Rapid Response Brief

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What can research evidence tell us about: Strategies to improve caregiver awareness and completion of the 2nd and 3rd doses of the malaria vaccine when these doses are not aligned with routine childhood immunisation visits.

Key messages

The newly introduced malaria vaccine has faced implementation challenges in Mukono district. There has been a severe drop in the uptake of doses 2 and 3 of the vaccine. To improve caregiver awareness and completion of the 2nd and 3rd doses, Mukono district can employ the following strategies:

- Use of enhanced visual cues on home-based immunisation records (e.g., stickers, stamps, coloured markers) to prominently highlight and indicate scheduled return dates for Doses 2 and 3. This improves recall, reinforces salience of upcoming visits, and supports timely completion.

- Deploy structured parental education with visual aids. Use graphics and audio tapes during the first vaccination visit to explain the 4-dose malaria schedule. This strategy can increase completion rates by approximately 36% by emphasizing the 2nd and 3rd doses.
- Utilize community-led follow up. Engage Community Health Workers (CHWs) to conduct home visits or phone calls for children who have missed the 2nd or 3rd dose window, as identified through digital or paper-based registers.
- Caregiver voice-based digital reminders. Leverage MHealth platforms to send automated voice messages rather than just SMS. Voice reminders are more effective for low-literacy caregivers and have achieved completion rates as high as 98%, compared with 57% in control groups.
- Implement SMS-Plus (incentivized reminders). Combine digital reminders with small conditional incentives (e.g., transport subsidies or talk time). This reduces the "effort barrier" for caregivers traveling to a facility specifically for a non-aligned dose.

Where did this Rapid Response come from?

This document was created in response to a specific question from a policy maker in Uganda.

It was prepared by the Center for Rapid Evidence Synthesis (ACRES), at the Uganda country node of the Regional East African Community Health (REACH) Policy Initiative

✚ Included:

- **Key findings** from research
- **Considerations about the relevance** of this research for policy decisions in Uganda

✘ Not included:

- Recommendations
- Detailed descriptions

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Short summary

Background:
Mukono district has faced significant challenges in implementing the newly introduced malaria vaccine. While the first dose (Schedule 1) achieved a reported coverage of 110%, and the fourth dose (Schedule 4) maintained high uptake due to alignment with mass health campaigns, coverage for the second and third doses; administered at 7 and 8 months of age plummeted to 24%. The high first dose uptake of 110% was because of the campaign but in normal routine immunization this could be lower than observed. The R21/Matrix-M malaria vaccine is a multi-dose vaccine given at 6, 7, 8, and 18 months. Its 2nd and 3rd schedule coincides with a period when children at 7 and 8 months typically have no routine immunization visits, leading to a misalignment. This has resulted in a significant decline in follow-up, with coverage dropping from 110% at Dose 1 to only 24% for Doses 2 and 3. This retention failure threatens to undermine the public health impact of the vaccination program, as partial immunization offers significantly reduced protection against severe malaria. Thus, the District Health Team (DHT) is interested in identifying interventions that can help improve uptake of the 2nd and 3rd dose.

Rapid Response Question: What strategies can improve caregiver awareness and completion of the 2nd and 3rd doses of the malaria vaccine when these doses are not aligned with routine childhood immunization visits?

Findings:

Caregiver awareness, recall, and motivation are key determinants of completing non-aligned vaccine doses. Strategies such as, enhanced visual cues on home-based immunisation records, structured caregiver education, community-led follow up of missed vaccinations ,voice-based reminders and incentives significantly improve the uptake of later doses, especially when implemented together.

Conclusion:

To address the low malaria vaccine uptake of the 2nd and 3rd dose," Mukono District should adopt an active follow-up model that combines caregiver communication, reminders, and follow up for missed vaccinations within routine immunisation and community health systems.

Background

Uganda introduced the malaria vaccine in April 2025. The introduction was done through a mass health campaign, which attracted a large number of caregivers to health facilities. As a result, Mukono District reported malaria vaccine coverage of 110% for the first dose. This high coverage largely reflects campaign delivery rather than routine immunisation performance. The malaria vaccine is given in four doses: at 6, 7, 8, and 18 months of age. The District Health Team (DHT) noted a sharp drop in uptake of the second and third doses, with coverage falling to about 24%.

How this Rapid Response was prepared

After clarifying the question being asked, we searched for systematic reviews, local or national evidence from Uganda, and other relevant research.

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According to the Assistant District Health Officer (ADHO), the first dose coincided with vitamin A supplementation and distribution of mosquito nets, which may have encouraged caregivers to attend. In contrast, the second and third doses are given at 7 and 8 months, a period when there are no other routine immunisation visits or additional child health services(1). Caregivers are therefore required to make extra visits to the facility, which may partly explain the low turnout for these doses. However, other factors may be contributing, including emerging vaccine hesitancy, concerns about adverse events following immunisation, and limited understanding among some caregivers about the importance of completing the full malaria vaccine schedule(2, 3).

Experience from malaria vaccine pilots in Ghana, Kenya, and Malawi shows that introducing a four-dose vaccine into an already busy routine immunisation schedule can be challenging(2, 3). Although campaigns can increase uptake in the short term, as seen with the first malaria vaccine dose in Mukono, coverage may decline once services return to routine delivery. This makes it important to closely monitor routine immunisation performance and use the data to guide corrective actions where gaps are identified.

In contrast, uptake of the fourth dose at 18 months has remained relatively high because it is given alongside the second measles–rubella (MR2) vaccination and mass deworming campaigns. When the second and third doses are missed, children remain only partially protected against malaria, which reduces the overall benefit of the vaccine. These challenges led the Mukono District Health Team to seek evidence on strategies that could improve uptake of the second and third doses of the malaria vaccine.

Rapid Response Question: What strategies can improve caregiver awareness and completion of the 2nd and 3rd doses of the malaria vaccine when these doses are not aligned with routine childhood immunization visits?

Summary of findings

The evidence on strategies to address the low uptake of the second and third doses of the malaria vaccine was drawn from studies evaluating interventions aimed at caregivers of children under five years of age. These studies examined approaches designed to influence caregiver knowledge, recall, decision-making, and follow-up behaviours in relation to multi-dose vaccine schedules.

Although the interventions were not always specific to the malaria vaccine, they focused on improving the timeliness and completion of multi-dose vaccines by strengthening caregiver engagement rather than targeting broader health system performance. As such, they are relevant and can be adapted to improve uptake of the second and third malaria vaccine doses.

It is important to note that the effectiveness of these strategies may vary depending on the community context, caregiver characteristics, and the specific vaccine involved.

Table 1. Summary of evidence on strategies to improve completion of malaria vaccine doses 2 and 3

Strategy option	**What the intervention involves (from evidence)**	**Evidence of effect on completion**	**Key sources**
Enhanced visual cues on home-based immunisation records.	Enhancement of child health cards through the addition of clear visual cues, such as colour highlights, stickers, stamps, or bold markings; to prominently indicate return dates and upcoming doses.	Approximately 36% increase in completion of 2nd and 3rd doses. When combined with brief counselling at first dose, there's 49% increase in vaccine completion of 2nd and 3rd dose.	(4)
Structured caregiver education at first dose	Short facility- or community-based education using visual/audio tools explaining full multi-dose schedule.The session typically lasts only 2–3 minutes to ensure it is feasible for busy clinics.	Approximately 36% relative increase in completion of multi-dose vaccines	(5)
CHW/VHT-led follow up of missed vaccination	Systematic identification of missed doses through routine HMIS or VHT registers, followed by active follow-up via home visits or phone calls to trace and return children who have	30–37% improvement in coverage in LMICs	(6)

	missed scheduled malaria vaccinations.		
Voice-based digital reminders (mHealth)	Automated reminders (voice calls or SMS-plus) sent before and after missed appointments. Use phone registers obtained during the first visit to trigger voice reminders 3 to 5 days before and after scheduled malaria doses	SMS reminders Increased vaccination uptake by approximately 8–18 percent compared to usual care. Voice based reminders Increased vaccination uptake by approximately 12–22 percent. Combined SMS & voice reminders Increased vaccination uptake by approximately 20–25 percent. Digital reminders improved full immunisation completion by approximately 10–20 percent On-time vaccination improved by 7–15 percent Reminder–recall systems increased return rates by approximately 15–25 percent Improved attendance for follow-up doses; voice reminders outperformed SMS-only	(3, 7-9)
Incentivized reminder systems (SMS-plus)	Digital reminders combined with small conditional incentives (airtime, transport refund) linked to Dose 2 & 3 attendance	Majority of studies report improved completion, especially effective for later doses.	(10)

1. Enhancing Visual Cues on Immunisation Records to Highlight Doses 2 and 3

Enhancing home-based immunisation records by adding clear visual cues, such as coloured stamps, stickers, or highlighting, to prominently mark upcoming doses, increases vaccine coverage by 36 %. However, if it is combined with brief caregiver counselling at the initial visit that vaccine coverage increases to 49%(4, 9). Enhancing visual cues on immunization records makes scheduled return dates more visible, reduces confusion about the vaccination timeline, and supports caregivers in completing multi-dose schedules on time.

2. **Caregiver education improves understanding o f the full malaria vaccine schedule**

Structured parental education delivered at health facilities or within communities can improve completion of multi-dose vaccines by about 36%(9). Approaches that use visual or audio aids are more effective than text-heavy materials, particularly in settings with varied literacy levels. At the first malaria vaccine visit, health workers can provide a short, standardised explanation that clearly highlights the second and third doses as essential for full protection, rather than optional visits. Facility-based health education sessions help caregivers better understand the malaria vaccine schedule by addressing community knowledge gaps related to vaccine effectiveness, safety, and the risks of partial protection when doses are missed. The use of recorded, printed, or visual aids supports consistent messaging to caregivers, while communication training for health workers, lay providers, and designated spokespersons is important to ensure messages are delivered clearly and confidently(3).

3. **Community-led follow-up of missed vaccination.**

Community-based approaches, including the use of community volunteers, can be effective in improving uptake of routine immunisation, although the level of improvement may vary across different communities. Follow-up of children who miss scheduled vaccinations, led by community health workers, has been shown to improve immunisation coverage by approximately 30–37% in low- and middle-income countries(9). This approach works best when it is linked to routine health facility registers and supported by clearly defined follow-up responsibilities. Village Health Teams (VHTs) can be engaged to follow up children who miss the second and third doses of the malaria vaccine using facility line lists, building on existing community systems and complementing digital reminder strategies.

4. **Digital reminder systems address “forgetting” and low urgency.**

A number of studies support the use of digital message reminders as a convenient and acceptable method to minimize parental forgetfulness and potentially reduce appointment no-shows(3, 7, 8). To increase effectiveness, messages need to provide appropriately translated immunization information, including vaccines that will be due in the future, recall messages, informing caretakers or parents about vaccines that are overdue, a thank you note for vaccines taken, and basic information about vaccine effectiveness, safety, and the need to complete the immunization schedule(8). Interventions combining SMS reminders with voice-based components show particular promise as they may overcome some of the outlined limitations associated with SMS only interventions. It was observed that, when given a choice between receiving SMS or voice message appointment reminders, 84.6% of mothers/caregivers chose to receive voice message reminders, whereas only 15.4% chose to receive SMS messages, and voice message reminders were preferred by 97.7% in rural areas(9).

5. **Incentives to reduce the opportunity cost of standalone visits**

Systematic review evidence indicates that small conditional incentives such as airtime or transport reimbursement improve vaccination completion, especially for later doses requiring a dedicated visit

(10, 11).

A targeted incentive scheme for malaria vaccine Doses 2 and 3 may help offset transport costs and increase the perceived value of attendance, especially in peri-urban and rural parts of the district. However, while incentives can improve short-term immunization uptake in low- and middle-income countries, their effects vary by context and may be associated with unintended consequences(11). Vaccination uptake may increase in the short term, but if incentives are withdrawn or interrupted, caregivers may stop vaccinating their children, and uptake may drop to previous levels or worse. Incentives may also create unnecessary suspicion in communities and undermine vaccination efforts (11). Therefore, the use of locally acceptable non-monetary incentives may offer a more sustainable approach when integrated within existing health systems.

Conclusions

Given the complexity of barriers to completion, no single intervention is likely to be sufficient. Improving uptake will require the coordinated use of multiple strategies informed by individual child dose tracking across all four malaria vaccine doses, subnational implementation experiences, emerging vaccine hesitancy, service disruptions, and other contextual constraints. Clear evidence on the expected impact of each intervention on dose completion, alongside information on implementation costs, will be essential for selecting the most appropriate and sustainable options. Targeted health communication strategies that prioritise accurate information, engage trusted health professionals, leverage mobile health tools, address misconceptions, and strengthen community engagement should remain central to these efforts.

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Conflicts of interest

None known.

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What is Rapid Response?

Rapid Responses address the needs of policymakers and managers for research evidence that has been appraised and contextualised in a matter of hours or days, if it is going to be of value to them. The Responses address questions about arrangements for organising, financing and governing systems, and strategies for implementing changes.

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Glossary

of terms used in this report: 01 sure rapid response guides 2011 11.pdf (cochrane.org)

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