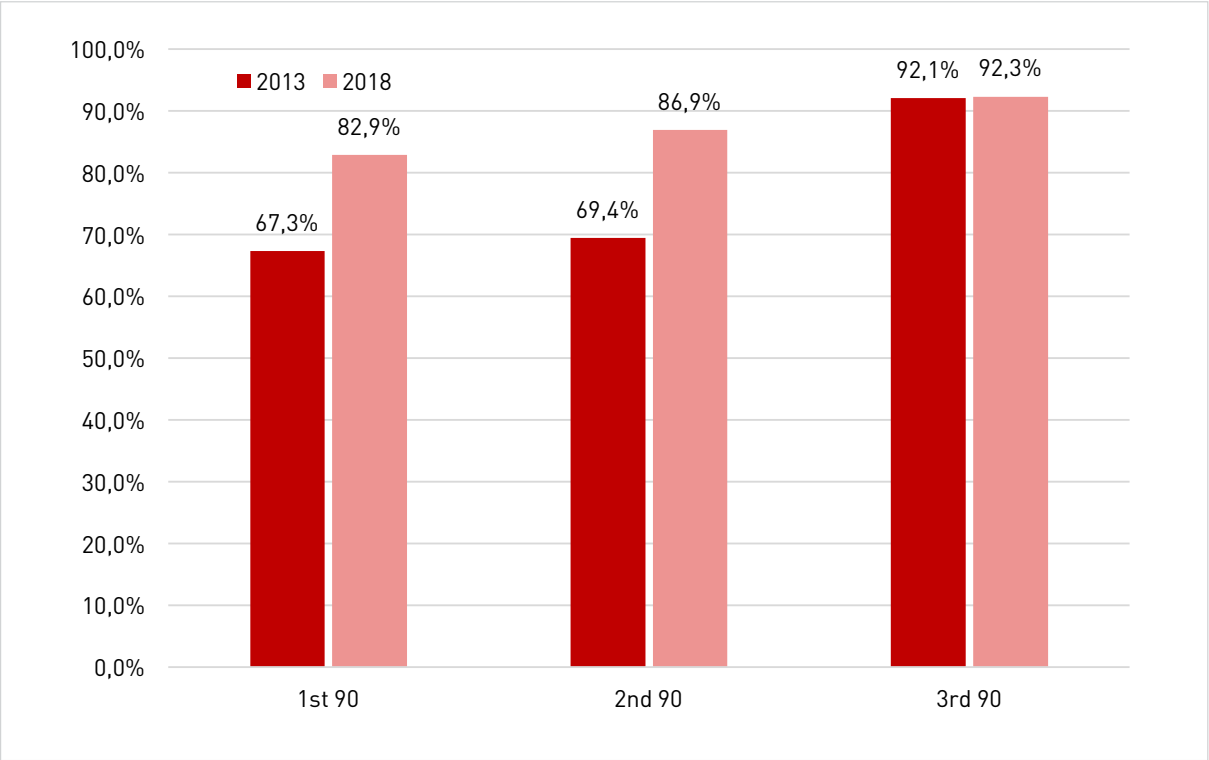
Overall results of 90-90-90 results, KZN, South Africa, 2013 and 2018

	1st 90		2nd 90		3rd 90	
Year	2013	2018	2013	2018	2013	2018
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
	75.2 (72.9- 77.4)	89.9 (87.7- 91.8)	70.4 (67.5- 73.1)	93.8 (91.8- 95.3)	93.1 (91.0- 94.7)	94.5 (92.5- 96.0)

Results of 90-90-90 results among women, KZN, South Africa, 2013 and 2018



Results of 90-90-90 results among men, KZN, South Africa, 2013 and 2018



7. ACKNOWLEDGMENT

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