

Care group model approach as an implementation strategy to reach zero-dose and under-vaccinated children: lessons from Mbeya region Tanzania

Abstract

Background: Reaching zero-dose and under-vaccinated children remains a critical challenge for achieving global immunization equity. *Zero-dose* children are those who have not received any vaccine doses. Operationally, Gavi defines zero-dose children as infants who have not received the first dose of a diphtheria, tetanus, and pertussis-containing vaccine (DTP1) by the end of their first year of life, while *under-vaccinated* children are those who have not received the third dose of a DTP-containing vaccine (DTP3) within the same period (Gavi, 2021–2025 Equity Goal). In this paper, the term *defaulters* refer to children who have missed one or more of the other required vaccine doses or antigens in their routine immunization schedule, excluding DTP3. This operational case study implemented the Care Group Model (CGM) through Community Health Workers (CHWs) to identify and vaccinate missed children in councils of Mbeya with hard-to-reach population.

Methods: Between September 2024 and May 2025, the CGM was introduced in four councils. A total of 525 CHWs were oriented to conduct household visits, verifying children's vaccination status, and refer unvaccinated children for services. Data from household screenings and a caregiver survey were analyzed to assess vaccination completion and behavioral changes among caregivers.

Results: CHWs visited over 54,000 households and screened nearly 83,000 under five children. About 1% were identified as zero-dose, 1.3% as under-vaccinated, and 11% as defaulters. More than 90% of referred zero-dose children completed vaccination. Caregiver survey findings showed improved perceptions of vaccine importance and awareness of service points. The estimated cost per child vaccinated through CGM was approximately five dollars.

Conclusions: The CHW-led CGM proved to be an effective and feasible strategy for identifying and vaccinating zero-dose and under-vaccinated children in hard-to-reach population. It demonstrated strong potential for advancing immunization equity and offers practical insights into integrating community-led strategies into routine health systems.

Keywords: Tanzania, childhood vaccination, vaccination coverage, care group model, community health workers, zero-dose, under-vaccinated children

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Introduction

Tanzania has made remarkable progress in strengthening its immunization program over the past two decades. Through strong government leadership and collaboration with partners, the country has achieved and sustained high routine immunization coverage for key antigens, introduced new vaccines, and expanded cold chain capacity nationwide.¹ The use of digital health platforms such as the District Health Information System 2 (DHIS2) and the Vaccine Information Management System (VIMS) has enhanced data visibility and decision-making, while regular outreach services and campaigns have further increased vaccine access in remote areas.^{2,3} As a result, Tanzania continues to perform above regional averages in coverage for major antigens such as the third dose of a Diphtheria-Tetanus-Pertussis containing vaccine (DTP3), the first dose of Measles-Rubella containing vaccine (MR1), and the third dose of Oral-Polio Vaccine (OPV3), reflecting a well-functioning immunization system supported by committed frontline health workers and community engagement structures.⁴

Despite these achievements, pockets with zero-dose and under-vaccinated children persist, particularly in hard-to-reach, mobile, and underserved communities. Gavi, the Vaccine Alliance defines zero-

dose children as children who have not received DTP1 and under-vaccinated children as those who have not received DTP3. These children often face geographical, socioeconomic, and behavioral barriers that limit their access to vaccination services. Traditional approaches such as mobile outreach and periodic intensification of routine immunization (PIRI) have helped to boost coverage but have not fully addressed the need for systematic household identification, tracking, and follow-up of missed children.^{5,6} This challenge aligns with the global zero-dose agenda under the Immunization Agenda 2030 (IA2030) and Gavi's strategy, which call for locally tailored, equity-driven solutions.^{7,8}

The Care Group Model (CGM) approach was introduced in Mbeya region, Tanzania as an additional community-based strategy to complement existing immunization efforts rather than replace them. By organizing Community Health Workers (CHWs) that conduct structured household visits and foster interpersonal communication, the model seeks to enhance identification and referral of zero-dose and under-vaccinated children. Evidence from countries such as Mozambique and Nigeria shows that CGMs can improve child health outcomes and strengthen community accountability.^{9,10} However, CGM is not designed to address all barriers to immunization such as supply chain disruptions or workforce shortages. Its success

therefore depends on integration with other components of the health system and sustained government support. The Mbeya Region pilot, implemented by the Ministry of Health through Immunization and Vaccine Development (IVD) program in collaboration with the Clinton Health Access Initiative (CHAI), offers important lessons on how CHW-led care groups can complement Tanzania's broader immunization strengthening agenda and advance progress toward closing the zero-dose gap.

Methodology

Design

This was an operational case study documenting the implementation of the CGM to strengthen immunization services. It describes how CHWs were deployed to deliver immunization messages, systematically identify zero-dose and under-vaccinated children, and facilitate their linkage to vaccination services through facility referrals or outreach sessions. This initiative provides practice-based evidence on how CGM can be adapted to enhance routine immunization and reduce inequities in coverage.

Setting

The intervention was implemented between September 2024 and May 2025 across four councils in Mbeya Region: Mbarali DC, Mbeya DC, Chunya DC, and Kyela DC. These councils were purposively selected due to contextual challenges affecting immunization performance:

- I. Mbarali DC and Mbeya DC experienced vaccine-preventable disease outbreaks in 2024 (rotavirus and measles respectively).
- II. Chunya DC, a geographically vast area with mobile populations such as pastoralists, miners, farmers and faces poor road access.
- III. Kyela DC is prone to seasonal flooding and cross-border movement with Malawi, leading to population mobility and follow-up challenges.

Orientation to regional and council teams

Implementation began with orientation sessions for Regional and Council Health Management Teams (R/CHMTs) to introduce the CGM approach, objectives, and operational modalities. These sessions emphasized stakeholder roles in mobilization, supervision, and data use for decision-making (Figure 1).

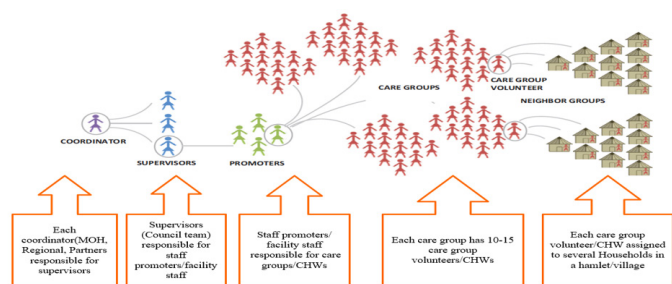


Figure 1 Modified Structure of a typical Care group delivery strategy.

Source: Adapted from Perry et al.⁹

Health facility selection and staff orientation

A total of 60 health facilities (HFs) across the four councils were selected based on contextual challenges outlined above. HF staff received orientation on CGM principles, data tools, and coordination

mechanisms with community stakeholders to ensure smooth implementation and supervision.

Recruitment and orientation of CHWs

In collaboration with HF Governing Committees and village leaders, additional CHWs were recruited to complement the existing workforce, increasing the number from two to five per village to ensure broader coverage and follow-up capacity.

A total of 525 CHWs (210 existing and 315 newly recruited) participated in a one-day orientation focused on:

- i. The routine immunization schedule.
- ii. Identification of zero-dose and under-vaccinated children through structured household visits.
- iii. Verification of immunization status using vaccination cards/booklets.
- iv. Effective communication with caregivers on the importance of timely vaccination.
- v. Referral processes linking children to nearby health facilities or outreach services.

Competency was assessed throughout the training through practical demonstrations. CHWs were provided with standardized registers and weekly reporting tools to record and submit data to health facilities.

Supervision structure

Supportive Supervision occurred at multiple levels:

- i. HF staff provided daily oversight and reviewed CHW weekly reports.
- ii. CHMTs offered ongoing technical support via online platforms and field visits, particularly in areas facing implementation challenges.

Household visits and follow-up

Each CHW was assigned to visit 6–8 households per day during the first month to ensure comprehensive coverage within their catchment areas. The subsequent weeks were dedicated to follow-up visits to confirm that identified children completed their missed vaccinations.

CHWs conducted door-to-door visits in 105 villages across the four councils, covering 54,652 households. They assessed the immunization status of all under-five children and classified them as zero-dose (*missed DTP1*), under-vaccinated (*missed DTP3*) as per **Gavi, the vaccine alliance** definitions, or defaulters (*missed at least one of other [excluding DTP3] required doses/antigens for their routine vaccination schedule*). Identified children were referred to HF or reached during outreach sessions jointly organized by CHWs and HF staff. Throughout the implementation period, no attrition was observed among CHWs, and all remained actively engaged.

Follow-up and data verification

CHWs verified vaccination status primarily using child health cards, and when unavailable, relied on caregiver recall and cross-checked against facility registers. Follow-up mechanisms included:

- i. Tracking referred children by comparing CHW records with facility immunization registers.
- ii. Coordinating outreach sessions for children unable to access health facilities.

- iii. Cross-verifying CHW records with facility data to ensure completion of referred cases.

Data management and analysis

Data collected by CHWs were compiled at the facility level, verified by facility staff, and submitted to district immunization focal persons for consolidation. Routine data quality checks were performed to ensure accuracy and completeness. Aggregate data was analyzed to assess coverage among zero-dose, under-vaccinated and defaulter children, disaggregated by district and antigen specific.

Qualitative data collection

To explore challenges encountered by CHWs during the CGM implementation, qualitative interviews were conducted with CHWs using a simple semi-structured interview guide. The interviews were carried out by facility staff and Council Health Management Team (CHMT) members as part of routine supervision visits. Discussions focused on CHWs’ experiences, barriers faced during household visits, and perceived facilitators of effective community engagement. Notes from the interviews were summarized and thematically analyzed to identify recurring challenges and practical lessons to inform program improvement.

Household survey

Sampling

A convenience sampling approach was employed to select caregivers and parents during household visits conducted by CHWs. Each CHW interviewed two caregivers per day until completing all assigned questionnaires, ensuring gender balance across respondents. Eligibility was limited to caregivers of children identified as either zero-dose or under-vaccinated, consistent with the intervention’s focus. Although not representative of the general population, this sampling method generated valuable programmatic insights into the experiences and behavioral drivers among families most affected by missed vaccinations.

Data collection and quality assurance

The household survey was implemented by trained CHWs who conducted both baseline and endline assessments through structured, face-to-face interviews during household visits. Supervisors and Council Health Management Team (CHMT) members regularly

monitored field activities to ensure adherence to data collection protocols.

Analysis

Baseline and endline survey data were analyzed to assess changes in caregivers’ behaviors related to immunization. Five behavioral indicators were analyzed, conducting z-tests for proportions, with confidence intervals and p-values calculated to assess statistical significance.

Ethical consideration

This is an operational case study documenting the implementation of the CGM in Mbeya region, Tanzania, between September 2024 and May 2025. The activity was part of the routine immunization strengthening efforts led by the MoH-IVD, with technical support from CHAI.

Data were collected by verifying vaccination cards, and caregiver recall during household visits. All data were aggregated at the Facility and Council level for reporting, with no personally identifiable information retained in analysis or dissemination. During household interviews, CHWs explained the purpose of the visit and obtained informed consent from caregivers before collecting information. Participation was voluntary, and caregivers could decline without any consequence to access to services.

The implementation adhered to principles of confidentiality, data protection, and respect for participants, aligning with national immunization program standards and ethical guidelines for operational public health activities.

Results

Reach and coverage

Across the four councils, 54,652 households were visited, screening 82,985 under-five children, exceeding the target of 48,000 households. A total of 821 (1.0%) zero-dose, 1,120 (1.3%) under-vaccinated, and 9,333 (11.2%) defaulter children were identified. Mbarali DC and Chunya DC reported the highest proportions of missed children across all categories, while Kyela DC had the lowest. Overall, defaulters constituted the largest group of missed children, highlighting the need to strengthen follow-up and completion of vaccination schedules within routine services (Table 1).

Table 1 The Care group model for Immunization services output in Mbeya region

S. No	Council	Target of households to be visited	Households visited	Total Under five children in households visited	Zero dose (missed DTP1) identified	% Zero dose identified in household visited	Under-vaccinated (missed DTP3) identified	% Under-vaccinated children identified in households visited	Defaulters (Missed one or more of other antigens (excluding DTP3))	% Defaulters in households visited
		A	B	C	D	E=D/C	F	G=F/C	H	I=H/C
1	Mbarali	13,000	13,885	23,629	424	1.80%	561	2.40%	3,459	14.60%
2	Mbeya DC	15,000	16,833	19,855	78	0.40%	123	0.60%	1,671	8.40%
3	Chunya	10,000	14,030	24,328	286	1.20%	357	1.50%	3,200	13.20%
4	Kyela	10,000	9,904	15,173	33	0.20%	79	0.50%	1,003	6.60%
Total		48,000	54,652	82,985	821	1.00%	1,120	1.30%	9,333	11.20%

Analysis of children identified and vaccinated across the four councils in Mbeya Region revealed encouraging outcomes following the Care Group Model (CGM) implementation. The highest numbers

of defaulters were reported in Mbarali DC (3,459 identified, 3,384 vaccinated) and Chunya DC (3,200 identified, 3,113 vaccinated). Under-vaccinated children represented the second-largest group,

with Mbarali DC identifying 561 and vaccinating 543, followed by Chunya DC (357 identified, 331 vaccinated). Zero-dose children comprised the smallest group, though still notable, with Mbarali DC (424 identified, 416 vaccinated) and Chunya DC (286 identified, 269 vaccinated) recording the highest figures. Overall, vaccination performance was strong across councils, with most identified children successfully reached and vaccinated (Figure 2).

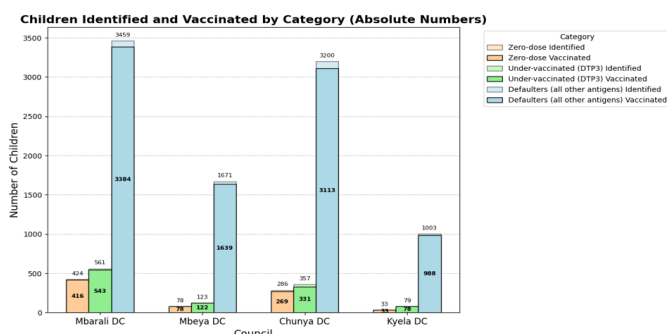


Figure 2 Absolute numbers of Zero dose children and defaulters identified and vaccinated in the four councils during CGM implementation.

When converted to coverage percentages, Mbarali DC, Mbeya DC, and Kyela DC all surpassed the 95% target across all categories, demonstrating strong performance in identifying and vaccinating missed children. This indicates that most zero-dose, under-vaccinated, and defaulter children reached through CHW-led household visits successfully received their required vaccines. Chunya DC also maintained commendable performance, achieving 97.3% coverage among defaulters, though it fell slightly below target for zero-dose (94.1%) and under-vaccinated (92.7%) children (Figure 3).

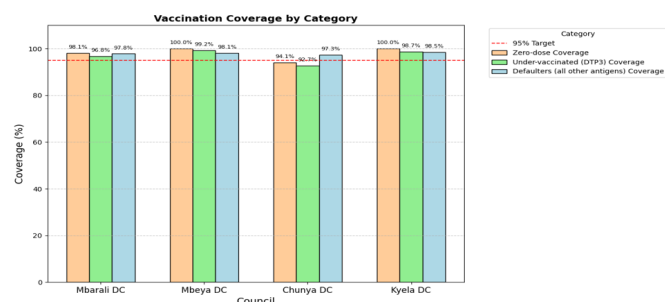


Figure 3 Coverage of Zero dose children and defaulters in the four councils during CGM implementation.

These results reflect the overall effectiveness of the Care Group Model (CGM) in improving immunization coverage across the four councils, with consistent success in reaching previously missed children. The findings further highlight the contribution of CHW household visits and interpersonal communication in promoting vaccine uptake and ensuring that immunization services reached even the most marginalized households.

Coverage by antigen

The analysis in Figure 4 below; shows that overall vaccination performance among defaulters identified was exceptionally strong across all antigens. The highest vaccination uptake was observed for MR1 and MR2, both achieving coverage rates of about 99%, indicating that nearly all children identified received their vaccines. Similarly, bOPV3 and PCV3 also recorded high vaccination completion rates of around 99% and 98%, respectively, reflecting strong follow-

up and effective household engagement by CHWs. Overall, these results demonstrate that most children identified through household visits were successfully reached and vaccinated, highlighting the effectiveness of the intervention in reducing defaulters across key immunization antigens.

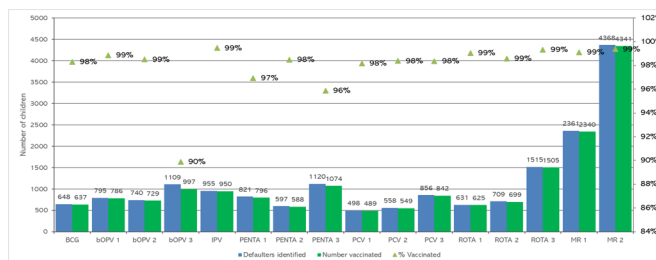


Figure 4 Children identified and vaccinated (antigen specific).

Out of schoolgirls eligible for Human Papilloma Virus (HPV) vaccination identified during CGM implementation

The analysis of out-of-school girls eligible for HPV vaccination across the four councils shows strong performance in both identification and vaccination coverage. Overall, most of eligible girls who were identified during household visits were successfully vaccinated, reflecting effective outreach and follow-up by CHWs. In absolute terms, Chunya DC recorded the highest number of identified (214) and vaccinated (203) girls, followed by Mbarali DC with 31 identified and 27 vaccinated. Mbeya DC achieved full vaccination among all 16 identified girls, while Kyela DC also demonstrated excellent performance, vaccinating all 23 girls identified (Figure 5).

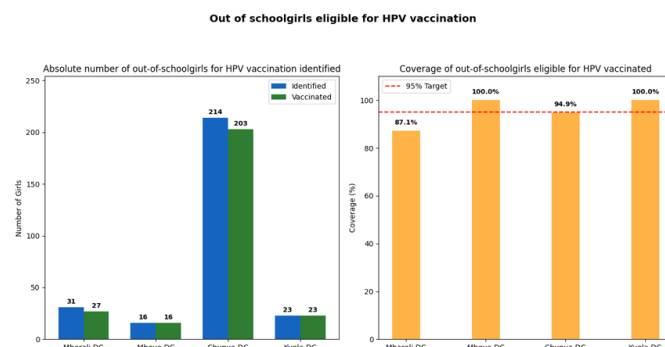


Figure 5 Out of schoolgirls eligible for HPV vaccination reached during CGM implementation.

Childhood vaccination survey results

The results demonstrated significant improvements in caregiver confidence in vaccines, awareness of vaccination schedules, and perceived community support for immunization, highlighting the positive influence of CHW-led interpersonal communication and household engagement.

The survey included 3,800 respondents at baseline and 1,200 at end line and revealed statistically significant improvements across all five behavioral indicators. The proportion of parents who perceived vaccines as “moderately” or “very” important rose from 96.7% to 98.5% ($p < 0.01$), while those reporting family and friends’ support increased from 95.6% to 99.0% ($p < 0.01$). Parents’ intention for their child to receive all vaccines increased from 96.3% to 99.0%, knowledge of vaccination sites improved from 97.5% to 99.0%, and

perceptions of service accessibility rose from 89.2% to 92.0% ($p < 0.01$ for all).

Although absolute differences ranged from 1.7 to 3.3 percentage points, the changes were statistically significant, reflecting meaningful improvements in attitudes and perceived support for immunization. Compared with baseline, endline findings indicate enhanced awareness, greater confidence in vaccines, and increased trust in health services, suggesting that CGM activities, including community engagement and house-to-house visits by Community Health Workers, effectively reduced hesitancy and fostered a more supportive environment for timely childhood vaccination (Figure 6).

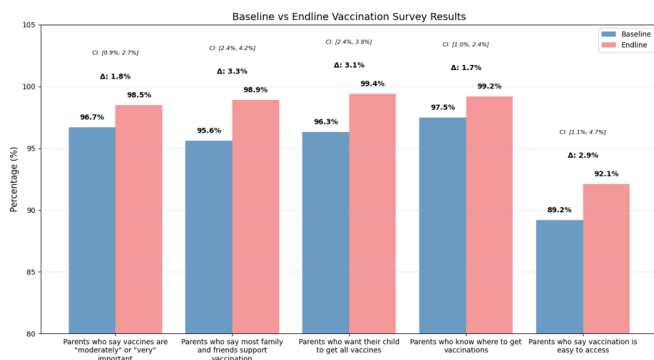


Figure 6 The Childhood vaccination survey results in Mbeya region.

Challenges faced by CHWs during CGM implementation

During the CGM implementation, CHWs encountered several challenges that limited their effectiveness in reaching all eligible children. Accessing remote households proved difficult, and in many cases, caregivers were unavailable, requiring repeated visits. Time also limited opportunities for in-depth discussions, as some families were occupied with work or other responsibilities. In addition, a proportion of caregivers expressed reluctance toward vaccination, influenced by false beliefs or misconceptions, while others deliberately hid their children during visits.

Operational barriers were also evident. Some caregivers lacked vaccination cards, making it difficult to verify immunization history, while others demonstrated limited knowledge about the importance of vaccines. In cases where parents were deceased, caregivers struggled to follow up with children's vaccination schedules. Collectively, these challenges highlight the need for strengthened community sensitization, improved tracking mechanisms, and tailored strategies to address persistent behavioral and logistical barriers.

Discussion

The Mbeya region is among the regions that have geographical challenges in reaching zero-dose and under-immunized children in Tanzania. The selected councils Mbarali DC, Mbeya DC, Chunya DC, and Kyela DC are characterized by geographic barriers (vast distances, poor roads, seasonal flooding), economic activities that drive mobility (pastoralism, mining, cross-border trade), and vulnerability to outbreaks (measles, rotavirus). This socio-demographic profile underscores that zero-dose, under-immunized and defaulters' status is not random but is concentrated among populations facing geographic, economic, and social barriers to access.

One of the key strengths of the CGM lies in its reliance on trusted community figures who are embedded within local norms and networks. This decentralization of outreach builds credibility

and enhances cultural sensitivity critical in contexts where vaccine hesitancy or misinformation is prevalent. Similar models in Rukwa and Dar es Salaam have shown that community champions, when equipped with the right tools and support, significantly boost vaccine uptake, especially for COVID-19 and routine immunizations.^{4,5}

The implementation of the CGM in Mbeya Region provides compelling evidence for a community-based, proactive strategy to reach zero-dose and under-immunized children. The success of the intervention, achieving over 90% vaccination completion for identified zero-dose children and clearing a significant backlog of defaulters, underscores that the primary bottleneck in these underserved areas was not necessarily profound vaccine refusal but rather a failure of the system to identify and facilitate access for marginalized populations. This finding aligns with the growing body of literature emphasizing that access, not just acceptance, is a fundamental driver of immunization inequity.^{11,12}

Within this context, the exceptionally high referral completion rates (90.9% - 98.1% for zero-dose, 90.1% - 98.2% for defaulters) signal that the primary bottleneck was not necessarily vaccine hesitancy but rather access and identification. The model successfully identified and reached these marginalized groups. The high completion rate among defaulters suggests that many dropouts are due to practical challenges (distance, time) rather than refusal, and that a proactive, facilitatory approach can successfully re-engage these families.

Addressing systemic barriers through proactive identification

The traditional, passive immunization system, which relies on families self-presenting at static health facilities and at usual outreach sessions geographies, is ill-suited to the geographic and socio-economic realities of regions like Mbeya. The CGM fundamentally shifted this dynamic. By deploying CHWs to conduct universal household screenings, the model generated hyper-localized, child-specific data that enabled a transition from broad, assumptive micro-planning to precise, targeted action. This proactive identification is crucial for reaching children in pastoralist, mining, and border communities who are systematically excluded from facility-based registers.^{2,13,14} The high defaulter clearance rate further suggests that many dropouts are due to practical challenges, such as distance, opportunity cost, and forgetfulness rather than entrenched hesitancy. A systematic review by Oyo-Ita et al.,¹⁵ supports that home visits and reminders are among the most effective interventions for improving immunization coverage in low- and middle-income countries (LMICs), directly addressing these logistical barriers.

The centrality of trust and facilitated access

The effectiveness of the CGM can be largely attributed to its use of trusted, embedded community figures. CHWs, as local insiders, possessed the cultural competence and social capital necessary to navigate sensitive issues, counter misinformation, and enter households that might be wary of external health workers. This trust was a critical asset in overcoming the reported challenges of caregiver reluctance and children being hidden during visits. The model went beyond mere identification; CHWs actively facilitated access by coordinating health facilities to organize targeted outreach sessions. This "bringing services to the doorstep" or providing guided referral significantly reduced the logistical burden on caregivers, a barrier consistently identified in studies of immunization uptake in rural Africa.^{16,17} This combination of trust-building and access facilitation creates a powerful mechanism for overcoming both social and structural barriers.

Sustainability, Cost-effectiveness, and Integration into routine systems

While the results are impressive, the long-term viability of the model depends on its successful integration into the routine health system. The estimated cost of \$4.7 to \$5.0 per vaccinated child (referring all cost per line items incurred during CGM implementation) positions the CGM as a highly cost-effective catch-up strategy, well within the range of other efficient community-based approaches in LMICs.^{13,15,18} However, sustainability requires moving from a project-based to a system-integrated approach. This entails formalizing the roles and incentives for CHWs, streamlining data flow through digital tools to reduce reporting burdens, and embedding proactive defaulter tracking as a standard component of facility-based routine immunization. The “minimum package” proposed combining integrated defaulter tracing with bi-annual “zero-dose sweeps”, provides a pragmatic pathway for this transition without overburdening the system. Additionally, more targeted strategies are needed to reach more out of school adolescents’ girls, male parents/Caregivers, and mobile pastoralist groups, the demographics often overlooked in routine immunization strategies.^{19,20}

Lessons learnt

Several important lessons emerged from the CGM implementation. First, the long interval between initial and subsequent vaccine doses contributed substantially to defaulting, with most defaulters observed being those missed MR1 and MR2. Second, household visits by community health workers were instrumental in enhancing the identification and linkage of previously unreached populations, including children who had never been registered at health facilities and those who defaulted due to family relocation, particularly within pastoralist and farming communities. In addition, CHWs effectively facilitated the inclusion of out-of-school adolescent girls in HPV vaccination efforts, addressing an equity gap in these communities. The information collected through household engagement also supported health facilities to refine outreach planning, leading to more targeted service delivery in underserved areas. Finally, the initiative contributed to increasing awareness of immunization services in marginalized communities, thereby strengthening demand generation and improving uptake.

Childhood vaccination survey

The childhood vaccination survey findings demonstrate the critical role of community engagement in shifting caregiver perceptions and improving immunization uptake. The observed increase in awareness, confidence, and trust in vaccines between baseline and endline is consistent with evidence from other low- and middle-income settings, where targeted community-based interventions and interpersonal communication have been shown to reduce vaccine hesitancy and increase demand for immunization services.²¹ House-to-house visits by Community Health Workers (CHWs) within the Care Group Model likely created opportunities for personalized dialogue and trust-building, addressing misconceptions and improving caregivers’ understanding of vaccination benefits, which aligns with findings from community-directed approaches in sub-Saharan Africa.²² These results underscore the importance of integrating behavioral insights into immunization programs, particularly in contexts where structural and informational barriers contribute to missed opportunities for vaccination.

The observed improvements in caregiver awareness, confidence, and uptake following Care Group Model (CGM) implementation in Mbeya are consistent with prior evidence that community-based volunteer networks can increase coverage of key child survival

interventions, including vaccination. Evaluations of Care Group projects have shown substantially larger coverage gains compared with non-Care Group programs and suggest potential reductions in under-five mortality where the model was implemented, attributable in part to frequent home visits and low volunteer-to-household ratios that facilitate repeated interpersonal communication and trust-building.²³

Challenges faced by CHWs

Despite these encouraging outcomes, the implementation also highlighted persistent challenges faced by CHWs that may undermine coverage if not adequately addressed. Difficulties in accessing remote households, caregiver unavailability due to competing priorities, and reluctance stemming from false beliefs mirror barriers reported in other studies of routine immunization programs.^{16,17} Operational issues, such as lack of vaccination cards, further complicated zero dose and under-immunized children tracking, reflecting broader health system constraints common in resource-limited settings.²⁴ Addressing these gaps will require strengthening data systems, ensuring continuity of records, and reinforce community sensitization to counter misinformation. Importantly, sustained investment in CHWs capacity and supportive supervision is critical, as these frontline workers remain pivotal in bridging the gap between health facilities and underserved communities.^{25,26}

Limitations

While the Care Group Model (CGM) in Mbeya region demonstrated strong effectiveness, several limitations should be noted. Some children identified through household visits remained unvaccinated due to tracking challenges, including migration, parental withholding, or receipt of vaccines at facilities not linked to local records. The assessment was further constrained by the absence of a control or comparator group, reliance on routine program data with potential for misclassification, and the short implementation period, which limited long-term follow-up. The caregiver survey also relied on convenience sampling of caregivers and parents those found with zero-dose or under-vaccinated children; although this aligned with the program’s target population, it reduced the representativeness of findings. Finally, as this was an operational case study rather than a formal research project, no institutional ethics review was sought; however, ethical principles were upheld through verbal caregiver consent, voluntary participation, and protection of confidential information. These considerations should be considered when interpreting the results and their generalizability.

Conclusion

The CHW-led Care Group Model proved to be a highly effective and feasible strategy for identifying zero-dose and under-vaccinated children and achieving high vaccination completion rates in hard-to-reach areas of Mbeya. Its success in clearing a significant backlog of missed vaccinations demonstrates its value as a targeted equity intervention. The model presents a robust and cost-efficient approach for accelerating progress toward immunization equity, with key recommendations emphasizing its sustainable integration into the routine health system.

Policy implications and recommendations for routine integration

The CGM, as implemented here, is a highly effective catch-up vaccination strategy. For routine integration into the Mbeya context and similar settings, we propose a sustainable “Minimum package” that focuses on the core, high-impact elements:

- I. Integrate proactive household visits by CHWs into the weekly routine of health facilities, specifically targeting children who miss scheduled appointments.
- II. Conduct bi-annual “zero-dose sweeps” in high-risk communities to identify and link up children who have never been engaged with the system.
- III. Use the data from CHWs to create and continuously update dynamic micro plans that reflect the true target population, including mobile and hard-to-reach groups.
- IV. Integrate a core group of CHWs into the health system with clear roles, standardized tools, modest incentives, and a structured supervision cascade to ensure sustainability.

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Conflict of interest

The authors declare that there is no conflict of interest associated with this manuscript.

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