

Donor Funding Amount and Tuberculosis/HIV Healthcare Service Delivery in Lyantonde and Kyotera Districts, Uganda: A Difference-in-Differences Analysis

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ARTICLE INFORMATION	ABSTRACT
Article history: Published: October 2026 Keywords: Donor Funding, TB/HIV Healthcare Delivery Difference-in-Differences Resource Dependence Theory Health Systems Resilience Uganda	This article reports findings on the first objective of a wider study examining the impact of donor funding cuts on tuberculosis (TB) and HIV/AIDS healthcare service delivery at Lyantonde General Hospital, Lyantonde District, and Kalisizo General Hospital, Kyotera District, Uganda. This objective determined the effect of donor funding amount on TB/HIV healthcare delivery; three further objectives, on funding type, duration, and technical assistance, are reported elsewhere. Anchored on Resource Dependence Theory and Health Systems Resilience Theory, the study adopted a quasi-experimental design using an event-study Difference-in-Differences framework, with Lyantonde General Hospital as the more donor-dependent intervention facility and Kalisizo General Hospital as the comparison facility, over pre-intervention (2020-2022) and post-intervention (2023-2025) periods. The analysis drew on a facility-level panel of 144 monthly observations, 265 patient exit interviews, and 32 key informant interviews. Donor funding declined more steeply at Lyantonde (UGX 520 million to UGX 300 million) than at Kalisizo (UGX 470 million to UGX 410 million). Trained TB/HIV healthcare providers declined by four more at Lyantonde than at Kalisizo (DiD = -4.00, 95% CI -6.07 to -1.93, $p = .006$). Patient satisfaction declined by 0.094 points ($p < .001$), while waiting time increased by 12.39 minutes ($p < .001$) at Lyantonde. A supplementary analysis found a strong positive association between funding amount and service delivery ($r = 0.870$; $R\text{-squared} = 0.757$, $p < .001$), not treated as a substitute for the primary estimates. Qualitative accounts linked the reduction to fewer outreach sessions, reduced transport and heavier workloads. The study concludes that reductions in donor funding amount were associated with statistically significant, differential deterioration in trained-provider capacity, satisfaction, and waiting time at the more donor-dependent facility, and recommends that the Ministry of Health increase domestic financing for donor-vulnerable TB/HIV activities, and that development partners adopt phased transition financing when reducing support.

1. Introduction

Donor funding has remained a major source of financing for healthcare service delivery in low- and middle-income countries (Phiri & Guven-Uslu, 2021), but the nature and priorities of donor funding have evolved significantly since 2020 in response to the COVID-19 pandemic, economic pressures, and changing global health priorities (OECD, 2023). As a result, the World Health Organization has reported that a majority of surveyed countries experienced disruptions in health services following reductions in official development assistance (World Health Organization [WHO], 2023), with recent reductions in donor funding diminishing support for TB diagnosis, treatment, laboratory services, surveillance, and community outreach, and exposing vulnerabilities in global health systems that rely heavily on external financing.

In Uganda, donor funding has played a critical role in supporting the national HIV/AIDS and TB response, with major partners such as the United States President's Emergency Plan for AIDS Relief (PEPFAR) and the United States Agency for International Development (USAID) historically financing HIV testing, antiretroviral therapy, viral-load monitoring, laboratory capacity, and healthcare workforce development. However, reliance on external financing continues to raise concerns about programme sustainability, national ownership, and the resilience of TB and HIV services during periods of donor funding uncertainty (WHO, 2023; Ministry of Health Uganda, 2022). A study conducted in Uganda found that the withdrawal of PEPFAR support from health facilities led to reduced quality of HIV services, disruptions in laboratory and outreach activities, shortages of trained personnel, and concerns about increased patient loss to follow-up (Zakumumpa et al., 2021), while recent reductions in PEPFAR and USAID funding have created significant financial pressures for HIV/AIDS and TB programmes, affecting antiretroviral therapy, laboratory services, community outreach, and active case-finding activities.

Lyantonde District continues to experience a considerable HIV burden, with district health data indicating an HIV prevalence of 10.1%, nearly double the national average, and TB/HIV co-infection at community level remaining high at 27%, contributing to poor treatment outcomes; HIV and TB programmes in the district depend substantially on external financing. Kyotera District similarly records the second-highest HIV prevalence nationally at 12.6%, more than double the national average, driven partly by

its fishing communities and mobile, border-crossing population, and has a high dependence on donor-supported health programmes. Both Lyantonde General Hospital and Kalisizo General Hospital have historically benefited from donor-supported programmes implemented through PEPFAR, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and other development partners, and recent reductions in external funding have raised concerns regarding the sustainability of TB/HIV service delivery at both facilities. It was against this background that the wider study from which this article is drawn assessed the impact of donor funding cuts on healthcare delivery services for TB and HIV/AIDS at Lyantonde General Hospital and Kalisizo General Hospital during the period 2020-2025. That study pursued four objectives: to determine the effect of donor funding amount on TB/HIV healthcare delivery, to examine the relationship between donor funding type and healthcare delivery outcomes, to assess the influence of funding duration on service sustainability, and to evaluate the contribution of donor-provided technical assistance; the latter three objectives have been reported elsewhere. This article addresses the first objective, namely, to determine the effect of donor funding amount on the delivery of HIV/AIDS and TB healthcare services in Lyantonde and Kyotera Districts.

The study was anchored on Resource Dependence Theory (Pfeffer & Salancik, 1978), which holds that organisations are not self-sufficient and must rely on external entities to supply critical resources such as funding, technology, and skilled personnel, and that organisations become vulnerable when they depend heavily on a narrow set of external providers without alternative local support, requiring them to develop strategies such as collaboration and resource diversification to manage the resulting uncertainty (Hillman, Withers, & Collins, 2009). In the context of rural Ugandan general hospitals such as Lyantonde and Kalisizo, key HIV and TB activities, ranging from outreach clinics to viral-load testing, have historically relied heavily on international donor allocations, such that unexpected reductions in donor support directly test institutional stability and force hospital managers to reallocate limited local resources to sustain baseline patient care. The study was complemented by Health Systems Resilience Theory, which defines health system resilience as the ability of a health system to absorb, adapt, and transform in response to shocks and long-term stresses while maintaining essential health services (Biddle, Wahedi, & Bozorgmehr, 2020; Fridell, Edwin, von Schreeb, & Saulnier, 2020), and which is particularly relevant to Uganda because HIV and TB programmes frequently face shocks such as donor funding fluctuations, medicine supply interruptions, and health workforce shortages.

Despite this theoretical grounding and the wider literature on donor dependence in Uganda's HIV and TB response, no known study has used a facility-level, event-study Difference-in-Differences design to quantify the differential effect of donor funding amount specifically on trained-provider capacity, patient satisfaction, and waiting time between two comparably donor-dependent general hospitals in Lyantonde and Kyotera Districts. Guided by this gap, the study was directed by the null hypothesis that there is no statistically significant effect of donor funding amount on HIV/AIDS and TB healthcare delivery services. This article reports the quantitative and qualitative evidence generated to test this hypothesis, discusses the findings in relation to Resource Dependence Theory, Health Systems Resilience Theory, and prior empirical work, and draws conclusions and recommendations relevant to the Ministry of Health, district local governments, and development partners.

2. Materials and Methods

2.1 Research Design and Approach

This article is drawn from a wider study that assessed the impact of donor funding cuts on TB/HIV healthcare delivery services at Lyantonde General Hospital and Kalisizo General Hospital. The specific analyses reported here relate to the study's first objective, which sought to determine the effect of donor funding amount on healthcare delivery. The wider study adopted a comparative quasi-experimental design, appropriate because donor funding alterations occurred through administrative and macro-policy decisions rather than the researcher's manipulation or random assignment (Capili & Anastasi, 2024). The design evaluated service-delivery metrics across the two government general hospitals over two designated periods, pre-reduction (2020-2022) and post-reduction (2023-2025), integrating quantitative facility metrics extracted from routine hospital records with qualitative key-informant insights.

2.2 Study Area and Population

The study was conducted at Lyantonde General Hospital, Lyantonde District, and Kalisizo General Hospital, Kyotera District, in the Central Region of Uganda, two government-owned general hospitals purposively selected because they provide comprehensive TB and HIV/AIDS prevention, diagnosis, treatment, care, and support services and have historically benefited from donor-supported programmes implemented through PEPFAR, the Global Fund, and other development partners. The study population comprised healthcare providers, hospital managers, district health officials, and TB/HIV patients receiving services at the two hospitals, together with retrospective hospital records on TB and HIV/AIDS service delivery.

2.3 Sample Size and Sampling Procedure

The patient sample size was determined using a standard difference-in-proportions formula (Charan & Biswas, 2013), based on an estimated proportion completing antiretroviral therapy of 0.80 before funding cuts and an expected proportion of 0.65 after cuts, at 95% confidence and 80% power, yielding 135 patients per facility; adjusted for 10% non-response, this gave a target of 150 patients per facility (300 in total), of whom 265 (88.3%) completed exit interviews. Patients were selected using systematic random sampling from daily clinic attendance registers. Healthcare providers involved in TB/HIV service delivery were selected using total population sampling, given the small, specialised nature of this population, yielding 32 respondents (100% response rate). Key informants, including medical superintendents, hospital administrators, district health officials, and TB/HIV programme coordinators, were selected using purposive sampling guided by data saturation, yielding 32 interviews (100% response rate). The facility-level panel comprised 144 monthly observations (2 facilities x 72 months, 2020-2025), and hospital records were reviewed using a census approach for all eligible TB and HIV/AIDS records within the study period.

2.4 Data Collection Instruments

Three main data collection instruments were used: a structured data extraction checklist, developed to collect retrospective quantitative data on donor funding characteristics and TB/HIV service-delivery indicators from hospital records, registers, and DHIS2 reports; a semi-structured key informant interview guide, administered to individuals with direct knowledge of TB/HIV programme implementation and donor funding management; and a patient exit questionnaire, administered to TB/HIV patients to assess waiting time, medicine availability, and satisfaction with care using five-point Likert-scale items. All instruments were pretested at a comparable health facility outside the study sites before final data collection.

2.5 Validity and Reliability

Content validity was established by developing the instruments from the study objectives, conceptual framework, and existing literature on donor financing and health-system performance, and by having the instruments reviewed by experts in public health, epidemiology, and health-systems research; a Content Validity Index of 0.80 or above was considered acceptable (Polit & Beck, 2021). Construct validity was ensured by aligning measurement indicators with the theoretical constructs underlying the study. Internal consistency reliability of the patient satisfaction questionnaire was assessed using Cronbach's alpha, with a coefficient of 0.70 or higher considered acceptable (Taber, 2018).

2.6 Data Analysis

Quantitative data were analysed using descriptive statistics (frequencies, percentages, means, and standard deviations) to summarise participant characteristics and outcome distributions, and monthly or quarterly outcome trends were plotted graphically with the funding-cut event marked on the time axis. The primary inferential framework was an event-study Difference-in-Differences (DiD) analysis, specified as $Y_{it} = \alpha_i + \lambda_t + \sum_{k \neq -1} \beta_k (\text{Intervention}_i \times 1(\text{Event Time}_t = k)) + \gamma'X_{it} + \varepsilon_{it}$, where α_i represents hospital fixed effects, λ_t calendar-time fixed effects, and β_k the estimated differential effect at event time k relative to the last pre-intervention period, chosen over a conventional two-period before-and-after comparison because it can distinguish the effect of the funding reduction from secular trends and facility-specific baseline differences (Baker, Larcker, & Wang, 2022; Sun & Abraham, 2021). For the outcomes reported under this objective, the number of trained TB/HIV healthcare providers was analysed using the simple DiD estimator, $\text{DiD} = (Y_{\text{Lyantonde}, \text{post}} - Y_{\text{Lyantonde}, \text{pre}}) - (Y_{\text{Kalisizo}, \text{post}} - Y_{\text{Kalisizo}, \text{pre}})$, while patient satisfaction and average waiting time, both continuous outcomes, were analysed using linear regression DiD. Because the study had only two hospitals, event-study results were interpreted with particular caution, with an emphasis on effect estimates, 95% confidence intervals, transparent presentation of the underlying time series, and triangulation with qualitative evidence, rather than statistical significance alone (Roth, 2022).

2.7 Ethical Considerations

Ethical approval was obtained from the Bishop Stuart University Research Ethics Committee (BSU-REC-2026-2224) before data collection, together with administrative permission from hospital management and district health offices. Completed questionnaires and extraction forms were assigned unique identification numbers rather than patient names to maintain confidentiality, electronic data were stored on password-protected computers and backed up on secure storage devices, and interview recordings and transcripts were labelled using participant codes rather than names.

3. Results

The study achieved a high overall response rate of 96.1% across all respondent categories. The patient questionnaire achieved a response rate of 88.3% (265 of 300 targeted), with Lyantonde recording a higher facility-level response rate (93.3%) than Kyotera (83.3%). Healthcare providers and key informants each achieved a 100% response rate at both facilities (32 of 32 targeted in each category). This section presents findings on the effect of donor funding amount on TB/HIV healthcare delivery at Lyantonde General Hospital and Kalisizo General Hospital.

3.1 Donor Funding Trends

Annual donor-funding data showed a sharper decline at Lyantonde General Hospital after 2023 than at Kalisizo General Hospital. Donor funding at Lyantonde declined from UGX 520 million in 2022 to UGX 300 million in 2025, a reduction of UGX 220 million, whereas funding at Kalisizo declined more modestly, from UGX 470 million to UGX 410 million over the same period, a reduction of UGX 60 million. Corresponding funding-duration and technical-assistance series also decreased more markedly at Lyantonde, establishing the exposure contrast on which the Difference-in-Differences analysis was based, with Lyantonde treated as the more donor-dependent intervention facility and Kalisizo as the comparison facility.

3.2 Effect of Donor Funding Amount on Trained TB/HIV Healthcare Providers

A simple Difference-in-Differences analysis was conducted to determine the effect of the donor funding reduction on the number of trained TB/HIV healthcare providers at each facility. Table 1 presents the results.

Table 1: Simple Difference-in-Differences in Trained TB/HIV Healthcare Providers

Facility	Pre M	Pre SD	Post M	Post SD	Within-Facility Change
Lyantonde	19.67	1.53	15.33	1.89	-4.33
Kalisizo	17.00	1.00	16.67	1.15	-0.33
Difference-in-Differences					-4.00

M = mean; SD = standard deviation.

Source: Facility Records, 2026.

As shown in Table 1, the simple DiD estimate was -4.00 trained providers (95% CI (-6.07, -1.93), $p = .006$). This indicates that the number of trained TB/HIV healthcare providers decreased by approximately four providers more at Lyantonde than at Kalisizo following the donor funding reduction, a statistically significant differential decline consistent with reduced access to donor-supported training and capacity-building opportunities at the more donor-dependent facility.

3.3 Effect of Donor Funding Amount on Patient Satisfaction and Waiting Time

Linear regression DiD analysis was conducted for patient satisfaction and average waiting time, both continuous outcomes. Table 2 presents the results.

Table 2: Linear Regression DiD for Patient Satisfaction and Average Waiting Time

Outcome	DiD Coefficient	95% CI	p-value	Interpretation
Patient satisfaction	-0.094	-0.139 to -0.049	< .001	Greater reduction at Lyantonde
Average waiting time (min)	+12.39	–	< .001	Greater increase at Lyantonde

Source: Patient Exit Interviews, 2026.

As shown in Table 2, patient satisfaction declined differentially at Lyantonde by 0.094 points on the 1-5 composite scale (95% CI (-0.139, -0.049), $p < .001$), while average waiting time increased differentially by 12.39 minutes ($p < .001$) relative to Kalisizo. The direction of both estimates is substantively consistent with the hypothesis that reductions in donor funding amount increased workload and weakened service responsiveness at the more donor-dependent facility.

3.4 Supplementary Association Analysis

A supplementary annual-level analysis examined the association between donor funding amount and a composite service-delivery index. Table 3 presents the results.

Table 3: Supplementary Association Between Donor Funding Amount and Service-Delivery Index

Analysis	Estimate	95% CI	p-value	R ²
Pearson correlation: funding vs. service-delivery index	$r = 0.870$	–	< .001	–
Linear regression: funding predicting service-delivery index	$\beta = 0.080$	0.048 to 0.112	< .001	0.757

Because the design is quasi-experimental, these association statistics were not treated as substitutes for the primary DiD estimates.

Source: Facility Records, 2026.

Table 3 shows a strong, positive, and statistically significant association between annual donor funding amount and the composite service-delivery index ($r = 0.870$, $p < .001$), with funding amount explaining 75.7% of the variance in the service-delivery index ($\beta = 0.080$, 95% CI (0.048, 0.112), $R^2 = 0.757$, $p < .001$). This supplementary association corroborates, though it does not substitute for, the primary DiD findings above.

3.5 Qualitative Findings on Donor Funding Amount

Key informants consistently described donor funding reductions as affecting activities that required regular operational inputs rather than completely stopping core TB/HIV clinical care. Participants reported reduced transport support for community work, fewer outreach sessions, and greater workloads among retained staff. One key informant from Lyantonde explained: “When operational funding became smaller, we reduced some outreach trips because transport and field facilitation could no longer be maintained at the previous level” (Medical Superintendent, Lyantonde General Hospital). A respondent from Kalisizo similarly noted: “The main clinic continued, but follow-up activities and community mobilisation were done less often because the resources for moving into the communities had reduced” (Hospital Administrator, Kalisizo General Hospital). These accounts provided contextual explanation for the quantitative pattern of increased waiting time, lower satisfaction, and reduced trained-provider capacity at the more donor-dependent facility.

3.6 Summary of Hypothesis Testing

Taken together, the simple DiD result for trained providers (Table 1), the linear DiD results for patient satisfaction and waiting time (Table 2), the supplementary association analysis (Table 3), and the corroborating qualitative accounts above provided converging evidence of a statistically significant differential effect of donor funding amount on TB/HIV healthcare delivery. The null hypothesis, that there is no statistically significant effect of donor funding amount on HIV/AIDS and TB healthcare delivery services, was therefore rejected.

4. Discussion

The first objective of this study sought to determine the effect of donor funding amount on TB/HIV healthcare delivery. The DiD results showed that the number of trained providers declined by four more providers at Lyantonde than at Kalisizo, patient satisfaction declined differentially, and average waiting time increased by approximately 12.39 minutes relative to the comparison facility, following the sharper post-2023 donor funding reduction at Lyantonde.

These findings are consistent with the logic of Resource Dependence Theory, which proposes that organisations become vulnerable when critical resources are controlled by a limited number of external providers (Pfeffer & Salancik, 1978; Hillman et al., 2009). In practical terms, reductions in externally financed staffing, training, and operational activities appear to have forced Lyantonde General Hospital to concentrate scarce resources on essential clinical services while reducing activities that support continuity, training, and community engagement, consistent with the qualitative accounts of reduced outreach trips and heavier workloads among retained staff.

The findings also align with Health Systems Resilience Theory. A resilient health system should absorb shocks while maintaining essential functions and adapting resource allocation, but prolonged funding constraints may push facilities from adaptive responses

into reductions in service capacity (Biddle et al., 2020; Fridell et al., 2020). The observed decline in trained-provider capacity, longer waiting time, and reduced satisfaction at Lyantonde is compatible with a system operating under increasing resource pressure. Importantly, the evidence should not be interpreted to mean that all TB/HIV services failed after donor funding cuts; core facility-based services remained available at both hospitals, while trained-provider capacity, satisfaction, and waiting time, indicators more sensitive to reductions in scope, frequency, and continuity of support, deteriorated more clearly at the more donor-dependent facility. This distinction is consistent with evidence from Uganda describing vulnerabilities in HIV service delivery when external programme support is reduced (Zakumumpa et al., 2021), and extends that evidence by quantifying the differential magnitude of these effects through a facility-level, event-study DiD design rather than descriptive comparison alone.

5. Conclusion and Recommendations

The study concludes that the post-2023 donor funding reduction was associated with poorer TB/HIV service-delivery conditions at the more donor-dependent facility. Trained providers declined, waiting time increased, and patient satisfaction declined more at Lyantonde than at Kalisizo, and the evidence therefore supports the conclusion that changes in the amount of available donor resources were associated with statistically significant differential changes in healthcare delivery capacity and quality.

The Ministry of Health and district local governments should progressively increase domestic financing for HIV and TB activities that are vulnerable to donor reductions, especially provider training, community follow-up, and programme supervision, given the clear differential decline in trained-provider capacity observed at the more donor-dependent facility. Development partners should use phased transition financing when reducing support so that recurrent programme costs, particularly staff training and retention, can be absorbed gradually rather than abruptly, reducing the risk of the workload and waiting-time pressures documented in this study.

Because the study relied on retrospective hospital records that were originally collected for routine programme monitoring rather than research purposes, and because the quasi-experimental design, comparing only two hospitals, cannot fully rule out facility-specific confounding factors or establish that donor funding cuts alone caused the observed changes, findings should be interpreted with appropriate caution regarding causal attribution. Future researchers should extend this event-study Difference-in-Differences approach to a larger sample of donor-dependent facilities across multiple districts to strengthen statistical power and generalisability, and should examine the long-term effects of donor funding reductions on the continuity and sustainability of TB and HIV/AIDS services, particularly trained-provider retention, patient satisfaction, and waiting times, beyond the 2025 study endpoint.

Consent for Publication: All authors consented and approved the manuscript to be submitted for publication.

Availability of Data and Materials: The data supporting the findings of this article are available from the corresponding author upon reasonable request, subject to hospital and district health office data-sharing agreements.

Competing Interests: The authors declare no competing interests.

Funding: This research was funded by the authors.

Authors' Contributions: Tumusiime Fred Katakanya conceptualised the study, collected and analysed the data, and prepared the original draft of the manuscript. Gershom Atukunda and Bright Laban Waswa supervised the study and reviewed and edited the manuscript. All authors read and approved the final manuscript.

List of Acronyms and Abbreviations

BSU-REC	Bishop Stuart University Research Ethics Committee
CI	Confidence Interval
DHIS2	District Health Information System, Version 2
DiD	Difference-in-Differences
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
OECD	Organisation for Economic Co-operation and Development
PEPFAR	United States President's Emergency Plan for AIDS Relief
R ²	Coefficient of Determination
SD	Standard Deviation
TB	Tuberculosis
UGX	Uganda Shillings
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
WHO	World Health Organization

Acknowledgments: The authors thank the healthcare providers, hospital managers, district health officials, and patients of Lyantonde General Hospital and Kalisizo General Hospital for their participation in this study. Appreciation is also extended to the Lyantonde and Kyotera District Health Offices and Bishop Stuart University for their support during the conduct of this research.

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