HIV Treatment Interruptions: A Lorenz Curve Analysis of 9 PEPFAR-Supported Countries Achieving the 95-95-95 Targets

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Background

The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) supports provision of lifesaving antiretroviral therapy (ART) for people living with HIV (PLHIV) in over 55 countries. Despite reaching the UNAIDS 95-95-95 targets, many countries continue to face significant challenges with Interruption in Treatment (IIT) among PLHIV on ART. This analysis examines IIT rates from Fiscal Years (FY) 2021 to 2024 across nine PEPFAR-supported countries — Botswana, Eswatini, Kenya, Lesotho, Malawi, Namibia, Rwanda, Zambia, and Zimbabwe — that have achieved or are nearing these targets. We explore IIT trends in the context of high treatment coverage (Tx_CURR) and viral load suppression (VLS) to identify persistent gaps and inform targeted interventions.

Methods

We conducted a longitudinal analysis of quarterly PEPFAR Monitoring, Evaluation, and Reporting (MER) data from FY2021 Q1 to FY2024 Q3 for nine afore-mentioned countries. We calculated percent IIT (defined as the proportion of the treatment cohort with no clinical contact or antiretroviral therapy pick-up > 28 days since the last expected encounter), Tx_CURR and VLS percentages for each quarter, stratified by sex. To assess differences, we generated Lorenz curves to visualize the distribution of IIT across subnational regions within each country and collectively across all nine countries over time. Additionally, Gini coefficients were calculated to quantify the level of inequality in IIT distribution.

Results

The treatment cohort of PLHIV on ART across the nine countries increased from 5,252,596 individuals (64.2% female) in FY2021 Q2 to 5,932,928 (64.9% female) in FY2024 Q3, with VLS proportion remaining stable at 95.7%. During the study period, overall IIT decreased from 1.9% in FY2021 Q2 to 1.6% in FY2024 Q3. Throughout the duration analyzed, IIT was greater among men than women (2.02% vs. 1.72%, p<0.001). Lorenz curves indicated that IIT distribution was unequal but Gini coefficient decreased from 0.22 in Q2 FY2022 to 0.08 in Q3 FY2024 (Z score 5.04, p<0.001), reflecting a substantial reduction in inequality.

Figure 1. Lorenz Curve by Quarter: ART vs. IIT

Botswana, Eswatini, Lesotho, Malawi, Namibia, Rwanda, Zambia, Zimbabwe, FY21-24Q3

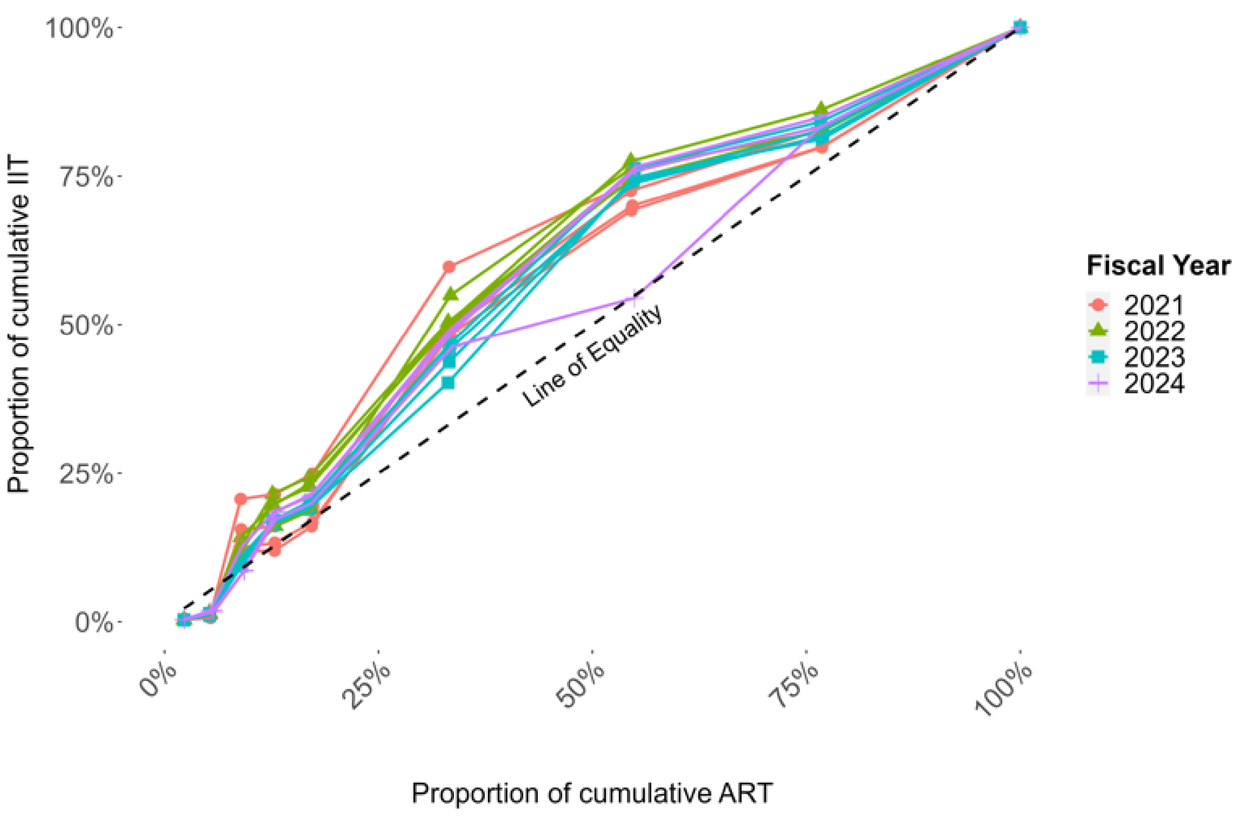


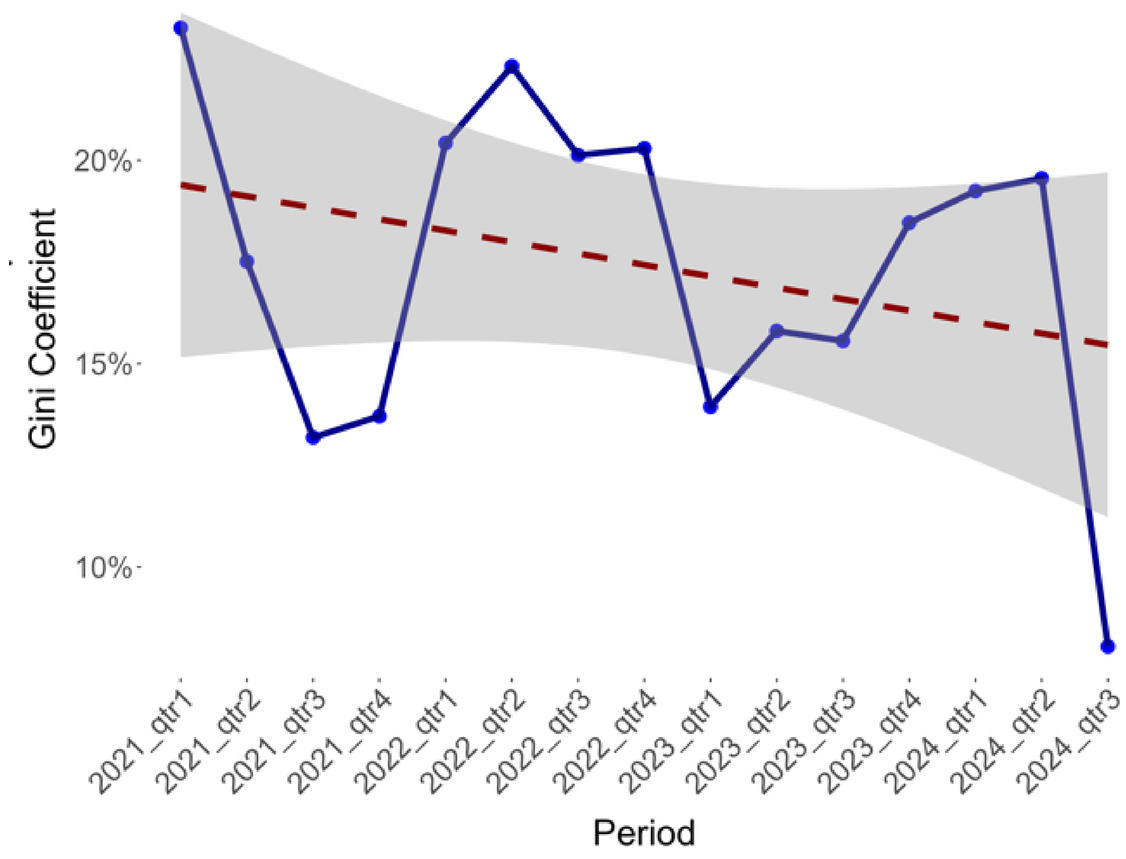
Table 1. Proportion of Interruption in Treatment (IIT), stratified by sex and time

	2021_qtr1		2022_qtr1		2023_qtr1		2024_qtr1		Cumulative Change in IIT		GINI Coefficient Change (2021-2024)
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Botswana	0.004	0.003	0.008	0.006	0.007	0.005	0.012	0.008	0.005	0.004	0.023
Eswatini	0.004	0.004	0.029	0.028	0.038	0.035	0.03	0.029	0.028	0.026	-0.044
Kenya	0.017	0.014	0.017	0.014	0.022	0.017	0.015	0.013	-0.005	-0.003	0.063
Lesotho	0.016	0.014	0.015	0.012	0.014	0.011	0.014	0.011	-0.004	-0.004	-0.002
Malawi	0.048	0.038	0.052	0.042	0.035	0.027	0.037	0.03	-0.018	-0.014	0.009
Namibia	0.111	0.102	0.055	0.05	0.067	0.061	0.059	0.053	-0.071	-0.065	0.020
Rwanda	0.004	0.003	0.004	0.002	0.004	0.003	0.004	0.002	-0.001	0	0.063
Zambia	0.014	0.011	0.023	0.019	0.041	0.034	0.027	0.021	0.01	0.009	0.090
Zimbabwe	0.007	0.007	0.006	0.005	0.007	0.007	0.007	0.006	0	-0.001	0.116

Notes: IIT defined as proportion of the treatment cohort with no clinical contact or antiretroviral therapy pick-up > 28 days since the last expected encounter

Figure 2. Gini Coefficient: ART vs. IIT

Botswana, Eswatini, Lesotho, Malawi, Namibia, Rwanda, Zambia, Zimbabwe, FY21-24Q3



Conclusions

- Overall **IIT volume and differences by sex decreased** from FY2021 to FY2024; however, treatment interruptions remain a **persistent challenge** across the nine evaluated countries.
- **Lorenz curves and Gini coefficients** highlight the need for **targeted and focused interventions** for populations at higher risk of IIT.
- **Men and specific sub-populations** continue to experience **higher rates of IIT**, underscoring the necessity of **tailored retention strategies.**

Limitations:

- **Silent transfers:** Movement of PLHIV between subnational regions that is not documented may lead to **misclassification of IIT.**
- **Data Scope:** Findings are based on program-reported data; **additional qualitative research is needed** to elucidate and address barriers to continuity of treatment.

Future Directions:

- Enhance strategies to **improve continuity of treatment** for PLHIV on ART to improve their health and prevent onward transmission.
- **Strengthen health systems to capture patient-centered data** to better understand and prevent the underlying reasons for IIT.
- **Assess program adaptations** (e.g., **decentralized ART distribution models**) to improve continuity in treatment, especially during crises.

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