Yearly Trends of HIV and Syphilis in Jos, Nigeria: A Retrospective Review of Records From Two Teaching Hospitals

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Abstract

Background: Reports from parts of the United States and Europe describe renewed concern about HIV transmission in some populations and a sustained resurgence of syphilis. However, whether similar patterns are evident in rapidly growing urban settings in Nigeria remains uncertain. This study assessed annual trends in HIV and syphilis positivity in Jos while avoiding causal interpretation of migration, which was not directly measured.

Methods: A retrospective review of monthly aggregated HIV and syphilis testing records from two teaching hospitals in Jos was conducted for 2020–2023. Annual numbers tested, annual numbers positive, and positivity rates with 95% confidence intervals (CIs) were calculated. Formal trend assessment used a grouped binomial logistic regression with year as a continuous variable and Cochran–Armitage tests for trend.

Results: HIV positivity peaked in 2021 and declined thereafter despite increasing annual testing volumes. The odds of HIV positivity decreased over time (odds ratio per year 0.58, 95% CI 0.48–0.69; $p<0.001$), and the Cochran–Armitage test also indicated a significant downward trend. Syphilis positivity remained low across all study years but rose in 2023; however, the upward trend was not statistically significant in the grouped binomial regression (odds ratio per year: 1.70, 95% CI: 0.84–3.45; $p=0.142$) or in the Cochran–Armitage test.

Conclusion: Within these hospital records, HIV positivity declined after 2021, whereas syphilis positivity remained low with a recent increase that warrants continued surveillance. Migration and urbanization may provide contextual background, but they were not measured in this dataset and should not be interpreted as causal determinants of the observed trends.

Keywords

HIV; syphilis; sexually transmitted infections; trend analysis; urbanization; migration; Nigeria; Jos

Introduction

Human immunodeficiency virus (HIV) and syphilis remain important public health concerns despite major advances in treatment and prevention. Expanded antiretroviral therapy has reduced HIV-related mortality in many regions, but transmission patterns remain heterogeneous. International literature indicates that HIV trends in high-income settings are mixed rather than uniformly increasing: some countries have reported rising rates of new HIV cases since 2010, whereas regional UNAIDS summaries for western and central Europe and North America show an overall decrease in annual new infections since 2010.[1,2] In contrast, syphilis resurgence has been more consistently documented across high-income settings, with review and surveillance studies describing increasing incidence across North America and Europe over the past decade.[3,4]

Although migration and urban growth are often discussed as contextual influences on sexually transmitted infection (STI) transmission, these pathways are complex and cannot be assumed from routine surveillance data alone. Population mobility may change sexual network structure and access to care, but behavioral and structural determinants such as stigma, service availability, and socioeconomic inequality are also relevant to HIV and syphilis epidemiology.[5,6] Therefore, migration should be treated as background context unless directly measured.

Within Nigeria, HIV burden remains substantial in key populations, with the 2020–2021 Integrated Biological and Behavioural Surveillance Survey reporting weighted HIV prevalence of 28.8% among transgender people, 25.0% among men who have sex with men, 15.5% among female sex workers, and 10.9% among people who inject drugs.[7] Nigerian studies among HIV-care populations have also reported measurable syphilis burden, including hospital-based prevalence estimates in North Central Nigeria, Lagos, Abuja, and Makurdi.[8-10,13] Against this background, the present study used routine records from two teaching hospitals in Jos to examine annual HIV and syphilis positivity trends and to determine whether local data suggest increases comparable to those reported elsewhere.

Literature Review

African and Nigerian literature provides important context for interpreting the Jos findings. In a five-country sub-Saharan African analysis of Population-based HIV Impact Assessment surveys, active syphilis prevalence ranged from 0.9% in Tanzania and Zimbabwe to 3.0% in Zambia, and prevalence was higher among people living with HIV than among those without HIV.[11] A systematic review and meta-analysis of sub-Saharan African studies further estimated pooled syphilis prevalence among people living with HIV at 7.3% overall, with a pooled estimate of 5.5% in West and Central Africa and a relative risk 3.5 times higher than among people without

HIV.[12] These findings show that syphilis remains epidemiologically relevant in African settings and that its burden is concentrated in some clinical and demographic subgroups.

Nigerian studies similarly indicate that syphilis prevalence varies by population and setting. Earlier work from North Central Nigeria, summarized in a hospital-based cohort of HIV-infected subjects, cited syphilis seroprevalence figures of 4.1% and 4.0% among commercial sex workers in Ibadan and Lagos, respectively, and 0.125%, 1.7%, and 2.97% among pregnant women in Enugu, Ilorin, and Oshogbo.8 More recent Nigerian studies among HIV-infected clinic populations reported syphilis prevalence of 1.8% in Lagos and 0.35% in Abuja, whereas a Makurdi HIV outpatient cohort found syphilis coinfection prevalence of 6.4%.[9,10,13] These studies are not directly comparable to the present analysis because the Jos dataset reflects aggregated testing records from mixed hospital attendees rather than a defined HIV-positive cohort, yet they demonstrate that syphilis burden in Nigeria is setting-specific and can vary widely.

This literature highlights two implications for the present study. First, comparisons between Jos and high-income settings should be contextual rather than deterministic. Second, the interpretation of any local trend should emphasize the underlying data source and the tested population. A hospital-based time series of aggregated positive and negative tests can characterize the direction of change, but it cannot attribute observed patterns to migration, urbanization, or other individual-level determinants without additional data.

Methods

Study design and setting: This study was a retrospective descriptive analysis of routinely collected HIV and syphilis testing data from two teaching hospitals in Jos, Plateau State, Nigeria. Jos is a major urban center that has experienced substantial population movement from surrounding communities and other parts of the country. In the present study, migration and urbanization were considered contextual issues only; neither variable was directly measured in the dataset.

Data source and study population: Data were extracted from hospital records containing monthly aggregated counts of HIV and syphilis positive and negative test results. The available dataset covered March–December 2020, January–December 2021, January–December 2022, and January–November 2023. The records did not include patient-level identifiers, demographic variables, behavioural variables, migration history, or laboratory protocol documentation by year.

Laboratory testing information: The extracted records contained only aggregated monthly counts of positive and negative results and did not document assay names, testing algorithms, confirmatory procedures, quality-assurance procedures, or whether protocols changed over time. Consistency of testing methods across study years therefore could not be independently verified

from the records available for analysis. This limitation is explicitly acknowledged in the interpretation of findings.

Outcome measures: For each infection, the number tested was defined as the sum of positive and negative test results. Annual positivity rate was calculated as the number positive divided by the total number tested in a given year, expressed as a percentage. Because annual testing volume varied, the positivity rate was treated as the principal comparative measure.

Statistical analysis: Monthly values were aggregated by calendar year. Descriptive statistics summarized annual testing volumes, annual positive counts, positivity rates, and 95% confidence intervals (Wilson score method). To strengthen quantitative assessment of temporal change, formal trend analyses were added using grouped-binomial logistic regression models with year entered as an ordinal continuous predictor and Cochran–Armitage tests for trend. Odds ratios (ORs) per year with 95% confidence intervals were reported. Given the aggregated structure of the data and the limited number of years, these analyses were interpreted as tests of linear trend rather than causal models.

Ethical considerations: The analysis used retrospective aggregated hospital data with no personal identifiers. Ethics approval identifiers and institutional administrative approval numbers were not included in the available information and should be inserted before journal submission if required by the target journal or participating institutions.

Results

The dataset included four calendar years, with 10 months of records in 2020, 12 months in 2021, 12 months in 2022, and 11 months in 2023. Annual HIV positive counts were 34, 58, 26, and 10 in 2020, 2021, 2022, and 2023, respectively, corresponding to annual testing totals of 474, 711, 756, and 792. Annual HIV positivity was 7.17% (95% CI 5.18%–9.86%) in 2020, 8.16% (95% CI 6.36%–10.40%) in 2021, 3.44% (95% CI 2.36%–4.99%) in 2022, and 1.26% (95% CI 0.69%–2.31%) in 2023.

Annual syphilis positive counts were 2, 0, 1, and 6 in 2020, 2021, 2022, and 2023, respectively, corresponding to annual testing totals of 476, 711, 756, and 793. Annual syphilis positivity was 0.42% (95% CI 0.12%–1.52%) in 2020, 0.00% (95% CI 0.00%–0.54%) in 2021, 0.13% (95% CI 0.02%–0.75%) in 2022, and 0.76% (95% CI 0.35%–1.64%) in 2023.

Formal trend analyses indicated a statistically significant decline in HIV positivity over time. In grouped-binomial logistic regression, the odds of HIV positivity decreased by approximately 42% per year (OR 0.58, 95% CI 0.48–0.69; $p<0.001$). The Cochran–Armitage test also supported a significant downward trend ($Z=-6.38$; $p<0.001$). For syphilis, grouped-binomial logistic regression estimated an OR of 1.70 per year (95% CI 0.84–3.45; $p=0.142$), while the Cochran–Armitage test yielded $Z=1.52$ ($p=0.129$), indicating that the observed increase was not statistically significant at the conventional 0.05 level.

Visual inspection of the figures shows that HIV peaked in 2021 and declined thereafter, whereas syphilis remained uncommon but increased in 2023. Because HIV testing totals increased over time while HIV positivity decreased, the downward HIV trend is unlikely to be explained solely by reduced testing volume.

Discussion

The revised analysis clarifies two main points. First, the observed HIV pattern in Jos was a significant decline after 2021 rather than a sustained increase. Second, the recent increase in syphilis positivity was small in absolute terms and was not statistically significant in the formal trend analyses. These findings do not support the conclusion that Jos has experienced the same pattern of simultaneous HIV and syphilis increase described in some international reports. Instead, the Jos data suggest divergent patterns: a significant downward HIV trend and a low-level, statistically non-significant upward syphilis signal that requires surveillance rather than over-interpretation.

Comparison with African and Nigerian studies places these findings into a more relevant regional context. The syphilis positivity observed in Jos (0.00%–0.76% by year) was lower than the pooled prevalence reported among people living with HIV in sub-Saharan Africa and lower than several clinical cohorts from Nigeria.9-13 It was closer to the lower end of hospital-based Nigerian estimates, such as the Abuja report of 0.35%, and lower than the Lagos estimate of 1.8% and the Makurdi estimate of 6.4% among HIV clinic attendees.9,10,13 These differences are plausible because the Jos dataset included aggregated hospital testing records rather than a defined HIV-positive cohort, and prevalence can vary substantially by population, setting, and testing indication.

The discussion of migration and urbanization also required tighter wording. In this dataset, migration was not measured, and no patient-level residential history, mobility measure, or migration indicator was available. As a result, migration and urban growth can only be presented as contextual circumstances that may shape service demand and sexual network mixing; they cannot be interpreted as causal determinants of the observed HIV or syphilis trends. Any stronger claim would exceed the evidentiary limits of the hospital records used here.

Because the extracted records contained only aggregated counts of positive and negative tests, the analysis could not verify assay type, testing algorithm, confirmatory strategy, or year-to-year consistency in laboratory procedures. Therefore, observed temporal changes should be interpreted as changes in recorded positivity rather than definitive changes in biological incidence. Future surveillance-oriented studies in Jos would be strengthened by linking annual results to assay documentation and quality-assurance records.

The inclusion of formal trend analyses improves the analytical rigor of this study, but the data structure still limits inference. With only four annual time points and no patient-level covariates,

the models identify a linear trend in annual positivity rather than mechanisms of change. Future studies should collect demographic, behavioural, and migration-related variables to clarify risk patterns and to determine whether mobility, sexual behavior, or service access explains local STI dynamics.

Study Limitations

This study has several limitations. It was based on aggregated routine records from two teaching hospitals and may not represent the broader population of Jos or Plateau State. The dataset did not cover complete calendar years for 2020 or 2023. Patient-level demographic, behavioral, and migration-related variables were unavailable, preventing direct evaluation of risk factors or determinants. The extracted records also lacked laboratory protocol metadata, so year-to-year consistency of testing methods could not be independently verified. Syphilis-positive counts were small, limiting statistical precision. Finally, as a retrospective descriptive analysis, the study identifies trends in recorded positivity but cannot establish causality.

Conclusion

After revision in response to the reviewer comments, the manuscript supports a cautious interpretation: HIV positivity declined significantly after 2021 within these two Jos teaching hospitals, whereas syphilis positivity remained low and showed a recent increase that was not statistically significant. Migration and urbanization remain relevant contextual issues, but they were not measured and should not be interpreted as causal explanations in this study. Future work should incorporate patient-level demographic, behavioural, migration, and laboratory-process data to better understand the determinants of STI transmission in Jos.

Tables

Table 1. Coverage of monthly HIV and syphilis testing records by year.

Year	Number of months in dataset	Months included
2020	10	March, April, May, June, July, Aug, Sep, Oct, Nov, Dec
2021	12	Jan, Feb, March, April, May, June, July, Aug, Sep, Oct, Nov, Dec
2022	12	Jan, Feb, March, April, May, June, July, Aug, Sep, Oct, Nov, Dec
2023	11	Jan, Feb, March, April, May, June, July, Aug, Sep, Oct, Nov

Table 2. Annual HIV and syphilis positive counts, numbers tested, and positivity rates with 95% confidence intervals.

Year	Months	HIV positive	HIV tested	HIV positivity % (95% CI)	Syphilis positive	Syphilis tested	Syphilis positivity % (95% CI)
2020	10	34	474	7.17 (5.18-9.86)	2	476	0.42 (0.12-1.52)
2021	12	58	711	8.16 (6.36-10.40)	0	711	0.00 (-0.00-0.54)
2022	12	26	756	3.44 (2.36-4.99)	1	756	0.13 (0.02-0.75)
2023	11	10	792	1.26 (0.69-2.31)	6	793	0.76 (0.35-1.64)

Table 3. Year-on-year change in annual HIV and syphilis positive counts and positivity rates.

Year	HIV positive	HIV YoY change in positives, %	HIV change in positivity, percentage points	Syphilis positive	Syphilis YoY change in positives, %	Syphilis change in positivity, percentage points
2020	34	—	—	2	—	—
2021	58	70.59	0.98	0	-100.00	-0.42
2022	26	-55.17	-4.72	1	—	0.13
2023	10	-61.54	-2.18	6	500.00	0.62

Table 4. Formal statistical trend analyses for annual HIV and syphilis positivity.

Infection	Grouped-binomial OR per year	95% CI	P value (GLM)	Cochran–Armitage Z	P value (trend test)
HIV	0.58	0.48-0.69	<0.001	-6.38	<0.001
Syph	1.70	0.84-3.45	0.142	1.52	0.129

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