



# Small-world challenges and solutions identified by mid-level managers within a decentralized healthcare system during a tuberculosis-prevention therapy rollout study: “When a big drum like the District Health Officer talks”

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## ABSTRACT

**Background:** Decentralisation policies that devolve certain administrative and decision-making powers to local levels can pose challenges for public health and healthcare systems. For a decentralised health system to function optimally, mid-level systems must rely on tightly clustered, so-called “small-world” networks to efficiently scale-up national health campaigns and share best practices. Few studies have qualitatively tackled the mechanisms of small-world creation and their potential effects on public health promotion during centralized national campaigns in a decentralised, mid-level healthcare system tier.

**Methods:** We conducted 23 in-depth interviews and six focus group discussions with mid-level healthcare managers during a cluster-randomised trial from 2019 to 2021, whose intervention component aimed to increase isoniazid preventive therapy (IPT) uptake and prevent tuberculosis among people living with HIV in Uganda. The intervention consisted of 8 mini-collaborative meetings where intervention clusters received management and skills-based training and shared results with other district managers. We used a thematic analysis technique to identify key challenges stemming from the decentralised nature of the healthcare system and pinpoint the mechanisms and conceptual tools by which intervention groups overcame these challenges.

**Results:** Training management and leadership skills in mini-collaboratives promoted mid-level manager agency to address several drawbacks associated with the decentralisation of healthcare systems through what we call ‘horizontal accountability’. Improving communication as a group, intervention participants encouraged teamwork in their districts, developed bridging ties with other districts and built a denser cluster of networks. Pairing transparency with a sense of reciprocal accountability moving in multiple directions, upwards to the Ministry of Health (MoH), downwards towards local communities, and horizontally towards peers, fostered the creation of small-world networks and improved information flows within a decentralised healthcare context.

**Conclusions:** Increased collaboration demonstrably strengthened the clustering of small-world network ties at a horizontal level, more quickly disseminating best practices through collegial competition, sustaining the uptake of IPT while ensuring accountability to peers, the MoH, and local communities.

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## 1. Background

Decentralisation involves a central government devolving decision-making and other administrative powers “to actors at lower levels in a political-administrative and territorial hierarchy” (Ribot, 2002; Salifu et al., 2022). Beginning in the 1980s and gaining traction into the 1990s, the World Bank and other international organisations promoted decentralisation policies for various sectors in multiple developing countries (Kristiansen and Santoso, 2006; Massuunganhe, 2022; Myrtho Casséus et al., 2022; Ghuman and Singh, 2013). In 1997, Uganda began to decentralise its healthcare system, devolving increased responsibility for healthcare oversight to mid-level health managers throughout the country, which as a result of regular district-splitting by 2018 comprised 135 districts (Kirungatashobya et al., 2018; Mutebi et al., 2019). These mid-level managers included not only District Health Officers (DHOs) tasked with operational planning, health service management, and both HIV and non-HIV care, but also members of the District Health Team such as District Tuberculosis and Leprosy Supervisors (DTLSs), whose responsibilities were more specialised (Lohman et al., 2016). In 2003, to address some of the inherent biases in decentralisation (e.g. variations in financing districts, distribution of medicines, health system performance), the Ugandan government introduced District League Tables with the aim of assessing the range of district performance and improving decision-making quality within the system (Kirungatashobya et al., 2018). Nevertheless, as in other countries, decentralisation has tended to bias resources towards urban centres, with rural areas less fully resourced (Mansour et al., 2022; WHO, 2011; Bossert and Beauvais, 2002).

*Motivations for decentralisation.* Before being deployed in the health sector, the initial global movement towards decentralisation supposed that decentralisation would break up pre-existing social networks that were contributing to corruption or inefficiency in different sectors (e.g. political, financial), whilst fostering good governance by encouraging democratisation and innovation through empowering local communities (Myrtho Casséus et al., 2022; Ghuman and Singh, 2013; Bossert and Beauvais, 2002; Mitchell and Bossert, 2010; Uzzi et al., 2007; Suhail et al., 2022; Fonn et al., 2021; Dansou and Carrier, 2023; Sabbi and Ndikubwimana, 2024). This assumption relied on *social network theory*, which posits that individuals are linked parts of an interconnected whole, operating interdependently rather than autonomously (Moody and White, 2003). One type of social network is a *small world*. The terminology of ‘small worlds’ is rooted in work beginning in the 1950s (Schnettler, 2009), continued in a social science context by Milgram (Milgram, 1967) in the 1960s, and popularised by both fictional and scientific works in the 1990s (Guare, 1990; Watts and Strogatz, 1998). In a *small world network*, actors are tightly clustered together, with most actors in the network likewise connected directly to one another with few intermediaries (Uzzi et al., 2007). The presence of ‘short-cuts’ bridging more distal clusters can tighten the network by shortening the distance between any two nodes in the network (Watts and Strogatz, 1998). Disrupting the shape of these connexions through breaking up small-world networks and vertically-nested hierarchies into polycentric, localised systems lessens the ability of corruption to flourish by putting greater space between corrupt actors and easing bottlenecks created when all decisions pass through a single actor (Howell-Moroney, 2008). Political decentralisation also meant decentralisation of other sectors, including within the healthcare system (Mutebi et al., 2019).

*Consequences of decentralisation.* Breaking up the nestedness of vertical hierarchies, however, sometimes resulted in a consequent loss of horizontal connectivity to mid-level colleagues, one of several possible unforeseen effects of decentralisation (Mutebi et al., 2024, 2025). As a result, although the fiscal and administrative attention of mid-tier actors became more directed locally, they often lost the ability to share and compare best practices directly with their mid-level peers in other districts since information no longer passed quickly and easily between them (Massuunganhe, 2022; Myrtho Casséus et al., 2022; Fonn et al.,

2021; Moody and White, 2003). Horizontal connexions between low- and mid-tier personnel could thus become casualties of decentralisation, leading to information asymmetry – a kind of silo effect as mid-level tiers became connected to their neighbours only through a hierarchically vertical node (Kristiansen and Santoso, 2006; Ghuman and Singh, 2013; Mitchell and Bossert, 2010; Lieberman et al., 2009), rather than horizontally with colleagues sharing potentially similar challenges and solutions. (See Fig. 1.).

Administrative and fiscal decentralisation had the potential to negatively affect health policy goals when health status outcomes became secondary to the concerns of the distinct small worlds of political and economic actors and when the mid-level administrative units of the Ministry of Health became effectively separated from one another and unable to share knowledge directly (Kirungatashobya et al., 2018; Suhail et al., 2022; Fonn et al., 2021); political interference and delays after district splitting further exacerbated this process (Mutebi et al., 2025).

Mixed results were also evident during attempted scale-ups of centrally-directed national disease prevention campaigns (e.g. vaccinations, tuberculosis prevention); when attempting to focus on the health of populations with high mobility; or when addressing spillover situations like poverty and infectious disease. In each instance, centralised healthcare policies would have been more effective than decentralised ones (Myrtho Casséus et al., 2022; Fonn et al., 2021; Howell-Moroney, 2008; Khaleghian, 2004; Ferreira de Sousa et al., 2022). These mixed results are “due to the complexity of the process involved and challenges in implementation. Therefore, the desired benefits are not always achieved” (Suhail et al., 2022). Effects no longer followed a linear path, but reflected the open and dynamic nature of health governance (Mutebi et al., 2024; Conteh, 2016).

Several studies have highlighted challenges which result from poorly or rapidly implemented decentralisation policies (Myrtho Casséus et al., 2022; Mutebi et al., 2019, 2025; Mitchell and Bossert, 2010; Suhail et al., 2022; Ferreira de Sousa et al., 2022). Yet to date, most interventions have focused only on the upper levels of the Ministry of Health (MoH), not the mid-level managers (Salifu et al., 2022; Fonn et al., 2021; Johnson et al., 2021; Heerdegen, 2020). Further, although studies have pointed out that mid-level managers often struggle to fit into their role in the wake of decentralisation (Massuunganhe, 2022; Ghuman and Singh, 2013; Mansour et al., 2022; Dansou and Carrier, 2023), few, if any, have qualitatively tackled dynamics among different personnel roles within the same mid-level tier. This limits our understanding of the mechanisms of small-world creation and their potential effects on public health promotion.

This paper approaches those open questions through an analysis of qualitative data gathered during the SEARCH-IPT study, which incorporated small-world theory to design an intervention targeting middle managers (both DHOs and DTLSs) in three regions of rural Uganda to boost provisioning of Isoniazid prevention therapy (IPT) to people living with HIV (PLHIV) (Kakande et al., 2022). While earlier implementation questions concerned how to decentralise properly (Bossert and Beauvais, 2002; Ferreira de Sousa et al., 2022), the present question is how to manage emergent, centrally directed health programmes within a decentralised context. In other words, how can the most effective small-world be fostered in a decentralised healthcare setting?

## 2. Methods

*Study setting: tuberculosis prevention in Uganda.* In Uganda, DHOs are responsible for the implementation of national programs at the district level. One such programme is Isoniazid Prevention Therapy (IPT) to reduce the incidence of TB disease and stem the transmission of tuberculosis (TB) among people living with HIV (PLWH) (Kirungatashobya et al., 2018). TB has been one of the top causes of mortality in people with HIV globally (Craddock, 2012; Gupta et al., 2015; WHO, 2020). In 2015, the WHO set a target to reduce TB incidence by 80% and deaths by

90% by 2030 (WHO, 2020). Uganda has historically had a high burden of both TB and HIV (TB: 91.000 persons in 2021; HIV: 1.4 million in 2022), and PLHIV made up just over 50% of all TB deaths in Uganda in 2021, despite PLHIV accounting for only 3% of the country’s population (WHO, 2022). In 2018, less than 2% of PLHIV were receiving TB preventive therapy, indicating the need to scale up IPT to curtail preventable deaths.

The SEARCH-IPT trial began with 82 Ugandan health districts across three regions in 2017 and 2018, continuing until early 2022. Forty-three districts were cluster-randomised to the intervention, and 39 to a control arm; all managers invited from these eligible districts elected to participate (Kakande et al., 2022). Clusters of 14 districts based on region (east-central, east, and southwest), adjacency, HIV prevalence, and a comparable ratio of urban to rural districts, were randomly assigned by 1:1 pairs to either intervention or control arms at a regional meeting. The 43 intervention districts received skills-based management and leadership training at biannual mini-collaboratives taught by international business consultants and facilitated by experts in TB and HIV from Ugandan research organisations or medical centres. Control districts continued with standard practice. An average of 99% of the 26 eligible managers (both DHOs and DTLs) attended the biannual meetings for the SW region, whilst the east and east-central regions saw 83% average attendance rate for the 24 and 36 eligible managers, respectively. The

final ‘intervention dose’ was 8 meetings, totalling 64 h of exposure, including socialising during one-hour lunch breaks (Kakande et al., 2022). The primary outcome measurement was IPT initiation rates for adult PLWH over the course of two years (2019–2021).

The mini-collaboratives disseminated knowledge about IPT, and the intervention districts shared data and best practices with their regional cohorts in the course of receiving training in leadership and communication skills. In addition to sharing best practices, participants acquired skills in areas like data-based decision-making, root-cause analysis, data quality assurance, and self-reliance through implementing their own solutions (Johnson-Peretz et al., 2024). The mini-collaboratives also furnished the DHOs with comparative quarterly progress reports on IPT uptake in all intervention districts, so participants could see how their performance compared to neighbouring districts while generating knowledge-sharing opportunities.

*Theoretical justification.* While a detailed description of the intervention has been published with the primary results elsewhere (Kakande et al., 2022; Johnson-Peretz et al., 2023; Christian et al., 2024), the key theoretical element of the intervention concerns small world theory. Watts and Strogatz (1998) presented a mathematical model of how small worlds result from the creation of ‘short-cuts’ in path length between different actors in a non-regular, non-random network. Path lengths describe the number of nodes one must pass through to connect any two

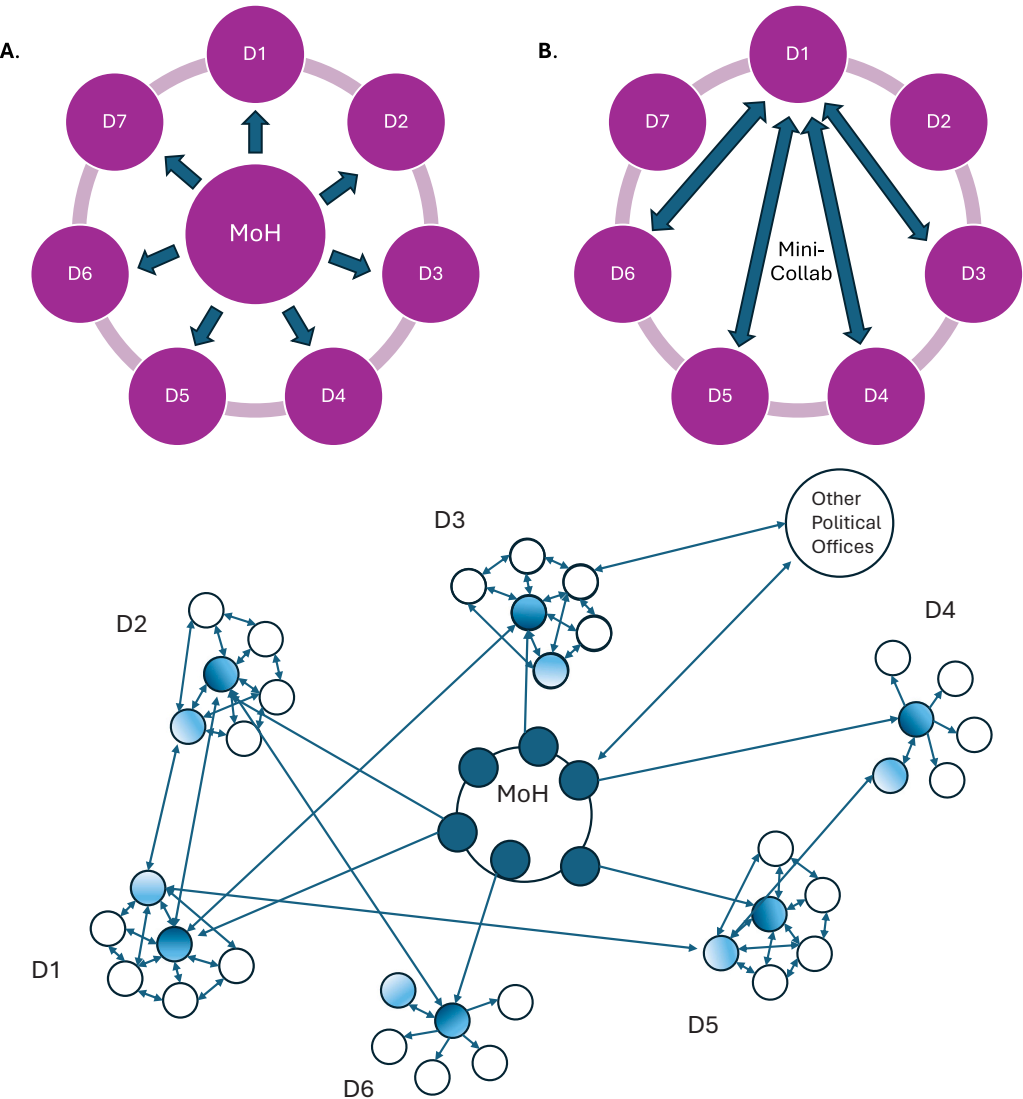


Fig. 1. the caption should be: “Siloed vs Small Worlds in Network Theory.

individuals in the network. When a group of nodes are likely to be connected to one another (e.g. in sharing a friendship group), they call this ‘clustering’ or ‘cliquishness’. Watts and Strogatz noted that as the path length between any two nodes or actors in the network decreases, cliquishness (mathematically termed the “cluster coefficient”) does not necessarily increase; individual actors do not automatically begin to connect with all the other node’s contacts. Nonetheless, the overall network has ‘tightened’ and information passes more quickly between the connected clusters or cliques. In this respect, the ‘short-cuts’ in Watts and Strogatz are similar to ‘bridging weak ties’ described in Granovetter’s work in the 1970s and 1980s on social networks (Granovetter, 1983). For Granovetter, ‘weak ties’ describe acquaintances typical in ‘low-density’ networks; ‘strong ties’ characterise one’s own social circle of friends or co-workers and are more typical of ‘high-density’ networks. Bridging weak ties span the distance between two distinct social worlds, or as Granovetter phrases it, “local bridges <are> ties between two persons that are the shortest (and often the only plausible) route by which information might travel from those connected to one to those connected to the other” (Granovetter, 1983).

Small world theory suggests the random links formed at the collaboratives would speed up dissemination of skills and increase the pace of attitude changes (Uzzi et al., 2007). For our purposes, ‘cliquishness’ or a density of ties would indicate an intra-district working group where most actors know and are connected to one another, while decreased path lengths that result from short-cuts without increase in cliquishness pertain to weaker, inter-district ties. In the flat, horizontal realm of small worlds, we posited that the mini-collaboratives would function as ‘event-based hubs’ promoting the exchange of innovation and its diffusion through weak ties bridging the more closely connected groups within individual districts. In other words, by giving an opportunity for the creation of weak ties to bridge between more closely connected groups, the mini-collaboratives fostered the distributed, horizontal small worlds through which information passes, even though the focus of the collaboratives was on imparting business and leadership skills (Kakande et al., 2022).

*Theoretical caveats.* Importantly, clustering among nodes or individuals does not reliably illustrate power asymmetries among any two individuals connected by a path, and thus may not capture hierarchy well. Nor do small-world networks necessarily distinguish between strong and weak ties (unless ‘cliquishness’ or cluster-coefficients stand in for strong ties), although this can sometimes be inferred by context, as Granovetter’s work on weak ties suggests (Granovetter, 1983).<sup>2</sup> Finally, researchers applying these network theories do not always account for cross-cultural variations in how social networks form and are maintained.

*Qualitative data collection and sampling procedures.* Over a three-year period (February 2019, January 2020, and September 2021), trained qualitative study researchers conducted six two-hour-long focus group discussions (FGDs) with participant observation immediately after the mini-collaborative meetings to evaluate the intervention’s impact. All DHO and DTLs participants were invited to attend the FGDs, each with 7–11 participants, as we have noted elsewhere (Kakande et al., 2022; Johnson-Peretz et al., 2024, 2023; Christian et al., 2024). One FGD in the East region comprised only DTLs; the others included both DHOs and DTLs in the same group. All but two participants were male, similar to the overall health district leadership composition in Uganda. Most participants had been in their position for two or more years. The same researchers conducted in-depth, semi-structured key informant interviews (KIIs), lasting less than 45 min on average, between February and August 2019 and September and December 2020 with 23 control

district key informants at the DHO or DTLs level (out of 77 eligible managers in 39 eligible districts; or approximately 30% of eligible participants).

We used the same selection process for KIIs (control) as for FGDs (intervention), but the KIIs required active outreach, whereas the FGDs leveraged the mini-collaborative days. Coordinators reached out to DHOs/DTLs randomly in each region until reaching saturation and a number roughly similar to FGD participants. We did not conduct focus group discussions among control study participants because the control groups remained individualised (per the decentralised model) during the study; they therefore functioned as a comparison group that attested to the ongoing, non-intervention conditions within the healthcare system. While this approach meant KII participants might focus more on individual challenges or frustrations, and FGD participants on shared norms, both FGD and KII guides developed for this study followed a similar semi-structured interview format (Johnson-Peretz et al., 2023; Christian et al., 2024). All participants answered questions on the TB situation in their district, patient perspectives on preventative therapy, stakeholder engagement, logistics and resources, clinical policies, and in-district communication with both front-line staff and MoH officials. For the FGDs, perspectives on the intervention content and impact were also discussion topics. Questions were informed by, but not limited to, small world theory and questions remained open-ended. We include the guides as [supplementary material](#). Mini-collaborative participants received a travel reimbursement from their home districts to the mini-collaboration venue, while qualitative team members travelled to the control DHO sites to conduct KIIs. All participants gave written, informed consent to participate prior to study activities. FGDs and KIIs were conducted in English, and were developed by one of the study authors (CSC).

*Qualitative analysis.* Ugandan study team members (CA, FA) recorded and transcribed participant conversations, reviewing them for quality assurance before analysis. The second author (CC) also took field notes. The first author (JJP), effectively blinded to the terminology used in the trainings (though not to intended study outcomes) in virtue of being brought onto the study after the FGDs and KIIs were conducted, then analyzed the qualitative data using the RADaR (Rigorous and Accelerated Data Reduction) framework analysis technique (Watkins, 2017), with the initial research question focused on how participants felt about the standard national approach to IPT rollout and their own district-focused leadership skills. The RADaR technique, a systematic and iterative process to inductively identify and condense salient data in the service of a single research question using spreadsheets or word processing software, was chosen because the data set was relatively small and a rapid analysis was necessary for presenting preliminary results to the study leadership (MRK, DVH, GC, CSC) within a short turnaround time. Per standard RADaR technique, data was cut and pasted directly into an initial spreadsheet, pairing interview questions next to responses in separate columns, same row; a parallel column allowed for row-by-row annotation of emergent themes that were then condensed through further iteration of the method. Framework analysis after presentation and group feedback further refined the initially identified themes, as the earlier reduction uncovered broad thematic groups divisible into context (i.e. pre-existing social and physical geography contexts) (Johnson-Peretz et al., 2023), management (i.e. concrete practices participants changed) (Johnson-Peretz et al., 2024), and structure (this article). The ‘structure’ label referenced relations between different levels of the healthcare system or specific roles within it, with particular attention to systemic challenges (see Fig. 2). While the label ‘structure’ was ‘intervention agnostic’, it accounted for agency in the way people work within or around institutional constraints. The focus was not on lessons learned or practices changed (as in the ‘management’ group), but rather on ‘pain points’ (persistent, recurring sources of trouble that cause annoyance) and underlying dynamic *mechanisms* (e.g. information bottlenecks) giving rise to these challenges.

<sup>2</sup> In network diagrammes, one could plausibly use a single line (–) to indicate weak ties and a double line (=) to indicate stronger ties. Similarly, one could use arrows (→, ↔) not only to illustrate the directional flow of information, but also of power in a network.



Further data reduction identified sub-themes within the ‘structure’ group, which we organised around two main areas of interest: 1) DHO communication challenges, including upwards to MoH and downwards to frontline workers; and 2) DTLs- and TB focal person-reported challenges. The first and second authors (JJP, CC) then discussed these findings to prevent overlap between their respective research foci. Although small-world theory informed the design of the mini-collaboratives, its relevance for addressing unintended consequences of decentralising policies was only recognised during this final analysis stage when the first author (JJP) began to more deeply examine the potential origin of the systemic obstacles that fostering small worlds helped overcome. Final analysis of the data thus pursued the research question: Which previously examined middle manager-identified pain points stem from healthcare system decentralisation, and how did intervention participants learn to address these during the SEARCH-IPT trial? The objective this paper pursues, namely, how global health policymakers can manage emergent, centrally directed health programmes within a decentralised context through effectively fostering bridging weak ties to create small-world relationships and horizontal accountability, crystallised from that analysis.

**Qualitative research team.** The qualitative study and writing team consisted of a disciplinarily diverse group of authors based in both Uganda and the United States: medical anthropology (JJP), epidemiology (CC), human geography (CSC), adolescent health (CA), development studies (FA) and clinical medicine (GC, DVH, EK, MRK); all are engaged in public health. The Uganda-based authors (CA, FA, EK, MRK) confirmed interpretations of the data. This ensured that the translation and interpretation of the data respectfully captured the nuances of participants’ voices. All research was approved by the respective IRBs and entities in Uganda (School of Medicine Research and Ethics Committee at Makerere University School of Medicine (2017–116) and Uganda National Council for Science and Technology (HS 233)) and California (University of California, San Francisco (17–22136)).

### 3. Results

In-depth interviews with control group participants and focus group discussions with intervention districts revealed structural dynamics that

hindered the establishment of inter-district bridging ties between their local networks. We present examples of DHOs learning to use their decision-making space to manoeuvre at the mid-management level and create horizontal ties with peers without the risk of vertically re-centralising the healthcare system, addressing obstacles highlighted by DTLs, whose challenges we lay out next. Finally, we show how trial intervention participants overcame the key stumbling block of motivating teamwork in the District Health Team as a whole by strengthening small-world ties through open communication, the results of which DHOs could report to peers at the mini-collaboratives.

#### 3.1. Agency and the creation of small world ties within a decentralised healthcare system

Like with the DTLs role, one challenge in decentralised healthcare systems is a lack of clarity on the extent of the DHO’s power to expand and interpret policy. Overall, participants recognised that the Ugandan healthcare system needs multiple network connexions to function effectively:

“Perhaps at the time when someone was writing this project down, someone looked at the DHOs and considered them key players in service delivery. But you see there are many pieces that have to be moved for services to be delivered. ... you have pushed the piece for the DHOs’ motivation, information ... but there are other pieces that must be pushed. We have talked about the facility in-charges at the lower health units; that is the piece that must be pushed. Individual pieces – for some of you who know the game of chess – there are castles and bishops and queens that must also be pushed at the ministry level and inter-ministerial level because that is where the majority of the decisions are made.” *DHO Intervention*

Coordinating those moving parts, especially when they function at the same mid-tier management level, presented challenges in a decentralised healthcare system context. Among our participants, control districts seemed reluctant to recognise themselves as actors forming a vertical link between policymakers and policy implementers, or the “people on the ground”, including the local communities they served. This compromised both the morals and morale of control-site DHOs when the MOH indicated IPT roll-out to Health Centre IVs (fourth-level health centres) and said nothing about smaller clinics. As control sites reported, their effectiveness in executing these responsibilities was sometimes hampered by a very real lack of resources, including fuel, stationary, air time for phones, and even a computer in the DHO office. In such a context, one control DHO expressed reluctance to creatively implement policy around increasing IPT uptake, citing “the public standing orders section 9: ‘what is not provided, you cannot authorise’” (*DHO Control*). In contrast, the intervention groups became more dynamic when faced with resource constraints:

“We even go beyond where the research study is. I even went beyond where the <Implementing Partners> wanted: they had sampled some health facilities, but for me, I said, ‘I will go everywhere ART is being provided.’” *DHO Intervention*

Intervention sites suggested that they began to exercise their authority more effectively because during the mini-collaborations, they had learned more about their own position in relation to the MoH nationally and to the communities they served locally. In one intervention-group DHO’s words, “the missing link was the organisation and implementation of IPT, the linkage between the man on the ground and the person who is making the policies.” This recognition underscores the need for conscious creation of the multi-directional ties that lead to small-world networks and that foster a sense of accountability that looks not solely upwards to hierarchical superiors (e.g., MoH officials) but also horizontally to the implementing team. Importantly, the empowerment expressed by the intervention group in connecting policymakers with

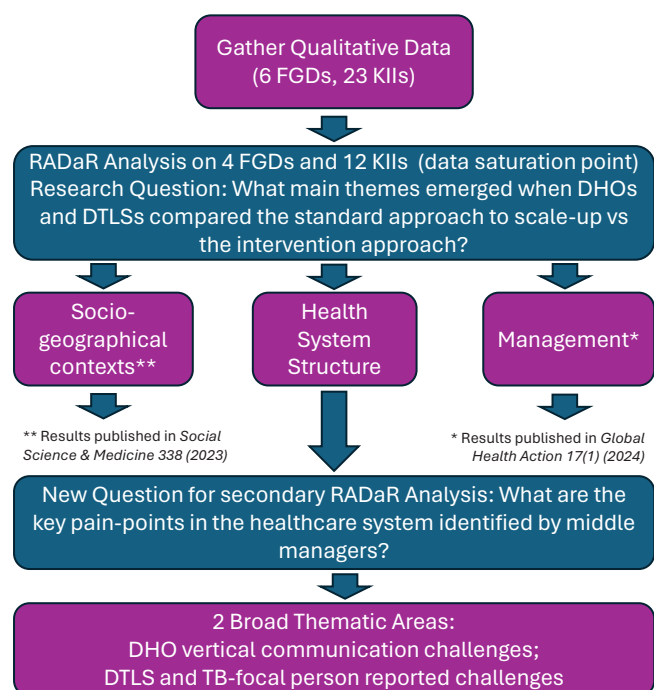


Fig. 2. RADaR Analysis Flowchart.

people on the ground also touched the moral fibre of the DHOs and, thus, their morale. As one control informant noted when raising an ethical question regarding distribution of Isoniazid,

“You remember when we were talking about Isoniazid, that we started implementing it at only Health Centre IVs? But diagnostic centres go beyond Health Centre IVs. Are we unfair to clients who cannot access Health Centre IVs? So, while the policy is okay with it, it has some implications – and that is discrimination.” *DHO Control*

Health centre IVs, being larger than clinics, are generally located in more populous or central areas, but district leaders felt accountable to the people even from the smaller or more distant communities. The intervention group, in contrast to the control group, felt empowered to address that ethical dilemma using the tools they learned through the intervention, without feeling that their team’s agency violated or exceeded policy guidelines.

In contrast to control districts, intervention DHOs gained a sense of ‘implementation confidence’ by improving communication, making presentations to and getting feedback and support from their colleagues, and by subsequently implementing self-initiated sensitivity training for frontline workers. As one intervention arm DTLS put it, “We have shared a variety of challenges and we have also shared experiences on how to overcome such challenges.” Contrasting the SEARCH-IPT mini-collaborations with MOH meetings, one DHO observed,

“I told <a colleague> that your <SEARCH-IPT trial> meetings are more engaging and they are task-oriented because in them you ask many questions, for instance: how, where, and what – among other questions. So in summary, your meetings are engaging, task-oriented, and informative – especially from the presentations that are usually given when the team meets.” *DHO Intervention*

The horizontal accountability to peers in the give-and-take of the SEARCH collaboratives was more productive for innovative policy implementation than a strictly top-down approach had been. The ability of the DHO to create that link with ‘the person-on-the-ground’ seemed compromised when DHOs felt national directives constrained the decision-making space locally. The back-and-forth questioning of fellow DHOs, and especially (mentioned by several participants) the expectation that they will present to their colleagues, gave the DHO an increased sense of efficacy, a sense of one’s actions generating concrete results and affecting others, in the way that learning-by-teaching often does. Through this sort of collaborative approach, the top-down directive widened out at the district level to foster horizontal ties, facilitating greater engagement with local teams and creating the small worlds that decentralising policymakers may have assumed would automatically be present.

### 3.2. Systemic obstacles highlighted by DTLS and TB Focal Person roles

The lessons DHOs reported addressed several DTLS concerns. We uncovered three potential areas of misperception around the DTLS role as highlighted by both DHOs and DTLSs. These areas concerned the DTLS role’s authority, data management and ownership, and competing responsibilities, each associated with unintended consequences from decentralisation and overcome through fostering small world networks and accountability to peers. The associated position of TB focal person, more often found at the frontline level, is a fourth subtheme emerging in the context of the DTLS managerial role.

#### 3.2. .1 DTLS authority

Both control and intervention DTLSs indicated limits to their authority, and both control and intervention participants highlighted the centrality of DHO support for buttressing the authority they did have. Control participants desired DHO accompaniment not only to address this, but also as a way for the DHO to become acquainted with the on-the-ground work performed by the DTLS:

“I am a DTLS. However, the people that I supervise – I do not have absolute power or authority towards them ... So, when a big drum like the DHO talks about something people tend to pick it up. ... Now that would also give us power as the DTLS: you also stand firm because people will hear you because of your boss.” *DTLS Intervention*

#### 3.2. .2 DTLS data ownership

Interviews revealed occasional cross-communication over the exact role of the DTLS around data management, potentially compromising the efficacy of the decentralised model to respond to TB. This included a lack of independent authority, or specifically, a lack of effective ties between DTLSs and the people they supervised. DTLSs reported that DHOs did not always fully appreciate the activities of the DTLS:

“... if I moved with <the DHO>, maybe he would give strength to my visit so that even the people I supervise could feel the importance of it. ... Much as I do that work on behalf of the DHO, at least once in a while, he should be moving out with me so that he also appreciates what I report to him.” *DTLS Control*

Additionally, lack of experience in the field with the DTLS seems to have fueled and been fueled by divergent expectations between the DTLS and DHO about the DTLS role, extending into the realm of data management. The DTLSs understood the role means being a supervisor who must demonstrate ownership of the data, not only by reporting statistics to multiple team members, but also by doing data cleaning and validation. However, when asked if it was the role of the DTLS to manage the TB data, one control DHO noted:

“They <the DTLSs> are not taking part in the data collection, all they do is to get the data from the biostatistician at the end of the month. For example, for orders of IPT, they are supposed to take part because they should be knowing the stocks and all that, but you realise that they are so not into it. <...> Every DTLS should own the data totally and just approach the biostatistician when they get technical challenges.” *DHO Control*

The importance of DTLSs ‘owning’ the data was noted by a control-group DHO who could easily bypass the DTLS for data information by going directly to the biostatistician: “I have not done a study to see how many patients go without INH, but I can get that from the Biostat because it is an indicator that is reported on, on a monthly basis.” Together, the above quotes illustrate a vertical accountability that compromised horizontal connexions and accountability within the district team. The DTLSs suggested that DHOs had developed professional ties with members of the District Health Team in a rather siloed fashion, i.e. one-on-one with the DTLS, one-on-one with the Biostatistician, and one-on-one with the DTLS’s supervisees, rather than fostering a closer network of strong ties between all members of the team.

Although DTLSs could challenge the idea that they are mere data-collectors, both control and intervention DTLS participants desired greater recognition of DTLS responsibility for the data, and allocation of time to realise that responsibility:

“It is not data collection as some people sometimes allege. And now that the reporting has been synchronised into the DHIS <District Health Information Software> tool, we would see the DTLS do the supervision, do the validation, and the information will go to the system. And for you to be able to go and support this facility, then you need time.” *DTLS Control*

After the intervention collaboratives, DHOs in intervention districts subsequently made more effective use of their DTLSs by requesting weekly reports.

“Particularly in my place, we experienced poor capture of TB cases, and as such, I was challenged. Actually, I informed my DTLS to increase the number of engagements we have together with the frontline health workers so that we increase our yield. In so doing, we

also considered IPT as part of the core ingredients of the communication to be passed on to the providers.” *DHO Intervention*

Greater confidence in the ability of the DTLS to manage data also led to a consequent increase in decision-making based on that data, especially in tracking facilities which were not initiating IPT. Giving the DTLS the responsibility for reporting to the entire district health team, with the DHO present, gave the DTLS a more visible role and more authoritative voice, while strengthening the cluster of intra-team horizontal ties necessary for effective rollout and scale up of IPT in the district.

### 3.2. .3 Competing demands

Data management, however, remained only one of several competing responsibilities for the DTLS. This was common to intervention and control districts, who responded similarly in giving the DTLS time to be in facility and in the field:

“We designated the DTLS to have some time so that he can be able to do follow-up in individual health facilities and mentor some new health workers, and then we have redistribution of drugs taking place in our region.” *DHO Intervention*

Importantly, the difference in the approaches taken by control and intervention groups was highlighted by the intervention group giving time for the DTLS to mentor new health workers, an aspect of the role neglected in control districts, yet essential in fostering stronger network ties. In contrast, despite extra time, a control group DTLS implied he did not have the skills to budget time or create timelines, compromising his responsibilities to Implementing Partners. Overwork and a lack of capacity weakened leadership efficacy not only for the DTLS but, by extension, for the DHO as well.

### 3.2. .4 The TB focal person

A DTLS is, first and foremost, a frontline health worker (e.g., a clinical officer assigned to a health facility in the district) who is assigned an additional administrative role on the District Health Team to oversee TB services. When DHOs recognised that TB is not a one-person job, they sometimes brought on a subdistrict TB focal person. One intervention district used specific lessons from the mini-collaborative, building broader buy-in for their vision by engaging people with positive outlooks to build up interest in managing TB:

“In our facility, I had mentored somebody to be like the health subdistrict focal person for TB, but this person went away for school ... But when we had a meeting, I talked about a gap which was there and said we need people to come and support TB management. The only statement I made was that ‘whoever is willing to come and work with me in TB, I am ready to train you.’ And then one person started by showing interest. ... and many people now started coming in; they want to learn how to manage TB patients. So, I want to encourage my colleagues that working with those who are positive will also change the <previously indifferent> attitude of those other people and they will begin coming in.” *DTLS Intervention*

The subdistrict TB focal person in our intervention case presented an opportunity not only to alleviate the overwork of the DTLS, but also to build interest in TB prevention more broadly among the team. By definition, though, a ‘one-man issue’ does not make a small world; creating a small world meant bringing others on board by strengthening ties between district and sub-district levels. Although shared with other managers during the FGD, this seemed to be a unique case among our intervention groups. Nonetheless, intervention groups were explicit about the give-and-take nature of communication with, and data management by, their TB focal persons, highlighting the structural links that role needed in order to function well:

“We tasked the district focal person to keep updating the team, the frontline health workers, on the performance of each health facility

that is participating. So, what he does, he picks up a phone and calls to find out how many have been initiated, and then he summarises that ... and shares <it> on the platform of the health workers.” *DHO Intervention*

The focal person thus coordinated and ‘centralised’ data on behalf of all participants in the district. Control districts, however, seemed not to fully engage the possibilities of such a role, not really delegating responsibility for data coordination to a focal person, though allowing them to report their challenges to the team. For the DTLS participants, the multitude of responsibilities, lack of time management training, and cross-communication with their DHOs combined to create a frustrating but addressable dynamic amenable to multiple solutions once different districts began communicating horizontally.

### 3.3. Small worlds, bridging ties, and accountability links within decentralised settings

Both intervention and control DHOs focused on how open communication was closely tied to a sense of their own power, whether in the face of MOH meetings where they were often passive recipients of knowledge, or (especially for control districts) in terms of uncertainty about the extent of their power to interpret the implementation of those policies. A repeated concern among both control and intervention group DHOs was getting buy-in from frontline staff. While sometimes expressed as ‘downward communication’, participants also framed it as the presence or absence of teamwork among various stakeholders within the district healthcare system; the links of accountability and communication simply were not as strong in an overall decentralised context. Yet the value of teamwork and its relation to morale did not disappear under such conditions, and one control DHO mentioned how seeing things change through teamwork was motivating. When teamwork was missing, however, participants referred to the root issue as an ‘attitude problem’ without a clear solution. The intervention group, though, showed itself able to address teamwork deficits by passing on the lessons they had learned in the mini-collaboratives:

“The most important thing that we did was to get the facility in-charges on board. The special thing that we did was that after our one-day MBA – before we forgot the concepts of customer care, the concepts of quality, and all that – we engaged the facility in-charges and TB focal person. So for us, we got a ‘one-day MBA’ <i.e., the leadership and management training component of the SEARCH-IPT intervention> and we gave them a 3-hour MBA. And it made a difference by the way, because by the time they left, they were all charged up.” *DHO Intervention*

These sites effectively multiplied the types of links among the different members of their teams, in part because the mini-collaborations created horizontal accountability among mid-tier managers. Such multiplication and strengthening of ties, however, was not limited simply to the district team itself: other sites brought on Implementing Partners to help mentor staff and sensitise them to the importance of IPT. Unsurprisingly, when DHOs became more accustomed to presenting ‘horizontally’ to their peers as fostered by the intervention collaborative meetings, those skills also extended in the other direction, improving communication between the DHO and the frontline health workers:

“From the time this project came in up to today, I see a downward communication; that is from the office of the DHO to the frontline health workers, and <it> did not only stop there. It actually went down to the sub-county health workers, and these are people who are very active in contact tracing. That is a reason as to why we are seeing an increase in the IPT uptake. Also, at various points of service delivery, we see the same concern: There is increased health talk on IPT, and also contact.” *DHO Intervention*

Through improved communication, intervention groups encouraged teamwork within their districts, building a denser cluster of networks. A perceptual shift fostered this improvement by no longer attributing personnel attitudes to self-generating apathy, but instead viewing such attitudes as an opportunity for training and sensitisation.

Ultimately, DHOs in the intervention group collaboratively opened up their own decision-making space, while bringing others into the decision-making process. The intervention thus gave district-level managers the confidence to roll out IPT more widely, while providing the tools to create buy-in and motivate their front-line and district teams. This, in turn, fostered the small-world ties that paired transparency with a reciprocal movement in both directions – horizontally and vertically – between actors in their network. In contrast to the unidirectional ties they felt with MOH officials, ensuring that the original purposes of decentralisation could be realised.

#### 4. Discussion

This qualitative study, embedded within an intervention trial that applied small-world theory targeting health-system middle managers in rural Uganda, revealed unintended negative consequences stemming from decentralisation and how the active cultivation of distributed, horizontal networks through mini-collaborative meetings helped solve those issues through information sharing and adoption. Despite the many benefits of decentralisation, rolling out or scaling up healthcare policies in countries with decentralised healthcare systems means engaging with the particular structural biases inherent to decentralisation, including issues of upward and downward accountability (Massuanganhe, 2022; Myrtho Casséus et al., 2022; Mitchell and Bossert, 2010; Ferreira de Sousa et al., 2022; Kamuzinzi, 2016), variability in data quality (Suhail et al., 2022; Lieberman et al., 2009; Heerdegen, 2020; Izudi et al., 2019), and the existence of narrow or unknown decision-making spaces (Mutebi et al., 2025; Heerdegen et al., 2020) – decision-making space being the ability to interpret national policies to suit a local context (Mansour et al., 2022; Bossert and Beauvais, 2002; Dansou and Carrier, 2023). In light of our findings, we suggest moving beyond the upward and downward accountability that researchers in those studies advocate, to include a third dimension: *horizontal accountability*, which we expand on and differentiate from other researchers below (Conteh, 2016; Jarvis and Levasseur, 2015; Schillemans, 2011).

Studies have noted that decentralisation creates a two-levered machine, with power in the hands of the government and the populace. “The big challenge lies in the effort to reconcile these two movements towards common objectives shared collectively” (Myrtho Casséus et al., 2022). From the perspective of our DHO participants, the key problem was a missing link between policymakers and the ‘person-on-the-ground’. Through the mini-collaborative meetings, intervention groups came to realise themselves as the actors who must forge those links and tighten the bonds between smaller clinics and larger district centres, in both vertical and horizontal directions (Suhail et al., 2022; Fonn et al., 2021). This multi-directionality aligns with studies that have stressed the need to strengthen health systems in coordination with each part; scale-up is possible with system-wide coordination even within low-resource and decentralised settings (Heerdegen, 2020; Katahoire et al., 2015).

In this regard, Mansour (2022) recommends that “the transfer of management authority to the local levels should be accompanied by adequate decision-making and management capacities for the health managers to perform better and improve health services,” while Bossert notes that decision space can be widened when DHOs ‘learn by doing’, which is what the mini-collaboratives were intended to encourage (Mansour et al., 2022; Bossert and Beauvais, 2002; Dansou and Carrier, 2023; Kakande et al., 2022; Bossert et al., 2015; Nanyonjo et al., 2020). Such action-oriented training has been shown to improve outcomes in other studies (Ghuman and Singh, 2013; Johnson et al., 2021; Barasa

et al., 2016; Bradley et al., 2012). Conversely, reports from Asia identified a *lack* of capacity development in Nepal and role confusion in Vietnam after decentralisation as reasons why decentralisation of the health system failed (Ghuman and Singh, 2013). In our study, through giving presentations to their peers, intervention groups began to form a culture of leadership development that further strengthened the healthcare system, ensuring that ties operated both horizontally and vertically in both directions rather than merely top-down, enabling the greater participation that is one aim of decentralisation (Fonn et al., 2021; Dansou and Carrier, 2023; Ferreira de Sousa et al., 2022).

Earlier research in both Uganda and Ethiopia among DHOs in rural districts demonstrated that the relationship between DHOs and frontline facilities was key to ensuring high performance at the frontline level (Mansour et al., 2022; Bradley et al., 2012). Although both DHOs and DTLs are considered mid-level managers, the DTLs role appeared to be the most isolated link at the district level in Uganda’s decentralised healthcare system. Thus, the most explicit tightening of the healthcare system network in our study occurred at the frontline within the district, through increased communication between DHOs and frontline facilities including the DTLs. Visible DHO support of DTLs recommendations, either by accompaniment or by giving the DTLs a reporting role in district meetings, helped lend the DTLs needed authority. Additionally, weak ties between DHOs of non-neighbouring districts also helped bridge the local, tightly clustered networks of the district team and create the small worlds we reference. These ties move beyond the phenomenon of engaging (though not creating) pre-existing small networks after district splitting, when child districts sometimes pull personnel from neighbouring districts outside the parent district after splitting to establish their governance committees (Mutebi et al., 2025).

#### Recommendations

Previous studies have highlighted Uganda’s strong performance in decision-making with respect to managing contracts with private providers, implementing partners, and the construction of district hospitals (Mansour et al., 2022; Bossert and Beauvais, 2002; Dansou and Carrier, 2023). Such performance relies on individual skills which can be taught, learned, shared, and improved (Fonn et al., 2021; Johnson et al., 2021). Researchers have noted, however, that mid-level managers are often caught between top-down and bottom-up accountability to the MoH on the one hand and local communities on the other (Massuanganhe, 2022; Mitchell and Bossert, 2010; Heerdegen, 2020; Desta et al., 2020). Including the third dimension of *horizontal accountability* (Mitchell and Bossert, 2010; Fonn et al., 2021) facilitates the movement of information and practices, creating cultures of leadership and the capacity to realise achievable targets. To form a small world where horizontal accountability has meaning, however, links between actors must be actively fostered and developed (Suhail et al., 2022; Fonn et al., 2021; Katahoire et al., 2015; Bradley et al., 2012; Berhanu et al., 2021). It is not enough to break up the old and hidden small worlds to root out corruption and realise efficiency gains through decentralisation (as the World Bank desires), (Kristiansen and Santoso, 2006; Myrtho Casséus et al., 2022; Ferreira de Sousa et al., 2022). Rather, formerly hidden small worlds must be made transparent to collaboratively express peer norms and decision-making space; this is the role of horizontal accountability and a key lesson intervention participants learned, as we have described in more detail elsewhere (Johnson-Peretz et al., 2024).

To excel in the Ugandan health system context, therefore, a central change would be to encourage DHOs and DTLs to develop *horizontal accountability* by sharing lessons and best practices with same-level colleagues from other regional districts in a collaborative, though not re-centralised context. This is an essential part of refining and assimilating knowledge among professions in high-stakes environments (Fonn et al., 2021; Barasa et al., 2016; Klein, 2017). Incorporating short modules like the SEARCH-IPT mini-collaborative trainings into overall health education may also yield positive results by preparing



practitioners entering the field to engage in ongoing collaborative models with their colleagues, as other researchers have suggested (Mutebi et al., 2025; Johnson et al., 2021; Izudi et al., 2019; Tabrizi et al., 2016). Such strategies offer clues to how small networks of weak ties can be sustained, or even more tightly clustered, in newly constituted groups (Mutebi et al., 2025). Similar models have already shown some success in Yogyakarta, Indonesia (Lieberman et al., 2009), and more importantly, can draw on wider African traditions of communal participation.

Collaborative opening-up of decision-making space, as exemplified in the Rwandan pre-colonial concept of *imihigo*, can link vertical accountability with horizontal accountability (Ferreira de Sousa et al., 2022). In 2006, six years after decentralisation, the Rwandan president resurrected the pre-colonial idea of *imihigo* (Sabbi and Ndikubwimana, 2024; Kamuzinzi and Rubyutsa, 2019). While the pre-colonial meaning of *imihigo* concerned warriors vowing to succeed in various tasks in upcoming battles, the new context transformed this into a “self-defined policy target one vows to achieve for the public good”. Generally speaking, the vowed targets do not pertain to ordinary district activities and can draw on the central government for technical advice and additional funding (Sabbi and Ndikubwimana, 2024; Kamuzinzi and Rubyutsa, 2019). Once a goal is vowed, all the components necessary for achieving it are placed in a single file, detailing clear budgets, clear timeframes, and clear intended results, and coordinated by a single focal person who ensures all actors realise their responsibilities (Kamuzinzi and Rubyutsa, 2019). External third parties assess progress and success in accomplishing the stated goals, and these are made public for all to see (Kamuzinzi and Rubyutsa, 2019). Failing to achieve the stated targets results in public shame and a loss of face, as district leaders are accountable to the people and president for what they vowed; accountability is thus intrinsic and reputational (Kamuzinzi and Rubyutsa, 2019). Although district leaders decide what to take up, the system can promote a form of competition among districts to outdo one another in achieving similar but realistic goals (Sabbi and Ndikubwimana, 2024; Kamuzinzi and Rubyutsa, 2019). Other districts may then adopt the practices of successful districts (Sabbi and Ndikubwimana, 2024).

*Imihigo* aligns with African political systems that promote solidarity (Wiredu, 1996) because of the emphasis on ‘unity of work’ (Kamuzinzi and Rubyutsa, 2019), and mutual participation in the realisation of the avowed project (Wiredu, 1996). This means the actors are equal partners and co-creators of a meaningful and realistic outcome (Sabbi and Ndikubwimana, 2024; Kamuzinzi and Rubyutsa, 2019; Okeja, 2022). This solidarity is therefore not without good-natured competition, but such competition is also valued in Uganda, as noted in other studies (Christian et al., 2024; Waiswa et al., 2021). Because of the decentralised context in which *imihigo* thrives, it aligns with the concept of subsidiarity (Behr, 2020) seen in African systems that promote consensus-building before acting (Wiredu, 1996). Some theorists have argued that post-deliberation consensus is not the ideal; rather, such consensus should also be generative of agency (Okeja, 2022), which aligns with one example of horizontal accountability in Manitoba (Canada), where the goal was to institutionalise reciprocity, or in our context, ‘to enable becoming, in the sense of ... a more viable response to the situation’ (Okeja, 2022). The types of deliberation examined by these theorists (Wiredu and Okeja) also alter the context and meaning of Bossert’s ‘decision-making space’, but such an analysis is beyond the scope of the current paper.

While the Bunyankole in Uganda have historically not been as enthusiastic about consensus as some other ethnic groups in Africa (Wiredu, 1996), our participants did discuss sensitisation to IPT as a pivotal catalyst in their work. Such sensitisation is a prerequisite for consensus-building and the ‘conceptual creativity’ underlying the sort of innovation the *imihigo* system – and the mini-collaboratives – promote (Sabbi and Ndikubwimana, 2024; Okeja, 2022). The baraza system in Uganda has also proven to facilitate information flows, speed the

completion of delayed projects, and increase public participation in their realisation (Van Campenhout et al., 2019).

Although some models advocating horizontal accountability aim to increase democratic control, this varies depending on the agency’s mandate (Schillemans, 2011). Even as *imihigo* may promote managerialism over decentralisation per se, it is well suited to district level contextualisation (Kamuzinzi and Rubyutsa, 2019). Such an approach meshes well with the mandate of public health at both district and ministry levels, which require a certain degree of bureaucratic accountability.

The nature of horizontal accountability is to provide stimuli for learning (Conteh, 2016; Schillemans, 2011; Okeja, 2022). Our mini-collaboratives, the *imihigo* system in Rwanda, the baraza system in Uganda, and inter-agency horizontal accountability systems in the Netherlands all show increases in the information sharing phase of accountability mechanisms (Schillemans, 2011; Van Campenhout et al., 2019). While such environments can also foster participation via increased agency after often public deliberation, as Okeja (2022) in particular argues, this should not be conflated with democratic control. *Imihigo* works well with public peer accountability and inter-institutional cooperation. It is suited to the formal mechanisms of both bureaucratic and democratic systems of vertical accountability, but also thrives in situations of horizontal and peer accountability (Kamuzinzi and Rubyutsa, 2019). The different levels of collaboration and power sharing (Jarvis and Levasseur, 2015) align well with different levels of peer accountability (Kamuzinzi and Rubyutsa, 2019), though accountability in the *imihigo* system is intrinsic and reputational, in contrast to European and Canadian models (Jarvis and Levasseur, 2015; Schillemans, 2011). Because of the reputational component inherent to *imihigo*, it functions best in contexts where honour and face are important. In contexts such as the Westminster adversarial political system, where blame is more important than face, it may not function as well; even the European parliamentary system of coalition formation, contrasted with traditional African systems of ‘deliberative agency’ and consensus-building, may not be the ideal contexts for *imihigo* to thrive, (Sabbi and Ndikubwimana, 2024; Conteh, 2016; Wiredu, 1996; Okeja, 2022). Even so, the *imihigo* system permits a degree of criticism of the government in contexts where such criticism is otherwise challenged (Sabbi and Ndikubwimana, 2024).

Our control districts evinced similarities to the pre-*imihigo* situation in Rwanda, and intervention districts, like the post-*imihigo* system, thought outside the box and strengthened teamwork in ways that promoted investment in the stated outcomes, reducing rigid hierarchies between principals and actors (though hierarchies did remain in our groups) (Kamuzinzi and Rubyutsa, 2019). Nevertheless, while our regional mini-collaboratives bear some similarities to the *Imihigo* system, two salient differences remain. First, the DHOs did not decide to take upon themselves scale up of IPT in their districts; this was rolled out either nationally or via our intervention. Second, ours could be considered ‘soft *imihigo*’ in that the mini-collaboratives motivated more flexible implementation in ways that the *imihigo* system does not permit (Sabbi and Ndikubwimana, 2024); relational contracts, as implemented in Manitoba, Canada, may prove a useful model for such ‘soft *imihigo*’ (Conteh, 2016). Similarly, consequences to reputation were not as strong as in Rwanda. In part, this is because of the nature of MoH projects and district accountability to them. Nonetheless, like in the *Imihigo* system, DHOs committed to scale-up of IPT beyond the usual previous district activities, consolidated the project as a district team, saw how their districts compared to other districts regionally on the basis of external assessments, and learned from the successes of high-performing districts. The inter-district weak ties created by the mini-collaborative meetings also helped tighten the intra-district teams.

Coincidentally, and due to the need to increase IPT reach among PLHIV in Uganda, this study overlapped with a sudden national scale-up of IPT (Kiggundu, 2019), providing a ‘natural experiment’ showing how targeted training and national scale-up campaigns work differently in

the context of a decentralised national healthcare system *without* intentionally-created small worlds. Intervention sites showed sustained change in IPT initiation (across 5 quarters or 15 months follow-up) after the 100-day government push ended (Kakande et al., 2022), suggesting that by addressing these demonstrated weak spots via the conscious fostering of horizontal information flows and peer accountability may lead to more sustainable outcomes after centralised, national pushes – like Tuberculosis Preventive Therapy in Uganda – come to an end.

In this context, the cost of sustaining should be mentioned since, depending on the degree of fiscal decentralisation, ongoing costs should be incorporated into annual district budgets and accounted for before district splitting (Mutebi et al., 2019, 2025). In our study, as we have noted, “holding mini-collaborative meetings in subsequent years with local business consultants would have cost \$11 638 per year. Intervention cost per district was \$3 716 in year 1 and \$1 433 in each subsequent year,” meaning that the costs to individual districts decrease over time (Kakande et al., 2022). To ensure this approach is fiscally valued, district epidemiologists can share the return-on-investment in life-years for the population and per-capita savings either district-by-district or regionally at regional meetings. This would promote collective moral investment in the work and align with some indigenous African approaches to participatory decision-making.

## 6. Limitations and future directions

Despite the commonalities with communal governance traditions in other parts of the continent, this study's findings, focused strictly on rural Uganda, may still be of limited generalizability. Even within Uganda, we included only 61% of the total number of districts; our findings may thus not be representative of urban areas or districts in the northern region. However, multiple regions face unintended consequences stemming from decentralisation, and the conscious fostering of small-world networks through bridging ties to same-tier peers may help overcome these challenges. We did not, however, explore how the participants' gender may have affected the formation of such ties.

Similarly, we did not set out to identify which challenges DTLs specifically faced; rather, we intended to examine the effects of the intervention on improving communication between mid-level managers and their teams. The focus group discussion format with the intervention groups, especially the one with DTLs alone, may have provided DTLs participants with the solidarity necessary to speak frankly about their shared experiences, even though such social contexts introduce the possibility of a social desirability bias (i.e. only talking about positive perceptions related to the intervention). This solidarity may in turn have resulted from increased trust from the collaborative meetings in which they had been taking part with their colleagues from other districts, and contrasts with the limitations of the individual control group KIIs, who as mentioned, may have been more prone to focus on individual frustrations than on shared norms despite answering similar IDI-guided questions. Nonetheless, we approached data with caution, and both control and intervention DTLs mentioned similar challenges.

Finally, on a theoretical level, although we mentioned cultural contexts, small-world theory potentially, though not necessarily, ignores different challenges resulting from geographic context (i.e. urban, peri-urban, rural) and terrain, and how cultures of network building may differ in those three geographic zones. It may also overlook what facilitates or constrains links from crossing these geographic divides. Future research might take these gaps into account, especially for urban/rural spillover situations and political arrangements. Similarly, although the study saw sustained changes in IPT initiation rates after the intervention ended (Kakande et al., 2022), suggesting that efforts to create small worlds need not entail large expenditures of money or time to be effective (rather, they require intention and sharing of best practices), we do not know for how long those small-world ties continue to exist. A longitudinal study, therefore, presents an opportunity for future research.

## 7. Conclusion

Regional mini-collaborative meetings to impart management lessons strengthened the clustering of horizontal small-world network ties at the previously relatively siloed mid-tier health systems manager level, providing opportunities to form bridging weak ties among districts within a region and to tighten intra-district small-world clusters. Inculcating horizontal accountability through expected presentations to peers, publicly-shared district rankings, and exchanging best practices at the district level during targeted leadership training of this oft-neglected tier solved problems inadvertently created by decentralisation. Ensuring horizontal accountability to peers and simultaneous vertical accountability to the MoH and local communities bears similarities to indigenous African concepts of governance, agency, and accountability in ‘soft imihigo’ style and warrants deeper exploration on the continent.

## List of abbreviations

DHO: District Health Officer(s)

DHT: District Health Team(s)

DTLS: District Tuberculosis and Leprosy Supervisor(s)

HC IV or Health Centre IV: Health Centre, Level Four. (For reference, Health Centre IIs are outpatient clinics staffed by nurses; Health Centre IVs are more like small hospitals with the ability to admit patients, carry out emergency operations, and are overseen by senior medical officers.)

HIV: Human Immunodeficiency Virus

IP: Implementing Partner

IPT: Isoniazid Prevention Therapy

MoH: Ministry of Health

PWH: People living with HIV

TB: Tuberculosis

## Declarations

### Ethics approval and consent to participate

All research was approved by the respective IRBs and entities in Uganda (School of Medicine Research and Ethics Committee at Makerere University School of Medicine (2017-116) and Uganda National Council for Science and Technology (HS 233)) and California (University of California, San Francisco (17-22136)). All participants gave written consent to participate prior to study activities, per our description in the methods section. The UCSF ethical review board considers a range of ethical guidelines: <https://irb.ucsf.edu/regulations-statutes-guidance>. Specifically, the following codes/ ethical standards were used by the UCSF IRB in review of this study: The Belmont Report, Office of Human Research Protections (OHRP): Protection of Human Subjects 45 CFR 46.

## Trial registration

NCT03315962 Registered 20 October, 2017.

## Author's information / Reflexivity statement

The writing team consists of a disciplinarily diverse group of authors: medical anthropology (JJP), epidemiology (CC), human geography (CSC), and clinical medicine (remaining authors); all are engaged in public health. The first and second authors are junior team members, and at the time of writing the second and third authors were PhD students in global health. The first author works closely with third and fourth authors (CA and FA) on this and other studies; both are based in Uganda. Along with the other Uganda-based senior authors (EK, MK), they confirmed interpretations of the data. This ensured that the translation and interpretation of the data respectfully captured the nuances of participants' voices. The researchers acknowledge that some may

disagree with our interpretations on the basis of their differing experiences of the same environments as well as differing disciplinary backgrounds.

### CRedit authorship contribution statement

**Elijah Kakande:** Writing – review & editing, Supervision, Investigation, Funding acquisition. **Carol S. Camlin:** Writing – review & editing, Supervision, Funding acquisition. **Moses R. Kanya:** Supervision. **Fred Atwine:** Project administration, Investigation, Data curation. **Gabriel Chamie:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Diane V. Havlir:** Writing – review & editing, Supervision, Funding acquisition. **Canice Christian:** Writing – review & editing, Project administration, Investigation, Data curation. **Jason Johnson-Peretz:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Cecilia Akatukwasa:** Project administration, Investigation, Data curation.

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### Declaration of Competing Interest

No authors have competing interests.

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### Consent for publication

All authors have reviewed and consented for this manuscript to be published. No identifying images, personal details, or clinical details of participants are present in the manuscript.

### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ssmhs.2026.100279](https://doi.org/10.1016/j.ssmhs.2026.100279).

### Data availability

Data is available upon request, but is not publically available due to confidentiality concerns.

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