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 Pakistan, the first dose of measles-rubella vaccine (MR1), the second dose of inactivated polio vaccine (IPV2) and typhoid conjugate vaccine (TCV) are administered at 9 months of age. Although national immunization coverage rates have rebounded since the acute disruptions of COVID-19 and the 2022 floods, national estimates mask delayed vaccination, sub-national disparities and inefficiencies in how 9-month vaccination is actually achieved, for both families and the health system. Despite large-scale supplemental immunization campaigns, persistent measles transmission underscores that timely routine vaccination at 9 months remains critical for effective disease control. Because measles requires very high population immunity (95% with two doses) to interrupt transmission, delays or missed vaccination at the 9-month visit can sustain immunity gaps even when overall coverage eventually increases, leaving substantial numbers of children susceptible to measles and other vaccine-preventable diseases.

Drivers of 9-month delay and dropout

Through participatory qualitative interviews with 106 caregivers, heads of household, health care workers, community influencers and EPI officials in Sialkot District (Punjab) and Karachi East District (Sindh), we identified **five primary drivers** of delayed or missed vaccination that were either unique to or more pronounced at the 9-month point:

- Strong **reminders and outreach services** early in the immunization schedule **do not reliably extend** to the 9-month point
- **Missing vaccination cards** create perceived barriers to accessing vaccination services
- **Perceived lower risk as children grow** prompts families to reweigh the costs and benefits of vaccination and reduces vaccination urgency as families return to their regular routines and other priorities
- **Vaccine stockouts and restrictive vial-opening practices** drive repeated visits, long waits and missed opportunities
- **Knowledge gaps and confusion** drive hesitancy and compound other barriers

These drivers rarely occur in isolation. Compound behavioral and system-level barriers, exacerbated by gender norms and power dynamics, access challenges and general service delivery challenges, ultimately lead to delay, and for some, dropout.

Community-identified solutions to improve 9-month coverage

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

- SMS Reminder & Video Educational Messages for On-Time 9-Month Vaccination
- Optimized 1166 Hotline Content to Improve On-time 9-Month Vaccination
- Digital Vaccination Card for Improved Continuity and On-Time 9-Month Vaccination
- Community-Based Follow-up to Reinforce On-Time 9-Month Vaccination
- Descriptive and Illustrative Vaccination Cards to Strengthen Caregiver Understanding of 9-Month Vaccination

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 put in the effort to go to immunization sessions on their due dates, 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 MR1 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

The Expanded Programme on Immunization (EPI) was initiated in Pakistan in 1978. EPI Pakistan aims to protect children by immunizing them against childhood diseases such as tuberculosis, poliomyelitis, diphtheria, pertussis, Hepatitis B, measles and infections caused by Haemophilus influenzae B and pneumococci.

In the past few decades, Pakistan EPI has endeavored to increase MR coverage through targeted campaigns, mop-up activities and crash activities. These efforts have significantly improved MR1 coverage rates, increasing from 57% in 2010 to 82% in 2022.[1] However, the country is home to 1.1 million children without a measles vaccine, the fourth largest number of children globally. Overall MR coverage remains below the WHO recommended target of 95%.[2] Measles has been endemic in Pakistan for decades and accounts for 65% of the total burden in the region.[3] During the COVID-19 pandemic, Pakistan witnessed a significant surge in the reported incidence rate of measles, escalating from 9 cases per 1,000,000 total population in 2019 to 43.4 cases per 1,000,000 total population in 2021.[4] Pakistan's vaccination system was slow to recover following the pandemic and was further impacted by nation-wide flooding in 2022, which resulted in measles outbreaks across 31 districts of the country, mainly among urban slum, rural and conflict-affected communities[5]. Vaccination coverage and dropout rates vary significantly by province and have consistently lagged behind global and regional benchmarks (Figures 1 and 2).

[1] WHO/UNICEF Estimates of National Immunization Coverage, 2024 Revision (completed 15 July 2025). https://immunizationdata.who.int/global/wiise-detail-page/measles-reported-cases-and-incidence?CODE=PAK&YEAR Accessed: Jan 29, 2026.

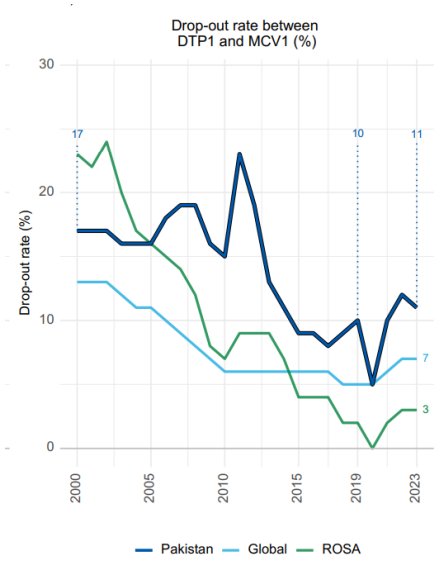
[2] Minta AA, Ferrari M, Antoni S, et al. Progress Toward Measles Elimination — Worldwide, 2000–2022. MMWR Morb Mortal Wkly Rep 2023;72:1262–1268. DOI: http://dx.doi.org/10.15585/mmwr.mm7246a3.

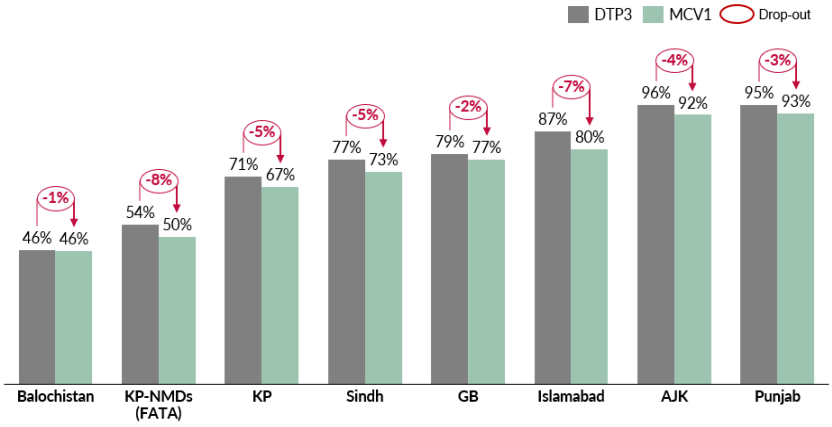
[3] Rana, M. S., Usman, M., Alam, M. M., Ikram, A., Salman, M., & Umair, M. (2022). The world's largest measles-Rubella vaccination campaign in Pakistan: Time to invest in routine immunization. *Human vaccines & immunotherapeutics*, *18*(5), 2080444. https://doi.org/10.1080/21645515.2022.2080444

[4] WHO/UNICEF Estimates of National Immunization Coverage, 2024 Revision (completed 15 July 2025). https://immunizationdata.who.int/global/wiise-detail-page/measles-reported-cases-and-incidence?CODE=PAK&YEAR Accessed: Jan 29, 2026.

[5] World Health Organization, Regional Office for the Eastern Mediterranean. (2022, November 23). *Measles-rubella campaign undertaken to prevent disease outbreaks in Pakistan*. WHO EMRO. https://www.emro.who.int/pak/pakistan-news/measles-rubella-campaign-undertaken-to-prevent-disease-outbreaks-in-pakistan.html

Figure 1 (left): WHO/UNICEF Estimates of National Immunization Coverage, 2023 revision; Figure 2 (right): Data from TPVICS Round II (2022) – Provincial breakdown of DTP3 and MCV1 Coverage (Most recent data, prior to MR1 introduction)





To better understand the factors behind low coverage and high delay and dropout at the 9-month vaccination touchpoint, VillageReach, in partnership with Impetus Advisory Group and the Pakistan Ministry of Health, conducted a qualitative, participatory study in Sialkot District (Punjab province) and Karachi East district (Sindh province). At 9 months of age, children in Pakistan receive the first dose of measles-rubella (MR1), along with the typhoid conjugate vaccine (TCV) and second dose of inactivated polio vaccine (IPV2). Dropout between the DTP3 vaccine (given at 14 weeks) and MR1 (at 9 months) is 13% in Sialkot and 18% in Karachi East.[6] The study aimed to **identify drivers of delay or dropout and potential solutions to improve on-time vaccination at the 9-month immunization touchpoint**, as part of a broader four-country study.

Qualitative data was collected between October 2024 and June 2025. Two male and two female peer researchers were recruited and trained to join the research team. Participants were recruited from 4 health facilities and their catchment areas in each district. The study included participatory interviews with 106 participants, including caregivers, heads of household, health care workers, community influencers and EPI stakeholders (Table 1). Participants represented both on-time vaccination experience (caregivers and heads of household whose children had completed at least one 9-month vaccine before the age of 12 months) and delayed or missed vaccination (those whose children had not received any 9-month vaccines before the age of 12 months). Additionally, 15 health facility observations were also conducted.

[6] Rhoda D, Soofi SB, Hussain I *et al.* Third-Party Verification Immunization Coverage Survey (TPVICS) Round 1 vaccination coverage quality indicators (VCQI) analyses survey report [version 1; not peer reviewed]. *Gates Open Res* 2025, **9**:88 (document) (https://doi.org/10.21955/gatesopenres.1117235.1)

Table 1: Study Sample

Participant Type	Sample (n)		
	Participatory Data Collection	Ideation Workshops	Prototyping Workshops
Caregivers	48	13	5
Heads of household	23	8	3
Health care workers	16	9	4
Community influencers	16	6	2
EPI officials	3	1	0
Total	**106**	**37**	**14**

Rapid analysis using participatory debriefing and affinity mapping was conducted alongside data collection. In-depth thematic analysis using Atlas.ti was conducted for all transcripts.

Drivers of MR1, IPV2 and TCV Delay and Dropout

We identified five primary themes that represent drivers of vaccination dropout or delay that were either unique to or more pronounced at the 9-month point:

1. Strong reminders and outreach services early in the immunization schedule do not reliably extend to the 9-month point
2. Missing vaccination cards create perceived barriers to accessing vaccination services
3. Perceived lower risk as children grow prompts families to reweigh the costs and benefits of vaccination and reduces vaccination urgency as families return to their regular routines and other priorities
4. Vaccine stockouts and restrictive vial-opening practices drive repeated visits, long waits and missed opportunities
5. Knowledge gaps and confusion drive hesitancy and compound other barriers

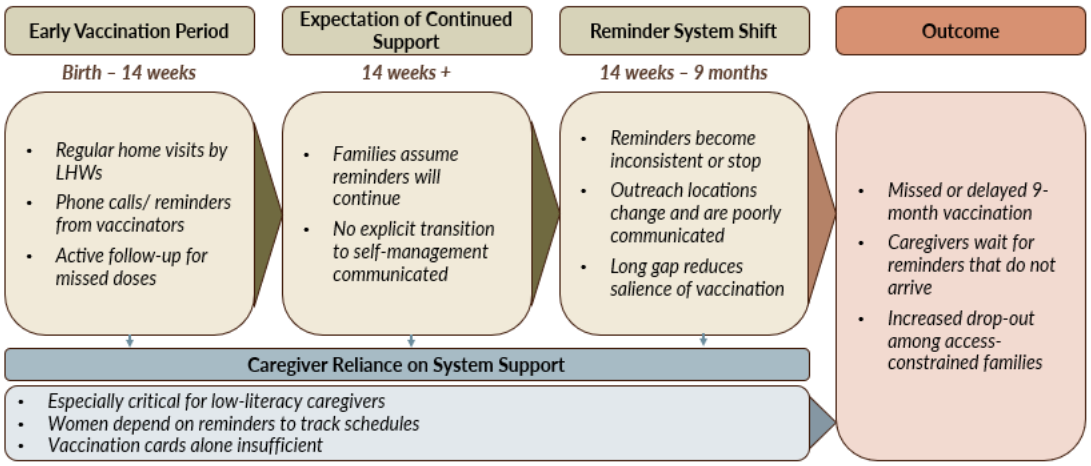
We also identified three general vaccination barriers that, while not unique to the 9-month point, can exacerbate the primary drivers and increase the likelihood of dropout:

1. Gender norms and power dynamics
2. Access challenges
3. General service delivery challenges

Additionally, we found that often individuals whose children missed the 9-month vaccines rarely experienced one driver, but rather a combination of 9-month dropout drivers and general vaccination barriers that ultimately caused dropout.

1. Strong reminders and outreach services early in the immunization schedule do not reliably extend to the 9-month point

Figure 3: Breakdown of reminder and outreach services causes forgotten dates



Many caregivers and household heads described that early in the vaccination schedule, they received regular home visits from LHWs or phone calls from vaccinators to remind them about upcoming vaccination due dates or outreach services, or to follow up if they had missed a vaccine. This was especially important for less educated caregivers who could not understand the due dates written on their vaccination cards. Given that literacy rates are considerably lower among women (49%) compared to men (69%)[7], women in particular relied on these reminder visits and calls to keep track of their children's vaccination schedules.

After reliably receiving reminders through the 14-week vaccinations, many families expected the system would continue to support them. When reminders stopped or became unreliable at 9 months, families were not prepared to start remembering due dates on their own, and the gap created by the system's inconsistency led to missed appointments. Many families reported that they missed or were late for the 9-month vaccines due to not receiving a reminder on time or at all. This barrier is exacerbated by the long gap between the 14-week and 9-month vaccinations, during which parents get preoccupied with other priorities, pay less attention to the vaccination schedule, or lose the vaccination card, making them even more dependent on external reminders.

> *"In the past, the health department was very efficient at reminding us of when we missed a vaccination, even if it was delayed by a day or two. However, [at 9-months], no one contacted us. Of course, it was our responsibility as well, but if they had called to remind us, we probably would have gone for the vaccination, regardless of our negligence. However, the institutions and health departments are there to remind us to vaccinate our children. Even if we are negligent, they are supposed to remind us." – 38-year-old father of dropout child in Sialkot District*

Reminder visits and calls were especially important for caregivers who faced access challenges traveling to facilities and instead relied on outreach services to get their children vaccinated. Many communities do not have a specific location for outreach sessions, and instead, those services take place in different homes each time. Home visits from LHWs and other reminders were essential for informing parents about where those services would take place. One caregiver cited "lack of awareness of vaccination days and location due to shifting homes" as the reason her child did not get vaccinated on time. As reminder systems become less reliable later in the schedule, caregivers who face access challenges may miss opportunities to get their children vaccinated due to lack of awareness of outreach activities.

> *"The lady health workers who come for vaccinations likely didn't knock on our door or make any announcements. We didn't know whether the vaccination team had arrived or not… At times, when vaccination teams specify a particular house/location where families must gather to get their children vaccinated, it becomes almost impossible for mothers to get their children vaccinated. They may not be able to go due to some problem or because they don't have anyone to accompany them… In our case, no one came to our house. If the vaccination teams were at someone else's home, people were not well-informed about it. Those who were aware got their children vaccinated, while others who didn't know were left out." – 31-year-old uncle of delayed child in Sialkot District*

[7] UNESCO. Country Profile Trends. UNESCO Institute for Statistics Indicator Dashboard. 2022. Accessed April 3, 2024. http://sdg4-data.uis.unesco.org/

"We thought that the LHWs would come to our home to give the [9-month] vaccine. We kept waiting for them which caused delays. They used to come where we lived before. Then I realized they won't come so I told her father that we needed to go by ourselves. We went and they told us at the facility that the 9 months vaccine is only given on Mondays or Saturdays. I couldn't go again because my husband could not take off from work during those days." – 37-year-old mother of delayed child in Sialkot District

While many caregivers and household heads described reminder and outreach systems not reaching them at the 9-month point, health care workers noted that reminders continue through the whole vaccination schedule. However, some health care workers and community influencers reported some challenges with the reminder system, including: phone numbers are sometimes recorded incorrectly; private facilities do not connect with the EIR system, resulting in incomplete vaccination records for some children which hinders tracking and timely reminders; parents sometimes ignore the calls or texts; or they may get new SIM cards during the long gap between the 14-week and 9-month points, making them unreachable for reminder texts or calls.

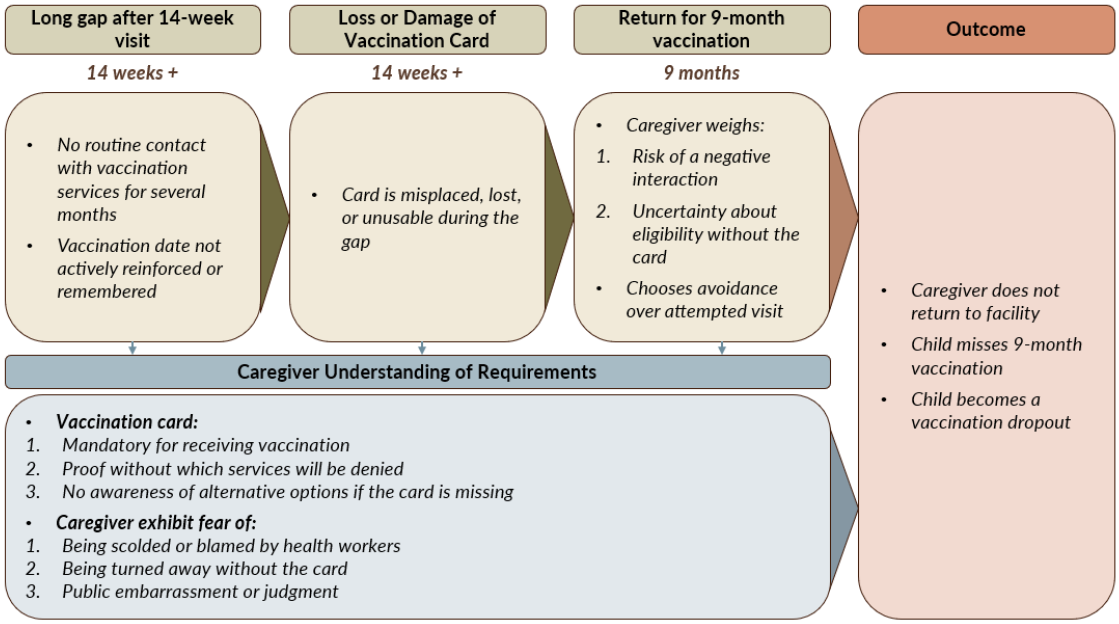
"Often, vaccinators write down the numbers themselves, and those numbers end up being switched off or invalid. Sometimes even the address is written incorrectly. The vaccinator just completes the formality by filling in the wrong information, and later it becomes difficult to track the children for follow-up." – Male community influencer from Karachi East District

"I have the phone numbers of community members, and we call them, but only about fifty percent of the numbers are active at that time." – Male vaccinator from Sialkot District

"Like, when parents come to me, they say they didn't receive any reminder, whereas the NGO people [who support the facility] say they do send reminders. But some people ignore the call, some change their contact numbers. So those who ignore the call don't get reminders again. So I think that's the issue—proper reminders not being given." – Male vaccinator from Karachi East District

2. Missing vaccination cards create perceived barriers to accessing vaccination services

Figure 4: Missing vaccination cards create access barriers and drive forgetfulness



The 9-month point in the immunization schedule occurs after a long gap from the 14-week visit—creating a period in which some caregivers lose or damage the vaccination cards, or others travel to other areas and forget their vaccination cards at home. In addition to making it more challenging to remember vaccination dates, a lost or missing vaccination card can also make caregivers concerned that they may be yelled at by health care workers for not being careful or that they might not be allowed to receive services without the card. Caregivers who lost cards often dropped out of the vaccination process entirely, while those who left them at home while traveling typically delayed the 9-month vaccination until they returned home.

> *"The vaccination card got burned. I was scared of the vaccinator — that if I go, the vaccinator will get angry and ask why I didn't keep the card safe. That's why I didn't go." – 20-year-old mother of dropout child in Karachi East District*

Caregivers described hearing inconsistent messaging around how lost cards were handled or whether it was possible to replace the card and continue with the vaccination process. These inconsistencies contributed to confusion and perceived barriers to accessing vaccination services.

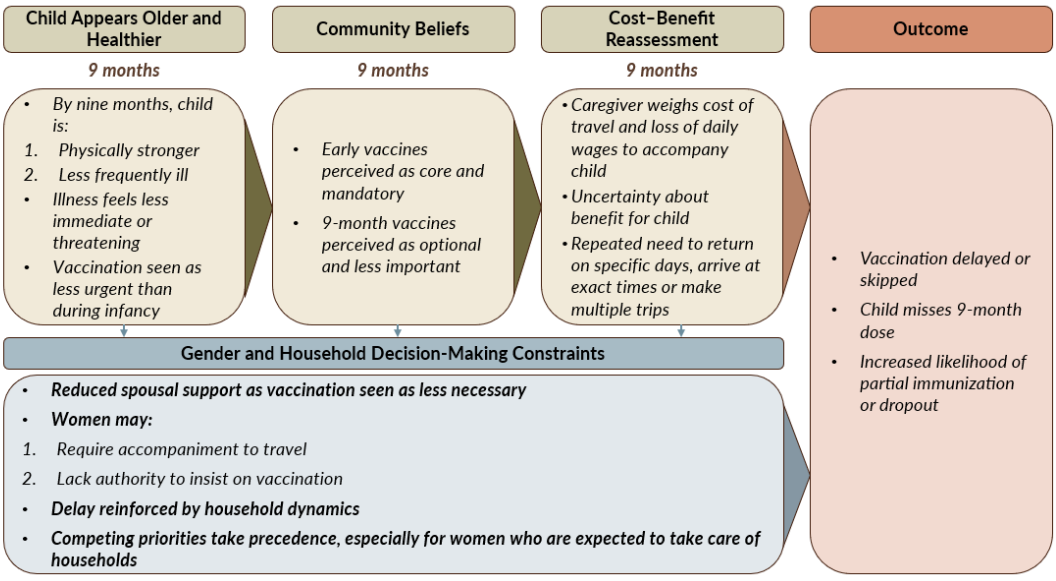
> *"The LHW would come to our house often and she was from our neighborhood. She knew us and she would be at the facility too to assist us. At this facility, they just kept saying that we won't get a vaccine because we don't have a card. When you came and when our old LHW called us, we came to know that we can get vaccines after getting a new card. People at this facility did not tell us that we can get a new card… They said it is not possible. Then we made them talk to LHW from our previous neighborhood on the phone to that male vaccinator. He then made us the new card and we got the vaccine." – 19-year-old mother of delay child in Sialkot District*

Health care workers, however, reported a fairly straightforward process for managing caregivers who were missing the vaccination card. They could either pull up digital versions of the vaccination records through Pakistan's electronic immunization registry (EIR) or could refer to facility registers or photos of the old cards and then transfer that information into a new card for the caregiver. Many caregivers who were missing cards were not aware of this option and simply decided not to return to the facility.

> *"We have a physical and electronic record for every child stored in our systems. [In case of a lost card,] we ask for the child's name and date of birth which helps us access the previous records for the child by calling a staff at the center and they provide us with the details of what vaccines the child has already had and the ones they are due for. After which we make new vaccination cards for the child with all the required details written on it after vaccinating them." – Male vaccinator from Sialkot District*

3. Perceived lower risk as children grow prompts families to reweigh the costs and benefits of vaccination and reduces vaccination urgency as families return to their regular routines and other priorities

Figure 5: Parents reassess costs and benefits of vaccination as sense of vaccination urgency lessens and families focus on other priorities



By nine months, many caregivers perceive their children as older, stronger and less vulnerable. As the perceived risk of illness declines, the urgency to continue vaccination wanes. Some parents described not knowing that the 9-month vaccines were as important as the earlier vaccinations. As a result, parents described re-weighing the costs and benefits of vaccination: the inconvenience of travel, disruption to routines and side-effects like fever no longer seemed worth it if the 9-month vaccines weren't all that necessary.

> *"At first, when the child is small, you need to take them for vaccinations and bring them back. But by the time of the 9-month vaccination, the child is older, and many parents tend to forget about it. Parents are often not very particular about the vaccination schedule, thinking it's not a big deal and that they can get it done later. I also forgot and realized late about the vaccination, so I inquired about it. There were some weddings in the family, my brothers weren't around, and I admit I acted a bit irresponsibly… We didn't realize that the 9-month vaccination was mandatory. We thought that vaccinations for 3, 4, or 6 months were more important. As you are mentioning that the 9-month vaccination is crucial, the vaccination teams should have informed us about its importance as well." – 31-year-old uncle of delayed child in Sialkot District*

As children grew older and stronger between the 14-week and 9-month points, families returned to their normal routines and their other priorities, such as traveling for weddings or taking care of sick family members. Families that felt that the later vaccines were no longer important prioritized those other activities and responsibilities and put vaccination on hold until it was more convenient. This barrier was compounded by access challenges for families that traveled and didn't know when or where to go for vaccines, who had left vaccination cards at home, or who didn't trust the services in the unfamiliar setting.

> *"I said that I would get it done [at home] in Karachi… The vaccinators in Punjab would have done it, but I didn't tell them… Vaccination is done very well in Karachi… We wanted to get it done from the dispensary [in Karachi], as the vaccinators take great care of the children. They give injections very gently, so the children don't feel much pain." – 40-year-old mother of delayed child in Karachi East District*

The perceived unimportance of the 9-month vaccines prompts families to reweigh the costs and benefits of vaccination. Even when families don't believe in rumors or myths about vaccines and understand that side-effects are a normal part of the vaccination process, they may be less willing to deal with the hassle of a child having pain or a fever following vaccination, as this disrupts daily routines.

> *"I used to think, leave the vaccination because the baby will get a fever, the baby will be fussy. That's why. And I thought the initial vaccines are beneficial, but the later ones are not as useful. So, I thought, leave this vaccine. But then the health worker explained to me, and my sister-in-law also said to get these injections. So, I listened to everyone and got it done two weeks ago… I thought the ones given earlier are the important ones. The last ones are not beneficial." – 35-year-old mother of delayed child in Karachi East District*

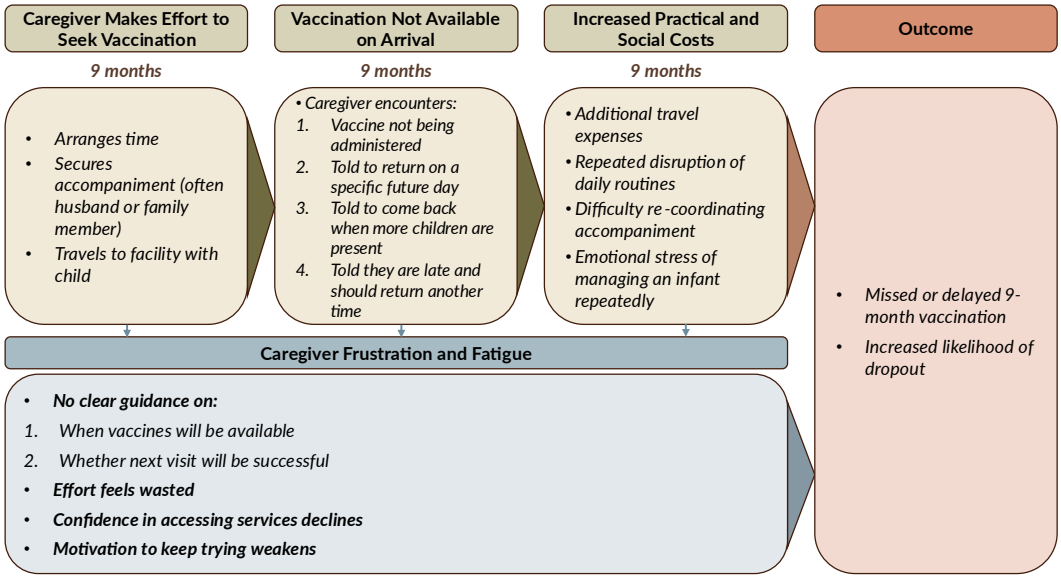
This driver is exacerbated by gender norms. Husbands may provide less support as they return to their normal routines, creating access barriers for women who need to be accompanied to the facility. In addition, women may not have the decision-making power to continue with vaccination if their husbands feel it is no longer necessary or not worth the downsides of side-effects.

Some caregivers were remotivated to catch their children up on missed vaccines if they observed that their children or other unvaccinated children in their community were sick or unwell. Child illness reminded parents that their children were still vulnerable.

> *"When she didn't get the 9 months vaccines on time and she got sick, I thought that maybe she was getting sick because of not getting the vaccine. But I believe that vaccines are necessary for children's health." – 37-year-old mother of delayed child in Sialkot District*

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

Figure 6: Stockouts and anti-wastage practices create missed opportunities



Some caregivers described traveling to facilities only to find that vaccines were unavailable or not being administered that day. EPI stakeholders noted that stockouts are particularly challenging for MR and IPV vaccines due to reallocation of available stock towards campaigns. In addition, MR vaccines are subject to open-vial wastage due to coming in 10-dose vials that expire 6 hours after being opened. If actual wastage rates exceed the anticipated wastage rates used in procurement calculations, then it results in vaccine shortages. To prevent stockouts, vaccinators try to minimize open-vial wastage by administering MR vaccines only on specific days of the week and only when a minimum number of children are present.

> *"We managed the MR vaccine shortage by using the limited stock we received. We continued outreach vaccination, but only 1-2 children came to the fixed site, leading to wastage of 8 doses. So, we decided to vaccinate only on Mondays. We called the children on Mondays to avoid wastage and cover all children." - Female vaccinator in Karachi East District*

In many smaller facilities, MR vaccines are administered only on certain days of the week. This means that caregivers may travel to the facility only to be told that they cannot receive vaccines that day and they should return on a different day. This can be demotivating and creates additional challenges for caregivers who already experience access challenges or who are dependent on their husband or family member to accompany them to the facility.

In many facilities, health care workers wait until a minimum number of children are present before opening the vial to limit the number of doses that get thrown away. If not enough children need the MR vaccine on a given day, then caregivers are told to return the following week. Similarly, if caregivers arrive late, after the vaccines have expired, health care workers often refuse to open a new vial and instruct the caregiver to return on a later date and to be on

time for the session. This can be a challenge for caregivers who require accompaniment to travel to the facility and are dependent on others' schedules.

> *"It was my own fault [that the 9-month vaccine was delayed]. I asked my husband 3-4 times to take me to go for the vaccination. One time I went to get it on a Wednesday. They asked me to come on Saturday. The next time I went, I was late. They asked me to come on Tuesday. Next time, I went on Tuesday. There were two interns sitting over there. They told me I was late. I argued with them, and then they told me that they will administer the vaccine, even though I was late." – 32-year-old mother of delayed child in Sialkot District*

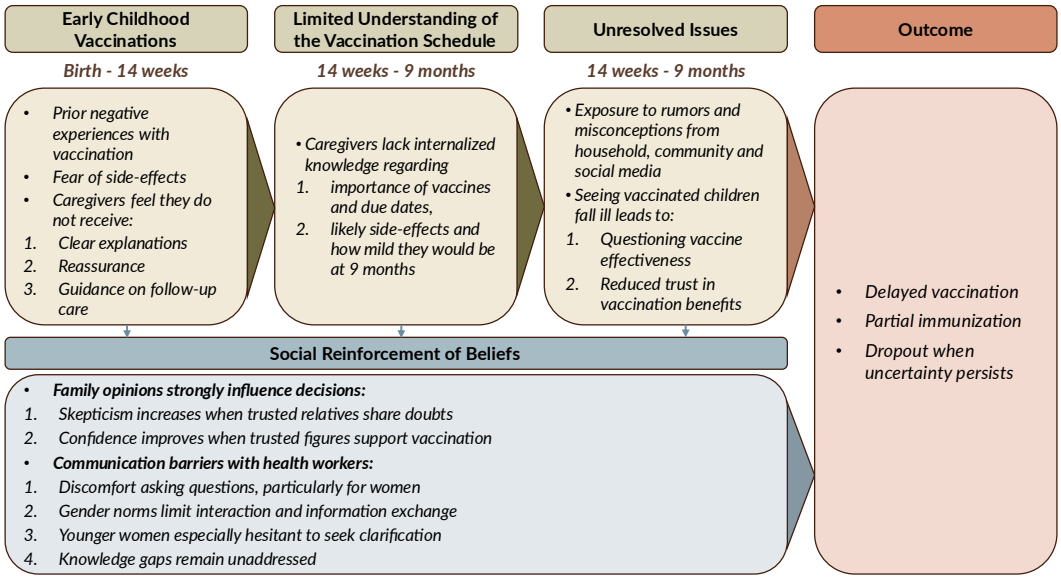
When caregivers face repeated experiences of stockouts or being told to return on a different date due to anti-wastage policies, they can grow frustrated and lose motivation to continue spending time, money and effort traveling to the facility if they are not confident they will receive the needed services.

> *"First, I went to the person who sits at the outreach site here. I went there to get the [9-month] vaccine. They said that the [MR] vaccine was short… The next day, I took my mother to a place at the fixed site… When we went there, they said to check about the vaccines next week because there was a shortage of vaccines. The vaccinator said that in one bottle, there are doses for 10 children. So when 10 children are available, then they will open the vial because they also didn't have vaccines; there was a shortage. Then I checked at my hospital about the vaccine. They said that they have the vaccines, but they give them on a specific day in a week for children. But the vaccines were short. So then I thought that instead of going too far and not finding the vaccine again, it's better not to go because handling the baby is also difficult. This was a big problem. I didn't understand what to do." – 25-year-old mother of delayed child in Karachi East District*

> *"No, no one informed me [when the vaccines would be available again]. Instead, they said to come and check daily whether the vaccines are available or not. Because once a vial is opened, who knows, among 10 children, maybe my child's turn will come, so the vaccine can be administered. I told them that it is very difficult. How can I come daily to check? I also go to work every day." – 25-year-old mother of delayed child in Karachi East District*

5. Knowledge gaps and confusion drive hesitancy and compound other barriers

Figure 7: Knowledge gaps and rumors drive hesitancy and uncertainty



Knowledge gaps came in multiple forms. A few participants described not knowing when the vaccination schedule ended or when the 9-month vaccines were due, contributing to reliance on external reminders. Others noted that they were unaware that the 9-month vaccines were necessary for the child, contributing to the driver related to perceived unimportance of later vaccines. In other cases, parents felt that they didn't have enough information about what side-effects to expect – some parents were unaware that the 9-month vaccines typically have minimal side-effects and were deterred after experiencing bad side-effects from the Penta vaccine at 14-weeks.

> *"We also didn't know if the vaccination schedule was complete or not because the team came, but they didn't specify which child had missed his vaccination... They should inform parents about potential reactions to the vaccine and reassure them that it's normal, explaining how the child will recover. Instead, the vaccinators just come, administer the vaccine and leave without offering any advice. They just complete their task for the day." – 31-year-old uncle of delayed child in Sialkot District*

> *"The reason [for missing the 9-month vaccines] was that I didn't know whether to get it done or not. Some people said it's given at 18 months, so I didn't know when it was due." – 35-year-old mother of dropout child in Karachi East District*

Some participants described that these knowledge gaps were the result of vaccinators not providing adequate education when administering the vaccines. In some cases, they felt that this was due to facilities being overly crowded and causing vaccinators to rush through patients to manage their workload. Health care workers shared similar perspectives, noting that there were insufficient staff to handle both vaccination and education efforts.

"We need more help from people and number of workers or volunteers to help us reach the maximum number of people within a community or area to effectively spread our message and information about vaccines. But that is difficult because of the staff shortage." – Male vaccinator in Sialkot District

In other cases, insufficient counseling was related to gender and social norms that restricted interactions between male vaccinators and mothers or female vaccinators and fathers; if a male health worker was administering vaccines without the husband present, he might seek to minimize interactions with the caregiver and provide her with adequate information. As found in the gender analysis, there is a lack of female health care providers in urban poor areas of Pakistan which limits the availability of gender-sensitive health services in those settings, especially for younger women.

"It was difficult for me to talk to the vaccinator… Because he was a male vaccinator. Obviously, if there was a female vaccinator, it would have been easier to talk or ask something. We feel shy talking to a male vaccinator." – 20-year-old mother of dropout child in Karachi East District

"[The male vaccinator] comes to give vaccines to children, and he doesn't talk much to women alone, that is why he doesn't explain much why he is giving that particular vaccine, I think." – 32-year-old mother of delayed child in Sialkot District

For some parents, knowledge gaps came in the form of belief in rumors or other misconceptions that they heard from social media or other community members. Participants cited rumors that the vaccines caused infertility and were being used as a form of population control. In other cases, participants simply felt that vaccines were ineffective after seeing children who had received vaccines but still got sick.

"We sometimes get the thought that these vaccines are not doing anything much, they are being given just to make us feel like our kids are safe from diseases… It's not like the kids who get the vaccine are safe from every illness/ disease and my mind stopped believing in the efficacy of these vaccines as we have a sick child in our own house who has gotten vaccines every month but then why does she have polio?... This is not only the case in our house but in plenty others too where the same sick kids can be seen that were all vaccinated and yet have the disease. It's something to think about, that if these vaccines are so good, then why do the kids still continue to have these diseases?" – 36-year-old father of delayed child in Sialkot District

Some myths and rumors were exacerbated by the intensive polio campaigns that are regularly held in Pakistan. Some parents expressed concern about how forceful and persistent the polio teams were with providing vaccination services while they did not do the same for other necessary health services.

"Health care workers come again and again, so sometimes, without vaccinating the children, I send them back from the door because I feel suspicious, like why are they forcing us… My heart doesn't feel right about giving polio drops from the health care workers because they come twice in a month—once at the beginning and then at the end—to give vaccines. So my heart doesn't accept it. Don't know what the reason is that the health team themselves come to homes to give drops, and they don't care about any other need, but they reach exactly on time to give the drops… I had heard that my father-in-law was very against vaccination. He used to say that through this vaccination, birth control is done. So because of that, I didn't consider vaccination very necessary. And one more thing is also true—there is no arrangement for any other thing. There's no good

hospital in this area, not even a good clinic, etc. So for that, the health care workers don't do anything, but for drops, they go door to door in every street." – 40-year-old mother of dropout child in Karachi East District

Parents who believed in rumors were highly influenced by family members and other trusted information sources. If their family members also believed in those rumors, then this reaffirmed their skepticism about vaccination, leading to dropout. If, however, they received positive information about vaccination from family or a trusted health worker, then this encouragement often assuaged their fears and remotivated them to seek vaccination.

"I have doubts. I think about what these people are injecting into us… I see things on mobile. People are always scared, thinking America is giving us something harmful, that they are trying to stop our future generations, that fewer children will be born. There are many such things… I don't know if what they say on mobile is true or false, whether it benefits us or harms us… But then the health worker explained to me, and my sister-in-law also said to get these injections." – 35-year-old mother of delayed child in Karachi East District

Contextual Compounding Factors

GENDER NORMS AND POWER DYNAMICS

Gender norms and dynamics limited women's mobility and autonomy, exacerbating many of the other drivers of 9-month dropout. Many participants reported that men provide some assistance with the vaccination process (e.g. helping remember due dates or accompanying the caregiver to the facility), but that ultimately, taking care of and vaccinating children was largely the mother's role. This created challenges for some caregivers who were already balancing other work and responsibilities and then had limited support from their husbands with the vaccination process.

"Their father [scolds me for getting vaccinations]. He gets angry. He says that I asked you to not get the vaccination… He says that the children cry a lot after the vaccination, and they get sick, so there is no need to get the vaccination, especially when you have to do the household chores." – 30-year-old mother of dropout child in Sialkot District

Many caregivers reported that decisions about vaccination were often made together by the child's parents and sometimes influenced by in-laws or other family members, especially when living in joint families. In some cases, though, caregivers felt limited in their ability to continue with vaccination if their husbands objected or did not feel that the 9-month vaccines were necessary. This finding is consistent with the gender analysis, which found that women often face restrictions in making decisions for themselves or their families, with decisions typically made by male family members in various aspects such as health, education and employment[8]. However, we also found that female elders (i.e. mothers-in-law) were quite influential in vaccination decisions, perhaps even more so than male elders.

[8] Gibson E, Truog S, Chihana T, Dhive V, Guerette J, Zaman A, Bin Tahir Mir H, Ibrahim R, Aigbogun E, Olufadi H, Ezeogu E, Atta S, Aiyelabegan F (2024) *Gender Analysis Report: For a Study of Immunization Delay or Dropout between the Infant Series and the 9-month Touchpoint*. VillageReach.. https://www.villagereach.org/wp-content/uploads/2024/09/Gender-Analysis-9mo-Immunization-Dropout-Study.pdf

Many participants noted that gender and social norms restricted women from traveling outside of the home alone, a finding that was consistent with the gender analysis. This meant that they could only travel to vaccination sites when accompanied by their husbands or another family member. This restriction created access challenges for some women and exacerbated barriers related to anti-wastage policies; dependency on another person's schedule and availability made it more challenging for women to travel to the vaccination center on the specific day(s) of the week when MR vaccines were administered or to arrive to the session on time before the MR vaccine had expired.

> *"We face problem while going for the vaccination. We need to go to the Hospital. The father of the children is usually at work. When we call him that we need to get this work done. he always says that he is coming in a while, but he always arrives very late… We don't usually travel [to the facility] alone. When [vaccination services] are near, then we go." – 28-year-old mother of delayed child in Sialkot District*

ACCESS CHALLENGES

Caregivers reported general challenges accessing vaccination services due to poor roads, long distances and lack of money or means of transport to reach the facility. Caregivers also noted having conflicting responsibilities that made it harder for them to find time to travel to the facility. Access challenges were exacerbated by gender norms and lack of family support; many caregivers noted a reliance on spouses or other family members to accompany them to the facility.

> *"My mother-in-law was living with me and she was very sick. That made it difficult for me to manage household chores, so I couldn't get the vaccination done. Traveling was also difficult, and due to housework, it was hard to take out time for vaccination… This is an important reason [why I didn't get the 9-month vaccinations], because there is no one to help with taking care of the children or housework." – 26-year-old mother of dropout child in Karachi East District*

Participants commented on the importance of outreach services and support from Lady Health Workers to help caregivers overcome access challenges.

> *"When a health worker comes to our house and if we are busy at that time, she sits in our house and waits for us to get free. She checks the child's vaccination card. I prepare for vaccination, and the health worker goes with me to the vaccination center. Then we get the child vaccinated, and after vaccination the health worker comes with us and drops us back home… One year ago, when I got the 9-month vaccination done, even then the health worker came and I went with her to the outreach site for vaccination… I feel that the biggest ease is because of the health care workers, because if they don't go with me for vaccination, then it's difficult for me to get it done. My husband works from morning to night, my mother-in-law is sick, I can't go alone. So I thank them that they come to our house and make it easy for us to go and come back from vaccination." – 28-year-old mother of delayed child in Karachi East District*

GENERAL SERVICE DELIVERY CHALLENGES

Some parents reported general negative experiences with the vaccination services, especially at facility-based sessions. Many cited the crowded facilities and long waits that cut into their daily schedules and prevented them from managing their other responsibilities. This finding was consistent with the gender analysis, which found that female

caregivers may have negative service delivery experiences due to hurried vaccination encounters or limited information being provided. Some described negative interactions with health care workers, for instance if the vaccination card was lost.

> *"It takes a lot of time because of the rush. Since we have only one facility nearby, people from all the surrounding villages come here… It is difficult to wait because you get frustrated eventually with the kids. But we have no choice but to wait for our turn." – 27-year-old mother of vaccinated child in Sialkot District*

Health care workers commented on the challenges that they experienced when delivering vaccination services, especially due to the high workload and staff shortages. This contributed to long wait times and caregivers' perceptions of staff being rushed or inattentive.

> *"[My vaccination work this week] was quite challenging. The crowd was larger than usual, and we only had one vaccinator available at the facility. With so many people coming in, especially in the morning, it was tough to manage… We had to be extra organized to make sure each child received the correct vaccine and that caregivers understood post-vaccine care, despite the rush… Caregivers seemed more anxious because of the wait, so we needed to reassure them often. It was a balancing act to keep things calm and efficient." – Female vaccinator in Sialkot District*

These poor service experiences lowered some caregivers' motivation to continue with the vaccination process at the 9-month point, especially if they had trouble getting to the facility or if they felt that the later vaccines were less important.

Key differentiators between on-time, delayed and dropout participants

An analysis of the frequency that participants raised specific concepts when discussing their 9-month vaccination experiences and outcomes revealed a set of key factors that differ noticeably between on-time, delayed and dropout participants. Table 2 shows the percentage of participants in each group who described each factor influencing their vaccination journey.

Table 2: Density of caregiver and head of household participants, by vaccination status, who mentioned factors influencing their vaccination journeys

Related Theme	Factor	On-time (N=23)	Delay (N=31)	Dropout (N=16)
Outreach / reminder systems drop off	Forgetting due dates			
Missing vaccination cards create perceived barriers	Missing vaccination card			
Perceived lower risk and return to other priorities	Extenuating family circumstances (e.g. caregiver or family member illness)			
	Travel during 9-month point			

	Belief that vaccines are important			
Missed opportunities	Services unavailable or rescheduled (e.g. due to stockout or anti-wastage practices)			
Knowledge gaps and hesitancy	Concern about side-effects			
	Poor counseling or education			
	Trust in government recommendation for vaccination			
Contextual compounding factors	Family support			
	Long wait times / crowded facilities			

Factors that facilitate on-time vaccination at 9 months

In general, caregivers and heads of household that completed 9-month vaccines on-time **felt strongly about the importance** of the 9-month vaccines, **had their vaccination cards** in possession, had **reliable reminders** from family members or health care workers on or before the due date, had **no unusual conflicting obligations** such as travel or family illness and had **active support from family** to manage transport and other responsibilities. Some completed vaccinations on time by happenstance when outreach services happened to coincide with their children's 9-month due dates. Some noted that completed vaccination cards were essential for facilitating the process of getting birth certificates, which served as an incentive to completing vaccination. Notably, most caregivers who completed vaccination on time didn't encounter systemic challenges and noted that the process was easy.

> *"[We got the 9-month vaccine on time because of] that lady worker who came to our house specifically to give us a reminder about the vaccine that it is due today because we had completely forgotten about it but when she came and told us, we brought the child to get the vaccine right away. [If she hadn't come], we would not have gotten the vaccine at all because we had no clue about it." – 69-year-old grandfather of vaccinated child in Sialkot District*

Factors that facilitate a delayed individual catching up

Some caregivers successfully caught their child up on delayed 9-month vaccinations even after encountering drivers that typically led to dropout. These catch-up facilitators included:

- **Follow-up reminders for parents who forgot due dates:** Phone calls from vaccinators or home visits from LHWs, helped remind parents that the 9-month vaccines were overdue and informed them about options to continue vaccination.
- **Encouragement from trusted sources:** Encouragement from trusted sources such as LHWs or family members helped ease hesitancy for some parents who had heard rumors or misconceptions about side-effects.
- **Outreach services:** Outreach services created opportunities for caregivers who experienced access challenges (especially those who relied on accompaniment to travel to the facility) or who were busy with other conflicting responsibilities that prevented travel to the facility.
- **Child sickness reinforces importance of vaccines:** Some parents who had delayed the 9-month vaccination were motivated to continue with vaccination after their children became sick or seemed unhealthy.

Factors that push potential delayed vaccination to dropout

Some vaccination barriers are resolved with time (for instance, after returning home from traveling or a sick child getting better), allowing caregivers to get their children vaccinated behind schedule. However, in some cases, even when the main barriers were already resolved, caregivers did not return to the facility for delayed vaccination and dropped out entirely. A key barrier that can push delays into dropout is caregivers' lack of knowledge on how to get back on schedule if their child has fallen behind. Some caregivers are unsure whether health care workers will vaccinate children after the 9-month window, leading them to give up entirely rather than pursue delayed vaccination.

> *"The only difference [between the 14-week and delayed 9-month experiences] was the fear, the concern that the child might be too old, and the doctor might say something." – 28-year-old mother of delayed child in Karachi East District*

> *"One day, I also told my husband that we forgot about the baby's vaccination. So, my husband said, "How can we get it now? The baby's vaccination time has passed"… I just forgot, and when I told my husband, he said that now the vaccines cannot be given because the baby is older." – 34-year-old mother of dropout child in Karachi East District*

CASE STUDY

You Have to Keep Going Back

Samara is a 25-year-old nurse and single mother living with her mother in a one-room home in Karachi East. Divorced during her pregnancy, she returned to work shortly after giving birth to Amina. She believes deeply in vaccination. *"Vaccination is very important… measles, pneumonia, polio, these are dangerous diseases."*

At 14 weeks, Amina received her vaccines on time. Samara was organized and diligent. She kept the vaccination card carefully stored and knew exactly when each dose was due. She went to a nearby private outreach site, paying 2,000–3,000 rupees per dose, which she found manageable. Still, she noticed issues. The site lacked basic supplies and staff used the injection's wrapper to stop the bleeding. She recalled: *"The vaccinator didn't have any Band-Aid or anything… the vaccinator placed the syringe wrapper on the injection site… This worried me."*

Amina began experiencing severe diarrhea and formula intolerance. These episodes escalated: at five months she became unconscious and was hospitalized for two weeks with pneumonia. Samara moved between private and public hospitals searching for care: *"We know how dangerous measles is,"* she said. *"Children die."*

When Amina reached nine months, Samara fully intended to vaccinate her on time. She first went to the same private outreach site where she had always gone. This time, she was told to return on a specific day. Not wanting to delay, she immediately went to a public health facility. There, she was told there was only one vial of the measles-containing vaccine and they couldn't open it for Amina since they had to wait for 9 more kids. *"The vaccinator said that there is a shortage of vaccines… From this one MR bottle, we cover 10 children."*

She then checked the private hospital where she worked. They told her vaccines are only administered on certain days. She couldn't get Amina vaccinated at work as she would need to take time off. Despite being a health worker, she had no pathway to get her daughter vaccinated.Samara emphasized how being a single mother made everything harder. *"Other mothers have their husbands to help them… to ask the vaccinator, to go back and check again and again. A husband could even take the male vaccinator's number. I cannot do that."* She also noted that the system demands much from parents but does little to inform them. *"If any vaccine is short, then parents should be informed… The vaccinator has our whole bio-data — they can even call us to come and get the vaccines."*

When Amina was 13 months old, Samara went to a health facility for an entirely different purpose, to obtain Amina's birth certificate. While there, she asked if vaccinations were available. This time, she was lucky. Not only were MR1, TCV and IPV available, but the vaccinator also took time to address her concerns, especially her fear that Amina might accidentally receive a duplicate dose due to her slightly damaged vaccination card.

The vaccinator scanned the card's QR code and showed her Amina's digital immunization record: *"After scanning, all the baby's data appeared… He showed me which vaccines were given and which were left. This made me very satisfied. I didn't know that vaccinators have digital data — I thought everything was on paper."*

Samara believes there are things that could have made this journey easier for her:

- Vaccines should be available every day, everywhere.
- Parents should be informed when vaccines are in stock.
- Reminders should be sent when a child is due.
- Health care workers should receive better training on counseling and clinical judgement.
- Policies requiring 10 children per vial without alternatives burden families, especially mothers.

Samara's experience shows that even the most motivated, informed and determined parents can be derailed by inaccessible services, stockouts, rigid vial-opening policies, limited communication and the heavy burden placed on mothers to navigate the system alone.

Local health workers explained that they believe coverage challenges are both systemic and caregiver related. MR vaccines contain 10 doses, and they cannot open them for a single child due to waste concerns. Shortages are common, and when they occur, vaccinators coordinate with other health facilities to borrow doses or schedule follow-ups for children. If MR1 is unavailable, other due vaccines like Typhoid and IPV are typically administered, and caregivers are given a follow-up date for MR1.

Health care workers also observed that caregivers often stop attending after the 3-month vaccines, sometimes due to forgetfulness, relocation or the perception that later vaccines are unnecessary: *"Most caregivers bring their children for early vaccines up to Penta 3, but after 3–4 months they stop coming. Some are unaware that the 9-month vaccines are due, while others forget or move houses. Even well-intentioned parents can be disrupted by these long gaps, and some children appear healthy, leading caregivers to believe further vaccines are unnecessary."*

"This is a picture of a vaccine bottle. The meaning of this picture is that I had to go far for this because it wasn't available nearby. To go to the far health facility, I had to take an auto. And the vaccinator said that from this one MR bottle, we cover 10 children. So if I got late, then I would have to take the auto again, make another round, get the baby ready, carry the baby, take out time, and if even then the vaccine wasn't given, then I would come back without getting vaccinated. So I feel that if any vaccine is short, then parents should be informed. Or, for example, select 10 children in a week from that one vial to cover, and only call those 10. The rest should be called the next week. That way, parents won't face trouble, won't have to come again and again. Neither will the vaccinator have an issue, nor the parents."

Community-Identified Solutions to Improve Coverage at 9 Months

Across Karachi East and Sialkot, 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, improves access to vaccination records and services when vaccination cards are missing, strengthens knowledge and confidence through clear and compassionate communication and materials that reach lower literacy caregivers and improves service readiness and follow-up.**

Communities identified and prioritized solutions to address barriers to 9-month vaccination through human-centered design (HCD). Ideation and prototyping workshops were held in Karachi East and in Sialkot.

In Karachi East, a total of 26 caregivers, heads of household, community influencers and health care workers contributed to the ideation workshop in July 2025 to generate and refine priority solutions, and 7 engaged with early prototypes of 3 prioritized solutions in August 2025.

In Sialkot, a total of 11 caregivers, heads of household, community influencers, health care workers and EPI officials contributed to the ideation workshop in July 2025 and 7 engaged with early prototypes of 2 prioritized solutions in September 2025.

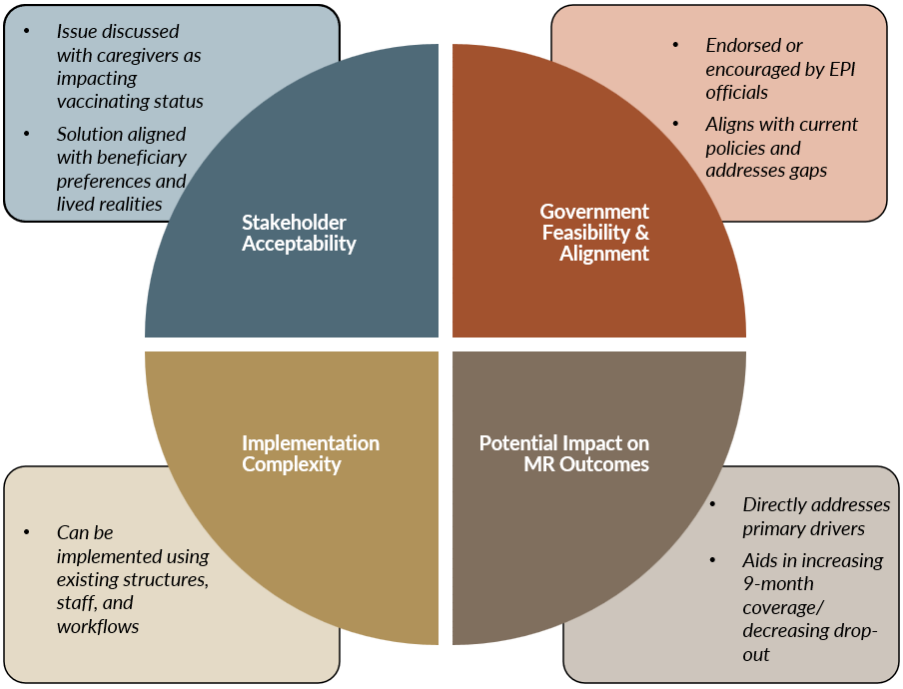
Solution Prioritization Process

Solutions identified through HCD workshops and EPI discussions were assessed using an internally-developed matrix (Figure 8) to evaluate feasibility, potential impact and scalability by examining the following dimensions:

- Stakeholder Acceptability: alignment with caregiver realities and barriers to vaccination
- Government Feasibility and Alignment: government recognition of the issue and the extent to which existing systems and structures can support the solution
- Implementation Complexity: ease of implementation within current operational constraints, including alignment with existing interventions and anticipated financial and resource requirements
- Potential Impact on 9-Month Vaccination Outcomes: relevance to primary drivers of low coverage and potential to improve vaccination uptake and timeliness within a 3-10 month timeframe

Finally, solutions that were rated as high-impact and low-risk were cross-checked against prior implementation experience to assess precedent and practical viability across comparable contexts.

Figure 8: Solution Assessment Matrix



Five solutions that originated from the HCD workshops were prioritized for prototyping:

1. SMS Reminder & Video Educational Messages for On-Time 9-Month Vaccination
2. Optimized 1166 Hotline Content to Improve On-Time 9-Month Vaccination
3. Digital Vaccination Card for Improved Continuity at 9-Month Vaccination
4. Community-Based Follow-up to Reinforce On-Time 9-Month Vaccination
5. Descriptive and Illustrative Vaccination Cards to Strengthen Caregiver Understanding of 9-Month Vaccination

1. SMS Reminder & Video Educational Messages for On-Time 9-Month Vaccination

SOLUTION DESCRIPTION

To help address forgetfulness and reduced urgency caused by the long gap between 14-week and 9-month vaccination touchpoints, this solution will deliver educational messages through WhatsApp videos and frequent, personalized reminders through SMS. The aim is to provide accessible messaging for populations with limited literacy and reinforce urgency and importance of timely MR1, TCV and IPV2 administration.

This solution is aligned with government priorities outlined in the National Immunization Policy, which calls for reminder systems[9]. No consistently functioning system exists at the national level, especially for vaccinations in later infancy.

During prototyping in Karachi East, caregivers, heads of household and health care workers helped to refine message content, format and trusted messengers. SMS was considered central to the strategy, to ensure access for those without smartphones, while WhatsApp was a complement for storytelling and awareness raising.

Key insights from prototyping to strengthen the solution design:

- Practical, actionable video content (such as information about navigating stockouts or sharing session timing) were preferred over generic awareness messages.
- Trusted influencers included doctors, vaccinators, LHWs and other known community leaders.
- SMS reminders should be short, personalized to the recipient to increase credibility (child's name, date for 9-month appointment), and should provide a helpline number.

Both caregivers and heads of household shared feedback on the role of videos, texts and calls:

> *"For reminders, I prefer short texts (and calls most of all), while videos are better for awareness." – Head of household*
>
> *"Videos, especially official videos from EPI or doctors or influencers, would be most trusted." – Caregiver*
>
> *"Videos are easier to remember because even if you forget what they say, sometimes you remember what you saw."– Caregiver*

Table 3: Solution design components mapped to 9-month delay and dropout drivers (SMS reminders)

Drivers of 9-month delay & dropout	Design components to address identified drivers
Weakened reminder system	• Frequent, personalized SMS & video reminders keep 9-month vaccines top-of-mind
Missing vaccination card	• SMS reminders explicitly state due date, reducing reliance on vaccination cards that may be lost or hard to read
Reduced sense of urgency	• Content of messages emphasizes the importance of MR1, IPV2 and TCV • Trusted messengers (such as doctors or LHW) reinforce messaging
Missed opportunities due to stockouts and anti-wastage practices	• *Not directly addressed*
Knowledge gaps and confusion	• Clear information provided to address confusion and hesitancy

[9] Federal Directorate of Immunization, Government of Pakistan. (2022). *National immunization policy 2022* (Policy document). Expanded Programme on Immunization (EPI). https://www.epi.gov.pk/wp-content/uploads/2023/01/NationalImmunizationPolicy2022-compressed.pdf

Gender dynamics	• Tailored to preferences of both caregivers and heads of household
Access challenges	• Primary focus is SMS to ensure breadth of reach, with WhatsApp as complementary
General service delivery challenges	• *Not directly addressed*

SMS REMINDERS: KEY COMPONENTS

The co-created solution builds on past efforts but is tailored to increase effectiveness:

- Combining SMS and WhatsApp videos and voice to increase accessibility for low-literacy caregivers
- Content will feature local influencers, health care workers and caregivers, increasing trust and relevance.
- Messages will be delivered at multiple points before the 9-month touchpoint
- Provides facility information to reduce reliance on outreach services or campaigns

Prototype tool: Sample video message from an EPI vaccinator

SOLUTION CONTEXT

Text-based reminders have been implemented in Pakistan before through Zindagi Mehfooz (2017-2021), which used SMS reminders linked to an Android-based immunization registry operated by health care workers[10]. While the program successfully covered 30 districts and was scaled in Sindh, it focused primarily on early childhood vaccines and relied mostly on text messages.

EXPECTED RESULTS

[10] Interactive Research and Development. (n.d.). *Zindagi Mehfooz (Safe Life)*. IRD Global. https://ird.global/program/maternal-and-child/projects/zindagi-mehfooz/

Repeated SMS reminders and credible, actionable educational messages through WhatsApp will increase caregivers' and heads of household's awareness and reduce logistical barriers by providing facility information, thereby boosting motivation to overcome existing challenges to ultimately improve 9-month vaccination coverage.

IMPLEMENTATION CONSIDERATIONS

This solution will require developing SMS reminders and WhatsApp video content and then periodic revisions informed by monitoring data and caregiver feedback. Government approval will be needed to validate messaging, and user-friendly opt-in mechanisms will need to be established. SMS and data costs will require ongoing budget. For long-term sustainability, the solution should be integrated into existing government or partner messaging platforms.

2. Optimized 1166 Hotline Content to Improve On-Time 9-Month Vaccination

SOLUTION DESCRIPTION

To address persistent rumors and misconceptions and concerns about side effects, this solution will enhance Pakistan's existing national toll-free health hotline (1166) to provide timely, reliable information to caregivers and heads of household.

During prototyping in Karachi East, caregivers, heads of household and health care workers simulated a helpline call. Participants expressed a high willingness to use a trusted, government-run hotline for clear guidance.

Key insights from prototyping to strengthen the solution design:

- Caregivers prefer speaking to a live operator (rather than engaging with a chatbot) when they are anxious, confused or when there is disagreement within the household.
- Training in compassionate communication is critical to help avoid negative interactions to discourage repeat use.
- Participants were not aware of the helpline, highlighting the need for proactive promotion and integration with reminder messages (potentially through Solution 1).

"I knew [of the helpline] but I had no idea what the number was so I never ended up calling." – Caregiver

"I got all the information I needed regarding vaccination, but I did not get a chance to speak with the doctor. It would be better if all callers got the option to speak to a doctor." – Caregiver

"Some parents have complained that the helpline is either busy or off." – Health care worker

Table 4: Solution design components mapped to 9-month delay and dropout drivers (optimized 1166 hotline)

Drivers of 9-month delay & dropout	Design components to address identified drivers
Weakened reminder system	• Standardized scripts for operators to reinforce the importance of timely 9-month vaccines

Missing vaccination card	• When caregivers are traveling or vaccination cards are lost, 1166 can confirm facility locations and give clear guidance on 9-month vaccination dates
Reduced sense of urgency	• Develop standardized scripts on the importance of MR1, IPV2 and TCV at 9 months
Missed opportunities due to stockouts and anti-wastage practices	• *Not directly addressed*
Knowledge gaps and confusion	• 1166 expands content to provide reliable information on 9-month vaccines
Gender dynamics	• Caregivers and heads of household can access 1166 at the time and place of their choosing
Access challenges	• Enhanced 1166 mitigates travel or mobility challenges without going to a facility
General service delivery challenges	• Operators can clarify session timing and provide practical information

OPTIMIZED 1166 HOTLINE: KEY COMPONENTS

The co-created solution builds on the existing 1166 hotline through these key enhancements:

- Standardized scripts and training for operators to build awareness of the importance of 9-month vaccines and encourage adherence to timely immunization
- Training for hotline agents on compassionate communication
- Integration with SMS reminders delivered through Solution 1
- Expand 1166 content to include practical guidance on side effects, after-care, session timing and nearest facility.
- Option for callers to be referred directly to a doctor or vaccinator for clinical or sensitive questions

Prototyping: A household head calls the 1166 hotline

SOLUTION CONTEXT

The 1166 helpline is an established national platform for public health information, offered free of charge from 9am-12am every day. Originally developed to support polio eradication, it later served as a Covid-19 helpline, during which time up to 100,000 calls were received by 150 operators. Some callers experience busy lines or have trouble reaching an operator.

EXPECTED RESULTS

Enhancing 1166 content will provide caregivers and heads of household with timely, reliable information about 9-month vaccination, helping to reduce delays or dropouts caused by misinformation or logistical challenges, especially when caregivers are traveling.

IMPLEMENTATION CONSIDERATIONS

Helpline enhancements will need to be accompanied by tailored demand generation and promotion strategies, as most participants were unaware of the hotline, as well as an assessment of current helpline performance to ensure that increased demand can be met.

3. Digital Vaccination Card for Improved Continuity at 9-Month Touchpoint

SOLUTION DESCRIPTION

Between the early infant vaccination series and the late infancy vaccination series, vaccination cards may be misplaced or be forgotten when caregivers travel away from their home. A digitally enabled vaccination card accessible through a QR code or SMS link will enable caregivers, heads of household and vaccinators to easily retrieve a child's immunization record from anywhere. This solution may complement a personalized reminder system through SMS to provide a reliable record for families.

During prototyping in Karachi East, caregivers, heads of household and health care workers tested QR-based digital cards.

At the beginning of the exercise, one caregiver commented, *"I don't know how to use this [QR code]. My husband has a smartphone so he might know how to use it."* Once she had tested the QR code prototype, she was more enthusiastic: *"It is very easy to read this information. It is useful for not having to look for the card again and again."*

Table 5: Solution design components mapped to 9-month delay and dropout drivers (digital vaccination card)

Drivers of 9-month delay & dropout	Design components to address identified drivers
Weakened reminder system	• Digital vaccination cards empower caregivers and heads of household to stay on top of their vaccination status without outreach services
Missing vaccination card	• Digital vaccination cards will allow caregivers who have lost or forgotten vaccination cards during the long gap to access their records
Reduced sense of urgency	• Digital vaccination cards enable caregivers who have received reminders to act on the information, even if physical cards have been lost

Missed opportunities due to stockouts and anti-wastage practices	• *Not directly addressed*
Knowledge gaps and confusion	• Digital vaccination cards provide an accurate, reliable vaccination record that reduces confusion
Gender dynamics	• SMS pathway allows caregivers to retrieve the digital record independently
Access challenges	• Offline functionality and low-data design support caregivers traveling or living in remote areas
General service delivery challenges	• Digital records help vaccinators resolve confusion or delays

DIGITAL VACCINATION CARD: KEY COMPONENTS

Key insights from prototyping to strengthen the solution design:

- Smartphone ownership was not common, especially among caregivers, making alternative access pathways, such as an SMS-based link, essential.
- Once guided in the use of QR codes, caregivers who were previously unfamiliar found them easy to use.
- Offline functionality and low-data design are critical for low-connectivity areas
- Allow screenshots or downloads of the vaccination record

Prototyping: Caregivers access vaccination records through a QR code

SOLUTION CONTEXT

There are no digital vaccination cards currently in use in Pakistan; the health system relies on paper-based vaccination cards. Electronic systems, such as the National Electronic Immunization Registry and eHealthcare MIS, exist for vaccination records for health care workers, but these systems are not accessible by families. Currently, the paper-based vaccination card contains a QR code that links data to the electronic registry. The use of electronic databases is a key pillar of the National Immunization Policy.

EXPECTED RESULTS

Creating a digital vaccination card will allow caregivers and heads of household to access their child's vaccination record directly, rather than relying on paper-based cards or immunization registers available only to health care workers. This will help to improve continuity of care when families travel and strengthen caregiver confidence in vaccination due dates, especially when linked with personalized reminders.

IMPLEMENTATION CONSIDERATIONS

Digital vaccination cards will require the design of a user-friendly digital interface, optimized for low bandwidth and low literacy. Existing paper-based cards have QR codes on them, so rollout of digital vaccination cards will need to ensure interoperability or alignment to avoid confusion. Basic guidance for health care workers and families should also be available.

4. Community-Based Follow-Up to Reinforce On-Time 9-Month Vaccination

SOLUTION DESCRIPTION

To address low awareness of the 9-month vaccination, inconsistent reminders and the limited ability of caregivers to track dates due to low literacy or misplaced vaccination cards, this solution strengthens community-based follow-up using targeted, multimodal messaging.

During prototyping in Sialkot, caregivers, heads of household, community influencers and health care workers reviewed illustrated pamphlets, completed a disease-identification exercise, tested WhatsApp reminders and discussed QR code access to community WhatsApp groups. Participants expressed a strong preference for targeted, predictable reminders and felt combining multiple methods would mitigate reliance and challenges with a single communication channel.

Key insights from prototyping to strengthen the solution design:

- WhatsApp reminders are widely accessible and trusted, but groups should be small, neighborhood-specific and moderated only by health care workers to avoid spam or misinformation.
- Audio/video messages increase inclusivity. Semi-literate or illiterate caregivers respond better to short voice notes or videos than text-only reminders.
- Pamphlets are highly valued and likely to be shared. Participants found the pamphlet clear, useful and something they would keep with vaccination cards.
- Disease visuals increase motivation. Images of vaccine-preventable diseases, especially measles, were repeatedly described as a strong motivator for timely vaccination.
- QR codes are feasible but may require support. Caregivers may need brief guidance on scanning codes, and some households require alternative access pathways such as SMS links.
- This solution should complement but not replace existing public announcements. Participants consistently emphasized retaining community loudspeaker announcements alongside digital reminders.

  "These will be beneficial for caregivers; they should keep these safe alongside their vaccination cards." - Community influencer

"I would definitely share this with my wife and other family members who have young children." - Head of household

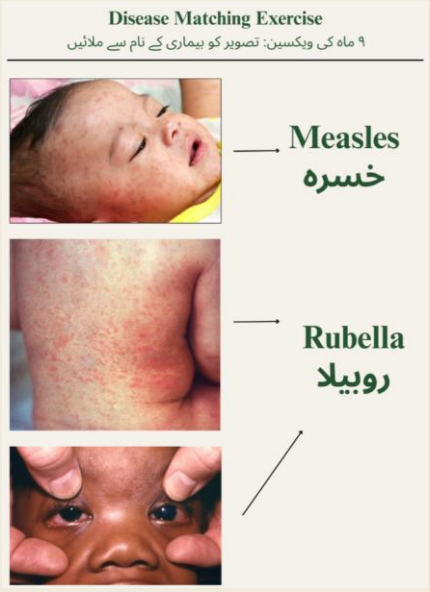
Table 6: Solution design components mapped to 9-month delay and dropout drivers (community-based follow-up)

Drivers of 9-month delay & dropout	Design components to address identified drivers
Weakened reminder system	• Multiple methods bolster existing reminder systems to fill gaps or inconsistencies
Missing vaccination card	• Pamphlets and audio/video reminders help mitigate lost or forgotten vaccination cards
Reduced sense of urgency	• Disease-identification visuals increase recognition and salience of vaccine-preventable diseases
Missed opportunities due to stockouts and anti-wastage practices	• *Not directly addressed*
Knowledge gaps and confusion	• Clear, accessible information for semi-literate and illiterate caregivers
Gender dynamics	• Audio and video messages increase accessibility for women with low literacy or mobility
Access challenges	• Caregivers received information when traveling or unable to attend public announcements
General service delivery challenges	• *Not directly addressed*

COMMUNITY-BASED FOLLOW-UP: KEY COMPONENTS

The co-created solution combines:

- Door-to-door reminders delivered by health care workers a few days prior to outreach sessions
- Community-specific WhatsApp groups managed by HWs or supervisors to share timely reminders, audio or video messages and essential vaccination information
- Simple, illustrated pamphlets on the vaccination schedule, benefits and disease symptoms
- An interactive disease-identification activity used by HWs to increase recognition of vaccine-preventable diseases and motivate adherence



Prototyping: Interactive disease-matching activity

SOLUTION CONTEXT

Pakistan's current reminder system relies heavily on health worker outreach, paper vaccination cards to remind and inform families and community announcements. Door-to-door visits are common for polio outreach, but not for later vaccines. This solution will build on existing outreach mechanisms to explicitly focus on the 9-month vaccination touchpoint through additional channels that families already trust, such as home visits and WhatsApp. Educational pamphlets are typically available in written Urdu. This solution will ensure that pamphlets heavily feature visuals to increase access for low literacy populations.

EXPECTED RESULTS

Multimodal follow-up is expected to result in increased on-time 9-month vaccination through timely, predictable reminders through channels families already trust. This solution will help caregivers remember due dates, understand vaccine importance, and stay motivated during the long gap after 14 weeks.

IMPLEMENTATION CONSIDERATIONS

To implement the multimodal follow-up, health care workers will require additional training on messaging specific to 9-month vaccination for the door-to-door reminders, community WhatsApp groups will need to be created and managed, pamphlets will need to be designed and printed and disease-identification visuals will need to be created.

5. Descriptive and Illustrative Vaccination Cards to Strengthen Caregiver Understanding of 9-Month Vaccination

SOLUTION DESCRIPTION

To improve recall of 9-month vaccination dates, this solution redesigns vaccination cards that use clear visuals, simplified language and prominent indicators of due dates. The redesigned vaccination card is co-designed by caregivers to respond directly to their needs and preferences. During prototyping in Sialkot, caregivers, heads of household and health care workers reviewed the redesigned card alongside the current version.

Key insights from prototyping to strengthen the solution design:

- The larger font and simplified layout of the prototype were appreciated, particularly the prominent scheduled and actual vaccination dates.
- Illustrations and disease-specific icons improved caregivers' grasp of what each vaccine protects against, reinforcing motivation to complete the schedule.
- Participants recommended removing any fields that aren't relevant for all infants and including two contact numbers to improve follow-up
- The single-page format is easier to keep with other essential documents and to reference without health worker support

Table 7: Solution design components mapped to 9-month delay and dropout drivers (illustrated vaccination cards)

Drivers of 9-month delay & dropout	Design components to address identified drivers
Weakened reminder system	• A visually intuitive card improves tracking of when the next vaccine is due
Missing vaccination card	• Improved design is easier to retain with essential documents, reducing the likelihood of losing vaccination cards
Reduced sense of urgency	• Illustrations connecting vaccines to visible disease outcomes reinforce the importance of 9-month immunization
Missed opportunities due to stockouts and anti-wastage practices	• *Not directly addressed*
Knowledge gaps and confusion	• Co-created explanations and icons reduce reliance on literacy
Gender dynamics	• Visual cues and plain language support women with lower literacy
Access challenges	• Clear records reduce confusion when traveling
General service delivery challenges	• Simplified vaccination card format help vaccinators complete records consistently

ILLUSTRATED VACCINATION CARDS: KEY COMPONENTS

The co-created solution enhances the current vaccination cards through:

- Larger font and simplified layout
- Dates that vaccines are scheduled and received displayed prominently
- Illustrations and disease-specific icons for different vaccines

Prototyped illustrated vaccination card

SOLUTION CONTEXT

Pakistan's current vaccination card is designed primarily for recording data within the health system and provides limited visual support for caregivers. The redesigned card aligns with national immunization goals to improve immunization literacy within the existing context. It can be integrated directly into existing workflows without increasing burden on health care workers.

EXPECTED RESULTS

The redesigned card is expected to strengthen caregivers' ability to follow the full immunization schedule, reducing confusion around due dates and improving timeliness for the 9-month vaccination. Overall, the simplified, caregiver-focused design aims to minimize missed appointments driven by uncertainty or misinformation and to build confidence throughout the vaccination journey.

IMPLEMENTATION CONSIDERATIONS

Successful rollout of the redesigned card will require alignment with existing EPI administrative processes as well as appropriate approvals. Health care workers will need orientation on completing the updated fields. The card will need to be printed on quality paper with consistent ink to ensure readability.

Other Proposed Solutions to Improve Coverage at 9 Months

While the prototyping workshops focused on solutions that originated from the HCD workshops, a more comprehensive set of solutions was developed based on insights gathered from both the research and co-creation phases and through engagements with EPI (Figure 9).

Figure 9: Comprehensive set of solutions originating from HCD workshops and EPI leadership

Solutions suggested in HCD workshops:

Top-voted solution in HCD workshops | *Solution endorsed during HCD workshop*

Solution Proposed	Karachi Workshop	Sialkot Workshop
MR-specific health camps/baithaks	■	■
Illustrative Vaccination Cards		■
Structured MR IPC at the 14-Week Touchpoint	■	■
Targeted MR-related digital media campaigns	■	■
Hiring additional vaccinators/LHWs	■	■
Digital QR Codes	■	
Enhanced 1166 Health Hotline	■	
SMS reminders & WhatsApp educational messages	■	
Strengthening orientation & trainings		■
Provision of Paracetamol	■	
Ensuring availability of dose at every visit	■	■
MR-specific defaulter tracking and microplanning	■	■
Punitive action for defaulters		■
Transportation provided to fixed sites for caregivers	■	■
Optimizing placement/visibility of vaccination sites	■	■
Provision of mobile credit for vaccinator follow-ups		■

Solution tested in prototyping workshop | *Solution not prototyped, but could be adapted from existing interventions*

Solutions suggested by federal/provincial EPI leadership:

Solution endorsed during HCD workshop

Solution Proposed	Karachi	Sialkot	Federal
Strengthening orientation & trainings	■	■	
Structured MR IPC at the 14-Week Touchpoint	■		■
Targeted MR-related digital media campaigns			■
Allocating POL for vaccinators in far-flung areas	■		
MR-specific defaulter tracking and microplanning		■	■
Integration of immunization services with nutrition			■
Hiring additional vaccinators/LHWs		■	
Recognition of high-performing vaccinators	■		
SMS reminders & WhatsApp educational messages			■
Strengthen monitoring of MR drop-out trends		■	

Overlapping solutions across HCD Workshops/EPI interviews:

Strengthening orientation & trainings	MR-specific defaulter tracking and microplanning
Structured MR IPC at the 14-Week Touchpoint	Hiring additional vaccinators/LHWs
Targeted MR-related digital media campaigns	SMS reminders & WhatsApp educational messages

We identified existing interventions that related to the prioritized solutions from the HCD workshops (highlighted in red above) and five additional solution ideas (highlighted in blue above). Figure 10 presents the target beneficiaries and impact of existing related interventions. These existing interventions largely focused on the broader routine immunization cycle rather than the 9-month point specifically. While only a subset of these solution ideas was prototyped, Annex A includes additional details for the remaining 5 solutions, including adaptations to tailor the existing interventions for the 9-month touchpoint.

Figure 10: Beneficiaries and impact of existing interventions that relate to proposed solutions

Solutions	Previously Implemented	9-Month Beneficiaries Included	Geography and Demographic	Impact
1. 9-Month specific health camps/baithaks	Yes	Yes	**Demographic:** RI beneficiaries **Geography:** Karachi SHRUCs	An ***average of 23 children*** *immunized at each camp/baithak*
2. 9-Month specific defaulter tracking and microplanning	Yes	Yes	**Demographic:** RI beneficiaries **Geography:** Karachi CBV-UCs	***Reduced dropout by 23 p.p.*** *across the immunization schedule compared to non-tracked beneficiaries*
3. SMS reminders & WhatsApp educational messages	Yes	Yes	**Demographic:** RI beneficiaries **Geography:** Sindh	*Caregivers who received SMS reminders for MR1 were* ***7% more likely to have their child vaccinated timely***
4. Illustrative vaccination cards	Yes	Yes	**Demographic:** RI beneficiaries **Geography:** Select Karachi SHRUCs	***50% of caregivers exhibited increased knowledge of full course of RI*** *due to visual graphics shared*
5. Integration of immunization services with nutrition programmes	Yes	Yes	**Demographic:** BISP NN eligible beneficiaries **Geography:** Karachi SHRUCs	***100% of BISP NN enrolled children received/on track to receive MR1 vaccination*** *compared to 30% in remaining SHRUC populations*
6. Structured IPC at the 14-Week Touchpoint	Yes	No	**Demographic:** Penta beneficiaries receiving Paracetamol **Geography:** Karachi SHRUCs	***Reduced dropout by 16 p.p.*** *between Penta 1-Penta 3*
7. Targeted MR-related digital media campaigns	Yes	No	**Demographic:** HPV vaccine beneficiaries **Geography:** Select districts in Sindh	*Caregivers exposed to digital ads* ***1.9x more likely to get vaccinated*** *during campaigns*
8. Enhanced 1166 Health Hotline	*Not implemented previously*			
9. Digital QR Codes	*Not implemented previously*			

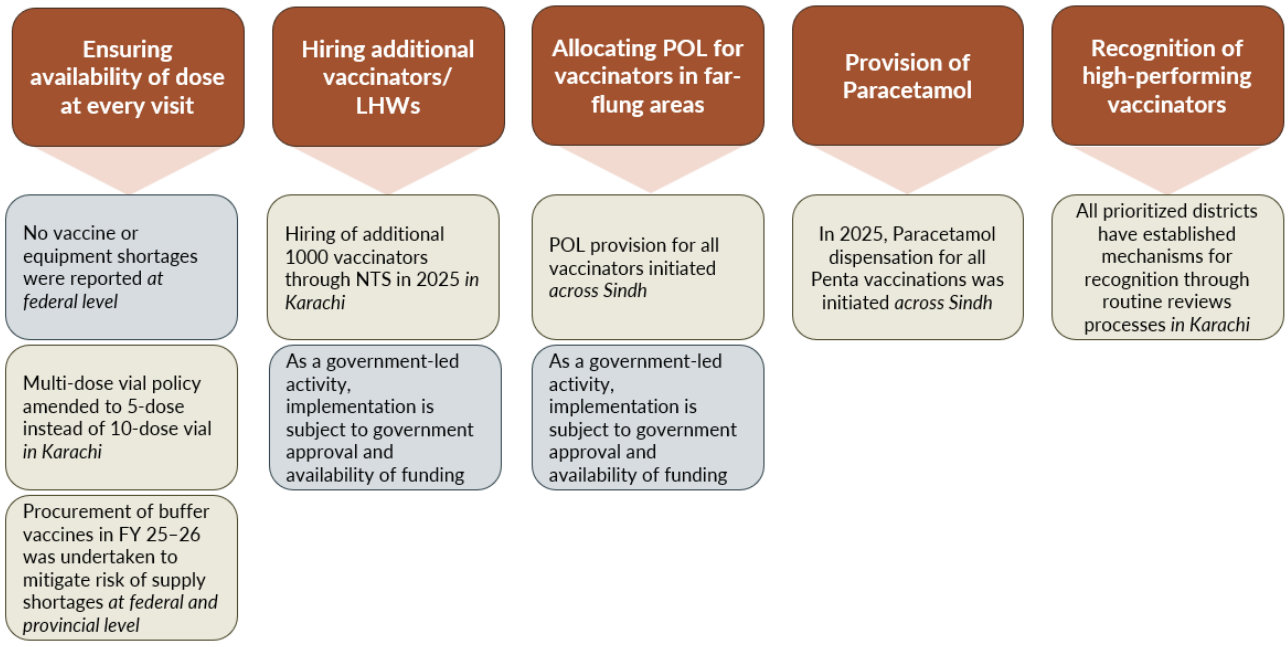
Solution tested in prototyping workshop

Policy Considerations to Improve Coverage at 9 Months

Recent Updates to Vaccination Policy and Context

Federal and provincial EPI leadership report that key supply-side constraints have been substantially mitigated in FY 2025–2026 through policy and other health system changes that have improved vaccine availability, workforce capacity and operational support (Figure 11). However, variability in MR routine immunization and campaign coverage as well as the continued occurrence of measles cases across provinces indicate that gaps in coverage and service delivery persist.

Figure 11: Policy changes and vaccine system improvements made in FY25-26



While these improvements do not directly inform or alter the design of the proposed solutions, which focus primarily on demand-side and service experience drivers, they provide an important enabling environment for implementation. Improved service readiness increases the likelihood that caregiver-focused interventions translate into successful vaccination outcomes.

At the same time, these reported improvements represent an area for continued validation and learning. Ongoing review of vaccine availability and utilization data as well as service delivery patterns will be important to substantiate the extent and consistency of supply-side stabilization across contexts. As systems and reporting mechanisms continue to evolve, future analyses can further assess how supply readiness interacts with demand-side interventions and influences vaccination outcomes at the 9-month touchpoint.

Moving MR1 from administration at 9 months to 6 months

The World Health Organization (WHO) sometimes recommends an earlier supplemental dose of a measles-containing vaccine (such as MR) as young as 6 months during outbreaks or periods of elevated transmission[11]. 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 MR1 from 9 months to 6 months would help improve measles vaccination coverage.

Across most caregivers, heads of household and health worker participants, views on moving the measles vaccine (MR1) to 6 months were mixed. The majority expressed either indifference or conditional support, often deferring to recommendations from health authorities or international bodies. This was particularly true for less educated or less informed caregivers, who often relied entirely on health staff or government guidance. In contrast, EPI staff tended to be more cautious, basing their support on operational feasibility, costs and evidence specific to Pakistan's demographics and epidemiology.

Among caregivers and heads of household who favored moving MR1 to 6 months, many felt the change could make the vaccination schedule easier to follow, would align with the existing Vitamin A supplementation touchpoint and potentially reduce dropouts. Some also suggested that earlier vaccination could help prevent measles in younger infants.

> *"…I think giving the first dose of MR at 6 months is better because my child at 8 months had measles. There was very high fever, and we had to admit him to the hospital. After a lot of treatment, he recovered. So I feel MR1 should be given at 6 months."* – 35-year-old mother of on-time child, Karachi East

Health care workers who supported the change emphasized that it could improve coverage by shortening the gap between doses, reducing consequences such as lost vaccination cards or missed follow-ups and preventing measles cases in younger children. However, several health care workers and caregivers noted that the success of this change would heavily depend on robust reminder systems (SMS alerts and phone follow-ups) which both health care workers and caregivers with delays emphasized as essential for preventing missed doses

Caregivers and heads of household who preferred keeping MR1 at 9 months cited concerns about the shorter interval between doses. They worried it could result in more injections over a shorter period and increase the number of clinic visits, adding logistical challenges.

> *"…if MR1 happens at 6 months, then it means an extra visit. We'll have to go at 6 months and at 9 months too. That will be even more difficult. At 9 months is better for us, because then there's also the 15-month vaccine."* – 42-year-old mother of on-time child, Karachi East

Beyond logistical concerns, some households also expressed cultural beliefs that 9 months is the 'right' or traditional age for measles vaccination and several caregivers feared that 6-month-olds would be more vulnerable to severe

[11] World Health Organization. (2025). Summary of WHO position papers – immunization schedules. https://cdn.who.int/media/docs/default-source/immunization/immunization_schedules/immunization-summary-table-2.pdf

vaccine reactions or unable to tolerate the injection and preference for the current longer interval to allow for sufficient recovery between doses. Among some health care workers, despite supporting the change in principle, flagged concerns about increased workload and resource strain without adequate staffing or supply support

Among the three EPI officials interviewed, opinions varied. One suggested that an earlier MR1 could help improve coverage but emphasized that such a change is a policy-level decision with cost implications. Another noted that any schedule adjustment would need to align with Pakistan's demographics and epidemiology.

> *"Maternal antibodies decline around 6–7 months. About 50% of mothers are also anemic or malnourished. Changing the schedule requires evidence and consideration of local demographics and epidemiology. I do not support doing this in Pakistan. MR1 is given at 12 months in most countries, and at 6 months in others." – National EPI official*

Across all participant groups, there was a consistent call for comprehensive communication and engagement with caregivers and health care workers if any schedule change were to be implemented. Community influencers in particular strongly highlighted this and emphasized the need for gradual community-based approaches to rolling out a schedule change.

Table 8: Pros and cons of moving MR1 from 9 months to 6 months

Advantages of moving MR1 to 6 months	Disadvantages of moving MR1 to 6 months
• Provides earlier measles protection • Spreads out doses, reducing stress for parents/children • Shortens gap from Penta-3, easier for reminders • Aligns with 6-month Vitamin A visit	• Perception that infants may be too weak at 6 months • More clinic visits, adding logistical burden • Requires strong communication campaign • Concerns about system readiness (supply, cold chain)

Conclusion

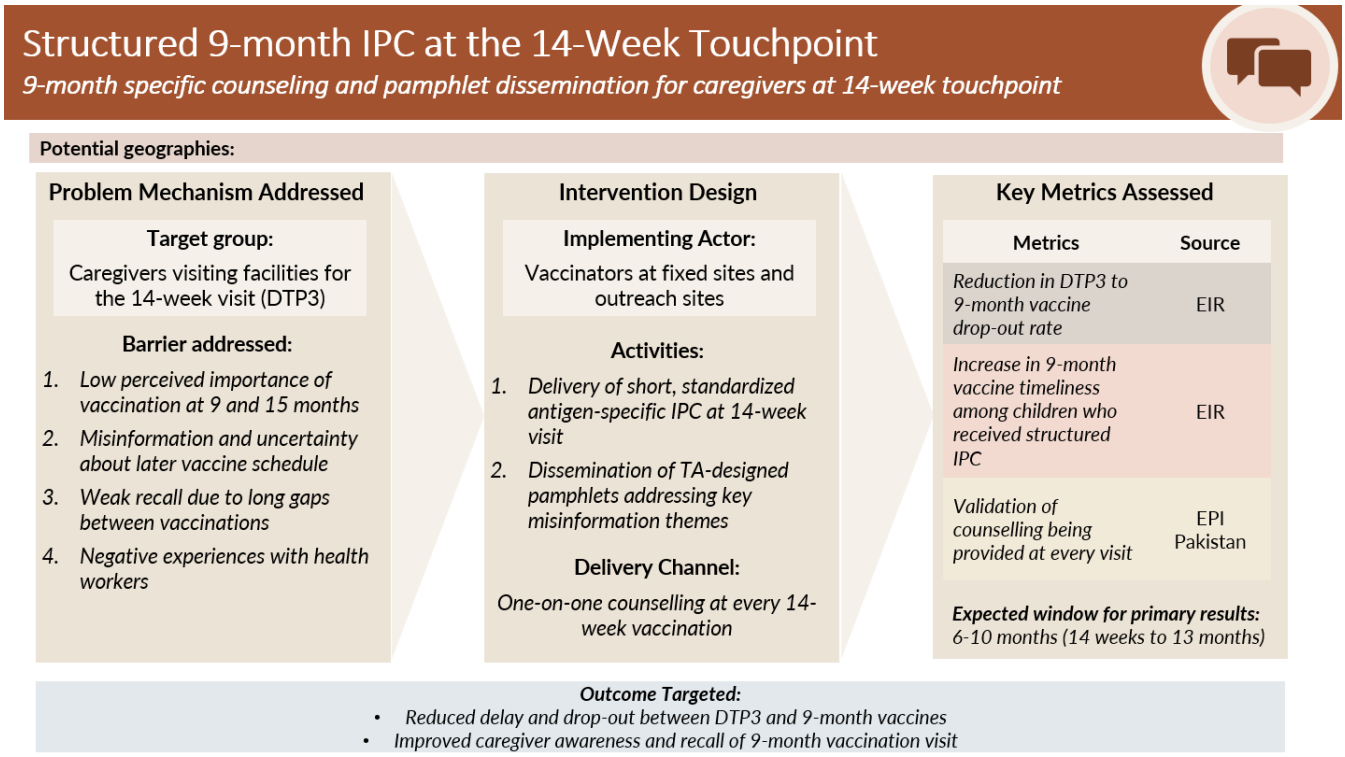
In Pakistan, low immunization coverage rates for MR1, IPV2 and TCV are driven by a combination of social, behavioral and system-level factors that are either unique to or more pronounced at 9 months than earlier in the vaccination schedule. Families may begin with strong intent, evidenced by successful vaccination through 14 weeks, but the long interval until 9 months weakens routines and reminders, and reduced perceived urgency makes delay feel acceptable. Knowledge gaps and perceived barriers associated with lost or missing vaccination cards deter some caregivers from seeking services. When caregivers attempt to act, the outcome is shaped by access and service barriers such as stockouts or restrictive vial-opening practices. 9-month vaccination barriers are exacerbated by general challenges that caregivers experience, such as restrictive gender norms and power dynamics, facility access challenges and other general service delivery barriers such as long wait times that reduce motivation. 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.

While there are some similar drivers of both zero-dose and 9-month vaccination dropout, there are also challenges unique to or more pronounced at the 9-month point, particularly those related to health system readiness and service delivery. Shortages of MR1 result in stockouts and services being available only on certain days or when a minimum number of children are present, creating barriers and frustration that are unique to the 9-month point. Additionally, the breakdown in reminder systems represents a shift in how vaccination structures and support systems operate between early infancy and later vaccinations, creating structural barriers that aren’t present for zero-dose populations.

The community-designed solutions package directly addresses the barriers identified in the study. The co-created solutions address multiple steps in the pathway through a coordinated package that re-establishes reminders and urgency in later infancy, improves access to vaccination records and services when vaccination cards are missing, strengthens knowledge and confidence through clear and compassionate communication and materials that reach lower literacy caregivers and improves service readiness and follow-up. The new EPI policies and improvements to vaccine stock and health workforce capacity are likely to improve service readiness, creating an enabling environment for implementation of the solutions package, which focuses more on addressing demand-side barriers. In addition, as those policies and improvements take effect, it creates an opportunity to learn and build stronger evidence for supply chain and service-side interventions, such as the shift to 5-dose vials in Karachi East, that have the potential to improve vaccination coverage at 9 months.

Annex A: Details of Other Proposed Solutions

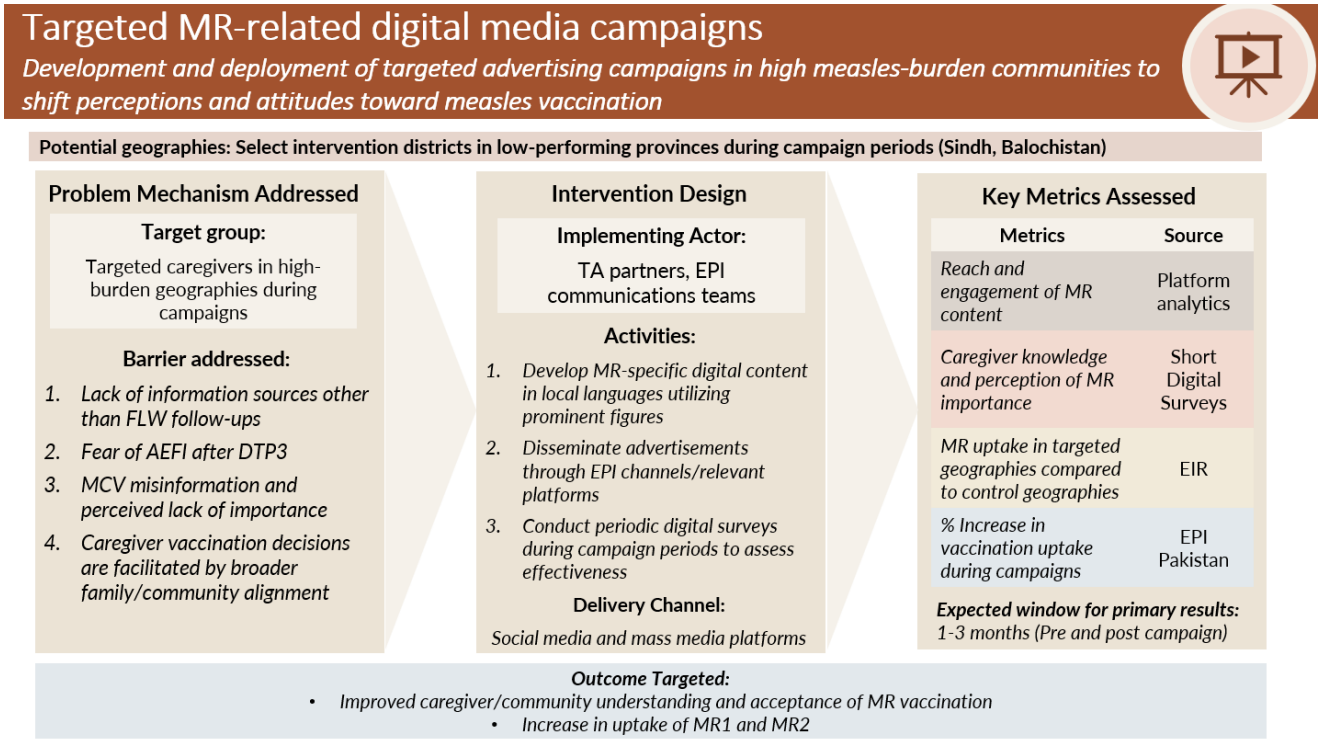
Solution 1: Structured 9-month IPC at the 14-week touchpoint



Proposed Activities:

- Develop standardized, 9-month specific IPC content for the 14-week visit with important misinformation themes, dates for vaccination as well as answers to common questions.
- Train health care workers on IPC delivery and dissemination of pamphlets at 14-week touchpoint.
- Pre-test pamphlets addressing key misinformation themes in pilot facilities in high drop-out/delay pockets.
- Health care workers deliver short, standardized IPC during 14-week vaccination visits.
- Health care workers distribute and explain pamphlets during facility and outreach sessions.
- Caregivers retain pamphlets for reference and share messages with household decision-makers.
- Monitor implementation fidelity and health worker adherence to messaging through validation calls and field visits.
- Measure caregiver understanding, recall and attitudes toward 9-month vaccination through surveys.
- Assess changes in timing and uptake of 9-month vaccination

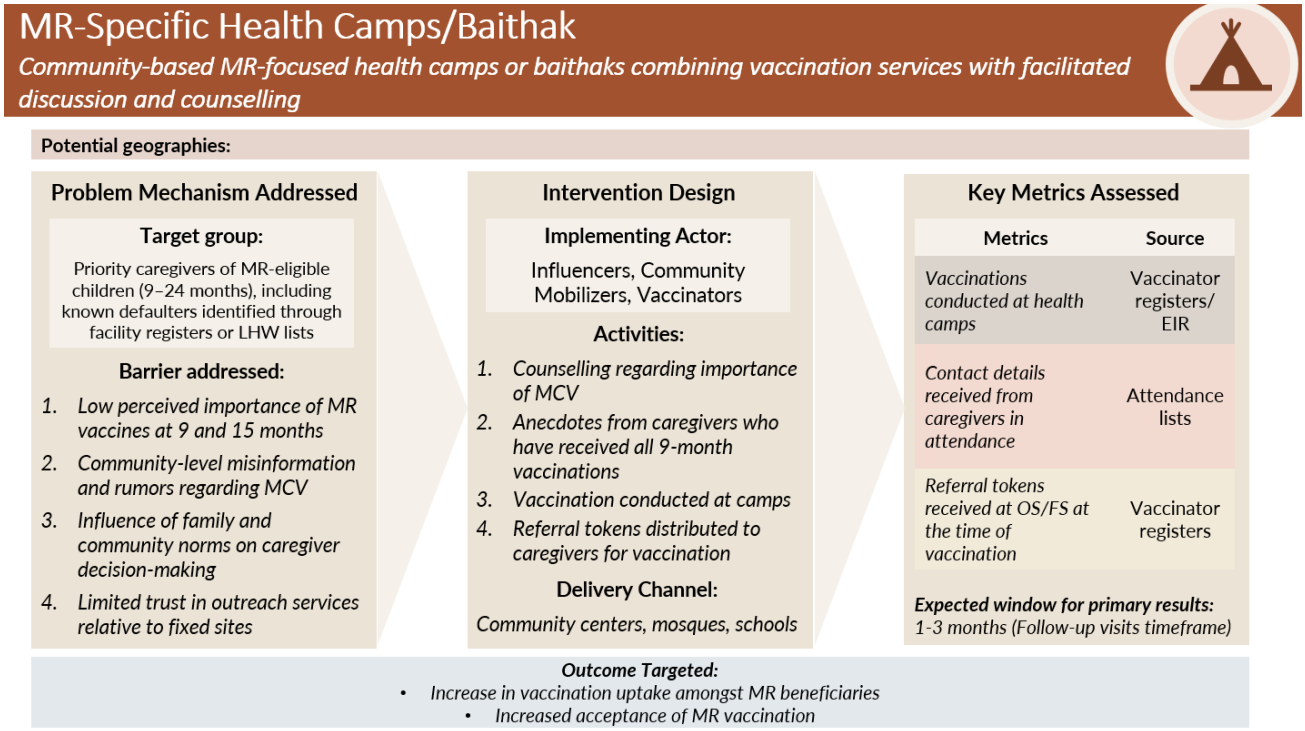
Solution 2: Targeted MR-related digital media campaigns



Proposed Activities:

- Develop MR-specific digital content in local languages featuring prominent and trusted figures
- Pre-test digital content with caregivers/federal EPI to ensure clarity, cultural relevance, message resonance as well as alignment with EPI messaging
- Adapt content for different platforms (e.g., short videos, audio clips, static visuals)
- Disseminate digital advertisements through official EPI channels and relevant social and messaging platforms
- Schedule content release to align with Measles campaigns (before and during)
- Amplify reach through repeated exposure across multiple platforms and touchpoints.
- Conduct baseline and endline digital surveys pre and post campaign periods to assess message reach, comprehension and recall as well as any increase in willingness to vaccinate.
- Analyze survey data to assess perceived trust, message effectiveness and influence on vaccination intent.
- Use findings to refine content, targeting and dissemination strategies for subsequent campaign cycles.
- Measure increase in vaccination rates in intervention versus control districts to evaluate impact on vaccination.

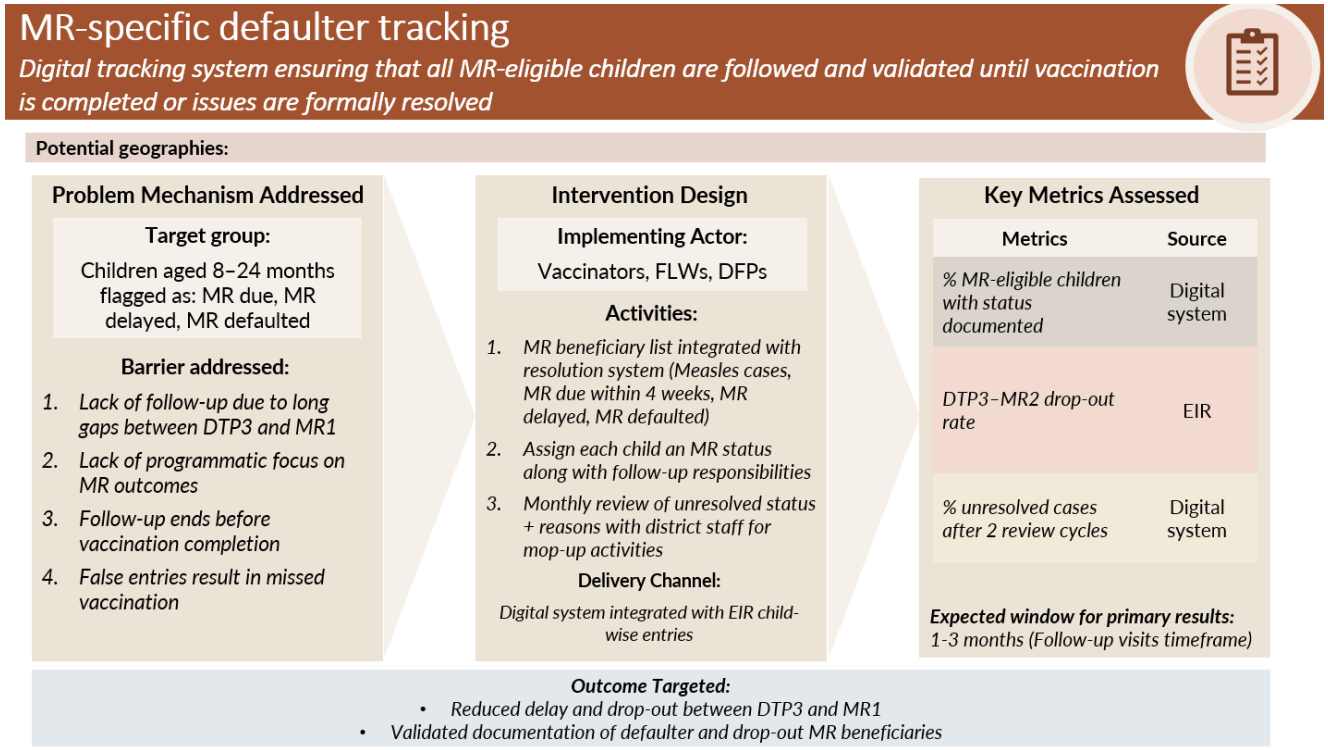
Solution 3: MR-specific health camps / baithak



Proposed Activities:

- Plan and coordinate with district EPI staff to allocate vaccinators, engage Lady Health Workers and trusted community influencers and strategically site vaccination camps in identified defaulter and dropout areas.
- Incorporate anonymized household-level caregiver narratives to address common concerns related to side effects, perceived necessity and vaccination delays.
- Organize vaccination services and coordinate camp schedules to align with community availability, including evening sessions to facilitate the participation of male caregivers.
- Distribute referral tokens during counselling sessions to facilitate access to vaccination at camps or fixed facilities for caregivers unable to vaccinate at the point of contact.
- Use referral tokens to reinforce caregiver intent, direct caregivers to appropriate vaccination points and enable tracking of follow-through.
- Monitor vaccination uptake associated with referral tokens and camp-based service delivery.
- Assess caregiver responsiveness to counselling, narrative-based messaging and referral mechanisms through observed changes in vaccination uptake.

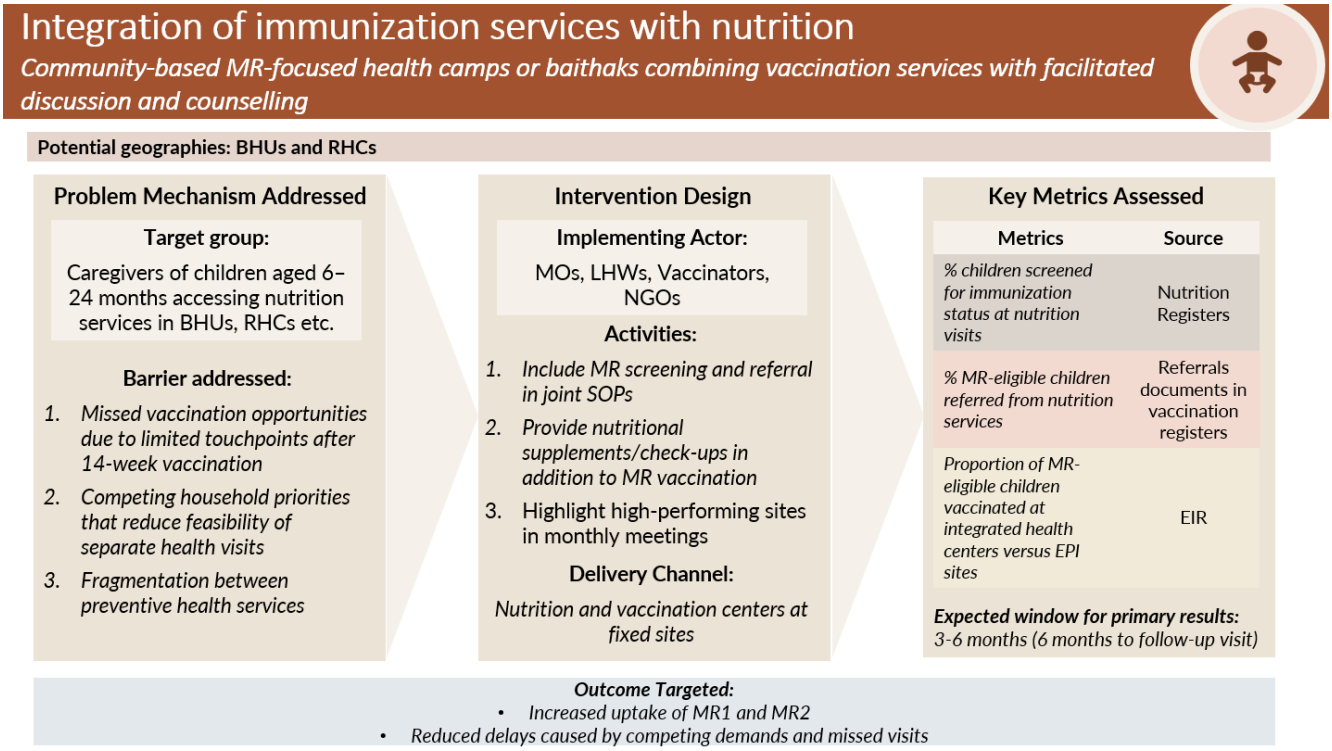
Solution 4: 9-month specific defaulter tracking



Proposed Activities:

- Integrate a 9-month beneficiary list in district follow-up lists and EIR systems, with children categorized by 9-month status (e.g., measles case, due within one month, delayed, defaulted).
- Optimize beneficiary categorization to enable health care workers to begin tracking children prior to their due date, thereby improving the timeliness of 9-month vaccination.
- Validate defaulter and delayed lists developed through the EIR, ensuring consistency across systems and preventing loss of follow-up when monthly EIR defaulter lists are updated.
- Assign a clear 9-month vaccination status to each child, along with defined follow-up responsibilities for health care workers and outreach staff.
- Develop mechanisms to ensure continuity of tracking, so that children remain visible in the system until vaccination is completed or a documented resolution is reached.
- Identify low-performing areas through GIS mapping of beneficiaries
- Monthly joint reviews with district EPI staff of unresolved statuses and underlying reasons, to inform targeted follow-up and mop-up activities.
- Measure timeliness and increase in vaccination compared to pre-intervention period.

Solution 5: Integration of immunization with nutrition services



Proposed Activities:

- Integrate immunization screening and referral into joint SOPs across EPI and nutrition services, ensuring that children attending nutrition visits are routinely screened for 9-month vaccination status, including MR and other eligible antigens.
- Systematic screening of children at nutrition service touchpoints to identify those who are due, delayed, or defaulted for 9-month vaccinations, creating an additional entry point beyond routine EPI sessions.
- Refer eligible children from nutrition services to appropriate vaccination points, including integrated health centers or nearby EPI sites, using standardized referral protocols.
- Provide nutrition services alongside vaccination services at integrated health centers, reducing missed opportunities and increasing caregiver motivation to vaccinate.
- Monthly review of performance data with district staff, highlighting high-performing integrated sites to identify effective practices and inform replication and scale-up.