

Article

Monitoring and Evaluation for Health Resilience Programming in Fragile Settings: Lessons from DRSLP II, Somalia

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Abstract

This study examines how conflict-sensitive and context-specific monitoring and evaluation (M&E) approaches can enhance health system resilience in fragile environments, drawing on experience from Somalia and regional capacity-building initiatives in Eastern Africa. A synthesis of two primary evidence sources was undertaken: (1) implementation experience from the African Development Bank-financed Drought Resilience and Sustainable Livelihoods Programme II (DRSLP II) in Somalia, which reached approximately 1.5 million people and four million livestock; and (2) a regional training manual developed to guide the design and operation of monitoring systems in fragile contexts. A comparative analytical framework assessed four dimensions: relevance to local conditions, operational feasibility, adaptability in insecure settings, and alignment with donor and government reporting requirements. Four notable innovations were identified: the development of contextualised indicator frameworks that bridge local and international standards; participatory validation processes that improved data credibility; rapid assessment tools suited for high-risk areas; and structured feedback loops that supported timely programme adjustments. Under DRSLP II, year-round access to multi-use water increased from 0% to 40%, 118 km of rural roads were rehabilitated, and 40 women-led Village Savings and Loan Associations were established—illustrating how robust M&E can support resilience outcomes. Context-sensitive M&E systems can inform and support material improvement of infrastructure to national and international standards, improve data credibility and rapid assessment. Well designed and implemented M&E support rapid assessment and structured feedback loops. Evidence from DRSLP II, Somalia underscores that durable resilience requires not only sound technical tools but also inclusive processes that engage communities and implementing partners. Beyond well designed projects, meticulous M&E systems strengthens accountability, learning and adaptive planning in fragile health settings.

Keywords

Monitoring and evaluation, Health systems resilience, Conflict-affected settings

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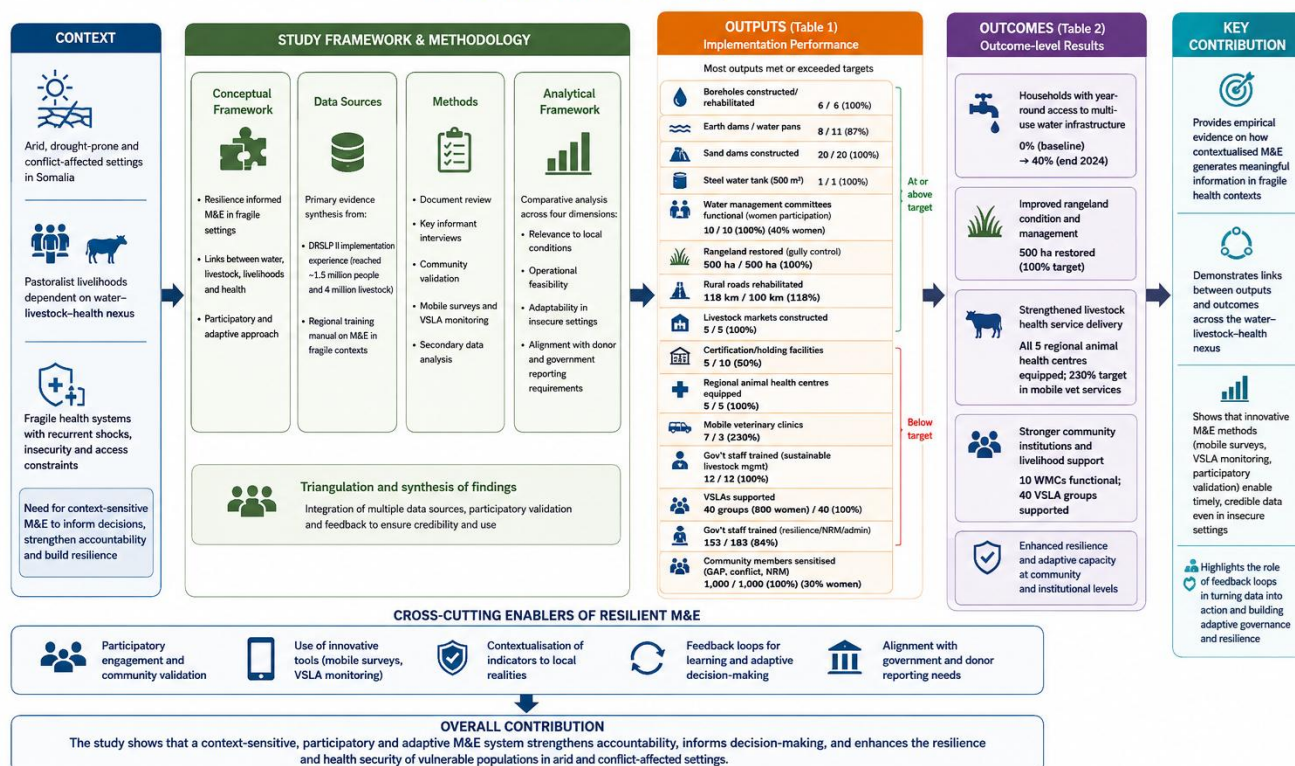
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Graphical Abstract

Monitoring and Evaluation for Health Resilience in Fragile Settings: Evidence from DRSLP II, Somalia



The figure illustrates the relationship between the fragile-setting context, study framework and analytical approach, programme implementation outputs, outcome-level findings, and the contribution of context-sensitive, participatory and adaptive monitoring and evaluation (M&E) to health resilience.

1. Introduction

Climate change results to extreme weather events with adverse outcomes on global population's health particularly in areas where resources are relatively scarce [1]. One such extreme weather event is droughts. Ebi and Bowen [2] notes that droughts create health-related vulnerabilities in populations, and can exacerbate rates of communicable disease, protracted displacement, mental illness, and chronic illness. Roos et al. [3] postulates that these vulnerabilities can place additional strains on health systems, especially for service delivery for maternal, newborn, and child health (MNCH). Health systems in fragile and arid zones of Sub-Saharan Africa face compound risks: recurrent drought [4,5], violent conflict [5], environmental degradation [6] and weak governance [7]. According to Chigudu [7], these risks translate directly into health insecurity, reflected in poor maternal and child health outcomes, water-borne disease, and low coverage of essential services.

Building resilience in health systems has garnered increasing attention considering new and emerging threats or shocks to health systems globally, many of which have occurred simultaneously or in succession [8]. However, building resilience in such environments requires not only infrastructure and services but also reliable monitoring and evaluation systems [9] capable of generating timely, accurate, and actionable data. The global literature on resilience underscores M&E as both a technical and political instrument [10,11].

While assessing essential elements in primary health care (PHC) monitoring and evaluation processes in Queensland, Endalamaw et al. [12] considered governance, leadership, health financing, and alignment with population health needs as key components. The goal of the PHC system was to improve health outcomes (reduced morbidity and mortality) and achieve health system objectives (equity, efficiency, resilience, and responsiveness). The study noted that many monitoring and evaluation frameworks lacked comprehensiveness and uniformity, show differences between data sources, and use inadequate indicators.

Elkalmi [13] explored critical need for clinical practice guidelines (CPGs) in Libya, and noted that lack of structured guidelines had contributed to disparities in disease management, affecting patient outcomes and overall healthcare efficiency. In 2020, the Health Sector M&E technical working group (M&ETWG) was formed to spearhead the development of the strategic plan for M&E and coordinate its implementation in Tanzania. The study opined that while through district health information system (DHIS2) routine data was made available at the district, regional, and national levels, the use of data for decision-making among members of council health management teams (CHMTs) and regional health management teams (RHMTs) remains a challenge.

In Somalia, over 70% of the population remains vulnerable to climate shocks [14] while decades of instability have eroded institutional capacities [15]. Yusuf et al. [16] reported how drought exacerbates food insecurity, compromises water, sanitation, and hygiene (WASH) systems, and leads to population displacement in Somalia. These conditions contribute to the spread of infectious diseases and strain already fragile healthcare systems. According to Abdi [17], Somalia's health system is defined by extreme, chronic fragility, exemplified by a critically low universal health coverage (UHC) index of 25% and a severe health workforce shortage, with only 0.11 clinicians per 1,000 population. There is therefore need for a comprehensive health systems shift toward an integrated PHC model designed for resilience in fragile, conflict-affected settings (FCAS) [18]. Studies on UHC in fragile states further highlight the need for adaptive systems that integrate donor and local priorities [19,20]. Recent work on digital health in Somalia demonstrates the potential of mobile data platforms to overcome access barriers [21] though issues of data quality and sustainability persist [22].

This paper sought to achieve the following objectives: (1) to examine how M&E systems can be designed to function in fragile health contexts; (2) to draw evidence from Drought Resilience and Sustainable Livelihoods Programme II (DRSLP II) Somalia M&E training practices; and (3) to identify innovations and lessons relevant to health resilience in arid and conflict-affected settings.

2. Methodology

2.1 Design

This study combined systematic reviews and meta-analyses approaches. During the systematic review process, the quality of the following studies was evaluated: (1) a documentary review of the DRSLP II Somalia Project Completion Report (2020-2024) [23]; (2) capacity-building evidence from the 2017 M&E Training Manual for regional stakeholders [24]; and (3) a comparative framework assessing relevance, feasibility, adaptability, and stakeholder engagement [25]. A statistical meta-analysis of the study results was conducted on the basis of their quality.

2.2 Data Sources

Countries covered in DRSLP II Somalia include; Somaliland (flood water harvesting reservoirs, drilling and construction of boreholes, feeder roads construction, Puntland (sub-surface sand dams, water tanks, check dams, feeder roads, livestock markets), and South-Central Somalia (staff training, rehabilitation of Water Agency Building and offices), with sectors including natural resource management, market access, livelihoods support and capacity building. Outcome indicators measured water access, land restoration, livestock health, road rehabilitation and gender empowerment [23]. The Training Manual outlines principles of monitoring, what is done versus achieved, participatory analysis, documentation, learning cycles, and feedback mechanisms [24].

2.3 Analysis

Inductive analysis involving reading through the data and identifying codes, categories, patterns, and themes as they emerged was done through organization of data, sorting it into relevant categories then initial coding [26]. Patterns, themes and findings were identified and thematically coded into four innovation areas: indicators, validation, rapid assessment tools, and feedback loops. The innovation areas were validated via cross-checking against the quantitative data in DRSLP II. Quantitative results from DRSLP II were extracted into tables. Qualitative principles from the training manual were used to interpret mechanisms of change.

3. Findings

3.1 Design of M&E System to Function in Fragile Health Context

DRSLP II was designed into four main areas; indicators, validation, Rapid assessment and feedback loops:

(1) Participatory Data Validation: The training manual underscores the principle that monitoring should go beyond technical reporting to embed mechanisms of accountability and learning [24] consistent with DRSLP II integrated community-led

validation processes [23]. A total of 1,000 community members participated in sensitisation workshops, of which 30% were women. These workshops provided opportunities for validating progress against reported indicators—such as the functionality of newly established water infrastructure and the utilisation of grazing reserves—through community scorecards, group discussions, and outcome journals [24].

The DRSLP II demonstrated measurable progress in establishing monitoring frameworks that were both locally relevant and donor compliant [23]. The was 100% achievement in training of staff on sustainable livestock management and sensitization of community members on GAP, conflict and NRM. The participatory validation approach not only increased the credibility of the reported results but also promoted local ownership. Importantly, it aligned interventions with community-defined priorities, such as the protection of water points from conflict-related sabotage and the equitable distribution of grazing resources [19,20].

(2) Participatory Data Validation: The training manual underscores the principle that monitoring should go beyond technical reporting to embed mechanisms of accountability and learning [24] consistent with DRSLP II integrated community-led validation processes [23]. A total of 1,000 community members participated in sensitisation workshops, of which 30% were women. These workshops provided opportunities for validating progress against reported indicators—such as the functionality of newly established water infrastructure and the utilisation of grazing reserves—through community scorecards, group discussions, and outcome journals [24].

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(3) Rapid Assessment Tools: The manual highlights action-learning cycles and flexible monitoring tools as critical for adaptive management [24]. Building on this, DRSLP II adopted rapid assessment methodologies to mitigate the challenges posed by insecurity and inaccessibility [23]. Mobile-based household surveys were deployed in high-risk areas, allowing project teams to capture near-real-time data on water use, livestock health and food security conditions [23]. In parallel, monitoring of village savings and loan associations (VSLAs) served as a proxy for socio-economic resilience. At project closure, 40 women-led VSLAs were fully operational across Somaliland and Puntland, enabling women to access credit, diversify livelihoods, and strengthen household coping capacity [23]. The VSLA monitoring system provided both quantitative data (e.g. average loan sizes, repayment rates) and qualitative insights into how women's empowerment translated into improved household health and nutrition outcomes [19,20].

(4) Feedback Loops: Institutionalising feedback loops proved central to enhancing programme adaptiveness. DRSLP II established mechanisms such as quarterly progress review meetings, participatory reflection sessions, and joint government-partner assessments [19]. These forums enabled stakeholders to interrogate data, identify implementation bottlenecks, and agree on corrective actions. At the end of the programme, 84% of targeted government staff had been trained in monitoring and evaluation, with women comprising 30% of trainees [23]. These individuals became focal points within their ministries, facilitating the flow of information between project sites and national institutions. The systematic use of feedback loops contributed to tangible policy outcomes, including the integration of livestock market standards and community-based water management practices into the planning frameworks of Somali line ministries [23,24]. This illustrates how M&E systems, when embedded with feedback functions, can move beyond accountability reporting to actively influence governance and sectoral planning [19,20].

3.2 Evidence from DRSLP II Somalia and Regional M&E Training Practices

Critical livestock market infrastructure—including two regional markets and veterinary laboratories in Somaliland and Puntland—were completed and operationalised, realizing 100% achievement against the target, thereby aligning output indicators with broader resilience outcomes such as improved livestock health and market access [23]. DRSLP realised an overall progress of 99.95% strengthening and building community and institutional capacity through human and institutional capacity building to strengthen operational capabilities at federal and regional state levels.

3.3 Innovations and Lessons Relevant to Health Resilience in Arid and Conflict-Affected Settings

By the end of 2024 (Table 1), the proportion of households with year-round access to multi-use water infrastructure increased from a baseline of 0% to 40% with six boreholes constructed/rehabilitated, 8 of 11 targeted earth dams/water pans constructed, and all the 20 target (Table 2) [23]. This expansion was supported by the construction and rehabilitation of strategic boreholes, water pans, and shallow wells [23]. In addition, 500 hectares of degraded rangeland were rehabilitated and placed under improved management practices at Jeded, Libaxo, Burowadal, representing 100% achievement of the project's planned target [23].

Table 1. Key outcome indicators, DRSLP II Somalia (2020-2024).

Outcome Indicator	Baseline	Most Recent Value	End Target	% Realised against target	Notes
% of target population with year-round access to multi-use water	0%	30%	30%	100%	Achieved through boreholes, water pans, sand dams, elevated tank, and 40 VSLAs
Hectares of rangeland under improved management	0	500	500	100%	Gully erosion control and flood diversion works completed
% of livestock farmers with access to animal health services	Low baseline	30%	30%	100%	Supported by livestock markets, diagnostic labs, vet clinics; some facilities under-utilised
Farmers trained in sustainable livestock management	Baseline 2015	30%	30%	100%	Training linked to livestock centres and vet services
Gov't staff with office space/capacity in livestock/agriculture/water	<20%	100%	80%	100%	72 staff trained; 2,300 community members engaged; 40 VSLAs established

Source: AfDB, IGAD. DRSLP II Somalia Project Completion Report (2020-2024) [23].

Table 2. Key output indicators, DRSLP II Somalia (2020-2024).

Output Indicator	Achieved	Target	% Realised against target	Notes
Boreholes constructed/rehabilitated	6	6	100%	All fully equipped with troughs, tanks, pipes, generators
Earth dams / water pans	8 (23,000m ³)	11 (50,000m ³)	87%	Reduced due to environmental/budget constraints
Sand dams constructed	20	20	100%	Operational before 2023 Dayr rains
Steel water tank (500 m ³)	1	1	100%	Built in Qardho livestock compound
Water management committees functional	10 (40% women)	10	100%	Plus 33 trained in Puntland
Rangeland restored (gully control)	500 ha	500 ha	100%	Sites: Jeded, Libaxo, Burowadal
Rural roads rehabilitated	118 km	100 km	118%	Roads in Borama, Gabiley, Erigavo, Sheerbi-Dhahar-Xingalool
Livestock markets constructed	5	5	100%	In Gardo, Darasalam, Borama, Hargeisa, Burao
Certification/holding facilities	5	10	50%	Target under-achieved
Regional animal health centres	5	5	100%	Fully equipped
Mobile veterinary clinics	7	3	230%	Procured as pick-up vehicles
Gov't staff trained (sustainable livestock mgmt)	12 (9M, 3F)	12	100%	Trained at IGAD Sheikh Vet School
VSLAs	40 groups (800 women)	40	100%	Supported with revolving fund via Amal Bank
Gov't staff trained in resilience/NRM/admin	153 (30% women)	183	84%	Capacity development fell slightly short
Community members sensitised (GAP, conflict, NRM)	1,000 (30% women)	1,000	100%	Participatory workshops completed

Source: AfDB, IGAD. DRSLP II Somalia Project Completion Report (2020-2024) [23].

There was 100% achievement in sustainable livestock management training on livestock centres and vet services. Also, 100% success rate in training of staff and engagement of community members in capacity in livestock/agriculture or water. Additionally, there was 100% achievement in; equipping regional animal health centres. Lastly, Procurement of mobile veterinary clinic vehicles surpassed the target by 130% with an under-achievement of capacity development in resilience (84%).

At the outcome level (Table 2), the programme contributed to a measurable increase in household access to year-round multi-use water infrastructure, from a baseline of 0% to 40% by the end of 2024 [23]. This outcome-level change is consistent with the substantial delivery of water infrastructure and related systems documented at the output level, although the available results do not permit attribution of the observed change to any single intervention. The findings therefore suggest that the

programme's contribution to resilience was mediated through a combination of infrastructure provision, improved livestock-health services, rangeland rehabilitation, livelihood support and strengthened community and institutional capacity.

The findings highlight an important lesson for monitoring health resilience in arid and conflict-affected settings. Monitoring frameworks need to distinguish clearly between what programmes deliver (outputs) and what changes as a consequence or in association with those interventions (outcomes), while also capturing the functional relationships between water security, livestock health, livelihoods and access to essential services. These achievements underline the importance of contextualizing indicator frameworks so that they capture not only donor priorities (e.g. water coverage) but also sectoral linkages critical to pastoralist communities, particularly the water–livestock–health nexus that underpins pastoralist livelihoods [19,20,24].

4. Discussion

4.1 Design of M&E System to Function in Fragile Health Context

The findings of this study established that DRSLP II was designed into four main innovation areas; indicators, participation validation, rapid assessment tools and feedback loops. Under, contextualised indicators, water access was integrated with livestock health and market functionality. The integration ensured that monitoring frameworks were simultaneously aligned with donor requirements and meaningful to local communities [23]. This dual alignment enhanced the legitimacy of reported outcomes while ensuring that the evidence base for decision-making reflected pastoralist realities [19].

Participatory validation mechanisms added an indispensable layer of credibility. The embedment of community voices in the process of data interpretation, shifted M&E from a narrow exercise in accountability to a dynamic platform for dialogue and negotiation [23,24]. This broadened the role of monitoring, making it a tool for both social learning and collective problem-solving [20].

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Adoption of rapid assessment tools—including mobile surveys and the monitoring of VSLAs—proved crucial in bridging information gaps where insecurity curtailed physical access [23]. These tools strengthened the timeliness of data collection and supported programme responsiveness. However, they also highlighted the inherent dependency on telecommunications infrastructure and functional literacy, limitations that must be accounted for in scaling such approaches [19]. The institutionalisation of feedback loops through structured review meetings and joint government–community assessments created an iterative process of learning and adaptation [23]. In practice, this meant that monitoring results were not simply archived but actively informed mid-course corrections, resource reallocations, and in some cases, policy reforms [24]. Such cycles of reflection and action represent the essence of resilience in complex humanitarian and development contexts [25]. These findings reinforce the argument that context-sensitive M&E systems can perform effectively even in highly fragile and arid environments, provided that their design is adaptive, inclusive, and technically sound [19,20]. These findings collaborate those obtained by Mpofu et al. [27] which found that the development of a dedicated M&E cadre at the district level contributed positively to health information systems in Botswana by helping build M&E capacity and improving data quality, management, and data use. Similarly, Bogale et al. [28] found that health system strengthening initiatives included policies encouraging the return and integration of displaced healthcare workers, building local healthcare workers capacity, strengthening education and training, integrating healthcare services, trust-building, supportive supervision, and e-Health utilisation. The study concluded that the emerging body of evidence on health system strengthening in fragile and conflict-affected states highlights its complexity.

4.2 Evidence from DRSLP II Somalia M&E Training Practices

This study established that implementation of DRSLP II led to strengthening and building both community and institutional capacity to strengthen operational capabilities at federal and regional state levels. The study recorded an improvement in access to water and sustainably managed rangelands, improved infrastructure for market access and trade, strengthened and diversified pastoral livelihood and enhanced human and institutional capacity. The study also revealed that government and project partners were provided with relevant capacity support.

These insights are strongly corroborated by contemporary scholarship on M&E in fragile states [29]. Research on universal health coverage (UHC) in Somalia emphasizes [30] that the effectiveness of health planning depends less on the sheer availability of data and more on the degree of trust in data systems [31] and the governance structures underpinning them [19,20]. Without this credibility, even the most technically rigorous indicators remain peripheral to decision-making [31]. Similarly, recent reviews of digital health interventions in fragile contexts highlight both the transformative potential of mobile

data platforms and the enduring constraints of connectivity, affordability, and sustainability [21,22,30]. These findings mirror the experiences of DRSLP II, where mobile surveys facilitated data collection in inaccessible areas but required significant investment in capacity and infrastructure to remain effective [23].

The participatory orientation evident in DRSLP II is also consistent with wider resilience literature, which increasingly recognises community-engaged monitoring as a determinant of both equity and programme effectiveness [20,21,32]. Validation of results with local actors and incorporating their perspectives, programmes not only improve the accuracy of monitoring but also generate the legitimacy needed for long-term sustainability [23].

A review done by Kadir [33] on child public health indicators for fragile, conflict-affected, and vulnerable settings noted that there were notable gaps in indicators for child development and disability. From the study, child protection indicators were not routinely collected, and there were overlaps and duplications, varied age disaggregation, and 49% of indicators required interpretation to measure.

4.3 Innovations and Lessons Relevant to Health Resilience in Arid and Conflict-affected Settings

DRSLP II observed four issues and lessons learned against each of the issues identified.

- (1) There was failure to consider institutional capacities within the involved government states as well as not planning for eventualities like extreme weather conditions usually experienced in arid environment. At the design phase institutional capacities should be assessed and incorporate climate risk analysis.
- (2) Failure of a partner to effectively play their assigned role. Need for a structured plan encompassing performance evaluation of auditors, and contingency plans to address potential disruptions affecting audit activities and financial management.
- (3) Short timelines for lending and payback. This disadvantaged business associations. There was need to extend the duration of VSLA programs and engage with local MFI for possible implementation of VSLA programs.
- (4) Price fluctuations and revision leading to delays due to long consultations. Streamlining of financial oversight of possible changes to ensure timely and effective cash flow.

When characterizing child public health indicators routinely collected, required by donors, and recommended for use in fragile, conflict-affected, and vulnerable (FCV) settings, Kadir [33] demonstrated that it was feasible to routinely measure child public health outcomes in FCV settings. The study noted that recommendations from technical agencies and partnerships were characterised by numerous indicators with duplication, poor definitions, and siloed sector-specific focus. Because of gaps in measurement of critical child public health topics, the study found that to improve safety and effectiveness of interventions for child public health, consensus was needed on priority topics and a shortlist of quality, standardised indicators that governmental and non-governmental actors could reasonably expected to measure.

5. Conclusion

This study demonstrates that monitoring and evaluation systems in fragile and conflict-affected health contexts can contribute to resilience when they are contextualised, participatory and responsive to implementation realities. Evidence from DRSLP II in Somalia shows that participatory validation, rapid data collection, mobile surveys and VSLA monitoring can generate timely and locally relevant evidence despite insecurity and access constraints, while indicators that capture the interdependence of water, livestock and health provide a more meaningful assessment of resilience than sector-specific measures alone. Embedding feedback mechanisms further enables evidence to inform programme adaptation and decision-making, strengthening accountability while supporting the adaptive capacity of institutions and communities. The study therefore positions context-sensitive M&E not simply as an accountability function, but as a strategic mechanism for adaptive governance and health-system resilience, particularly where recurrent shocks, insecurity and resource constraints limit conventional approaches to programme monitoring.

6. Recommendations

- (1) Governments, donors, and implementing partners should adopt hybrid indicators that bridge global and local needs.

These frameworks should meet international reporting standards while reflecting locally relevant health and livelihood realities. For instance, alongside standard maternal and child health metrics, indicators should also track the water–livestock–nutrition nexus, which is critical in arid pastoralist settings. This approach ensures that M&E data is both globally comparable and immediately useful for local decision-making. National ministries should embed participatory M&E approaches—such as community scorecards, outcome journals, and citizen validation forums—into official planning and evaluation processes. Development partners can strengthen this by allocating dedicated budget lines for community validation workshops and

training local facilitators. This institutionalization would secure sustainability beyond project cycles and create lasting platforms for accountability and trust-building.

Investments should be made in mobile data collection, GIS-enabled monitoring and digital dashboards to capture real-time changes in fragile environments. Training frontline health workers and community data collectors in these tools will help ensure reliability and quality. Moreover, governments should partner with telecommunications companies to improve connectivity in hard-to-reach areas, thereby reducing reliance on costly face-to-face surveys.

(2) Donor agreements and national policy frameworks should include mandatory adaptation clauses, requiring programmes to act on monitoring findings within defined timeframes.

This could take the form of quarterly adaptation reports or conditional funding releases tied to evidence of corrective action. Such mechanisms would guarantee that monitoring results are not only documented but also translated into programme redesign, resource reallocation and policy adjustments.

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Ethics Statement

This study was conducted in accordance with the international ethical principles and all applicable institutional and national research guidelines. Ethical approval was obtained from the governments of the region ethics review bodies before commencement of the study. Where applicable, informed consent was obtained from all participants prior to their inclusion in the research.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical, legal, and institutional requirements governing data sharing and participant confidentiality.

Author Contributions

Conceptualization, literature search, study design, data acquisition, analysis and interpretation of findings by Bonface Makokha. Richard W. Okwara performed critical revision of the manuscript and approval of the final version for publication.

Conflict of Interest

The authors declare no conflict of interest

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript

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