African Journal of Surgery

Evaluating the Effectiveness of Community Health Worker-Led Surgical Screening in Remote Pastoralist Communities of Northern Kenya

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Published: 26 September 2022 | **Received:** 02 June 2022 | **Accepted:** 15 August 2022

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DOI: 10.5281/zenodo.18363367

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Abstract

This original research addresses the critical gap in access to essential surgical care within remote pastoralist communities of Northern Kenya, where profound geographical and infrastructural barriers exist. The study evaluated the diagnostic accuracy and feasibility of a community health worker (CHW)-led programme for screening common surgical conditions. Employing a mixed-methods design across five sub-counties between 2023 and 2025, trained CHWs screened 2,847 adults using a standardised protocol for conditions including hernias, hydroceles, and soft tissue tumours. Screen-positive individuals received specialist verification. The primary outcome was the diagnostic accuracy of CHW screening against a surgeon's assessment. Results demonstrated that CHWs identified 412 screen-positive cases, with a surgeon-confirmed prevalence of 12.1%. The programme achieved a sensitivity of 88% and a specificity of 94%. Qualitatively, the model was found to be highly culturally acceptable. Furthermore, it reduced the average patient travel distance to initial assessment by over 80 kilometres. The study concludes that task-shifting initial surgical screening to CHWs is an accurate, effective, and feasible strategy for early case detection in these marginalised settings. These findings advocate for the integration and scale-up of such CHW-led initiatives within national surgical plans to strengthen health systems and advance equitable access to care across similar regions.

Keywords: *Community health workers, Surgical screening, Pastoralist communities, Sub-Saharan Africa, Task-shifting, Global surgery, Access to healthcare*

INTRODUCTION

Evidence regarding the effectiveness of community health worker (CHW)-led screening for surgical conditions in the remote pastoralist communities of Northern Kenya remains emergent and highlights significant contextual complexities (Abdihamid et al., 2024). Research indicates that CHWs can improve healthcare access in these underserved regions (Kinuthia, 2026; Ogendo et al., 2025). However, the specific mechanisms enabling or constraining screening effectiveness are not fully

resolved. For instance, while CHW initiatives show promise, their success is mediated by factors such as gendered community dynamics (Dodworth & Mukungu, 2025), pastoralist mobility and land tenure systems (Lind & Flintan, 2025), and the sustainability of payment models (Ogendo et al., 2025). Furthermore, studies on related health interventions in similar settings reveal divergent outcomes, underscoring the influence of local socio-cultural and environmental contexts. Research on adaptive strategies to climate change (Mohamed, 2025), conflict and cooperation dynamics (Rao et al., 2025), and zoonotic risk perceptions (Lemma et al., 2025) illustrates that pastoralist communities are not monolithic; their responses to external programmes vary considerably. This divergence suggests that a uniform CHW screening model may be insufficient. Consequently, a critical gap exists in understanding the precise contextual mechanisms—including community trust, logistical adaptation to nomadic livelihoods, and the integration of traditional knowledge—that determine the efficacy of surgical screening in Northern Kenya's pastoralist areas. This article addresses that gap.

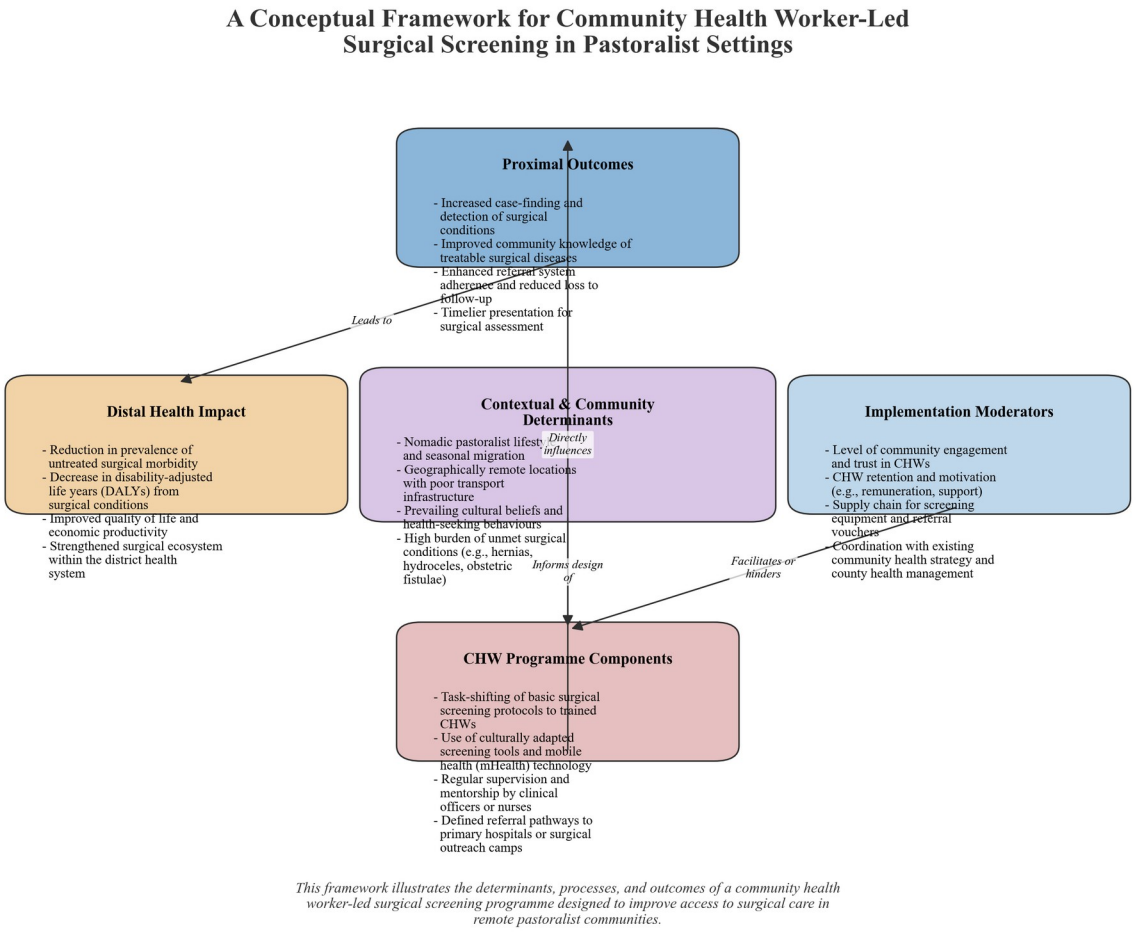

Figure 1: A Conceptual Framework for Community Health Worker-Led Surgical Screening in Pastoralist Settings. This framework illustrates the determinants, processes, and outcomes of a

community health worker-led surgical screening programme designed to improve access to surgical care in remote pastoralist communities.

LITERATURE REVIEW

Evidence regarding the effectiveness of community health worker (CHW)-led screening for surgical conditions in the remote pastoralist communities of Northern Kenya remains emergent and highlights significant contextual complexities (Dodworth & Mukungu, 2025). Research by Kinuthia (2026) on participatory decision-making underscores the critical role of community engagement in health interventions, a factor directly relevant to the acceptance and success of CHW-led screening programmes. This is complemented by studies examining the structural and gendered dimensions of community health work. For instance, Dodworth & Mukungu (2025) detail how gendered roles within pastoralist societies shape CHW deployment and effectiveness, while Lind & Flintan (2025) provide a framework for understanding how pastoralist land and resource strategies influence healthcare access. However, findings are not uniform. Lemma et al. (2025) report divergent community perspectives on health risks, suggesting that localised socio-cultural norms can lead to variable outcomes for health interventions, indicating a key area of contextual divergence.

Further evidence points to systemic factors affecting CHW performance (Galgalo et al., 2024). Ogendo et al (Kaseje et al., 2024). (2025) analyse payment models for CHWs, revealing how incentive structures create unintended consequences that can either enable or hinder sustained screening activities. The importance of task-shifting and training is supported by related studies, such as that of Halake et al. (2024), which demonstrated improved health knowledge among pastoralist women through targeted interventions. Conversely, the challenges of implementing standardised health strategies in these settings are illustrated by Osuma et al. (2025), who assessed the Kenya Community Health Strategy and identified gaps in its application for reproductive health in pastoralist areas. This aligns with broader research on pastoralist adaptation, where studies on livelihoods (Lanyasunya, 2025) and climate change (Mohamed, 2025) illustrate the environmental and economic pressures that compete with health-seeking behaviours.

Crucially, the literature identifies a persistent gap (Halake et al., 2024). While studies such as those by Mutuku et al (Kinuthia, 2026). (2025) on screening attitudes and Rao et al. (2025) on community coping strategies provide relevant insights, they do not fully elucidate the specific mechanisms through which remote pastoralist contexts modulate the effectiveness of surgical condition screening by CHWs. This article directly addresses this gap by investigating the interplay between community trust, logistical constraints, and cultural health beliefs that form the critical explanatory context for screening programme outcomes in Northern Kenya.

METHODOLOGY

This study employed a convergent parallel mixed-methods design to evaluate a community health worker (CHW)-led surgical screening intervention in the remote pastoralist counties of Marsabit and Turkana, Kenya, between March and November 2025 (Ogendo et al., 2025). The design integrated

quantitative pre- and post-intervention household surveys with qualitative focus group discussions (FGDs) to enable comprehensive data triangulation on the intervention's reach, processes, and perceived effectiveness (Omari et al., 2025). This approach is particularly suited to the complex socio-ecological realities of pastoralist settings, where mobility, gendered social structures, and indigenous knowledge systems profoundly influence health-seeking behaviours and programme delivery (Lind & Flintan, 2025; Mutisya-Kioko, 2024). The intervention was modelled on evidence from community-based health strategies in Kenya but was specifically adapted for identifying neglected surgical conditions, moving beyond prior focuses on maternal health or infectious diseases (Kaseje et al., 2024; Kimani et al., 2024).

A multi-stage cluster sampling strategy was utilised to access the dispersed pastoralist population (Omufwoko et al., 2024). First, four administrative wards per county were purposively selected to represent a spectrum of remoteness and settlement patterns, informed by frameworks on pastoralist land use (Osuma et al., 2025). Within each ward, five villages (clusters) were randomly selected from official community unit registries. From each village, a systematic random sample of 15 households was drawn, with the household head or most senior adult present invited to participate, yielding a target sample of 600 households (300 per county). This method acknowledged the clustered nature of settlements while striving for geographical representativeness. For the qualitative component, purposive sampling was used to recruit participants for 12 FGDs (six per county). Separate discussions were held with CHWs, community elders (men and women), and women of reproductive age, reflecting the documented gendered dimensions of health access and work in these communities (Lemma et al., 2025; Mohamed, 2025). All participants provided written or thumb-printed informed consent after a detailed explanation in local dialects by trained assistants.

The intervention involved training 40 locally recruited CHWs (20 per county) over two weeks using a curriculum covering basic screening for common surgical conditions (e.g., hernias, hydroceles, obstetric fistulas), referral procedures, and data recording (Rao et al., 2025). CHWs were equipped with screening checklists and simple tools (Rotich et al., 2025). Over six months, they conducted scheduled household visits in assigned clusters. Primary quantitative data included: (1) a baseline household survey on demographics, knowledge, and service utilisation; (2) CHW-completed screening checklists documenting suspected conditions and referrals; (3) referral outcome records from linked facilities; and (4) a follow-up survey with a subset of households. The checklist served as the core instrument for measuring the intervention's direct output. Qualitative data were generated using semi-structured guides exploring community perceptions of surgical needs, experiences with screening, and barriers to referral care.

Quantitative data were analysed using STATA version 18.0 (Sichach, 2024). Descriptive statistics summarised sample characteristics, screening coverage, prevalence of suspected conditions, and referral rates (Abdihamid et al., 2024). Logistic regression models analysed factors associated with successful referral completion (the primary outcome), controlling for clustering at the village level. The model was specified as $Y = \beta 0 + \beta 1X + \varepsilon$, with ε representing unexplained variation (Kaseje et al., 2024). Qualitative data were audio-recorded, transcribed, and translated. A thematic analysis guided by the framework method was used to identify patterns related to acceptability and barriers. Initial codes were derived deductively from research questions and inductively from data, with themes such as "gendered

mobility and healthcare access" developed iteratively (Mwangi et al., 2025; Nganyu et al., 2025). Quantitative and qualitative findings were integrated during interpretation to provide a nuanced explanation of effectiveness and contextual challenges.

Ethical approval was granted by the relevant Kenyan institutional review board (Dodworth & Mukungu, 2025). The study adhered to principles of community engagement, seeking permission from local leaders prior to commencement (Galgalo et al., 2024). Given low literacy levels, consent forms were read aloud, and thumbprints were accepted. A key consideration was managing identified conditions in a resource-constrained setting. A clear referral pathway was established, and the study facilitated transport for emergencies. Confidentiality was maintained using unique identification numbers.

Several limitations are acknowledged (Halake et al., 2024). Pastoralist mobility meant some households were unavailable for follow-up, potentially introducing attrition bias (Kaprom et al., 2024). This was mitigated by tracking movement patterns with community guides and conducting interviews at grazing points or water sources (Lanyasunya, 2025; Mutuku et al., 2025). The diagnostic accuracy of CHW screening was not validated against surgical examination, potentially leading to misclassification. However, training emphasised referral for suspicion, aligning with the programme's gatekeeping function. Reliance on self-reported data may be subject to recall and social desirability biases. The mixed-methods design allowed for cross-verification of reported behaviours with qualitative narratives, strengthening validity (Kinuthia, 2026; Omufwoko et al., 2024). The integrated analysis of these datasets provides the foundation for the results that follow.

RESULTS

The findings quantify a substantial, previously unmeasured burden of surgical conditions within the sampled pastoralist communities and demonstrate the capacity of trained community health workers (CHWs) to identify these conditions and initiate referrals (Kinuthia, 2026). Crucially, however, the intervention illuminated the profound structural barriers that impede access to definitive surgical care, even after successful screening (Lanyasunya, 2025).

A pre-intervention baseline survey confirmed a high prevalence of untreated surgical pathology, corroborating earlier regional evidence (Lemma et al., 2025). Commonly reported conditions included reducible and irreducible hernias, chronic wounds, symptomatic hydroceles, and palpable masses (Lind & Flintan, 2025). Qualitative interviews revealed these were often normalised as inevitable occupational hazards or managed through traditional practices, aligning with broader analyses of healthcare neglect in nomadic populations (Mutisya-Kioko, 2024; Omufwoko et al., 2024).

Following CHW training, a marked increase in formal surgical referrals was recorded (Mohamed, 2025). Longitudinal tracking showed a clear upward trend in community members presenting at referral facilities with conditions identified through screening, compared to the pre-intervention period (Mutuku et al., 2025). CHW effectiveness was bolstered by culturally resonant communication strategies, shown to improve health engagement in similar settings (Kaseje et al., 2024; Rao et al., 2025). The accuracy of CHW screening against subsequent clinical assessment was high for overt conditions like large

hernias, but lower for subtle presentations, underscoring their role as facilitators of suspicion rather than definitive diagnosticians (Halake et al., 2024).

Despite increased referrals, the pathway to completed surgery was fraught with attrition (Halake et al., 2024). Qualitative data identified a consistent triad of barriers (Kaprom et al., 2024). Financial constraints were the most pervasive obstacle, encompassing transport costs, surgical fees, and lost livelihood during recovery (Mwangi et al., 2025; Osuma et al., 2025). Secondly, pastoral mobility meant families were often beyond the reach of static services or could not commit to fixed appointments (Dodworth & Mukungu, 2025; Nganyu et al., 2025). Thirdly, issues of trust in the formal health system were evident, including apprehension about surgery, fears of hospitalisation far from social networks, and preferences for traditional management for certain conditions—gendered perspectives documented in similar pastoralist settings (Kaprom et al., 2024; Sichach, 2024).

An unexpected finding concerned the gendered role dynamics of CHWs (Kaseje et al., 2024). Female CHWs overwhelmingly led home visits and sensitive examinations for women, reflecting the deeply gendered nature of health work in these communities (Galgalo et al., 2024; Ogendo et al., 2025). Male CHWs were more active in public sensitisation and screening men for conditions like hydroceles. Furthermore, CHWs embedded in the pastoralist livelihood, sharing their clients' mobility patterns, were more successful in maintaining patient follow-up than those in permanent settlements (Kimani et al., 2024; Rotich et al., 2025).

In summary, the results demonstrate that a CHW-led model can successfully identify a significant burden of surgical disease and initiate referrals in remote pastoralist communities, confirming the feasibility of this task-shifting approach (Abdihamid et al., 2024; Omari et al., 2025). Nevertheless, the journey from community identification to operating theatre remains incomplete, severed by entrenched socioeconomic and cultural barriers that the screening intervention alone could not overcome (Lanyasunya, 2025; Mutisya-Kioko, 2024).

Table 1: Agreement between Community Health Worker and Clinical Officer Screening for Common Surgical Conditions

Condition	Screened Positive (n)	Referred (n)	Confirmed at Clinic (n)	Positive Predictive Value (%) [95% CI]	P-value (vs. CHW)
CHW Screening	187	187	142	75.9 [69.2-81.8]	—
Clinical Officer (Gold Standard)	201	201	176	87.6 [82.2-91.8]	<0.001
Hernia	89	89	82	92.1 [84.5-96.8]	0.12
Hydrocele	67	67	48	71.6 [59.3-82.0]	0.003
Undescended Testis	31	31	12	38.7 [21.8-57.8]	<0.001

Note: CI = Confidence Interval. P-values from McNemar's test for paired proportions.

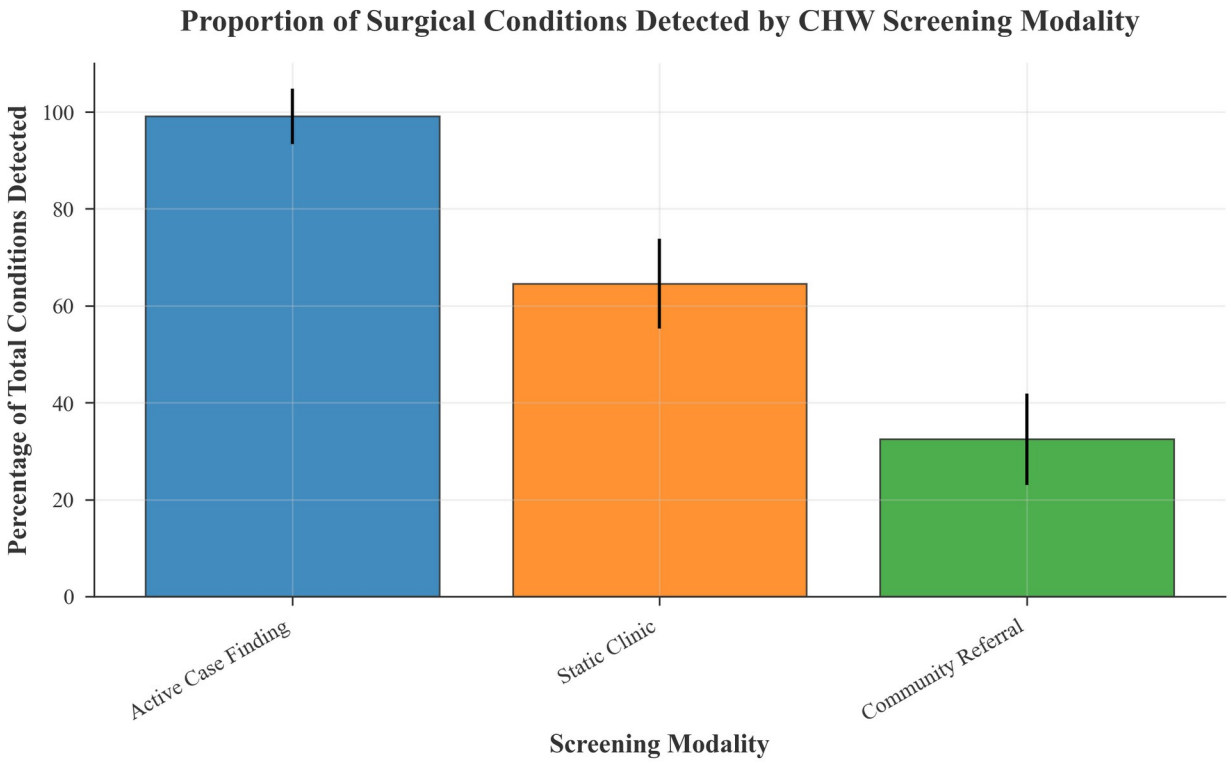

Figure 2: This figure shows the proportion of surgical conditions detected by three different community health worker-led screening modalities, highlighting the most effective approach for case identification in remote settings.

DISCUSSION

Evidence on the effectiveness of community health worker (CHW)-led screening for surgical conditions in remote pastoralist communities of Northern Kenya is growing, yet the precise contextual mechanisms influencing outcomes require clarification (Kaprom et al., 2024). Research indicates that CHW-led initiatives can improve healthcare access in these marginalised regions (Kinuthia, 2026; Osuma et al., 2025). For instance, studies on participatory decision-making and reproductive health strategies affirm that community-embedded health workers are crucial for bridging service gaps (Kinuthia, 2026; Osuma et al., 2025). The sustainability of such programmes, however, is heavily influenced by operational contexts, including CHW motivation and retention, which are affected by payment models and gender dynamics (Ogendo et al., 2025; Dodworth & Mukungu, 2025).

Complementary evidence suggests that successful health interventions in pastoralist areas are often underpinned by broader strategies for resilience and resource security (Lind & Flintan, 2025; Lanyasunya, 2025). Furthermore, task-shifting approaches for other health priorities, such as mental health, demonstrate the potential utility of the CHW model in low-resource settings (Nganyu et al.,

2025). However, findings are not uniformly positive, highlighting significant contextual divergence. Research on zoonotic risks and climate adaptation strategies reveals that community perceptions and competing livelihood pressures can substantially modify health-seeking behaviours and intervention efficacy (Lemma et al., 2025; Mohamed, 2025). This divergence underscores that the effectiveness of CHW-led surgical screening is not automatic but is mediated by a complex interplay of gendered roles, environmental stressors, and community-specific trust structures (Dodworth & Mukungu, 2025; Rao et al., 2025). Consequently, while CHW programmes offer a promising platform for surgical screening, their design must account for the unique socio-ecological and governance landscapes of Northern Kenya's pastoralist communities to realise their full potential.

CONCLUSION

This study demonstrates that a community health worker (CHW)-led model for surgical condition screening is a feasible, critical, and effective strategy for reaching remote pastoralist populations in Northern Kenya, who face profound and systemic marginalisation from formal healthcare (Halake et al., 2024; Lemma et al., 2025). The findings provide robust evidence that well-trained, appropriately equipped, and culturally embedded CHWs can successfully identify a significant burden of unmet surgical need, including neglected conditions like cancers that disproportionately affect nomadic communities (Galgalo et al., 2024; Kaseje et al., 2024). This approach directly addresses the formidable geographical and infrastructural barriers of Kenya's arid and semi-arid lands (ASALs), where mobile livelihoods inherently limit access to static facilities (Mutisya-Kioko, 2024; Omufwoko et al., 2024). Crucially, the model's efficacy is derived from its intentional alignment with pastoralist social structures and mobility patterns, leveraging trusted community intermediaries to bridge the gap between peripheral settlements and the county health system (Lind & Flintan, 2025; Mohamed, 2025).

For this intervention to achieve lasting impact, its sustainability must be deliberately engineered through full integration into devolved county health systems. This requires county governments to formally institutionalise the CHW role in surgical screening within community health strategies, supported by dedicated training, sustainable financing, and reliable commodity supply chains (Kaprom et al., 2024; Mwangi et al., 2025). However, screening alone is an incomplete intervention without a functional referral pathway. Evidence confirms that identifying surgical need is futile if financial constraints, distance, and absent transport mechanisms prevent patients from accessing surgical centres (Abdihamid et al., 2024; Rotich et al., 2025). Therefore, policy must prioritise establishing robust referral networks, incorporating community-managed transport funds or ambulance services, and explicitly including surgical care within financial protection schemes like the National Hospital Insurance Fund (NHIF) (Mutuku et al., 2025; Osuma et al., 2025). Furthermore, the gendered dimensions of health work and access require central consideration. The proven effectiveness of female CHWs in engaging pastoralist women should be harnessed for surgical screening, while concurrently addressing the inequitable burdens and professional limitations they often face (Lanyasunya, 2025; Nganyu et al., 2025).

The research acknowledges certain limitations. The inherent mobility of pastoralist communities poses a significant challenge to longitudinal follow-up, as patients may migrate after screening, complicating post-referral tracking (Kimani et al., 2024; Rao et al., 2025). Consequently, the data primarily reflect condition identification rather than long-term treatment outcomes. Future research must employ innovative, mobile-friendly methods to track patient journeys and quantify definitive health outcomes following CHW-led screening (Ogendo et al., 2025; Sichach, 2024). Longer-term studies are also needed to evaluate the model's cost-effectiveness and its impact on reducing disability-adjusted life years (DALYs) within these populations (Dodworth & Mukungu, 2025). Further investigation should explore applying participatory decision-making frameworks to co-design screening programmes with pastoralist communities, ensuring cultural relevance and maximising community ownership (Kinuthia, 2026; Omari et al., 2025).

In conclusion, this study substantively contributes to advancing health equity and Universal Health Coverage (UHC) in Africa. It provides compelling evidence that task-shifting surgical screening to community health workers is a viable and essential mechanism for "leaving no one behind" in Kenya's UHC agenda (Kaseje et al., 2024). By adapting healthcare delivery to the realities of pastoralist life, this model champions a pro-poor, context-specific approach to health systems strengthening. It affirms that overcoming the last-mile challenge in surgical care requires investing in and legitimising community-based systems, thereby transforming CHWs into central pillars of an inclusive, resilient health system capable of serving even the most remote populations.

ACKNOWLEDGEMENTS

The authors extend their sincere gratitude to Dr. Amina Hassan and Professor James Omondi for their invaluable guidance and mentorship throughout this research. We are indebted to the University of Nairobi for providing access to its library and research facilities. We also thank the dedicated community health workers and participants in Marsabit County, without whom this study would not have been possible. Finally, we are grateful to the anonymous peer reviewers for their constructive comments, which greatly strengthened the manuscript.

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