VILLAGE REACH

SCIDaR
SOLINA CENTRE FOR INTERNATIONAL DEVELOPMENT AND RESEARCH

Closing the 9-Month Immunization Gap

Barriers to late-infancy immunization and practical solutions to improve coverage at 9 months

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Executive Highlights

Why this matters now

In Nigeria, the first dose of measles-containing vaccine (MCV1), yellow fever and meningitis A are administered at 9 months of age. While national coverage data suggest only modest differences between coverage at 14 weeks and 9 months (62% coverage for DTP3 and 60% for MCV1 in 2023),[1] these averages mask delayed coverage and inefficiencies in how 9-month vaccination is actually achieved, for both families and the health system. Nigeria's recurrent measles outbreaks underscore that improving the timeliness of 9-month vaccination is critical for effective disease control. Because measles requires very high population immunity (95% with two doses), timely first-dose delivery is critical to prevent immunity gaps even when coverage eventually increases.

Drivers of 9-month delay and dropout

Through participatory qualitative interviews with 156 caregivers, heads of household, health care workers, community influencers and EPI officials in Kaduna and Enugu States, we identified **four primary drivers** of delayed or missed vaccination that were either unique to or more pronounced at the 9-month point:

- **Long gaps between visits weaken recall and follow-up**, as reminders and health system contact decline between the 14-week and 9-month appointments
- **Reduced perceived urgency as children grow older**, making it easier for caregivers to forget or deprioritize vaccination despite intent to vaccinate

[1] WHO/UNICEF Estimates of National Immunization Coverage. Immunization data. https://immunizationdata.who.int/ Accessed: January 29, 2026.

- **Negative prior experiences with side effects or service quality**, which erode motivation to return for later vaccines
- **Stockouts and restrictive vial-opening practices,** which lead to repeated visits, long waits and missed opportunities even when caregivers present on time

These drivers rarely occur in isolation. Compound behavioral and system-level barriers, amplified by distance, transport costs, household economic constraints and gendered decision-making norms, ultimately lead to dropout.

Community-identified solutions to improve 9-month coverage

Through human-centered design, participants co-designed and prioritized four complementary solutions to strengthen the 9-month vaccination touchpoint:

- Community-based door-to-door reminders for 9-month vaccination, potentially leveraging Nigeria's Community Health Workforce Program
- Intensified community sensitization through clear, compassionate and evidence-based messaging for 9-month vaccines delivered by culturally competent messengers
- Accountable, data-driven tracking for 9-month vaccination, with opportunities to leverage the electronic community health information system and the Identify-Enumerate-Vaccinate Strategy of the NPHCDA
- By-law on 9-month immunization for early education admission

Together, these solutions address behavioral and health-system gaps that prevent early vaccination intent from translating into vaccination coverage at 9 months.

Priority policy actions

Findings point to two potential policy levers to improve 9-month vaccination, especially for measles. Restrictive vial-opening practices at the 9-month visit delay vaccination even when caregivers present, suggesting that the shift from 10-dose to 5-dose vials could reduce missed opportunities if paired with aligned supervision, clear wastage guidance and reliable supply. Respondents also saw potential benefits to moving MCV1 from 9 months to 6 months to shorten the long gap after early infancy and maintain urgency, but emphasized that any timing change would require strong evidence on safety, clear communication and system readiness to avoid new barriers.

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Background

In Nigeria, the first dose of measles-containing vaccine (MCV1), yellow fever (YF) and meningitis A (MenA) are administered at 9 months of age through routine immunization. These vaccinations provide critical protection against highly transmissible diseases that remain endemic or outbreak-prone in Nigeria. A single missed visit at 9 months of age can mean multiple antigens are delayed or missed.

While national coverage data suggest only modest differences between coverage at 14 weeks and 9 months (62% coverage for DTP3 and 60% for MCV1 in 2023), these averages mask delays and inefficiencies in how 9-month vaccination is actually achieved. Timeliness matters for measles control, as children vaccinated late remain susceptible during a high-risk period and delayed vaccination can perpetuate outbreaks even when coverage eventually rises. Nigeria has one of the highest burdens of measles and the largest number of children missing routine immunizations in the world. First-dose measles vaccine (MCV1) coverage remains low at 60%, well below the 95% threshold needed to interrupt transmission.[2] Measles remains endemic in Nigeria, with ongoing confirmed cases reported annually and recurrent outbreaks affecting children due to gaps in population immunity.

To better understand the factors driving low and delayed immunization coverage at 9 months, VillageReach and the Solina Centre for International Development and Research (SCIDaR), in partnership with the State Primary Health Care Boards, conducted a qualitative, participatory study in Kaduna and Enugu States, where 3% and 16% of children, respectively, drop-out between the third dose of the diphtheria, tetanus and pertussis (DTP3) vaccine at 14 weeks and the MCV1 vaccine at 9 months. As part of a broader four-country study, the research aimed to **identify drivers and potential solutions for delay and dropout at the 9-month touchpoint**.

Between October 2024 and April 2025, trained peer researchers collected interviews, observations, and workshop inputs across four health facilities per state. Peer researchers interviewed 156 participants from four health facilities and their catchment areas in each district, including caregivers and heads of households of children with both on-time vaccination (at least one 9-month vaccine before 12 months) and delayed or missed vaccination (no 9-month vaccines by 12 months), health care workers, community influencers, and government officials. They also conducted eight health facility observations. Solutions to identified drivers of non-vaccination at 9 months were developed through two ideation workshops, followed by two prototyping workshops to further refine the identified solutions.

[2] WHO/UNICEF Estimates of National Immunization Coverage. Immunization data. https://immunizationdata.who.int/ Accessed: Jan 29, 2026.

Table 1: Study Sample

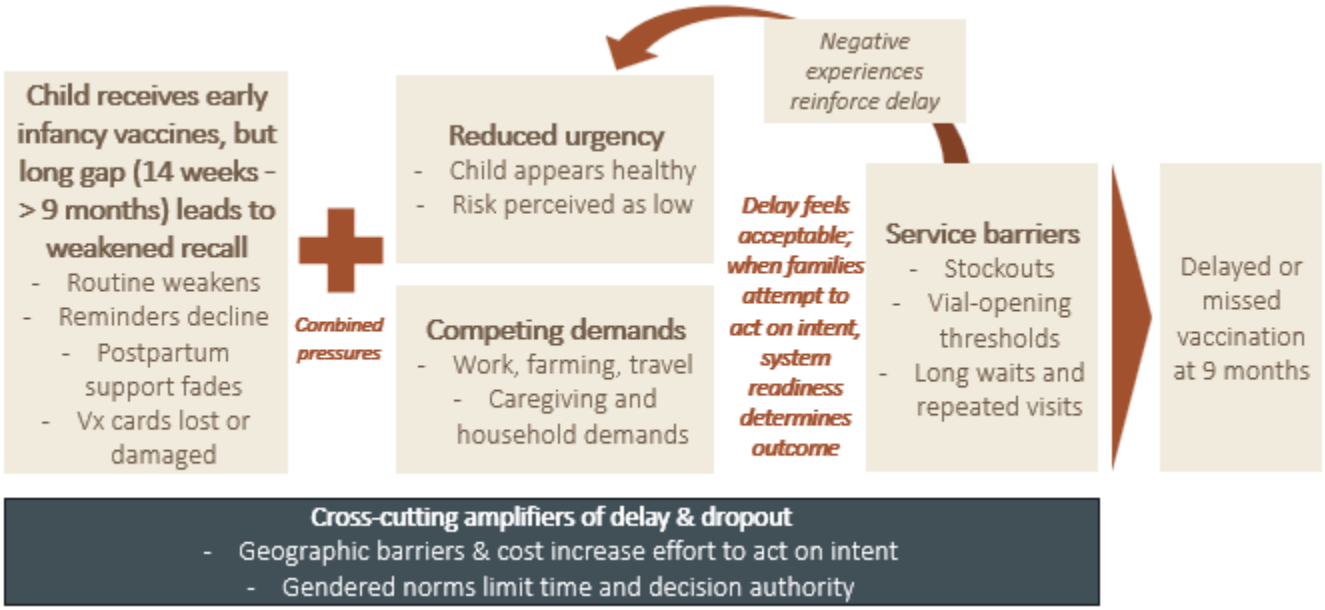
Participant Type	Sample (n)		
	Participatory Data Collection	Ideation Workshops	Prototyping Workshops
Caregivers	71	19	5
Heads of households	36	11	3
Health care workers	16	7	9
Community influencers	24	8	6
EPI officials	9	6	6
Total	**156**	**51**	**29**

To analyze the qualitative data, VillageReach used a participatory team-based approach, employing regular debriefs, affinity mapping, and in-depth thematic analysis using ATLAS.ti.

Drivers of MCV1, YF and MenA Delay and Dropout

Delay and dropout at the 9-month vaccination touchpoint rarely result from a single barrier. Instead, caregiver intent present in early infancy erodes over time through a sequence of compounding behavioral, social, and system-level pressures. Following the long gap after early infancy vaccination, weakened routines and reminders reduce recall. As children appear healthy and perceived risk declines, competing household and livelihood demands make delay feel acceptable. When caregivers eventually attempt to act on that intent, geographic distance, cost, and service-delivery barriers often determine the outcome, converting delay into missed vaccination. Negative service experience further reinforce delay. Each step along this pathway represents a distinct opportunity for targeted intervention to restore action and prevent dropout. Considering these themes as a pathway, a single intervention will have limited effect unless it addresses both late infancy follow-up and facility reliability when caregivers attend.

Figure: Pathways to delay and dropout at the 9-month touchpoint



The four primary themes that represent drivers of vaccination delay or dropout that were either unique or more pronounced at the 9-month touchpoint are described in detail below.

1. Long gap between 14 weeks and 9 months and weakened reminders in later infancy reduce recall despite intent to vaccinate

Between birth and 14 weeks, vaccination appointments are scheduled every 4 weeks, which creates a routine for the caregiver. This routine is reinforced by written dates on vaccination cards and frequent health care worker contact.

The next required touchpoint is at 9 months. This long gap between the 14-week and 9-month vaccinations means caregivers and heads of household had more opportunities to forget upcoming vaccines, resulting in missed or delayed vaccination for MCV1, YF, and MenA. As one mother of a child whose 9-month vaccinations were delayed explained:

> *"Honestly there's no strong reason at all. The only reason is as I have told you, you know how parents are, how we love our children we were playing and laughing with our child, vaccination didn't even occur to me, I completely forgot about it until when I realized…then I remembered the vaccination and then I went to vaccinate him. But for me there's no strong reason, his father didn't stop me from going, there's no excuse and it's not that someone influenced me about not going." -40-year-old mother whose child delayed vaccination, Kaduna*

> *"They come back after four weeks to get the second, so also the third one. So, when the child is 14 weeks, so it may not come back to the facility until that child is nine months. So, which means what? What we calculated f or weeks is around three to four months. Three to four months. Then an interval of almost five months. Five m onths, yes. So, people, also parents, tend to forget when to come back for measles."- EPI official, Kaduna*

There is general agreement that it is the caregiver's responsibility within the family to seek vaccination services, first seeking permission from the head of household. This is particularly strong in Kaduna, where if men are absent or do not provide permission, vaccination is unlikely. In Enugu, husbands provide important support in the form of transport and funds, but their influence is less active than in Kaduna in general. Some heads of household reported not being aware that the child had not received the 9-month vaccination.

> *"What happened when I did not get him vaccinated at 9 months was because there was no money. My husband had nothing he was doing and he did not allow me to do something but stay in the house, so he did not have enough money to enable me to get him vaccinated." – Father of child who received 9-month vaccines late, Enugu*

> *"When he was 9 months…I was not around. When I came back, he was already 10 months plus, I didn't really notice any change. I do not know whether it was the vaccination he was previously given that supported him up to that time that nothing showed it was not done, I think that was the reason, because the previous ones were done, maybe they give him protection against other things…It was when I came back that I got the information he was not taken and that was late." – Father of child who received no 9-month vaccines, Kaduna*

At 6 months, children may also receive Vitamin A drops in Nigeria, but this is optional and inconsistently attended. When caregivers do come at 6 months, health care workers reported taking the opportunity to remind caregivers about the 9-month touchpoint, but this was not strong enough to function as a reminder for the 9-month vaccinations.

By 9 months, caregivers have typically moved beyond the postpartum period (when they are intensely focused on newborn care) and resumed their work, household and community obligations. Furthermore, caregivers are more likely at this point to start traveling or caring for sick relatives, which can also contribute to missed appointments. Support available during postpartum, such as from a mother or mother-in-law, has usually decreased. This makes

finding the time to attend to household, work, and community obligations alongside getting vaccinations more difficult.

> *"But house chores were too much on me, plus farming. I don't have any house help. I was busy with house chores and kept postponing taking him to the hospital in Enugu for vaccination." – 25-year-old mother of child who received no 9-month vaccines, Enugu*

Follow-up and reminders from the health system also weaken due to limited resources for outreach, phone airtime and transport. Loss or damage to vaccination cards over time also undermine families' ability to track schedules. When reminders weakened, geographic distance and transport costs further reduced the likelihood that caregivers would make a return visit, particularly once routine postpartum support had diminished.

Knowledge gaps contributed to families forgetting about the vaccines due at the 9-month touchpoint. Some caregivers were simply unaware that vaccines were required at 9 months or did not receive timely information about when the next dose was due. Loss or damage to vaccination cards created uncertainty about whether and when vaccines were due, weakening caregivers' and heads of households' ability to track their child's schedule.

When the 9-month appointment was missed due to caregiver travel, competing priorities, or forgetfulness, some caregivers did not know if they could access vaccination late or feared being reprimanded if they attempted to access vaccination late.

> *"I didn't know I could get her vaccinated in another facility, I would have taken the health card along" -42-year-old mother of child who received their 9-month vaccines late, Kaduna*

> *"I felt the time had passed; until a day I met a Nurse... she told me that I could still bring her for the 9-month vaccination even though she was already 1 year old." – 25-year-old mother of child who received their 9-month vaccines late, Kaduna*

Lower recall despite an intent to vaccinate at earlier touchpoints was consistent across both Kaduna and Enugu.

2. Decreased perceived urgency at 9 months enables forgetting and de-prioritization

As infants grow older, caregivers increasingly perceive them as less vulnerable to disease. This shift lowers both perceived risk and the salience of the 9-month vaccines compared to early infancy.

> *"Honestly, at that time I was negligent and I forgot about it, as I was seeing my son healthy... so I just ignored the whole thing until I remembered." Mother of child who received 9-month vaccines late, Kaduna*

> *"Caregivers are more concerned about caring for the child when they are younger, but when it reaches 9 months, they feel that the child is strong enough, and they have laxity in attending to them as they did when the child was too young." 72-year-old male community influencer, Kaduna*

Lower urgency operates as a feedback loop with forgetting: when risk feels low, remembering feels less compelling, and forgetting is easier to rationalize. Even when caregivers remember the appointment, reduced urgency weakens motivation to overcome persistent barriers such as distance, transport costs, waiting times, or competing priorities.

> *"I'll put it as procrastination that emanated from my wife. So she was like, 'the child's vaccination is due', then what is holding you? Why not take her to the facility?... She would say she would go by next week, from next week maybe one thing will come up and she'll shift it to another week." -26-year-old father of child who received their 9-month vaccines late, Enugu*

The return to work, farming, and community obligations further compound this effect. Barriers that families successfully overcame in early infancy now feel heavier in the absence of support or reminders.

> *"Had it been the health facility is our neighbor… I don't think that spirit of procrastination wouldn't have lived in us even for a second." -26-year-old father of child who received their 9-month vaccines late, Enugu*

Overall, this decrease in urgency typically leads to delay and makes vaccination less likely, eventually converting to dropout when other barriers are present.

> *"I was afraid to go, again…I thought that when I got there, they would scold me for not coming when I was supposed to." – Mother of child who received no 9-month vaccines, Enugu*

Health care workers noted that when they are able to conduct home follow-up, missed appointments are resolved. Caregivers commonly return for vaccination once reminded.

> *"Some, when you go, they even say we forgot the date… so today we followed you home… and we tell them to come to the health facility… and they do come." – 60-year-old female community influencer, Kaduna*

3. Negative experiences with side effects at prior vaccine touchpoints erode motivation

For some families, negative experiences with vaccination services or side effects at earlier touchpoints can reduce motivation to seek out 9-month vaccinations or cause them to delay the 9-month vaccinations. Several caregivers described fear of repeating painful side effects, including swelling, fever and excessive crying, which made them hesitant to bring their child back for additional vaccines. One mother described her concerns:

> *"The main reason why I delayed the 9-months antigens was because the vaccines she received before the 9-months vaccines made her thigh so hard and it was painful, so I felt like not returning for the 9-month vaccination but I later made the decision to take her." -22-year-old mother of child who received their 9-month vaccines late, Kaduna*

In some households, this hesitancy was reinforced by family members, as one father described:

> *“Why she didn’t get vaccinated on time was because of the rise in temperature from the last vaccine and we didn’t get to sleep... Later on, the girl started crying, and I was told that since they receive the vaccine, she has been running temperature and that was how we were not able to sleep that night... for a while her temperature was high so I said they shouldn’t go for immunization because it is not good for her to get vaccinated and we won’t be able to sleep..." -35-year-old father of child who received their 9-month vaccines late, Kaduna*

This reluctance is not rooted in opposition to vaccination, but rather concern about the child’s discomfort and the household burden of managing side effects. Managing side effects imposed direct financial costs on families, including purchasing paracetamol or other medicines, paying for transport to seek care, and lost income from interrupted work or sleepless nights caring for a feverish child. While many health care workers reported providing routine counseling on expected reactions and home management, many caregivers reported receiving little or no guidance about what to expect or how to manage side effects.

It is worth noting that the actual side effects reported after receiving the 9-month vaccines were actually fairly minimal compared to earlier touchpoints, but families lacked information about what to expect at the 9-month touchpoint.

Poor treatment at facilities further erodes motivation to return. Beyond concerns about side effects, caregivers who experienced disrespectful treatment, such as being scolded for lateness or being treated dismissively, reported feeling discouraged from returning for future doses.

> *"The health workers didn't even give me a listening ear...I got angry and left" -28-year-old mother of child who received no 9-month vaccines, Kaduna*

> *"When I remember how the health worker treated me when I was at the facility, by ignoring me, I didn't feel like returning to the facility again, it weakens me anytime I remember the treatment from the nurse" -35-year-old mother of child who received no 9-month vaccines, Kaduna*

4. Vaccine stockouts and restrictive vial-opening practices drive repeated visits, long waits, and missed opportunities

Official policy is to vaccinate any eligible child who presents at the vaccination session, but in practice, health workers often apply informal minimum thresholds before reconstituting a 10-dose MCV, YF or MenA vial to avoid wastage. Caregivers and health care workers described needing 3-5 children before a vial would be opened due to the need to discard the reconstituted vaccine after six hours. Facility observations confirmed this practice. This has a more significant impact in lower-volume facilities, such as those in remote areas. This practice is driven by uncertainty about stock availability and concerns about discarding unused doses once a vial is opened.

“The measles vaccine is 10 doses for 10 children, so you see they can’t open it for one person, but at least minimum of 3 persons is okay…that’s why they fixed [vaccination sessions] for one day….But according to [the higher level], even if it is one person, we are to open it. We here are the ones doing it like that because the vaccine is not enough to reduce running out of stock.” -26-year-old male health care worker, Kaduna

This practice means that even if caregivers overcome memory, motivational, and knowledge barriers and arrive on time with their child, they are often told to wait until more children come or to return on another day. Some caregivers may be unable or unwilling to wait for a long time or without the confidence that the vaccines will be administered that day.

"The difference was that, we didn't get the 9-month vaccination we went to the facility for the 9-month vaccines but I was told that I was the only one that came for those vaccines and they can't open a vial unless the children are up to 5 that is when it can be opened, I should go to another PHC to get those vaccines, but in my thoughts; I have never gone to the PHC for any reason how will I go there at 9 months that was why I refused to go." -28-year-old mother of child who received no 9-month vaccines, Kaduna

Many caregivers described multiple trips to the facility, requiring repeated out-of-pocket costs for transport and missed work. Caregivers reported not fully understanding why this practice occurs, as they may just be told to return on a different day without an explanation. Ultimately, this erodes motivation and trust in the health system.

"I went and sat there and wasted my time—thirty minutes to an hour—and didn’t get it. Of course, you’d feel bad, honestly... And then they told me to come back next week. When I went back, the child wasn’t well, so I said I wouldn’t go back... After that I got negligence and I didn’t go back" - Mother of child who received no 9-month vaccines, Kaduna

“I met the nurse at the facility and told her I was there for uptake of 9-month vaccines…but she told me vaccines are finished…then she arrogantly left me standing there…didn’t care about why I was there…When I remember how the health care worker treated me when I was at the facility, by ignoring me, I didn’t feel like returning to the facility again, it weakens me anytime I remember the treatment from the nurse.” -35-year-old mother of child who received their 9-month vaccines late, Kaduna

Health care workers reported that concerns or even perceptions about availability of 9-month vaccines directly influenced these minimum-threshold practices. At facilities with unpredictable supplies, health care workers enforce stricter requirements (often at least 5 children) before opening vials, while facilities with reliable forecasting report opening vials for individual children. Beyond these practices, actual stockouts compound access barriers at the 9-month touchpoints. Caregivers and health care workers report instances where vaccines are unavailable, forcing caregivers to make repeated trips. Health care workers cited

multiple reasons for stockouts of 9-month vaccines: insufficient forecasting, upstream shortages at national and state levels, delayed redistribution of available vaccines and constraints on transport to deliver or pickup supply.

While vial-opening practices were observed in both states, stockouts were more common and longer in Kaduna than Enugu. Health care workers and caregivers in Kaduna described explicit refusals and instructions to return another day, while in Enugu, service denial was less explicit, as immunization was often bundled with other services such as HIV lab tests or mobilization during market days to boost turnout and enable vial opening.

Facilitators of 9-month vaccination and catch-up

Factors that facilitate a delayed individual catching up

Despite encountering similar drivers, some caregivers successfully caught their child up on delayed 9-month vaccinations. We identified two key factors that facilitated catch-up and linked them to specific drivers that contributed to non-vaccination at 9-months (Table 2).

Table 2: Factors that facilitate catch-up of missed 9-month vaccines

Catch-up facilitators	Related dropout drivers
Cues from vaccination cards and facility scheduling and outreach from volunteer community mobilizers triggered catch-up	• Long gaps and weakened reminders • Decreased urgency
Social support or encouragement from husbands (permission, transport, or money), mothers-in-law (prompts), co-wives (childcare help) and health care workers (permission to vaccinate late)	• Long gaps and weakened reminders • Decreased urgency

Factors that facilitate on-time vaccination at 9 months

Caregivers and heads of household whose children completed the 9-month vaccination on time were more likely to benefit from consistent multi-channel reminder systems and accessible services, particularly in terms of transport and cost. Positive service quality and trust supported timely vaccination but trust alone was insufficient without reminders and practical access. Active financial support from fathers or heads of household contributed to on-time vaccination but was not universal, indicating that this support complements other enablers. Table 3 summarizes the factors present among households with on-time 9-month vaccination that were absent among households with delayed or missed vaccination.

Table 3: Comparison of factors present for on-time vaccinated caregivers and heads of household v. delayed/non-vaccinated caregivers and heads of household

Factor	On-time vaccinated groups	9-month Delay/Dropout Vaccination groups

Active financial support from fathers or household heads	Sometimes	Not present
Positive service quality and trust	Always	Sometimes
Timely, multi-channel reminder systems	Sometimes	Not present
Service accessibility	Always	Rarely

CASE STUDY 1

Erosion of Vaccination Intent

Adaku is a 32-year-old mother of three living in Enugu town. Her husband, Ibrahim, works away from home for extended periods. At the time of the interview, her youngest children, twin boys named Akachi and Ukachi, were over one year old and had not received their 9-month vaccines, although they had completed all routine vaccinations through 14 weeks.

Although Adaku described vaccination visits in early infancy as challenging due to the cost of transport and distance to the health facility, her husband's financial support and encouragement allowed her to prioritize vaccination visits. She understood the vaccination schedule well. Adaku counted the weeks between early infancy appointments and observed healing of the vaccination site to help her remember when to return for vaccination. When Akachi and Ukachi experienced fever and swelling after early infancy vaccination, Adaku managed side effects with medication and household support, reinforcing her confidence in vaccination.

However, between when the twins were 14 weeks and 9 months, a sudden change in household circumstances disrupted her routine. Her husband needed to travel for his brother's funeral, incurring significant expense and straining the household's finances. Without transport money, Adaku needed to walk to the health center, alone, carrying one twin in her arms and strapping the other to her back.

> *"I wanted to go, but after the burial, there was no money left. Even to trek with two children was very difficult."*

In addition, the family still owed the health center payment from treatment before the delivery. When she considered returning for vaccination, the unpaid debt increased her reluctance due to fear of being questioned by the health care workers. Ultimately, despite Adaku's belief in vaccination, Adaku postponed returning to the clinic due to a change in financial circumstances and her husband's absence, and the twins missed their 9-month vaccinations.

Health workers at the same facility noted that transport cost and distance are persistent barriers in Enugu, and that even caregivers who manage to overcome these challenges in early infancy may struggle later if their circumstances or priorities shift. They explained that 9-month vaccination sessions can involve long waits or rescheduled visits when turnout is low because staff wait to open multi-dose vials, and that limited staffing and crowded sessions amplify these challenges. During a facility observation, the vaccination session ran from 9:00am to 2:00pm, the facility was crowded and lacked ventilation, and staffing was limited.

Adaku's experience illustrates how strong caregiver intent can erode under compounding financial, physical, and system-level pressures, transforming delay into dropout.

CASE STUDY 2

Discouraged by the System

Fatima is a 21-year-old mother of three living in Unguwar Rimi, Kaduna North. Her husband, Ali, works as a plumber. At the time of the interview, their son, Abubakar, was over one year old and had not received his MCV1, yellow fever or meningitis vaccines, as recommended at 9 months, despite completing all routine immunizations through 14 weeks.

Although vaccination visits in early infancy required walking to the health center and spending up to two hours waiting for health care workers, Fatima got Abubakar vaccinated on schedule in part because Ali approved vaccination, provided transport money, and accompanied Fatima when possible. Fatima described these experiences as routine and manageable, reflecting a strong sense of confidence in her ability to complete vaccination visits..

> *"It's something you have decided to do – anytime you are scheduled, you will try as much as possible to go."*

When Abubakar was 9 months old, Fatima again attempted to act on her intent to vaccinate and brought him to the health center. However, she was told that there were too few children present to open the 10-dose vials and was asked to return on another day. When she returned, health care workers told Fatim and other waiting caregivers that the 9-month vaccines were finished and that they should come back again. By the next appointment, Abubakar developed a fever associated with teething, and Fatima decided not to bring him for vaccination. As the days passed, household responsibilities continued and although Ali encouraged her to return to the facility, Fatima described feeling discouraged and a loss of confidence that the visits would be successful. She ultimately did not return.

Health care workers confirmed that when only a couple caregivers arrive for 9-month vaccination, they are asked to return when there are likely to be more caregivers present. This presents a tension for health care workers, as they weigh adherence to the policy to open vaccine vials for any child with the desire to maintain stock for other children.

> *"We were told even if it's a single child that comes, open it…if you tell them they should go and come back, they might not come back."*

Fatima's experience demonstrates how repeated service delivery failures, rather than lack of intent or awareness, can erode caregiver confidence and convert short-term delay into sustained dropout at the 9-month vaccination visit.

Community-Identified Solutions to Improve Coverage at 9 Months

Across Kaduna and Enugu, the study findings suggest that most caregivers intend to vaccinate and successfully complete early-infancy vaccines, yet this intent often does not translate into timely vaccination at 9 months. The findings also underscore that improving 9-month coverage requires more than generating demand. It requires reliably converting caregiver intent and attendance into vaccination. Taken together, the evidence points to the need for a **coordinated package that re-establishes reminders and urgency in later infancy, strengthens confidence through clear and compassionate communication, and improves service readiness and follow-up so that children are vaccinated when caregivers present.** Importantly, communities emphasized that these solutions should build on existing government platforms, community health workforce structures, and accountability mechanisms to support feasibility, sustainability, and scale.

Communities identified and prioritized solutions to address barriers to 9-month vaccination through human-centered design (HCD). Three solutions emerged in only one state, while one solution emerged in both states. This reflects both shared barriers to timely 9-month vaccination and differences in community context, governance, and system readiness between Kaduna and Enugu.

1. Community-based door-to-door reminders for 9-month vaccination (Kaduna)
2. Intensified community sensitization through clear, compassionate and evidence-based messaging for 9-month vaccines (Kaduna and Enugu)
3. Accountable, data-driven tracking for 9-month vaccination (Enugu)
4. By-law on 9-Month immunization for early education admission (Enugu)

Although each intervention is described separately, these solutions work best when combined, as they target different (and often compounding) contributors to missed or delayed 9-month vaccinations.

1. Door-to-door reminders

To strengthen recall between the 14-week and 9-month vaccination visits, door-to-door reminders would refocus existing community-based follow-up mechanisms to explicitly target the 9-month vaccination touchpoint. This approach could leverage Nigeria's Community Health Workforce Program by engaging trained community health workers and volunteers already embedded within community health structures, rather than creating parallel structures. Trained community health workers and volunteers would conduct structured door-to-door visits to households with children who are eligible for 9-month vaccines to verify vaccination status and provide timely reminders about routine immunization sessions. While door-to-door follow-up has previously occurred in an informal and inconsistently applied manner, this approach introduces a dedicated tracking tool and standardized reminder script to improve consistency and quality of information provided to families. Evidence suggests that reminder

approaches, including community outreach, can improve vaccination completion and timeliness, particularly when reminders are repeated and linked to a clear appointment date.[3,4]

Caregivers and health care workers consistently described the long interval between early infancy vaccines and the 9-month visit as a period when reminders lessen, routines resume, and vaccination cards may be misplaced. This solution engages trusted, familiar community actors who already have routine contact with households through government-supported community health programs to re-establish urgency and urge families who need a prompt to seek 9-month vaccination.

Table 4: Solution design components mapped to 9-month delay and dropout drivers (door-to-door reminders)

Drivers	Design components to address identified drivers
Long gap between vaccines and weakened reminders	• Structured, door-to-door household visits by trained volunteers with standardized scripts
Decreased urgency	• Personalized reminders that prompt action
Prior negative experiences erode motivation	• Opportunity for caregivers to ask questions during household visits
Restrictive service delivery practices	• Improved alignment between community follow-up and facility service availability

[3] Eze P, Lawani LO, Acharya Y. Short message service (SMS) reminders for childhood immunisation in low-income and middle-income countries: a systematic review and meta-analysis. *BMJ Global Health*. 2021;6:e005035.

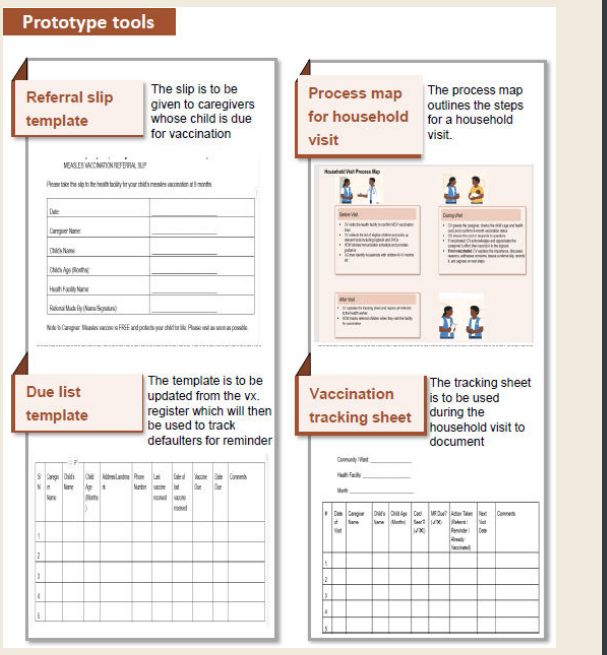
[4] Oladepo O, Dipeolu IO, Oladunni O. Outcome of reminder text messages intervention on completion of routine immunization in rural areas, Nigeria. Health Promot Int. 2021 Aug 24;36(3):765-773.

DOOR-TO-DOOR REMINDERS: KEY COMPONENTS

This solution builds on an informal practice in which community volunteers conduct door-to-door visits with varying consistency. Key components provide structure and consistency to the approach.

- Process map that guides actions before, during and after household visits
- A draft list of due dates for tracking upcoming vaccinations
- Vaccination tracking sheet to record each child's immunization status
- Referral slip template to facilitate caregiver follow-up

To further strengthen the solution, CVs would be provided interpersonal communication training to strengthen trust building between the health system and families.



2. Intensified Community Sensitization with Evidence-Based Messaging

To help address hesitation, confusion, and reduced urgency surrounding the 9-month vaccination visit, this solution uses clear, evidence-based, culturally resonant, and emotionally supportive messaging tailored specifically to the 9-month touchpoint. Messages would be delivered by culturally competent and trusted messengers, including religious leaders, health care workers, and traditional leaders, with standardized but adaptable communication tools to explain what vaccines are given at 9 months, what side effects to expect, how to manage them, and when to seek care. Emphasis is placed on compassionate, non-judgmental communication that reinforces caregiver intent while addressing fear and misinformation. Community engagement literature emphasizes that trust-building is strengthened when communities help shape messages, identify trusted messengers, and dissemination channels.[5]

Caregivers and heads of household described a drop-off in health education messaging after 14 weeks. This solution provides targeted messaging on the unique concerns of late infancy, including fear of side effects, misinformation about measles, yellow fever, and meningitis A, and uncertainty about whether vaccination is still necessary as children grow older. The solution also emphasizes sharing health education messages in familiar, trusted settings such as

[5] Sommers, T., Dockery, M., Burke, N., et al. (2025). Building trust and equity in vaccine communication through community engagement. *Human Vaccines & Immunotherapeutics*, *21*(1).

antenatal clinics, religious gathering and community meetings, ensuring that caregivers continue to receive consistent vaccination information beyond early infancy.

Table 5: Solution design components mapped to 9-month delay and dropout drivers (evidence-based sensitization)

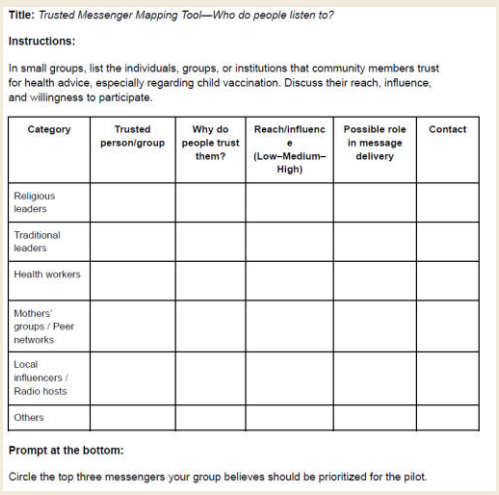
Drivers	Design components to address identified drivers
Long gap between vaccines and weakened reminders	• Take-home materials that caregivers can keep with vaccination cards to reinforce timing
Decreased urgency	• Structured messaging that emphasizes the continued importance of specific diseases
Prior negative experiences erode motivation	• Standardized guidance and reassurance around mild side effects and when to return for care
Restrictive service delivery practices	• *Not directly addressed*

EVIDENCE-BASED SENSITIZATION: KEY COMPONENTS

This solution builds on existing messaging on general immunization to focus explicitly on 9-moth vaccines. Key components include:

- Standardized messaging guide for trusted local figures to deliver 9-month specific education
- Take-home materials for caregivers with simple language and visual cues reinforcing the timing of the importance and timing of 9-month visits
- Myth-busting content
- Guidance on compassionated communication
- Guidance on adapting messaging to the context and forum

Messenger mapping tool, take-home information sample and sample compassionate messaging guidance



Title: *Trusted Messenger Mapping Tool—Who do people listen to?*

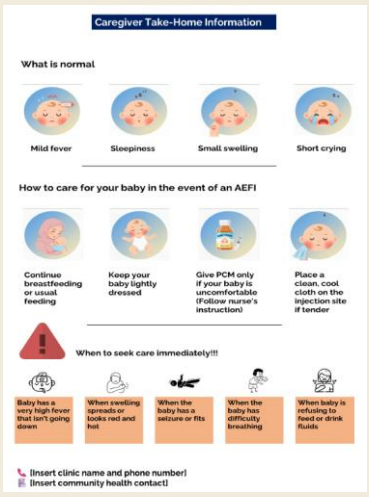
Instructions:

In small groups, list the individuals, groups, or institutions that community members trust for health advice, especially regarding child vaccination. Discuss their reach, influence, and willingness to participate.

Category	Trusted person/group	Why do people trust them?	Reach/influence (Low–Medium–High)	Possible role in message delivery	Contact
Religious leaders					
Traditional leaders					
Health workers					
Mothers' groups / Peer networks					
Local influencers / Radio hosts					
Others					

Prompt at the bottom:

Circle the top three messengers your group believes should be prioritized for the pilot.



3. Data-Driven Tracking with Dedicated Record-Keeping and Accountability

To help address missed opportunities and weak follow-up around the 9-month vaccination visit, this solution would strengthen facility-based tracking systems to explicitly identify and follow up with families whose children are due for 9-month vaccination. While door-to-door reminders focus on household-level recall and motivation, data-driven tracking strengthens facility accountability and follow-up. Where feasible, this approach could build on Nigeria's electronic community health information system and the Identify-Enumerate-Vaccinate (IEV) strategy of the National Primary Health Care Development Agency (NPHCDA) to improve visibility of children who are due or overdue for vaccination. Registries are most useful when they enable defaulter tracing, establish clear roles and responsibilities, and generate simple dashboards for supervision.[6]

The approach introduces simple paper tools into existing health center workflows, paired with clear responsibility for timely and accurate immunization record-keeping at the facility level. Data-driven tracking would be paired with accountability and supervision to help supervisors regularly review immunization performance using improved facility data and support health care workers in addressing missed or delayed vaccinations.

This solution shifts from relying on informal practices or overburdened staff to identify children who miss 9-month visits by creating a structured mechanism paired with supervision to institutionalize follow-up with 9-month defaulters, while strengthening data quality and ownership at the point of service delivery to ensure follow-up actions are feasible and sustained.

Table 6: Solution design components mapped to 9-month delay and dropout drivers (data-driven tracking)

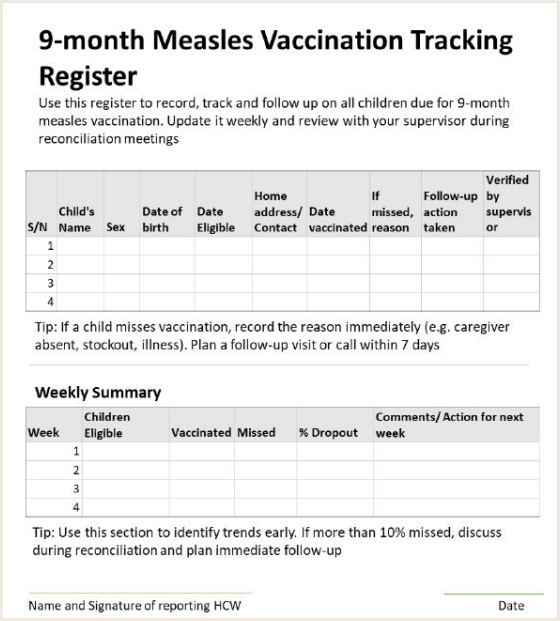
Drivers	Design components to address identified drivers
Long gap between vaccines and weakened reminders	• Facilitate more regular follow-up to strengthen reminders in later infancy based on improved data
Decreased urgency	• *Not directly addressed*
Prior negative experiences erode motivation	• *Not directly addressed*
Restrictive service delivery practices	• Indirectly addressed by improving data visibility to support supervision and problem-solving

[6] Carnahan E, Ferriss E, Beylerian E, et al. Determinants of facility-level use of electronic immunization registries in Tanzania and Zambia: an observational analysis. *Glob Health Sci Pract*. 2020;8(3):488-504.

DATA-DRIVEN TRACKING AND RECORD-KEEPING: KEY COMPONENTS

This solution strengthens existing paper-based registers, health facility roles, and supervision practices by introducing structured tracking and accountability mechanisms into existing workflows. Key components include:

- Enhanced immunization register with dedicated fields for 9-month vaccines, follow-up actions, and next appointment dates
- Designation of a facility-level record-keeping officer with a clear task to ensure immunization documentation
- Supportive supervision checklist to guide monthly supervisory visits
- 9-month vaccine monitoring chart displayed in health facilities to track progress



9-month Measles Vaccination Tracking Register

Use this register to record, track and follow up on all children due for 9-month measles vaccination. Update it weekly and review with your supervisor during reconciliation meetings

S/N	Child's Name	Sex	Date of birth	Date Eligible	Home address/ Contact	Date vaccinated	If missed, reason	Follow-up action taken	Verified by supervisor
1									
2									
3									
4									

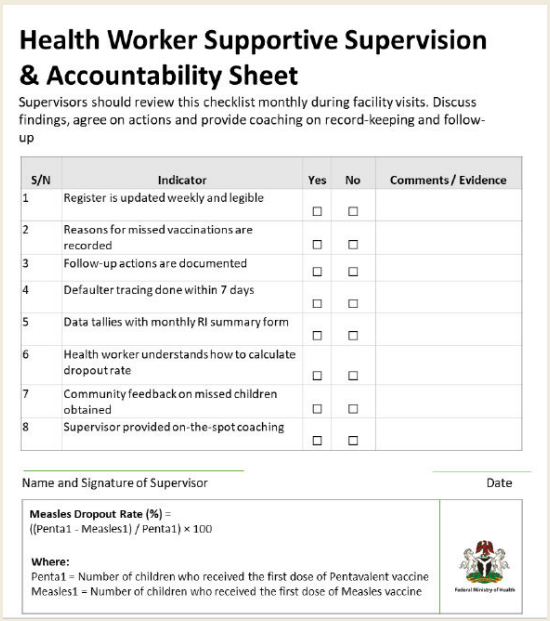
Tip: If a child misses vaccination, record the reason immediately (e.g. caregiver absent, stockout, illness). Plan a follow-up visit or call within 7 days

Weekly Summary

Week	Children Eligible	Vaccinated	Missed	% Dropout	Comments/ Action for next week
1					
2					
3					
4					

Tip: Use this section to identify trends early. If more than 10% missed, discuss during reconciliation and plan immediate follow-up

Name and Signature of reporting HCW Date



Health Worker Supportive Supervision & Accountability Sheet

Supervisors should review this checklist monthly during facility visits. Discuss findings, agree on actions and provide coaching on record-keeping and follow-up

S/N	Indicator	Yes	No	Comments / Evidence
1	Register is updated weekly and legible	☐	☐	
2	Reasons for missed vaccinations are recorded	☐	☐	
3	Follow-up actions are documented	☐	☐	
4	Defaulter tracing done within 7 days	☐	☐	
5	Data tallies with monthly RI summary form	☐	☐	
6	Health worker understands how to calculate dropout rate	☐	☐	
7	Community feedback on missed children obtained	☐	☐	
8	Supervisor provided on-the-spot coaching	☐	☐	

Name and Signature of Supervisor Date

Measles Dropout Rate (%) =
((Penta1 - Measles1) / Penta1) × 100

Where:
Penta1 = Number of children who received the first dose of Pentavalent vaccine
Measles1 = Number of children who received the first dose of Measles vaccine

4. By-Law on 9-Month Immunization for Early Education Admission

To increase motivation for 9-month immunization, this solution would introduce a community by-law or administrative requirement that caregivers must verify completion of 9-month immunization before children are admitted to school. The approach builds on existing governance and decision-making structures, recognizing that formal endorsement by traditional leaders, community councils, and local government authorities is critical for authority and compliance. During prototyping workshops, participants emphasized that when vaccination expectations are clearly codified and publicly endorsed by trusted leaders, caregivers are more likely to prioritize the 9-month visit and follow through even after delays. Positioning immunization verification as a routine administrative requirement, rather than a punitive measure, was seen as key to acceptability and fairness. Verification should be paired with on-site catch-up days to ensure that the initiative acts as a prompt rather than an exclusionary barrier.

Table 7: Solution design components mapped to 9-month delay and dropout drivers (by-law for school admission)

Drivers	Design components to address identified drivers
Long gap between vaccines and weakened reminders	• School enrollment checkpoints act as a structured reminder
Decreased urgency	• By-law elevates the importance by linking vaccines to school admission
Prior side effects erode motivation	• *Not directly addressed*
Restrictive service delivery practices	• *Not directly addressed*

BY-LAW FOR SCHOOL ADMISSION: KEY COMPONENTS

This solution is designed to be simple and aligned with existing immunization and education systems. Key components include:

- Community-endorsed by-law text clearly defining required vaccination status, aligned with national immunization schedule
- Defined verification process using child health cards
- Conditional enrollment provision that allows catch-up vaccination
- Clear exemption pathways consistent public health guidance
- Public sensitization guidance to ensure caregivers understand the by-law

Policy Considerations to Improve Coverage at 9 Months

While the community-identified solutions address key behavioral and follow-up gaps that weaken recall, urgency and motivation before the 9-month visit, the findings also point to system-level policy levers needed to ensure that when caregivers do present, children are vaccinated without delay.

Changing the MCV vial from 10 doses to 5 doses

Our findings emphasize that restrictive vial-opening practices at the 9-month touchpoint are a contributor to delayed or missed vaccination for caregivers who arrive on time with intent to vaccinate. Although official guidance is to vaccinate any eligible child who presents, health care workers in both Kaduna and Enugu described applying informal minimum thresholds before reconstituting 10-dose vials to reduce wastage and avoid running out of stock.

The study findings also highlight that transitioning to a 5-dose vial (as is currently underway in Nigeria with the transition to MR) may not be sufficient to increase coverage of vaccines administered at 9 months, unless accompanied by implementation measures that shift the incentives and constraints influencing the link between policy and practice. To realize the benefits of smaller vials, the following considerations will be important:

- **Align supervision and accountability with timely vaccination goals,** including clear, consistently reinforced expectations that vaccinating eligible children as they present is the priority, even if wastage increases.
- **Strengthen vaccine forecasting, stock reliability, and redistribution practices,** particularly in Kaduna where stockouts were reported to be more common and longer, to reduce health care worker reluctance to open vials for small numbers of children.
- **Consider that multiple antigens are administered at 9 months,** and poor vaccination outcomes may persist if yellow fever and meningitis A vaccines continue to require minimum thresholds or if session design remains inflexible.
- **Equip health care workers with practical guidance and messaging** to explain vial-opening constraints transparently to caregivers and reduce frustration and loss of trust when delays do occur.

Shifting to 5-dose MR vials is a promising policy reform because it directly targets a structural factor in delay and dropout, and its impact can be maximized by considering complementary considerations.

Moving MCV1 from administration at 9-months to 6-months

The World Health Organization (WHO) sometimes recommends an earlier supplemental dose of MCV as young as 6 months during outbreaks or periods of elevated transmission. Given the barriers to completion of 9-month vaccines and the high transmissibility of measles in particular, study respondents were asked for their perspectives on whether shifting MCV1 from 9 months to 6 months in routine immunization would help improve measles vaccination coverage.

The most consistently cited potential benefit was that moving MCV1 to 6 months could **improve recall by shortening the long interval** between early infancy vaccinations and the next required visit.

"Yes, honestly [moving to 6 months] will improve coverage...Because that gap of 3 months, it will make the caregivers to be relaxed. Some will even think that their children have finished their immunisations...It will increase the coverage." -EPI official, Kaduna

This perspective aligned closely with broader findings from the study that weakened reminders in later infancy contribute to forgetting and delayed action at the 9-month touchpoint.

A second perceived advantage was that **earlier vaccination could provide earlier protection** in a context where measles can occur before 9 months. The same EPI official noted:

"Some children develop the measles infection before they reach 9 months, so if they were given the vaccine at 6 months, it will prevent them from contacting the virus." – EPI official, Kaduna

Some respondents also suggested that shifting MCV1 earlier could help maintain urgency because caregivers tend to be more attentive when children are younger and perceived to be more fragile.

"For some children, they have started walking at 9 months So, they feel what is the need of taking a grown child to the facility for vaccination but when a child is 3-6 months the child still looks fragile and so you want to give him/her everything at that time. if changed to 6 months, I believe caregivers will take their children for the vaccines" -28-year-old mother of child who received their 9-month vaccines late, Kaduna

This aligned with the study's finding that declining perceived risk as children age can make delay feel acceptable, especially when combined with competing demands.

The strongest concern was that younger infants may not be physiologically ready or that they would experience greater discomfort.

"The experience I had at 9 months, I think the pain will be too much for the [younger] child." -38-year-old mother of child who received 9-month vaccines, Enugu

Some respondents felt that changing the timing alone would not be sufficient to address entrenched barriers.

"If they don't want to take the vaccines, whether or not the period is moved, they still will not take their children for vaccination..." -35-year-old mother of child who received 9-month vaccines on-time, Kaduna

Some even felt that changing the timing would have negative effects on turnout, especially during the transition to the new policy.

"The challenge is that the women may not turn up. The turn up will be very poor, because before they become used to it, it will take time... They will find it difficult to adapt with the system; Coming at six months, not nine month" 45-year-old female health care worker, Kaduna

Overall, respondents were open to moving MCV1 to 6 months as a way to improve recall and protect children earlier in a high-risk context, but their acceptance was conditional on evidence around potential side effects and strong communication for health care workers and communities around the policy shift.

Conclusion

In Nigeria, low immunization coverage rates for MCV1, YF, and MenA are driven by behavioral and system-level factors that are either unique to or more pronounced at 9 months than earlier in the vaccination schedule. Families may begin with strong intent, evidenced by successful vaccination through 14 weeks, but the long interval until 9 months weakens routines and reminders, and reduced perceived urgency makes delay feel acceptable. When caregivers attempt to act, the outcome is shaped by access and service barriers such as restrictive vial-opening practices. Barriers rarely occur in isolation; instead, they compound over time, reinforcing delays to become dropout. Improving 9-month coverage requires interventions that restore follow-up and urgency in later infancy and ensure that when caregivers attempt to access services, they are reliably vaccinated without repeated trips or long waits.

The community-designed solutions package directly addresses this evidence. The co-created solutions address multiple steps in the pathway by re-establishing reminders and urgency, strengthening caregiver confidence through clear and compassionate communication, and improving the facility's ability to identify, track and follow up with children due for 9-month vaccines, alongside a mechanism to reinforce prioritization through community governance. Key policy reforms have the potential to reduce missed opportunities at the point of service delivery by not only supporting the transition to 5-dose MCV1 but pairing it with implementation measures to align supervision, strengthen stock reliability and providing explicit guidance for how to manage the other antigens administered at 9 months.

FOR MORE INFORMATION, PLEASE CONTACT

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