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Impact of Decentralization on HIV and TB Program Performance in the Rural Central Region of Uganda: The Mediating Role of Decentralized Monitoring and Accountability

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ABSTRACT

This study examines the impact of decentralization on HIV and Tuberculosis (TB) program performance in rural central Uganda, highlighting the mediating role of decentralized monitoring and accountability (DMA). Decentralization aims to improve service delivery through local governance, yet its effectiveness and underlying mechanisms remain underexplored. A cross-sectional survey of 145 district leaders overseeing HIV and TB programs across eight districts utilized a structured questionnaire and SPSS Version 27. The reliability of decentralization constructs was verified using Cronbach's alpha, while principal component analysis confirmed their Validity. Five constructs emerged: local resource mobilization (LRM), decentralized strategic resource allocation (DSRA), decentralized collaborative program governance (DCG), decentralized program administration (DPA), and DMA, alongside HIV and TB Program Performance (HPP). Regression and mediation analyses demonstrated that DSRA and DPA significantly enhanced HPP by promoting equitable resource allocation and administrative efficiency. DMA mediated the effects of DSRA, DCG, and DPA on HPP, reinforcing gains through transparency, reporting, and stakeholder oversight. However, LRM showed no significant direct or mediated impact, implying that fiscal autonomy alone may not drive program success. These findings suggest decentralization can strengthen health outcomes when supported by robust local planning, administrative capacity, and continuous monitoring. Policymakers should channel resources into local governance infrastructure, DMA included, to ensure that decentralized frameworks advance HIV and TB service delivery.

1 | Introduction

HIV and Tuberculosis (TB) remain significant global public health challenges, particularly in resource-limited settings such as sub-Saharan Africa. In 2023, approximately 39.9 million people worldwide were living with HIV, with 1.3 million new infections and 630,000 AIDS-related deaths reported (UNAIDS 2024). TB also imposes a substantial burden, with an estimated 10.8 million new cases and 1.25 million deaths, including 161,000 among people with HIV, in the same year (World Health Organization [WHO] 2024b). Uganda is among the 30 high-burden countries for both epidemics, with an adult HIV prevalence of 5.1% in 2022 (WHO 2024c). Additionally, the national TB incidence rate was estimated at 134 cases per

Summary

- Decentralization improves HIV and TB program outcomes when paired with strong administrative capacity and strategic resource allocation at the district level in Uganda's rural central region.
- Decentralized monitoring and accountability plays a vital mediating role, enhancing the impact of governance practices by promoting transparency, timely reporting, and program oversight.
- Local resource mobilization had limited effect, highlighting that decentralization must go beyond financial autonomy to include robust monitoring systems and responsive local decision-making for effective health service delivery.

100,000 people in 2023 (WHO 2024d). Despite the expansion of antiretroviral therapy (ART) and improved TB diagnostics, systemic challenges such as delayed diagnosis, uneven resource allocation, and fragmented service delivery hinder progress toward the 2030 elimination targets.

Decentralization, which is the transfer of decision-making authority, financial resources, and administrative responsibilities from central to local governments has been widely promoted as a strategic reform to enhance health system performance in low- and middle-income countries (LMICs) (Brennan and Abimbola 2023; Kalinina et al. 2019). Proponents argue that local governments, due to their proximity to communities, are better positioned to design and implement context-specific interventions that address local socioeconomic, epidemiological, and cultural conditions (Brennan and Abimbola 2023; Mitchell and Bossert 2010). Despite these theoretical advantages, empirical evidence on the impact of decentralization on health outcomes remains mixed. Systematic reviews reveal considerable heterogeneity in the effects of decentralization, documenting both beneficial and adverse outcomes (Dwicaksono and Fox 2018; Panda and Thakur 2016). These varied findings underscore the complexity of decentralization processes and suggest that local contexts and implementation dynamics significantly influence the success or failure of decentralization reforms.

In Uganda, the health sector has undergone decentralization since the 1990s, aiming to improve service delivery and accountability by devolving responsibilities to district-level authorities (Kabeba Muriisa 2008; Mayanja and Akunda 2023; Sumah et al. 2014). This approach has integrated key public health programs, notably those targeting HIV and tuberculosis (TB), within decentralized governance structures. Nonetheless, evidence on how this strategic shift affects the performance of HIV and TB programs at the district level is limited. While some studies point to enhanced service delivery and health outcomes under decentralized governance, others highlight concerns related to resource allocation, local managerial capacities, and fiscal sustainability (Dwicaksono and Fox 2018; Oliveira et al. 2024).

The present study addresses this gap by evaluating HIV and TB program performance within Uganda's decentralized health system. It examines four specific constructs: local resource mobilization (LRM), decentralized strategic resource allocation (DSRA), decentralized collaborative governance, and decentralized program administration (DPA) to illuminate how decentralized governance might influence program outcomes. This focus is particularly timely, given Uganda's persistent HIV and TB burden and ongoing efforts to meet ambitious 2030 elimination targets. By analyzing these constructs, the study provides valuable insights into the effectiveness of decentralized governance in addressing entrenched health challenges.

Grounded in two complementary theoretical frameworks decentralization theory and the resource-based view (RBV) this study integrates perspectives on how devolved authority and strategic resource use can optimize health system performance. Decentralization theory asserts that transferring governance, financial, and administrative responsibilities to local authorities can improve service delivery by tailoring interventions to local realities (Torban et al. 2023). It posits that such proximity fosters efficiency, responsiveness, and accountability, which are especially critical for managing complex health challenges like HIV and TB (Rakmawati et al. 2019). However, critics note that decentralization might exacerbate regional disparities and weaken service quality if resources are distributed unevenly and local capacities are insufficient (Panda and Thakur 2016; Sapkota et al. 2023).

The RBV complements these insights by highlighting the strategic use of local resources and capabilities to enhance performance (Barney 1991). Applied to a decentralized context, the RBV underscores that financial autonomy, administrative expertise, and robust monitoring systems can be critical assets in managing HIV and TB programs. When local decision-makers effectively allocate resources according to community needs, decentralization can drive significant improvements in health outcomes (Sun and Andrews 2023). Conversely, a lack of capacity or oversight may lead to resource mismanagement and inefficiencies, undermining the potential gains of decentralization (Barney 1991).

By integrating decentralization theory and the RBV, this study interrogates how local decision space, resource endowments, and accountability mechanisms jointly shape HIV and TB program performance in Uganda. This conceptual framework offers a nuanced perspective on whether, and under what conditions, decentralized governance succeeds in enhancing service delivery and outcomes. Critically, the analysis spotlights the mediating role of decentralized monitoring and accountability (DMA) in ensuring that devolved systems translate into tangible improvements.

To empirically assess these issues, a cross-sectional quantitative study was conducted among district health leaders in Uganda's rural central region, encompassing eight districts with high HIV prevalence and significant TB incidence. Structured questionnaires captured data on decentralization practices and program outcomes. Principal component analysis (PCA) ensured construct validity for LRM, DSRA, DCG, DPA, and DMA, while multiple regression with mediation tested hypothesized

relationships. The findings illustrate how LRM, strategic resource allocation, collaborative governance, and program administration when supported by effective monitoring and accountability can jointly drive enhanced HIV and TB program performance.

Overall, this study contributes theoretically and practically by refining the understanding of how decentralization influences health outcomes through resource-based mechanisms and governance structures. Policymakers and health practitioners can leverage these insights to strengthen decentralization strategies that align resources with localized needs, establish robust oversight systems, and foster intersectoral collaboration. Ultimately, evidence-driven approaches to decentralization, backed by effective accountability structures, hold the promise of improved HIV and TB outcomes in Uganda and other similar LMIC contexts.

2 | Literature Review and Hypothesis Building

2.1 | Theoretical Underpinnings

This study examines the impact of decentralized health governance on HIV and tuberculosis (TB) program performance by integrating decentralization theory and the RBV. Decentralization theory advocates for the devolution of governance, financial, and administrative responsibilities from central authorities to local governments to enhance service delivery (Mitchell and Bossert 2010; Torban et al. 2023). It posits that local authorities, being closer to their communities, can design and implement health interventions that are more attuned to local socioeconomic, epidemiological, and cultural contexts, thereby improving efficiency and effectiveness. Additionally, decentralization is believed to foster stakeholder engagement, accountability, and local ownership, which are essential for addressing complex health challenges like the dual burden of HIV and TB (Hidayat et al. 2018; Mayanja and Akunda 2023).

Complementing this, the RBV emphasizes the strategic utilization of an organization's internal resources and capabilities to achieve superior performance. In the context of decentralized health systems, RBV suggests that local governments' ability to mobilize and manage resources such as financial autonomy, administrative expertise, and effective monitoring systems is critical for improving health outcomes (Barney 1991). For instance, DSRA and robust monitoring mechanisms can ensure that interventions are both context-specific and resource-efficient, which is particularly vital in resource-constrained settings where optimal resource utilization can significantly enhance program outcomes (Sun and Andrews 2023).

Integrating decentralization theory and RBV provides a comprehensive framework for understanding how decentralized governance can optimize health system performance through localized decision-making and efficient resource management. While decentralization theory highlights the structural benefits of devolving authority, RBV focuses on the strategic management of resources within this decentralized framework. Together, they address each other's limitations: Decentralization Theory offers insights into structural changes but may overlook the importance of internal resource capabilities, whereas RBV emphasizes resource utilization but may not fully account for the structural dynamics introduced by decentralization. By combining these perspectives, this study aims to elucidate how decentralized structures, when coupled with effective resource management, can enhance the performance of HIV and TB programs in Uganda.

2.2 | Hypotheses on Decentralized Health Governance

Decentralized health governance assumes that transferring authority and resources to local governments improves service efficiency and responsiveness by aligning interventions with local needs (Chris James et al. 2019; Kalinina et al. 2019). However, effectiveness depends on how well local actors utilize this decision space. The RBV complements this by emphasizing internal capabilities such as fiscal autonomy and administrative systems as drivers of performance (Barney 1991). Guided by these theories, this study hypothesizes that four decentralization components LRM, DSRA, Decentralized Collaborative Program Governance (DCG), and DPA directly influence HIV and TB Program Performance. It also explores the mediating role of DMA in enhancing the effectiveness of these components.

LRM refers to the capacity of local governments to generate and deploy financial resources to meet community-specific health needs. Fiscal autonomy is particularly vital in settings where national funding is limited and local priorities differ markedly from one region to another (Cui and Wang 2024; Faguet 1997). Kyriacou and Roca-Sagalés (2023) demonstrate that when local governments in larger jurisdictions can mobilize resources effectively, there is a corresponding improvement in health service quality and access. However, studies from Uganda and India have also highlighted that in low-income contexts, structural inequities and fiscal constraints may limit the potential benefits of LRM (Panda and Thakur 2016; Sapkota et al. 2023). Based on this evidence, it is hypothesized that

H1. *Local Resource Mobilization significantly influences HIV and TB Program Performance.*

DSRA involves the judicious distribution of financial and material resources based on localized health needs (Abimbola et al. 2019; Balaguer-Coll et al. 2010; Zon et al. 2017). The underlying assumption is that resource allocation should be responsive to regional disparities in health status. Empirical evidence from countries such as Indonesia and Kenya indicates that when resources are allocated strategically at the local level, service delivery outcomes improve significantly (Hidayat et al. 2018; Rakmawati et al. 2019). Moreover, DSRA is critical to ensuring that areas with higher disease burdens receive the necessary funds for targeted interventions. Thus, the following hypothesis is proposed:

H2. *Decentralized Strategic Resource Allocation significantly influences HPP.*

DCG emphasizes the importance of participatory decision-making and multi-stakeholder engagement (Dick-Sagoe 2020;, 2024; Kigume and Maluka 2019). By involving local government officials, community leaders, and health providers in the governance process, decentralized systems can foster transparency, accountability, and responsiveness. Studies have shown that participatory governance structures such as community scorecards and participatory budgeting can improve the alignment of health programs with local priorities (Bossert et al. 2003; Mitchell and Bossert 2010). For instance, research in Africa underscores that local agencies, when empowered to collaborate effectively, can recalibrate service delivery to better address community needs (Sabbi et al. 2024). Based on these findings, it is hypothesized that:

H3. *Decentralized Collaborative Program Governance significantly influences HPP.*

DPA pertains to the operational capacity of local governments to implement health programs effectively (Balaguer-Coll et al. 2010; Hidayat et al. 2018; Mayanja and Akunda 2023). Administrative functions such as human resource management, procurement, logistics, and data management are essential for the smooth execution of health services. Empirical research from Tanzania demonstrates that variations in local administrative capacity significantly affect service delivery outcomes (Kigume and Maluka 2019). In resource-limited settings, robust program administration is a key lever for achieving improved performance. Therefore, the following hypothesis is posited:

H4. *Decentralized Program Administration significantly influences HPP.*

DMA plays a critical mediating role in translating the potential benefits of decentralized management into tangible improvements in health program performance (Danhoundo et al. 2018; Joshi 2017; Yilmaz et al. 2010). While the four key dimensions of decentralized management, local resource mobilization, DSRA, DCG, and DPA are designed to directly enhance health outcomes, their true impact is fully realized only when robust monitoring and accountability systems are in place (Joshi 2017; Natalisma et al. 2021). Mechanisms such as local oversight committees, community scorecards, and participatory budgeting ensure that local governments operate transparently and align their actions with the specific needs of the communities they serve (Dwicaksono and Fox 2018; Sun and Andrews 2023).

Effective DMA is essential for converting decentralized authority into effective service delivery. For example, studies in Uganda have demonstrated that without strong DMA, decentralization's benefits are often undermined by inefficiencies and corruption, resulting in a gap between the officially mandated decision space (de jure) and actual practices (de facto) at the local level (Dick-Sagoe 2020; Zon et al. 2017). This accountability gap can lead to misallocation of resources and compromised health outcomes. Effective LRM helps establish systems to track financial flows, while strategic resource allocation ensures funds are distributed based on actual needs, both of which contribute to stronger monitoring and accountability.

Furthermore, DMA reinforces and enhances the actions taken through other decentralized management dimensions. DCG fosters transparency by integrating community feedback and participatory decision-making processes, thereby reinforcing local accountability (Bossert et al. 2003; King 2015; Natalisma et al. 2021). Similarly, effective DPA, supported by systematic data management and operational audits, improves service delivery outcomes by ensuring that health interventions are implemented efficiently (Kigume and Maluka 2019). Based on these observations, additional hypotheses have been proposed:

H5. *Local resource mobilization significantly influences decentralized monitoring and accountability.*

H6. *Decentralized strategic resource allocation significantly influences DMA.*

H7. *Decentralized collaborative program governance significantly influences DMA.*

H8. *Decentralized Program Administration significantly influences DMA.*

H9. *Decentralized Monitoring and Accountability significantly influences HPP.*

2.2.1 | The Mediating Role of DMA

Indirect Effects in Decentralized Health Systems refer to the ways in which the direct impacts of decentralized governance components such as LRM, Strategic Resource Allocation, Collaborative Program Governance, and Program Administration are transmitted to ultimately improve HIV and TB Program Performance through the mediating function of DMA (Joshi 2017; Natalisma et al. 2021; Yilmaz et al. 2010). DMA encompasses the processes and mechanisms of local oversight committees, community scorecards, participatory budgeting, and other evaluative tools that ensure local interventions are continually monitored, evaluated, and adjusted based on performance feedback (Akin et al. 2005; Jiménez-Rubio et al. 2005; Nakatani et al. 2024). These accountability mechanisms are especially critical in resource-constrained settings where the risk of inefficiencies and corruption is high if monitoring is weak. Without robust DMA, the additional resources or improved governance practices introduced by decentralization may not translate into enhanced service delivery, leaving gaps between intended and actual outcomes (Kim et al. 2024; King 2015; Sreeramareddy and Sathyanarayana 2013).

The theoretical underpinnings for this mediation model are twofold. First, decentralization theory posits that transferring decision-making authority to local governments improves responsiveness by aligning service delivery with local needs; however, this benefit is contingent upon the presence of strong oversight and accountability systems that enforce transparency (Arkorful et al. 2021). Second, the RBV emphasizes that the mere possession of valuable resources, financial, human, or infrastructural does not guarantee optimal outcomes unless these resources are managed efficiently and subject to ongoing

evaluation (Mkoma and Rwekaza 2021; Rakmawati et al. 2019). DMA embodies this evaluative function by ensuring that financial flows, strategic allocations, collaborative decision-making, and operational processes are continuously scrutinized. In effect, DMA serves as a quality control mechanism that maximizes the impact of decentralized interventions by ensuring that the resources and capacities developed at the local level are used appropriately and lead to tangible health improvements (Juliarti et al. 2022; Nakatani et al. 2024).

Specifically, the mediation framework posits that each decentralization component exerts its influence on HPP indirectly through its impact on DMA. For example, even if LRM succeeds in generating additional funds, the actual improvement in program performance depends on whether these funds are effectively monitored and directed toward priority interventions. Likewise, the benefits of DSRA are realized only when ongoing oversight ensures that resources are equitably distributed and used efficiently (Balaguer-Coll et al. 2010; Hemingway et al. 2021; Nishimura 2022). Similarly, the positive effects of DCG are contingent on incorporating participatory and transparent accountability mechanisms that convert stakeholder input into concrete improvements in service delivery (Martineau et al. 2018; Witter et al. 2019). Lastly, the operational efficiencies achieved through DPA must be sustained by robust monitoring to maintain high-quality performance over time (Juliarti et al. 2022; Sun and Andrews 2023). Based on these considerations, the following indirect (mediation) effects hypotheses are proposed:

H10. *Local resource mobilization exerts a significant indirect effect on HPP through DMA.*

H11. *Decentralized strategic resource allocation exerts a significant indirect effect on HPP through DMA.*

H12. *Decentralized Collaborative Program Governance exerts a significant indirect effect on HPP through DMA.*

H13. *Decentralized Program Administration exerts a significant indirect effect on HPP through DMA.*

In Figure 1, the conceptual model is introduced showing how four decentralization constructs (LRM, DSRA, DCG, DPA) affect HIV AND TB program performance directly and through the mediating role of DMA, with associated hypotheses labeled for clarity. The arrows depict direct and indirect effects, highlighting how robust monitoring and accountability can amplify the impact of decentralized health governance.

3 | Methodology

3.1 | Study Design

This study adopts an explanatory research design employing a quantitative approach to examine the relationships between decentralization components and the performance of HIV and TB programs. Guided by decentralization theory and the RBV, the study uses a deductive strategy to test theory-driven hypotheses. A cross-sectional survey method was applied to collect data at a single point in time from health stakeholders in Uganda's Mubende region. This design allows for systematic measurement and statistical analysis of financial, administrative, and accountability constructs, supporting generalizability and objective inference (Creswell and Creswell 2018; Sekaran and Bougie 2016).

3.2 | Study Population and Sampling Technique

The study population comprised 270 leaders engaged in HIV and TB programs across eight districts within the Mubende region. These individuals comprising District Health Officers, Chief Administrative Officers, District Community Development Officers, Planning Officers, Chief Finance Officers, and Health Facility Leaders were identified from official records maintained by the District Health Offices and verified through the Uganda Ministry of Health (Uganda Ministry of Health 2021). A target sample of 161 was calculated using the Taro Yamane formula (Yamane 1973) with a 5% margin of error and a 95% confidence level. A simple random sampling

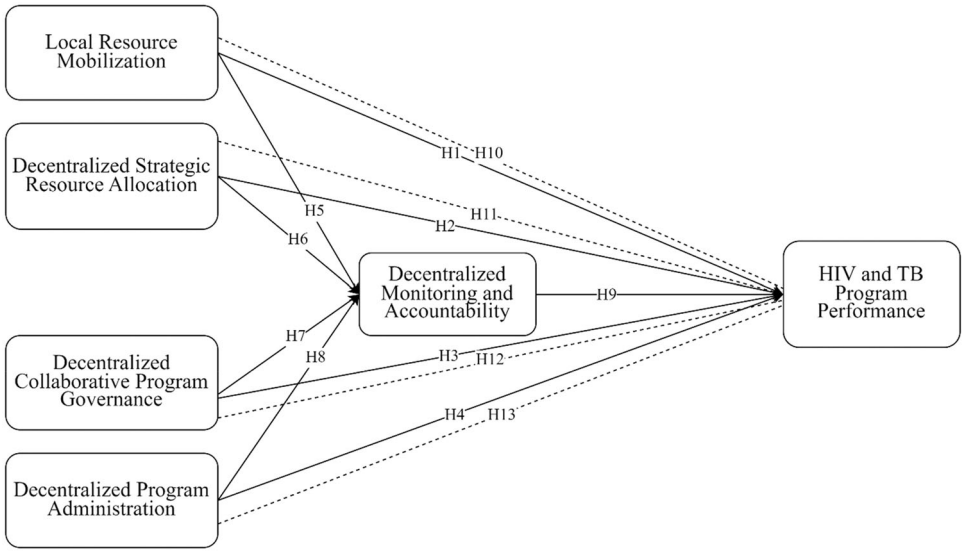

FIGURE 1 | Study Conceptual Model.

technique was then applied, using the RAND function in Microsoft Excel on a comprehensive sampling frame that categorized potential respondents by facility leaders and district staff.

3.3 | Data Collection and Instrumentation

The items were developed based on an extensive review of empirical and theoretical literature in the fields of decentralization, public health governance, and health systems performance to ensure construct validity and contextual relevance (Abimbola et al. 2019b; Chen et al. 2021; Kigume and Maluka 2019; Kyriacou and Roca-Sagalés 2023; Mayanja and Akunda 2023b; Sabbi et al. 2024). All items were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The first section captured demographic and background information, including district of assignment, cadre, gender, and years of professional experience. The remaining sections assessed DCG, DPA, DSRA, LRM, DMA, and HIV and TB program performance. These constructs were operationalized using indicators such as stakeholder engagement, fiscal autonomy, administrative efficiency, transparency, and service delivery outcomes among vulnerable populations.

Data collection was conducted by trained research assistants through face-to-face interviews with sampled respondents. This method was selected to accommodate the demanding schedules of health managers and district-level officials while ensuring comprehensive responses. Appointments were scheduled in advance via phone calls to confirm availability and minimize disruptions. Written informed consent was obtained before each interview, and respondents were assured of confidentiality and voluntary participation. Out of the 161 targeted respondents, 145 were successfully interviewed, resulting in a 90% response rate considered acceptable according to established survey research standards (Dillman et al. 2014). The remaining 16 individuals were not interviewed due to their inaccessibility during the data collection period, despite multiple follow-up efforts.

3.4 | Measurement of Variables

Composite scores for each construct were computed by averaging the responses to all items associated with that construct, each measured on a 5-point Likert scale. This scoring method, which assigns values from 1 (strongly disagree/low) to 5 (strongly agree/high), provides a parsimonious and interpretable measure of each dimension. The use of mean scores as composite indicators is a well-established practice in social science research, as it captures central tendencies while preserving response variability (DeVellis 2016; Field 2013). This approach enables consistent comparisons across constructs and facilitates the use of composite variables in subsequent statistical analyses, including regression and structural equation modeling.

3.5 | Data Analysis

Data cleaning was conducted in Microsoft Excel to remove errors, check for missing values, and ensure consistency in coding. All statistical analyses were performed using SPSS Version 27. Composite scores for each construct (DCG, DPA, DSRA, LRM, DMA, and HPP) were computed by averaging item responses on a 5-point Likert scale. PCA with Varimax rotation was used to verify the factor structure, retaining items with loadings ≥ 0.60. Reliability was assessed using Cronbach's Alpha, with all constructs meeting the minimum threshold of 0.70 for acceptable internal consistency (Nunnally and Bernstein 1994). Convergent validity was evaluated through average variance extracted (AVE) and composite reliability (CR), both exceeding recommended cutoffs of 0.50 and 0.70, respectively (Fornell and Larcker 1981; Hair et al. 2019). The inferential analysis included multiple linear regression to assess the direct effects of decentralization variables on HIV and TB program performance. Assumptions of normality and multicollinearity were tested using histograms, P–P plots, and VIF/Tolerance values. Mediation analysis followed the Baron and Kenny (1986) framework, supplemented by the Sobel test, to examine the indirect effects of decentralization through DMA.

3.6 | Ethical Considerations

This study was conducted in full compliance with the Declaration of Helsinki to ensure the ethical treatment of participants and the integrity of the research process. Ethical approval was obtained from the Mildmay Uganda Research and Ethics Committee (REC REF 0804-2018) and the Uganda National Council for Science and Technology (SS639ES). Participants were fully informed about the study's purpose, their rights, and the confidentiality of their responses through detailed consent forms. Participation was voluntary, with the right to withdraw at any time without consequence, and all data were securely stored and anonymized to protect participant privacy.

4 | Results

4.1 | Respondents' Demographic Distribution

The results shown in Table 1 highlight a diverse profile of district leaders, with 60.7% male and 39.3% female respondents. Mityana District had the highest representation (22.8%), followed by Kassanda (13.8%) and Luwero (13.1%), with the rest distributed across five other districts, ensuring a fair geographic spread. Regarding work experience, 54.5% had 0–5 years, 24.8% had 6–10 years, 7.6% had 11–15 years, and 13.1% had over 15 years. This mix of new and experienced leaders provides broad insights into the decentralized governance of HIV and TB programs.

4.2 | Results of PCA, Reliability, and Construct Validity Findings

To determine the underlying structure and assess the psychometric properties of the study constructs, a PCA was conducted using SPSS. This analysis evaluated standardized factor

TABLE 1 | Respondents' demographic distribution.

Category	Subcategory	Frequency	Percent
Gender	Female	57	39.3
	Male	88	60.7
	Total	***145***	***100.0***
District	Kassanda	20	13.8
	Kiboga	11	7.6
	Kyankwanzi	12	8.3
	Luwero	19	13.1
	Mityana	33	22.8
	Mubende	18	12.4
	Nakaseke	17	11.7
	Nakasongola	15	10.3
	Total	***145***	***100.0***
Work experience	0–5 years	79	54.5
	6–10 years	36	24.8
	11–15 years	11	7.6
	> 15 years	19	13.1
	Total	***145***	***100.0***

loadings, internal consistency, and convergent validity through metrics such as Cronbach's Alpha, AVE, CR, eigenvalues, and explained variance, as summarized in Table 2. All retained items loaded above the recommended minimum threshold of 0.65, with the majority exceeding 0.70. Although one item each under DSRA (0.659) and LRM (0.657) marginally exceeded the threshold, they were retained due to conceptual relevance and satisfactory model fit. Constructs for DCG, DPA, DSRA, DMA, and HIV and TB Program Performance all demonstrated good internal consistency, with Cronbach's Alpha values above 0.70. LRM, while slightly lower at 0.560, was considered acceptable for exploratory research (Hair et al. 2019).

Convergent validity was confirmed as all constructs recorded AVE values above the recommended threshold of 0.50 and CR values ranging from 0.774 to 0.877, exceeding the 0.70 benchmark (Fornell and Larcker 1981; Hair et al. 2019). For example, DCG showed strong psychometric properties with item loadings between 0.749 and 0.824, an AVE of 0.610, a CR of 0.824, and an eigenvalue accounting for 32.0% of the variance. Similarly, HPP yielded an AVE of 0.575, a CR of 0.803, and explained 43.7% of the variance. These results support the construct validity and reliability of the measurement model, providing a robust basis for the subsequent regression and mediation analyses.

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.861, indicating a meritorious level of suitability for factor analysis (Kaiser 1974). Additionally, Bartlett's Test of Sphericity was significant, χ^2 (435) = 2247.118, $p < 0.001$, confirming the factorability of the correlation matrix and supporting the robustness of the factor structure.

4.3 | Assumption Testing for Regression Analysis

4.3.1 | Normality of Residuals

To evaluate the normality of residuals, a Normal P–P Plot of Regression Standardized Residuals (Figure 2) and a Histogram of Standardized Residuals (Figure 3) were analyzed. The histogram reveals a symmetric distribution around the mean (SD = 0.982), with a normal curve overlay confirming approximate normality. Minor deviations from the curve are minimal and do not indicate significant violations of the normality assumption. The Normal P–P Plot further supports these findings, showing residuals closely aligning with the diagonal line of expected cumulative probabilities. Although slight deviations occur at the extremes, they are negligible and do not compromise the normality assumption. Together, these assessments confirm that the residuals meet the assumption of normality required for valid regression analysis.

4.3.2 | Multicollinearity Diagnostics

Multicollinearity was assessed using Tolerance values and Variance Inflation Factors (VIF), as summarized in Table 3. All Tolerance values exceeded 0.10, and VIF values remained below 10, indicating no multicollinearity concerns. For example, LRM had a Tolerance of 0.686 and a VIF of 1.458, while DSRA recorded a Tolerance of 0.468 and a VIF of 2.139. These results confirm that predictors are not highly correlated, ensuring stable and interpretable regression coefficients. Figures 2 and 3, along with Table 3, demonstrate that key assumptions of normality and multicollinearity were met, ensuring the regression model's robustness and the reliability of its results.

4.4 | Hypotheses Testing

4.4.1 | Direct Effects Analysis

This study examined the direct and mediated effects of key decentralization components on HIV and TB Program Performance. The constructs analyzed included LRM, DSRA, DCG, and DPA, with DMA serving as the mediator. Following the framework proposed by Baron and Kenny (1986), we first evaluated the direct relationships between these decentralization practices and HPP. The Sobel test (Sobel 1982) was subsequently used to assess the significance of indirect effects, and mediation was further validated using the guidelines from Hayes (2013). This systematic approach allowed us to determine not only the standalone effects of each variable but also how DMA contributes to the overall impact on program performance.

In the direct effects model, LRM did not significantly influence HPP ($\beta = 0.049$, SE = 0.047, $p = 0.300$), leading to the rejection of H1. DSRA, however, showed a significant positive effect on HPP ($\beta = 0.108$, SE = 0.076, $p = 0.020$), thereby supporting H2. DCG presented a marginally nonsignificant effect on HPP ($\beta = -0.127$, SE = 0.069, $p = 0.070$), which provided only partial support for H3. In contrast, DPA demonstrated a clear

TABLE 2 | Standardized loadings, reliability, AVE, CR, and factor variance.

Variable	Item statement	Loading	Cronbach's alpha	AVE	CR	Eigenvalue	% Variance explained
DCG	Enhanced integration across program areas	0.824					
	Improved ownership at district/community level	0.769					
	Better coordination among stakeholders	0.749	0.770	0.610	0.824	2.564	32.0
DPA	Strengthened HIV AND TB service delivery through administration	0.839					
	Timely implementation of programs	0.771					
	More efficient access and resource allocation	0.665	0.746	0.580	0.804	2.195	27.4
DSRA	Programs address unique community needs	0.834					
	Improved stakeholder coordination in planning	0.788					
	More equitable resource distribution	0.690					
	Enhanced efficiency in resource use	0.674					
	Stakeholder participation improves service quality	0.659	0.810	0.536	0.851	3.730	46.6
LRM	Transparent and fair resource allocation	0.918					
	Empowered districts for resource mobilization	0.657	0.560	0.637	0.774	1.028	12.9
DMA	Timely data collection	0.813					
	Improved tracking of program outcomes	0.761					
	Increased stakeholder participation	0.727					
	Better information sharing	0.724					
	More accurate program data	0.701					
	Monitoring supports decision-making	0.671					
	Improved accountability and transparency	0.573	0.838	0.509	0.877	3.563	50.9
HPP	Program efficiency under decentralization	0.822					
	Reaching vulnerable communities	0.762					
	Accessibility of HIV AND TB services	0.673					
	Program achieved its objectives	0.649					
	Sustainability of program results	0.640					
	Reliable program outcomes	0.798					
	Community engagement and participation	0.746					
	Availability of essential resources	0.729	0.717	0.575	0.803	3.936	43.7

Note: KMO = 0.861, Bartlett's test of Sphericity χ^2 (435) = 2247.118, $p < 0.001$, confirming factorability.

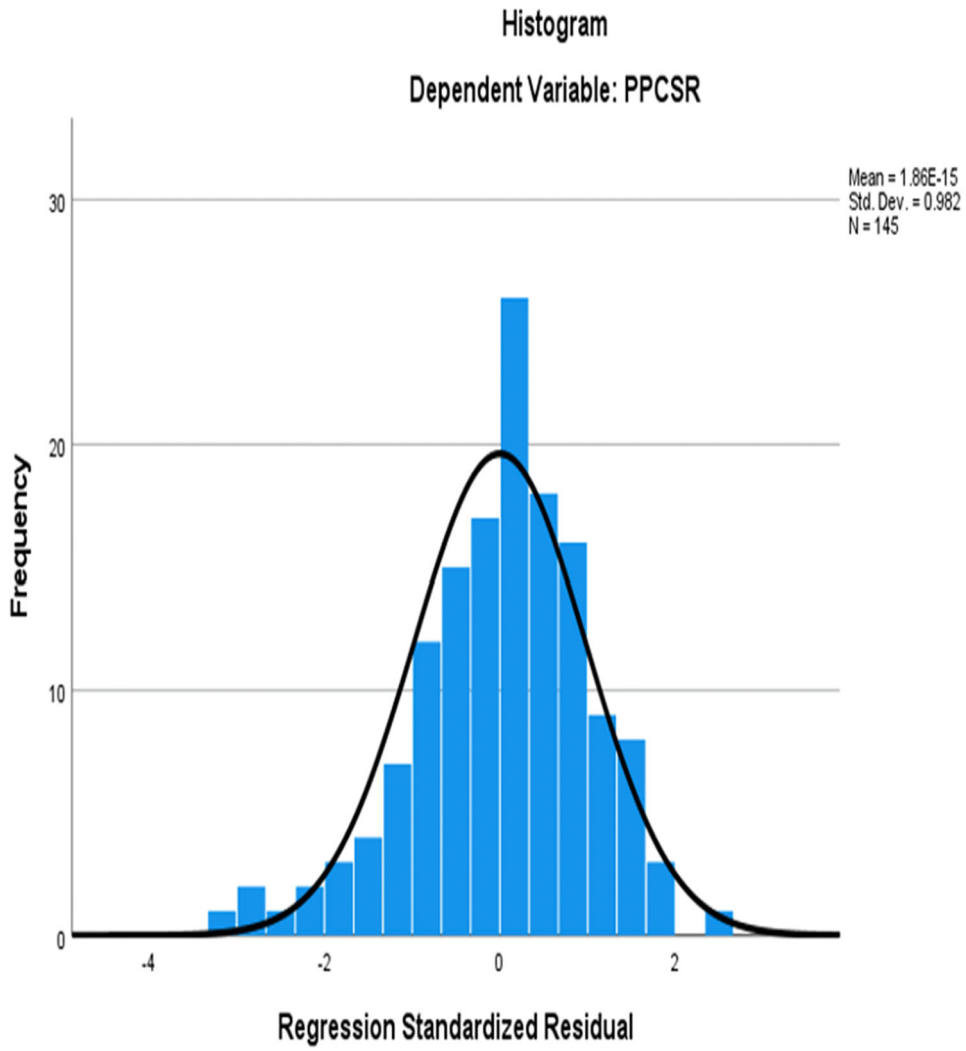

FIGURE 2 | Histogram of regression standardized residuals for HIV and program performance.

positive influence on HPP ($\beta = 0.152$, SE = 0.067, $p = 0.025$), thus confirming H4. Shifting our focus to the mediator, we found that LRM did not have a significant impact on DMA ($\beta = 0.042$, SE = 0.042, $p = 0.322$), failing to support H5. Conversely, DSRA strongly improved DMA ($\beta = 0.282$, SE = 0.064, $p < 0.001$), supporting H6. Similarly, DCG ($\beta = 0.402$, SE = 0.052, $p < 0.001$) and DPA ($\beta = 0.127$, SE = 0.059, $p = 0.033$) significantly enhanced DMA, supporting H7 and H8, respectively.

Finally, DMA itself was found to have a significant positive effect on HPP ($\beta = 0.224$, SE = 0.043, $p = 0.018$), thereby confirming H9 and highlighting its central role in mediating the effects of decentralization on program performance. These results are summarized in Table 4:

4.4.2 | Mediation Analysis

The mediation analysis clarifies how DMA serves as a critical conduit between decentralization inputs and improved HIV and TB Program Performance. By assessing the indirect effects, the analysis reveals that while some decentralization components translate into better program outcomes only through effective monitoring, others do not benefit from this mediation. In particular, LRM did not show a significant indirect effect on HPP via DMA ($\beta = 0.009$, SE = 0.009, $p = 0.327$; Sobel Z = 0.98, $p = 0.327$), indicating that resource generation alone does not automatically yield performance gains. This finding fails to support H10, underscoring that without strategic allocation or oversight, locally mobilized resources may not effectively impact overall program outcomes.

Conversely, DSRA demonstrated a robust indirect effect on HPP through DMA ($\beta = 0.063$, SE = 0.026, $p = 0.014$; Sobel Z = 2.45, $p = 0.014$). This supports H11 and confirms that when resources are allocated strategically and monitored diligently, the potential for improved program performance is significantly enhanced. Similarly, DCG also benefits from DMA's mediating role ($\beta = 0.090$, SE = 0.042, $p = 0.031$; Sobel Z = 2.15, $p = 0.031$), supporting H12. This suggests that collaborative governance can lead to better outcomes if it is complemented by strong accountability measures.

Finally, DPA showed a significant indirect effect on HPP via DMA ($\beta = 0.028$, SE = 0.010, $p = 0.007$; Sobel Z = 2.68, $p = 0.007$), thereby supporting H13. This finding illustrates that robust local administration, when reinforced by effective

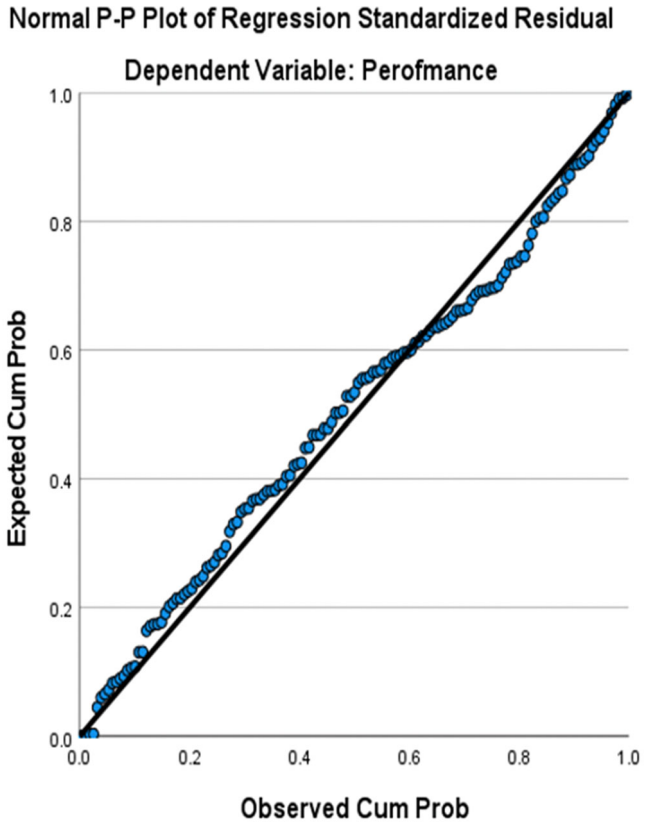

FIGURE 3 | Normal P–P plot of regression standardized residuals for HIV and TB performance.

monitoring and accountability systems, can unlock the full potential of decentralization. Collectively, these results, summarized in Table 5, emphasize the pivotal role of DMA in-transforming decentralization efforts into tangible health program improvements.

5 | Discussion

This study examines how devolving decision-making to local communities can reconfigure the governance and delivery of HIV and TB programs. By focusing on the interrelationships among LRM, DSRA, DCG, and DPA, it highlights the tangible ways decentralization can shape health outcomes (Chris James et al. 2019; Mayanja and Akunda 2023). At the heart of this framework lies DMA, conceptualized as a critical backbone that transforms plans into measurable action, ensures equitable resource delivery, and drives focus on outcomes over bureaucratic process (Sapkota et al. 2023; Zon et al. 2017). Through this integrative lens, the discussion helps clarify under what conditions decentralization enhances performance, where gaps remain, and what can be done to improve its effectiveness.

The findings show that specific components of decentralization positively influence HIV and TB program performance. Two elements DSRA and DPA showed statistically significant positive effects. DSRA promotes fairness and responsiveness in distributing resources, enabling local tailoring of services to diverse needs be they geographic, economic, or cultural (Hidayat

TABLE 3 | Collinearity diagnostics.

Predictor	Tolerance	VIF
LRM (local resource mobilization)	0.686	1.458
Decentralized strategic resource allocation	0.468	2.139
Decentralized collaborative program governance	0.664	1.507
Decentralized program administration	0.490	2.042

TABLE 4 | Direct effects results.

Path (Hypothesis)	β	SE	*p* value	Supported
LRM → HPP (H1)	0.049	0.047	0.300	Not supported
DSRA → HPP (H2)	0.108	0.076	0.020	Supported
DCG → HPP (H3)	−0.127	0.069	0.070	Marginally supported
DPA → HPP (H4)	0.152	0.067	0.025	Supported
LRM → DMA (H5)	0.042	0.042	0.322	Not supported
DSRA → DMA (H6)	0.282	0.064	< 0.001	Supported
DCG → DMA (H7)	0.402	0.052	< 0.001	Supported
DPA → DMA (H8)	0.127	0.059	0.033	Supported
DMA → HPP (H9)	0.224	0.043	0.018	Supported

TABLE 5 | Indirect effects via DMA.

Path (Hypothesis)	β	SE	*p* value	Sobel test (*Z*)	*p* value (Sobel test)	Supported
LRM → DMA → HPP (H10)	0.009	0.009	0.327	0.98	0.327	Not supported
DSRA → DMA → HPP (H11)	0.063	0.026	0.014	2.45	0.014	Supported
DCG → DMA → HPP (H12)	0.090	0.042	0.031	2.15	0.031	Supported
DPA → DMA → HPP (H13)	0.028	0.010	0.007	2.68	0.007	Supported

Abbreviations: LRM, local resource mobilization; DSRA, decentralized strategic resource allocation; DCG, decentralized collaborative program governance; DPA, decentralized program administration; DMA, decentralized monitoring and accountability; HPP, HIV and TB program performance.

et al. 2018; Rakmawati et al. 2019). This finding supports Hypothesis 2 and aligns with broader literature suggesting that strategic autonomy improves responsiveness and local relevance (Ibrahim 2024; Kyriacou and Roca-Sagalés 2023). DPA also emerged as key, ensuring local capacity to manage logistics, coordinate delivery, and troubleshoot service bottlenecks in real-time. These results affirm Hypothesis 4 and echo findings from Kenya and Indonesia, where stronger administrative autonomy improved service delivery and responsiveness (Kigume and Maluka 2019; Tsofa et al. 2017). Conversely, not all decentralization components yielded strong direct effects. LRM and DCG showed limited impact. The weak performance of LRM, which failed to support Hypothesis 1, likely stems from fiscal asymmetries and systemic inequities, where wealthier jurisdictions outpace disadvantaged ones (Abimbola et al. 2019; Singla and Stone 2018). Similarly, DCG was only marginally significant, providing partial support to Hypothesis 3. Without robust oversight, participatory structures may be symbolic rather than transformative (Natalisma et al. 2021; Zon et al. 2017).

DMA emerged as a pivotal mechanism linking decentralization components to improved program outcomes. When DSRA, DCG, and DPA function through DMA, their influence on program performance becomes more pronounced. For instance, Hypothesis 6 illustrates how DSRA is strengthened when aligned with monitoring and transparency. Absent such systems, locally allocated resources may be misused or misdirected. DMA enhances planning credibility and accountability, as seen in India and Uganda, where participatory planning coupled with transparency boosted efficiency and responsiveness (Singla and Stone 2018). The mediation effect related to DCG (Hypothesis 7) underscores that meaningful governance reform depends on authentic community involvement and feedback mechanisms. Evidence from Ghana and Kenya shows that when inclusive governance is matched with strong monitoring, trust, and service quality improve (Reidy et al. 2014). Similarly, the mediation of DPA (Hypothesis 8) highlights the importance of aligning administrative efficiency with real-time data and accountability tools. This feedback loop ensures service gaps are identified and corrected early. The confirmation of Hypothesis 9 further underscores DMA's catalytic role, echoing global findings that without credible oversight, decentralization may fragment services or deepen inequality (Cui and Wang 2024; Sapkota et al. 2023).

LRM's limited performance both directly and through DMA reflects a recurring challenge in decentralization literature. Merely assigning fiscal responsibility to local actors does not address historical imbalances in resource distribution or technical capacity (Abimbola et al. 2019; Dick-Sagoe 2020). Without supportive institutional frameworks and intergovernmental equity mechanisms, LRM risks reinforcing regional disparities, as seen in Ghana and India where better-off areas disproportionately benefited (Faguet 1997; Singla and Stone 2018). To shift this dynamic, policy must prioritize fiscal equalization, capacity building, and alignment of resource mobilization with transparent governance. Without these reforms, LRM remains a weak lever for improving health equity and system resilience (Ibrahim 2024; Oliveira et al. 2024).

The analysis of indirect pathways further affirms DMA's critical enabling function. The significant mediation effects of DSRA (Hypothesis 10), DCG (Hypothesis 11), and DPA (Hypothesis 12) through DMA reinforce the notion that decentralization's success is contingent on robust monitoring and feedback systems. These findings align with cross-country studies showing that decentralization efforts lacking effective governance, role clarity, and data systems often fail to deliver substantive improvements (Brennan and Abimbola 2023; Zon et al. 2017). Conversely, in systems where local actors have both authority and oversight tools, service delivery becomes more targeted, efficient, and equitable. In contrast, the lack of significant indirect effects for LRM (Hypothesis 13) reaffirms that resource generation alone is insufficient. Research consistently finds that financial autonomy must be paired with accountable governance, transparency, and citizen engagement to yield durable health system gains (Kyriazos and Poga 2023; Rakmawati et al. 2019). Ultimately, the study reinforces that decentralization is not just about shifting decisions downward, it is about equipping local actors with the tools, systems, and legitimacy to act effectively in the public interest.

6 | Conclusions

This study demonstrates that decentralization can significantly improve HIV and TB program outcomes when local teams are empowered with both authority and accountability. Specifically, when districts are given more control over how resources are allocated and how services are administered on a day-to-day basis, programs become more responsive, timely, and aligned with community needs. Transparent resource use and efficient local administration also help build trust, encouraging community members to engage more actively with health services. However, not all decentralization efforts yield immediate benefits. Initiatives like LRM and DCG alone are not enough unless they are backed by strong monitoring systems and meaningful community involvement.

Grounded in decentralization theory and the RBV, this study emphasizes that success depends not just on transferring

authority but on equipping local actors with the skills, tools, and systems to use it well. Improving fiscal capacity, strengthening local decision-making, and encouraging community participation are critical steps toward achieving equitable and people-centered health systems. These insights are especially relevant for resource-constrained settings, where efficient use of limited funds and inclusive governance can make the difference between stagnation and progress. In the end, decentralization done right is not just a policy shift it is a practical strategy for building sustainable, trusted, and community-driven healthcare systems.

7 | Implications of the Study

7.1 | Practical Implications

On the ground, our findings mean that local program managers and other players working on HIV and TB can do better when they have the right tools and support to manage resources and make timely decisions. When local leaders have the authority to decide how funds are spent (DSRA) and when they run their programs more effectively (DPA), health services become more responsive to what communities actually need. By giving district administrators, the training and confidence to handle resources carefully and by strengthening DMA systems, we can build trust. This trust, in turn, ensures that services reach the right people at the right time. Just as importantly, inviting community members into the conversation through health committees or open planning forums helps ensure that health interventions truly match local priorities and improve people's well-being.

7.2 | Theoretical Implications

The results of our study also shape how we understand health systems more broadly. Decentralization theory suggests that pushing decisions down to the local level can make health care more attuned to real community needs. Our findings confirm that idea, but they also show that having the freedom to decide is not enough, local teams need strong monitoring and accountability frameworks (like DMA) to make sure that decisions lead to actual health improvements. From an RBV perspective, local skills, effective resource planning, and good monitoring aren't just nice additions; they're vital “assets” that give decentralized health programs a clear advantage. Put simply, when local people have the tools and know-how to use their resources wisely and when they can see how well their efforts are working, everyone benefits.

7.3 | Policy Implications

For policymakers, the message is clear: decentralization can work wonders, but only if it's accompanied by well-thought-out checks and balances. That means building transparency into how money is spent, regularly sharing information about what's working and what's not, and ensuring that resources aren't just spread evenly, but fairly, especially in places with fewer means. By making DMA and DSRA part of national health policy, leaders can encourage local districts to rely on data, not guesswork, and to manage their finances in a way that actually improves health outcomes. Strengthening local capacity to generate and handle their own resources is key imagine performance-based grants or new ways of raising funds locally that let under-resourced districts stand on their own feet. Such policies can pave the way for more equitable, efficient, and people-centered health services.

7.4 | Implications for Global Health Governance

These lessons go beyond Uganda and can inspire global health policymaking, especially in places where limited resources and complex health challenges like HIV and TB are daily realities. Decentralization, when done right, can help health systems adapt more quickly to local conditions, be it cultural nuances or sudden outbreaks. The crucial factor, as we've shown, is strong accountability and monitoring to ensure that new freedoms at the local level are directed towards genuine improvement.

For international partners, like donors, NGOs, and global health organizations this means investing in training, building better data systems, and encouraging partnerships across sectors. These steps can help ensure that money and efforts actually close gaps in care, rather than widen them. And when crises hit like the COVID-19 pandemic decentralized, well-monitored health systems are often better positioned to respond quickly, fairly, and effectively. In the long run, this approach can help build more resilient health systems that serve everyone, including the most vulnerable, in a fair and dignified manner.

8 | Limitations and Future Research Directions

This study offers key insights into the impact of decentralization on HIV and Tuberculosis (TB) program performance but has some limitations. The cross-sectional design restricts causal inference, emphasizing the need for longitudinal studies to better understand the long-term effects of decentralization. The findings are context-specific and may not generalize to settings with different governance and fiscal dynamics. Future research should explore these relationships across diverse regions to broaden the understanding of decentralization's impact.

While DMA was a central focus, other mediators such as community engagement, intersectoral collaboration, or technological innovations may also play critical roles. Incorporating multiple mediators in future studies can provide a more comprehensive picture. This study relied on quantitative methods, and integrating qualitative approaches could uncover nuanced perspectives from stakeholders involved in program implementation.

Challenges in LRM and DCG present opportunities for further exploration. Investigating strategies to strengthen these components, especially in resource-limited contexts, and the role of technology in improving decentralized governance could offer

valuable insights. Lastly, future research should focus on how decentralized systems can enhance equity, particularly for marginalized populations, while balancing efficiency goals to advance inclusive health outcomes.

Author Contributions

All the authors contributed equally to this study.

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Ethics Statement

This study was conducted in accordance with the Declaration of Helsinki and received ethical approval from the Mildmay Uganda Research and Ethics Committee (REC REF 0804-2018) and the Uganda National Council for Science and Technology (SS639ES).

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data available from the corresponding author upon reasonable request, subject to ethical approvals and confidentiality.

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