Assessing the Prevention of Mother-to-Child Transmission of HIV in Mozambique

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Integrative Learning Experience

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**Abstract**

**Background:** Prevention of mother-to-child transmission (PMTCT) of HIV is essential for controlling the HIV/AIDs epidemic in poor, resource-limited countries. Women in Mozambique disproportionately experience health inequalities, which impacts HIV transmission to children. Access to antenatal care (ANC), HIV testing, and antiretroviral therapy (ART) are critical for positive health outcomes among women and children. **Objective**: To examine the 95-95-95 HIV elimination targets among women (aged 15-49 years), infant HIV outcomes, and selected sociodemographic and behavioral characteristics. **Methods:** Mozambique’s Population-based HIV Impact Assessment (PHIA) from 2021 was utilized to perform descriptive statistics among 2,065 mother-infant pairs. The primary focus was to identify the target idenicators for the elimination of MTCT of HIV. **Results:** Among the population of women who gave birth to their last child, 92% attended ANC, 73.5% knew their HIV status, and 94.3% of HIV-positive women received ART. Among the population of infants born, 23.% knew their HIV status, of whom 0.4% were HIV-positive. **Conclusion:** Observed gaps in care or “leaks” in the PMTCT cascade highlight weaknesses in the country’s HIV response. Findings indicate that further research is needed to explore contextual factors associated with the prevention of HIV and the significance of associations.

**Assessing the Prevention of Mother-to-Child Transmission of HIV in Mozambique**

**Integrated Learning Experience Rationale**

Prevention programs and the widespread use of antiretroviral therapy (ART) have seen great advancement in the last couple of decades. HIV-positive individuals that adhere to ART are now able to live long and healthy lives. With no cure to date, however, control and prevention measures are the key to progressively reducing new HIV infections and end AIDS. Despite on-going progress to reduce new HIV infections and enhance access to antiretroviral therapy, public health challenges continue to exist within vulnerable population groups.

Sub-Saharan Africa continues to bear a significant burden in which 64.9% of the global population living with HIV infections reside. Mozambique accounts for approximately 9% of people living with HIV in Sub-Saharan Africa, of whom 62.5% were women (aged 15 and older) (UNAIDS, 2024). Transmission of HIV occurs primarily through heterosexual relations in Mozambique; however, other known drivers of infection rates include harmful gender norms, sexual violence, and mother-to-child transmission (MTCT). MTCT of HIV is the primary mode of transmission among children under the age of 15 years. Prevention of mother-to-child transmission (PMTCT) programs play a key role in reducing HIV transmission rates to children. Without the necessary treatment, “approximately 15-30% of infants born to women living with HIV will acquire HIV during gestation and delivery, with a further 5-15% of infants acquiring HIV through breastfeeding” (WHO, 2022).

As a global health priority, the United Nations’ Sustainable Development Goal 3: to ensure healthy lives and promote well-being for all at all ages; The Joint United Nations Programme on HIV/AIDs (UNAIDS) 95-95-95 strategy for HIV testing, treatment, and viral suppression; and UNAIDS initiative to eliminate mother-to-child transmission (EMTCT) aligns for sustained efforts in the control and prevention of HIV/AIDS. Efforts for the “PMTCT protects mothers and HIV-exposed children from infection and decreases infant morbidity and mortality” (Ahoue-Leray, 2019). Mozambique has made progress toward reducing the health burden of HIV/AIDs in recent years with approximately 86% who knew their HIV status, 93% of those who were HIV-positive were also on ART, and 88% of those who were on ART were virally suppressed in 2022 among all people living with HIV. However, the HIV testing and treatment cascade for children continues to lag compared to men and women aged 15 and older (Appendix A1) (UNAIDS, 2025). Access and utilization of antenatal care during pregnancy serves as a critical point of entry to comprehensive maternal and child health services which include HIV testing and treatment necessary to prevent vertical transmission. Table 1 demonstrates the alignment between the selected MPH competencies, Sustainable Development Goal, and public health issue in the dataset.

**Table 1.**

*Alignment between MPH program competencies and Sustainable Development Goal*.

|  |
| --- |
| Project Goal: Assess HIV trends among mother-infant pairs in Mozambique for PMTCT. |
| Problem Statement: The substantially high rate of HIV prevalence in Mozambique, especially among women of child-bearing age, leads to high HIV infection among their infants and impacts the overall national HIV/AIDS health burden.  |
| **Variables in the dataset** | **SDG** | **MPH Competencies**  |
| AgeEducationMarital StatusWealth QuintileResidenceAntenatal care (ANC)Pregnant women HIV statusReceived ART among HIV-positive  pregnant women Viral load suppression among  HIV-positive pregnant womenHIV testing among infantsInfants HIV statusBreastfeeding status  | Sustainable Development Goal 3: Ensure healthy lives and promote well-being for all at all ages.  | C-2C-4C-7GH5 |

**Literature Review**

Efforts to prevent vertical transmission play a critical role in reducing the rate of HIV infections among children by providing essential services such as HIV testing, counseling, family planning, and antiretroviral therapy regimes. Four strategies that comprise PMTCT include primary prevention of HIV infection in women of reproductive age and their partners, prevention of unintended pregnancies among HIV-positive women, prevention of HIV transmission from infected mothers to their infants, and providing supportive care for HIV infected mothers, their infants, and family members (Bhardwaj, Carter, Aarons, & Chi, 2015). The disproportionate burden of HIV among women, however, has a complex set of socioeconomical factors that make risk reduction efforts challenging.

Mozambique is one of the poorest countries in the world, with a Human Development Index (HDI) ranked 183 out of 193 countries and territories in 2022. Mozambique also ranked 118 out of 166 countries for the Gender Inequality Index (GII), which synthesizes gender-based inequalities in three dimensions- reproductive health, empowerment, and economic activity (UNDP, 2024). A country analysis highlighted the following (WFP, 2022):

* Sixty percent of the population, estimated at 31.1 million people, lives in extreme poverty per capita gross national income of USD 420.
* Since 2015, the country has faced an economic downturn, with steep decline in foreign direct investment.
* The economic fallout of the 2016 hidden debt crisis saw a significant reduction in external financing, a withdrawal of donor support, devaluation of the currency, and austerity measures that compromised the delivery of social services to an already vulnerable population.
* Since 2017, armed conflict in Cabo Delgado – Mozambique’s poorest province in terms of multidimensional poverty – has escalated rapidly, compounding existing vulnerabilities and affecting more than 13 million people.
* In 2020, the cascading impacts of COVID-19 caused the economy to contract by a further 1.3 percent, resulting in an estimated 2 million people entering poverty in less than a year.
* Food insecurity is a risk factor for HIV infection and a critical barrier to adherence to antiretroviral treatment and retention in care.
* Prevalent discriminatory cultural norms, limited public resources, policy gaps, and a shortage of data impedes the effective inclusion of people with disabilities and the safeguarding of human rights.

Disruptions in HIV care reported among countries in Sub-Saharan Africa during the COVID-19 pandemic added to on-going challenges women face in accessing health services. Among pregnant women, “access to and the use of antenatal care services decreased, with reports of home deliveries due to service barriers to antenatal care access and use as a result of travel restrictions, limited transport access, fear of contracting COVID-19 at health facilities, and other facility-related barriers” (Setshedi, Tshivhase, & Moyo, 2024). Notably, it highlights the importance of strengthening the nation’s capacity for PMTCT services to achieve health equity and equality.

In Mozambique, the primary mode for HIV transmission is through heterosexual relations. Underlying mechanisms between men and women result from biology, sexual behavior, and socially constructed gender differences such as roles and responsibilities, access to resources, and decision-making power. Women are especially vulnerable to gender-based discrimination, sexual violence, and economic hardships that contribute to the high prevalence of HIV in the region (Magadi, 2011). Demonstrated by the four strategies of PMTCT, a combination of approaches for the control and prevention of HIV is necessary due to the complexity of factors that influence health-related behaviors among women. PMTCT programs primarily target women of child-bearing years and their partners to prevent the increase of HIV in children. It helps reduce morbidity and mortality rates in children due to HIV but also averts HIV infections as they age, in which they may further transmit the infection due to lack of knowledge and existing inequalities that make ART access and adherence difficult. Factors associated with the success of PMTCT programs and continual progress toward the elimination of HIV/AIDS include the following (WHO, 2022):

* universal and equitable access to HIV testing services (HTS) for pregnant and breastfeeding women.
* initiation of lifelong triple ART for pregnant women living with HIV, with support for adherence.
* retention in care and viral suppression for pregnant and postpartum women and girls living with HIV.
* safe delivery practices.
* optimal infant-feeding practices.
* access to postnatal ART prophylaxis for HIV-exposed infants.
* access to HTS for early infant diagnosis (EID), determination of final outcome, and early treatment for infants and children diagnosed with HIV.

The elimination of mother-to-child transmission (EMTCT) program monitors progress on the 95-95-95 targets among pregnant women. Similar to UNAIDS 95-95-95 strategy, the EMTCT program target goals are 95% of pregnant women attend antenatal care, 95% are tested for HIV, and 95% of pregnant women living with HIV initiate ART prior to or during pregnancy. In 2011, Mozambique “endorsed the ‘Global Initiative for the Elimination of Vertical Transmission.’ This constituted a radical change in the prevention paradigm, aiming to reduce the MTCT rate to less than 5% and PMTCT coverage to 90%” (Ahoua-Leray, 2019). HIV testing services (HTS) integrated with the first antenatal care visit has been a promising approach in increasing HIV diagnosis, knowledge of HIV status, and linkage to health care services for ART. Additionally, the Option B+ policy**,** recommended by the World Health Organization in 2015, promoted the provision of ART to seropositive pregnant women regardless of their CD4 count and staging. With the integration of HTS, the roll-out of the EMTCT guidelines, and the Option B+, the coverage of pregnant women who received ART has slowly increased since 2015. (Appendix A2).

Guidelines developed by the World Health Organization (WHO) recommend pregnant women attend a minimum of eight ANC visits to improve maternal and child health outcomes (WHO, 2018). In regions of Sub-Saharan Africa, such as Mozambique, many pregnant women under-utilize antenatal care services due to factors such as maternal age, education, marital status, or employment status. Monitoring progress is an integral function for addressing gaps in health care services and tracking progress for disease prevention. A study conducted to examine the trends of HIV testing in Sub-Saharan Africa, both inside and outside ANC settings, indicated the proportion of women (aged 15–49 years) increased from 8% in 2005 to 39% in 2021. The diverse results reported between the countries, however, were likely due to differences in national testing coverage outside antenatal care settings. The proportion of women who received an HIV test during an antenatal care visit varied less between countries (Allorant et al. 2024). Investigating the trends in utilization of antenatal care, HIV testing, and factors associated to socioeconomical inequalities among pregnant women across Mozambique provide insights on the impact intervention programs have on linking HIV-positive women and their children to treatment.

The Global AIDS Strategy 2021–2026, developed by the Joint United Nations Programme on HIV/AIDS (UNAIDS), emphasizes the importance of reducing inequalities that hinder progress to end AIDS. Much of the current research takes a broad focus on gaps in HIV prevention efforts and the population groups disproportionately impacted by health outcomes. Women in Mozambique are uniquely affected by social determinants of health that can be exacerbated during pregnancy. Previous studies conducted within Sub-Saharan Africa indicate that HIV-positive women with low socioeconomic status and poor access to health care are especially prone to high rates of vertical HIV transmission and are less likely to retain appropriate care (Kamanzi, Richter, Paul, & Jarvis, 2022). Understanding the barriers that intersect with the utilization of antenatal care, HIV testing, and ART utilization is necessary for the improvement of health outcomes among women and children.

With a large proportion of Mozambique’s population living in poverty coupled with individual sociocultural attributes, inadequate health infrastructure and skilled human resources, women continue to face multiple barriers in accessing HIV testing services and retention of care for the HIV care continuum (Yaya, Oladimeji, Oladimeji, & Bishwajit, 2019). Evidence-based decision-making requires systematic monitoring and evaluation to enhance HIV prevention efforts. Continuous monitoring of these indicators is critical to provide evidence for cost-effective strategies, appropriate policy changes, and ethically guided responses. Given the significant health burden of HIV among women and children in Mozambique and the recent health crisis due to the COVID-19 pandemic, sustained efforts to evaluate progress are necessary to ensure gaps in health care services are identified and addressed.

This literature review focuses on pregnant women (aged 15–49) who experience a disproportionate rate of HIV infection in Mozambique. HIV infection rates are driven by interrelating socioeconomic disparities, such as limited access to healthcare, social stigma, discrimination, harmful gender norms, level of education, age, and occupation. Individual-level theories and constructs (e.g. Health Belief Model) have been beneficial to intervention programs seeking to improve a woman’s health-related behavior by providing health education and counseling. However, individual-level approaches are not fully effective in the scope of social, economic, political, and environmental factors that are associated with one’s health-seeking behaviors and attitudes. A combination of approaches that utilize individual, interpersonal, and community approaches are likely to have substantial influence in reducing the proportion of women and their children infected with HIV (Hampanda, 2013). As such, taking a socio-ecological approach is better suited for examining trends in antenatal care utilization, HIV testing service, and antiretroviral therapy.

**Methods**

**Study design**

This secondary data analysis used the Mozambique Population-based HIV Impact Assessment from 2021. As part of the PHIA Project, it was conducted as a nationally representative, multi-stage household-based survey to measure the impact of the country’s HIV response. The effort was led by the country’s Ministry of Health with support from the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) through the U.S. Centers for Disease Control and Prevention (CDC) with technical support from ICAP at Columbia University. Individuals aged 15 years and older were eligible to participate. Participation in the survey was voluntary with informed consent provided before interviews. Home-based HIV testing and counseling were provided along with a referral to care for all participants who tested positive with the home- or laboratory-based test. Blood samples were collected by trained staff after participant consented and sent to laboratories for quality control testing. Ony participants who consented and provided a blood sample have an associated biomarker record. The HIV-positive laboratory samples were analyzed to determine the viral load, presence of antiretroviral medications, HIV subtyping, and drug resistance testing. Information on children was only collected in association with the eligible participant’s roster file.

**Conceptual Framework**

The social-ecological approach is best suited in addressing antenatal care (ANC) coverage among pregnant women in middle- to low-income countries where gaps in the HIV treatment cascade are unique. The overarching goal for antenatal care visits, as it relates to this study, is to increase access to ART and prevent loss of follow-up care. Retention in care is vital to educating women during their pregnancy, labor, and postpartum stages for the prevention of pediatric HIV infections. Health care providers and community health workers are in a capacity that enables them to positively influence factors (e.g. number of antenatal visits) on multiple levels by working with individuals, families, healthcare services, and other community aspects (Appendix B).

**Selection of participants**

The Mozambique Population-based HIV Impact Assessment from 2021 had a total of 17,105 adult participants aged 15 years and over, of whom 14,488 provided blood samples and had a final HIV status determined. Among the adult population surveyed, 13.1% (n = 2,237) were women who gave birth during the 3 years preceding the survey. Variables were selected to include social and behavioral characteristics among women aged 15–49 years who gave birth within three years prior the survey. The analytic variables in the dataset utilized subset variables corresponding to females who gave birth to their last-born child. Women who reported giving birth prior to January 1, 2018 or reported no live births were not included. After exclusion of values, detailed below, the sample size was 2,065.

**Outcome and predictors**

**Infant HIV status (outcome)***.* As PMTCT programs aim to prevent new HIV infections among children, the primary outcome measure assessed was infant HIV status. The variable named ‘lastbornhivstatus’ was measured as a categorical response (1 = result of last-born first virologic HIV test was positive, 2 = result of last-born virologic HIV test was negative, 3 = result of last-born child’s first virologic test is not known, and 99 = not tested/missing). Value 99 was not excluded to capture the frequency of infants without a known HIV status.

**Attended antenatal care***.* The analytic variable named ‘anclastchild’ was a categorical measurement in the original dataset (1 = mother who gave birth in 3 years proceeding survey received at least one antenatal care during last pregnancy, 2 = mother who gave birth in 3 years proceeding survey did not receive antenatal care during last pregnancy, 3 = mother missing data on antenatal care during last pregnancy, 4 = non-mother). Values 3 = missing data and 4 = non-mothers were excluded. The analysis re-labels the dichotomous response values as 1 = yes and 2= no.

**HIV status while pregnant***.* The analytic variable named ‘testedpregawaredetail’ was measured as a categorical response in the PHIA dataset and in this study. Original response categories include 1 = tested HIV positive during pregnancy, 2 = tested HIV negative during pregnancy, 3 = already knew they were HIV positive before pregnancy, 4 = tested for HIV during pregnancy, but did not receive positive or negative results, 5 = did not test during pregnancy and did not know they were HIV positive before pregnancy, and 99 = missing and male participants. Value = 99 was excluded from this analysis.

**Received ART among HIV-positive women***.* The analytic variable named ‘arvspregnancydetail’ was measured as a categorical response in the PHIA dataset and in this study. Original response categories include 1 = already taking ARVs at first antenatal visit, 2 = newly initiated during pregnancy or labor, 3 = no ARVs during pregnancy or labor, and 99- unknown whether took ARVs during pregnancy or labor. No values were excluded to capture the frequency of mothers without known use of ARVs.

**Viral load suppression***.*The variable named ‘vls’ was measured as a categorical variable. Original responses included 1 = viral load suppressed (< 1000 copies/mL), 2 = viral load not suppressed, and 99 = results not determined (missing). Data from viral load suppression only included women who consented to having their blood drawn. No values in the original dataset were excluded.

**Breastfeeding status***.* The variable named ‘breastfedlastchild’ was measured as a categorical variable. Original responses included 1 = never breastfed last born, 2 = previously breastfed last born, 3 = currently breastfeeding last born, 4 = missing data on mother’s breastfeeding status of last born, and 99 = missing (non-mothers). Values coded as 4 and 99 were excluded from this analysis.

**Early infant testing***.* The variable named ‘lastborntestedbirthdetail’ was measured as a categorical variable. Original responses included 1 = last born child had an HIV test done within two months of birth, 2 = last born child had an HIV test done more than 2 months but less than 12 months after being born, 3 = last born child had an HIV test done more than 12 months after being born, 4 = last born child had an HIV test done, but the date of the test is unknown, 5 = last born child did not have an HIV test done, and 99 = unknown if tested (missing). No values in the dataset were excluded to capture the frequency of infants with a known HIV status (outcome variable).

**Age***.* The variable ‘agegroup’ was measured as a categorical variable. The PHIA dataset formatted age in 5-year groups. The values 4 = 15–19 years, 5 = 20–24 years, 6 = 25–29 years, 7 = 30–34 years, 8 = 35–39 years, 9 = 40–44 years, and 10 = 45–49 years were included in this study. All other age categories were excluded. There were no missing cases to be excluded.

**Education***.* The variable ‘education’ was measured as a categorical variable pertaining to the mother’s highest level of school ever attended. Responses for the PHIA dataset included 1 = no education, 2 = primary, 3 = secondary, 4 = more than secondary, and 99 = missing. Missing cases were excluded.

**Marital Status***.* The variable ‘married’ was measured as a categorical variable. Responses included 1 = never married, 2 = married or living separately, 3 = divorced or separated, 4 = widowed, and 99 = missing. Missing cases were excluded.

**Wealth Quintile***.* The variable ‘wealthquintile’ was measured as a categorical variable. Responses included 1 = lowest, 2 = second, 3 = middle, 4 = fourth, 5 = highest, and 99 = missing. Missing cases were excluded. The categories were re-labeled as 1 = Q1 (lowest), 2 = Q2, 3 = Q3, 4 = Q4, and 5 = Q5 (highest).

**Residence***.* The variable named ‘urban’ was measured as a dichotomous response with 1 = urban and 2 = rural. There were no missing cases to be excluded.

**Statistical analysis**

The IBM SPSS standard 30 statistical software was used to perform descriptive statistics. For the purposes of this analysis, the World Health Organization’s 95-95-95 HIV target indicators for the elimination of mother-to-child transmission (EMTCT) were the primary focus in the study. Other factors were assessed as well to gain better insight into gaps in care that impact the prevention of vertical transmission in Mozambique.

**Results**

**Descriptive characteristics**

***Antenatal care coverage- first 95 target***

Table 2 presents the descriptive characteristics among mothers who attended antenatal care (ANC) during their last pregnancy. Among the population of women who gave birth in Mozambique, 92% (n = 1898) attended at least one ANC visit. Those aged 20–24 years old (30.1%) had the greatest proportion of women reporting at least one ANC visit compared to those aged 45–49 years old (1.2%). Among socioeconomic covariates explored, most women who attended at least one ANC had attained primary education (48.3%), were married or living together (76.9%), were in the Q4 wealth quintile (24.9%), and were from a rural residence (61.6%). Conversely, the lowest proportion of women who attended at least one ANC visit were those who attained more than secondary education (2.8%), were widowed (1.5%), were in the Q1 wealth quintile (15.8%), and were from a urban residence (38.4%).

**Table 2**

*Descriptive characteristics among mothers with reported ANC coverage*.

|  |  |  |
| --- | --- | --- |
|  | **Attended ANC**N = 1898 or 92.0% | **Did Not Attended ANC**N = 167 or 8.0% |
| Characteristics | n | % | n | % |
| Age Group (years) |  |  |  |  |
|  15-19 | 225 | 11.9 | 15 | 9.0 |
|  20-24 | 571 | 30.1 | 40 | 24.0 |
|  25-29 | 466 | 24.6 | 52 | 31.0 |
|  30-34 | 343 | 18.0 | 30 | 18.0 |
|  35-39 | 192 | 10.1 | 18 | 11.0 |
|  40-44 | 78 | 4.1 | 9 | 5.3 |
|  45-49 | 23 | 1.2 | 3 | 1.7 |
| Education |  |  |  |  |
|  No education  | 348 | 18.3 | 85 | 51.0 |
|  Primary education | 917 | 48.3 | 63 | 37.7 |
|  Secondary education | 580 | 30.6 | 19 | 11.3 |
|  More than secondary | 53 | 2.8 | 0 | 0.0 |
| Marital Status |  |  |  |  |
|  Never married | 179 | 9.43 | 17 | 10.2 |
|  Married or living together | 1460 | 76.9 | 126 | 75.4 |
|  Divorced or separated | 230 | 12.1 | 24 | 14.4 |
|  Widowed | 29 | 1.5 | 0 | 0.0 |
| Wealth Quintile |  |  |  |  |
|  Q1 (poorest) | 299 | 15.8 | 49 | 29.3 |
|  Q2 | 350 | 18.4 | 49 | 29.3 |
|  Q3 | 352 | 18.6 | 40 | 24.0 |
|  Q4 | 473 | 24.9 | 24 | 14.4 |
|  Q5 (richest) | 424 | 22.3 | 5 | 3.0 |
| Residence |  |  |  |  |
|  Rural | 1168 | 61.6 | 135 | 81.0 |
|  Urban | 730 | 38.4 | 32 | 19.0 |

***HIV testing coverage- second 95 target***

Table 3 presents the descriptive characteristics among mothers with a known HIV status. Among the population of women who gave birth, 73.5% (n = 1518) knew their HIV status, of whom 8.1% already knew they were HIV-positive before pregnancy, 3.6% test positive during pregnancy, and 88.3% tested negative during pregnancy. Those aged 20–24 (28.9%) had a greater proportion of knowing their HIV status than those aged 45–49 (1.1%). Among the socioeconomic covariates explored, most women who knew their HIV status had attained primary education (46.6%), were married or living together (77.0%), were in the Q4 wealth quintile (26.9%), and were from a rural residence (58.6%). Whereas the lowest proportion of women who knew their HIV status were those who attained more than secondary education (3.1%), were widowed (1.4%), were in the Q1 wealth quintile (14.0%), and were from an urban residence (41.4%).

**Table 3**

*Descriptive characteristics among mothers with known HIV status.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Knew HIV Positive Before Pregnancy**(n = 123 or 8.1%) | **Tested for HIV During ANC** | **Total**  **Known HIV Status**N=1518 or 73.5% | **Total** **Unknown HIV Status**N= 547 or 26.5% |
|  | **Tested Positive During Pregnancy**(n = 54 or 3.6%) | **Tested Negative During Pregnancy**(n = 1341 or 88.3%) |
| Characteristics | n | % | n | % | n | % | % | n | % |
| Age Group (years ) |  |  |  |  |  |  |  |  |  |
|  15-19 | 3 | 2.4 | 0 | 0.0 | 162 | 12.1 | 10.8 | 75 | 14.0 |
|  20-24 | 20 | 16.3 | 15 | 27.7 | 403 | 30.0 | 28.9 | 173 | 31.6 |
|  25-29 | 32 | 26.0 | 11 | 20.4 | 347 | 25.9 | 25.7 | 128 | 23.4 |
|  30-34 | 34 | 28.0 | 12 | 22.2 | 242 | 18.0 | 19.0 | 85 | 15.5 |
|  35-39 | 25 | 20.0 | 13 | 24.1 | 123 | 9.2 | 10.6 | 49 | 8.9 |
|  40-44 | 9 | 7.3  | 2 | 3.7 | 48 | 3.6 | 3.9 | 28 | 5.0 |
|  45-49 | 0 | 0.0 | 1 | 1.9 | 16 | 1.2 | 1.1 | 9 | 1.6 |
| Education |  |  |  |  |  |  |  |  |  |
|  No education  | 22 | 17.9 | 12 | 22.2 | 227 | 16.9 | 17.2 | 172 | 31.0 |
|  Primary education | 58 | 47.2 | 27 | 50.0 | 622 | 46.4 | 46.6 | 273 | 50.0 |
|  Secondary education | 42 | 34.1 | 15 | 27.8 | 446 | 33.3 | 33.1 | 96 | 18.0 |
|  More than secondary | 1 | 0.8 | 0 | 0.0 | 46 | 3.4 | 3.1 | 6 | 1.0 |
| Marital Status |  |  |  |  |  |  |  |  |  |
|  Never married | 6 | 4.9 | 1 | 1.9 | 137 | 10.2 | 9.5 | 52 | 10.0 |
|  Married or living together | 87 | 70.7 | 42 | 77.7 | 1039 | 77.5 | 77.0 | 418 | 76.0 |
|  Divorced or separated | 23 | 18.7 | 7 | 13.0 | 154 | 11.5 | 12.1 | 70 | 12.7 |
|  Widowed | 7 | 5.7 | 4 | 7.4 | 11 | 0.8 | 1.4 | 7 | 1.3 |
| Wealth Quintile |  |  |  |  |  |  |  |  |  |
|  Q1 (poorest) | 13 | 10.7 | 6 | 11.1 | 194 | 14.5 | 14.0 | 135 | 25.0  |
|  Q2 | 14 | 11.4 | 3 | 5.6 | 220 | 16.4 | 15.6 | 162 | 29.7 |
|  Q3 | 21 | 17.0 | 14 | 25.9 | 252 | 18.8 | 18.9 | 105 | 19.1 |
|  Q4 | 37 | 30.0 | 16 | 29.6 | 355 | 26.5 | 26.9 | 89 | 16.2 |
|  Q5 (richest) | 38 | 30.9 | 15 | 27.8 | 320 | 23.8 | 24.6 | 56 | 10.0 |
| Residence |  |  |  |  |  |  |  |  |  |
|  Rural | 66 | 53.7 | 30 | 55.6 | 794 | 59.2 | 58.6 | 413 | 76.0 |
|  Urban | 57 | 46.3 | 24 | 44.4 | 547 | 40.8 | 41.4 | 134 | 24.0 |

***Antiretroviral therapy (ART) coverage- third 95 target***

Table 4 presents the descriptive characteristics among HIV-positive mothers with ART coverage. Among the population of HIV-positive women who gave birth, 94.3% (n = 167) received ART, of whom 67.7% were already on ART at their first ANC visit and 32.3% were newly initiated during pregnancy. Those aged 30–34 (25.0%) had a greater proportion of receiving ART than those aged 45–49 (0.6%). Among the socioeconomic covariates explored, most women who received ART had attained primary education (48.5%), were married or living together (73.1%), were in the Q4 wealth quintile (31.1%), and were from a rural residence (54.5%). However, the lowest proportion of women who received ART were those who attained more than secondary education (0.6%), were never married (4.2%), were in the Q1 wealth quintile (9.0%), and were from an urban residence (45.5%). Figure 1 demonstrates the proportion of reported HIV status among mothers and ART use among HIV-positive mothers in this study.

**Table 4**

*Descriptive characteristics among HIV-positive mothers with ART coverage.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Already on ART at First ANC Visit**(n = 113 or 67.7%) | **Newly Initiated on ART During Pregnancy**(n = 54 or 32.3%) | **Total** **Received ART**N = 167 or 94.3% | **Total** **Without ART**N = 1898 or 91.9% |
| Characteristics | n | % | n | % | % | n | % |
| Age Group (years) |  |  |  |  |  |  |  |
|  15-19 | 3 | 2.7 | 0 | 0.0 | 2.3 | 237 | 12.5 |
|  20-24 | 18 | 15.9 | 15 | 27.8 | 19.8 | 578 | 30.5 |
|  25-29 | 30 | 26.5 | 10 | 18.4 | 23.9 | 478 | 25.2 |
|  30-34 | 29 | 25.7 | 13 | 24.1 | 25.0 | 331 | 17.4 |
|  35-39 | 24 | 21.2 | 13 | 24.1 | 22.0 | 173 | 9.1 |
|  40-44 | 9 | 8.0 | 2 | 3.7 | 6.4 | 76 | 4.0 |
|  45-49 | 0 | 0.0 | 1 | 1.9 | 0.6 | 25 | 1.3 |
| Education |  |  |  |  |  |  |  |
|  No education  | 17 | 15.0 | 13 | 24.1 | 18.0 | 403 | 21.2 |
|  Primary education | 54 | 47.8 | 27 | 50.0 | 48.5  | 899 | 47.4 |
|  Secondary education | 41 | 36.3 | 14 | 25.9 | 32.9 | 544 | 28.7 |
|  More than secondary | 1 | 0.9 | 0 | 0.0 | 0.6 | 52 | 2.7 |
| Marital Status |  |  |  |  |  |  |  |
|  Never married | 6 | 5.3 | 1 | 1.9 | 4.2 | 189 | 9.9 |
|  Married or living together | 79 | 69.9 | 43 | 79.6 | 73.1 | 1464 | 77.1 |
|  Divorced or separated | 21 | 18.6 | 7 | 1.4 | 16.8 | 226 | 12.0 |
|  Widowed | 7 | 6.2 | 3 | 5.6 | 5.9 | 19 | 1.0 |
| Wealth |  |  |  |  |  |  |  |
|  Q1 (poorest) | 10 | 8.8 | 5 | 9.25 | 9.0 | 333 | 17.5 |
|  Q2 | 13 | 11.5 | 3 | 5.6 | 9.6 | 383 | 20.2 |
|  Q3 | 18 | 15.9 | 15 | 27.8 | 19.8 | 359 | 18.9 |
|  Q4 | 36 | 31.9 | 16 | 29.6 | 31.1 | 445 | 23.4 |
|  Q5 (richest) | 36 | 31.9 | 15 | 27.8 | 30.5 | 378 | 20.0 |
| Residence |  |  |  |  |  |  |  |
|  Rural | 60 | 53.1 | 31 | 57.4 | 54.5 | 1212 | 63.9 |
|  Urban | 53 | 46.9 | 23 | 42.6 | 45.5 | 686 | 36.1 |

**Figure 1**

*Reported HIV status and ART usage among HIV-positive mothers.*

Received ART among HIV-Positive Mothers

Maternal HIV Status

***Infant HIV status- outcome target for the prevention of vertical transmission***

Table 5 presents the descriptive characteristics of maternal health behaviors among infants at risk of HIV infection. Among the population of infants born, 0.4% (n = 9) were HIV positive and 22.7% (n = 468) were HIV negative (Figure 2). Among HIV-positive infants, the highest proportion was among mothers who attended ANC (100%), mothers who tested HIV positive during pregnancy (77.8%), mothers who were newly initiated on ART during pregnancy (55.6%), mothers who were currently breastfeeding (77.8%), mothers who achieved viral suppression (66.7), mothers who had an early infant HIV test completed within two months (44.5%), and mothers who had early infant test completed within two and eleven months (44.5%). Conversely, the lowest proportion of HIV-positive infants was among mothers who did not attend ANC (0.0%), mothers who already knew they were HIV positive before pregnancy (22.2%), mothers who were already taking ART at first ANC (22.2%) or mothers not receiving ART during pregnancy (22.2%), mothers who never breastfed (11.1%) or ever breastfed (11.1%), mothers who did not have determined results for viral load suppression (11.1%), and mothers who had an early infant test completed more than 12 months (11.0%). Figure 2 demonstrates the proportion of reported HIV status and ART use among infants in this study.

**Table 5**

*Descriptive characteristics of maternal health behaviors among HIV exposed infants.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | HIV PositiveN = 9 or 0.4% | HIV Negative N = 468 or 22.7% | Unknown StatusN = 1588 or 76.9% |
| Maternal Characteristics | n | % | n | % | n | % |
| Attended ANC |  |
|  Yes | 9 | 100.0 | 462 | 98.7 | 1427 | 89.9 |
|  No | 0 | 0.0 | 6 | 1.3 | 161 | 10.1 |
| HIV Status  |  |
|  Already knew HIV positive before pregnancy  | 2 | 22.2 | 105 | 22.4 | 16 | 1.0 |
|  Tested HIV positive during pregnancy  | 7 | 77.8 | 40 | 8.6 | 7 | 0.4 |
|  Tested HIV negative during pregnancy  | 0 | 0.0 | 293 | 62.6 | 1048 | 66.0 |
|  Results not known or not tested | 0 | 0.0 | 30 | 6.4 | 517 | 32.6 |
| Received ART  |  |
|  Already taking ART at first ANC | 2 | 22.2 | 100  | 21.4 | 11 | 0.7 |
|  Newly initiated on ART during pregnancy | 5 | 55.6 | 41 | 8.7 | 8 | 0.5 |
|  No ART received | 2 | 22.2 | 327 | 69.9 | 1569 | 98.8 |
| Breastfeeding Status  |  |
|  Never breastfed | 1 | 11.1 | 8 | 1.7 | 18 | 1.1 |
|  Ever breastfed, but not currently | 1 | 11.1 | 253 | 54.1 | 602 | 37.9 |
|  Currently breastfeeding | 7 | 77.8 | 207 | 44.2 | 968 | 61.0 |
| Viral Load Suppression a |  |  |  |  |  |  |
|  Suppressed  | 6 | 66.7 | 130 | 27.8 | 32 | 2.0 |
|  Not Suppressed | 2 | 22.2 | 22 | 4.7 | 34 | 2.1 |
|  Results not determined | 1 | 11.1 | 214 | 45.7 | 1265 | 79.7 |
|  Not tested **b** | (0) | (0.0) | (102) | (21.8) | (257) | (16.2) |
| Early Infant Testing  |  |  |  |  |  |  |
|  HIV test done within 2 months  | 4 | 44.5 | 235 | 50.2 | 5 | 0.3 |
|  HIV test done between 2 and 11 months | 4 | 44.5 | 108 | 23.1 | 2 | 0.1 |
|  HIV test done more than 12 months | 1 | 11.0 | 99 | 21.1 | 1 | 0.1 |
|  Had an HIV test, but date on test is unknown | 0 | 0.0 | 26 | 5.6 | 2 | 0.1 |
|  Did not have an HIV test | 0 | 0.0 | 0 | 0.0 | 1488 | 93.7 |
|  Unknown if tested | 0 | 0.0 | 0 | 0.0 | 90 | 5.7 |

**a** Timeframe on achieved viral suppression correlated to intrauterine or postpartum characteristics not indicated.

b Data for infant HIV status associated with non-consent for maternal HIV virological testing**.**

**Figure 2**

*Reported infant HIV status.*

**Discussion**

**Prevention of mother-to-child transmission (PMTCT) cascade of HIV**

In resource limited settings such as Mozambique, monitoring of the PMTCT cascade is integral to measuring progress for the elimination of vertical transmission of HIV. This study found that among mothers (aged 15-49 years) 92% attended antenatal care (at least one). A study conducted to analyze PMTCT trends at PEPFAR-supported sites in Mozambique between 2022 and 2023 among pregnant women (aged 15-49 years old) reported 87.3% attended at least one ANC visit (ANC1) and 48.6% attended ≥4 ANC visits (ANC4). Furthermore, “ANC coverage was higher in the southern provinces, with the highest ANC coverage in Maputo Province (ANC1: 99.5% and ANC4: 82.7%)” (Langa, et al., 2024). Though Mozambique has seen an increase in ANC utilization among women in recent years, issues surrounding access to ANC, late initiation of ANC, frequency of ANC visits, quality of care, and cultural beliefs and values are persistent barriers (Reis-Muleva, Duarte, Silva, Gouveia, & Borges, 2021). A study conducted by Chicumbe & Martins (2022) using data from the 2015 nationwide Malaria, Immunization and HIV Indicators Survey (MZAIS) reported that “approximately 75% of women did not comprehensively use all steps of maternity health care services despite accessing the health system through at least one ANC.” Another study conducted by Biza, et al. (2015) assessed issues with ANC utilization. They identified that system or organizational factors, health care provider factors, and individual factors were associated with negative maternal health outcomes resulting from insufficient implementation of the ANC model.

Testing and linkage to long-term care are critical components of ANC for improving maternal and child health outcomes of HIV. Data from this study indicate that 73.5% of women knew their HIV status, of whom 11.7% were HIV-positive. Approximately 31% of HIV-positive women were newly diagnosed during their ANC visit. Though not conclusive, those who already knew they were HIV-positive before pregnancy may be indicative of the proportion of women who had attended ANC and tested positive during a prior pregnancy or acquired an HIV test prior to becoming pregnant. The study conducted by Lango, et al. (2024) indicated between 2017 and 2023 “among the HIV-positive pregnant women in ANC1, the proportion who were newly identified as HIV-positive (as opposed to known status at entry) decreased from 52.3% to 36.8% (Appendix A3). This suggests an overall improvement in UNAIDS 95-target indicator among women who know their HIV status.

However, approximately 26% of the women did not know their HIV test results or did not get tested. This highlights an important gap or “leak” in PMTCT cascade which underscores the importance of effective service delivery, rapid identification of HIV cases, and expansion of HIV testing coverage in high-burden countries (Hamilton, et al, 2017). Optimum use of healthcare services by pregnant women can be hindered by sociodemographic inequalities impacting the rate of HIV testing. Findings from a previous study indicated “only 15.3% of women made their first ANC visit within the first trimester, 60.1% had adequate number of ANC visits, and 75.4% took an HIV test during pregnancy (Yaya, Oladimeji, Oladimeji, & Bishwajit 2019)

Among HIV-positive women, approximately 94% received antiretroviral therapy (ART) while the remaining 6% of women who did not receive ART highlights an additional gap or “leak” in the PMTCT cascade . Following the implementation of UNAIDS global plan to eliminate vertical transmission of HIV, the revision of PMTCT guidelines, and the Option B+ policy, the proportion of pregnant women initiating ART significantly improved. “In Sub-Saharan Africa, HIV-positive pregnant women on ART increased from 14% in 2010 to 84% in 2019” (Astawesegn, Stulz, Conroy, & Mannan, 2022). In Mozambique, coverage of pregnant women who received ART increased from 82% in 2015 to 86% in 2021 (Appendix A2) (UNAIDS, 2025). This reflects slow progress toward PMTCT and likely disruptions in health care services following the onset of the COVID-19 pandemic.

Additional research is needed to examine the temporal trends of ART use among pregnant and breastfeeding women as this study simply identifies the proportion of women who received ART at the time of their pregnancy and ANC visit. However, research highlights the importance of early initiation of ART for viral load suppression and the prevention of vertical transmission. In the study conducted by Langa, et al. (2024) at PEPFAR-supported sites, from 2017 to 2023 the “proportion of pregnant women who received a viral load test increased from 24.5% to 74.9%. In the same period the viral load suppression rate among pregnant women increased from 51.4% to 88.5% and among breastfeeding women increased from 60.8% to 92.7%” (Appendix A4). A study conducted by Fernandez-Luis, et al. (2022) reported that “in 2018, although more than 95% of HIV-positive pregnant women in Mozambique received ART, the rate of transmission at the end of breastfeeding was 15% (95% CI 11.8-19.0%): 7% during the first 6-weeks postpartum and 8% during breastfeeding.” Although this study does not report on contextual factors, information such as the timing of ART initiation (e.g. before, during, or after pregnancy) and adherence to treatment are key factors for mother-to-child transmission rates of HIV.

**Infant HIV Outcomes**

Among the women who participated in the survey, 23.1% infants had a known HIV status, of whom 0.4% were HIV positive. The national vertical transmission rate was estimated at 10% in 2022 (PEPFAR, 2023). UNAIDS (2025) reported that the vertical transmission decreased from 16% in 2015 to 12% in 2021. UNAIDS also reported new HIV infections averted due to PMTCT increased from approximately 23,000 in 2015 to 27,000 in 2021 (Appendix A2). This indicates slow, but continued progress towards the elimination of MTCT. Of importance is the complex, multifaceted interaction between maternal health behaviors, cultural beliefs and attitude, and socioeconomic status that influence transmission rates. Further research is needed to evaluate these factors and to improve retention in care, early infant diagnosis, early prophylaxis among HIV-positive infants, and final HIV outcome post-breastfeeding. Continued progress in reducing inequalities among women and children is necessary for ending the HIV/AIDS epidemic and ensuring healthy lives for all at all ages (SDG 3).

**Limitations**

A major limitation in cross-sectional study designs is the inability to establish a cause-and-effect relationship since the explanatory and outcome variables were collected at the same time. The Population-Based HIV Impact Assessment (PHIA) for Mozambique was designed to identify unmet needs among vulnerable population groups and measure achievements of the country’s HIV/AIDs response. However, the data does not provide for in-depth analysis of the relationships between factors (e.g. timing of first ANC, HIV test, ART, and viral load suppression impacting infant HIV status). Additionally, non-responses to the survey or non-consents to blood testing associated with HIV status can potentially skew data.

**Future research**

Reduce the HIV transmission rate among infants by 5% in the next 5 years by improving retention in care and adherence to ART among HIV-positive pregnant or breastfeeding women. Retaining HIV-positive women is critical to ART adherence and viral suppression. Strategies to promote retention in care may include offering transportation, offering home-based care, or creating a supportive environment within the clinic. Previous research identified underlying causes of HIV transmission rates related to poverty level, lack of empowerment, lack of knowledge of risk behaviors, stigma and discrimination, and poor access to quality health services. Overall, the findings of this study indicate that further research is needed to explore contextual factors associated with the PMTCT of HIV and the significance of the associations. In this study a 92% of women attended at least one ANC visit, but only 73.5% women knew their HIV status. Entry into antenatal care, an early step in the PMTCT cascade, can have downstream impact on infant HIV status. (Bhardwaj, Carter, Aarons, & Chi, 2015). Loss of follow-up at ANC services translates into lost opportunities for counseling, testing or retesting, and treatment for HIV. This ultimately results in poor adherence to ART and eventual hospitalization from opportunistic infections.

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**Appendix A**

**HIV Trends in Mozambique**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** |
|  | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) |
| **All** |  |  |  |  |  |  |  |  |
| Know HIV Status | 63 (60-68) | 69 (65-73) | 73 (69-78) | 77 (72-82) | 79 (75-85) | 80 (75-86) | 83 (78-90) | 86 (80-94) |
| Received ART | 64 (61-69) | 70 (66-75) | 74 (70-80) | 72 (68-77) | 74 (70-80) | 75 (71-81) | 85 (80-92) | 93 (87->98) |
| Viral Suppression | - | - | - | - | 76 (72-82) | 85 (80-92) | 88 (83-92) | 88 (83-96) |
| **Children (0-14 yr)** |  |  |  |  |  |  |  |  |
| Know HIV Status | 43 (37-48) | 50 (42-52) | 58 (49-64) | 59 (49-65) | 65 (54-72) | 57 (48-63) | 64 (54-71) | 73 (61-81) |
| Received ART | 91 (78->98) | 91 (77->98) | 90 (76->98) | 89 (74->98) | 90 (75->98) | 86 (72-95) | 88 (74->98) | 87 (73-97) |
| Viral Suppression | - | - | - | - | 46 (38-51) | 62 (52-68) | 64 (53-71) | 71 (60-79) |
| **Women (15+ yrs)** |  |  |  |  |  |  |  |  |
| Know HIV Status | 71 (67-76) | 76 (71-81) | 79 (75-86) | 82 (77-89) | 84 (79-91) | 85 (80-93) | 87 (81-95) | 90 (83-98) |
| Received ART | 66 (63-71) | 74 (70-80) | 78 (73-84) | 75 (71-81) | 78 (73-85) | 78 (73-85) | 88 (81-95) | 95 (88->98) |
| Viral Suppression | - | - | - | - | 79 (74-86) | 87 (81-94) | 90 (83-97) | 90 (82-97) |
| **Men (15+ yrs)** |  |  |  |  |  |  |  |  |
| Know HIV Status | 56 (52-61) | 62 (58-67) | 66 (62-72) | 71 (66-77) | 73 (68-79) | 75 (70-82) | 78 (73-85) | 82 (76-89) |
| Received ART | 55 (52-60) | 58 (55-63) | 64 (60-70) | 62 (58-67) | 64 (60-70) | 68 (63-74) | 80 (74-86) | 89 (83-97) |
| Viral Suppression | - | - | - | - | 76 (71-83) | 86 (80-93) | - | 89 (83-97) |

Table A1. HIV testing and treatment cascade, Mozambique, 2015-2022. *Data Source*: extracted from UNAIDS (2025).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** |
|  | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) | % (CI) |
| HIV testing among pregnant women | >98 | >98 | >98 | >98 | >98 | >98 | >98 | >98 |
| Coverage of pregnant women who receive ART  | 82 (74-96) | 76 (70-89) | 84 (77->98) | 85 (77->98) | 86 (78->98) | 82 (76-96) | 86 (78->98) | 90 (82->98) |
| Early infant diagnosis | 41 (37-47) | 43 (39-50) | 48 (44-57) | 55 (51-65) | 59 (53-68) | 60 (55-70) | 64 (58-74) | 71 (65-83) |
| Vertical Transmission rate | 16 (14-17) | 16 (15-18) | 14 (12-16) | 14 (12-16) | 13 (11-15) | 14 (12-16) | 12 (10-14) | 10 (8-12) |
|  | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** |
|  | N  | N  | N  | N  | N  | N  | N  | N  |
| New HIV infections averted due to PMTCT | 23,000 | 22,000 | 25,000 | 26,000 | 27,000 | 26,000 | 27,000 | 26,000 |

Table A2.Elimination of vertical transmission, Mozambique, 2015-2022. *Data Source*: extracted from UNAIDS (2025).

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Figure A3. Trends among HIV-positive women attending ANC1 at PEPFAR-supported sites, newly identified vs. HIV status already known at entry, Mozambique, 2017-2023. *Data Source*: Langa, et al. (2024).

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Figure A4. Viral load suppression rate percentages among HIV-positive women on ART in ANC at PEPFAR-supported sites, Mozambique, 2017-2023. Data Source: Langa, et al. (2024).

**Appendix B**

**Socio-ecological model for retention in care**



Appendix B. Socio-ecological model of retention in care throughout the PMTCT continuum. *Data Source*: Humphrey, J., et al (2021).