Prevalence of HIV and Antiretroviral Therapy (ART) Coverage in Uganda: A Comprehensive Study of 2022 Trends

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1. Background

In 2022, Uganda continued to face significant challenges and make strides in the fight against HIV/AIDS. On January 28, 2003, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), the largest commitment by any nation to address a single disease in history, was announced (**1**). By September 2022, more than 1.3 million persons with HIV infection in Uganda were receiving PEPFAR-supported ART, an increase of approximately 5,000% from September 2004. As indicators of the ART program's effectiveness, a proxy MTCT rate decreased 77%, from 6.4% in 2010 to 1.5% in 2022, and the viral load suppression rate (<1,000 viral copies/mL) increased 3%, from 91% in 2016 to 94% in September 2022 (2).

The country has an HIV prevalence rate of approximately 5.1%, with variations across different regions and populations (**2,3**). However, Uganda has also made substantial progress in increasing access to antiretroviral therapy (ART). By 2022, about 98% of the estimated 1.4 million people living with HIV in Uganda were receiving ART, a critical component in managing the virus and improving the quality of life for those affected (**2,3**). This high ART coverage has been instrumental in reducing AIDS-related mortality and new HIV infections, demonstrating Uganda's commitment to addressing the epidemic through comprehensive healthcare strategies and support systems (**2,3**).

2. Aim

To evaluate the status on the impact of ART coverage on HIV prevalence in 2022 in 146 districts/cities in Uganda.

3. Methodology

Data of district estimates for HIV prevalence and ART coverage 15-49 years – 2022 were ranked in order from district with highest to lowest prevalence. The cut-off values for HIV prevalence were as follows:

- High: HIV prevalence ≥ 7 %
- Moderate: HIV prevalence between 5-6.9 %
- Low: HIV prevalence ≤ 4.9 %

No other factors, such as demographics, socio-economics, behavioral factors, clinical factors or healthcare factors, among others, could be analyzed due to the lack of stratification of the data.

Data from HIV prevalence and ART coverage was provided by the Uganda AIDS Commission, the Official Statistics Provider for Uganda (Uganda Bureau of Statistics, UBO) and the Uganda Demographic and Health Survey (UDHS) 2022. Data is of public

consumption and is stored in The PLATFORM for the NEEDY and the research team analyzing the data of the current report.

Statistical analyses were performed using GraphPad Prism 5.0. The steps of the outbreak investigation followed the previously described guidelines (**4,5**). For correlation analyses, data was analyzed by generalized linear modeling, as previously described (**6**), which is equivalent to analysis of covariance (ANCOVA). When comparing multiple groups, one-way analysis of variance (ANOVA) followed by Tukey's post hoc test was used. Data are presented as Mean ± SD. Statistical significance was defined as $P < 0.05$.

4. Results

The percentage of districts with low prevalence of HIV reached 55.5 % of the cases analyzed, with a 24 % of the cases with moderate prevalence and 21 % of the cases with high prevalence (**Figure 1A**).

The HIV prevalence of those districts with low occurrence was 2.78 ± 1.19 %. With significantly higher prevalence, the districts with a moderate rate, exhibited a 5.79 ± 0.57 % of HIV prevalence. And the districts with high occurrence rate showed an HIV prevalence of 9.92 ± 0.45%, which was significantly higher than the other two groups (**Figure 1B**).

No differences were observed in the ART coverage among groups (**Figure 1C**).

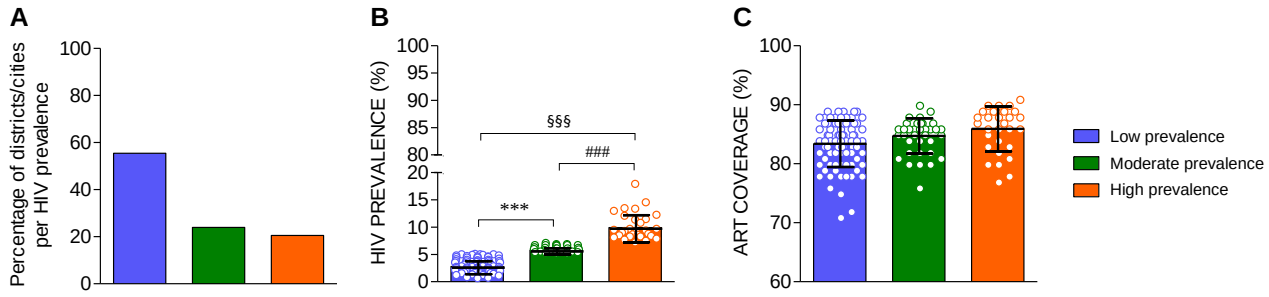

Figure 1. (**A**) Percentage of districts/cities per HIV prevalence. (**B**) HIV prevalence expressed in percentage (%). (**C**) ART coverage. Data are Mean ± SD. ***$P < 0.001$ moderate *versus* low prevalence; ###$P < 0.001$ high *versus* moderate; §§§$P < 0.001$ high *versus* moderate.

Correlation analyses of the pooled data showed a significant positive correlation between ART coverage and HIV prevalence, with a poor correlation coefficient and a mild slope of the correlation line (**Figure 2A**).

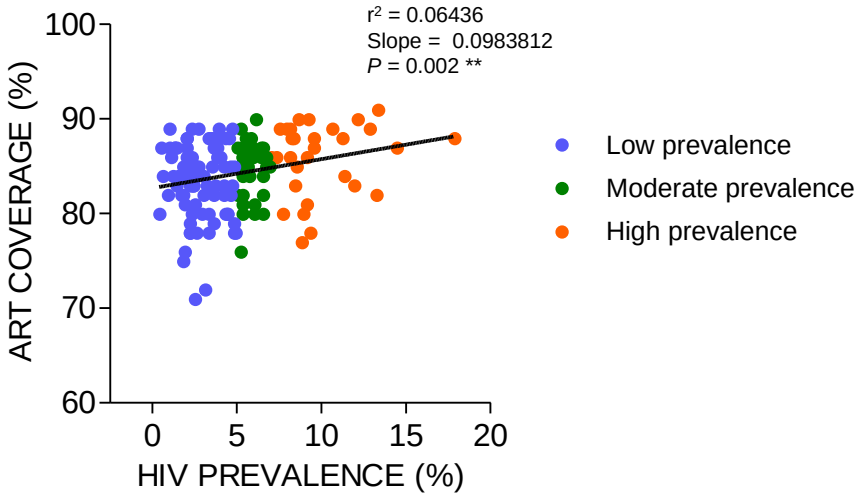

Figure 2. Correlation between ART coverage and HIV prevalence in 146 districts/cities in Uganda in 2022. Individual data points are represented for both co-variates stratified in low, moderate and high HIV prevalence. ***P* < 0.01, significant correlation.

To verify whether or not this significance was spurious, the same parameters were correlated in the three strata in which the data was divided. Here, no significant correlation was found between ART coverage and HIV prevalence neither in districts with low, moderate or high HIV prevalence (**Figure 3A-C**).

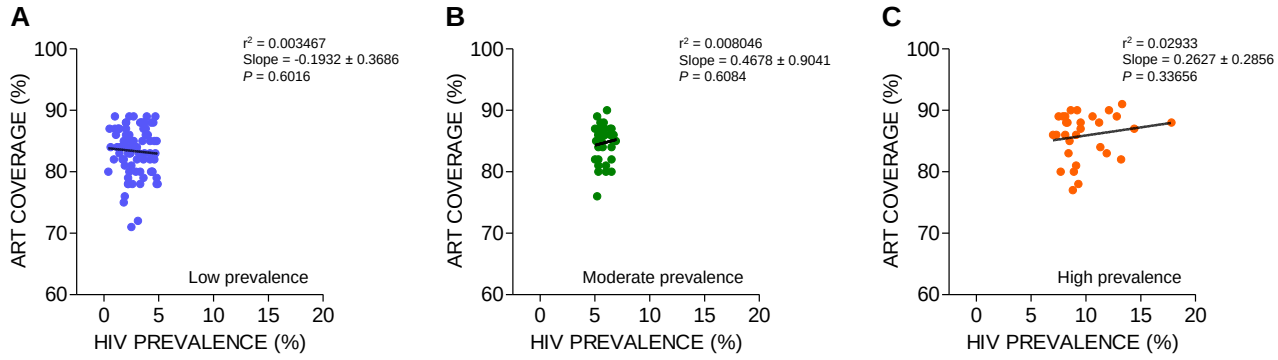

Figure 3. Correlation between ART coverage and HIV prevalence in 146 districts/cities in Uganda in 2022. Individual data points are represented for both co-variates stratified in (**A**) low, (**B**) moderate and (**C**) high HIV prevalence.

5. Discussion

The lack of correlation between ART coverage and HIV prevalence in all the districts analyzed in a Ugandan population aged 15-49 years old in 2022 suggest that the general ART coverage was good enough not to contribute to an increase in the HIV prevalence at that time.

Considering the statements in the Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection (**7**), 89 % of the analyzed countries (135 out of 146) had a high level of treatment coverage (80% or more of the eligible population) that is accessible and affordable. However, there are still 16 out of the 146 districts/cities with an

ART coverage below the standards of the WHO, as shown in (**Table 1**). This means that, although in the general case-scenario, the ART coverage is compliant with the WHO´s standards, a considerable effort is still needed to achieve the adherence to the ART therapy in the districts/cities listed in (**Table 1**).

Table 1. District estimates for HIV prevalence (%) and ART coverage (%) 15-49 years old population in Uganda – 2022, ranked in order from district with lowest to highest ART coverage in areas with high HIV prevalence (Gulu and Omoro), moderate HIV prevalence (Kibaale) and low prevalence (all other districts listed in the table).

District/City	HIV Prevalence (%)	ART Coverage (%)
Gulu	8,8	77
Omoro	9,3	78
Kibaale	5,2	76
Moroto	2,5	71
Mayuge	3,1	72
Kween	1,8	75
Bukwo	1,9	76
Dokolo	4,9	78
Alebtong	4,8	78
Kamuli	3,3	78
Bugweri	2,6	78
Buyende	2,2	78
Luuka	2,2	78
Kaberamaido	4,8	79
Iganga	3,6	79
Namutumba	2,2	79

However, according to the data analyzed, the HIV prevalence in the districts/cities studied seem to be driven by factors other than ART coverage, especially in those areas with a high rate of HIV. It is thus essential to identify other aspects in the battle against HIV in Uganda. The most important ones are listed below:

1. Cultural Practices and Beliefs:

- Polygamy and multiple sexual partnerships are common in some regions, increasing the risk of HIV transmission.
- Gender Inequality: Women often have less power in relationships, limiting their ability to negotiate safe sex practices.

2. Stigma and Discrimination:

- Fear of being stigmatized discourages many people from getting tested for HIV or seeking treatment.
- Discrimination against people living with HIV/AIDS can lead to social isolation and mental health issues, further complicating prevention and treatment efforts.

3. Poverty and Economic Factors:

- Poverty can lead to higher engagement in transactional sex or sex work as a means of survival.
- Limited economic opportunities may also reduce access to healthcare services and education.

4. Lack of Education and Awareness:

- Insufficient sex education in schools and communities results in low awareness about HIV transmission and prevention methods.
- Misconceptions and myths about HIV/AIDS persist, leading to risky behaviors.

5. Healthcare Infrastructure and Accessibility:

- Inadequate healthcare facilities and resources in rural and underserved areas hinder access to testing, prevention, and treatment services.
- Shortages of healthcare workers and supplies can limit the effectiveness of HIV programs.

6. High Mobility and Migration:

- High rates of internal and cross-border migration, especially among young people seeking work, increase the risk of spreading HIV.
- Migrants may have limited access to healthcare services and information about HIV prevention.

7. Biological Factors:

- High prevalence of other sexually transmitted infections (STIs), which can increase susceptibility to HIV.
- Circumcision rates are low in some areas, and male circumcision has been shown to reduce the risk of heterosexual HIV transmission.

8. Conflict and Instability:

- Areas affected by conflict and political instability may experience disruptions in healthcare services and increased rates of sexual violence.
- Displacement and refugee populations often have limited access to HIV prevention and treatment services.

9. Behavioral Factors:

- High rates of alcohol and substance use can lead to impaired judgment and risky sexual behaviors.
- Low condom usage, often due to cultural opposition or lack of availability, contributes to the spread of HIV.

10. Policy and Governance Issues:

- Inconsistent implementation and enforcement of HIV prevention policies.

- Limited funding for HIV programs, affecting the sustainability and reach of interventions.

Addressing HIV prevalence in Uganda requires a multifaceted approach that tackles these underlying social, economic, and structural factors alongside improving ART coverage where and when needed, and keeping the ART coverage in those areas compliant with the WHO´s guidelines. Importantly, these actions must be immediately taken to aim for an HIV prevalence of 0.3 %, as it happens in Western Europe and North America (**8**).

6. References

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