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Strengthening Maternal and Child Health Systems through Digital Tools and Task Sharing: Evidence from Rural Kenya

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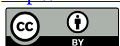
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Abstract

The study evaluated the impact of digital health tools, task sharing, capacity building, and maternal health financing on Maternal, Newborn, and Child Health (MNCH) systems in Kisii, Kajiado, and Migori counties in Kenya, under the *Tekeleza* project[1]. It aimed to assess how these interventions influenced MNCH service uptake, outcomes, and referral systems, using a mixed-methods approach with data from healthcare providers, community health promoters, and mothers. Findings showed that digital tools like the LUCY App improved coordination and maternal care but highlighted the need for better app features and wider access. Task sharing in areas like sonography enhanced service delivery but required stronger stakeholder engagement. Capacity-building through training was crucial for skill development, though additional training on emerging health issues was needed. Financial interventions, such as the Linda Mama program, boosted service uptake, but reimbursement processes needed improvement. Strengthening referral systems between lower- and higher-level facilities was identified as essential for timely access to care. The study concludes that integrating digital tools, expanding task sharing, enhancing training, and reinforcing health financing and referral systems are critical for strengthening MNCH services in rural Kenya, with broader implications for similar low-resource settings.

Keywords

Digital Health Tools, Task Sharing, Maternal Health Financing, Referral Systems

[1]*Tekeleza* is a *Swahili* word for "implement the decision". A lot of wishful decisions have been made to improve the quality of care for mothers and children, but they are yet to be fulfilled. This project has been keen to implement some of those delayed decisions to increase the utilization of high-quality community and primary MNCH care.

1. Introduction

1.1. Background to the Study

Maternal health care is critical in reducing maternal and child mortality. Globally, an estimated 289,000 deaths occur during pregnancy and childbirth annually. Proper maternal care during pregnancy and delivery could prevent up to 1.3 million neonatal deaths, 531,000 stillbirths, and 113,000 maternal deaths. The Sustainable Development Goals (SDGs) aim to reduce global maternal mortality to less than 70 deaths per 100,000 live births by 2030 [1]. However, despite progress, global maternal mortality remains a significant challenge. Between 2000 and 2020, the global Maternal Mortality Ratio (MMR) declined by 34%, from 339 to 223 deaths per 100,000 live births, an annual reduction rate of 2.1%. While this is notable, it is well below the 6.4% annual rate needed to achieve the SDG target by 2030. Although maternal mortality has decreased to 287,000 by 2020, nearly 800 women still die every day from pregnancy and childbirth complications—equivalent to one death every two minutes [2].

Despite increased international attention toward addressing maternal and child health, the pace of progress has been slow. The reduction in maternal mortality, largely attributed to better access to skilled and emergency obstetric care, has stagnated in recent years [3]. From 2016 to 2020, the global reduction in maternal deaths was effectively zero. This stagnation underscores the preventable nature of maternal mortality, as nearly all maternal deaths could be avoided with appropriate care [4]. As Dr. Mahmoud Fathalla eloquently stated, "Mothers are not dying because of diseases we cannot treat. They are dying because societies have yet to make the decision that their lives are worth saving" [5].

Maternal mortality is a reflection of broader inequalities in sexual and reproductive health, both between and within countries. Sub-Saharan Africa, home to many of the world's least developed health systems, accounts for over 70% of maternal deaths. A woman in this region is 130 times more likely to die from pregnancy complications than a woman in Europe or North America. Even within countries, disparities are vast. In Madagascar, for example, wealthier women are five times more likely than poorer women to receive skilled assistance during childbirth [6]. In the Americas, people of African descent face higher levels of obstetric mistreatment. Sub-Saharan Africa experiences around 200,000 maternal deaths annually, primarily due to lack of access to skilled delivery and emergency care [7] [8]. Skilled attendance during birth is inversely related to maternal mortality, and variations in mortality within regions often reflect differences in access to modern maternal health services [9].

The global shortage of health professionals further exacerbates maternal health challenges. In Africa, 56% of the global shortage of health professionals—particularly those dedicated to reproductive, maternal, newborn, and adolescent health—occurs on the continent [10]. Many deliveries still occur without the assistance of skilled health personnel. WHO estimates that 60 million deliveries annually are attended by untrained traditional birth attendants, family members, or no one at

all [11].

Research has long pointed to the low utilization of maternal health services for delivery. Factors such as distance from health services, high costs, competing demands on women's time, and poor quality of care have all been identified as significant barriers [12]. Gender discrimination, low levels of female education, and the inability of women to make decisions about their own care contribute to further delays in seeking care and preventable deaths [13]. While the importance of Antenatal Care (ANC) has been debated, evidence supports its positive association with safe delivery services [14]. To reduce maternal mortality, it is essential to build robust health systems that offer accessible, high-quality reproductive health services, including family planning, safe abortion, skilled delivery, and postpartum care [15].

In Kenya, maternal mortality remains a significant issue despite efforts to reduce it. The Kenya Demographic and Health Survey (KDHS) reports have tracked the country's progress in this area. The 2003 KDHS reported 506 maternal deaths per 100,000 live births and 77 neonatal deaths per 1000 live births. By 2008, maternal deaths had increased to 520 per 100,000 live births, while neonatal deaths decreased to 52 per 1000 live births. The 2022 KDHS showed improvements, with maternal mortality reduced to 355 per 100,000 live births and neonatal mortality at 41 per 1000 live births. While these trends are encouraging, they remain far from the SDG target of 70 maternal deaths per 100,000 live births by 2030. Additionally, only 66% of women attended at least four ANC visits, and 89% of births were assisted by skilled providers. Despite these improvements, many women in Kenya begin ANC visits late in pregnancy and attend fewer visits than recommended by WHO [16]-[18].

1.2. *Tekeleza* Project in Rural Kenya

Amref Health Africa and Amref International University (AMIU) implemented the *Tekeleza* project to improve maternal and child health outcomes in three Kenyan counties: Kisii, Kajiado, and Migori. The project aimed to break the cycle of limited access to quality MNCH services by leveraging digital health innovations such as AMREF's mobile training platforms (*EddApp & JIBU*), the *MJali* household data collection tool, and the Philip's *Lumify* portable ultrasound screening tool. These technologies aimed to enhance access to quality, affordable, and financially sustainable MNCH care.

Digital health tools, or mHealth, have been proposed as solutions to many of the challenges facing developing countries' health systems, such as workforce shortages, limited health information, and the difficulty of tracking patients. Evidence suggests that digital platforms like E*ddApp* and *JIBU* can improve the performance of primary healthcare workers, particularly in remote areas. Moreover, digital technologies add value to data collection and monitoring, facilitating data-driven decision-making and resource allocation. When digital health tools are integrated into existing health systems and incentivized appropriately, they can contribute significantly to improving health outcomes.

The *Tekeleza* project sought to increase access to quality MNCH services, strengthen service delivery linkages between communities and health facilities, and improve the availability of essential MNCH supplies through innovative financing models. Its interventions included upskilling primary healthcare workers using the *EdApp* micro-learning platform, training midwives to conduct early obstetric ultrasound screening, and using digital literacy tools to improve pregnant women's health-seeking behavior. Community Health Promoters (CHPs) were incentivized through income-generating activities and performance-based rewards to motivate them to create demand for MNCH services. Midwives were also incentivized through user fees to ensure the sustainable implementation of obstetric point-of-care ultrasound screening. Additionally, the project utilized the M-Jali application to enroll pregnant women in the *Linda Mama* National Health Insurance Fund for perinatal care, addressing the weak community referral system. Overall, the *Tekeleza* project aimed to improve the quality of community-facility linkages, increase facility preparedness, strengthen referral systems, and develop a sustainable financing model for integrated MNCH services.

1.3. Problem Statement

The "Continuum of Care" for Maternal, Newborn, and Child Health (MNCH) emphasizes integrated service delivery from pregnancy through early childhood, with a focus on Preventing Mother-to-Child Transmission (PMTCT) of HIV and improving health outcomes through focused antenatal and postnatal care. However, the effectiveness of this approach is often compromised by poor adherence to antenatal care schedules, which impacts the timely delivery of essential interventions like immunizations, nutrition counseling, and malaria prevention. Additionally, postnatal services remain critical, as many maternal and child deaths occur shortly after birth, yet follow-up care is frequently missed, leading to gaps in PMTCT, family planning, and immunization. Despite Kenya's constitutional guarantees for health access and reforms like the Social Health Insurance Act of 2023, significant disparities persist in service coverage, especially among the poorest households, who bear a disproportionate financial burden for healthcare. The *Tekeleza* project aimed to address these challenges by promoting integrated service delivery models in Kisii, Migori, and Kajiado counties, yet evidence of its impact on MNCH outcomes and sustainable healthcare financing remains limited. This study sought to evaluate the project's effectiveness and identify strategies for improving continuity of care in these resource-constrained settings.

1.4. The Conceptual Framework

The conceptual model of the study (**Figure 1**) illustrates the key challenges affecting the uptake and utilization of MNCH services among pregnant women and mothers of children under 18 months, as well as barriers to delivering quality care and the common sources of health financing. The model highlights three critical contexts that influence the utilization of MNCH services: the community context,

the health facility context, and the health financing context, providing a comprehensive overview of how these interconnected factors impact service delivery and access.

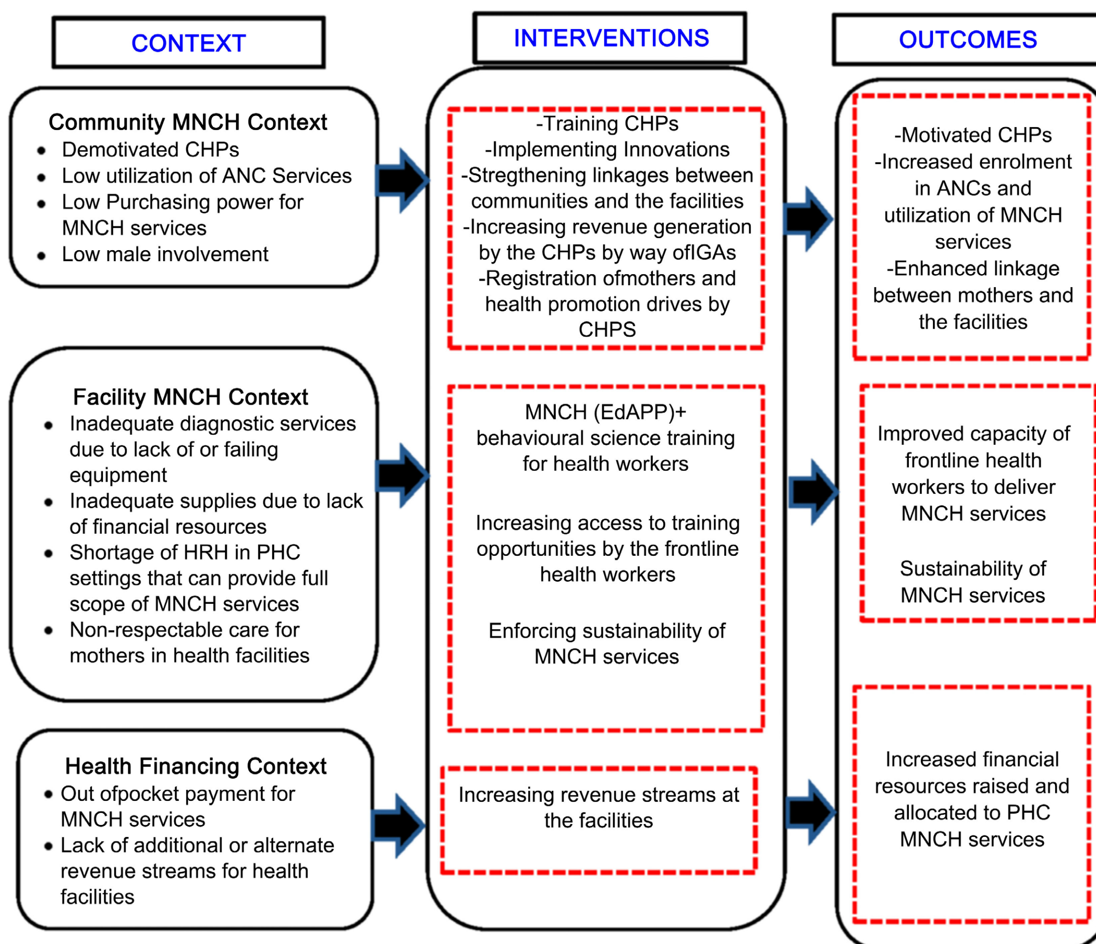

Figure 1. The conceptual model.

2. Methods

2.1. Study Design, Sampling and Data Collection Approaches

The study employed quasi experimental study design where data collection involved use of mixed methods (qualitative and quantitative). Quantitative data was sourced from household surveys, health facility assessments, and secondary data abstraction. Household surveys targeted women aged 15 - 49 years who had resided in the project areas for at least six months, ensuring they were familiar with local healthcare services. Participants were excluded if they had recently relocated or were not primary decision-makers in household health matters. Random Sampling method selected households from Community Health Units (CHUs) records, with a total sample of 404 households from intervention site adjusted for non-responses. Some secondary data for indicators of interest from non-intervention site CHUs was used to make performance comparisons with the intervention sites. Health

facility surveys included healthcare providers who were currently employed and had been with the facility for at least six months to ensure familiarity with service delivery processes.

Qualitative data was collected through Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and desk reviews. Participants for KIIs included Sub-County Health Officers, project staff, and health facility managers, chosen for their direct involvement in the *Tekeleza* project and MNCH service delivery. The inclusion criteria for KIIs and FGDs required participants to have at least one year of relevant professional experience within the project catchment area. Exclusion criteria for qualitative participants included a lack of experience with project activities or unwillingness to consent to the interview.

A purposive sampling strategy ensured a diverse representation of perspectives, with sample sizes based on the informants' roles and their relevance to the study objectives.

Data collection was enhanced using digital tools, with household and facility surveys administered via *KoBoCollect* on smartphones or tablets for real-time data entry. This approach facilitated quality assurance, adherence to protocols, and rapid troubleshooting during fieldwork.

Quantitative analysis involved the use of the Statistical Package for Social Sciences (SPSS v. 26). Data cleaning procedures included handling outliers and missing responses. Descriptive statistics and cross-tabulations were conducted, while baseline and endline comparisons were adjusted for confounding factors. Qualitative data, analyzed thematically using NVivo 12, included the consideration of external factors such as policy or economic shifts that could have influenced healthcare outcomes. To further contextualize findings, the study compared intervention site results with similar non-project sites, providing a quasi-experimental perspective.

2.2. Ethical Considerations

Ethical approval for the *Tekeleza* evaluation was obtained from the Amref Health Africa Ethics and Scientific Review Committee (Approval No. AMREF/ESRC P1730/2024) and the National Commission for Science, Technology, and Innovation (NACOSTI) under License No: NACOSTI/P/24/39238. In addition, administrative clearance was secured from relevant county and sub-county public health offices. The study team also made courtesy calls to Sub-County Public Health Officers (SCPHOs) and Sub-County Administrators to ensure proper security and logistical arrangements.

Confidentiality was strictly maintained throughout the study. All confidential data—whether written, visual, oral, or digital—provided to Firstdata Research Consultants Ltd. was safeguarded and only shared with authorized personnel. Each individual involved in handling study data, including enumerators and statisticians, signed a Data Confidentiality Agreement. The information was accessible strictly on a need-to-know basis, ensuring that sensitive information was not disclosed to any third party without prior written consent from an appointed representative.

The study participants were only included after providing informed consent. Literate respondents signed written consent forms, while for illiterate participants, consent forms were read aloud in a language they understood, often Swahili. Research assistants signed off to confirm the participants' approval and voluntary participation. Special measures were taken to assist participants with special needs, including providing alternative consent formats and obtaining legal guardians' consent where necessary. Throughout, participants were made aware that they could decline participation or withdraw from the study at any point.

To ensure the protection of study subjects, the research team took several precautions to preserve the anonymity of participants and maintain their privacy. No identifying information was included in research reports and codes that could potentially reveal participants' identities were destroyed after the study was completed. Additionally, photographing and audio recording were only conducted with explicit participant consent. The participants were fully informed about their right to review and request the cessation of any recordings. Furthermore, those attending Focus Group Discussions (FGDs) were compensated for their travel expenses, while household survey and key informant interview participants were not compensated, as they did not incur extra costs during the study.

3. Results

3.1. Impact of Digital Health Tools on Service Delivery

The *Tekeleza* project's integration of digital health tools, particularly the LUCY app, significantly improved maternal and child health service delivery. Among the 64 participating mothers, 92.2% utilized the app for pregnancy-related education, enhancing their awareness and understanding of maternal health. Nutritional guidance was accessed by 79.7% of users, and 73.4% used the app to track antenatal care visits, promoting consistent prenatal check-ups. However, the app's role in tracking postnatal care was limited, with only 26.6% of mothers utilizing this feature, highlighting the need for improved postnatal follow-up.

Community Health Promoters (CHPs) also reported enhanced service delivery efficiency through digital tools like EdApp and M-JALI. All CHPs used these innovations for health education and client referrals, noting that the tools improved their service delivery skills and community engagement. The LUCY app was particularly effective in aiding CHPs with pregnancy risk identification and referral processes, as well as promoting family participation in healthcare. Overall, digital tools within the *Tekeleza* project not only expanded access to health education but also empowered healthcare providers, facilitating better health outcomes across Kisii, Kajiado, and Migori counties.

3.2. Task Sharing and Capacity Building among Healthcare Workers

The *Tekeleza* project's task-sharing initiatives significantly bolstered healthcare workers' capacity in Maternal, Newborn, and Child Health (MNCH) service delivery.

Integrating Obstetric Point-of-Care Ultrasound (OPOCUS) into midwives' and clinical officers' roles addressed the sonographer shortage in Level 3 facilities, while expanding healthcare workers' skills. This strategy enhanced early decision-making and service efficiency, with collaborative efforts between clinical officers and midwives improving patient care and referral management.

Community Health Promoters (CHPs) contributed to the task-sharing model by managing Linda Mama program enrolment and streamlining the referral process using digital tools. This led to increased service uptake and higher ultrasound screening rates. Targeted training for healthcare workers focused on OPOCUS and effective referral practices, enabling nurses and midwives to balance new responsibilities with traditional duties.

Task sharing reduced travel burdens and wait times for mothers seeking ultrasound services, leading to better health outcomes and increased client satisfaction. Overall, the *Tekeleza* project demonstrated that task-sharing and capacity building, supported by digital tools, can effectively strengthen MNCH service delivery, benefiting rural communities.

3.3. Health Financing Mechanisms and Their Role in MNCH Outcomes

The *Tekeleza* project demonstrated the critical role of health financing mechanisms, particularly Income Generating Activities (IGAs) and Performance-Based Incentives (PBIs), in strengthening MNCH services.

3.3.1. Income Generating Activities (IGAs)

IGAs provided financial motivation for Community Health Promoters (CHPs), especially in Kajiado and Migori, where higher engagement with maternal health services led to increased referrals and enrollments in programs like *Linda Mama*. Challenges in Kisii, including transport costs and early cessation of IGAs, hindered success, underscoring the need for better support and business skills training for CHPs to ensure sustained benefits.

3.3.2. Performance-Based Incentives (PBIs)

PBIs effectively linked financial rewards to service outcomes, encouraging CHPs to increase referrals and ultrasound screenings. The model motivated 97.1% of CHPs to intensify community outreach, contributing to greater healthcare utilization. Despite some dissatisfaction regarding target variability, the financial incentives positively influenced community engagement and MNCH service uptake.

3.3.3. Implications for MNCH Outcomes

By financially empowering CHPs, these mechanisms directly improved access to maternal and child health services, helping reduce barriers like transport costs for vulnerable mothers. For sustainability, continuous training and transparent financial management are essential, alongside active CHP involvement in decision-making.

3.4. Strengthened Referral Systems and Their Impact on Health Outcomes

The *Tekeleza* project developed a more effective referral system to improve access to MNCH services. Central to this improvement were the Community Health Promoters (CHPs) and digital tools that streamlined communication between communities and health facilities. CHPs acted as key connectors, educating families on the importance of maternal care and referring them to health services. Digital applications, including M-Jali and LUCY, enabled CHPs to manage referrals more efficiently. M-Jali digitized the registration and tracking of referrals, minimizing delays associated with manual processes. This approach ensured that health facilities received timely and accurate patient information, enhancing preparedness and reducing delivery complications. The digitized system allowed faster access to necessary care, and the LUCY app provided mothers with information on available services and costs, increasing service uptake. A digital dashboard tracked client progress, enabling better follow-ups and care coordination.

The strengthened referral system had a profound impact on MNCH outcomes. Table 1 shows that there was a significant decrease in the proportion of mothers not attending ANC clinics, which dropped from 53.4% at the project's onset to just 1.4% at exit. Similarly, the proportion of deliveries assisted by skilled birth attendants increased to 97.6%, reflecting a 4.9% rise from baseline figures. Table 2 shows that the vaccination coverage for children also improved markedly, with fully vaccinated rates climbing from 67.8% to 85.7%. Furthermore, the referral system facilitated by M-Jali directly influenced the uptake of *Linda Mama* claims, indicating that enhanced communication between CHPs and health facilities led to better access to maternal health services.

Table 1. Lactating mothers who attended at least 4 ANC visits.

Percentage of lactating mothers who attended at least 4 ANC visits	County names							
	Kajiado		Kisii		Migori		Overall	
	%	%	%	%	%	%	%	%
	Base line	End line	Base line	End line	Base line	End line	Base line	End line
At least four	33.0	48.2	39.0	60.0	15.2	79.8	30.1	63.6
Thrice	10.6	30.4	19.0	28.6	1.3	14.1	11.0	24.0
Twice	1.1	12.7	11.0	6.7	1.3	5.1	4.8	7.8
Once	2.1	8.9	1.0	4.8	0.0	1.0	1.1	4.6
None	53.2	1.3	30.0	2.8	82.3	0.0	53.1	1.4
Total	**79**	**100.0**	**105**	**100.0**	**99**	**100.0**	**283**	**100.0**
N	**94**	**80**	**100**	**108**	**79**	**99**	**273**	**287**

However, the implementation of the *M-Jali* application was not without challenges. Issues such as poor internet connectivity, limited digital literacy among

some CHPs, and integration difficulties at health facilities occasionally hindered the referral process. Instances of lost or misplaced referrals also arose, primarily due to high workloads among healthcare workers. These challenges underscored the need for continuous training and support to ensure the successful integration of digital tools into existing health systems.

In conclusion, the strengthened referral systems established by the *Tekeleza* project significantly improved access to MNCH services, resulting in better health outcomes for mothers and children. By leveraging the roles of CHPs and innovative digital tools, the project created a more efficient and effective referral process that enhanced the overall quality of care. Despite existing challenges, the successful implementation of the referral system marked a critical advancement in the delivery of maternal health services, with the potential for scalability and sustainability in similar contexts.

3.5. Comparative Analysis of Baseline and Endline Outcomes

3.5.1. Number of Children at 0 - 18 Months Who Were Fully Immunized for Age

The *Tekeleza* project made significant strides in enhancing immunization coverage among children aged 0 - 18 months, as reflected in the results of both the baseline and endline surveys. The overall increase in the proportion of fully vaccinated children, from 67.8% at baseline to 85.7% at endline (an increase of 17.9%), underscored the effectiveness of targeted interventions, as shown in **Table 2**. This notable improvement was attributed to the project's emphasis on community sensitization efforts led by Community Health Promoters (CHPs). By fostering awareness and ensuring that caregivers understood the importance of vaccinations, the project enhanced community engagement and compliance.

Table 2. Percentage of children fully vaccinated for age.

Whether child is fully vaccinated for age	County names							
	Kajiado		Kisii		Migori		Overall	
	%	%	%	%	%	%	%	%
	Base line	End line	Base line	End line	Base line	End line	Base line	End line
Yes	77.7	92.5	47.0	79.6	82.3	86.9	67.8	85.7
No	22.3	7.5	53.0	20.4	17.7	13.1	32.2	14.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
N	**94**	**80**	**100**	**108**	**79**	**99**	**273**	**287**

Inferential analysis using Negative Binomial Regression (where facility-based data was compared between the *Tekeleza*-supported primary health facilities and similar tier non-supported primary health facilities) further supported these findings, demonstrating a significant difference between the treatment and comparison groups. The Omnibus Test of indicator M1 in **Table 3** yielded a Likelihood

Ratio Chi-Square statistic of 10.67 (P-value < 0.05), indicating that the *Tekeleza* interventions significantly affected immunization rates. The Incidence Rate Ratio (IRR) of 0.6319 signified that children in the comparison group were 36.8% less likely to be fully immunized than those in the treatment group. This suggested that the interventions implemented by *Tekeleza* not only increased immunization rates but also highlighted systemic barriers faced by the comparison group, such as distance to health facilities and vaccine availability, thus prompting the need for ongoing community support initiatives.

Table 3. Inferential comparison of facility data from *Tekeleza* supported and non-supported facilities on select MNCH indicators.

Indicator	Baseline value	Endline value	Change	Statistical test	Chi-square (likelihood ratio)	P-value	Incidence Rate Ratio (IRR)	Interpretation
M1: Number of Children 0 - 18 Months Who Were Fully Immunized for Age	67.8%	85.7%	+17.9%	Negative Binomial Regression	10.67	<0.05	0.6319	Children in the comparison group were 36.8% less likely to be fully immunized than those in the treatment group, indicating significant improvements in immunization rates due to the intervention.
M2: Number of Pregnant Women Who Received/ Completed 4+ ANC Visits	46.8%	98%	+51.2%	Negative Binomial Regression	24.51	<0.05	0.4934	Women in the comparison group were 50.66% less likely to complete 4 or more ANC visits compared to those in the treatment group, demonstrating a substantial increase in ANC attendance.
M3: Number of Mothers Who Received/ Completed 4+ PNC Visits	26.1%	Data not available	Data not applicable	Negative Binomial Regression	3.993	<0.05	0.7315	Mothers in the comparison group were 26.85% less likely to complete 4 or more PNC visits than those in the treatment group, indicating significant gaps in postnatal care.
M4: Number of Births Assisted by a Skilled Provider	92.5%	97.6%	+5.1%	Negative Binomial Regression	48.401	<0.05	0.3545	Mothers in the comparison group were 64.55% less likely to have births attended by skilled providers compared to those in the treatment group, reflecting the effectiveness of the intervention in promoting skilled attendance during childbirth.

Note: Change indicates the percentage point difference between baseline and endline values. The IRR values help to illustrate the comparative likelihood of outcomes between the treatment and comparison groups.

3.5.2. Number of Pregnant Women Who Received/Completed 4+ ANC Visits

The *Tekeleza* project's interventions also positively impacted Antenatal Care (ANC) attendance, with the proportion of mothers attending at least one ANC visit soaring from 46.8% at baseline to 98% at endline. This dramatic rise reflected the project's commitment to improving maternal health service utilization through enhanced healthcare access and education. The analysis showed that Kajiado

County had the most significant increase, with attendance jumping from 43% to 99.3%. Inferential analysis of indicator M2 in **Table 3** corroborated these outcomes, with an Omnibus Test Likelihood Ratio Chi-Square of 24.51 (P-value < 0.05). The IRR of approximately 0.4934 indicated that women in the comparison group were about 50.6% less likely to complete 4 or more ANC visits compared to those in the treatment group. This evidence illustrated that the interventions not only raised attendance rates but also fostered positive changes in maternal health-seeking behavior, which was essential for improving maternal and neonatal outcomes.

3.5.3. Number of Mothers Who Received/Completed 4+ PNC Visits

Despite the WHO's recommendations for critical Postnatal Care (PNC) timings, the findings revealed significant challenges in ensuring mothers received comprehensive PNC. The data showed that only 26.1% of mothers across the three counties completed all three recommended postnatal examinations, indicating that while interventions improved ANC attendance, gaps in postnatal care remained. The inferential analysis of indicator M3 in **Table 3** yielded an Omnibus Test Likelihood Ratio Chi-Square of 3.993 (P-value < 0.05), and the IRR of approximately 0.7315 suggested that mothers in the comparison group were 26.8% less likely to complete 4 or more PNC visits than those in the treatment group. These findings highlighted a critical area for improvement in the *Tekeleza* project, indicating the need for intensified advocacy and service delivery enhancements focused on postnatal care to ensure that mothers received essential follow-up care. The insights from key informants revealed systemic challenges in PNC uptake, reinforcing the project's necessity to integrate postnatal services within its broader maternal health strategy.

3.5.4. Number of Births Assisted by a Skilled Provider

The success of *Tekeleza*'s interventions in promoting skilled birth attendance was evident in the substantial increase in health facility deliveries. The proportion of mothers delivering at health facilities rose from 92.5% at baseline to an impressive 97.6% at endline, with notable gains observed across all counties. The results suggested that the project's strategies to enhance healthcare access, coupled with community outreach efforts, effectively encouraged mothers to utilize skilled care during childbirth. Inferential analysis of indicator M4 in **Table 3** further substantiated these gains, with an Omnibus Test Likelihood Ratio Chi-Square of 48.401 (P-value < 0.05). The IRR of approximately 0.3545 indicated that mothers in the comparison group were 64.5% less likely to have their births attended by skilled providers compared to those in the treatment group. This underscored the significant impact of *Tekeleza*'s interventions in improving maternal health outcomes by ensuring that births were assisted by qualified healthcare providers, thereby reducing the risks associated with unskilled deliveries.

The comparative analysis of baseline and endline outcomes demonstrated that *Tekeleza*'s targeted interventions made a substantial impact on maternal and child

health indicators across the studied regions. The combination of community engagement, enhanced healthcare access, and strategic partnerships with CHPs effectively addressed barriers to immunization, antenatal care, and skilled birth attendance. However, the findings also revealed critical areas for continued focus, particularly in postnatal care, indicating the need for ongoing efforts to ensure comprehensive maternal health services were accessible to all women.

4. Discussion

The *Tekeleza* project's findings underscore the effectiveness of digital tools, task sharing, health financing, and referral enhancements in improving Maternal, Newborn, and Child Health (MNCH) outcomes in rural Kenya. The project's approach provided clear evidence of the impact that a well-integrated health system can have in resource-constrained settings.

Digital health tools like the LUCY app played a crucial role in enhancing service delivery. With a high uptake for pregnancy-related education and nutritional guidance, the app successfully disseminated vital health information to mothers. The tracking of Antenatal Care (ANC) visits through digital tools encouraged regular check-ups, a critical factor in maternal health. However, the lower engagement with postnatal care services through the app indicated that further efforts are needed to maintain healthcare engagement after delivery. Digital platforms also benefited Community Health Promoters (CHPs), equipping them with resources to provide accurate information, manage referrals efficiently, and reduce the delays traditionally associated with manual processes.

Task sharing proved to be another successful component of the project, addressing the gap in healthcare staffing. The initiative expanded the responsibilities of midwives and clinical officers, empowering them to conduct Obstetric Point-of-Care Ultrasound (OPOCUS) services locally. This strategy not only reduced the burden of travel for expectant mothers but also enabled timely and informed healthcare decisions, contributing to better maternal and neonatal outcomes. While there were initial reservations among healthcare workers about expanded roles, consistent training ensured a smooth transition and highlighted the potential of task sharing to strengthen healthcare systems.

Health financing mechanisms such as Income Generating Activities (IGAs) and Performance-Based Incentives (PBIs) provided a motivational boost for CHPs, supporting them in outreach and education roles. However, challenges in Kisii County, including transportation costs and premature IGA termination, limited the financial gains for some CHPs. PBIs showed success in incentivizing performance, but inconsistencies in referral target setting revealed the need for a clearer and more equitable incentive structure.

Enhanced referral systems, underpinned by digital tools like M-Jali, were pivotal in improving access to MNCH services. These tools enabled CHPs to register and track referrals digitally, minimizing miscommunication and ensuring that healthcare providers were prepared for incoming cases. The improvements were

reflected in increased ANC attendance rates and higher skilled birth attendance, reinforcing the importance of streamlined communication between communities and healthcare facilities. While occasional issues like internet connectivity and increased workload arose, the referral system overall set a strong precedent for efficient healthcare delivery.

The project achieved noteworthy gains in health outcomes, with significant increases in immunization coverage and ANC attendance. Yet, the continuity of care after delivery remained a challenge, as evidenced by the lower completion rates of postnatal care visits. This shortfall suggests a need for more focused advocacy and service delivery improvements to support maternal health beyond childbirth.

In conclusion, the *Tekeleza* project demonstrated that integrating digital tools, task sharing, and health financing into maternal and child health services can effectively address both supply-side and demand-side barriers. The resulting improvements in access to services, enhanced capacity of healthcare workers, and greater community engagement highlight the potential for scaling similar interventions in other rural settings. However, ongoing challenges in postnatal care continuity and financial sustainability must be addressed to ensure the long-term success of these interventions.

5. Conclusion

In conclusion, the *Tekeleza* project successfully demonstrated that integrating digital tools and task sharing can significantly enhance maternal and child health systems in rural Kenya. Digital innovations like the LUCY app and M-JALI facilitated better health education, service tracking, and referral processes, while task sharing enabled midwives and clinical officers to fill critical service gaps, improving care quality. Health financing mechanisms supported CHPs, driving increased community engagement and service uptake. These interventions resulted in measurable gains in key health indicators, including immunization coverage and antenatal care attendance. However, the project highlighted persistent challenges in postnatal care that require targeted interventions. Future research should focus on strategies to sustain digital health adoption post-project, improve postnatal care engagement, and address financial sustainability to ensure long-term success. These insights underline the potential of integrated, context-specific interventions to strengthen healthcare delivery in underserved areas.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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