Article (Explore Econ Finalist)

The Impact of PEPFAR on HIV Incidence and Treatment in Sub-Saharan Africa

Sandra Paing[1], Adiba Azman[2], Anand Clarke[3], Zsofi Lazur[4], Abpira Wincey[5]

[1] Student (BSc Economics, 2022-25), Dept. of Economics, UCL, UK; sandra.s.paing@gmail.com
[2] Student (BSc Economics, 2022-25), Dept. of Economics, UCL, UK; adiba.azman28@gmail.com
[3] Student (BSc Economics, 2022-25), Dept. of Economics, UCL, UK; anand.clarke@outlook.com
[4] Student (BSc Economics, 2022-26), Dept. of Economics, UCL, UK; zsofilazur@gmail.com
[5] Student (BSc Economics, 2022-25), Dept. of Economics, UCL, UK; abby.wincey.22@alumni.ucl.ac.uk

How to cite
Paing, S., *et al*, (2025). The Impact of PEPFAR on HIV Incidence and Treatment in Sub-Saharan Africa *UCL Journal of Economics*, vol. 4 no. 1. DOI: 10.14324/111.444.2755-0877.2076

Peer review
This article has been selected for publication on recommendation of the scientific committee of UCL's ExploreEcon undergraduate research conference

Abstract
This paper investigates the impact of the President's Emergency Plan for AIDS Relief (PEPFAR) on HIV incidence and treatment outcomes across 11 sub-Saharan African countries from 2004 to 2018. As one of the largest bilateral health aid initiatives globally, PEPFAR's effectiveness in curbing HIV infections remains an important empirical question, particularly in regions with high youth and female HIV prevalence. Using a panel dataset and country fixed effects models, this study examines the relationship between PEPFAR aid per capita and two key outcomes: HIV incidence and access to antiretroviral therapy (ART). Results indicate that while PEPFAR funding has no significant impact on the general population, it substantially reduces HIV incidence among youth aged 15–24, especially young women. Additionally, male education is found to lower HIV prevalence in both men and women, highlighting the role of gender dynamics in HIV risk. The analysis also shows that PEPFAR significantly improves ART coverage for pregnant women, aligning with its targeted maternal and child health initiatives. However, broader treatment access remains unaffected, suggesting limitations of vertical aid programs in addressing systemic healthcare needs. These findings underscore the importance of directing resources toward vulnerable groups and incorporating gender-sensitive strategies. They also highlight the need for long-term investment in health systems to sustain progress. This study contributes to the literature on aid effectiveness and informs future global health policy on optimizing disease-specific interventions within broader development goals.

Keywords: Economic Development, Foreign Aid, Health, Inequality, Gender, Sub-Saharan Africa

1. Introduction

HIV/AIDS remains a global concern, with developing countries facing challenges in prevention/treatment access. By 2000, sub-Saharan Africa accounted for 70% of all HIV/AIDS cases, often becoming the leading cause of adult mortality (World Health Organization, 2001).

Introduced in 2003, the President's Emergency Plan for AIDS Relief (PEPFAR) became one of the largest bilateral aid programs targeting a disease. It has funded over $100bn in HIV prevention, testing, and treatment, particularly in sub-Saharan Africa (U.S. Department of Health & Human Services, 2024).

Given its scale, evaluating PEPFAR's effectiveness in reducing the spread of HIV remains an important question. This paper examines its impact on HIV incidence and treatment across sub-Saharan Africa, and contributes to the literature on whether targeted aid improves health outcomes. Our results show that aid significantly reduces HIV incidence among youths (particularly women) and improves ART access for pregnant women, but has no clear effect on the general population.

2. Data and Methodology

This study compiles panel data for PEPFAR focus countries in sub-Saharan Africa from 2004 to 2018. Out of the 15 total focus countries (U.S. Department of State, 2009), 12 are located in sub-Saharan Africa. However, due to insufficient data for Nigeria, our final dataset consists of 11 focus countries (Botswana, Côte d'Ivoire, Ethiopia, Kenya, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Uganda, Zambia).

We employ two country fixed effects baseline models to examine the impact of PEPFAR on HIV outcomes, specifically on HIV incidence/prevalence and ART coverage. A fixed effects model helps address omitted variable bias by controlling for any unobserved time-invariant country characteristics.

2.1. Impact of PEPFAR aid on HIV incidence/prevalence

$$HIV_{it} = B_o + B_1 PEPFAR_{it} + \delta X_{it} + \gamma_i + \lambda_t + \varepsilon_{it}$$

where:

- HIV_{it} = Incidence/Prevalence of HIV in country i at time t
- $PEPFAR_{it}$ = PEPFAR aid per capita (constant USD)
- X_{it} = Vector of control variables (economic, demographic, and governance factors)
- γ_i = Country fixed effects, controlling for time-invariant differences
- λ_t = Year fixed effects
- ε_{it} = Error term

Our first equation investigates the effect of foreign aid on the spread of HIV. We initially estimate the regression using *Incidence of HIV (per 1000 uninfected population)* as our primary outcome variable, before using other variations to explore specific trends:

- By age group:
o *Incidence of HIV (ages 15-24, per 1,000 uninfected population)*
o *Incidence of HIV (ages 15-49, per 1,000 uninfected population)*

- By gender:
o *Prevalence of HIV (% of females ages 15-24)*
o *Prevalence of HIV (% of males ages 15-24)*

https://doi.org/ 10.14324/111.444.2755-0877.2076

Data for these dependent variable indicators are sourced from the World Bank Development Indicators database (World Bank, 2025). For our independent variable $PEPFAR_{it}$,we use USAID Foreign Assistance data (USAID, 2025). Aid per capita is calculated as total aid disbursement divided by the recipient country's population each year.

2.2. Impact of PEPFAR aid on ART coverage

$$ART_{it} = B_o + B_1 PEPFAR_{it} + \delta X_{it} + \gamma_i + \lambda_t + \varepsilon_{it}$$

With our second equation we look at the aid's impact on HIV treatment. Our outcome variable is ART_{it} , measured using two indicators (World Bank, 2025):

- *ART coverage (% of people living with HIV)*
- *ART coverage for PMTCT (% of pregnant women living with HIV)*
(PMTCT = Prevention of Mother-to-Child Transmission)

Other factors influencing HIV incidence and treatment are included in a vector of controls X_{it}:

- Economic Factors
o *GDP growth rate (annual %)* (World Bank, 2025)
o *Government health spending (% of GDP)* (World Bank, 2025)
- Demographic Factors
o *Urban population (% of total population)* (World Bank, 2025)
o *Contraceptive usage (% of women ages 15-49)* (United Nations, 2024a)
o *Mean years of schooling* (United Nations Development Programme, 2024)
- Governance Factors
o *Corruption Perceptions Index* (Transparency International, 2024)

To address the issue of collinearity, GDP growth rate is used in place of GDP or GDP per capita (Kim, Y., 2019). We use clustered standard errors to adjust for within-country correlation, providing more reliable statistical inference.

https://doi.org/ 10.14324/111.444.2755-0877.2076

3. Results

VARIABLES	(1) Incidence of IIIV (per 1000 uninfected population)	(2) Incidence of IIIV ages of 15-24 (per 1000 uninfected population)	(3) Incidence of IIIV ages of 15-49 (per 1000 uninfected population)
Aid Per Capita	-0.0369	-0.0842**	-0.0541
	(0.0219)	(0.0332)	(0.0317)
GDP growth rate (annual %)	0.00303	-0.0216	-0.000713
	(0.0194)	(0.0270)	(0.0303)
Government health spending (% of GDP)	-1.086***	-2.183***	-1.642***
	(0.307)	(0.526)	(0.401)
Urban Population (% of total population)	-0.354***	-0.433***	-0.507***
	(0.0614)	(0.0941)	(0.0963)
Contraceptive usage	-0.0144	-0.00252	-0.0146
	(0.0129)	(0.0198)	(0.0202)
Corruption Index	-0.0114**	-0.0187**	-0.0145*
	(0.00494)	(0.00787)	(0.00721)
Mean years of schooling	-0.116	-0.365	-0.196
	(0.185)	(0.310)	(0.264)
Constant	21.36***	30.67***	31.37***
	(2.014)	(3.636)	(3.170)
Observations	155	155	155
R-squared	0.865	0.788	0.848
Number of countries	11	11	11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

***Table 1*:** PEPFAR Aid & HIV Outcomes across Age Groups

Table 1 presents our findings of the impact of PEPFAR on HIV incidence across various age groups. Column (1) examines overall HIV incidence is statistically insignificant.

We disaggregate the populations: individuals aged 15–24 and individuals aged 15–49. Notably, Column (2) observes HIV incidence amongst youths aged 15–24 is statistically significant. The corresponding coefficient of -0.0842 implies that for each additional dollar of aid per capita, new HIV infections decrease by 8.4 cases per 100,000 uninfected individuals. Column (3) observes individuals aged 15–49, where the impacts of aid are statistically insignificant.

https://doi.org/ 10.14324/111.444.2755-0877.2076

VARIABLES	(1) Prevalence of HIV Male (% of ages 15-24)	(2) Prevalence of HIV Male (% of ages 15-24)	(3) Prevalence of HIV Female (% of ages 15-24)	(4) Prevalence of HIV Female (% of ages 15-24)
Aid Per Capita	-0.0228***	-0.0207***	-0.0344*	-0.0315*
	(0.00471)	(0.00472)	(0.0161)	(0.0165)
GDP growth rate (annual %)	-0.00371	0.000440	-0.0340**	-0.0267**
	(0.00404)	(0.00534)	(0.0120)	(0.0117)
Government health spending (% of GDP)	-0.257*	-0.290**	-1.114***	-1.154***
	(0.116)	(0.118)	(0.232)	(0.260)
Urban Population (% of total population)	-0.0247	-0.0377**	-0.175**	-0.205**
	(0.0137)	(0.0158)	(0.0754)	(0.0780)
Contraceptive usage	0.00498	0.00406	0.00739	0.00672
	(0.00523)	(0.00486)	(0.0117)	(0.0123)
Corruption Index	-0.00160	-0.00291	-0.00174	-0.00469
	(0.00166)	(0.00172)	(0.00430)	(0.00516)
Mean years of schooling (Male)	-0.168***	-	-0.577**	-
	(0.0428)	-	(0.227)	-
Mean years of schooling (female)	-	-0.0249	-	-0.289*
	-	(0.0579)	-	(0.134)
Constant	4.633***	4.380***	17.81***	17.10***
	(0.584)	(0.651)	(2.409)	(2.551)
Observations	155	155	155	155
R-squared	0.486	0.442	0.714	0.693
Number of countries	11	11	11	11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

***Table 2*:** PEPFAR Aid & HIV Outcomes for Males and Females

Table 2 shows that PEPFAR significantly reduces HIV prevalence amongst youth aged 15–24, with a larger effect observed for females. Four regressions were run: two for male and two for female HIV prevalence, controlling for gender-specific education. Among young men, an additional dollar of aid per capita lowers HIV prevalence by 0.0207–0.0228 percentage points. For young women, the reduction is 0.0315–0.0344 points. Surprisingly, results also show an asymmetric effect of education: one additional year of **male education** significantly reduces HIV prevalence in both men (−0.168, $p<0.01$) and women (−0.577, $p<0.05$), while **female education** has no effect on men and only a modest impact on women (−0.289, $p<0.1$).

https://doi.org/ 10.14324/111.444.2755-0877.2076

VARIABLES	(1) Antiretroviral therapy coverage (% of people living with HIV)	(2) Antiretroviral therapy coverage for PMTCT (% of pregnant women living with HIV)
Aid per capita	0.386	1.842**
	(0.373)	(0.799)
GDP growth rate	-0.418	-0.125
	(0.351)	(0.568)
Government health spending (% of GDP)	6.169	2.499
	(5.822)	(10.11)
Urban population (% of total population)	5.216***	6.807***
	(1.396)	(2.125)
Contraceptive usage	0.728*	0.724
	(0.360)	(0.515)
Corruption index	-0.0550	0.147
	(0.163)	(0.261)
Mean years of schooling	5.007	-1.508
	(4.148)	(4.545)
Constant	-214.1***	-221.1***
	(32.93)	(65.89)
Observations	155	155
R-squared	0.802	0.592
Number of countries	11	11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: PEPFAR and Antiretroviral Therapy Coverage

Lastly, Table 3 explores the relationship between PEPFAR and access to antiretroviral therapy (ART), assessing both general access and the prevention of mother-to-child transmission (PMTCT). In column (1), aid per capita lacks statistical significance whereas, in column (2), aid per capita exhibits a positive and significant relationship with PMTCT coverage (1.842, $p<0.05$). A unit increase in aid per capita results in a 1.842% increase in the share of pregnant women living with HIV receiving ART. PEPFAR funding has improved treatment access for pregnant women.

4. Limitations

Our results are restricted due to limitations we encounter in our model and data. The limited time span of available data presents a challenge, restricting the ability to analyse long-term trends. Additionally, gaps between data points in certain years pose difficulties in achieving a comprehensive analysis.

A further limitation is the potential for reverse causality. Countries with higher initial HIV prevalence may attract greater levels of external support, making it difficult to establish the causal impact of aid. The use of an instrumental variable (IV) could account for such endogeneity. Another complication is the underreporting of HIV status due to social stigma, undermining data reliability.

A final limitation is the presence of other donors providing aid to the countries under observation, which may confound the extent to which the impact of PEPFAR can be isolated. Nonetheless, given that PEPFAR remains the largest initiative targeting the disease, we believe the findings offer insights into its influence.

5. Discussion

Our study reveals that PEPFAR is most effective when directed towards targeted populations, especially those most vulnerable. This is mainly due to PEPFAR being a vertical program—allocating resources to eradicate a specific disease, in contrast to a wide range of health outcomes.

Table 1 shows PEPFAR reduces HIV incidence in the youth population but not in the broader population. This reflects PEPFAR's focus on youths, influenced by a phenomenon the "youth bulge" in sub-Saharan Africa, where there is a relatively larger share of youths — an age group associated with greater vulnerability to HIV (UNAIDS, 2023).

https://doi.org/ 10.14324/111.444.2755-0877.2076

In contrast, the insignificant results of PEPFAR in the general population suggests behavioural limitations. Older people are less likely to seek testing due to stigma, leading to delayed entry into care (NIH, 2023).

The stronger impact of PEPFAR on reducing HIV prevalence among young females reflects both their greater vulnerability and the program's targeted interventions. Adolescent girls in sub-Saharan Africa are over three times more likely to be infected than males (UNAIDS, 2019), prompting later PEPFAR initiatives like DREAMS (2014), which invested in education, PrEP access, gender-based violence prevention, and reproductive health services. These likely drove the larger reductions observed in young women.

Additionally, the finding that male education lowers HIV prevalence in both genders highlights the role of gender inequality. In many settings, men control sexual decision-making, limiting women's ability to negotiate safe sex (Gupta, 2002). Unequal gender norms and male-perpetrated violence are linked to greater HIV risk for women (Dunkle et al., 2004). Thus, educating men may reduce such behaviours and indirectly protect women.

In Table 3, we observe PEPFAR's success in improving ART coverage among pregnant women, further demonstrating the effectiveness of its vertical programming. Targeted interventions, when integrated with existing health platforms, can deliver consistent care and measurable outcomes.

However, PEPFAR does not significantly improve *overall* ART coverage, suggesting limits to vertical programs. For an overall delivery of ART, PEPFAR would still need horizontal, system-wide changes such as fixing health systems and building long-term capacity.

6. Conclusion

Our findings suggest that HIV aid is most effective when targeted toward vulnerable groups, particularly youth, young women, and pregnant women. Effective foreign aid programs must also account for gendered risk dynamics, for example by supporting male education, which can reduce HIV prevalence across both sexes. PEPFAR's significant impact on HIV reduction underscores the need for sustained funding, as abrupt withdrawal could reverse progress. To ensure long-term impact and reduce future aid dependency, efforts should also focus on strengthening local health systems and building domestic capacity for service delivery.

https://doi.org/ 10.14324/111.444.2755-0877.2076

References

Dunkle, K.L, et al. (2004). Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *The Lancet*, 363(9419), pp.1415–1421. doi:https://doi.org/10.1016/S0140-6736(04)16098-4

Gupta, G.R. (2002). How men's power over women fuels the HIV epidemic. *British Medical Journal*, 324(7331), pp.183–184. doi:https://doi.org/10.1136/bmj.324.7331.183

Kim, Y. (2019). The effectiveness of PEPFAR's funding for women and children with HIV/AIDS. I*nternational Journal of Health Planning and Management*, 34, pp. e896–e916. doi:https://doi.org/10.1002/hpm.2706

National Institutes of Health (2023). *HIV and Older People*. Available at: https://hivinfo.nih.gov/understanding-hiv/fact-sheets/hiv-and-older-people

Transparency International (2024). *Corruption Perceptions Index*. Available at: https://www.transparency.org/en/cpi/2024

United Nations (2024a). *World Contraceptive Use*. Available at: https://www.un.org/development/desa/pd/data/world-contraceptive-use

United Nations Development Programme (2024). *Human Development Reports*. Available at: https://hdr.undp.org/data-center/specific-country-data#/countries/

UNAIDS (2023). *The Youth Bulge and HIV: Risks and Opportunities*. UNAIDS. Available at: https://www.unaids.org/sites/default/files/media_asset/the-youth-bulge-and-hiv_en.pdf

UNAIDS (2019). *Women and HIV: A spotlight on adolescent girls and young women*. Geneva: Joint United Nations Programme on HIV/AIDS. Available at: https://www.unaids.org/sites/default/files/media_asset/2019_women-and-hiv_en.pdf

USAID (2025). U.S. Foreign Assistance by Country. Available at: https://foreignassistance.gov/cd

U.S. Department of Health & Human Services (2024). *PEPFAR*. Available at: https://www.hiv.gov/federal-response/pepfar-global-aids/pepfar

U.S. Department of State (2009). *Focus Countries*. Available at: https://2001-2009.state.gov/s/gac/countries/fc/index.htm

World Bank (2025). *World Development Indicators*. Available at: https://databank.worldbank.org/source/world-development-indicators

World Health Organization (2001). *HIV Surveillance Report for Africa*. Available at: https://data.unaids.org/publications/external-documents/hiv-surv-rpt-2000_en_pdf.pdf