

A model that works: Leveraging community health care workers (CHWs) to reach zero-dose and under-vaccinated children through the care group model approach; assessing continuity after initial contact

Abstract

Background: Tanzania has made notable progress in expanding immunization coverage; however, a considerable number of children remain zero-dose or under-vaccinated. 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). To address these persistent gaps, the Care Group Model (CGM) was implemented in the Mbeya Region in 2024 and 2025, leveraging community health workers to conduct household visits, identify missed children, and link them to immunization services.

Methods: Ten health facilities were purposively selected based on having the highest number of zero-dose children and those who had received DTP1 but had not returned for DTP2. A retrospective review of CGM registers and facility immunization registers was conducted to determine whether children identified and vaccinated during CGM follow-up returned for subsequent doses. Data was analyzed using STATA version 16, calculating proportions and odds ratios to assess continuity of care and the likelihood of returning for the next scheduled dose.

Results: In Mbeya DC, 96.9% (31/32) of zero-dose children and 91.4% (53/58) of those missing the second Pentavalent dose completed subsequent vaccinations. In Mbarali DC, 89.7% (52/58) of zero-dose children and 95.6% (109/114) of those missing the second Pentavalent dose completed subsequent doses. Across districts, continuity of care exceeded 90%. Children were reached through both fixed-site and outreach services, demonstrating operational flexibility and equitable access.

Conclusion: The CGM demonstrated strong effectiveness in ensuring continuity of care for zero-dose and under-vaccinated children. Its success likely stemmed from community-based identification, trusted engagement by Community Health Care Workers (CHWs), and integration with facility and outreach services. Expansion of this approach could accelerate progress toward universal immunization coverage in Tanzania and similar settings.

Keywords: immunization coverage, zero-dose children, under-immunized children, community health workers, continuity of care, Tanzania

Introduction

Globally, immunization remains one of the most effective and equitable public health interventions, preventing an estimated 3–5 million deaths each year.¹ Yet, disparities persist approximately 14.5 million infants globally did not receive the first dose of diphtheria–tetanus–pertussis-containing vaccine (DTP1) in 2023, and over 60% of these zero-dose children reside in just ten low- and middle-income countries, most of them in sub-Saharan Africa.^{1,2} Recent analyses have emphasized that reaching zero-dose and under-immunized children is not merely a service delivery issue but a reflection of deeper structural, social, and contextual inequities.^{3–5}

In sub-Saharan Africa, zero-dose prevalence remains substantial, with studies estimating that between 10% and 20% of children aged 12–23 months have never received DTP1.^{3,6} These gaps are strongly associated with maternal education, household wealth, urban-rural

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residence, and health system accessibility.^{4,7} The “three delays” model proposed by Wiysonge et al.,⁴ illustrates how immunization gaps often result from (i) delay in decision-making due to socio-cultural or informational barriers, (ii) delay in reaching health facilities due to distance or cost, and (iii) delay in receiving adequate services due to weak system responsiveness. Addressing these delays requires community-rooted solutions that strengthen linkages between households and health facilities.

In Tanzania, while national DTP3 coverage stood at 94% in 2023,⁸ subnational disparities persist, especially in hard-to-reach and peri-urban areas.^{9,10} According to the Ministry of Health and WHO data, many zero-dose and under-immunized children reside in areas with constrained access to routine services or limited awareness about immunization schedules.^{1,8} Tanzania’s “Big Catch-Up” initiative launched in 2023–2024, led by the Immunization and Vaccine Development (IVD) program, aims to identify and vaccinate these

missed children through intensified outreach and the engagement of community health workers.¹⁰

The Care Group Model (CGM) represents a promising adaptation of community engagement strategies for immunization equity. Traditionally applied in maternal and child health, the model organizes community volunteers (Care Group Volunteers, or CHWs) into peer-led structures that conduct home visits, disseminate health messages, and track health behaviors.¹¹ When adapted for immunization, the CGM supports household-level identification of zero-dose and under-immunized children, referral to facilities or outreach posts, and continuous follow-up until the immunization schedule is completed.^{9,12} Similar approaches have shown success in Dar es Salaam, where integrating CHWs, local leaders, and urban outreach improved DTP1 coverage and reduced dropout rates among under-immunized children.¹³

However, while global and regional efforts have emphasized identification of zero-dose children, evidence on post-identification continuity ensuring that children complete subsequent doses remain scarce. Studies like Nzilibili et al.,¹⁴ in Ilala District demonstrate the value of human-centered design and CHW engagement to locate and link zero-dose children to services, yet the persistence of follow-up and continuity remains underexplored. This study therefore assesses continuity of care after CHW identification and referral within the Care Group Model implemented in Mbeya Region, Tanzania. Specifically, it evaluates whether children identified as zero-dose or under-vaccinated through CHWs received subsequent doses and explores service modalities (fixed vs outreach) influencing this continuity.

The care group model and community health workers

Community Health Workers are increasingly recognized as critical actors in extending primary health care and reaching underserved populations, including those missed by routine immunization services.^{5,12} The Care Group Model is a structured community-based approach in which CHWs or “Care Group Volunteers” organize and lead peer groups of caregivers to deliver health education, conduct household visits, identify missed children, mobilize caregivers, and refer families to nearby health facilities.^{11,15} Originally designed for maternal, newborn, and child health and nutrition programs, the model has demonstrated effectiveness in improving health behaviors and reducing child morbidity and mortality across multiple low-resource settings.¹¹ More recently, the CGM has been adapted to support immunization catch-up initiatives, with CHWs using tracking tools and community engagement to identify zero-dose and under-immunized children and link them to vaccination services.^{10,14}

Rationale for this study

While much of the literature focuses on identifying zero-dose children, or on interventions aimed at increasing first-dose coverage, less is known about continuity of care: once a child is identified as zero-dose or under-vaccinated, how reliably do they receive the subsequent doses? Few studies have systematically documented follow-up after CHW referral in the Tanzania context. Understanding whether initial contact translates into completion of missed vaccines is critical: an effective system must not only find missed children but ensure they finish the needed schedule.

This study assesses continuity of care after identification and referral, whether children so identified within the Care Group Model, implemented in Mbeya Region, Tanzania, from April 2024 to May 2025 subsequently received required vaccine doses. The

CGM utilized Community Health Workers to identify zero-dose and under-vaccinated children through household visits and link them to vaccination services. The model was rolled out in two phases: the first in Mbeya and Mbarali districts (40 facilities), followed by Chunya and Kyela districts (20 facilities).

Objectives

- I. To assess among identified zero-dose and under-vaccinated children in Mbeya region (Mbeya DC and Mbarali DC) what proportion complete their subsequent vaccinations after initial contact via the Care group model.
- II. To examine the use of services (fixed site versus outreach) and the differences between them in supporting continuity for subsequent doses.
- III. Draw lessons for scaling this model in Tanzania and similar settings.

Methods

Study design

A retrospective review of routine programmatic data was conducted, focusing on children identified as zero-dose and under-vaccinated through the Care Group Model (CGM) from September 2024 to May 2025. The objective was to assess continuity of care following initial contact and referral by CHWs.

The care group model intervention

The Care Group Model was implemented by orienting Community Health Workers to identify and refer zero-dose and under-vaccinated children. The orientation also included In-depth knowledge of the national immunization schedule, including the antigens due at each visit and the appropriate timing and intervals between doses. Skills to correctly identify and classify children as “zero-dose” or “under-vaccinated” through household visits and verbal screening.

During regular household visits, CHWs used dedicated registers to record identified children, referred them to health facilities or outreach posts, and conducted follow-ups to ensure vaccination. Data from these CHWs tracking tools was reported up from facilities to councils, region, and at Clinton Health Access Initiative (CHAI) creating an accountable feedback loop for monitoring and supervision.

Study setting and sampling

Ten health facilities were purposively selected from the 40 facilities participating in Phase 1 of CGM implementation in Mbeya DC and Mbarali DC. Selection focused on facilities that had the highest number of zero-dose children and those who had received DTP1 but had not returned for DTP2, as identified during CGM activities. These sites were chosen because they provided the most substantial caseload for assessing continuity of care following CHW-supported vaccination.

Within these selected facilities, the analysis focused on two cohorts of children identified by CHWs during household visits:

- I. Those who received their first dose of Pentavalent vaccine (Penta1) after initial CHW identification.
- II. Those who had received their second Pentavalent dose (Penta2) after initial CHW identification.

Data collection and analysis

Data collection

A retrospective data abstraction was conducted using two routine data sources:

1. Care group model registers

- Used to identify de-identified children who were referred by CHWs during household visits.
- Provided dates of identification and dates of the first catch-up dose (Penta1 for zero-dose children, Penta2 for those who had missed it).

2. Health facility immunization registers

- Used to verify whether children recorded in CGM registers returned for their subsequent scheduled doses (Penta2 or Penta3).
- Allowed tracking of vaccination modality (fixed post vs. outreach).

For each child listed in CGM registers, facility immunization records were cross-checked to confirm subsequent dose administration, enabling an assessment of continuity of care.

Variables and definitions

The key outcome was continuity of care (**Dose return outcome**), defined operationally as:

- For zero-dose children: Return for and receipt of the second Pentavalent dose (Penta2).
- For children missing Penta2: Return for and receipt of the third Pentavalent dose (Penta3).

The service modality (fixed site vs. outreach) for the subsequent dose was also recorded.

Data analysis

Data were entered in excel and analyzed using STATA version 16. Proportions were calculated to determine continuity rates, stratified by district and vaccine dose category. To examine the association between service modality and the likelihood of receiving the subsequent dose, a binary logistic regression was performed, generating odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$.

Ethical clearance

This programmatic data review was initiated by Clinton Health Access Initiative (CHAI) and the Mbeya Regional and Council Health Management Teams, to assess the continuity of care within the Care Group Model.

The study was classified as a retrospective review of program data, utilizing only secondary, anonymized data from routine programmatic registers (CGM tracking and health facility immunization registers). As the study involved no direct contact with human participants and used fully de-identified data, it was deemed minimal risk and therefore, no formal ethical review was required.

Results

Across both districts, over 90% of children identified and referred by CHWs received their subsequent vaccine dose (Penta2 for zero-dose children, Penta3 for those missed Pentavalent second dose). This

shows the model successfully moves children beyond just an initial contact and ensures they progress in their immunization schedule. The high performance was consistent in both Mbeya DC (96.9% for zero-dose, 91.4% for those missed Pentavalent second dose) and Mbarali DC (89.7% for zero-dose, 95.6% for those missed Pentavalent second dose), indicating the model's robustness across different locations. Figure 1

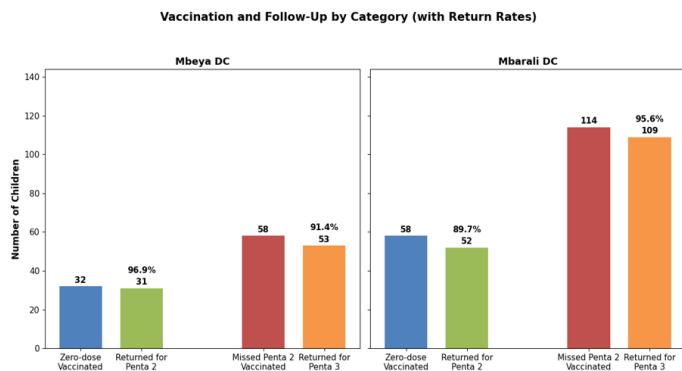


Figure 1 Vaccination and follow-up across the two councils.

Service modality for subsequent doses (Fixed vs Outreach)

Examining how these subsequent vaccinations were delivered. The data shows that the health system utilized both service delivery modes effectively to ensure follow-up: Most subsequent doses (Penta2 and Penta3) were administered at fixed posts. A substantial proportion (approximately 26-42% across districts and doses) were delivered through outreach services. This demonstrates operational flexibility, using outreach to reach families who could not easily return to a fixed health facility. Figure 2

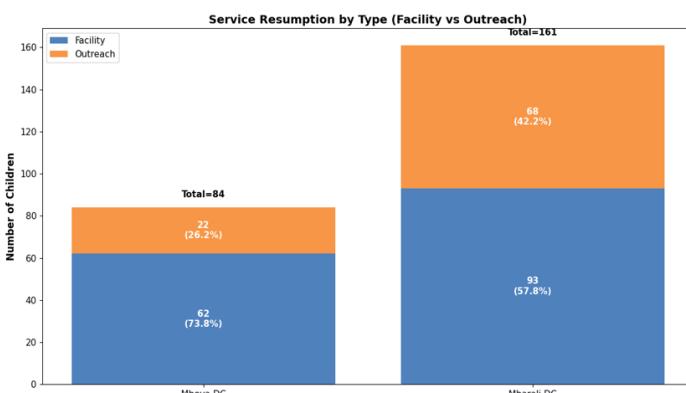


Figure 2 Service resumption by type (Facility vs Outreach).

Analysis of fixed and outreach posts association with continuity of subsequent doses

The regression analysis reveals a powerful story about caregiver engagement and health-seeking behavior after the initial contact and education by Community Health Workers. Once children were identified and received their initial "catch-up" dose, and caregivers counselled on the importance of completing the immunization schedules, the responsibility shifted to the families to return for subsequent doses. The mode of service delivery for these subsequent doses (fixed post vs. outreach) reflects the choices and actions of these now-informed caregivers.

The results clearly show that: A significant majority of caregivers chose to bring their children to fixed health posts for their subsequent doses (Penta2 and Penta3). For the combined data, 63% of subsequent doses were administered at fixed posts. The strong, statistically

significant odds ratios (e.g., OR=2.7 for Penta2 and OR=2.6 for Penta3 in the combined total) confirm that the likelihood of a child receiving their follow-up vaccine was substantially higher at a fixed post than at an outreach session (Table 1).

Table 1 Comparison of return rates for Penta 2 and Penta 3 by Service modality and District

Outcome	District	Modality	Returned n (%)	Odds Ratio (95% CI)	p-value	Interpretation
Penta 2	Mbeya DC	Fixed post	23 (74%)	2.9 (1.1–8.2)	0.03*	Higher return among fixed post clients.
		Outreach	8 (26%)	Ref	–	
	Mbarali DC	Fixed post	30 (58%)	1.8 (1.0–3.2)	0.05*	Slightly higher fixed post return.
		Outreach	22 (42%)	Ref	–	
	Combined total	Fixed post	53 (63%)	2.7 (1.3–5.8)	0.005*	Fixed post significantly higher return.
		Outreach	30 (37%)	Ref	–	
	Mbeya DC	Fixed post	39 (74%)	2.6 (1.2–5.8)	0.01*	Stronger continuity from fixed posts.
		Outreach	14 (26%)	Ref	–	
	Mbarali DC	Fixed post	63 (58%)	1.7 (1.0–2.9)	0.05*	Higher fixed post return, borderline significance.
		Outreach	46 (42%)	Ref	–	
	Combined total	Fixed post	102 (63%)	2.6 (1.6–4.3)	<0.001*	Consistent advantage of fixed posts overall.
		Outreach	60 (37%)	Ref	–	

Significant at $p < 0.05$.

Discussion

This operational evaluation shows that the Care Group Model (CGM), implemented through CHWs in Mbeya Region, achieved very high continuity of care: over 90% of zero-dose and under-vaccinated children identified during household screening subsequently received their next scheduled dose. This pattern reflects a meaningful shift in caregiver behavior. The CHW intervention not only facilitated initial vaccination but also motivated caregivers to return for subsequent doses. With improved awareness of the importance of completing the immunization schedule, many caregivers independently sought services often at fixed health posts to ensure vaccination continuity. Thus, the Care Group Model extended beyond service delivery to empower communities and reinforce self-reliant health-seeking behavior. While outreach services (37% of follow-up doses) remain vital for equitable access, the predominant use of fixed posts underscores the model's success in strengthening caregiver-driven demand for immunization.

This level of follow-through is notable given persistent regional setbacks in routine immunization recovery after COVID-19 and the continued burden of zero-dose children across sub-Saharan Africa.² Our findings align with a growing body of evidence showing that community-rooted identification and active follow-up are essential for converting case finding into sustained vaccination uptake. Multilevel and spatial analyses demonstrate that zero-dose status is shaped by a range of individual, household, and contextual factors including maternal education, antenatal care attendance, household wealth, rural residence, and accessibility of health services which influence both initial non-contact and the likelihood of returning for subsequent doses. Interventions that reduce these barriers and build caregiver trust therefore have an outsized impact on continuity of care.³

Two programmatic elements likely explain the high continuity observed in Mbeya. First, CGM's reliance on trusted CHWs who conduct house-to-house screening and interpersonal counselling addresses the "first delay" (decision to seek care) and helps mitigate

misinformation and hesitancy through repeated, tailored interactions. This mechanism has been documented in other Tanzanian implementation studies and human-centred design efforts. Second, the model's operational flexibility combining fixed-post vaccination with targeted outreach and active tracking through facility registers reduces the "second" and "third" delays (reaching and receiving services) by enhancing accessibility and ensuring reliable follow-up. These mechanisms align with recent programmatic guidance emphasizing CHW engagement and flexible service delivery to reach zero-dose children.¹⁴

Comparatively, our >90% return rates for Penta2 and Penta3 exceed many routine catch-up efforts that rely solely on periodic outreach or passive demand generation at facilities. This suggests that household identification, coupled with a functioning referral-and-verification loop (CGM registers cross-checked with facility immunization registers), substantially increases the likelihood that identified children complete their next dose. Nonetheless, the small proportion of children who did not return highlights persistent structural and social barriers such as migration, competing livelihood pressures, or missing documentation consistent with findings from similar studies across the region.⁶

Explaining the high continuity observed

The success of the CGM in this study can be attributed to several interrelated factors:

- I. Community-based identification and trusted engagement – *CHWs, as members of the same communities, bridged cultural and informational gaps, reinforcing caregiver confidence in vaccination.*
- II. Effective tracking and referral mechanisms – *CGM registers and routine facility linkage ensured accountability and real-time feedback on child follow-up.*
- III. Operational flexibility – *The integration of both fixed-site and outreach modalities minimized geographical barriers, echoing*

findings from UNICEF's⁵ pro-equity analysis and Tanzania's Big Catch-Up campaign.

- IV. Caregiver empowerment – *Once caregivers understood the importance of completing the Immunization schedule, they increasingly chose fixed posts for follow-up doses, suggesting intrinsic motivation and self-driven health-seeking behavior, consistent with Vasudevan et al., 2023.¹²*
- V. Health system integration and supervision – *Coordination between CHWs, health facilities, and council health teams provided system-level reinforcement and ensured reliable vaccine supply and supervision.*

Public health and policy implications

The Care Group Model (CGM) demonstrates strong potential as a low-cost, high-impact strategy to reduce zero-dose prevalence and clear large backlogs of defaulters when integrated into routine immunization micro-planning. The estimated cost of approximately US\$5 per vaccinated child compares favorably with other community outreach strategies and supports the scalability of the model provided that CHW supervision, community engagement, and data integration are consistently maintained.²

The model aligns closely with Tanzania's national immunization priorities under the IVD Program, as well as the Gavi 5.0 Equity Agenda (2021–2025) and the WHO Regional Framework for Immunization Recovery post-COVID-19, all of which emphasize reaching zero-dose and under-immunized children through community-based strategies. Scaling the CGM nationally could help sustain immunization coverage above 95% by strengthening the continuum from identification to full schedule completion.

To institutionalize and sustain this approach, policymakers should:

- i. Strengthen CHW capacity through continuous training and supportive supervision;
- ii. Sustain funding for community engagement and outreach activities; and
- iii. Embed zero-dose and follow-up indicators within routine immunization monitoring and data systems, including digital case-management tools where feasible.

Limitations and future studies

Limitations of this evaluation reliance on secondary, facility-linked program data, purposive facility sampling, and short follow-up limited to Penta2/Penta3 mean that results should be generalized cautiously. Purposive selection of high-caseload facilities was intentional to assess continuity where it mattered most, but future studies should apply representative sampling, prospective follow-up to full schedule completion (including measles and other antigens), and mixed-methods to unpack caregiver decision processes and reasons for non-return. Qualitative work would also illuminate how CHW messaging, gender dynamics, or opportunity costs shaped caregiver action in this context.⁵

Finally, the current global context with measles resurgence and persistent zero-dose clusters in fragile and underserved settings underscores the urgency of scalable, equity-focused approaches that not only find missed children but reliably complete their schedules (<https://www.cdc.gov/media/releases/2024/p1114-measles-cases.html>). CGM's combination of community trust, active follow-up, and alignment with facility services provides a promising model

for closing persistent immunization gaps and accelerating progress toward IA2030 targets, provided national governments embed these approaches within routine financing, supervision and data systems.

Conclusion

In conclusion, the Care Group Model demonstrated that CHW-led, community-centered engagement can effectively ensure continuity of care for zero-dose and under-vaccinated children. By linking household identification with health-facility follow-up and operational flexibility, the model reinforces Tanzania's progress toward universal immunization coverage. This approach offers an adaptable, pro-equity strategy for other regions seeking to close immunization gaps and sustain coverage beyond first-dose contact.

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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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