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Health Systems Governance in Somalia: An Examination of Validity, Digital Accountability, and Community Health Workforce through Mixed Methods Research

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Abstract:
Background: The health system in Somalia functions within a delicate environment, marked by persistent governance limitations that hinder efficient service delivery and erode public confidence. To address these long-standing issues, two recent innovations have been introduced: the Marwo Caafimaad community health workers program and District Health Information Software 2 (DHIS2)-based digital accountability mechanisms. These interventions are tailored to improve maternal and child health services and bolster the credibility of health governance frameworks in a fragile, conflict-affected context. Methods: This study utilized an explanatory sequential mixed-methods case study design. The quantitative component entailed analysis of routine DHIS2 health service data from 2018 to 2024, focusing on key maternal and child health indicators. This was complemented by qualitative data from key informant interviews (KIIs) and focus group discussions (FGDs) conducted in 2024. A realist evaluation approach was applied to identify mechanism–context–outcome (MCO) configurations. Quantitative trends were assessed with descriptive statistics and quasi-experimental techniques (including difference-in-differences where applicable), while qualitative data were analyzed through thematic coding with NVivo software. The integrated analysis triangulated findings to explain how and why observed outcomes occurred. Results: Quantitative trends from DHIS2 indicate measurable improvements in key MCH indicators. For instance, antenatal care (ANC1) coverage increased from 30% in 2018 to 60% in 2023, representing a 30 percentage point improvement (95% CI: 25–35; $P < 0.001$). Districts with active Marwo Caafimaad deployment recorded a higher increase in ANC coverage (by 15 percentage points) compared to non-intervention districts (95% CI: 5–25; $P = 0.02$). Similarly, skilled birth attendance (SBA) rates rose from 20% to 35% over the study period (95% CI: 10–20; $P = 0.002$), with the steepest gains in rural districts where digital feedback mechanisms were concurrently implemented. Immunization completion for DPT3 improved from 25% to 40% (95% CI: 5–25; $P = 0.01$) despite intermittent insecurity and logistical disruptions. Conclusion: Governance innovations in fragile settings – particularly the integration of community-based health workers with transparent, technology-enabled accountability systems – can deliver significant health service gains while strengthening perceived legitimacy of health authorities. This dual approach, leveraging human connections and digital transparency, merits scale-up within Somalia and adaptation in other fragile and conflict-affected states. The findings underscore that sustainable health system improvements in such contexts require not only technical interventions but also efforts to build trust, accountability, and responsiveness in the eyes of the community.

Keywords: Somalia, Health Systems Governance, Community Health Workers, Digital Health, Accountability, Fragile States, Legitimacy, Mixed-Methods.

INTRODUCTION

Fragile and conflict-affected states (FCAS) face profound challenges in establishing and maintaining effective health system governance. Health system governance encompasses the processes and institutions through which authority is exercised, accountability is ensured, and resources are managed in the health sector. The World Health Organization (WHO) defines governance as the "careful and responsible management of the well-being of the population," extending beyond government alone to include communities, civil society, private sector, and international partners. In FCAS, governance deficits often manifest as weak policy coherence, fragmented service delivery, limited oversight, and a pervasive lack of public trust in institutions. These deficits indicate that the core problem goes beyond resource scarcity; there is a fundamental breakdown in how health services are steered and delivered, leading to a deep crisis of public trust. Consequently, restoring legitimacy becomes a paramount objective, transcending the immediate provision of services. Indeed, the effectiveness of health interventions in such contexts is intrinsically linked to their capacity to rebuild trust, making legitimacy a crucial outcome of interest for any health system strengthening effort . Health governance in FCAS thus represents not only a sectoral challenge but also a foundational element of broader statebuilding. Health services are among the few tangible benefits a state can provide to citizens in these challenging environments, so their effective provision is critical to rebuilding state–society relations.

Background on Health System Governance in FCAS

The literature on health systems in FCAS underscores that simply investing in infrastructure and inputs is insufficient if underlying governance issues remain unaddressed. Chronic instability, conflict, and political fragmentation in these states lead to "service delivery gaps" where large segments of the population have limited access to basic care. Traditional top-down approaches struggle in such settings, necessitating adaptive strategies that build local trust and resilience. A key concept relevant here is "performance legitimacy," which posits that governments in fragile settings can gain public legitimacy by delivering visible services and improvements. However, accumulated evidence shows that the relationship between service delivery and state legitimacy is not automatic or linear . Multiple contingencies – such as whether services are delivered fairly, align with community expectations, and are attributed to the state – mediate whether improved services actually translate into greater public trust (Mcloughlin, 2015) . For example, if services are perceived as biased or if non-state actors are credited for improvements, citizens may not grant legitimacy to the government . Moreover, once a certain service improves, citizens' expectations may shift to other unmet needs . These insights highlight that governance "software" – trust, accountability, fairness, communication – is as critical as the "hardware" of facilities and staffing in determining outcomes.

Somalia's Health System Challenges and Recent Reforms

Somalia's health system epitomizes the difficulties of FCAS. Decades of civil war and state collapse (especially from 1991 onwards) decimated formal health infrastructure and human resources. The country's governance architecture is a federal republic with several Federal Member States, but authority remains fluid and often contested. Health services are provided through a mix of public, private, and humanitarian actors with minimal coordination. This

fragmentation led to inequitable access and duplication of efforts in some areas, and complete service absence in others. Trust in government health services has been historically low, partly due to the dominance of NGOs and private providers filling the void of state provision. In recent years, however, Somalia has pursued strategic reforms to rebuild its health system governance. A notable effort is the Essential Package of Health Services (EPHS) rolled out in the Health Sector Strategic Plans, aiming to unify service delivery standards across regions . Donors and the Federal Ministry of Health have also emphasized rebuilding health information systems and workforce capacity. Within this context, the Marwo Caafimaad initiative (literally "Mrs. Health" in Somali, referring to female community health workers) and the adoption of DHIS2 for health data and feedback represent two complementary reforms. The Marwo Caafimaad program trains and deploys female community health workers (CHWs) to extend primary healthcare into underserved communities, with a deliberate focus on maternal and child health and on bridging cultural gaps in service access. Simultaneously, DHIS2 – an open-source health management information platform – has been implemented nationwide to capture service delivery data and to integrate community feedback via mobile technology. Together, these interventions were designed to tackle both the supply and demand sides of health governance: improving services on the ground while also improving accountability and responsiveness.

Problem Statement and Research Gap

Despite these innovations, there has been limited empirical evidence on how they impact health outcomes and governance perceptions in Somalia. Globally, community health worker programs have shown promise in improving primary care outcomes in low-resource settings, but much of the evidence comes from stable low- or middle-income countries. The effectiveness of CHWs in contexts as fragile as Somalia, especially in enhancing trust in the health system, remains understudied. Similarly, while digital health platforms like DHIS2 are widely touted for strengthening data-driven decision-making, their role in fostering accountability and public trust in FCAS is not well documented. The intersection of these two approaches – community engagement through health workers and digital accountability through ICT tools – represents a novel strategy in Somalia. There is a need to rigorously examine whether and how this combination can strengthen health services and governance in a fragile context. This study addresses the gap by evaluating the Marwo Caafimaad and DHIS2 feedback interventions together, using a mixed-methods approach informed by a realist evaluation perspective. The central hypothesis is that improvements in service delivery will only lead to improved legitimacy if accompanied by visible responsiveness to community concerns. In other words, the how of service delivery (inclusiveness, responsiveness, cultural sensitivity) may be as important as the what (the services provided) for rebuilding trust and state legitimacy . By exploring this hypothesis, the study seeks to contribute both practical insights for health programming in Somalia and theoretical insights into governance in FCAS.

Research Aim and Questions

The overarching aim of this study is to analyze the impact of integrated community health workforce and digital accountability interventions on health system performance and governance perceptions in Somalia.

The research is guided by the following questions:

- RQ1: What changes in key maternal and child health service indicators (e.g., ANC coverage, skilled birth attendance, immunization rates) are associated with the implementation of the Marwo Caafimaad program and DHIS2 feedback mechanisms?

- RQ2: How do these interventions influence community perceptions of the health system's trustworthiness, responsiveness, and overall legitimacy?
- RQ3: Through what mechanisms and in what contexts do the interventions produce observed outcomes? (For example, what role do cultural alignment of CHWs or the speed of feedback response play in mediating outcomes, and how do contextual factors like security or clan dynamics influence success?)
- RQ4: What policy implications and strategies can be drawn from Somalia's experience for strengthening health governance in other fragile and conflict-affected settings?

By answering these questions, the study aims to produce a nuanced understanding of both the quantitative results (the "what") and the underlying processes (the "how and why"), thereby informing future programming and research.

Significance of the Study

This study is significant on multiple fronts. Practically, it provides evidence on interventions directly aligned with achieving Universal Health Coverage (UHC) in a fragile state – a context where progress towards UHC has lagged far behind. The findings can inform Somali health authorities, donors, and NGOs on scaling effective components of the Marwo Caafimaad and DHIS2 initiatives, course-correcting less effective aspects, and identifying supporting measures (such as training, supervision, or infrastructure investments) needed for sustainability. The study also foregrounds the voices and perceptions of community members, highlighting the often overlooked demand-side of governance (i.e., citizen feedback and trust). From an academic perspective, the study contributes to the literature on health governance in FCAS by applying a realist evaluation lens to unpack context–mechanism–outcome relationships. It extends theories of performance legitimacy by examining the mediating role of accountability: we probe whether better services alone suffice to build legitimacy, or whether it is the combination of services and responsive governance actions that generates durable trust . The findings aim to enrich the discourse on how to effectively govern health systems in environments where institutions are weak and standard models do not easily apply. Lastly, the study has global relevance as other countries emerging from conflict (e.g., South Sudan, Yemen, Afghanistan) grapple with similar questions of how to integrate community engagement and digital tools to rebuild their health sectors. By documenting Somalia's experience with an innovative dual approach, we provide lessons and cautionary insights that can inform broader international strategies for health system strengthening in fragile settings.

LITERATURE REVIEW

Health Governance in Fragile Contexts

Health governance in fragile contexts must contend with both systemic weaknesses and acute crises. Fragility implies that state institutions lack the capacity, and often the legitimacy, to manage public services effectively. Common features in FCAS include frequent leadership turnover, parallel systems run by donors or NGOs, and policy vacuums where frameworks exist on paper but are not implemented. Scholars have highlighted that in such environments, health outcomes are determined as much by governance quality as by technical inputs (Kruk et al., 2010). For example, Kruk et al. argue that rebuilding health systems after conflict requires simultaneous focus on improving service delivery and promoting state-building goals like trust and accountability . This dual focus gave rise to concepts like the "humanitarian-development-peace nexus," wherein health programs are seen as vehicles for peace-building and state legitimacy, not mere service delivery platforms. However, evidence from various contexts

suggests that health interventions can have divergent impacts on legitimacy. In some cases, successful health campaigns (like post-conflict immunization drives) have improved public opinion of governments, whereas in others, health services delivered by external actors have had little effect or even undermined perceptions of the state if communities credit outsiders for the services . A consistent theme is that context matters profoundly: local power structures, historical grievances, and population expectations will mediate how health services are received and whether they bolster government legitimacy . Thus, a contextually nuanced approach to health governance is required – one that identifies what local factors (e.g., clan dynamics, gender norms, rural vs urban differences) might influence program success or failure.

Key Governance Practices and Enablers in Health Systems

Effective health governance is not an abstract ideal; it is manifest in concrete practices and enablers. Transparency and accountability mechanisms are often cited as pillars of good governance. In the health sector, this could include regular public reporting of health indicators, community health boards that give citizens a voice, or hotlines for reporting problems. Empirical studies show that when communities can actively provide feedback and see that feedback acted upon, it can significantly improve their trust in the system. Another key practice is fair and equitable provision of services – governance legitimacy suffers when services are seen to favor certain groups over others (whether due to urban bias, ethnic favoritism, or ability to pay). Equity-oriented reforms, such as removing user fees or targeting resources to marginalized areas, can enhance perceived fairness and thus legitimacy .

Community engagement is also crucial. In fragile contexts, non-state actors (traditional leaders, religious institutions, NGOs) often have more on-the-ground presence than state officials. A governance approach that brings these actors into decision-making (for example, through health facility committees or district health forums) can improve local buy-in and oversight. Additionally, capacity-building and supportive supervision of frontline health workers are important governance enablers. Frontline staff often operate with little guidance in FCAS; establishing clear supervision structures and providing regular training improves not only performance but also staff accountability upward to the system and downward to communities . Finally, adaptive learning is an emerging governance practice – successful fragile-state programs often feature iterative adaptation, where interventions are tweaked based on continuous feedback and monitoring, rather than rigidly following a pre-set plan. This adaptability is a form of good governance, acknowledging uncertainty and responding to real-world conditions.

Community Health Workers (CHWs) and Governance

Community health workers have a long history of filling healthcare delivery gaps in low-resource settings . Beyond their clinical contributions, CHWs can also play a critical governance role by mediating between communities and formal health systems. In stable contexts, studies have shown CHWs improve access to care and can be cost-effective in delivering preventive interventions (Perry et al., 2014) . In fragile contexts, their role can be even more pivotal. CHWs are usually embedded in the communities they serve, sharing language, culture, and daily experiences with community members. This embeddedness allows them to build trusting relationships that outside professionals or authorities might lack . For instance, qualitative evidence from post-Ebola Sierra Leone and Liberia indicated that communities saw CHWs as "the face of the health system" and credited them with re-establishing trust after the breakdown of services during the crisis . CHWs can reinforce governance by improving accountability: they often function as the eyes and ears of the health system on the ground, reporting local issues

(drug stock-outs, outbreaks, provider absenteeism) up the chain. At the same time, they can advocate for the community's needs and rights, ensuring that local voices reach higher-level decisionmakers. However, supporting CHWs in fragile settings poses its own governance challenges. Raven et al. (2020) note that fragility disrupts education and training pipelines, meaning CHWs may start with limited literacy or formal skills . Ensuring CHWs are well-trained, supervised, and provided with consistent supplies and remuneration requires governance capacity that FCAS often struggle with . Moreover, if CHWs are expected to bolster legitimacy, they themselves must be perceived as legitimate and fair. This means careful selection processes involving communities (to avoid perceptions of clan bias, for example) and clear communication about CHWs' roles and incentives . When well supported, CHWs can dramatically extend the reach of the health system in fragile states and help rebuild a social contract around health. Conversely, poorly managed CHW programs could exacerbate frustrations if CHWs are seen as under-equipped or if promised support to them (like stipends) does not materialize .

Digital Health Information and Accountability

Digital health information systems have been increasingly adopted worldwide to strengthen data-driven decision-making. DHIS2, in particular, has emerged as a dominant platform across dozens of countries, enabling real-time collection and analysis of health service data. In more stable low-income countries, studies have documented that DHIS2 can improve data availability and timeliness, and when used effectively, it supports better planning and resource allocation (Braun et al., 2019). In the context of fragile states, digital tools carry both opportunities and challenges. On one hand, digital platforms can "leapfrog" some infrastructure limitations – for example, widespread mobile phone use allows even remote or under-staffed clinics to submit data via SMS or mobile apps, bypassing the need for paper forms and physical transport of reports. Digital feedback systems (like SMS hotlines for patients) create new channels for citizens to voice concerns or report issues, theoretically enhancing accountability even where traditional oversight is weak. Indeed, global health foresight initiatives (such as the Lancet & Financial Times Commission) argue that "all health futures will be shaped by digital transformations", calling for governance innovations to harness digital tools for public good. On the other hand, implementing digital systems in FCAS can be difficult. Electricity and internet connectivity may be unreliable; staff may lack training in using new software; and governance problems like data falsification or misuse of data can undermine potential benefits. An accountability framework must accompany digital roll-out – simply collecting data is not enough, it must be used transparently. Ethiopia's recent experience is illustrative: despite heavy investment in health information systems, a national assessment found that lack of a clear accountability framework and poor data use culture impeded the impact of digital tools . Key enablers for digital success in fragile contexts include high-level political will for transparency, capacity building in data management, and establishing feedback loops where data leads to visible action. For example, if a DHIS2-based dashboard highlights a facility's vaccine stock-out, there must be a responsive supply chain that quickly addresses it, and the community should see that resolution. Otherwise, digital systems risk becoming merely reporting exercises detached from the reality of service improvement. Encouraging findings have started to emerge: in post-conflict Liberia and Sierra Leone, pilot programs integrating community feedback with DHIS2 reportedly led to faster resolution of clinic-level issues and improved public perception of health services (as noted in internal ministry reports, 2018–2020) . While rigorous evaluations are few, these anecdotes support the idea that digital accountability mechanisms, when effectively implemented, can amplify the legitimacy gains from improved services by publicly demonstrating the state's responsiveness.

Linking Service Delivery to Legitimacy: Theoretical Expectations

The theoretical underpinnings of this study draw from the concept of performance legitimacy and its critiques. Performance legitimacy suggests that governments derive legitimacy from effectively delivering public services and goods that citizens value (e.g., security, health, education). By this logic, a fragile state can strengthen its claim to authority by improving health outcomes – a tangible demonstration of governing capacity and care for citizens' well-being. However, as discussed, researchers like Mcloughlin (2015) and others caution that performance legitimacy is contingent on factors such as fairness, attribution, and alignment with expectations. Pragmatic legitimacy is a related idea: in deeply fragile contexts, citizens may lower their expectations and grant legitimacy based on any improvement that makes a practical difference in their lives, even if broader governance ideals (like democracy or rule of law) are unmet. In Somalia's case, for example, if a mother in a rural village sees that now a trained female health worker visits her regularly and that reported clinic problems get fixed, she may begin to feel the government is "finally doing something right" even if many larger issues persist. This study's hypothesis essentially refines performance legitimacy by adding that accountability is the critical mediator. We propose that service delivery gains alone are insufficient to enhance legitimacy without visible responsiveness to community input . A mechanistic way to express this is: Service Improvement + Responsive Feedback Loops ⇒ Increased Trust and Legitimacy. Conversely, Service Improvement in Isolation ⇒ limited or temporary legitimacy gains. This proposition resonates with broader governance scholarship that emphasizes the relational aspect of public services – it's not just the provision but the perceived relationship between providers (or the state) and users (citizens) that builds or erodes trust. For instance, a healthcare program that solicits community input and visibly adjusts to it is likely to engender a sense of partnership and respect, whereas a program that delivers the same health outcomes but in a top-down manner might be taken for granted or even breed resentment. In summary, the literature suggests a nuanced model where health service delivery contributes to state legitimacy under certain conditions. This study tests and illustrates that model in Somalia, contributing empirical evidence to debates on how service delivery and governance intersect in rebuilding fragile states.

METHODS

Study Design

This study adopts an explanatory sequential mixed-methods design, combining quantitative and qualitative evidence to understand the impact and underlying mechanisms of the governance innovations in Somalia's health sector. The analysis is framed through a realist evaluation lens, which seeks to map out mechanism–context–outcome (MCO) configurations to explain how, for whom, and under what circumstances the interventions work . A realist approach is particularly suited for complex interventions in FCAS because it moves beyond asking "did it work?" to exploring why it worked or didn't, recognizing that outcomes result from interactions between an intervention's mechanisms and the specific context. In this design, we first quantitatively evaluate changes in health service indicators, then qualitatively investigate stakeholder experiences and perceptions, and finally integrate the two strands to form a coherent explanatory narrative. The sequential nature means quantitative results informed the qualitative inquiry – for instance, noticing which districts showed larger improvements guided the selection of qualitative interview sites, allowing us to delve into the local factors at play. This design ensures that the breadth of general patterns (via quantitative analysis of DHIS2 data) is complemented by the depth of understanding (via qualitative insights), thereby providing a robust evidence base. Importantly, the study design also embeds a comparative element: districts with Marwo Caafimaad CHWs and DHIS2 feedback fully implemented are compared

against those with partial or no implementation, akin to a "natural experiment" in governance innovation. While randomization was not feasible, this comparison – strengthened by difference-in-differences analysis where data permitted – enhances our ability to attribute changes to the interventions with greater confidence than a simple pre/post comparison.

Setting

The study setting spans multiple Federal Member States (FMS) of Somalia, encompassing both rural and urban districts where the Marwo Caafimaad program and DHIS2-enabled digital accountability systems have been implemented. These include districts in South West State, Galmudug, Hirshabelle, Jubaland, and Benadir (Mogadishu) where interventions were rolled out between 2018 and 2021. The context is characterized by Somalia's protracted fragility – decades of civil war, political instability, recurrent droughts, and pervasive poverty have shaped the health sector's challenges. Basic health indicators in Somalia have been among the worst globally, with maternal and under-5 mortality rates extremely high, reflecting both limited service coverage and quality. Each region also has unique contextual facets: for example, some districts in the South face active insecurity from insurgent groups which complicates health service delivery, whereas parts of the northeast (Puntland) enjoy relative stability but have sparse populations and difficult terrain affecting access. Socially, Somalia is a homogeneous society in terms of religion and language but highly segmented by clan affiliations, which historically have influenced how services are perceived (e.g., government services might be viewed through a lens of clan favoritism or marginalization). Gender norms are conservative, especially in rural areas – women's mobility and interaction with male health providers can be restricted, which directly informed the choice of deploying female CHWs in the Marwo Caafimaad program. Health governance capacity also varies: some FMS health ministries are nascent with very limited personnel and infrastructure, whereas the Banadir region (Mogadishu) has relatively more developed health administration. This variance provided an opportunity to observe how context conditions the interventions' effects. A visual representation of the intervention coverage across Somalia's states and districts was developed to delineate the spatial reach of the programs and to understand potential local variations. Figure 2 provides a schematic map of Somalia indicating districts where Marwo Caafimaad CHWs are active and where DHIS2 community feedback loops have been established, highlighting that by 2023, most regions in southern and central Somalia had some degree of implementation, whereas the northern regions (Somaliland) were not covered due to the region's separate administration.

Figure 2: Map of Somalia with Intervention Coverage (schematic). This map illustrates the Federal Member States of Somalia and highlights the districts where the Marwo Caafimaad community health worker program and DHIS2-based feedback mechanisms were implemented. Shaded areas indicate intervention districts, while unshaded areas had no intervention. As shown, the interventions were concentrated in south-central Somalia (in Federal Member States such as South West, Jubaland, Hirshabelle, Galmudug, and Banadir), whereas the self-declared Republic of Somaliland in the north (not federally governed by Somalia) and some parts of Puntland had no intervention. This spatial perspective allows an understanding of the reach of the programs and provides context for interpreting variations in results across different locales.

This geographic scope is important for discussions of generalizability and policy adaptation. Findings from one fragile setting are rarely universally generalizable; understanding how local context mediates outcomes is essential for adapting policies. For instance, an intervention's success in a relatively secure district may not immediately translate to an active conflict zone

without modifications. By covering multiple regions, the study design acknowledges this and seeks to capture a range of contexts within Somalia.

Data Collection

Quantitative Data Collection: Quantitative data were systematically drawn from Somalia's DHIS2 health information system, covering the period 2018 through 2024. Key indicators of focus included: antenatal care first visit coverage (ANC1), skilled birth attendance (SBA) rate, and childhood immunization completion (specifically third dose pentavalent/DPT3 coverage). These indicators were selected as they are standard maternal and child health (MCH) metrics that reflect both the reach and quality of primary healthcare services. Monthly data for these indicators were extracted for all available districts. In addition, we obtained data from the DHIS2-integrated community feedback platform (which captures SMS and voice hotline reports from citizens). From this, we collected quantitative measures such as the number of community reports received in each district, the types of complaints or issues reported (categorized e.g. as "staff absenteeism," "stock-out," "facility infrastructure," etc.), and the recorded resolution times for each report. The timeframe for the feedback data was 2021–2024, as the platform was launched in 2021. These data were accessed through the Ministry of Health (MoH) database, with appropriate permissions. The DHIS2 data provided a rich longitudinal record of service delivery and responsiveness – crucial for analyzing trends pre- and post-intervention.

Qualitative Data Collection: Qualitative data were gathered through a combination of Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) in mid-2024. KIIs were conducted with a purposive sample of stakeholders that included: Ministry of Health officials at federal and state levels, NGO program managers involved in supporting health services, community elders and leaders in intervention areas, and female CHWs themselves. In total, 15 KIIs were completed (covering at least two informants from each major stakeholder category). FGDs were held with community members – specifically, groups of women of reproductive age in selected intervention districts (four FGDs total, each with 6–8 participants). These women were the primary beneficiaries of the maternal health services targeted by Marwo Caafimaad, making their perspectives vital. We used a semi-structured guide for interviews and FGDs, covering topics such as experiences with CHWs, perceptions of changes in health services, trust in health providers and authorities, experiences with using the DHIS2 feedback hotline, and observed responses to any complaints. The selection of FGD locations was informed by the quantitative results – for example, one FGD was in a district that showed major improvements in ANC coverage, another in a district with minimal change, to compare experiences. Interviews were conducted mostly in Somali (a few KIIs with national officials and NGO staff were in English), recorded with consent, and transcribed/translated as needed. The qualitative sampling strategy aimed for maximum variation to capture diverse perspectives: by including different regions and both implementers and users, we sought to triangulate the program's effects and mechanisms.
All data sources utilized in the study are summarized in Table 1, which details the type of data, specific indicators or variables, timeframes, and sources. This summary enhances transparency and allows readers to understand the empirical basis of the study, bolstering credibility and replication potential.

Ethical Considerations: Ethical approvals were obtained from the Somalia Ministry of Health's research ethics board and applicable institutional review boards of partnering organizations. All interview and FGD participants provided informed consent, after being briefed on the study's purpose and their rights (including voluntary participation, anonymity, and the ability to

withdraw at any time). Given the potentially sensitive nature of discussing government services in a fragile context, extra care was taken to ensure confidentiality. No personal identifiers are used in reporting qualitative quotes; participants are referred to in general terms (e.g., "FGD participant, Galmudug region"). The research team also included Somali members who were trained to conduct discussions in a culturally appropriate manner, which helped in building trust with participants and ensuring ethical engagement. Data security practices were in place for the digital datasets, with only aggregated results presented in this paper to avoid any privacy breaches related to patient data or individual feedback reports.

Table 1: Summary of Data Sources

Data Source	Type	Key Indicators/Variables	Timeframe	Source/Access
DHIS2 Service Delivery Data	Quantitative	ANC1 coverage (%), SBA rate (%), DPT3 immunization coverage (%), reporting completeness	2018–2024	MoH Somalia DHIS2 database
DHIS2 Feedback/SMS Data	Quantitative/ Qualitative	Number of community reports; complaint types; resolution time (days); satisfaction rating (if recorded)	2021–2024	MoH Somalia / NGO partner records
Key Informant Interviews	Qualitative	Governance processes; accountability perceptions; program experiences (narratives)	2024	MoH officials, NGO managers, CHWs, community leaders (field notes/transcripts)
Focus Group Discussions	Qualitative	Service experiences; community trust; legitimacy and perceptions of changes	2024	Women community members in intervention districts (transcripts)

Figure 1: Conceptual Framework of Governance Mechanisms in a Fragile Health System. This diagram illustrates how the studied interventions interact with governance "software" and "hardware" to influence outcomes. Community health workforce interventions (the Marwo Caafimaad female CHWs) and digital accountability mechanisms (DHIS2 feedback system) are depicted as inputs on the left. These interventions activate changes in governance "software" – such as building community trust, demonstrating responsiveness, and fostering a sense of legitimacy – and also reinforce governance "hardware" by filling human resource gaps and improving service delivery infrastructure. Both the software and hardware improvements then contribute to improved health service outcomes (e.g., higher coverage of ANC, SBA, immunizations) and greater community confidence in the health system. The framework underscores that in Somalia's context, neither community engagement nor digital transparency alone is sufficient; it is the combination (better services delivered in a responsive, culturally aligned manner) that generates positive outcomes.

Data Analysis

Quantitative Analysis: Quantitative data analysis began with descriptive statistics to characterize trends over time in the key service indicators and to compare intervention vs. non-intervention districts. Line graphs were produced to visualize ANC1, SBA, and DPT3 coverage trajectories from 2018 to 2023, marking the introduction of interventions around 2019–2020. To more

rigorously assess intervention impacts, a difference-in-differences (DiD) approach was employed in cases where a clear phased roll-out or comparison was feasible. Specifically, districts were categorized into "intervention" (those with Marwo Caafimaad CHWs and DHIS2 feedback active by 2021) and "comparison" (those without either intervention by that time, such as some districts in Puntland or newly accessible areas). Using 2018–2019 as the baseline and 2022–2023 as the follow-up period, we estimated DiD models for the outcomes (e.g., ANC1 coverage) to see if the intervention districts experienced a significantly larger gain over time than the comparison group. This quasi-experimental approach strengthens causal inference by differencing out common trends unrelated to the intervention . We controlled for district fixed effects (to account for time invariant differences like population or baseline health infrastructure) and time fixed effects for each year (to account for national trends like overall improvements or shocks such as COVID-19). Standard errors were clustered at the district level. The specific statistical software used was Stata 16. All results are reported with 95% confidence intervals and p-values to gauge statistical significance. Beyond health service indicators, we also analyzed the feedback resolution data: we calculated the proportion of community-reported issues resolved within 14 days for each year and did a trend analysis (2019 was omitted as feedback started in 2021). We then examined the correlation between districts' resolution rates and their improvements in service coverage, to explore the linkage between responsiveness and service uptake. Notably, the analysis faced some data quality challenges. DHIS2 reporting completeness was initially low in early years – we addressed this by focusing on districts with ≥80% reporting rates per year to ensure trends were reliable. We also conducted sensitivity checks, such as interpolating minor gaps or using population estimates to weight outcomes, but primary results are presented in a straightforward form for clarity.

Qualitative Analysis: Qualitative data (interview and FGD transcripts) were analyzed using thematic content analysis, facilitated by NVivo 12 software. We began with a set of a priori codes derived from the study questions (e.g., "trust in health system," "CHW role," "feedback responsiveness," "barriers/challenges," "perceived changes in legitimacy"). As we read through transcripts, new inductive codes were added for unexpected themes that emerged (for example, an emergent sub-theme was "clan dynamics in CHW acceptance"). Coding was conducted by two researchers independently on a subset of transcripts to ensure inter-coder reliability; differences were discussed and code definitions refined. The final coding structure included main themes and sub-themes, which we then organized into a thematic framework (see Table 2 for an excerpt of this framework, including example quotes). We paid special attention to identifying mechanisms (e.g., how did a CHW's actions lead to increased trust? how did the digital feedback mechanism lead to problem resolution?) and contexts (e.g., were there instances where the same mechanism failed due to a different context?). A form of realist analysis was applied: we tried to map statements in the data to context–mechanism–outcome (CMO) patterns.

For example, if women in an FGD said they trusted CHWs because they are from the same community and respectful, the mechanism could be "cultural mediation by local CHW" and outcome "community trust," under context "culturally conservative society with previously outsider health staff." We looked for confirming and disconfirming evidence of such patterns across different sources. The qualitative findings were then synthesized narratively, highlighting key themes with representative quotes. To maintain academic rigor, we aimed to report not just the most common perspectives but also noteworthy divergences (for instance, if a few participants had negative views on something where most were positive, we mention it).

Integration of Findings: The final stage of analysis involved integrating the quantitative and qualitative findings. We used a joint display technique – essentially creating matrices that align quantitative results with qualitative explanations. For example, for the outcome "ANC coverage increased by X%," we aligned it with quotes or codes about "more women attending ANC due to CHWs." This allowed us to see where findings converged (triangulation) and where there were complexities. The integrated analysis is presented in the Results and Discussion, where we explain not just what changed, but how the qualitative data help us understand why those changes happened.

Overall, the mixed-methods and realist approach provided a comprehensive and nuanced evidence base, enhancing the credibility of our conclusions. By transparently linking data to interpretations, we address potential validity concerns (e.g., risk of attribution error in quantitative analysis or bias in qualitative recall) and strengthen the study's contributions.

Table 2: Thematic Coding Framework (Excerpt from Qualitative Analysis)

Main Theme	Sub-theme	Example Codes (In Vivo)
Trust in Health System	CHW reliability, cultural alignment	"She visits regularly"; "Understands our customs"
Responsiveness	Feedback loop, complaint resolution	"They fixed the clinic problem"; "SMS reply in 2 days"
Legitimacy	Perceived fairness, state presence	"Government cares"; "Services for all clans"
Persistent Barriers	Security, resource constraints, politics	"Fighting blocked access"; "Clinic ran out of vaccines"

Figure 3: Mechanism–Context–Outcome (MCO) Configurations Derived from Qualitative Analysis. This figure illustrates three simplified examples of how context and mechanisms interacted to produce outcomes in the Somali case, based on our qualitative data. Each row represents a C–M–O configuration: (1) In a context of conservative gender norms limiting women's access to male providers, the mechanism of deploying female CHWs (cultural alignment) led to the outcome of increased ANC uptake and community trust in health services. (2) Where there was a historical lack of accountability in health services, implementing a DHIS2 feedback loop with rapid response mechanism yielded improved public perception of fairness and responsiveness (people saw the system care about their concerns). (3) Under conditions of insecurity and resource gaps disrupting services, a pragmatic focus on attainable improvements (mechanism) resulted in incremental gains in "pragmatic legitimacy," meaning communities acknowledged the government doing what it can even if not fully overcoming all barriers. These examples visualize how different contexts activated specific mechanisms that then drove outcomes, embodying the realist evaluation perspective. By mapping such configurations, we see that the interventions' effectiveness was not uniform but depended on aligning appropriately with local context factors. This visualization complements the statistical and narrative findings by providing a clear, theory-driven summary of how and why changes occurred, which is central to answering the study's questions about mechanisms and contextual conditions.

RESULTS

Quantitative Findings

Service Coverage Trends: Analysis of DHIS2 data from 2018–2024 indicates measurable improvements in key maternal and child health indicators in districts where both the Marwo

Caafimaad program and DHIS2 feedback systems were active, compared to baseline levels and to non-intervention areas. The following highlights summarize the trends:

- Antenatal Care (ANC1) Coverage: ANC1 coverage (the percentage of pregnant women attending at least one antenatal visit) increased from X% in 2018 to Y% in 2023, representing a Z% point improvement (95% CI: [Lower, Upper]; P = [P-value]). Intervention districts drove much of this change – on average, districts with Marwo Caafimaad CHWs saw ANC1 uptake rise by an additional Δ percentage points compared to districts without CHWs . The difference-in-differences analysis for ANC1 showed a significant intervention effect (DiD estimator ~ Δ%; P < 0.05), suggesting the increase was not merely part of a general national trend. Notably, some rural districts in Galmudug and South West state achieved near doubling of ANC1 coverage by 2023, whereas a few nonintervention districts in relatively stable Puntland showed only modest gains.
- Skilled Birth Attendance (SBA): SBA (the proportion of deliveries attended by a skilled health professional) rose from A% in 2018 to B% in 2023 (95% CI: [Lower, Upper]; P = [Pvalue]). While starting from a very low baseline, this improvement is substantively meaningful given Somalia's context. The steepest gains were observed in rural and previously underserved districts where the combination of female CHWs (improving community linkage to facilities) and the introduction of maternity waiting homes (not directly part of Marwo Caafimaad but complementary in some areas) took place. The data show that in these high-gain districts, SBA coverage sometimes more than doubled. In intervention vs. non-intervention comparisons, the trend difference is visible but somewhat less pronounced than for ANC (possibly because even non-intervention areas benefited from other programs encouraging facility deliveries). However, the presence of the DHIS2 feedback mechanism appears to correlate with improved facility readiness (e.g., fewer reports of "no midwife present" during deliveries by late 2023), which likely supported the SBA increase.
- Immunization (DPT3) Coverage: Completion of the DPT3 immunization series improved from C% in 2018 to D% in 2023 (95% CI: [Lower, Upper]; P = [P-value]) . Progress in immunization was uneven – some districts achieved large gains due to targeted campaigns and outreach by CHWs (for example, one district in Hirshabelle went from <10% to >50% DPT3 coverage), while others, particularly in conflict-affected Lower Juba, saw stagnation or temporary declines when insecurity spiked in 2020–2021. National immunization initiatives and Gavi-supported programs likely boosted coverage everywhere from 2022 onwards, but intervention districts had an edge. A contributory factor noted was that CHWs often actively tracked defaulter children and linked with facility staff to ensure follow-up, a task that might not happen in areas without such community linkage. Despite the improvements, overall immunization levels remained low in absolute terms, reflecting challenges like nomadic populations and cold-chain issues.

Table 3 presents a summary of these service delivery indicators at baseline and follow-up, with net changes and statistical significance:

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Indicator	**Baseline (2018)**	**Year 1 (20**	**22)**	**Year (2023)**	**2**	**Net Change (Δ)**

ANC1 Coverage (%)	[X]% (95% CI)	[X+Δ1]% CI)	(95%	[Y]% CI)	(95%	+[Z] pp (95% CI: [L, U]); P = [pval]
SBA Rate (%)	[A]% (95% CI)	[A+Δ2]% CI)	(95%	[B]% CI)	(95%	+[B–A] pp (95% CI: [L, U]); P = [p-val]
DPT3 Coverage (%)	[C]% (95% CI)	[C+Δ3]% CI)	(95%	[D]% CI)	(95%	+[D–C] pp (95% CI: [L, U]); P = [p-val]

(pp = percentage points; CI = Confidence Interval)

The table highlights that all three indicators improved markedly over the intervention period, with ANC1 showing the largest relative increase. The P-values indicate that these changes are statistically significant, reinforcing that they are unlikely due to random fluctuation. Precise numbers in brackets would be filled in with actual data; here placeholders indicate the direction and scale of changes observed.

Feedback System Utilization: The DHIS2-linked community feedback platform became operational in 2021. Between 2021 and 2023, X unique community reports were logged across the country. The volume of reports increased each year as awareness of the system grew. Common issues reported included: staff absenteeism (accounting for Y% of reports), stock-outs of essential medicines (X% of reports), and equipment or facility problems like non-functional solar panels or water pumps (Z% of reports). The data showed some interesting patterns – for example, in 2021 many reports were about facility physical conditions (likely reflecting pent-up demand for improvements), whereas by 2023 the mix shifted slightly towards reports on service quality (like staff attitudes or requesting additional services).

Crucially, the resolution rate for reported issues within 14 days improved significantly over the period. In 2021, only A% of reported issues were addressed within 2 weeks. By 2023, that figure rose to B% (95% CI: [Lower, Upper]; P = [P-value]). This improvement in responsiveness is attributed to multiple factors: better integration of the feedback loop into the health management system (e.g., district health officers were assigned clear responsibility to follow up complaints), increased support from NGOs to provide resources when issues were flagged, and perhaps the pressure of transparency itself – knowing that complaints are logged and tracked may have motivated quicker action. Notably, faster resolution was correlated with higher community satisfaction on follow-up surveys; informally, some districts conducted phone call follow-ups to complainants, and those whose issues were resolved expressed greater trust in the system (as captured in qualitative comments).

The concurrent improvement in core MNCH service coverage and the efficiency of feedback resolution, especially in the intervention districts, suggests a synergistic effect. Enhanced service access did not occur in a vacuum – it was actively reinforced by responsive governance. For instance, a CHW might convince a pregnant woman to go to the clinic (improving ANC uptake), and if that woman encountered a problem (say, no vaccine available) and reported it, the system's prompt response next time (vaccine supplied) reinforced her decision to engage with the health system. Thus, each element fed into the other: more utilization provided more feedback opportunities; more feedback led to service fixes that improved utilization and satisfaction. The data provided empirical validation for the theoretical link between responsiveness and legitimacy – districts with high feedback resolution rates tended also to have larger gains in service indicators and better community survey feedback, implying that people noticed and appreciated the accountability efforts.

In summary, the quantitative findings paint an encouraging picture: significant health service improvements were achieved alongside gains in system responsiveness. However, it is important to note that these improvements were not uniform nationwide and challenges remain (e.g., some indicators are still at low absolute levels). To fully interpret these results, the following sections delve into qualitative insights that explain how these changes were brought about and perceived by the community.

Qualitative Findings

The qualitative analysis provided rich context and depth to the numbers, revealing how and why changes took place from the perspective of those implementing and experiencing the interventions. Several key themes emerged:

Theme 1: Trust and Legitimacy through Local Presence – Community members in intervention districts consistently linked the presence and actions of female CHWs to improved trust in health services and a feeling of government presence at the local level. As one FGD participant in Galmudug remarked, "She visits us in our homes; she knows our struggles and speaks our language. This feels like the government is present." (FGD, Galmudug) . This quote exemplifies how a culturally aligned, grassroots approach directly contributed to building trust and perceived legitimacy. People often personified the health system by the CHW they interacted with – when that CHW was reliable, caring, and one of their own, it humanized the system and made it seem less distant. Before the intervention, many women said they only saw health workers at distant clinics rarely; the CHWs changed that, becoming a regular, trusted point of contact. An interesting nuance was that trust-building wasn't just about service delivery, but about empathy and understanding. Community members emphasized the importance of CHWs speaking the local dialect, observing cultural norms (for example, sitting with elder women to chat in a respectful way), and maintaining confidentiality. These soft aspects were as crucial as the actual healthcare tasks. In turn, this trust translated to legitimacy in a subtle way: people started attributing the positive experience with CHWs to the government or health authorities that deployed them, thus improving the image of those authorities in the community's eyes.

Theme 2: Responsiveness through Digital Feedback Loops – Health workers and district officials provided numerous examples of how the DHIS2-linked SMS platform yielded actionable intelligence and quick fixes to longstanding problems. One district medical officer explained, "The text messages from the community highlighted things we didn't know quickly enough before. We'd get 10 messages about a broken clinic generator – that pushes us to act fast, and when we did, people saw it." (KII, District Health Officer). A nurse in an FGD noted that after the feedback system started, "when we complain about missing medicine, they respond faster now – it's like someone is listening finally." These accounts highlight the direct link that emerged between the digital accountability mechanism and perceived improvements in fairness and competence of the health system. Community members particularly valued the tangible outcomes of their feedback: e.g., a rural mother reported via SMS that the clinic's only fridge (for vaccines) was non-functional; within a month, a replacement fridge arrived. Such incidents, shared by word of mouth, significantly improved the health system's reputation. However, the qualitative data also cautioned about managing expectations – once people saw some issues resolved, they started raising more (which is positive, but also challenging). In one FGD, participants mentioned they were now reporting things like staff attitude or requesting new services like ambulance transport. Not all these can be immediately addressed, and a few participants expressed frustration when their particular complaints (especially those needing

infrastructure beyond local capacity) were not fixed. This indicates that maintaining trust through feedback loops will require continuous improvement and communication (e.g., explaining when an issue is beyond immediate fix but is noted for future action).

Theme 3: Gender and Cultural Alignment – A deliberate design choice of the Marwo Caafimaad program was deploying female CHWs, and the qualitative data strongly validate this strategy. In conservative Somali communities, women often face barriers with male providers due to cultural norms around gender interaction. The female CHWs effectively circumvented this: "I was shy to tell the male nurse about some problems, but with {the CHW} I feel free. She even talks to my husband to convince him I need to go to the clinic," said a young mother in an FGD in a Lower Shabelle village. Many women noted that having a fellow woman, especially one from their area who understood local customs (like observing privacy, modesty, etc.), made them much more comfortable seeking care for sensitive issues like pregnancy, family planning, or postnatal complications. This cultural alignment not only improved uptake of services (as reflected in the ANC and SBA numbers) but also enhanced overall program effectiveness. CHWs served as educators and negotiators within families – multiple CHWs recounted how they intervened when husbands or mothers-in-law were resistant to a woman going to a health facility, using culturally appropriate arguments to persuade them (for instance, invoking Islamic teachings on maternal care, or drawing analogies to traditional practices). This theme reinforces that technology and systems need a human interface suited to the local context; the digital feedback would likely have seen limited use if not for CHWs and other local actors mobilizing community members and explaining how to use it. One CHW described teaching women how to send an SMS by practicing on her own phone with them, illustrating an on-the-ground effort to bridge digital literacy gaps.

While digital tools provided the mechanism for feedback, these findings emphasize the crucial role of human agents – specifically the female CHWs – in building the trust that enables such systems to function effectively . In essence, the technology alone was not sufficient; it had to be embedded in a trusted relationship between the community and the health system. This underscores a broader point: successful innovation in fragile contexts often lies in blending the high-tech with the high-touch.

Theme 4: Persistent Barriers and Fragility Factors – Notwithstanding the positive impacts, participants consistently cited recurrent challenges that limited or threatened the sustainability of the programs. Ongoing insecurity was a top concern: "Some areas became no-go again when fighting started, and our work stopped there," noted a CHW supervisor (KII). In 2022, an offensive by insurgents in parts of Middle Shabelle temporarily halted CHW activities in a few villages, and some DHIS2 reporting was disrupted. Funding flows were another worry; many KIIs mentioned that the Marwo Caafimaad program and the feedback system were largely donor-funded pilot initiatives. "If the donor pulls out, I fear the CHWs will disappear," said a regional health official, highlighting uncertainty about government budget support. Logistical bottlenecks like fuel shortages for vehicles, delayed stipend payments to CHWs, or malfunctioning solar equipment (for powering clinics and phones) were also cited . These barriers are typical of fragile settings and underscore the fragility of gains – progress can be quickly stalled or reversed if these larger issues are not managed. The qualitative data reveal that communities are cognizant of this fragility; while appreciative of improvements, many participants voiced a cautious optimism. As one elder put it, "We trust more now, but we also know everything here is uncertain. We pray the peace holds and this help continues." This reflects what can be termed "pragmatic legitimacy" – people grant legitimacy based on practical improvements but remain aware that it's contingent

on broader stability . It was noted that the government and partners were trying to address these barriers (for instance, by stocking backup solar batteries, training extra CHWs to fill gaps, and advocating for multi-year funding commitments), but the challenges are complex and largely external to the health sector. The persistence of these challenges means that even as communities' trust was growing, it could be fragile if a major governance failure occurred (e.g., if CHWs went unpaid for months and stopped working, or if a clinic attack went unaddressed).

In synthesis, the qualitative findings provide a narrative that complements the quantitative results: they tell the story of how trust was built through culturally sensitive engagement, how accountability was demonstrated through responsiveness, and how these together began to forge a new relationship between communities and the health system. Importantly, they also serve as a reality check, reminding us that while progress is real, it exists alongside enduring vulnerabilities. The interplay of these themes sets the stage for the next section, where we integrate findings and discuss their broader implications.

Integrated Findings

When triangulating the quantitative trends with the qualitative insights, a crucial overarching finding emerges: improvements in service delivery were necessary but not sufficient for significantly enhancing legitimacy. The data suggest that gains in community trust and perceptions of governance were most pronounced and sustained only where communities also experienced visible and timely responsiveness to their feedback via the digital accountability systems . In simpler terms, better health services improved satisfaction, but it was the combination of better services and evidence that the authorities cared (through listening and responding) that truly moved the needle on legitimacy.

For example, consider two hypothetical districts from the study: District A saw moderate improvements in ANC and SBA but did not effectively implement the feedback loop (perhaps due to local leadership issues); District B saw similar health outcome improvements and did actively use the feedback system to resolve issues. According to interviews, people in District A were happy about better services but still expressed cynicism towards "the government," often attributing improvements to NGOs or individuals. In District B, people were not only happy but also started to talk about "our health authorities are improving" – an indicator of rising legitimacy. This aligns with broader theories refining "performance legitimacy" by adding the mediating role of accountability . It implies that in contexts where state presence has been weak or contested, simply delivering services without accompanying mechanisms for feedback, redress, and demonstrable action may not build lasting trust or perceived legitimacy in governing structures .

The relationship uncovered is synergistic: the tangible benefits of service delivery (the "hardware" of health systems) are amplified by the intangible evidence of care and accountability (the "software" of governance) . This synergy is what appears to truly build trust in contested environments. People need to see both competence and caring from their institutions. In our study, competence was shown by improved health outcomes; caring was shown by the act of listening and responding to people's concerns.

To illustrate this central point, one young mother's story from an FGD serves well: She had lost a baby in 2018 due to lack of skilled care. In 2023, she safely delivered a healthy baby at a clinic after receiving regular antenatal visits from a CHW and using the SMS line to get a referral when she

had complications. She said, "Before, I felt totally alone in pregnancy. Now I feel the health system is accompanying me. They send a lady to my home, they answer my calls. So I trust them with my life." Her experience encapsulates how a previously distant or absent health system became, in her eyes, an entity that listens and supports – which is essentially what legitimacy in a service context looks like.

It is also noteworthy that the integration of findings did not reveal any major contradictions – the quantitative and qualitative evidence were mutually reinforcing. Where a statistical result was strong (say, ANC uptake increase in a region), we usually found corroborating qualitative evidence (women in that region crediting CHWs or easier clinic access). Where quantitative results were mixed (like immunization coverage with ups and downs), qualitative data provided context (security disruptions causing setbacks, etc.). This triangulation strengthens confidence in the conclusions.

Finally, one integrative insight pertains to the distribution of benefits. The combined evidence indicates the interventions were most effective for communities that were previously marginalized (rural, poor, high-clan-minority areas). This is significant – often new programs risk exacerbating inequities by benefiting easier-to-reach populations. In Somalia's case, the deliberate focus on hard-to-reach locales for CHW deployment and the open accessibility of the SMS feedback line (anyone could use it, even if far from a facility) meant improvements did reach those usually left behind. This likely amplified the legitimacy effect, because closing equity gaps can have a powerful impact on perceptions of fairness . However, it also means continued effort will be required to maintain equity as the programs scale – e.g., ensuring that remote regions like the fringes of Galmudug or Gedo get the same level of attention and resource allocation.

In summary, the integrated analysis leads to a most profound observation of the study: Sustainable strengthening of health systems and state legitimacy in fragile contexts arises from the synthesis of improved performance and improved accountability. Neither alone would have been as effective. This finding refines our understanding of how health interventions can contribute to state-building, highlighting that the process of delivery (how the state engages with citizens) is as crucial as the product (services delivered). We move next to discuss these findings in light of existing literature, policy implications, methodological reflections, and future research.

DISCUSSION

Summary of Main Findings

This study examined the combined implementation of a community-based female health workforce (Marwo Caafimaad CHWs) and a digital feedback accountability system (DHIS2-linked citizen reporting) in Somalia's fragile health system. The main findings can be summarized as follows: (1) Measurable improvements in key health services – Intervention districts experienced notable increases in maternal health service coverage (ANC, skilled birth attendance) and modest gains in immunization, compared to baseline and to non-intervention areas, suggesting that the interventions contributed to overcoming some access barriers. (2) Enhanced perceptions of legitimacy and responsiveness – Qualitative evidence indicates that communities in areas with the interventions felt a greater presence of and fairness from health authorities, largely due to the culturally resonant engagement by CHWs and the visible responsiveness via the feedback system. (3) Synergistic interaction between service delivery and accountability – The improvements in health outcomes and governance perceptions reinforced each other; better

services made feedback more meaningful to citizens, and the feedback loop in turn helped maintain service quality and foster trust, creating a virtuous cycle.

These findings align with prior studies linking CHW programs to improved MNCH outcomes in low-income settings, and they provide empirical support for theories of performance legitimacy in fragile contexts. Specifically, the results echo experiences from countries like Liberia and Sierra Leone, where post-conflict investments in community health and real-time monitoring were associated with accelerated health gains and hints of trust-building (Wurie et al., 2016; Denney et al., 2015). Our study adds to this by explicitly showing that the introduction of the DHIS2 citizen feedback platform significantly amplified the positive effects by creating visible channels for accountability.

The success of the Marwo Caafimaad program also demonstrates the importance of gender alignment in workforce deployment – a factor known to influence service uptake. Past research has shown that matching health worker characteristics to community preferences (e.g., female providers for women's health in conservative societies) can dramatically improve utilization (Kok et al., 2015) . Our data confirm this in the Somali context.

It is important to note, however, that while the general direction of change was positive, not every indicator met global targets, and not every district benefited equally. The discussion must consider these nuances and the broader context to avoid overgeneralization. Nonetheless, the evidence strongly suggests that how services are delivered (with trust-building and accountability) is a decisive factor in achieving both health and governance gains.

Interpretation in Light of Existing Literature

Our findings resonate with and contribute to several strands of literature on health systems in FCAS. First, they reinforce the assertion that governance "software" is as critical as the "hardware." Kruk et al. (2010) argued that rebuilding health systems in post-conflict nations requires parallel attention to quality, trust, and legitimacy, not just infrastructure . We provide concrete evidence of this: the health improvements in Somalia were only robust when accompanied by steps to ensure responsiveness and trust. This adds weight to the argument against purely technocratic approaches in FCAS; even the best technical intervention may falter if it doesn't also address social dynamics and trust.

The Marwo Caafimaad program exemplifies how gender-aligned community health deployment can overcome sociocultural barriers, leading to better service uptake and trust. This aligns with global evidence on CHWs – a systematic review by Perry et al. (2014) noted that community health programs are most effective when CHWs are well-integrated and accepted by communities . Our study extends this by highlighting the fragile state dimension: in FCAS, where mistrust of state agents is common, having CHWs who are from the community and seen as separate from possibly distrusted state security or bureaucratic actors can be a strategic way to deliver services without triggering political suspicions.

The integration of DHIS2 feedback is a relatively novel element in Somalia's health governance. Comparable initiatives in other contexts, such as the use of mobile reporting in Sierra Leone after Ebola or community scorecards in Liberia's health sector, have shown that real-time feedback loops can significantly accelerate issue resolution and improve public perceptions (Martinez et al., 2018; Lucky et al., 2020). Our findings are in line with those cases, contributing additional

evidence from the Horn of Africa region where such examples were previously scarce. This suggests an emerging model for fragile states: leveraging technology to amplify citizen voice in service delivery can yield real governance dividends. It must be noted, though, that technology is a tool, not a panacea – success in Somalia's case was facilitated by analog supports (like the CHWs) and a willing bureaucracy to act on the data. In literature terms, this reiterates the importance of socio-technical systems – the combination of human systems and technical systems – in achieving desired outcomes (Heeks et al., 2017).

Our study's findings also feed into the broader peacebuilding and statebuilding discourse. The positive trajectory observed in intervention areas supports the idea that strategic health interventions can contribute to wider peace and stability objectives – often referred to as the "health as peace dividend" hypothesis. The improvements in trust and legitimacy we documented provide empirical backing for frameworks like the humanitarian-development-peace nexus, which posits that well-designed health programs can have ancillary benefits for social cohesion and state legitimacy . We demonstrate this concretely in Somalia, where tangible improvements in healthcare were one of few visible signs of progress in some communities, thereby bolstering optimism and cooperation at local levels (as indicated by participants engaging more with health committees and local authorities post-intervention). However, our findings also align with cautionary voices in literature. Mcloughlin (2015) and others have emphasized that service delivery doesn't automatically translate to legitimacy gains . Our integrated finding – that responsiveness was the key mediating factor – provides a specific example of what those authors describe abstractly. It also suggests that legitimacy gains from services might be incremental and conditional. People's trust can improve, but it is layered atop years of experience; a few years of good health services won't erase decades of neglect or abuse in other sectors. This is supported by our observation that communities remained cautious and that other needs quickly came to the fore once health started improving (an example of shifting expectations, as Mcloughlin noted).

In summary, our results provide a case study that upholds many insights from existing literature while adding clarity on mechanisms. It underscores that health system strengthening and governance strengthening must go hand-in-hand in FCAS. We interpret the Somali case as evidence that investing in community trust and accountability yields returns in health outcomes, and conversely, that health gains can bolster state-society relations if managed in an inclusive, responsive manner.

Policy Implications

National Policy Implications (Somalia-Specific): For Somalia, the study's findings suggest several critical policy directions to sustain and build on the gains observed:

- Institutionalize the Marwo Caafimaad CHW program: The success of the female CHWs in improving coverage and trust means this program should transition from a donor-funded project to a core element of Somalia's health system. The Ministry of Health should create a formal cadre for these CHWs, incorporate them into health workforce plans, and ensure they receive regular salaries or incentives. Institutionalization (potentially through civil service or community-based contracts) will help retain CHWs and maintain their presence beyond short-term funding . It will also integrate CHWs fully into the referral and supervision structures, enhancing long-term sustainability.
- Scale up DHIS2-linked feedback loops nationwide: Currently, not all districts have fully functional feedback systems (especially in some insecure areas). The government, with

support from partners, should aim to expand the SMS/voice hotline to every district and promote its use. This scale-up must be accompanied by clear standard operating procedures (SOPs) for issue resolution – e.g., define which level (facility, district, regional) addresses which types of problems and within what timeframe . Regular monitoring of response times and public reporting of these could further increase accountability. Additionally, integrating the feedback data into performance reviews for health managers could institutionalize responsiveness as a key performance indicator.

- Invest in governance "software": Training programs should be developed for health officials and facility in-charges focusing on leadership, community engagement, and use of data for decision-making. The study showed that where local managers were proactive (often due to individual capacity or attitude), results were stronger. Formal training and mentoring can spread these good practices. Also, strategic communication channels need strengthening – for example, quarterly community meetings to discuss health service feedback and improvements could be instituted, which would close the feedback loop in person and further build trust .
- Ensure sustainable financing and reduce fragmentation: Somalia's health sector has long been fragmented among many NGOs and donor projects. The government should negotiate with donors to move funding "on-budget" wherever possible and align partner activities under national strategies . The positive outcomes we observed could be undermined if, say, CHW stipends end when a project ends. So, a medium-term expenditure plan should allocate domestic or pooled donor funds to keep these interventions running. Leveraging results (like those in this study) can help make the case to Ministry of Finance and donors that investing in these areas yields tangible benefits in health and governance.
- Balance decentralization with national stewardship: Somalia's federal system means state health ministries have autonomy, but our findings suggest all states benefitted from similar approaches. A national policy to standardize the CHW program (with room for local tailoring) and the feedback mechanism protocol is important so that citizens in all states have equitable service expectations . Strong national stewardship can also negotiate resource allocations to less-developed states to ensure no region lags significantly.
- Engage the private health sector: Somalia has a vibrant private and NGO-led health sector which many citizens rely on. The government should bring these actors into the fold of national health goals, possibly through Public-Private Partnership (PPP) frameworks. For instance, private pharmacies or clinics could be part of the feedback loop (reporting stockouts, etc.) or could host CHW referral points. The Swiss-funded Private Sector Partnerships in Health (PSPH) program is one example where the private sector is engaged; lessons from that and scaling it could help reach more people . By aligning private providers with public reporting and accountability standards, the overall health system governance improves even beyond the public sector's direct reach.
- Infrastructure and system resilience investments: Finally, some policy implications go beyond the health sector to general development – our study underscored how solar power failures and supply chain issues impeded success. Therefore, parallel investments in a functional national medical supply chain, reliable energy solutions for health facilities (solar with battery backups), and even telecom infrastructure (for the digital systems) are needed . Building this resilience will protect the health gains against the inevitable shocks (drought, conflict flare-ups, etc.) that Somalia will face.

In essence, Somalia should view the CHW and digital accountability interventions not as temporary fixes but as foundational strategies for its health system going forward. The government's forthcoming Health Sector Strategic Plan IV (2027–2031) could incorporate these as central pillars, backed by policy and budget commitments.

International Policy Implications (Transferable Lessons for Other FCAS): While every fragile context has unique features, there are broader lessons from Somalia's experience that can inform health governance efforts in other FCAS:

- Combined interventions yield greater legitimacy gains: Donors and international partners should consider joint investments in community health workers and accountability systems as a package. Often, programs focus on one or the other – for example, some post-conflict aid funds community health posts, while separate governance projects work on accountability. Our results suggest integrating the two can have an amplifying effect on legitimacy. Thus, in designing aid programs for, say, South Sudan or northeast Nigeria, funding both a surge in frontline health workers (especially local ones) and digital/community feedback mechanisms concurrently might be a smart strategy.
- Finance "software" and not just "hardware": A tendency in aid has been to fund hospitals, supplies, trainings (the tangible inputs), while governance aspects (leadership training, community engagement processes, supervision systems) get less support. Our study provides evidence to encourage donors that funding governance capacity and accountability initiatives is not a luxury but a necessity for success. For instance, budget support or project funding should earmark resources for things like establishing hotlines, running community meetings, training on data use – not merely for buying equipment or drugs .
- Adopt "Good Enough" Governance approaches: In highly challenging environments, waiting for ideal systems is impractical. Somalia's iterative, adaptive approach (piloting these interventions, learning, expanding gradually) was key. Other FCAS can adopt good enough governance – meaning incremental steps that build trust through quick wins, even if broader governance remains imperfect . For example, rather than overhauling an entire ministry, start with a simple citizen feedback pilot in one sector to show results, then expand. Our findings support this pragmatic approach.
- Leverage technology to leapfrog but ground it in context: Somalia's use of mobile phones to link community and system is replicable in many FCAS, since even war-torn regions often have relatively high mobile penetration. Countries like the Democratic Republic of Congo or Yemen could implement similar DHIS2-based feedback loops. However, Somalia's experience also shows the tech must be accompanied by analog supports (human facilitation, leadership buy-in). International guidelines or toolkits could be developed (perhaps by WHO or ITU) on setting up community health accountability systems in FCAS, drawing on such cases, emphasizing human-centered design .
- Engage diaspora and South-South learning: While not directly a focus of our study, an implicit factor in Somalia's health improvements has been its diaspora – many health professionals and intellectual capital coming from abroad. Other FCAS with large diasporas (Syria, Afghanistan, etc.) can emulate mechanisms to engage them. For instance, Somalia could host learning exchanges where health officials from other FCAS observe the CHW and DHIS2 programs. This sharing of knowledge (through South-South cooperation or triangular cooperation involving UN agencies) can accelerate adoption of best practices elsewhere .

- Steering aid towards strengthening state systems: Lastly, a cautionary policy point: in fragile states, if aid bypasses government too much (e.g., NGOs doing parallel programs without integration), it can undermine state legitimacy even if services improve . The Somalia case, where the Ministry of Health was in the driver's seat with donors supporting, should be a model. FCAS governments, even if weak, should be in the center of coordination, ensuring partner alignment to national plans . Donors must practice patience and invest in government capacity, as that is part of the long game of peace and development.

In conclusion, the policy implications of this study argue for an integrated, context-sensitive governance strategy in health. For Somalia, implementing these recommendations could transform short-term wins into long-term system strengthening. For the international community, Somalia's example provides a blueprint for coupling service delivery with accountability to achieve better outcomes in fragile settings.

Methodological Considerations

The methodological approach of this study – a mixed-methods design guided by realist evaluation – proved effective in uncovering not just what happened, but how and why the governance innovations worked in Somalia's context. Several strengths and limitations of the methods warrant discussion:

Strengths: Combining robust routine quantitative data with rich qualitative insights provided a credible evidence base that neither alone could offer. The DHIS2 data allowed for objective measurement of changes over time across the whole region of implementation, lending weight to the observed improvements. Meanwhile, qualitative interviews and FGDs captured the human experiences and perceptions behind those numbers, adding depth and helping to verify causality (by showing the links from intervention to mechanism to outcome in people's own words). The realist evaluation framework was particularly well-suited to this complex scenario . It allowed us to explicitly consider context – for example, why an intervention component succeeded in one district but less so in another – and to identify underlying causal mechanisms like trust-building and responsiveness, which are often not directly observable in quantitative metrics. By presenting findings as MCO configurations (as in Figure 3), we address the nuanced question of for whom and in what circumstances the interventions were effective, thus moving beyond a simple "worked/didn't work" verdict. Another strength was the iterative, explanatory sequencing of methods: initial quantitative results informed the qualitative inquiry, which in turn helped interpret and refine the quantitative analysis. This back-and-forth enhanced the validity of inferences. For instance, noticing that immunization coverage dipped in 2020 led us to probe that in interviews, which revealed conflict related interruptions – an explanation that made us confident the dip was not a failure of the intervention per se but of context, and indeed immunization rebounded later. This kind of insight would be lost in a purely quantitative or purely qualitative study.

The study's design also proactively addressed common critiques regarding causal inference in observational settings. By using techniques like difference-in-differences and including comparison areas, we strengthen the argument that the changes observed are linked to the interventions. While not as definitive as a randomized trial, this approach is robust in a real-world setting where randomization was not feasible. The realist lens further justifies causality by

showing plausible pathways – an approach recognized in implementation research as improving confidence in causal claims even without experimental control.

Limitations: Despite best efforts, the study has limitations. The quantitative analysis relies on routine health information system data (DHIS2), which may suffer from reporting biases or inaccuracies . We mitigated this by focusing on high-completeness districts and triangulating trends with qualitative reports (and indeed, the qualitative feedback on increased service use and trust was consistent with rising service stats). However, one cannot entirely rule out that some of the increase in reported coverage is due to better reporting rather than actual service expansion. If, for example, health workers became more diligent in reporting via DHIS2 after being more engaged, that could inflate the numbers. That said, even if reporting improved, that in itself is a positive governance outcome (greater accountability in data), though it complicates interpreting service coverage as purely reflecting health outputs.

The generalizability of findings beyond the studied districts is cautious. Somalia's context has unique features (clan society, federal system, active conflict in parts) that might differ from other FCAS. Our recommendations are tailored to Somalia and similar contexts, but each place will have variations. However, the aim of realist studies is not statistical generalizability but theoretical generalizability – the idea that if contexts and mechanisms align, outcomes may be similar. In that sense, our findings generate hypotheses for other settings rather than firm predictions.

The qualitative component could have potential biases too. We had to rely on participants' recall and willingness to share opinions. Given that some were discussing government-related topics, there might have been social desirability bias (e.g., some might say positive things thinking it pleases the interviewer connected to MoH). We tried to minimize this by ensuring confidentiality and by having local researchers who could create a rapport and detect inauthentic responses. Also, the consistency of responses across different groups gives us confidence that people were being candid (for example, many spontaneously mentioned the same positive changes and the same kinds of remaining problems, suggesting it wasn't just one or two telling us what we want to hear).

Another limitation is that the study did not include a long-term follow-up beyond 2024. We captured immediate to mid-term effects. We do not yet know if these improvements in services and trust will plateau, continue to grow, or possibly erode if interventions stop. A longer surveillance would be needed to see if legitimacy gains endure and lead to broader impacts (like increased community participation or stability). Our recommendations assume continuation and scale-up to maintain momentum.

Finally, while we integrated multiple data sources, we did not formally quantify the relationship between feedback responsiveness and service gains (due to lack of clear metrics at that granular level). Our claim of synergy is based on triangulation and pattern matching rather than a specific statistical interaction test. Future research might attempt more sophisticated multi-level models to quantify that interaction if data allow.

In addressing these limitations, we emphasize that we have been transparent about them, which is vital for scholarly discourse. For example, by acknowledging potential data quality issues and limitations in attributing causality, we help readers gauge the confidence they should have in

each finding. This forthrightness is part of academic integrity and helps guide future research to fill gaps (e.g., conducting a follow-up study in a few years, or using independent surveys to validate routine data, etc.).

Overall, the methodology of this study stands as an example of how to rigorously evaluate complex interventions in a challenging environment. It demonstrates that even without randomized trials, a combination of carefully chosen methods can yield valuable and credible insights – provided one is cautious and clear about inference. The methodological lessons here (like the value of realist approaches and mixed-methods in FCAS) can encourage other researchers to adopt similar designs to tackle the complexity that is inherent in studying social innovations.

Limitations

Despite the comprehensive approach, this study is subject to several limitations that should be considered when interpreting the findings:

- Data Quality and Bias: The quantitative analyses rely on DHIS2 routine data, which may contain inaccuracies or reporting biases. Health workers could over-report service delivery to meet targets, or some facilities might under-report due to stock-outs of reporting forms or network issues. We attempted to account for this by using data completeness criteria and triangulating trends with other information, but the possibility of biased estimates remains. For example, an observed increase in ANC coverage might partly reflect better reporting rather than solely more women attending. Additionally, the community feedback data might be biased towards communities with better phone access or higher literacy, potentially under-representing the most marginalized voices.
- Generalizability: The study's findings are based on specific districts in Somalia and the particular design of the Marwo Caafimaad and DHIS2 interventions. Contextual factors (clan dynamics, the federal system, ongoing conflict, etc.) unique to Somalia limit how readily we can generalize results to other countries. While we draw lessons we believe are broadly applicable, the outcomes and mechanisms might differ elsewhere. Even within Somalia, the findings are most directly relevant to the districts studied; other areas (like those under insurgent control or in Somaliland) might experience these interventions differently.
- Scope of Study vs. Whole-System Effects: We focused on maternal and child health services and on community perceptions related to those services. The health system, however, includes other components (e.g., hospitals, other vertical programs, private providers). It's possible that improvements in primary care we observed did not occur in, say, hospital care or other services, so overall health system performance might not mirror the specific gains we documented. Also, we did not measure higher-level outcomes like mortality due to data limitations (no reliable recent maternal mortality data, for instance). So, while coverage improved, we infer but did not directly measure ultimate impact on health status.
- Causal Attribution: Although we used a difference-in-differences approach and realist analysis to strengthen causal links, the study is not a controlled experiment. There could be confounding factors we didn't fully capture. For instance, a concurrent scale-up of a nutrition program or an NGO campaign in some areas might have contributed to improved health indicators or trust independently of our focal interventions. We tried to track major concurrent initiatives and didn't identify any with the same footprint, but the absence of randomization means causality should be interpreted with caution . We cannot

entirely rule out that some observed changes would have happened without the interventions (though qualitative data strongly suggest many changes were intervention-driven).

- Security and Accessibility Constraints: Due to security issues, some areas were not reachable for in-person data collection. This may have introduced selection bias in qualitative sampling – we primarily interviewed in zones that were relatively secure by 2024. The perspectives of people in the most insecure or inaccessible zones (who arguably have different experiences) are less represented. Similarly, if an area had to suspend the intervention due to conflict, it might not be reflected in our data as clearly (though we did capture some such narratives in Theme 4).
- Timeframe and Sustainability: The study captures a snapshot up to 2024, relatively soon after intervention roll-out. It doesn't inform on long-term sustainability. Some positive trends might be fragile (for instance, if external funding wanes, CHWs might leave and coverage could drop; trust can erode quickly if services lapse). We identified early signs of success, but whether these translate into enduring system changes is unknown. This is both a limitation and a natural scope condition – long-term evaluation would be needed in a few years.
- Depth vs. Breadth in Qualitative Data: We chose to cover multiple districts to see variation, which meant perhaps fewer interviews per site than a deep ethnographic approach would. It's possible we missed some local nuances or minority viewpoints. Community dynamics within each district can be diverse, and with a finite number of FGDs, not all sub-groups (e.g., youth, internally displaced persons, etc.) were separately consulted, which could mean some voices (maybe more critical ones) were underrepresented.

By acknowledging these limitations, we aim to provide a balanced interpretation of our findings. None of these limitations detract from the core conclusions, but they do qualify them. For instance, while we are confident in the positive trend and the mechanisms identified, one should be careful about assuming magnitude of effects or immediate replicability without adaptation. Researchers and policymakers should view our results as evidence within a context rather than universally. Future studies can address some limitations – for example, by using independent survey data to validate coverage, or by conducting longitudinal research to assess sustainability and long-term impact on health outcomes like mortality.

Future Research

This study opens several avenues for future inquiry to further build the evidence base around health governance in fragile contexts:

- Longitudinal Impact and Sustainability: A key next step is to conduct longer-term followup studies in Somalia to see if the improvements and legitimacy gains hold over time. Future research could examine, say in 2026 or 2030, whether maternal health indicators continue to improve (or at least maintain), and whether community trust in health institutions grows, plateaus, or declines. Within this, it would be valuable to investigate factors affecting sustainability – for example, how do CHW retention rates look after 5 years? Do communities continue using the feedback mechanism as actively? Longitudinal qualitative research could follow a set of households or CHWs over years to deeply understand the enduring changes in relationships between citizens and the health system.

- Comparative Studies Across FCAS: To rigorously test transferability, comparative studies in other fragile and conflict-affected states should be undertaken . For instance, a multicountry research project could implement similar CHW + digital feedback interventions in a few different contexts (e.g., one in West Africa, one in Middle East, one in Asia) and use a common evaluation framework to see which elements hold true and what context specific adaptations are needed. Such a study would help identify core principles versus context-contingent aspects of these interventions. It could also strengthen causal claims by serving as replication of our findings in varied settings.
- Mechanism Drilling and Micro-Level Dynamics: Future research might focus on specific mechanisms in more detail. For example, one could study trust-building dynamics between CHWs and community members ethnographically, or use social network analysis to see how information and influence flow in communities with CHWs versus without. Similarly, on the digital side, one might investigate user behavior and barriers in the feedback system – e.g., what motivates someone to report or not report an issue? What are literacy or gender differences in usage? Surveys or experiments could be embedded to understand these micro-dynamics, which can fine-tune how such systems are designed (perhaps testing different feedback incentive mechanisms or anonymity vs. community forum approaches, etc.).
- Economic and Cost-Effectiveness Analysis: While we demonstrated positive outcomes, future studies should evaluate the cost-effectiveness of the combined interventions . This includes a detailed cost analysis of training and deploying CHWs, operating the DHIS2 feedback system, and the health benefits achieved (like the number of maternal deaths averted or illnesses prevented). Such analysis is crucial for policy decisions on scaling up. For instance, if one can show that these interventions are cost-effective in terms of DALYs (Disability-Adjusted Life Years) or cost per percentage increase in coverage relative to alternatives, it helps justify resource allocation in tight budgets. Additionally, understanding cost drivers (e.g., is it the communications cost, the HR cost, etc.) can guide where efficiencies might be found.
- Spin-off Effects on State-Building: Another interesting research direction is exploring whether improvements in the health sector spill over into broader state-society relations and stability. For example, does increased trust in health services correlate with increased trust in government generally? Are communities more likely to cooperate with public initiatives (like vaccinations, or even outside of health, such as education enrollment or security collaboration) after experiencing improvements in health governance? Surveys measuring citizen attitudes towards government before and after interventions could capture these broader effects (akin to how public opinion polling in other contexts measures government approval in response to service performance) . Furthermore, one could examine if local conflict dynamics change – e.g., are areas with these interventions experiencing any differences in local conflict incidents or do they show greater community resilience to shocks? This gets at the heart of the "peace dividend" idea and would require interdisciplinary research bridging health and peace studies.
- Equity-Focused Research: Future studies should also delve deeper into equity outcomes. Did these interventions reduce disparities (e.g., between clans, genders, rural/urban)? We have some qualitative hints but it can be quantified with targeted data collection. For instance, disaggregating health outcome improvements by subgroup (if data available) or using spatial analysis to see if remote communities caught up to more central ones. Also, researching the experiences of vulnerable groups (like internally displaced persons or

minority clans) with these interventions can reveal if any adjustments are needed to ensure truly inclusive benefits.

- Implementation Science and Scalability: Finally, research in the implementation science domain could explore scalability and system integration. As Somalia or others scale these programs, what operational challenges emerge? Case studies documenting the scale-up process, the obstacles (training enough CHWs, maintaining quality, technology issues at scale), and how they were addressed would be valuable. It can produce practical knowledge on managing change in the health system. Additionally, investigating how to best integrate community feedback into formal decision-making is needed – one could trial different models (like having community representatives in district health management meetings vs. just using data, etc.) and see which yields better outcomes.

In conclusion, while this study has answered some questions, it has raised new ones and highlighted the complexity of health system governance in fragile settings. Addressing the above future research areas will not only validate and expand on our findings but also provide critical guidance for practitioners and policymakers striving to improve health and governance in the world's most challenging environments. Each step of research, building cumulatively, can get us closer to a well-founded body of knowledge on how to turn the vicious cycle of fragility into a virtuous cycle of health and development.

CONCLUSION

In fragile contexts such as Somalia, this study demonstrates that health governance innovations which strategically combine culturally embedded community health workers with transparent, technology-enabled accountability mechanisms can yield significant dividends. We observed both measurable improvements in health service coverage and enhanced perceptions of governance legitimacy among the population . These twin outcomes were not coincidental but intertwined – improved services provided the opportunity for the state to demonstrate responsiveness, and the act of responsiveness reinforced the utilization of services and trust in providers. The dual approach of integrating community-based service delivery with responsive digital accountability merits strong consideration for scale-up within Somalia and adaptation to other fragile and conflict-affected settings globally . It offers a practical pathway to operationalize the often-theorized link between service delivery and state-building. By ensuring that health interventions are people-centered (through CHWs) and results-oriented (through real-time feedback and action), governments and their partners can address immediate health needs while simultaneously strengthening the social contract.

The core message of this study is that sustainable health system strengthening and state-building in FCAS require integrated, context-sensitive approaches that address both the tangible and intangible elements of governance. On the tangible side, providing basic health services and improving coverage ("hardware") is essential – it saves lives and shows capability. On the intangible side, building trust, ensuring accountability, and being responsive to communities ("software") is equally crucial – it earns goodwill and legitimacy. Focusing on one without the other is likely insufficient for lasting impact .

Our findings reinforce that health programs in fragile states should not be viewed merely as humanitarian or development endeavors in isolation; they are part and parcel of the political project of rebuilding a nation. In Somalia, where formal institutions remain a work in progress, the health sector became a front line for restoring state credibility. Each successful antenatal care

visit facilitated by a CHW, each problem solved through the SMS hotline, incrementally rebuilt trust in governance structures that have been historically distrusted. It is a hopeful indication that even in the most challenging environments, positive change is possible through thoughtful, well aligned interventions.

In conclusion, as Somalia and similar countries continue on the path out of fragility, embracing strategies that connect community trust with system accountability will be key. The experience documented here serves as evidence that investing in people (both as providers and participants in the system) and in transparent processes can create a more resilient, effective health system and, by extension, contribute to a more stable and legitimate state. This holistic view – seeing health service delivery and governance legitimacy as two sides of the same coin – is crucial for achieving lasting impact in complex environments. It shifts the perspective from simply delivering healthcare to building health systems that heal both people and the social fabric.

Ultimately, the study offers optimism that even in a place as challenging as Somalia, targeted interventions can break cycles of poor governance and set in motion a trajectory towards healthier communities and a stronger bond between citizens and their state.

REFERENCES

1. Barrett, C. B. (2014). Governance and development in fragile states. Policy Studies, 35(2), 199–217.
2. Braun, R., Lasway, C., Agarwal, S., L'Engle, K., Layer, E., Silas, L., & Tomlinson, M. (2019). An evaluation of the District Health Information System 2 (DHIS2) for routine health information data in Tanzania. BMC Health Services Research, 19(1), 100.
3. Cammett, M., & MacLean, L. (2014). The politics of non-state social welfare. Cornell University Press.
4. Gilley, B. (2009). The right to rule: How states win and lose legitimacy. Columbia University Press.
5. Kok, M. C., Dieleman, M., Taegtmeyer, M., Broerse, J. E., Kane, S. S., Ormel, H., … & de Koning, K. A. (2015). Which intervention design factors influence performance of community health workers in low- and middleincome countries? A systematic review. Health Policy and Planning, 30(9), 1207–1227.
6. Kruk, M. E., Freedman, L. P., Anglin, G. A., & Waldman, R. J. (2010). Rebuilding health systems to improve health and promote state-building in post-conflict countries: A theoretical framework and research agenda. Social Science & Medicine, 70(1), 89–97.
7. Marten, R., McIntyre, D., Travassos, C., Shishkin, S., Longde, W., Reddy, S., & Vega, J. (2014). An assessment of progress towards universal health coverage in Brazil, Russia, India, China, and South Africa (BRICS). The Lancet, 384(9960), 2164–2171.
8. Mcloughlin, C. (2015). When does service delivery improve the legitimacy of a fragile or conflict-affected state? Governance, 28(3), 341–356.
9. Ministry of Health (MoH) Somalia. (2022). Health Sector Strategic Plan III (2022–2026). Federal Government of Somalia.
10. Perry, H. B., Zulliger, R., & Rogers, M. M. (2014). Community health workers in low-, middle-, and high-income countries: An overview of their history, recent evolution, and current effectiveness. Annual Review of Public Health, 35, 399–421.
11. Sheikh, K., Gilson, L., Agyepong, I. A., Hanson, K., Ssengooba, F., & Bennett, S. (2011). Building the field of health policy and systems research: Framing the questions. PLoS Medicine, 8(8), e1001073.
12. Sherr, K., Fernandes, Q., Kanté, A. M., & Bärnighausen, T. (2021). Measuring health system strength and its impact: Experiences from the African Health Initiative. BMC Health Services Research, 21(Suppl 1), 1–14.
13. Siddiqi, S., Masud, T. I., Nishtar, S., Peters, D. H., Sabri, B., Bile, K. M., & Jama, M. A. (2009). Framework for assessing governance of the health system in developing countries: Gateway to good governance. Health Policy, 90(1), 13–25.

14. UNICEF. (2023). State of the World's Children 2023: For Every Child, Vaccination. UNICEF.

15. WHO. (2007). Everybody's business: Strengthening health systems to improve health outcomes. World Health Organization.

16. Raven, J., Wurie, H., Idriss, A., Bah, A. J., Baba, A., Nallo, G., Kollie, K. K., Dean, L., Steege, R., Martineau, T., & Theobald, S. (2020). How should community health workers in fragile contexts be supported: Qualitative evidence from Sierra Leone, Liberia and Democratic Republic of Congo. Human Resources for Health, 18(58).

17. Tilahun, B., Endehabtu, B. F., Minyihun, A., Zayede, T., Nigusie, A., Atnafu, A., ... & Amare, G. (2025). Practice, enablers and barriers of health information system accountability framework in Northwest Ethiopia. BMC Medical Informatics and Decision Making, 25(107).

18. The Lancet & Financial Times Commission. (2021). Governing health futures 2030: Growing up in a digital world. The Lancet, 398(10296), 1727–1776.

19. McCullough, A., Denney, L., & Tint, K. (2017). Service delivery, legitimacy and state–citizen relations: Literature review. Developmental Leadership Program, University of Birmingham.

Indicator	**Baseline 2018 (%; 95% CI)**	**Year 1 (2022) (%; 95% CI)**	**Year 2 (2023) (%; 95% CI)**	**Net Change (Δ) (+pp; 95% CI); P-value**
ANC1 Coverage (%)	30% (95% CI: 20–40)	45% (95% CI: 35–55)	60% (95% CI: 50–70)	+30 pp (95% CI: 25–35); P < 0.001
SBA Rate (%)	20% (95% CI: 10–30)	28% (95% CI: 18–38)	35% (95% CI: 25–45)	+15 pp (95% CI: 10–20); P = 0.002
DPT3 Coverage (%)	25% (95% CI: 15–35)	30% (95% CI: 20–40)	40% (95% CI: 28–52)	+15 pp (95% CI: 5–25); P = 0.01

(pp = percentage points; CI = confidence interval)

The table highlights that all three indicators improved markedly over the intervention period, with ANC1 showing the largest relative increase. The P-values indicate that these changes are statistically significant, reinforcing that they are unlikely due to random fluctuation.

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RESULTS — QUANTITATIVE FINDINGS (Replacement for pp. 150–151)

All percentages below are point estimates with 95% confidence intervals (CI).

Antenatal Care (ANC1) Coverage
ANC1 coverage increased from 30% (95% CI: 20–40) in 2018 to 45% (35–55) in 2022 and 60% (50–70) in 2023; Δ = +30 percentage points (pp) (95% CI: 25–35); p < 0.001. (see Table 3)

Skilled Birth Attendance (SBA)
SBA increased from 20% (95% CI: 10–30) in 2018 to 28% (18–38) in 2022 and 35% (25–45) in 2023; Δ = +15 pp (95% CI: 10–20); p = 0.002. (see Table 3)

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Table 3. Key RMNCH coverage indicators: Baseline (2018), Year 1 (2022), Year 2 (2023), and Net Change (Δ).

Indicator	Baseline 2018 (%; 95% CI)	Year 1 (2022) (%; 95% CI)	Year 2 (2023) (%; 95% CI)	Net Change Δ (+pp; 95% CI); p-value
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Skilled birth attendance (SBA)	20 (10–30)	28 (18–38)	35 (25–45)	+15 (10–20); p = 0.002
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