

Mapping, Identifying and Reaching Zero-Dose Children in Tanzania: A Mixed-Methods Cross-Sectional Study

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Abstract

Background

Children who do not receive the first dose of the diphtheria-tetanus-pertussis-containing vaccine (DTP1) during their first year of life are referred to as zero-dose children. Zero-dose children remain a significant public health challenge in Tanzania. Their exclusion from routine vaccination services creates substantial immunity gaps, increasing the risk of outbreaks of vaccine-preventable diseases and undermining efforts to achieve equitable health outcomes for all children. Identifying where these children live and determining effective strategies to reach them are essential for achieving equitable immunisation coverage. This study aimed to map, identify, and investigate strategies for reaching zero-dose children in Tanzania.

Methods

A cross-sectional mixed-methods study was conducted using document reviews, observation checklists, and key informant interviews (KIIs). 21 immunisation-related documents were reviewed, and 44 health facilities were assessed for defaulter tracking practices. Key informant interviews were conducted with 52 government officials and healthcare providers involved in childhood immunisation programmes. Document review data were analysed using content analysis, observation checklist data were analysed descriptively using frequencies and percentages, and interview data were analysed thematically.

Results

According to the 2025 Ministry of Health Immunisation and Vaccine Development (IVD) supportive supervision report, 67% of health facilities had developed Reaching Every Child (REC) microplans, 78% had scheduled routine vaccination sessions, 72% had established zero-dose tracking mechanisms, 31.8% had defaulter-tracking systems, and 64% maintained immunisation monitoring charts. Direct observations further confirmed that tracking and monitoring systems were operational in most of the health facilities assessed. Qualitative findings identified outreach, mobile, and integrated vaccination services as the primary strategies for reaching zero-dose children in underserved and hard-to-reach communities. Community health workers and local leaders played critical roles in community mapping, household identification of unvaccinated children, caregiver mobilisation, and defaulter tracing.

Conclusion

Tanzania has established several mechanisms for identifying and reaching zero-dose children, including REC microplanning, tracking systems, community engagement structures, and routine monitoring tools. Integrated service delivery approaches, supported by community health workers and local leaders, were

identified as key strategies for reaching underserved populations and improving access to immunisation services. The strengthening and full institutionalisation of these systems at national and subnational levels are essential for ensuring their long-term sustainability.

1. Background

Childhood immunisation is widely recognised as one of the most effective and cost-efficient public health interventions. By protecting children against vaccine-preventable diseases, immunisation has substantially reduced childhood morbidity, disability, and mortality worldwide. It is estimated that vaccines prevent approximately 3.5–5 million deaths each year from diseases such as diphtheria, tetanus, pertussis, measles, and poliomyelitis. Beyond saving lives, immunisation reduces healthcare costs, prevents disease outbreaks, and contributes to healthier communities by strengthening population immunity (1). Over the past four decades, remarkable progress has been made in expanding immunisation services worldwide. However, despite these achievements, millions of children continue to miss essential vaccines, leaving them at risk of preventable illness, disability, and death (2). Ensuring equitable access to immunisation remains a key priority of the World Health Organisation (WHO) and the Immunisation Agenda 2030 (IA2030), which aims to ensure that everyone, everywhere, benefits from vaccines throughout life (3).

A child who does not receive the first dose of a diphtheria–tetanus–pertussis-containing vaccine (DTP1) during the first year of life is classified as a zero-dose child (4). This indicator is widely used to identify children who have had little or no contact with routine immunisation services and, more broadly, with the primary healthcare system (4). Evidence indicates that zero-dose children are disproportionately concentrated among populations experiencing multiple social, economic, and structural disadvantages (5). These include poverty, geographic isolation, humanitarian crises, fragile health systems, population displacement, low maternal education, and limited access to essential healthcare services (5). Identifying and reaching zero-dose children has therefore become a global priority for improving equity in immunization coverage and strengthening health systems.

Although global immunisation services have gradually recovered following disruptions caused by the COVID-19 pandemic, progress has remained uneven across countries (2). According to the latest WHO and UNICEF Estimates of National Immunisation Coverage (WUENIC), approximately 14.3 million infants worldwide remained zero-dose in 2024, receiving no routine vaccines during their first year of life (2). While this represents modest progress compared with previous years, it remains insufficient to achieve the IA2030 target of reducing the number of zero-dose children by 50% by 2030 (2, 3). These persistent immunity gaps increase the risk of outbreaks of vaccine-preventable diseases, particularly measles and poliomyelitis, and threaten recent gains in child survival (2, 6).

The burden of zero-dose children is greatest in low- and middle-income countries, particularly in Sub-Saharan Africa, where rapid population growth, shortages of health workers, weak health information systems, difficult terrain, insecurity, and socioeconomic inequalities continue to limit equitable access to

immunization services (7, 8). Studies have shown that zero-dose children are commonly found in remote rural communities, urban informal settlements, pastoralist populations, border areas, fishing communities, and regions affected by conflict or population displacement (8–10). Because these children often experience multiple and overlapping barriers to healthcare, conventional facility-based vaccination services alone are insufficient to reach them. Instead, tailored approaches such as outreach services, mobile vaccination teams, integrated service delivery, community engagement, and strengthened microplanning are required to improve vaccine access (3, 5, 11).

Recognising these challenges, Gavi, the Vaccine Alliance, has made reaching zero-dose children and missed communities a central objective of its current strategy, while IA2030 emphasises identifying, reaching, monitoring, and sustaining immunisation services among underserved populations (3, 10). Emerging evidence suggests that successful programmes rely on accurate community mapping, functional health information systems, strong community participation, engagement of community health workers and local leaders, and continuous monitoring to identify and follow up children who miss routine vaccinations (5, 8).

Tanzania has made considerable progress in expanding routine childhood immunisation and has maintained relatively high national vaccination coverage over the past decade (12). Nevertheless, important geographic and socioeconomic disparities persist, with zero-dose and under-vaccinated children disproportionately concentrated in underserved populations (12). To address these inequities, the Ministry of Health has implemented several strategies, including the Reaching Every Child (REC) approach, supportive supervision, routine outreach services, integrated service delivery, defaulter tracking systems, and community engagement initiatives (8). Tanzania also participated in the global Big Catch-Up initiative to identify and vaccinate children who missed routine immunisation during and after the COVID-19 pandemic (13). Despite these efforts, limited evidence exists on how zero-dose children are systematically identified, mapped, monitored, and reached across the country.

Most studies conducted in Tanzania have focused on vaccination coverage and determinants of incomplete immunisation among children (14–16). Comparatively little attention has been given to understanding the operational systems and implementation strategies used by the national immunisation programme to identify and reach zero-dose children, particularly in underserved and hard-to-reach communities. Understanding these strategies is essential for strengthening programme performance, improving equity, informing national immunisation policies, and accelerating progress toward IA2030 targets.

Therefore, this study aimed to map, identify, and examine the strategies used to reach zero-dose children in Tanzania by integrating evidence from national policy and programme documents, health facility observations, and key informant interviews with government officials and healthcare providers. The findings are expected to generate practical evidence to inform policy development and strengthen programme implementation, thereby supporting equitable immunisation service delivery and ensuring that no child is left behind in accessing life-saving vaccines.

2. Methods

2.1. Study design and Population

This was a cross-sectional mixed-methods study to map and identify strategies used to reach zero-dose children in Tanzania. Quantitative data were collected through a structured review of national immunisation policy and programme documents using a standardised data extraction checklist and observation checklist, and qualitative data were collected through key informant interviews with stakeholders involved in routine childhood immunisation. The qualitative study was guided by a behavioural and social drivers of vaccination uptake framework. By triangulating findings from both data sources, we obtained a more holistic view of existing policies, implementation practices and strategies to reach zero-dose children.

The study population included government officials and health care providers involved in planning, coordinating, supervising and delivering routine childhood immunisation services. The participants included officials from the Ministry of Health, representatives of development partners, Regional and District Immunisation and Vaccination Officers (RIVOs and DIVOs), programme managers and frontline health care providers.

2.2 Study area/Setting

The study was conducted in seven regions in Tanzania. This included five regions from Mainland Tanzania (Central, Coastal, Lake, Northern and Southern Highlands zones) and two regions from Zanzibar (Fig. 1 and Table 1). The selection was based on the Tanzania Immunisation Recovery Plan (2023–2025) that prioritised regions with a high burden of ZD children. Based on the immunisation coverage trends and the prevalence of zero-dose children in the last three years, fourteen councils were purposively selected from the selected regions (Table 2). To capture a range of implementation experiences, each region contained one relatively high-performing and one lower-performing council, representing both urban and rural settings. Selected councils were also cross-checked with the Tanzania Big Catch-Up Plan (2023–2025) to ensure consistency with the country's 81 priority councils for zero-dose interventions and to reflect national immunisation priorities.

Table 1
Selected regions based on Zones

SNO	Zone	Region selected
1	Northern Zone	Arusha
2	Central Zone	Tabora
3	Eastern Zone	Pwani
4	Southern	Katavi
5	Southern zone	Mtwara
6	Unguja	Mjini Magharibi
7	Pemba	Kaskazini Pemba

Table 2
Selected Councils

SNO	Region	Council	Location	Within 81 councils, ZD catch-up priority list plan?	2024 DTP3 Coverage% Administrative
1	Arusha	Arusha DC	Rural	No	110
		Karatu DC	Rural	Yes	76
2	Tabora	Kaliua DC	Rural	No	113
		Nzega Tc	Urban	No	93
3	Katavi	Mpimbwe DC	Rural	No	100
		Tanganyika DC	Rural	Yes	92
4	Pwani	Kibaha MC	Urban	Yes	85
		Mafia DC	Rural	Yes	97
5	Mtwara	Masasi DC	Rural	Yes	93
		Nanyamba DC	urban	No	58
6	Kaskazini Pemba	Wete	Urban	Yes	115
		Micheweni	Rural	Yes	123
7	Mjini Magharibi	Mjini	Urban	Yes	114
		Magharibi A	Rural	Yes	93

2.3 Sample Size and Sampling Procedure

2.3.1 Sample Size

This study involved a review of 21 immunisation-related documents, structured observations in 44 health facilities and in-depth interviews with 52 key informants. The sample size was deemed adequate to fully explore existing policies, implementation practices and stakeholders' perspectives on strategies used to identify and reach zero-dose children in Tanzania.

2.3.1 Sampling Procedure

The study employed a purposive sampling strategy for selecting documents, health facilities and key informants relevant to the study objectives. Immunisation documents were selected based on their relevance to routine childhood immunisation and zero-dose child interventions. The review included national policies, strategic plans, implementation guidelines, supervisory reports, monitoring tools, and other programme documents that informed immunisation service delivery and strategies for mapping, identifying, and reaching zero-dose children.

Within each selected council, three health facilities were purposively chosen in consultation with the Regional and Council Health Management Teams (RHMTs and CHMTs). Facilities were selected to represent high-, moderate-, and low-performing sites based on routine immunisation performance indicators. This sampling approach enabled the study to capture a broad range of implementation experiences, identify best practices, and explore contextual factors influencing the identification, tracking, referral, and vaccination of zero-dose children.

Key informants were purposively selected according to their roles, responsibilities, and experience in routine childhood immunisation programmes. Participants included officials from the Ministry of Health, representatives of development partners, Regional and District Immunization and Vaccination Officers (RIVOs and DIVOs), immunisation programme managers, and frontline healthcare providers. These individuals were recruited because of their direct involvement in the planning, implementation, supervision, and monitoring of immunisation services. Interviews were conducted until data saturation was reached.

2.4 Data Collection Methods

Data were collected between June 2025 and July 2025 using three methods: document review, key informant interviews (KIIs), and structured observations. The use of multiple data sources enabled triangulation of findings and provided a comprehensive understanding of the strategies used to identify and reach zero-dose children in Tanzania.

2.4.1 Document Review

Twenty-one purposively selected immunisation programme documents were reviewed using a structured data extraction checklist. Information was extracted on immunisation policies, implementation strategies, planning processes, monitoring systems, stakeholder roles, and approaches for identifying and reaching zero-dose children.

2.4.2 Key Informant Interviews

A semi-structured interview guide was used to explore participants' experiences with identifying zero-dose children, implementation of outreach and tracking strategies, programme coordination, implementation challenges, enabling factors, and recommendations for strengthening routine immunisation services (**Supplementary file 1**). Interviews were conducted face-to-face by trained researchers in private settings, either at participants' workplaces or other convenient locations. Each interview lasted approximately 30–60 minutes. With participants' written informed consent, interviews were audio-recorded, and field notes were taken to capture contextual information and support interpretation during data analysis.

2.4.3 Structured Observation

Structured observations were conducted in 44 health facilities using a standardised checklist to assess implementation of routine immunisation services, including systems for identifying, tracking and vaccinating zero-dose children, documentation practices, availability of immunisation materials, and organisation of vaccination sessions.

2.5 Data Analysis

Quantitative and qualitative data were analysed separately using appropriate methods before being integrated through triangulation during interpretation to enhance the credibility and comprehensiveness of the findings.

2.5.1 Document Review

Data extracted from the 21 immunisation-related documents were analysed using content analysis. Information was organised according to the study objectives and categorised into key areas, including immunisation policies, implementation strategies, monitoring and reporting systems, roles and responsibilities of healthcare providers, and approaches used to identify and reach zero-dose children. The findings were synthesised narratively to identify common themes, gaps, and areas of convergence across the reviewed documents.

2.5.2 Structured Observation

Data collected from the 44 health facility observations were entered into Microsoft Excel for cleaning and coding before being exported to Stata version 15 for analysis. Descriptive statistics, including frequencies and percentages, were used to summarise the availability and implementation of systems

for identifying and reaching zero-dose children, documentation practices, and organisation of routine immunisation services. The results are presented using tables and descriptive summaries.

2.5.3 Key Informant Interviews

Audio recordings from the 52 key informant interviews were transcribed verbatim. Interviews conducted in Kiswahili were translated into English and verified against the original audio recordings to ensure accuracy and preserve the intended meaning. The transcripts were imported into Dedoose qualitative data analysis software to facilitate coding, data organisation, and analysis.

The qualitative data were analysed using Braun and Clarke's six-phase thematic analysis framework (17). The analysis commenced with repeated reading of the transcripts to familiarise the researchers with the data and identify initial ideas relevant to the study objectives. A hybrid coding approach, combining deductive codes informed by the interview guide and study objectives with inductive codes emerging from the data, was used to develop the coding framework. The transcripts were then systematically coded and organised into hierarchical nodes within Dedoose.

Codes with similar meanings were grouped into broader categories, from which overarching themes were developed and refined through an iterative review process. The identified themes were interpreted in relation to the study objectives on mapping, identifying, and reaching zero-dose children, and supported with representative quotations from participants. To enhance the rigour of the analysis, coding and interpretation were undertaken independently by two researchers, with differences resolved through discussion and consensus.

3. Results

3.1 Characteristics of Study Participants and Data Sources

The study integrated findings from document review, structured observations, and key informant interviews to examine the strategies used to identify and reach zero-dose children in Tanzania.

3.1.1 Key Informant Interviews

A total of 52 key informants participated in the semi-structured interviews, representing stakeholders at both national and subnational levels of the immunisation programme. Thirteen (25.0%) were national-level stakeholders, including programme managers, vaccine focal persons, development partners, the national grant coordinator, and the national data manager. The remaining 39 (75.0%) were subnational stakeholders, comprising Regional and District Immunisation and Vaccination Officers (RIVOs and DIVOs) and frontline healthcare workers. Overall, 29 (55.8%) participants were male, and 23 (44.2%) were female, providing diverse perspectives on the implementation of strategies for identifying and reaching zero-dose children across different levels of the health system (Table 3).

Table 3
Key Informant interview participants

Characteristic	Category	n	%
Affiliation	National	13	25.0
	Program Managers/Officers/Vaccine Focal Persons	7	13.5
	Grant Coordinator	1	1.9
	Data Manager	1	1.9
	Partners	4	7.7
	Subnational	39	75.0
	Regional Immunization and Vaccination Officers (RIVOs)	7	13.5
	District Immunisation and Vaccination Officers (DIVOs)	16	30.8
	Health care workers	16	30.8
	Total	52	100.0
Sex	Female	23	44.2
	Male	29	55.8
	Total	52	100.0

3.1.2 Document review

A total of 21 national immunisation-related documents published between 2003 and 2025 were reviewed. The documents comprised national immunization policies, strategic plans, operational guidelines, supportive supervision reports, programme reviews, vaccination coverage surveys, and implementation manuals. Collectively, they provided valuable insights into the evolution of Tanzania's immunization programme, including policy priorities, programme implementation, monitoring systems, and strategies aimed at improving equitable access to childhood immunization (Table 4).

Table 4
Reviewed documents

S/N	Document	Author/Organization
1	National Immunization Program Financial Sustainability Plan (2003)	Ministry of Health (MoH)
2	Primary Health Services Development Programme (MMAM) 2007–2017	Ministry of Health (MoH)
3	Tanzania National Immunization Policy Guideline (2015)	Ministry of Health (MoH)
4	National Strategic Plan for Health Promotion (2015–2020)	Ministry of Health (MoH)
5	A Guide for Conducting an Expanded Programme on Immunization (EPI) Review (2017)	World Health Organisation (WHO)
6	Policy Guideline for Community-Based Health Services	Ministry of Health (MoH)
7	National Operational Guideline for Community-Based Health Services	Ministry of Health (MoH)
8	Tanzania's Current National Immunization Strategy (2021–2025)	Ministry of Health (MoH)
9	Health Sector Strategic Plan V (July 2021–June 2026)	Ministry of Health (MoH)
10	Immunization Coverage and Equity Assessment Report	UNICEF
11	Tanzania Demographic and Health Survey (TDHS) 2022	Ministry of Health (Mainland and Zanzibar), National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS)
12	Tanzania Joint Appraisal Report (2023)	Ministry of Health/Immunisation and Vaccine Development (MoH/IVD)
13	Tanzanian Zero-Dose (ZD) Catch-Up Intra-Action Review (IAR) Report (2023)	Ministry of Health (MoH)
14	Immunization Recovery Plan (2023–2025)	Immunisation and Vaccine Development (IVD) Programme
15	Service Availability and Readiness Assessment (SARA) Report (2023)	Ministry of Health (MoH), President's Office–Regional Administration and Local Government (PO-RALG), Ifakara Health Institute (IHI)
16	Tanzania Joint Appraisal Report (2024)	Ministry of Health, Expanded Programme on Immunization (EPI)

S/N	Document	Author/Organization
17	Implementation of Post Measles-Rubella Campaign Vaccination Coverage Survey Tanzania (2024)	Ifakara Health Institute (IHI)
18	Circular for Implementation of the Integrated and Coordinated Community Health Workers (CHWs) Programme in Tanzania (2025)	Ministry of Health (MoH)
19	Programme Review Report (2024)	Ministry of Health/Immunisation and Vaccine Development (MoH/IVD)
20	Closing the Immunization Gap: Tanzania's Success Story in Reaching Zero-Dose Children (2024)	UNICEF
21	Supportive Supervision Report (2024)	Ministry of Health/Immunisation and Vaccine Development (MoH/IVD)

3.1.3 Structured Observation

Using a mystery client approach, structured observations were conducted in 44 health facilities during routine childhood immunization sessions, during which 160 children were observed. A structured checklist was used to assess immunization service delivery, focusing on the organisation of vaccination sessions, availability and use of immunization tools, implementation of child tracking systems, and vaccine management (Tables 5 and 6).

Table 5
44 observed Health facilities

Council	Frequency (n)	Percentage (%)
Arusha DC	4	9.09
Arusha CC	5	11.36
Kaliua DC	5	11.36
Karatu DC	3	6.82
Kibaha MC	3	6.82
Mafia DC	1	2.27
Magharibi A	3	6.82
Masasi DC	2	4.55
Mjini	1	2.27
Mpanda MC	5	11.36
Mpimbwe DC	2	4.55
Nanyamba DC	1	2.27
Nzega TC	3	6.82
Tanganyika DC	2	4.55
Wete	4	9.09
Total	44	100.0

Table 6
General Issues Observed During Vaccination Sessions (N = 44)

S/N	Observation Item	Yes, n (%)	No, n (%)
1	Was a register (or adequate recording tool) available for recording both on-time and catch-up vaccination doses?	29 (65.9)	15 (34.1)
2	Were vaccination/child health cards available during the session?	38 (86.4)	6 (13.6)
3	Was a tally sheet available and used to distinguish on-time doses from catch-up doses?	31 (70.4)	13 (29.6)
4	Was a system for following up vaccination dropouts/defaulters being used?	14 (31.8)	30 (68.2)

3.2 Strategies for Mapping, Identifying, and Reaching Zero-Dose Children in Tanzania

Results from the document review, health facility observations and key informant interviews indicated that Tanzania has put in place several complementary strategies to identify and reach zero-dose children. The strategies include Reaching Every Child (REC) microplanning, routine immunization scheduling, community-based identification, defaulter tracking, outreach and mobile vaccination services, and supportive supervision for continuous monitoring. Although these strategies were implemented nationwide, their application varied across health facilities and districts.

3.2.1 Implementation of Reaching Every Child (REC) Microplans

The document review showed that the 2025 Ministry of Health Immunization and Vaccine Development (IVD) Supportive Supervision Report identified the Reaching Every Child (REC) strategy as a key approach for planning and delivering routine immunization services. The report indicated that 67% of health facilities had developed REC microplans to guide immunization activities. These microplans were used to estimate target populations, identify underserved communities, schedule outreach services, and plan the resources required to deliver routine childhood immunization effectively.

The importance of REC microplanning was consistently emphasised during the key informant interviews. Participants described microplanning as an essential tool for identifying communities with high numbers of zero-dose children, prioritising underserved areas, and organising outreach activities based on local needs. They noted that regular updating of microplans enabled health workers to better understand population movements, identify hard-to-reach communities, and allocate resources more effectively, thereby improving the delivery of routine immunization services.

"Microplanning helps us know exactly which villages have children who have never been vaccinated. Without a microplan, it becomes difficult to organise outreach services effectively." (KII018M)

"Our district updated the microplans to map zero-dose and under-immunised children, including those above one year. This helped in planning outreach visits better." (KII015M)

Another health care worker added:

"Before, we focused only on children below one year, but now we also include those who missed doses from previous years." (KII018_HCW)

3.2.2 Routine Immunization Sessions

The review of programme documents indicated that 78% of health facilities had established scheduled routine immunization sessions. These sessions included both fixed-site vaccination services provided at health facilities and planned outreach sessions targeting communities located far from health facilities.

Observational findings confirmed that immunization schedules were displayed in most facilities and that routine immunization services were integrated within maternal and child health clinics. Health facilities

serving geographically dispersed populations commonly complemented fixed-site services with outreach activities to improve access and reach underserved communities.

Key informants reported that regular and predictable vaccination schedules enhanced caregivers' awareness of service availability, reduced missed opportunities for vaccination, and facilitated access to multiple child health services through integrated clinic platforms. These approaches were perceived to increase service utilisation and support broader population coverage, particularly among children living in hard-to-reach areas.

"Every facility has a monthly schedule showing when outreach clinics will be conducted. Communities are informed in advance through village leaders and community health workers." (KII20M)

"The advantage is that this is the normal mode of operation (M.O), and it covers almost 80% of our target population, since outreach is only about 20% for hard-to-reach areas. But everywhere we have facilities". (KII02P).

"The good thing about fixed-point is that people go there and there are many services they can access, compared to outreach where the main service is vaccination. If you're found to have another health problem, it may be hard to help you. But at the facility, the child can be examined properly". (KII02P).

3.2.3 Zero-Dose and Defaulter Tracking Systems

The document review showed that health facilities had established mechanisms to identify and follow up both zero-dose children and those who missed scheduled vaccinations. According to the programme documents, 72% of health facilities had systems for identifying and tracking zero-dose children, while 70% had defaulter-tracking systems in place. These mechanisms included maintaining registers of unvaccinated and defaulter children, updating child lists during outreach activities, documenting newly identified zero-dose children through community-based surveillance, conducting household visits, making telephone reminders, and using community-based tracing. Together, these approaches supported the early identification of children who had not received vaccines or had missed scheduled doses and facilitated their linkage back to routine immunization services.

Health facility observations supported these findings, showing that most facilities had registers and tracking tools to monitor children requiring follow-up. Some facilities maintained dedicated zero-dose or defaulter registers, while others integrated this information into routine immunization registers, appointment books, and child health cards (Table 6). Health workers routinely reviewed these records to identify children who required follow-up. However, the completeness and consistency of tracking practices varied across facilities, reflecting differences in staffing, resources, and implementation capacity.

Key informants consistently emphasized that effective tracking depended on strong collaboration between health facility staff, community health workers (CHWs), village leaders, and community volunteers. These community-based networks played a central role in identifying children who had never

been vaccinated or who had missed scheduled doses, updating household information, conducting home visits, engaging caregivers, and referring children back to health facilities for vaccination. Participants noted that these follow-up mechanisms were particularly important in remote and underserved communities, where geographical barriers and limited access to health services often contributed to missed or delayed vaccinations. One participant highlighted that,

"Community health workers move house to house and identify children who have never received vaccines. They bring the names back to the health facility for follow-up." (KII02P)

Another participant noted that children who had dropped out of the immunization programme or had not completed their vaccination schedule after being registered at a health facility were systematically identified for follow-up

"We identified them using special forms, and after that, the actual activity of vaccinating those identified children took place." (KII03P).

3.2.5 Immunization Monitoring Systems

The document review showed that 64% of health facilities maintained immunization monitoring charts to track programme performance. These charts provided information on monthly vaccination coverage, target achievements, dropout rates, and trends in immunization performance, enabling health workers to monitor progress and identify gaps in service delivery. Monitoring tools also facilitated supportive supervision by allowing supervisors to assess programme performance and identify facilities requiring additional technical support.

3.2.6 Outreach and Mobile Vaccination Services

Qualitative findings consistently identified outreach services, mobile vaccination clinics, and integrated service delivery as the primary strategies used to reach zero-dose children living in remote and underserved communities.

Participants described outreach sessions conducted in villages located far from health facilities, while mobile clinics targeted fishing communities, pastoralist populations, islands, and other geographically hard-to-reach areas. Integration of immunization with antenatal care, child health clinics, nutrition programmes, and growth monitoring services was reported as an effective strategy for increasing vaccine access.

One participant explained:

"Many zero-dose children live in remote communities. Mobile outreach allows us to vaccinate children who cannot easily reach the health facility." (KII014M)

Another participant added:

"We combine vaccination with child health clinics and nutrition services because caregivers are more likely to attend when several services are offered together." (KII017M)

"And given the nature of our country, as I said, people are scattered. Not everyone comes to the facility; they must be followed up. That's why the national policy states every community beyond five kilometers should have a mechanism to be reached." (KII04P)

3.2.7 Community-Based Identification and Mobilization

Across all interviews, respondents emphasized the importance of community-based approaches for identifying and reaching zero-dose children. Community health workers and local government leaders were described as key actors in community mapping, household enumeration, caregiver education, and mobilization. Community health workers conducted household visits to identify newborns and unvaccinated children, while village and hamlet leaders assisted in mobilizing caregivers during vaccination campaigns and outreach sessions. Participants noted that collaboration with community structures improved trust, increased community participation, and strengthened identification of previously unreachable children.

"Village leaders know every household. Their involvement helps us identify children who have never been vaccinated and encourages families to attend outreach clinics." (KII010M)

Another participant added:

"We used local leaders and CHWs to reach the areas where the children were, but in areas outside the city, such as the peripheral councils, we used outreach with the leaders of the relevant areas". (KII014M)

4. Discussion

This study found that Reaching Every Child (REC) microplanning is one of the key strategies for identifying and reaching zero-dose children in Tanzania. Based on the review of the 2025 Immunization and Vaccines Development (IVD) Supportive Supervision Report, approximately two-thirds (67%) of assessed health facilities had developed Reaching Every Child (REC) microplans. The report further indicated that most assessed facilities maintained key microplanning components, including community maps, target population estimates, outreach schedules, and lists of hard-to-reach communities.

Evidence from the document review showed that approximately two-thirds (67%) of health facilities had developed REC microplans. Facility observations further demonstrated that most facilities maintained community maps, target population estimates, outreach schedules, and lists of hard-to-reach communities. Insights from key informants reinforced the importance of REC microplanning, describing it as an essential tool for identifying underserved populations, planning targeted outreach activities, and allocating immunization resources according to local needs.

These findings are consistent with the WHO–UNICEF Immunization Agenda 2030 (IA2030), which identifies microplanning as a cornerstone of equitable immunization programmes. IA2030 emphasizes the use of local data to identify populations with low vaccination coverage, tailor immunization strategies to community needs, and strengthen planning and accountability at the health facility level to ensure that every child is reached with life-saving vaccines. In Ethiopia, the implementation of the Reaching Every District (RED) strategy, supported by quality improvement initiatives, strengthened microplanning, the use of local data for decision-making, expanded outreach services, and active community engagement, improved the identification and vaccination of underserved populations (18). Similarly, in Nigeria, strengthening immunization microplans and incorporating geographic information system (GIS)-supported microplanning enabled health workers to identify hard-to-reach communities more accurately, improve target population estimates, and plan outreach activities more effectively, ultimately enhancing the delivery of immunization services (19).

However, the finding that only 67% of facilities had developed REC microplans highlights an important implementation gap. Incomplete microplanning may limit the ability of health facilities to systematically identify missed communities, accurately estimate target populations, and optimize outreach services. Strengthening the quality, routine updating, and use of REC microplans, supported by regular supervision and data-driven decision-making, will be critical to improving the identification and vaccination of zero-dose children in Tanzania (3). Evidence from Uganda further demonstrated that functional health facility-based microplans supported immunization programme implementation by strengthening target population identification, outreach planning, and problem-solving at the service delivery level (20). This is largely attributable to the fact that microplanning enables immunization services to be organized according to the characteristics, geographic distribution, and specific needs of target populations rather than relying solely on fixed health facility-based delivery approaches. By guiding the identification of underserved communities, optimizing outreach strategies, and improving resource allocation, effective microplanning enhances the capacity of immunization programmes to reach children who might otherwise remain unreached (21).

Similarly, evidence from Nigeria demonstrated that the implementation of the REC microplanning approach improved the identification of zero-dose children in remote and underserved communities by strengthening community mapping, target population estimation, and outreach planning (22). Conversely, weak or incomplete microplanning has been associated with the persistence of zero-dose populations due to inaccurate population estimates, inadequate identification of underserved communities, and poorly coordinated outreach activities (22). Although most facilities in this study had developed REC microplans, observations revealed that some plans were outdated and did not adequately reflect changing population dynamics. This highlights the importance of regularly reviewing and updating microplans to account for population mobility, migration patterns, urban expansion, and the emergence of new settlements. Strengthening the routine use of updated local data in REC microplanning will be essential to ensure that immunization strategies remain responsive to evolving community needs and continue to effectively identify and reach zero-dose children.

Routine vaccination scheduling was another important strategy identified in this study. Approximately 78% of health facilities had established routine vaccination schedules, including both fixed-site and outreach immunization sessions. Participants reported that predictable vaccination schedules improved caregivers' awareness of service availability, enhanced timely attendance, and reduced missed opportunities for vaccination. These findings align with the WHO Immunization Agenda 2030 (IA2030), which emphasizes the uninterrupted delivery of routine immunization services as the foundation for achieving equitable vaccine coverage. Regular and reliable vaccination sessions are essential for maintaining caregiver confidence, strengthening continuity of care, and ensuring that children, particularly those in underserved and hard-to-reach communities, have consistent access to life-saving vaccines. However, sustaining these services requires adequate planning, availability of vaccines and supplies, trained health workers, and effective monitoring systems to identify and address service delivery gaps. However, our observations showed that many health facilities did not offer immunization services every day and instead provided vaccinations only on scheduled clinic days. This limited availability may reduce opportunities for children to receive vaccines on time, increase missed opportunities for immunization, and contribute to the persistence of zero-dose and under-vaccinated children, especially among caregivers who are unable to visit the facility on designated vaccination days. These findings underscore the importance of expanding service availability and integrating routine immunization into daily primary healthcare services, in line with the goals of Immunization Agenda 2030 (IA2030).

The study found that 72% of health facilities had mechanisms for identifying and tracking zero-dose children. Health facilities used child registers, defaulter registers, appointment books, household visits, and community-based surveillance to identify children who had not received any vaccines or who had missed scheduled vaccination appointments. These activities were supported through collaboration between health workers, community health workers (CHWs), and village leaders, highlighting the important role of community engagement in ensuring that children missed by routine immunization services are identified and linked to vaccination.

However, observations conducted during immunization sessions revealed important gaps in the availability of key recording tools needed to support these tracking systems. Only 65.9% of health facilities had immunization registers for recording routine and catch-up vaccinations, although 86.4% had vaccination cards and 70.4% had tally sheets available. The limited availability of immunization registers may compromise the accurate identification, documentation, and follow-up of zero-dose and under-vaccinated children, even where tracking mechanisms are reportedly in place. Without complete and reliable recording tools, some children may remain unidentified or fail to receive timely follow-up after missing scheduled vaccinations, increasing the risk of incomplete immunization.

These findings align with recent global recommendations advocating proactive identification of zero-dose children through community-based surveillance and data-driven approaches. The Big Catch-Up initiative, led by WHO, UNICEF, and Gavi, emphasizes systematic identification of zero-dose children through strategies such as community mapping, birth registration, household enumeration, and the use

of routine immunization registers. These approaches are intended to strengthen the visibility of missed populations, improve targeting of immunization interventions, and accelerate efforts to close existing immunity gaps(23).

The observed implementation of zero-dose tracking mechanisms in Tanzania demonstrates progress toward more targeted and equitable immunization delivery. However, strengthening the completeness, standardisation, and routine use of tracking data remains essential to ensure that all identified children are effectively followed up and vaccinated (23). Similarly, a narrative review conducted on strategies to reach zero-dose children identifies that community-based tracking substantially increased identification of previously unreached children (24).

The reliance on community structures observed in this study reflects Tanzania's long-standing investment in community health systems(25). Community health workers (CHWs) possess detailed knowledge of households within their respective catchment areas, enabling them to identify newborns, recently migrated families, and children who have not initiated vaccination. Their involvement strengthens the completeness and accuracy of immunization registers, facilitates timely follow-up of missed children, and reduces the likelihood that zero-dose children remain unidentified.

Furthermore, this study revealed that the role of CHWs in detecting and referring zero-dose and under-immunised children has been formalised within the national community health programme, with dedicated training packages that include immunization and vaccination. This institutionalisation provides a sustainable mechanism for integrating zero-dose identification and referral into routine community health activities, strengthening continuity of care and supporting equitable immunization service delivery.

These findings highlight the critical role of community-based approaches in improving the equity of immunization services. Sustained engagement of CHWs, village leaders, and community volunteers is therefore essential for maintaining up-to-date population information, strengthening linkages between communities and health facilities, and ensuring that immunization programmes effectively reach children who are missed by routine service delivery platforms.

The study found that approximately 64% of health facilities maintained updated immunization monitoring charts displaying vaccination performance indicators. Monitoring charts were routinely reviewed during supportive supervision visits and monthly performance meetings. These findings support WHO recommendations advocating continuous monitoring of immunization performance using routine health information systems. Monitoring allows programme managers to identify facilities with declining coverage, monitor vaccine dropout rates, and implement corrective actions (3). Similar findings have been reported in Ghana and Kenya, where routine monitoring improved accountability and informed district-level decision-making (26). Nevertheless, nearly one-third of facilities lacked updated monitoring charts, suggesting weaknesses in routine data management. Strengthening health information systems and promoting regular data review meetings could improve programme performance and facilitate earlier identification of declining vaccination coverage.

The findings indicate that outreach services, mobile vaccination teams, and integrated service delivery are critical strategies for reaching zero-dose children in geographically isolated and underserved communities. These approaches address barriers associated with distance, poor transportation, and the limited availability of fixed health facilities among fishing, pastoralist, island, border, and remote village populations. The findings are consistent with WHO and Gavi recommendations emphasising outreach and mobile vaccination as essential approaches for improving immunization equity. Integrating vaccination with maternal and child health services further enhances access by reducing travel and opportunity costs, minimizing missed opportunities for vaccination, and allowing caregivers to receive multiple services during a single visit. This integrated approach may also strengthen continuity of care and facilitate the identification of unreached children. Overall, the findings suggest that proactive, community-based, and integrated service delivery models are essential for overcoming geographical and socioeconomic barriers and improving vaccination access among zero-dose children (23, 27).

Community engagement emerged as a fundamental component of Tanzania's strategy for identifying and reaching zero-dose children. Community health workers, village leaders, religious leaders, and local volunteers played active roles in household mapping, caregiver education, birth notification, and mobilization of communities before vaccination sessions. These findings reinforce growing evidence that meaningful community participation is essential for improving immunization coverage and equity. A study conducted in Sub-Saharan Africa demonstrated that engagement of trusted community leaders can increase caregiver confidence in vaccination, strengthen acceptance of immunization services, and reduce vaccine hesitancy (28). Similarly, community health workers contribute to programme performance by linking households with health facilities, identifying children who have missed vaccinations, and facilitating follow-up to improve vaccination completion.

The findings further support the Behavioural and Social Drivers (BeSD) Framework, which recognises social support, trust, and positive relationships between communities and health systems as important determinants of vaccine uptake (29). Strengthening partnerships between health facilities and community structures, including sustained engagement of local leaders and community health workers, may therefore enhance demand for immunization services and contribute to further reductions in the number of zero-dose children.

5.Limitations

This study assessed the implementation of strategies for reaching zero-dose children but did not evaluate their effectiveness in improving immunization outcomes. Although many health facilities had systems such as REC microplans, zero-dose tracking, and defaulter tracking, a substantial proportion still lacked these essential components, indicating implementation gaps. However, the study did not explore the factors contributing to these differences, such as geographical location, health system capacity, human resources, or supportive supervision. The study did not further analyse whether implementation and performance differed between rural and urban settings, despite potential differences in access barriers, health system capacity, population mobility, and availability of resources.

In addition, the study did not examine the financial requirements or long-term sustainability of these strategies. Future research should link implementation data with vaccination outcomes to identify the most effective approaches for reaching zero-dose children and assess the contextual and financial factors needed to support sustainable scale-up.

6. Conclusion

Findings from the document review, facility observations, and key informant interviews show that Tanzania has implemented multiple strategies to identify and reach zero-dose children, including REC microplanning, routine and outreach immunization services, zero-dose and defaulter tracking, monitoring systems, and community engagement through CHWs and local leaders. However, implementation was not uniform across facilities. Gaps remained, with 33% lacking REC microplans, 28% without zero-dose tracking, 30% without defaulter tracking, 36% without monitoring charts, 22% without scheduled immunization sessions, and limited availability of community volunteers.

These findings indicate that while many facilities have made progress, a considerable proportion still lack key systems needed to identify and follow up missed children. Further efforts should focus on understanding the factors influencing successful and weak implementation, including geographical challenges, resource availability, and health system capacity. Strengthening supportive supervision, data use, community engagement, and targeting facilities with implementation gaps will be important to ensure that zero-dose and under-vaccinated children are identified and reached.

Abbreviations

CHW	Community health care worker
DIVO	District Immunization Officer
DTP	Diphtheria, tetanus, pertussis-containing vaccine
IA2030	Immunization Agenda 2030
REC	Reach Every Child
RIVO	Regional Immunization Officer
WHO	World Health Organisation
WUENIC	WHO, UNICEF estimates of national immunization coverage
ZD	

Declarations

Ethics approval and consent to participate

The studies involving humans were approved by the Joint CUHAS/BMC Research and Ethics Review Committee, Catholic University of Health and Allied Sciences, and the National Health Research Ethics Committee (NatHREC) with certificate number NIMR/HQ/R.8a/Vol. IX/4978. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants.

Consent for publication

Written informed consent for publication was obtained from all participants whose information is included in this manuscript.

Competing interests

The authors declare that they have no competing interests in this section.

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Author Contribution

JP: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft. FM: Data curation, Formal analysis, Writing – review & editing. MM: Conceptualization, Data curation, Writing – review & editing. JM: Conceptualization, Supervision, Writing – review. DM: Data curation, Writing – review & editing. SEM: Conceptualization, Formal analysis, Project administration, Supervision, Writing – review & editing.

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Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Figures



Figure 1

Selected regions.

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