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Progress towards the UNAIDS 95-95-95 targets in the Fifth Botswana AIDS Impact Survey (BAIS V 2021): a nationally representative survey

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Declaration of interests

We declare no competing interests.

See **Online** for appendix

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Summary

Background—In 2014, UNAIDS set a goal to end the AIDS epidemic by achieving targets for the percentage of people living with HIV who were aware of their status, on antiretroviral therapy (ART), and virally suppressed. In 2020, these targets were revised to 95% for each measure (known as 95-95-95), to be reached among people living with HIV by 2025. We used data from the Fifth Botswana AIDS Impact Survey (BAIS V) to measure progress towards these testing and treatment targets in Botswana.

Methods—BAIS V used a two-stage cluster design to obtain a nationally representative sample of people aged 15–64 years in Botswana. During March–August, 2021, 14763 consenting participants were interviewed and tested for HIV in their households by survey teams. HIV-positive specimens were tested for viral load, presence of antiretroviral drugs, and recency of infection using the HIV-1 limiting antigen avidity enzyme immunoassay. Estimates of HIV-positive status and use of ART were based on self-report and the analysis of blood specimens for antiretroviral drugs. Viral load suppression was defined as an HIV RNA concentration of less than 1000 copies per mL. HIV incidence was calculated using the recent infection testing algorithm. Data were weighted to account for the complex survey design.

Findings—The national HIV prevalence in Botswana among people aged 15–64 years was 20·8% and the annual incidence of HIV infection was 0·2%. 95·1% (men 93·0%, women 96·4%) of people living with HIV aged 15–64 years were aware of their status, 98·0% (men 97·2%, women 98·4%) of those aware were on ART, and 97·9% (men 96·6%, women 98·6%) of those on

ART had viral load suppression. Among young people (aged 15–24 years) living with HIV, 84·5% were aware of their status, 98·5% of those aware were on ART, and 91·6% of those on ART had viral load suppression. The prevalance of viral load suppression among all people living with HIV was 91·8%, and varied by district—ranging from 85·3% in Gaborone to 100·0% in Selibe Phikwe.

Interpretation—BAIS V is the first population-based survey worldwide to report the achievement of the UNAIDS 95-95-95 goals, both overall and among women. Strategies to reach undiagnosed men and young people, including young women, are needed.

Introduction

HIV remains a global health threat, with 1·5 million new HIV infections and 650 000 HIV-related deaths worldwide in 2021.[1] Botswana has the third-highest HIV prevalence in the world, with one in five adults aged 15 years or older in the country currently living with HIV. The first case of HIV in Botswana was reported in 1985;[2] by the early 2000s, HIV had become a leading cause of death in the country, with life expectancy declining from 60·7 years in 1986 to 50·1 years in 2003.[3]

The core strategy of Botswana's nearly-40-year HIV response has been the commitment of national leadership, the investment in long-term partnerships, and the dedication to evidence-based programming.[2] The first National Strategic Framework (2003–09) delineated roles and responsibilities across government agencies and stakeholders, whereas the second National Strategic Framework (2010–16) further intensified the response activities and centred HIV prevention as a key national priority. A series of evidence-based initiatives followed, including medical male circumcision programmes in 2009 and the Treat All strategy in 2016, which made all people living with HIV eligible for antiretroviral therapy (ART) immediately after diagnosis.

In 2014, UNAIDS set the 90–90-90 targets with the aim that, by 2020, 90% of all people living with HIV would know their status, 90% of those who knew their status would receive treatment, and 90% of those on treatment would have viral load suppression.[4] Achievement of these targets by 2020 would result in 90% reductions in HIV incidence and HIV-related mortality by 2030.[4] In November, 2020, UNAIDS reported a global achievement of 84%, 87%, and 90% for the three measures,[1] and revised these targets to 95% for each (known as 95-95-95) by 2025. Starting in 2001, Botswana conducted a series of four national AIDS Indicator Surveys. However, these surveys did not include HIV viral load testing, which is required for estimation of the 95-95-95 cascade. In 2016, baseline household survey data from a community, pair-matched, cluster-randomised trial—conducted from 2013 to 2018—were used to project that Botswana had reached 83%, 87%, and 97% for these three measures.[5] Nationally representative survey data to corroborate and update these estimates were needed to measure Botswana's progress in reaching HIV epidemic control.

The Fifth Botswana AIDS Impact Survey (BAIS V)—an HIV-focused, nationally representative, household-based survey in Botswana—was conducted from March to August, 2021. The primary aims of BAIS V were to estimate national and district-level HIV prevalence, national HIV incidence, and, among people aged 15–64 years living with HIV, the proportions of those who were aware of their HIV status, receiving ART, and

had viral load suppression. Here we report on Botswana's progress towards achieving the UNAIDS 95-95-95 targets.

Methods

Study design and procedures

BAIS V used a two-stage, stratified cluster sample design. The sampling frame comprised all households in the 5203 enumeration areas in Botswana, based on the 2011 population census. In the first-stage sampling, 387 enumeration areas were selected with probability proportional to estimated size based on population projections for 2021. Following a listing of all households within the sampled enumeration areas, the second-stage sampling was conducted, during which an average of 35 households per enumeration area were randomly selected using an equal probability method. 13 560 households were selected, and 19 914 participants aged 15–64 years from those households were eligible for participation. BAIS V was due to start in April, 2020, following training of the survey staff, but fieldwork was delayed owing to the COVID-19 pandemic. The survey resumed on March 12, 2021, after verification that household listing was still accurate, and data collection was completed on Aug 16, 2021.

The BAIS V survey protocol—including forms for eligibility screening, consent, and referrals; recruitment materials; and questionnaires—was reviewed and approved by the Health Research and Development Committee–Botswana Ministry of Health and Wellness, and by institutional review boards at the US Centers for Disease Control and Prevention (CDC) and the University of Maryland, Baltimore (Baltimore, MD, USA). Continuous monitoring for deviations from the protocol and adverse events was done by survey management teams and reported promptly to all institutional review boards.

Participants and data collection

Survey data collection procedures were as described by Sachathep and colleagues.[6] In brief, field staff introduced the survey to the selected households and obtained oral informed consent from the head of household for the household interview. To be eligible for the survey, an individual had to be a citizen of Botswana or a permanent resident (living or working in Botswana) aged 15–64 years who slept in a selected household the night before the survey and who spoke one of the survey languages. The survey was implemented in English and the predominant local language, Setswana; additionally, verbal translation to other major local languages was allowed to accommodate participants who did not speak English or Setswana, provided that there was language proficiency among the field staff.

Questionnaire and field laboratory data were collected on tablet computers using Census and Survey Processing System (CSPro) version 7.72 software (US Census Bureau; Washington, DC, USA). The household interview collected information on household residents, economic support, deaths since Jan 1, 2019, and orphans and vulnerable children. The individual interview included information on demographic characteristics, sexual and reproductive health, marital status, male circumcision, sexual activity, HIV testing and

treatment history, and tuberculosis and other health issues. Participants who self-reported their HIV-positive status were asked questions about their HIV care experience.

Adults aged 18–64 years and emancipated minors aged 15–17 years provided oral informed consent; minors aged 15–17 years provided assent after permission from a parent or guardian. Consent was documented on tablet computers using an application programmed in CSPro.

Biomarker testing

BAIS V used similar methods for whole blood collection, testing, and return of results as has been described in detail previously.[7] All eligible and consenting participants were tested for HIV. Home-based testing and counselling were conducted according to the Botswana National Guidelines using a serial HIV rapid testing algorithm with the Determine HIV-1/2 rapid test (Abbott; Wiesbaden, Germany) and, if positive, the Unigold HIV-1/2 rapid test (Trinity Biotech; Wicklow, Ireland). Participants who tested HIV-positive and who reported not being on ART were counselled and linked to a clinic for ART, care, and support. Participants who self-reported being HIV-positive and had proof of documentation —including a health card, pill bottle, or HIV test card from testing services—had their blood drawn in the household but rapid testing was conducted at a satellite laboratory instead of at the household. Samples for which an HIV-positive result was recorded were further tested in a satellite laboratory for final classification of HIV status using the Geenius HIV 1/2 Supplemental Assay (Bio-Rad; Hercules, CA, USA). A positive result on this test defined an HIV-positive status for the survey. Quality assurance checks, such as proficiency testing, were conducted twice during the survey, using a panel of masked HIV-positive and HIV-negative dried tube specimens.

After processing in satellite laboratories, plasma and dried blood spot specimens were shipped to the Botswana National HIV Reference Laboratory (Gaborone) and stored at −80°C. Here, all plasma specimens (or dried blood spot specimens where plasma was not available) that had been confirmed as HIV-positive underwent HIV-1 viral load testing (measuring HIV RNA copies per mL) using the COBAS AmpliPrep/COBAS TaqMan (CAP/CTM) HIV-1 Test, version 2.0, on the COBAS AmpliPrep/COBAS TaqMan platform (Roche Molecular Diagnostics; Branchburg, NJ, USA), following the manufacturer's instructions. Viral load suppression was defined as less than 1000 copies of HIV RNA per mL based on WHO guidelines. HIV viral load results were returned to participants' preferred health-care facilities.

Dried blood spot specimens from all HIV-positive participants were tested for the presence of dolutegravir, atazanavir, and efavirenz—prescribed as first-line and second-line ART for adults in Botswana—at the Division of Clinical Pharmacology in the Department of Medicine at the University of Cape Town (Cape Town, South Africa) using high-resolution liquid chromatography coupled with tandem mass spectrometry. The detection of an antiretroviral drug indicated that the participant had been using the given drug at the time of blood collection. Results below the limit of detection in individuals who reported taking ART indicated no recent exposure to the regimen and that adherence to a prescribed regimen was suboptimal; however, such results could not be interpreted as the participant not being

on ART. In addition, given that only three antiretroviral drugs were selected for detection, their absence could not rule out the use of other ART regimens that do not include these drugs.

To estimate HIV incidence, a laboratory-based HIV recent infection testing algorithm was used, which includes a combination of assays: viral load, detection of antiretroviral drugs in specimens, and the HIV-1 limiting antigen (LAg) avidity enzyme immunoassay. Participants with a viral load of less than 1000 copies per mL were classified as having long-term infections, whereas those with a viral load of at least 1000 copies per mL were classified as having potential recent infections and were assessed using LAg avidity. The Sedia HIV-1 LAg avidity enzyme immunoassay (Sedia Biosciences Corporation; Beaverton, OR, USA) was used for plasma specimens, whereas the Maxim HIV-1 LAg avidity dried blood spot enzyme immunoassay (Maxim Biomedical; Bethesda, MD, USA) was used for dried blood spot specimens; both assays were conducted at the Botswana National HIV Reference Laboratory and interpreted following the manufacturers' instructions.[8] Plasma specimens with a median normalised optical density (ODn) greater than 1·5 and dried blood spots with a median ODn greater than 1·0 were classified as long-term infections, whereas plasma specimens with a median ODn of 1·5 or lower and dried blood spots with a median ODn of 1·0 or lower were classified as potential recent infections and were assessed for antiretroviral drugs. Specimens in which an antiretroviral drug was detectable were classified as long-term infections and those without were classified as recent infections.

Statistical analysis

All field data were collected on tablet computers, transmitted to a central server using a secure virtual private network, and stored in a secure PostgreSQL database. Laboratory data were cleaned[9] and merged with the final questionnaire database using unique specimen barcodes and participant identification numbers. After data cleaning, data were weighted to account for sample selection probabilities and were adjusted for non-response and non-coverage. Non-response-adjusted weights were calculated for households, individual interviews, and individual blood draws.[10] Household response rates were calculated using the American Association for Public Opinion Research Response Rate 4 method.[11] Descriptive analyses of response rates, participant characteristics, and other indicators were conducted using SAS version 9.4. Jackknife methods were used to estimate variance.

Incidence estimates were based on the number of HIV infections identified in the recent infection testing algorithm and calculated using the formula recommended by the WHO Incidence Working Group and Consortium for Evaluation and Performance of Incidence Assays. Assay performance parameters used for calculation were a mean duration of recent infection of 130 days (95% CI 118–142), a time cutoff of 1·0 years, and a percentage of false recent infections of 0·00%.[8]

When calculating the values for the conditional 95-95-95 cascade, the denominator for the first indicator, awareness of HIV-positive status, is the population of people aged 15–64 years living with HIV in Botswana. For the second and third indicators, the denominator is the value of the target preceding it—ie, the second indicator is the percentage of people on ART among those aware of their HIV-positive status (diagnosed), and the third indicator

is the percentage of people with viral load suppression among those on treatment. For the unconditional 95-95-95 values, the denominator for each indicator is the population of people aged 15–64 years living with HIV in Botswana.

Role of the funding source

BAIS V was funded by the US President's Emergency Plan for AIDS Relief (PEPFAR) through the US CDC. PEPFAR as the funder had no direct role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript. The US CDC was involved in the study design and provided technical assistance for the collection, analysis, and interpretation of data, and writing of the report.

Results

Of the 13 560 selected households, 11 478 were occupied and, of those, 10 210 were interviewed, resulting in a weighted household response rate of 86·3%. Of the 19 914 eligible participants aged 15–64 years, 17 205 participated in the individual interview and, of those, 14 763 consented to blood draw and HIV testing. The weighted interview response rate was 83·0% (78·3% among men and 86·8% among women), and the weighted blood draw response rate was 83·4% (81·0% among men and 85·4% among women).

HIV prevalence among participants aged 15–64 years was 20·8% and was higher among women (26·2%) than among men (15·2%), with an estimated 328 778 (95% CI 303 076–354 480) people in this age range living with HIV in Botswana. HIV prevalence increased with age, with the lowest prevalence observed in young people aged 15–19 years (2·1%) and the highest in adults aged 45–49 years (45·3%; table 1). The peak HIV prevalence in women was 52·0%, occurring among those aged 45–49 years, compared with 39·0% for men, occurring among those aged 50–54 years. HIV prevalence was high among people who were widowed (51·8%) and in those who completed primary education only (40·2%). Prevalence was higher in rural areas (24·6%) than in urban areas (18.9%) among both men and women (table 1). At the district level, HIV prevalence ranged from 11·1% in Gaborone to 33·3% in Central Mahalapye (table 1, figure 1). The highest HIV prevalence among women was observed in Central Mahalapye (41·3%) and among men in Central Tutume (26·6%).

The annual HIV incidence among people aged 15–64 years in Botswana was 0·2%, which corresponds to approximately 2200 new cases of HIV per year. Annual HIV incidence was 0·4% among women and 0·0% among men, and was highest among older women aged 50–64 years at 1·4% (appendix p 2). The incidence-to-prevalence ratio was 0·0096.

Overall, 95·1% of people living with HIV were aware of their status (96·4% among women and 93·0% among men; table 2, figure 2). Awareness of HIV status increased with age, from 84·5% among young people aged 15–24 years (women 82·3%, men 89·1%) to 96·9% among those aged 50–64 years (women 96·1%, men 97·9%). In addition to young men and women, the 95% target for awareness was also not reached in men aged 25–34 years (82·0%) and 35–49 years (92·2%). People with HIV living in rural areas had an overall awareness of their status of 95·7%, compared with 94·8% among their urban counterparts. At the district level, awareness ranged from 89·6% in Ngwaketse South to 98·6% in both Selibe Phikwe

and South East (table 2, figure 3). In 14 of 26 districts, more than 95% of people living with HIV were aware of their HIV status.

Among people living with HIV who were aware of their status, 98·0% were on ART (women 98·4%, men 97·2%; table 2, figure 2). Treatment among those who were aware of their HIV status surpassed the 95% target in all age groups, except among men aged 25–34 years (89·5%; table 2). Treatment was high in both rural and urban areas; all but one district achieved the 95% treatment target (Kgatleng, 94·4%; table 2, figure 3).

Viral load suppression among people who were on ART was 97·9% (women 98·6%, men 96·6%; table 2, figure 2). Suppression increased with age and was highest, at 99·2%, among those on ART aged 50–64 years (women 99·7%, men 98·5%; table 2). The 95% target for viral load suppression was achieved in all age groups, except among young women aged 15–24 years (91·5%) and among men aged 15–24 years (91·8%) and 25–34 years (91·1%). Suppression among those on ART was high in both rural (97·6%) and urban (98·1%) areas; all but one district achieved the 95% viral load suppression target (Central Tutume, 93·4%; table 2, figure 3).

Overall viral load suppression among all people living with HIV, regardless of awareness and ART status, was 91·8%—this surpasses the 85·7% target, which is the product of the three 95% targets for awareness, ART use, and viral suppression. The prevalence of viral load suppression varied by age and gender, ranging from 71·0% among men aged 25–34 years to 97·4% among men aged 55–64 years, and from 74·9% among young women aged 15–24 years to 96·5% among women aged 35–44 years (appendix p 3). The prevalence of suppression ranged from 85·3% in Gaborone to 100·0% in Selibe Phikwe; all districts except for Gaborone attained the overall target of 85·7% (figure 1, appendix p 4).

Discussion

The BAIS V survey results show the achievement of the UNAIDS 95-95-95 targets, both overall and among women, in Botswana—a country where HIV prevalence remains high at 20·8%. The achievement of these targets reflects the success of the Botswana national ART programme in the past 20 years—through the provision of comprehensive testing services, linkage to high-quality care and treatment, and retention in care—resulting in high rates of viral suppression.[2,12] As a result of these efforts, HIV incidence is low, particularly among men. The ratio of HIV incidence to prevalence (0·0096) surpassed the global target (0·03), suggesting that Botswana is transitioning to epidemic control.[13]

Among people living with HIV in Botswana, 95·1% were aware of their HIV status. This high level of awareness reflects decades of investment in HIV testing. Starting in 2000, Botswana expanded the availability of voluntary HIV counselling and testing[14] and, in 2004, the country implemented routine, opt-out HIV screening in prenatal and other clinical settings.[15] Despite the success, gaps do exist, with lower awareness of HIV status among young women aged 15–24 years, men aged 15–49 years, and in some districts. Similar results have been observed in HIV-focused household surveys in other sub-Saharan African countries[16,17] and in the Botswana Combination Prevention Project.[5,18] Furthermore, a

quarter of people living with HIV in Botswana presented late to care with advanced disease in 2015–17.[19] Lack of awareness of HIV-positive status among men and young women in Botswana leads to missed opportunities for linkage to care and treatment, and is a predominant contributor to the relatively low viral load suppression among young adults.[20]

Among people living with HIV who were aware of their HIV status, 98% were on treatment. This result was consistently high for men and women and for nearly all age groups. In 2002, Botswana became one of the first African countries to offer free ART to all citizens. In 2016, the government moved to a test-and-treat policy for people living with HIV and to more effective, dolutegravir-based first-line ART regimens, on the basis of WHO recommendations.[2] In 2019, the government extended free ART to 30 000 foreign residents living with HIV in Botswana, of whom less than a quarter were accessing treatment at the time.[21] However, younger adult men and women had lower rates of viral load suppression than older men and women. Men aged 25–34 years had the lowest rates of awareness (82·0%) and treatment (89·5%), and one of the lowest rates of viral load suppression (91·1%). A study in KwaZulu-Natal, South Africa, showed that men aged 25–40 years were the primary source of the high rates of HIV acquisition in adolescent girls and young women.[22] Undiagnosed or untreated people living with HIV contribute to ongoing transmission, resulting in a large and avoidable burden of morbidity and mortality.

Interventional studies have shown that high rates of HIV testing, treatment coverage, and viral load suppression for those on ART can be achieved even in resource-constrained settings that have high HIV prevalence.[23,24] The Third Botswana National Strategic Framework for HIV and AIDS 2019–23 emphasised a strategic shift towards revitalising HIV combination prevention and further scaling up antiretroviral treatment by extending free ART to non-citizens.[25] This policy shift further helped to close a considerable gap in the country's response to the epidemic by improving ART coverage and increasing the number of people with suppressed viral load. Sustaining and improving the effectiveness of the HIV response necessitates the continuous monitoring of trends to identify and address programmatic gaps in the response, including the risk of sexual transmission of HIV across segments of the population.[26] In 2020, the Government of Botswana began to implement a national combination prevention package for adolescents and young people, which defines services for different groups of young people—including adolescent girls and young women (through PEPFAR's DREAMS initiative), men and boys, adolescents living with HIV, and key populations.[21] There has also been a push to explore service delivery models that might increase the uptake of services among men and to address social and cultural norms that put women at higher risk of HIV.[2]

The BAIS V survey had several limitations. Between April, 2020, and March, 2021, implementation of the survey was delayed by the COVID-19 pandemic, and data collection (March–August, 2021) occurred during the height of the pandemic in Botswana. Lockdowns and movement restrictions enforced across the country to mitigate the spread of COVID-19 disrupted the provision of health services for HIV and tuberculosis and the delivery of family planning services.[27] A 2021 study showed that, over a 12-month period to October, 2017, approximately 14% of the population of Botswana moved their residency from one district to another through migration, resulting in high rates of population turnover in

some areas and further concentrating the population in urban areas.[28] As such, the current geographical variation in HIV prevalence might not accurately reflect the current situation owing to country-level migration, especially after the COVID-19 pandemic. In addition, the weighted response rate for blood draw and HIV testing was 83%, which could introduce participation bias. A study using weighted household survey data collected using methods similar to those of BAIS V showed that imputation methods that modelled HIV prevalence to account for non-participation generally agreed with the HIV prevalence from the naive model.[29] Given the robust weighting to account for non-response, we do not believe that participation bias is a substantial limitation of the survey. Although people who were considered members of priority populations were probably enrolled in the survey, they might not have disclosed their behaviours, limiting the ability to describe awareness, treatment, and viral load suppression among priority populations.[30] Non-resident foreign nationals living in Botswana and people living in congregate housing (eg, military personnel and university students in dormitories) were excluded because they were not in the census sampling frame provided by Statistics Botswana. Limitations of antiretroviral drug testing could lead to underestimation of the proportion of people living with HIV who are aware of their HIV status and on ART, resulting in potentially higher levels of achievement of the UNAIDS 95-95-95 targets in Botswana.

BAIS V is the first population-based survey to show achievement of the UNAIDS 95-95-95 goals, both overall and among women, providing evidence that these targets are achievable in low-income and middle-income African countries with a high HIV burden. Results from BAIS V will inform public health policy in Botswana and assist in prioritising HIV prevention interventions among population strata and districts in the country. Early HIV diagnosis, rapid linkage and retention to ART, and approaches to attract men and young women into early ART initiation should be prioritised.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data sharing

The de-identified individual participant data, data use manual, supplemental data manual, questionnaire, codebook, sampling and weighting technical report, and tabulation plan are available upon request. BAIS V data and supporting documentation are available online after registering at the Statistics Botswana website (https://www.statsbots.org.bw/).

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Research in context

Evidence before this study

Modelling suggests that achievement of the UNAIDS 95-95-95 targets (95% of people living with HIV know their status; 95% of those who know their status are receiving treatment; and 95% of those on treatment have viral load suppression) by 2025 can result in 90% reductions in HIV incidence and mortality by 2030. We searched PubMed and Google Scholar from Jan 1, 1985, to Aug 1, 2023, using medical subject headings and keyword terms (“Botswana”, “Africa” “HIV”, “UNAIDS targets”, “HIV prevalence”, “90-90-90” and “95-95-95”, “Surveillance”, “Survey”, “Epidemiology”), for English-language publications that reported on national progress towards the UNAIDS 95-95-95 targets and associated programmatic interventions. Using either model-based estimates or cross-sectional household surveys, several African countries have reported progress towards achieving the UNAIDS 95-95-95 target. Baseline results from the Ya Tsie study in Botswana, a community-randomised trial of HIV treatment and prevention interventions conducted in 30 non-urban communities from 2013 to 2018, showed that Botswana had reached 83%, 87%, and 97% in the three measures, and projected that the country could reach 95-95-95 targets in 2019. The US President’s Emergency Plan for AIDS Relief has supported the implementation of the HIV-focused household surveys in 17 African countries since 2015, including the Fifth Botswana AIDS Impact Survey (BAIS V).

Added value of this study

BAIS V was the first HIV-focused household survey in Botswana to include HIV viral load and to report progress towards the UNAIDS targets. This survey showed that the UNAIDS 95-95-95 targets have been achieved in Botswana, both overall and among women. To our knowledge, BAIS V is the first national HIV-focused household survey that provides evidence for national achievement of the UNAIDS 95-95-95 targets.

Implications of all the available evidence

Population-based household surveys conducted in Africa since 2015 have shown increased antiretroviral coverage in the population and concomitant reductions in HIV incidence. Although Botswana has made substantial progress, men and young people—including young women—did not reach the UNAIDS 95-95-95 targets. These results are consistent with other household survey data from Africa, particularly for HIV status awareness. The BAIS V results show that the UNAIDS 95-95-95 targets are achievable in low-income and middle-income African countries with a high HIV burden.

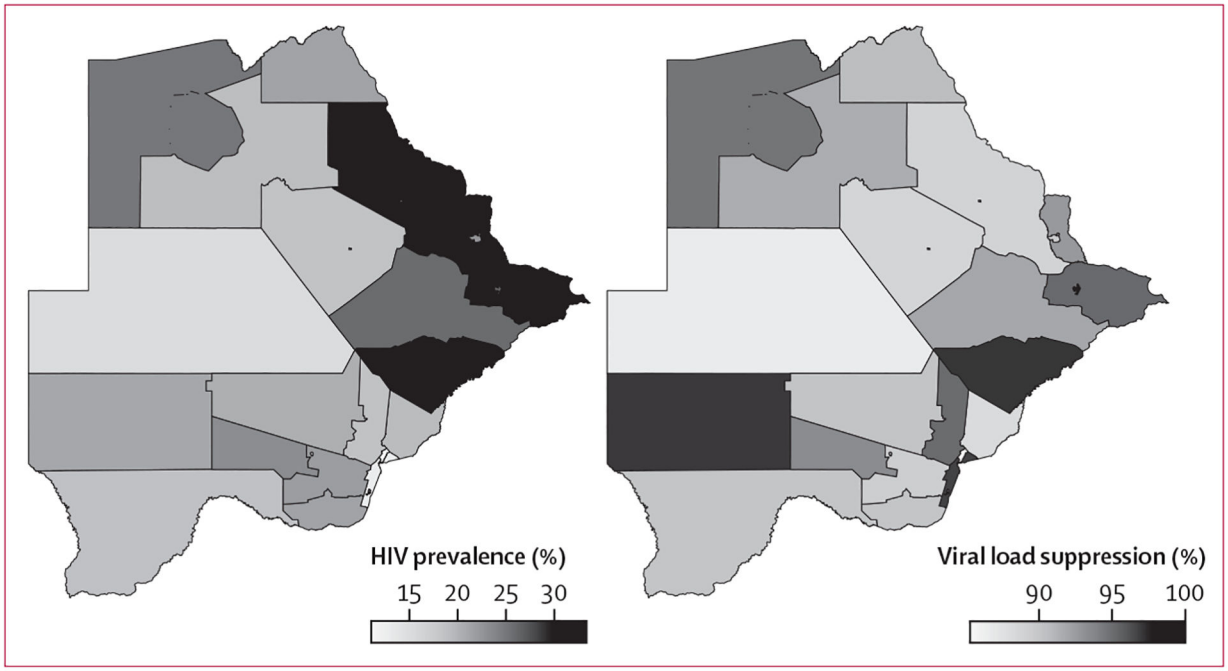

Figure 1:
HIV prevalence and viral load suppression among people aged 15–64 years living with HIV in Botswana by district

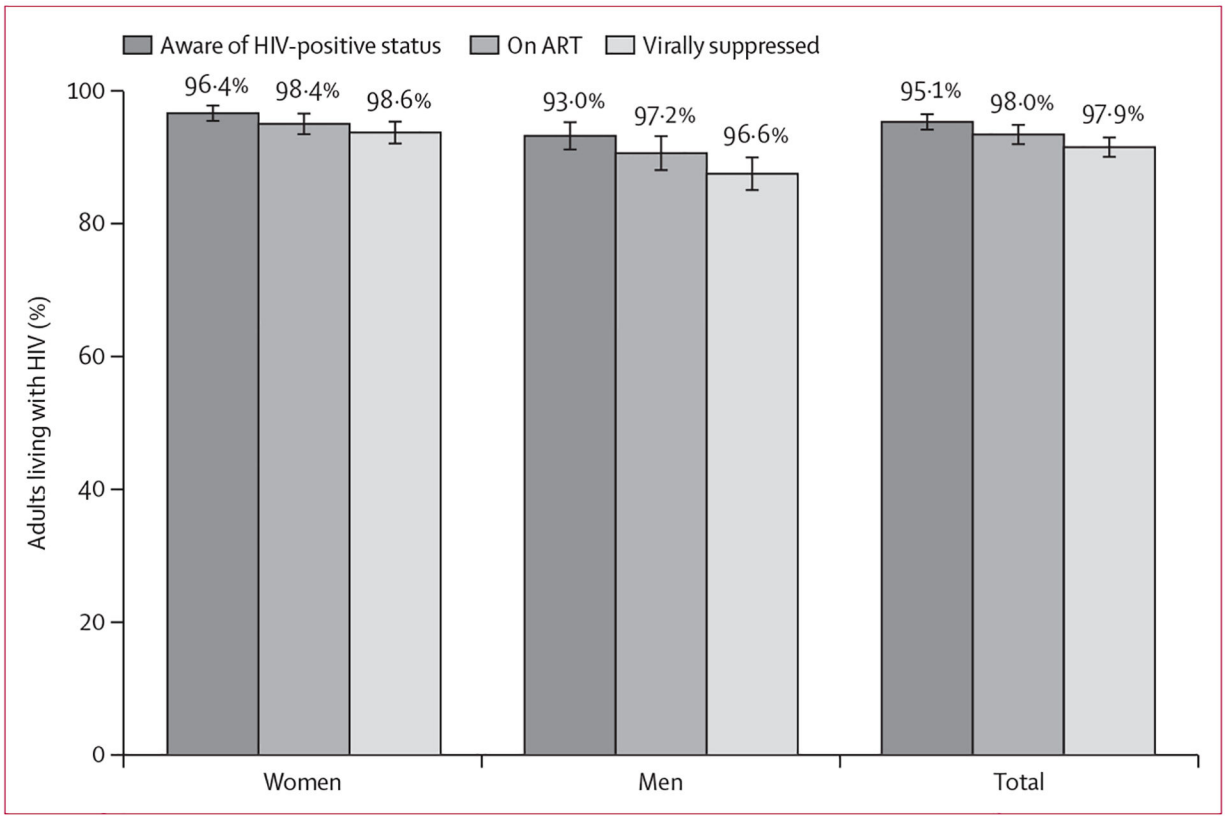

Figure 2: Progress towards the UNAIDS 95-95-95 targets in Botswana by gender

The UNAIDS 95-95-95 targets among people living with HIV aged 15–64 years are based on self-reported HIV status and ART use, both adjusted for having a detectable antiretroviral drug in the blood. Percentages refer to the conditional 95-95-95 targets. The heights of the bars represent the unconditional percentages for each indicator among all people living with HIV. Error bars are 95% CIs. ART=antiretroviral therapy.

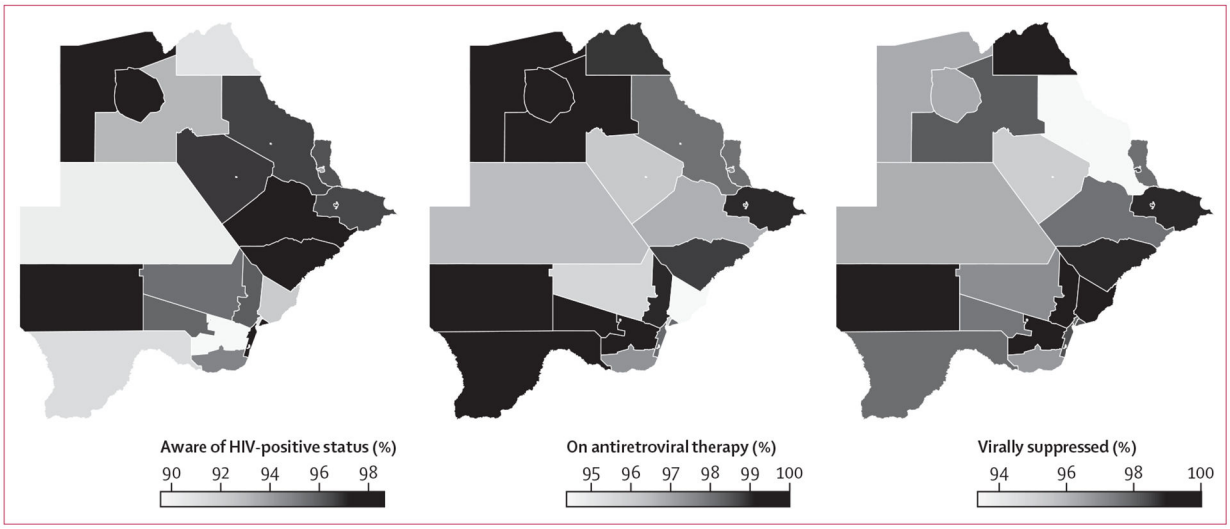

Figure 3:
Progress towards the UNAIDS 95-95-95 targets in Botswana by district

Table 1:

HIV prevalence among people aged 15–64 years in Botswana, by gender and selected demographic characteristics

	Men		Women		Total	
	Number	HIV-positive	Number	HIV-positive	Number	HIV-positive
Age, years						
15–64, total	6088	15·2% (13·8–16·6)	8675	26·2% (24·0–28·4)	14763	20·8% (19·1–22·4)
15–19	880	1·6% (0·4–2·8)	1011	2·7% (1·5–3·8)	1891	2·1% (1·3–2·9)
20–24	768	2·7% (1·4–4·0)	1137	6·7% (4·9–8·4)	1905	4·7% (3·6–5·8)
25–29	765	4·8% (2·0–7·5)	1078	15·8% (12·8–18·8)	1843	10·3% (8·0–12·6)
30–34	698	6·5% (4·2–8·7)	1060	20·2% (17·0–23·4)	1758	13·5% (11·4–15·6)
35–39	742	14·8% (10·9–18·6)	1161	35·6% (31·3–40·0)	1903	25·4% (22·7–28·2)
40–44	691	26·7% (21·6–31·8)	939	49·3% (41·5–57·0)	1630	38·0% (32·7–43·4)
45–49	569	38·7% (29·8–47·7)	749	52·0% (45·5–58·5)	1318	45·3% (38·4–52·1)
50–54	450	39·0% (31·1–46·9)	607	43·0% (36·1–49·8)	1057	41·0% (34·8–47·2)
55–59	299	34·3% (26·3–42·3)	535	38·7% (32·7–44·6)	834	36·7% (33·1–40·2)
60–64	226	29·6% (23·5–35·7)	398	32·6% (26·8–38·4)	624	31·3% (27·2–35·4)
Marital status						
Never married	3572	9·4% (8·1–10·8)	5091	23·5% (21·7–25·4)	8663	16·6% (15·3–17·9)
Married or living together	2178	23·2% (20·0–26·5)	2910	27·4% (24·1–30·6)	5088	25·3% (22·3–28·3)
Divorced or separated	290	22·8% (15·8–29·8)	435	35·8% (29·8–41·7)	725	29·4% (25·2–33·7)
Widowed	35	44·8% (23·1–66·5)	225	52·8% (40·8–64·8)	260	51·8% (41·0–62·6)
Education						
No education	534	33·5% (27·8–39·1)	596	38·1% (32·8–43·4)	1130	35·4% (30·7–40·1)
Primary	907	34·0% (30·1–37·9)	1314	45·8% (42·0–49·6)	2221	40·2% (37·5–43·0)
Secondary	3396	12·6% (11·2–14·1)	5061	27·3% (25·3–29·3)	8457	20·1% (18·8–21·5)
More than secondary	1244	7·2% (4·8–9·6)	1701	11·7% (9·2–14·3)	2945	9·5% (7·6–11·4)
Wealth quintile						
Lowest	1541	20·0% (17·4–22·6)	2070	34·9% (31·4–38·3)	3611	27·3% (24·8–29·7)
Second	1161	20·1% (17·6–22·6)	1812	34·4% (31·2–37·6)	2973	27·5% (25·4–29·5)
Middle	1089	16·2% (13·3–19·0)	1544	27·2% (23·9–30·6)	2633	21·6% (18·9–24·3)
Fourth	1180	14·5% (11·6–17·4)	1673	24·1% (21·4–26·7)	2853	19·5% (17·2–21·7)

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	Men		Women		Total	
	Number	HIV-positive	Number	HIV-positive	Number	HIV-positive
Highest	1117	6·6% (4·3–8·9)	1576	14·0% (11·3–16·7)	2693	10·5% (8·5–12·4)
Pregnancy status at time of survey						
Pregnant	··	··	286	16·4% (9·7–23·2)	··	··
Not pregnant	··	··	8334	26·6% (24·4–28·7)	··	··
Residence						
Urban	3408	13·7% (11·8–15·6)	4919	23·8% (21·0–26·5)	8327	18·9% (16·8–21·0)
Rural	2680	18·0% (16·4–19·7)	3756	31·3% (28·7–33·9)	6436	24·6% (23·1–26·1)
District						
Gaborone	156	6·8% (3·0–10·5)	203	15·5% (10·0–20·9)	359	11·1% (7·4–14·9)
Francistown	127	18·4% (11·7–25·2)	171	27·1% (20·2–34·0)	298	22·6% (17·3–27·8)
Lobatse	191	7·4% (2·3–12·5)	312	18·9% (14·6–23·3)	503	13·4% (9·2–17·6)
Selibe Phikwe	71	22·4% (12·1–32·7)	141	30·0% (23·5–36·5)	212	26·7% (22·1–31·4)
Orapa	400	12·6% (7·9–17·2)	518	21·4% (18·6–24·2)	918	17·1% (14·4–19·7)
Jwaneng	247	9·5% (5·3–13·8)	289	17·6% (11·6–23·7)	536	13·4% (9·1–17·6)
Sowa	148	12·1% (6·4–17·7)	157	19·9% (13·8–26·0)	305	15·6% (11·4–19·8)
Ngwaketse South	281	17·6% (15·0–20·2)	396	26·4% (20·7–32·1)	677	21·9% (18·8–25·0)
Borolong	238	17·2% (14·4–20·1)	323	25·5% (20·5–30·6)	561	21·4% (18·5–24·3)
Ngwaketse West	201	15·3% (11·5–19·2)	278	30·4% (23·0–37·7)	479	23·2% (18·6–27·7)
South East	282	9·0% (6·1–11·8)	333	17·7% (14·0–21·4)	615	12·8% (10·8–14·8)
Kweneng East	179	15·5% (11·6–19·5)	296	21·4% (13·3–29·5)	475	18·7% (13·4–24·1)
Kweneng West	276	17·7% (11·3–24·0)	447	23·1% (16·6–29·7)	723	20·5% (15·8–25·2)
Kgatleng	195	13·3% (7·7–19·0)	273	24·4% (18·9–29·8)	468	19·3% (15·6–22·9)
Serowe Palapye	255	16·7% (10·3–23·2)	344	35·9% (28·1–43·6)	599	25·9% (20·5–31·3)
Central Mahalapye	163	22·8% (15·8–29·7)	304	41·3% (35·3–47·3)	467	33·3% (27·4–39·2)
Central Bobonong	161	21·2% (10·9–31·5)	319	37·1% (28·9–45·2)	480	30·5% (22·8–38·2)
Central Boteti	212	13·1% (9·2–17·0)	296	24·1% (19·4–28·8)	508	18·6% (15·2–21·9)
Central Tutume	271	26·6% (19·8–33·3)	346	36·0% (29·7–42·4)	617	31·1% (24·7–37·5)
North East	167	22·7% (17·7–27·8)	301	36·1% (29·0–43·2)	468	30·0% (26·5–33·6)
Ngamiland East	456	12·4% (9·3–15·5)	662	25·7% (21·5–29·9)	1118	19·1% (15·7–22·4)
Ngamiland West	297	17·5% (12·5–22·5)	541	30·9% (26·6–35·2)	838	25·0% (20·8–29·1)

	Men		**Women**		**Total**	
	Number	**HIV-positive**	**Number**	**HIV-positive**	**Number**	**HIV-positive**
Chobe	218	13·9% (10·9–16·9)	255	30·8% (25·6–36·0)	473	21·4% (18·1–24·8)
Ghanzi	257	9·5% (6·3–12·7)	312	21·5% (16·9–26·1)	569	15·2% (12·6–17·8)
Kgalagadi South	381	14·7% (9·9–19·5)	514	22·8% (18·9–26·7)	895	18·8% (14·9–22·6)
Kgalagadi North	258	16·7% (12·3–21·0)	344	25·7% (22·6–28·8)	602	21·1% (18·3–24·0)

Data are weighted % (95% CI) or n.

Table 2:

Progress towards the UNAIDS 95-95-95 targets among people aged 15–64 years living with HIV in Botswana by selected demographic characteristics

	First 95% target; diagnosed and aware of HIV status		Second 95% target; on ART among those diagnosed		Third 95% target; virally suppressed among those on ART	
	Number	Weighted % (95% CI)	Number	Weighted % (95% CI)	Number	Weighted % (95% CI)
Age, years						
15–64, total	3417	95·1% (93·8–96·5)	3262	98·0% (97·2–98·7)	3208	97·9% (97·2–98·6)
Women	2428	96·4% (95·0–97·7)	2342	98·4% (97·5–99·2)	2309	98·6% (95·2–98·0)
Men	989	93·0% (90·8–95·2)	920	97·2% (95·7–98·8)	899	96·6% (95·2–98·0)
15–24	157	84·5% (74·6–94·4)	133	98·5% (96·3–100·0)	130	91·6% (86·3–96·9)
Women	118	82·3% (70·1–94·5)	99	97·8% (94·4–100·0)	96	91·5% (84·2–98·8)
Men	39	89·1% (77·3–100·0)	34	100·0% (100·0–100·0)	34	91·8% (83·9–99·8)
25–34	493	92·5% (89·9–95·0)	447	95·0% (92·2–97·0)	431	97·3% (94·2–100·0)
Women	408	95·6% (93·7–97·6)	383	96·5% (94·6–98·4)	371	98·8% (97·3–100·0)
Men	85	82·0% (72·0–91·2)	64	89·5% (76·9–100·0)	60	91·1% (80·5–100·0)
35–49	1778	95·9% (94·5–97·3)	1716	98·1% (96·9–99·4)	1691	97·9% (97·0–98·7)
Women	1281	98·0% (96·9–99·0)	1254	98·8% (97·3–100·0)	1242	98·6% (97·7–99·5)
Men	497	92·2% (88·7–95·7)	462	97·0% (94·7–99·2)	449	96·5% (94·7–98·2)
50–64	989	96·9% (94·9–98·9)	966	99·1% (98·4–99·8)	956	99·2% (98·7–99·7)
Women	621	96·1% (92·8–99·3)	606	98·9% (98·0–99·9)	600	99·7% (99·3–100·0)
Men	368	97·9% (96·1–99·6)	360	99·3% (98·2–100·0)	356	98·5% (97·6–99·5)
Residence						
Urban	1751	94·8% (92·7–96·9)	1667	97·7% (96·6–98·9)	1632	98·1% (97·2–99·1)
Rural	1666	95·7% (94·5–96·8)	1595	98·3% (97·5–99·2)	1576	97·6% (96·5–98·6)
District						
Gaborone	49	90·1% (76·3–100·0)	45	95·9% (87·4–100·0)	44	97·9% (93·4–100·0)
Francistown	74	93·6% (87·3–100·0)	69	97·4% (92·1–100·0)	68	98·4% (94·7–100·0)
Lobatse	80	93·4% (87·2–99·6)	75	95·8% (90·9–100·0)	72	97·7% (93·4–100·0)
Selibe Phikwe	61	98·6% (97·2–99·9)	60	98·2% (94·3–100·0)	59	100·0% (100·0–100·0)
Orapa	168	93·2% (88·4–98·0)	156	95·8% (92·8–98·8)	149	99·5% (98·4–100·0)
Jwaneng	83	93·7% (87·4–100·0)	78	97·8% (94·2–100·0)	77	97·9% (95·2–100·0)
Sowa	55	96·0% (90·1–100·0)	53	96·4% (91·3–100·0)	51	97·1% (90·9–100·0)

	First 95% target; diagnosed and aware of HIV status		Second 95% target; on ART among those diagnosed		Third 95% target; virally suppressed among those on ART	
	Number	Weighted % (95% CI)	Number	Weighted % (95% CI)	Number	Weighted % (95% CI)
Ngwaketse South	148	89·6% (84·2–95·0)	138	100·0% (100·0–100·0)	138	99·1% (97·4–100·0)
Borolong	132	94·9% (92·2–97·5)	126	97·3% (95·8–98·9)	123	96·7% (93·2–100·0)
Ngwaketse West	125	95·8% (92·5–99·1)	121	100·0% (100·0–100·0)	121	97·5% (94·8–100·0)
South East	90	98·6% (96·9–100·0)	88	98·2% (95·4–100·0)	86	98·3% (96·3–100·0)
Kweneng East	99	96·0% (91·5–100·0)	96	99·0% (97·0–100·0)	95	100·0% (100·0–100·0)
Kweneng West	166	95·5% (91·8–99·2)	160	95·6% (91·5–99·7)	155	97·0% (94·1–99·9)
Kgatleng	98	92·3% (89·1–95·5)	91	94·4% (90·3–98·4)	87	100·0% (100·0–100·0)
Serowe Palapye	176	97·3% (95·2–99·4)	171	96·7% (94·5–98·9)	166	97·6% (93·6–100·0)
Central Mahalapye	170	98·2% (96·2–100·0)	167	98·8% (96·9–100·0)	165	98·8% (98·3–99·4)
Central Bobonong	161	96·5% (92·0–100·0)	156	99·0% (98·7–99·3)	154	98·9% (97·4–100·0)
Central Boteti	108	96·8% (90·1–100·0)	104	96·1% (93·8–98·4)	102	95·2% (90·2–100·0)
Central Tutume	204	96·6% (94·7–98·6)	198	98·0% (95·1–100·0)	196	93·4% (89·9–96·9)
North East	152	96·3% (92·4–100·0)	148	98·0% (95·4–100·0)	146	97·7% (95·3–100·0)
Ngamiland East	246	93·1% (88·3–98·0)	230	99·2% (97·9–100·0)	228	98·1% (96·2–100·0)
Ngamiland West	230	98·4% (97·7–99·1)	226	100·0% (100·0–100·0)	226	96·2% (93·9–98·6)
Chobe	116	90·8% (82·7–99·0)	106	98·9% (96·6–100·0)	105	100·0% (100·0–100·0)
Ghanzi	101	90·2% (82·2–98·2)	93	96·4% (91·7–100·0)	90	96·2% (90·7–100·0)
Kgalagadi South	185	91·2% (86·8–95·6)	169	99·3% (98·0–100·0)	168	97·8% (94·1–100·0)
Kgalagadi North	140	98·5% (96·4–100·0)	138	99·2% (97·4–100·0)	137	99·3% (97·7–100·0)

Data are weighted % (95% CI) or n. In the conditional cascade, the denominator for the first 95%, awareness of HIV-positive status, is all people aged 15–64 years living with HIV. ART=antiretroviral therapy.