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Trends in HIV Viral Load monitoring in the South African National HIV Treatment programme between 2019 and 2025.

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Summary

As part of the global strategy to end the HIV/AIDS epidemic by 2030, the United Nations established the 95-95-95 targets. These aim for 95% of people living with HIV (PLHIV) to know their status, 95% of those diagnosed to be on treatment, and 95% of those on treatment to achieve viral suppression. The annual number of patients receiving an HIV viral load (VL) test within South Africa's National Health Laboratory Service (NHLS) can be used as a proxy for measuring the number of patients initiated on antiretroviral therapy (ART) and retained in care (i.e. for monitoring trends towards achieving the second 95 target), with the proportion that have a VL <1 000 copies per millilitre (cpml) used to assess progress towards the third 95 target. Furthermore, PLHIV estimates from the Thembisa Model can be used as a denominator to calculate VL monitoring coverage. We describe NHLS HIV VL testing data extracted from the National Institute for Communicable Diseases Surveillance Data Warehouse. Between 2019 and 2025, estimates from Thembisa 4.8 suggest an increase both in PLHIV and the proportion on ART from 7.46 million and 69,4% to 8.12 million and 78,7%, respectively. During this same period, the number of patients receiving a VL test within the public health sector increased from 4.81 million to 5.73 million, equating to an estimated VL monitoring coverage of 64.5% in 2019 and 70.5% in 2025. Over the same period, the absolute annual number and percentage of virally suppressed (<1 000 cpml) patients increased, peaking in 2025 at 5.41 million and 94.5%, respectively. In addition, the proportion of patients with low-level viraemia (50–1000 cpml) declined from 17.6% to 10.5%, with the proportion of patients with a VL <50 cpml reaching a peak of 84.0% in 2025. Although the number of patients having an annual HIV VL test and the proportion achieving virological suppression increased to the highest levels on record in 2025, this was accompanied by a decline in the total number of VL tests compared with 2023, highlighting negative year-on-year growth for two consecutive years and a static annual VL testing coverage of approximately 71% of all PLHIV. As of 2025, only two-thirds of PLHIV in South Africa have evidence of virological suppression. Whilst maintaining high-quality treatment outcomes, renewed emphasis on HIV testing, linkage to care, retention of newly diagnosed and disengaged patients, and virological monitoring will be essential if South Africa is to achieve the UN 95–95–95 targets by 2030.

Introduction

As part of the global strategy to end the HIV/AIDS epidemic by 2030, the United Nations established the 95-95-95 targets. These aim for 95% of people living with HIV (PLHIV) to know their status, 95% of those diagnosed to be on treatment, and 95% of those on treatment to achieve viral suppression.[1] The strategy is intended to assist national HIV programmes to ensure PLHIV live long, healthy lives and to prevent onward HIV transmission.

South Africa has the largest HIV treatment programme globally.[2] Approximately 80% of all HIV laboratory tests for the country's programme are performed by the National Health Laboratory Service (NHLS).[3] As the vast majority of HIV diagnoses are made using rapid tests conducted outside the NHLS, NHLS laboratory data cannot adequately assess progress towards the first 95 target. However, all PLHIV who have been diagnosed and initiated on antiretroviral therapy (ART) are required to have HIV viral load (VL) monitoring at least once

a year. HIV VL testing data, generated by 27 NHLS laboratories nationwide, can be used to measure trends in retention in care and have proven to be a valuable resource for monitoring aggregated HIV viral suppression rates.[3]

The aim of this report is to review NHLS HIV VL data from 2019 to 2025 as a means of monitoring and reporting on South Africa's progress towards achieving the second and third UNAIDS 95 targets.

Methods

Setting

South Africa's national HIV treatment guidelines have recommended HIV VL monitoring for all patients initiated on ART since 2004. Although there have been a number of guideline amendments over the years, the frequency of HIV VL testing has remained fairly consistent. Since 2016, South Africa has adopted a universal test and treat programme, with HIV VL testing not being recommended at the time of baseline. At the time that test and treat was being implemented, HIV VL testing was recommended at 6- and 12-months post ART-initiation, with a VL ≥50 copies per millilitre (cpml) warranting a repeat test in six months time and a VL ≥1000 cpml warranting a repeat test in two months time. HIV VL testing at 6- and 12-months post ART initiation was maintained in the 2019 guidelines but updated in the 2023 guidelines, which recommended testing at around 3- and 9-months post treatment initiation. Both the 2019 and 2023 guidelines recommended repeat VL testing in three months' time for all patients with a VL ≥50 cpml, with repeat testing six months thereafter for patients with persistent low-level viraemia (i.e. 50-999 cpml).

The NHLS collects and stores all public sector laboratory test-level data. Because SA does not have a universally implemented unique patient identifier within the health system, patient-level analyses are not directly available. To address this limitation, the National Institute for Communicable Diseases (NICD) Surveillance Data Warehouse (SDW) applies a probabilistic patient-linking algorithm to associate multiple VL tests performed on the same individual. Details of this methodology have been published elsewhere,[4] and the performance of the algorithm in linking adult VL and CD4 results has been found to have a sensitivity of 84%, with 0.3% of results matched incorrectly.[5] This approach enables estimation of the total number of unique patients receiving VL testing per year. Since national guidelines recommend at least one HIV VL test per annum per patient receiving ART, total patient-level VL tests performed in the past 12 months have been shown to be a good proxy for the total number of patients in care and comparable to the National Department of Health's (NDoH) District Health Information System indicator of total remaining on antiretrovirals (TROA).[6]

Analysis

To assess VL monitoring trends, the VL test data for this analysis were accessed on 14 January 2026 from the SDW at the NICD, a division of the NHLS, for the period 01 January 2019 to 31 December 2025. Both valid and rejected HIV viral load VL tests were included for reporting the annual number of HIV VL tests registered,

whereas reporting on the number of patients undergoing VL monitoring and suppression rates were restricted to valid results. All ages were included in the analysis, including tests registered with an unknown date of birth, with taken date used to describe the period of testing.

The following VL indicators were calculated annually per calendar year:

1. The total number of VL tests submitted and registered within the NHLS;
2. The total number of patients receiving at least one valid VL test per year, retaining only the most recent VL result per patient per annum; and
3. The VL suppression rates at both the <50 and <1 000 cpml thresholds. These were calculated using patient-level data as the proportion of patients whose most recent VL result in a given year met the relevant suppression threshold.

HIV VL testing coverage was calculated using the total number of patients having a valid VL test in a given year divided by the estimated 'Total people living with HIV' as well as 'Total on ART' outputs obtained from the Thembisa 4.8 Model.[7] Year-on-year percentage changes in VL testing, number of patients, and suppression rates were calculated using volumes from the previous year as denominators. Due to incomplete VL data for 2024, values for that year were interpolated, and percentage changes for 2025 were calculated using 2023 data as the reference for VL trends.

Data were analysed in Python 3.9.13 using pandas (v1.4.4) and matplotlib (v3.5.2).

Results

Between 2019 and 2025, the estimated annual number of PLHIV increased from 7.46 to 8.12 million, and the number on ART increased from 5.17 to 6.39 million.[7] Over the same period, the number of VL tests submitted rose from 5.84 million to 6.83 million, and the number of unique patients receiving a VL test increased from 4.81 million to 5.73 million (Figure 1a). National HIV VL monitoring coverage increased from 64.5% in 2019 to 70.5% in 2025, with a peak of 71,4% reached in 2023 (Figure 1b). The average number of VL tests performed per patient per year decreased slightly from 1.21 in 2019 to 1.19 in 2025. Expressed as a proportion of patients on ART with a VL done, this decreased from 93,1% in 2019 to 89,6% in 2025.

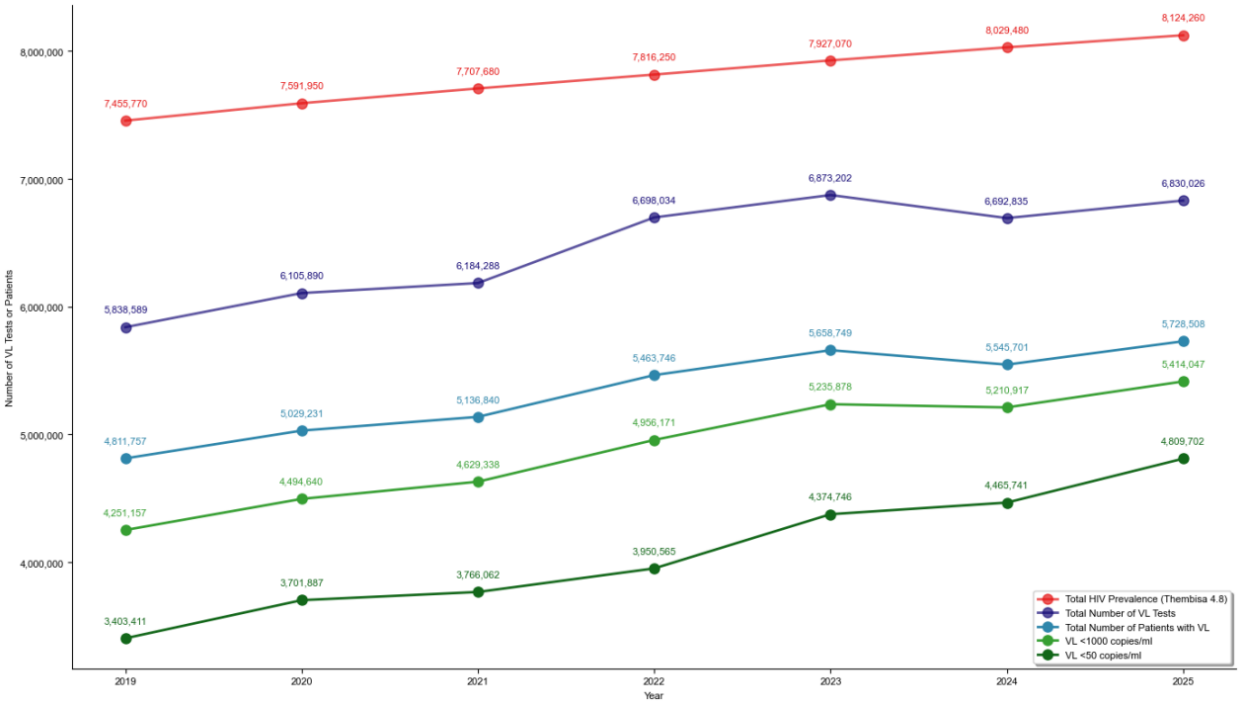

Figure 1a. Number of viral load (VL) tests and results in comparison to HIV prevalence, South Africa, 2019–2025. The total HIV VL tests performed and the total number of patients receiving a VL test in comparison to the Thembisa 4.8 model HIV prevalence estimates. VL suppression at the <1 000 cpml and <50 cpml thresholds are represented for the total number of patients undergoing VL testing (cpml=copies per millilitre).

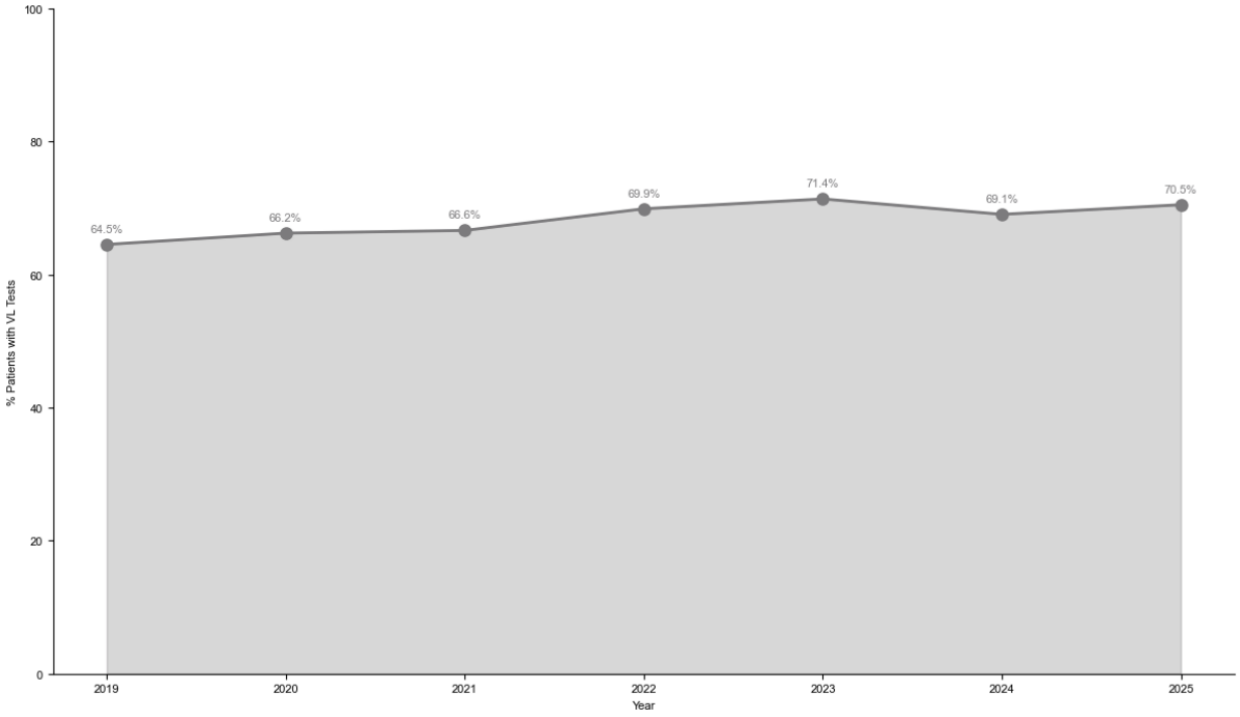

Figure 1b. Annual viral load (VL) coverage by year, South Africa, 2019–2025. The coverage of VL tests for all people living with HIV is given using the Thembisa HIV prevalence rates as a denominator.

Over the same period, the absolute annual number of virally suppressed patients increased at both the <50 cpml and <1 000 cpml suppression thresholds, both reaching peaks in 2025 of 4.81 million and 5.41 million, respectively (Figure 1a). The viral suppression rate at <1 000 cpml increased steadily from 88.3% in 2019 to 94.5% in 2025. The most pronounced gains occurred from 2022 onward, with 2025 showing the strongest performance and approaching the third 95 target (Figure 2a). Viral suppression at the more stringent <50 cpml also improved substantially from 70.7% in 2019 to 84.0% in 2025. As with the <1 000 cpml threshold, marked improvements were observed after 2022 (Figure 2a). Figure 2b illustrates changes in VL distribution over time. The proportion of patients with low-level viraemia (50–1000 cpml) declined from 17.6% to 10.5%, while the proportion with a VL >1 000 cpml decreased from 11.7% to 5.5%.

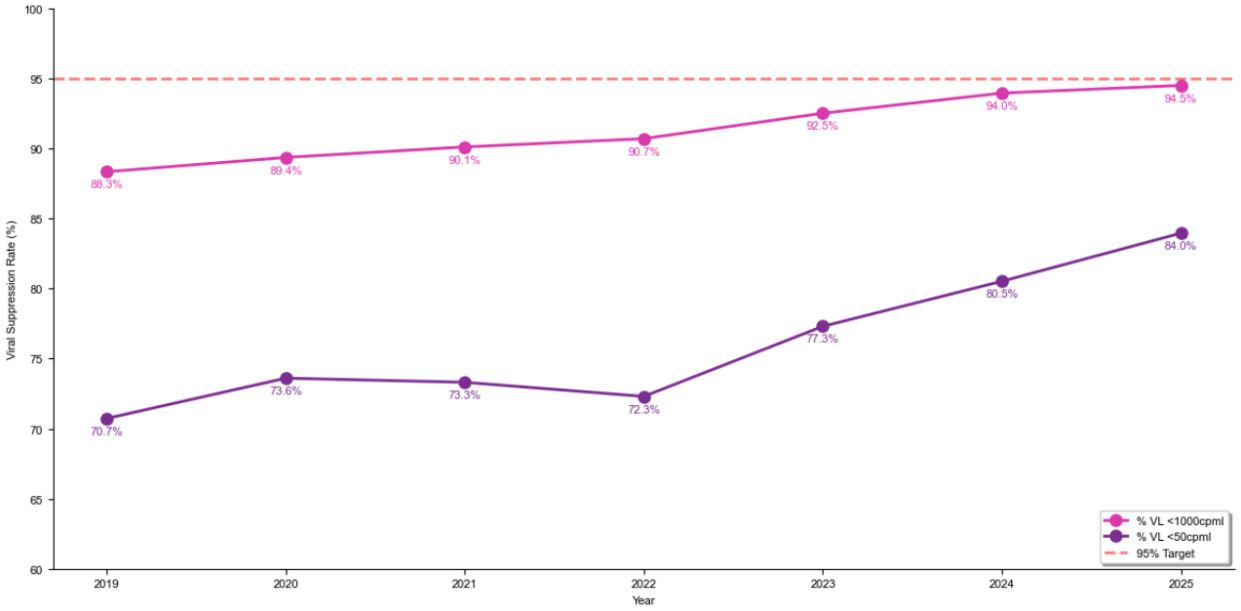

Figure 2a. Viral load (VL) suppression rates. HIV VL suppression rate trends in patients undergoing VL testing at <1 000 and <50 cpml thresholds in relation to the third 95% target as per the UN 95-95-95 targets (cpml=copies per millilitre).

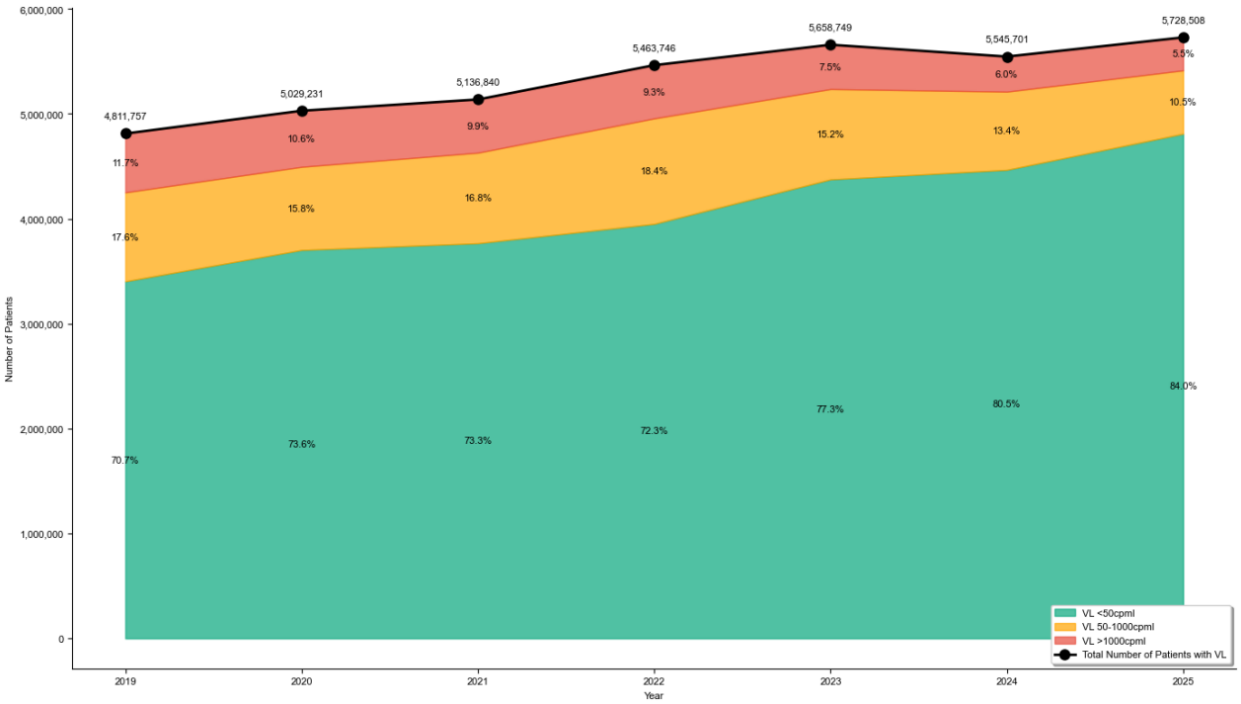

Figure 2b. Distribution of viral load (VL) suppression rates, South Africa, 2019–2025. Trends for the percentage of patients with VL results of <50 cpml (virally suppressed), 50-1000 cpml (low-level viraemia) and >1 000 cpml (virally unsuppressed). (cpml=copies per millilitre).

The Thembisa 4.8 estimates suggest a steady reduction in the annual rate of increase in HIV prevalence between 2019 and 2025. Although HIV prevalence is estimated to still be increasing year-on-year, the rate of increase is estimated to have decreased from 1.8% in 2020 to 1.2% in 2025 (Figure 3). In comparison with HIV prevalence estimates, VL monitoring indicators have fluctuated greatly. Year-on-year comparisons demonstrate that the largest annual increase for VL monitoring was in 2022, including increases in VL tests registered, patients monitored, and the number of patients virally suppressed at <1 000 cpml (Figure 3). After 2022, the rate of increase has declined for all of these indicators, with the exception of the number of patients virally suppressed at the <50 cpml threshold, which saw the greatest year-on-year increase of 10.7% in 2023.

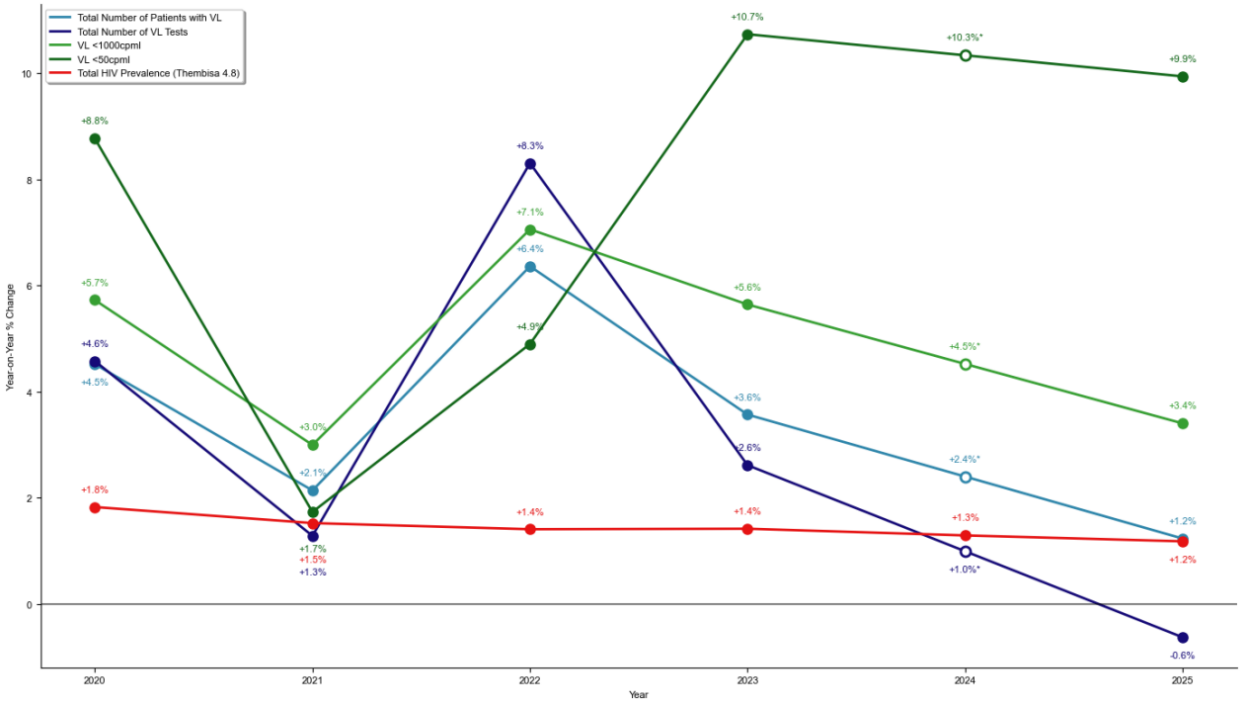

Figure 3. Annual percentage of viral load (VL) changes, South Africa, 2019–2025. Year-on-year percentage change in HIV VL testing, VL suppression rates and HIV prevalence. Interpolated data points for 2024 are indicated by open dots. (cpml=copies per millilitre).

In 2025, the rate of change of the total number of VL tests performed declined since 2020, demonstrating a negative growth rate of -0.6% for the first time. Although the number of patients receiving VL tests increased in 2025, the percentage increase of 1.2% was the lowest across the seven-year period. In contrast, viral suppression outcomes continued to improve, with a relatively greater annual increase at the <50 cpml threshold compared to the <1 000 cpml threshold.

Discussion

Analysis of VL tests processed by the NHLS and reported through the NICD SDW demonstrates that 2025 was characterised by the strongest viral suppression outcomes observed during the seven-year period, alongside the highest number of PLHIV receiving an HIV VL test. However, this was paradoxically associated with a decline in the total number of VL tests compared with 2023, highlighting negative year-on-year growth for two consecutive years and a static annual VL testing coverage among PLHIV of approximately 71%. Even a partially successful "1.1 million HIV campaign", launched by the NDoH in early 2025 to close the gap between the first two 95 targets within the year, should have resulted in a marked increase in VL tests performed in 2025 because PLHIV initiated on ART require VL monitoring.[8] As of 2025, only two-thirds of PLHIV in South Africa have evidence of virological suppression (<1 000 cpml), equating to >2.5 million people with possible viraemia.

Trends in the number of HIV VL tests performed per annum indicate that VL monitoring may only be keeping pace with newly diagnosed cases, and suggest SA is not on track to end AIDS as a public health threat by 2030. This is despite continued improvements in the viral suppression (<1 000 cpml) rates, approaching 95% in 2025, which are consistent with expanded dolutegravir ART coverage, programme maturation, and strengthening of clinical care and adherence support.

The modest decline in the average number of VL tests per patient per year may reflect improved viral suppression, allowing less frequent VL monitoring in clinically stable patients. This reduction in testing frequency may also be contributing to the observed decrease in overall VL testing volumes. However, the plateau in VL coverage combined with improving suppression outcomes may also indicate challenges with the programme's reach as well as retention of virally unsuppressed or higher-risk patients in care. This may include individuals newly diagnosed or previously lost to follow-up. This is especially concerning given evidence that patients with an unsuppressed VL are more likely to have delayed VL testing and possible disengagement from care.[9,10]

The impact of the NHLS cyberbreach in 2024 and the abrupt withdrawal of PEPFAR funding in early 2025 complicates the interpretation of VL trends, particularly with respect to the precise timing of reductions in VL testing. Although this analysis excludes VL tests performed in the private sector, data from the private medical schemes suggest these numbers are low, with any associated under-estimate of VL monitoring likely offset by the limited sensitivity of the probabilistic patient-linking algorithm. The annual number of patients with a VL test closely aligns with the NDoH TROA indicator,[6] further supporting its utility for trend analysis.

Conclusion and Recommendations

In 2025, South Africa achieved its strongest HIV viral suppression outcomes to date and reached the highest number of PLHIV through VL testing. However, VL testing volumes and coverage plateaued, signalling excellent outcomes among patients already in care but limited expansion to reach additional PLHIV. This trend is particularly concerning in view of the strong growth observed in earlier years.

Given that the stagnation in HIV VL testing followed substantial reductions in programme funding, further investigation into strategies to stabilise and expand VL testing is urgently required. While maintaining high-quality treatment outcomes, renewed emphasis on HIV testing, linkage to care, and retention of new and disengaged patients will be essential if South Africa is to achieve the UN 95-95-95 targets by 2030.

Acknowledgements

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Ethical considerations

The NICD has approval from the Human Research Ethics Committee of the University of the Witwatersrand (M160667; M210752) to conduct an analysis of routine laboratory data. No patient-identifying data were accessed for this analysis.

Conflict of interest

The authors declare no conflicts of interest

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References

1. Frescura L, Godfrey-Faussett P, Feizzadeh A A, et al, on behalf of The 2025 Testing Treatment Target Working Group. Achieving the 95 95 95 targets for all: A pathway to ending AIDS. *PLoS One*. 2022;17(8):e0272405.

2. Joint United National Programme on HIV/AIDS. AIDS, crisis and the power to transform: UNAIDS global AIDS update 2025. Geneva: UNAIDS; 2025. Available from: https://www.unaids.org/sites/default/files/2025-07/2025-global-aids-update-JC3153_en.pdf (accessed 16th June 2026).

3. Hans L, Cassim N, Sarang S, at al. HIV viral load testing in the South African public health setting in the context of evolving ART guidelines and advances in technology, 2013–2022. *Diagnostics*. 2023;13:2731.

4. Radebe L, Haeri Mazanderani A, Sherman GG. Evaluating patient data quality in South Africa's National Health Laboratory Service Data Warehouse, 2017-2020: implications for monitoring child health programmes. *BMC Public Health*. 2022;22(1):1266.

5. Bassett IV, Huang M, Cloete C, et al. Assessing the completeness and accuracy of South African National Laboratory CD4 and viral load data: a cross-sectional study. *BMJ Open*.2018;8:e021506.

6. The National Institute for Communicable Diseases. M&E Portal – HIV Online Dashboard. Available from: https://www.nicd.ac.za/ (accessed 16th June 2026).

7. Johnson LF, Meyer-Rath G, Dorrington RE, et al. The effect of HIV programs in South Africa on national HIV incidence trends, 2000–2019. *J Acquir Immune Def Syndr*. 2022;90:115-23.

8. World Health Organization [Internet]. South Africa launches 1.1 million HIV campaign to close treatment gap; [updated 2025 25 Feb; cited 2026 Mar 6]. Available from: https://www.afro.who.int/countries/south-africa/news/south-africa-launches-11-million-hiv-campaign-close-treatment-gap-0

9. Fox MP, Brennan AT, Nattey C, et al. Delays in repeat HIV viral load testing for those with elevated viral loads: a national perspective from South Africa. *J Intern AIDS Soc*.2020;23(7).

10. Haeri Mazanderani A, Radebe L, Sherman GG. Attrition rates in HIV viral load monitoring and factors associated with overdue testing among children within South Africa's antiretroviral treatment programme: Retrospective descriptive analysis. *JMIR Public Health and Surveillance*. 2024;10:e40796.