

START 269: ROUTINE IMMUNIZATION SCHEDULE

FINAL REPORT

UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS,
RESEARCH & TRAINING (START) CENTER

REPORT TO THE BILL & MELINDA GATES FOUNDATION

PRODUCED BY: NOLAN S., HERSMAN A., ZANE G., KRAUSE A., DURGA V., VENKATKUMAR S., KACHROO K., &
PAVLINAC P.

SEPTEMBER 2025



START
CENTER

STRATEGIC ANALYSIS,
RESEARCH & TRAINING CENTER

Department of Global Health | University of Washington

Table of Contents

INTRODUCTION.....	2
BACKGROUND AND RATIONALE	2
OBJECTIVES OF THE PROJECT	2
METHODS	3
LANDSCAPE REVIEW PROCESS	3
THEMATIC ANALYSIS APPROACH	3
CASE STUDY SELECTION CRITERIA.....	3
LANDSCAPE REVIEW FINDINGS	4
INTEGRATED DELIVERY	6
CHALLENGES FOR VISIT IMPLEMENTATION.....	7
SUCCESSFUL VISIT IMPLEMENTATION STRATEGIES.....	7
CASE STUDIES.....	9
MYANMAR: A CASE STUDY IN INTEGRATED CARE DELIVERY AT 6-MONTH WELL CHILD VISITS..	9
GHANA: SCALING UP MALARIA VACCINATION.....	11
BANGLADESH: SUSTAINABILITY OF INTRODUCING A NEW VISIT	18
SOUTH AFRICA – “FORCED SWITCH” TO A NEW MCV SCHEDULE	21
DISCUSSION AND RECOMMENDATIONS	25
LIMITATIONS	26
CONCLUSION	26
REFERENCES.....	27

Introduction

Background and rationale

Well child visits are an essential part of preventive healthcare in children, providing opportunities for overall health assessment, growth monitoring, vision and hearing screening, and to deliver key public health interventions such as routine vaccinations (1). These visits often occur in early infancy, between birth and 14 weeks, coinciding with national immunization schedules as part of the Expanded Programme on Immunization (EPI) (2).

Many countries' EPI schedules have a gap between 14 weeks and nine months leading to an extended period of no contact with the health care system, unless children seek care for illness or injury (2). In 2023, the World Health Organization (WHO) endorsed a 6-month well child visit for growth monitoring, developmental milestones, immunization checks and/or catch-up, caregiver support, and to offer parents guidance on feeding practices and nutrition (1). This six-month visit also provides an opportunity to deliver newly licensed vaccines such as the RTS,S and R21 for malaria, and in-development vaccines (such as for *Shigella*), which require doses later in the first year of life to avoid maternal antibody interference and provide longer protection. These new vaccines are particularly relevant for Global Alliance for Vaccines and Immunization (GAVI) eligible countries where the burden of infectious diseases remains high.

It remains unclear which countries have adopted a 6-month well child visit, what interventions are being delivered during these visits, the availability of coverage estimates, and what implementation challenges exist. Understanding the landscape of 6-month well child visits in GAVI-eligible countries is needed to inform future implementation of 6-month visits as a platform for well-child interventions or future vaccine distribution opportunities as countries plan to scale-up or introduce their delivery.

Objectives of the project

To address this gap, the University of Washington Strategic Analysis, Research, and Training (START) Center conducted the Routine Immunization project, which sought to:

- Assess the feasibility and policy support of introducing or strengthening a 6-month well child visit in GAVI-supported countries.
- Examine country experiences with schedule changes to identify challenges, sustainability, impact on coverage, and lessons learned for implementation.

- Identify opportunities to use a 6-month visit as a delivery platform for immunizations or other child health interventions.

Methods

Landscape review process

Our landscape review began with targeted Google and PubMed searches across all GAVI countries to determine which countries offer 6-month well child visits and which interventions are provided at these visits, using both grey and peer-reviewed literature. We focused on literature published in the last ten years. Vaccine coverage data and immunization schedules were identified and extracted from the WHO portal for relevant countries. In addition, Google searches were used to locate publicly available country-specific reports on 6-month well child visits (e.g. pediatrician handbooks) as well as country-specific vaccine schedules, as available. Collating these data and resources, we built a detailed database of current 6-month well child visit policies, activities, and adherence for the countries of interest.

Thematic analysis approach

From our landscape analysis we identified common themes across countries regarding the implementation of 6-month well child visits. We summarized key facilitators and barriers to implementation and analyzed available coverage and intervention adherence data, noting that adherence data were typically available only for vaccine interventions and were unavailable for some countries. Additionally, we identified themes across integrated programs including common combinations of interventions their influence on uptake, and the number and types of combined interventions by country. To illustrate these larger themes in practice, we developed short country spotlights that serve as illustrative examples of how they appear across different contexts.

Case study selection criteria

Drawing on our landscape review findings we selected 4 case studies, prioritizing countries with strong data, recent policy changes, and/or unique challenges. For each case, we conducted an expanded targeted literature search to gain additional qualitative or quantitative insights into the 6-month visit implementation experiences. Where feasible, we also interviewed subject matter experts in vaccine

implementation from the case study countries (N=3) to better understand implementers' experiences on the ground.

Landscape Review Findings

KEY TAKEAWAYS



KEY TAKEAWAY 1: Among the 57 countries explored, **27 countries (47%) have a dedicated 6-month visit** offering routine vaccination, Vitamin A supplementation, growth monitoring and/or routine wellness screening, or a combination of interventions.



KEY TAKEAWAY 2: Currently, **only 13 (48%) countries with a 6-month visit report any adherence data:** 10 on malaria vaccination, 2 on DTP-containing vaccines, 2 on pneumococcal vaccination, 1 on oral poliovirus vaccination, and 1 on postnatal care.



KEY TAKEAWAY 3: Among the 20 countries introducing malaria vaccination, the majority (75%) did not have a previously scheduled 6-month visit, making the vaccine a novel entry point for care.

Overview of 6-month interventions by country	
Interventions	Countries [^]
Malaria Vaccination (N=20)	Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Niger, Nigeria, Sierra Leone, South Sudan, Sudan, Uganda
Vitamin A Supplementation (N=10)	Cambodia, Central African Republic, Comoros, Ghana, Kenya, Malawi, Myanmar, Papua New Guinea, Sierra Leone, Togo
Growth Monitoring (N=6)	Cambodia, Ghana, Kenya, Malawi, Papua New Guinea, Sierra Leone
Other Routine Vaccinations (N=4)	Cambodia (Measles/Rubella), Myanmar (DTwP-Hib-HepB; PCV13; OPV), Nicaragua (DTwP-Hib-HepB; PCV13; OPV), Syrian Arab Republic (DTwP-Hib-HepB; OPV)
No Intervention (N=30)	Afghanistan, Bangladesh, Congo, Democratic Republic of North Korea, Djibouti, Eritrea, Ethiopia, The Gambia, Guinea-Bissau, Haiti, India, Kyrgyz Republic, Lao PDR, Lesotho, Madagascar, Mali, Mauritania, Nepal, Pakistan, Rwanda, Sao Tome and Principe, Senegal, Solomon Islands, Somalia, Tajikistan, UR Tanzania, Uzbekistan, Yemen, Zambia, Zimbabwe
[^] Countries may be represented more than once if they offer a combination of interventions at six months [*] Additional countries recommend Vitamin A supplementation for children age 6-59 months but deliver predominantly through campaigns or other methods outside routine well child visits.	

As of August 2025, 10 countries co-administer more than one intervention at 6-months:

- **Cambodia:** Measles/Rubella Vaccination, Vitamin A supplementation & Growth Monitoring
- **Papua New Guinea:** Vitamin A Supplementation & Growth Monitoring
- **Kenya, Malawi, Sierra Leone, & Ghana:** Malaria Vaccination, Vitamin A Supplementation, & Growth Monitoring
- **Nicaragua, Myanmar:** Pentavalent Vaccine (DTwP-Hib-HepB), PCV13, & OPV Vaccination
- **Myanmar:** Pentavalent Vaccine (DTwP-Hib-HepB), PCV13, OPV Vaccination, & VITAMIN A SUPPLEMENTATION
- **Syrian Arab Republic:** Pentavalent Vaccine (DTwP-Hib-HepB) & OPV Vaccination

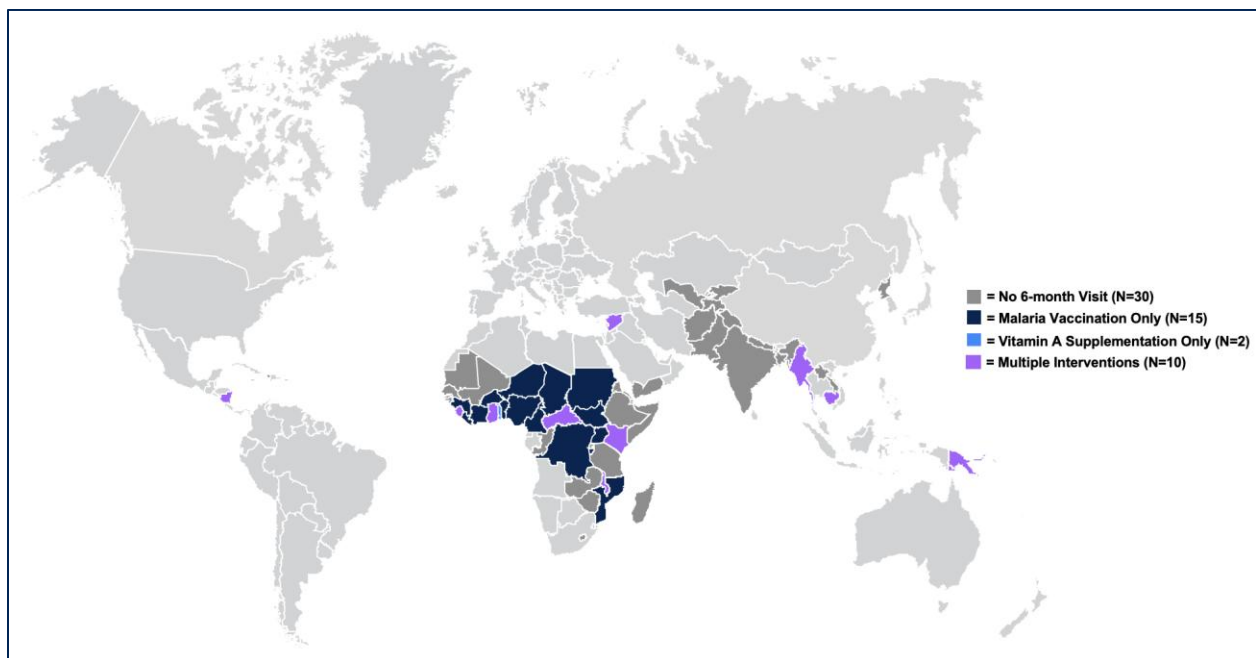


Figure 1. Interventions offered at 6-months by country (N=57).

As of August 2025, adherence data for 6-month visits were limited to 13 countries, captured in table 1 below.

Table 1. Scope of 6-month Visit Adherence Data. ^A

Country	Intervention	Adherence
Benin	Malaria Vaccine (Dose 1)	90% (2024)
Cameroon	Malaria Vaccine (Dose 1)	65% (2024)
Central African Republic	Malaria Vaccine (Dose 1)	28% (2024)
Chad	Malaria Vaccine (Dose 1)	27% (2024)
Côte d'Ivoire	Malaria Vaccine (Dose 1)	93% (2024)
Ghana	Malaria Vaccine (Dose 1)	65% (2024)
Kenya	1. Malaria Vaccine (Dose 1)	1. 80% (2024)

	2. Postnatal care interventions at 4–6-month postpartum in Kakamega County ^B	2. 50% (Date Unavailable)
Malawi	Malaria Vaccine (Dose 2) ^C	68% (95% CI: 63%, 73%; 2019-2021)
Mozambique	Malaria Vaccine (Dose 1)	55% (2024)
Myanmar	1. DTP-containing Vaccine (Dose 3)	1. 71% (2024)
	2. PCV-13 Vaccine (Dose 3)	2. 71% (2024)
	3. OPV Vaccine (Dose 3)	3. 71% (2024)
Nicaragua	PCV-13 Vaccination (Dose 3)	95% (2024)
Niger	Malaria Vaccine (Dose 1)	24% (2024)
Syrian Arab Republic	DTP-containing Vaccine (Dose 3)	79% (2024)

^A Only includes countries with data specific to a 6-month visit, excluding coverage estimates for all 6-59-month-olds, etc.

^B From Targeted Postnatal Care Implementation for Mothers in Selected Health Facilities in Western Kenya. (2025). Evidence-Based Nursing Research, 7(2), 32-39. <https://doi.org/10.47104/ebnrojs3.v7i2.386>

^C From Asante KP et al. 2024. Feasibility, safety, and impact of the RTS,S/AS01E malaria vaccine when implemented through national immunisation programmes: evaluation of cluster-randomised introduction of the vaccine in Ghana, Kenya, and Malawi. Lancet. 2024 Apr 27;403(10437):1660-1670. doi: 10.1016/S0140-6736(24)00004-7. Epub 2024 Apr 4. PMID: 38583454

Integrated delivery

Integrated delivery emerged as a recurring theme across countries that have introduced or strengthened 6-month visits. In ten Gavi-supported countries, the visit is used not only for vaccination but also as an opportunity to deliver other interventions such as vitamin A supplementation, growth monitoring, and caregiver counseling.

To illustrate how integration can work in practice, the following spotlight highlights Sierra Leone's experience, where the 6-month visit was leveraged to deliver a package of interventions and reinforce postnatal wellness (3).

Spotlight on Sierra Leone: 6-Month Visit as a Platform for Integrated Child Health Services



Overview:

Sierra Leone's **routine 6-month child health visit combines malaria vaccination, VAS, and growth monitoring** within a single, strategic touchpoint. The rollout of the RTS,S malaria vaccine in **2024** reinforced this visit as a critical moment for delivering multiple essential services effectively.

Key Historical Evidence:

A 2015 cluster study by Hodges et al. (PMID: 25665894) demonstrated the impact of integrating VAS into the EPI schedule at 6 months, rather than through campaigns alone, in the Western Area of Sierra Leone:

- Incorporating **VAS with counseling on feeding practices** ("mini package") or **with counseling on feeding practices and family planning** ("full package") led to a **higher proportion of children 6-11 months of age receiving their 1st dose of vitamin A closer to the age of 6-7 months** when compared to VAS alone (71.7% vs. 74.5% vs. 60.2%, respectively).
 - VAS at 6-months improved coverage, with levels increasing when other services were provided.

Important Limitations:

Adherence data for vaccination, VAS, or growth monitoring at 6-months are **not available nationally**:

- Underscores the need to strengthen monitoring systems to evaluate the impact of 6-month visits.

Challenges for visit implementation

Implementing 6-month well-child visit faces constraints across health systems and different country contexts. Logistically, many Gavi-supported countries operate in resource limited settings and face challenges with storage and distribution of new vaccines or supplements (4), and fragmented delivery channels such as overlapping campaigns and routine visits which complicate tracking and record-keeping, leading to missed or incomplete doses (5,6). Data gaps further limit implementation, as adherence and coverage information is often unavailable or inconsistent, particularly for non-vaccine interventions like vitamin A supplementation or growth monitoring, making it difficult to assess impact or adjust strategies. Caregiver and community factors also play a role: low awareness of the purpose and benefits of the visit, travel distance, costs, and competing household/employment responsibilities all reduce attendance, while trust in health systems, conflict, workforce shortages, and vaccine hesitancy can further complicate implementation of new visits (4,7–9).

Successful visit implementation strategies

To address these challenges, several countries use strategies to support the successful introduction and scale-up of 6-month well-child visits. Visit implementation is often supported by clear communication and strong community engagement. Messaging tailored to local contexts through radio, community meetings, or trusted leaders helps raise awareness and build acceptance of new visits (7). At the systems level, tools such as digital reminders, close monitoring of rollout performance,

and feedback mechanisms strengthen adherence and allow programs to adapt in real time (7,10). Support from partner organizations such as Gavi and the WHO through co-developed implementation plans, health worker training, and investments in cold chain and immunization infrastructure provides support for vaccine program sustainability (7,11). Together, these approaches can increase uptake of both vaccines and other child health interventions at the 6-month visit, while reinforcing routine service delivery more broadly.

Côte d'Ivoire shows how successful rollout strategies at the 6-month visit can drive high initial uptake of the R21 malaria vaccine, while deliberate planning for programmatic sustainability aims to secure these gains long term (7,11).

Spotlight on Côte d'Ivoire: Building a Sustainable 6-Month Visit



Overview: Côte d'Ivoire introduced the R21 malaria vaccine at a new 6-month visit in July 2024, targeting 38 high-incidence districts in the first phase. **Early results showed high uptake, with 93% of the target population receiving the first dose at 6-months** by December 2024, according to the WHO. Gavi reported that the rollout was reinforced through coordinated mass media campaigns, targeted community engagement, and culturally tailored digital health tools, alongside strong monitoring mechanisms led by advisory boards and the country's Interinstitutional Coordination Committee.

Programmatic Sustainability:

According to Gavi reports, **as the country transitions away from Gavi support, Côte d'Ivoire has committed to fully financing its routine immunization program within five years.** To prepare, the government is developing mechanisms to ensure uninterrupted vaccine procurement and delivery and has hosted regional conferences on sustainable immunization financing.

Limitations: The data on Côte d'Ivoire's rollout remain very new. Broader evidence on adherence and long-term sustainability will require additional time and monitoring.

Case Studies

Myanmar: Model for Integrated Care at 6-Months

KEY TAKEAWAYS

1. Myanmar was an **early adopter of the 6-month well-child visits**, offering vaccines beginning in 2022-2023 when the WHO first endorsed this additional visit.
2. Myanmar currently **delivers four interventions at 6-month well child visits**, serving as a potential model for integrated vaccine delivery, however the impact of these visits is not yet clear.

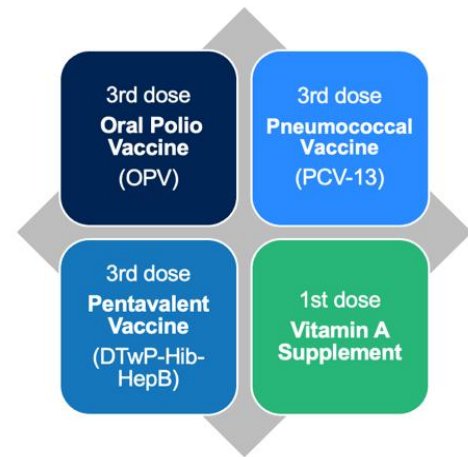


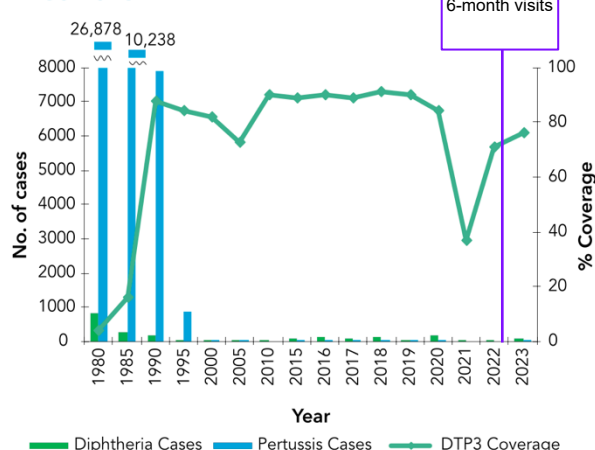
Figure 2. Myanmar's 6-month well child visit interventions.

INTEGRATED VACCINATION DELIVERY

Myanmar, a low-income country in South-East Asia, achieved strong immunization gains between 2015-2020, reaching higher coverage rates than many comparable nations (12). After the 2021 military coup, vaccination rates fell sharply, such as 3rd dose diphtheria coverage declining from 84% in 2020 to 37% in 2021 (13). Health officials, non-governmental organizations, health workers, and parents are working to restore immunization coverage (12). This includes delivering some vaccines at the recently added 6-month well child visit in 2022/23 (12,14).

Myanmar's child health schedule includes four interventions at this visit: 3rd dose DTwP-Hib-HepB, OPV, and PCV-13 vaccines, and the first vitamin A supplement (14,15). The impact of these additional

DTP3 coverage¹, diphtheria and pertussis cases², 1980-2023



¹ WHO and UNICEF estimates of immunization coverage

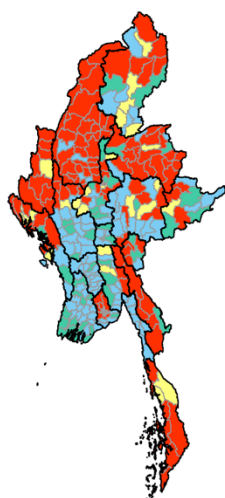
² WHO vaccine-preventable diseases: monitoring system 2023

visits is still uncertain, especially given persistent political and humanitarian barriers impacting vaccine delivery in Myanmar (see barriers below). Still, despite these barriers, 3rd dose coverage for 6-month vaccines improved overall between 2022 and 2023, but these gains were not uniform across districts and rates are still lower than in 2020 (Figure 3 and Figure 4) (14). PCV-13 saw the sharpest rise from 57% in 2022 to 78% in 2023; DTP-Hib-HepB-3 increased from 71% to 76% and OPV-3 from 75% to 80% (16).

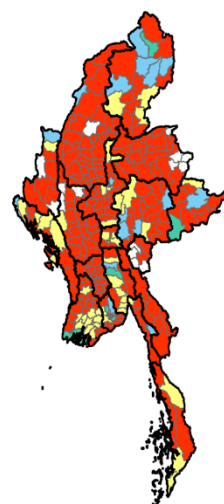
Fig
ad:

DTP-Hib-HepB3 coverage by district

2022



2023



■ <70%
 ■ 70% - 79%
 ■ 80% - 89%
 ■ ≥90%
 ■ no data

Source: SEAR annual EPI reporting form, 2022 and 2023 (administrative data)

Figure 4. DTP-Hib-HepB-3 coverage in Myanmar showing coverage declines in some districts between 2022-23 despite overall DTP-Hib-HepB-3 coverage increasing from 71% to 76% (Figure from UNICEF 2024 Myanmar EPI Factsheet).

FACILITATORS FOR VACCINATION IN MYANMAR

- **Parental demand** has driven efforts to resume vaccination services in some ethnic states in collaboration with nurse-led societies using 6-month visits for vaccine delivery (Poe et al., 2024).

- **Previously high vaccination rates** relative to other LMICs in 2015-20 suggests high intervention acceptability in the population, and successful implementation of EPI programming in many regions.
- **Historically, higher socioeconomic status (SES) and mothers' antenatal care seeking behaviors** were associated with higher childhood vaccination coverage (Nozaki et al., 2019).
- **In urban slums, mothers' vaccination knowledge, SES, and concerns about vaccine-preventable diseases** predicted complete childhood immunization (Lynn & Han, 2024).

BARRIERS TO VACCINATION IN MYANMAR

- **Persistent insecurity & attacks on health facilities and clinics** since the 2021 military coup have disrupted health delivery and care-seeking.
- **Blocked vaccine & medical supply shipments** by military authorities hinders access.
- Worsening humanitarian & protection crises limits safe movement, displaces communities, and impacts health service demand and delivery.
- **2025 Earthquake & Monsoon-related flash floods** damaged infrastructure.
- **Reduced international aid** contributed to 103 health facilities/mobile clinics suspending services and another 28 scaling down services.

Ghana: Scaling Up Malaria Vaccination

KEY TAKEAWAYS

- **Leveraging existing visits accelerates uptake.** Introducing the malaria vaccine at the six-month Child Welfare Clinic visit built on a trusted platform already used for vitamin A and growth monitoring.
- **Strong systems drive rollout.** Investments in safety monitoring, communication, and stakeholder engagement managed early hesitancy and supported high uptake.
- **R21 improved feasibility.** With simpler storage, easier administration, and lower cost, R21 reduced frontline burdens and made nationwide expansion more achievable.
- **Financing is critical.** Sustaining progress will depend on Ghana's ability to fund both vaccines and delivery operations as donor support declines.
- **A model for other countries.** Ghana's experience shows that embedding new vaccines into existing services—supported by strong platforms, effective communication, and steady domestic commitment—can enable both the scale-up of innovations and the strengthening of routine immunization systems.

EXPERT INSIGHT

Experts consulted for this case study include:

1. **Dr. Selorm A. Kutsoati**, Public Health Physician Specialist & Acting Programme Manager, Expanded Programme of Immunization, Ghana Health Service
2. **Dr. Mohammed Naziru Tanko**, Deputy Programme Manager, Expanded Programme on Immunization, Ghana Health Service.

BACKGROUND AND RATIONALE

Ghana's child health system has long relied on monthly Child Welfare Clinic (CWC) visits as the backbone of preventive care. In 2018, the Ministry of Health introduced the Maternal and Child Health Record Book (MCHRB), which gave caregivers a clear, home-based tool for tracking growth, immunizations, and nutrition (17). The book also formalized the CWC visit schedule, recommending monthly visits through the first year, shifting to every three months between ages one and two, and every six months up to age five (18). The six-month visit—featuring vitamin A, growth monitoring, and nutrition counseling—is a critical milestone, with high attendance rates,

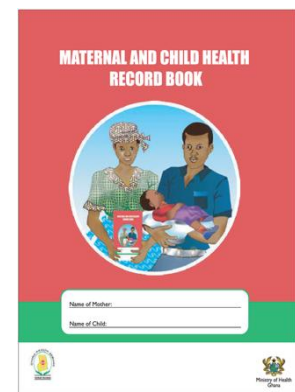


Figure 5. Ghana maternal child health record book

evidenced by consistently high first dose vitamin A coverage (Figure 6).¹ By anchoring preventive interventions to established visits and emphasizing integrated service delivery (17), Ghana created a stable platform for integrating new vaccines.

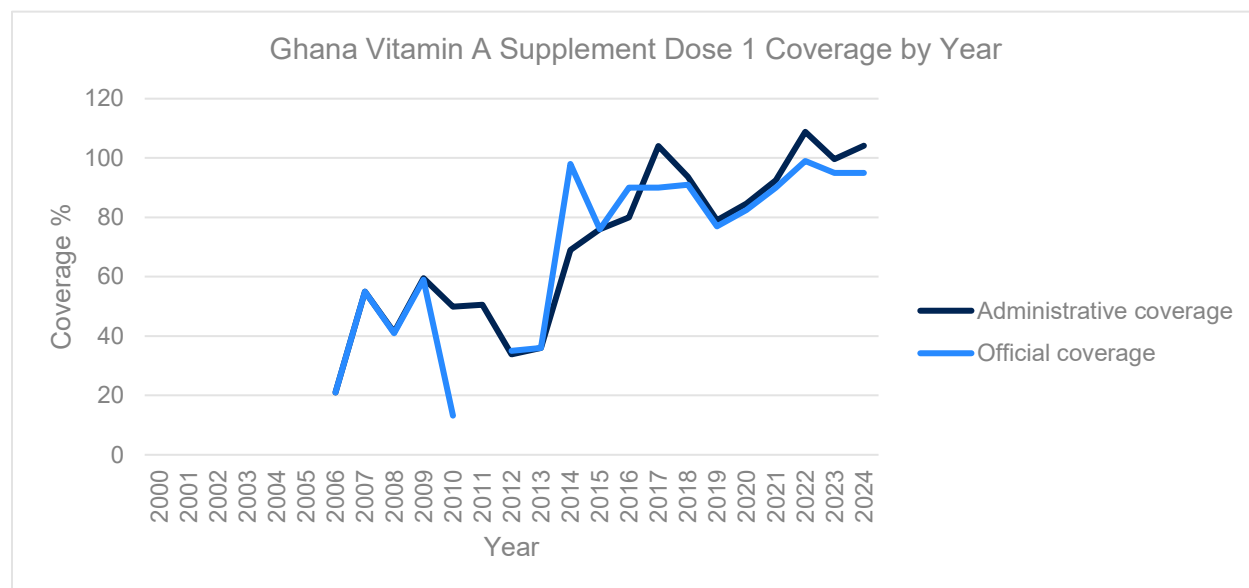


Figure 6. Vitamin A supplementation dose 1 coverage estimates in Ghana 2000-2024. Data source: WHO Immunization Data Portal, World Health Organization, WHO, 2025

ROLLOUT OF THE MALARIA VACCINE

When Ghana joined the Malaria Vaccine Implementation Programme (MVIP) pilot study in 2019, this visit offered a natural entry point for the first dose of RTS,S. As Dr. Naziru Mohammed, EPI Ghana, explained, the decision to align RTS,S with the six-month visit was deliberate: “Already at six months, there is the vitamin A supplementation... so scheduling the malaria vaccine dose one at six months wasn’t too new a visit to our population. And so, it contributed to the high uptake that we experienced.”

PILOT PHASE (2019–2022)

RTS,S was first introduced in 42 districts in 2019 as part of the MVIP, later expanding to 66 districts (20). Coverage in this phase was strong: study data indicated that 71% of eligible children received the first dose in 2020, rising to 76% in 2021 (21). By the end of 2022, more than 1.4 million doses had been delivered across 82 districts in seven regions (22). These estimates suggested that the integration of malaria vaccination into the six-month visit was not disruptive to other services and was

¹ Note that Ghana also delivers vitamin A supplementation through campaigns which may impact the ability to use vitamin A coverage as a proxy for 6-month visit attendance. However, recent campaigns have targeted children aged 9 months – 5 years, which is after the recommended first dose at 6-months (19).

readily accepted by caregivers. The pilot also provided valuable operational experience in vaccine storage, delivery, and safety monitoring. Based on these results, the World Health Organization (WHO) recommended RTS,S for widespread use among children in sub-Saharan Africa in October 2021 (23).

EXPANSION PHASE (2023–2024)

Building on pilot successes, Ghana expanded rollout in February 2023 to an additional 51 districts (20). The following year, in September 2024, Ghana introduced the R21 vaccine, a newer formulation with major logistical and financial advantages (20). As Dr. Kutsoati noted during our conversation, R21 does not require reconstitution, has a smaller cold chain footprint, and costs about half as much as RTS,S. She also noted the likely smooth acceptance of R21 because the GHS does not market the rollout as RTS,S or R21, but rather state the “malaria vaccine” in general (see Figure 7). R21 was introduced in 43 new districts, with a national plan for full coverage between 2025 and 2029.

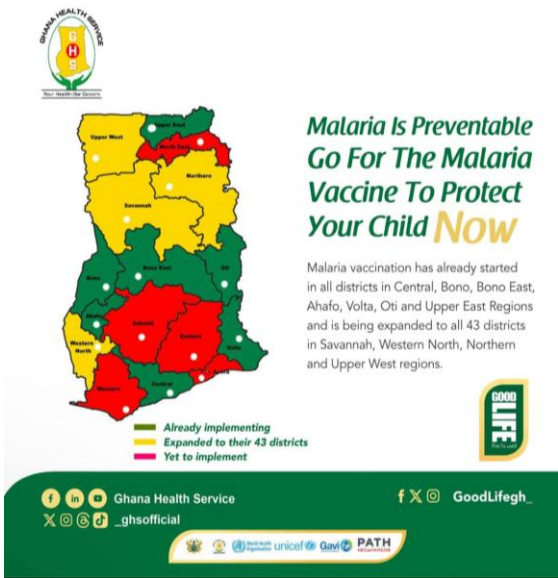


Figure 7. Social media advertisement for the malaria vaccine in Ghana.

COVERAGE TRENDS

Overall, Ghana has been highly successful at achieving high first-dose coverage for the malaria vaccine, which is delivered at six months (Table 2). In 2023, the first year of data available post-pilot, first-dose coverage continued to improve, reaching 85.7% of the target population. In 2024, the national coverage estimate fell to 65.2%, however the drop is largely explained by the expanded denominator that accompanied the introduction of R21 to additional districts in September 2024. With only a few months left in the reporting year, there was insufficient time to reach all eligible children in the newly added districts. As Dr. Kutsoati noted, the timing of the expansion had a direct impact on annual coverage reporting: “if we had started earlier in the year, probably we would have been able to reach all those for the year.”

Table 2. Coverage estimates for the malaria vaccine in Ghana from 2020-2024.

Year	1 st dose (6- months)	2 nd dose (7-months)	3 rd dose (9-months)	4 th dose (18-months)	Source
2019	55%	55%	39%	No data	Pilot coverage data (24)

2020	71%	67%	66%	8%	Pilot coverage data (24)
2021	76%	73%	74%	47%	Pilot coverage data (24)
2022	74%	70%	71%	51%	Pilot coverage data (24)
2023	86%	No data	67%	46%	WHO immunization database (25) ^A
2024	65%	No data	56%	49%	WHO immunization database (25) ^A

^A Admin coverage estimates were reported.

The contrast between dose one (at six months) and dose four (at 18 months) highlights the importance of anchoring vaccines within established visits. Dr. Mohammed explained Ghana's adaptation: "When we scheduled our fourth dose initially at 24 months, we had a huge challenge in terms of high dropouts... So we quickly switched to 18 months, because at 18 months we already had MR2 and MenA. That dramatically improved uptake." Similarly, aligning dose 3 at nine months with MR1 and yellow fever ensured no additional visits were required.

However, significant challenges still remain in reaching children after the first year of life. In general, Dr. Kutsoati noted that attendance at CWC visits declines as children age and caregivers face competing demands, especially after mothers return to work. This challenge is evident in the consistently lower coverage of fourth dose when compared to the first dose, even after the schedule shifted.

IMPLEMENTATION CHALLENGES

ONGOING COMMUNITY SENSITIZATION

During the pilot, pockets of hesitancy among caregivers and health workers created delays in vaccine acceptance. Some staff were uncertain about administering a new vaccine, making refresher training and supervision necessary. Caregivers in newly targeted districts were also unfamiliar with malaria vaccination, and communication campaigns had to work against misinformation and safety concerns. Each phase of expansion effectively required a new introduction, as every new district demanded fresh rounds of staff retraining and community sensitization. This repeated effort underscored how overcoming hesitancy was as critical—and as resource-intensive—as delivering the vaccines themselves.

OPERATIONAL BURDENS

Introducing RTS,S in 2019, and later managing both RTS,S and R21, strained Ghana's immunization logistics. RTS,S requires reconstitution and a bulky two-vial presentation, increasing cold chain and delivery demands (26). Stakeholders flagged the need for additional storage and distribution plans

(27). According to Dr. Kutsoati, R21 offers long-term relief with simpler storage and administration, but the transition required careful coordination to avoid disrupting routine services.

FINANCING PRESSURES

The rollout coincided with Ghana's entry into Gavi's transition phase in 2022, requiring steadily increasing domestic contributions. While Gavi currently covers about 85% of commodity costs in high-transmission districts, Ghana will assume full responsibility by 2030 (28). As Dr. Mohammed noted, "By 2030, the country is expected to transition from Gavi support completely... there will be some shocks... but a roadmap has been developed towards ensuring Ghana becomes self-financing."

The financing challenge extends far beyond the vaccine price. Operational costs—such as transport, cold chain expansion, training, community sensitization, and data management tools—also strain the national budget (28). In addition, while Ghana has created a transition roadmap and established a national steering committee to guide financial sustainability, cash flow and timeliness remain concerns. In previous years, Dr. Mohammed shared that delays in co-financing disbursements raised fears of stockouts. Encouragingly, he also noted a recent improvement: "As we speak now... the government has paid all the co-financing requirements for the year... telling us there are more positive outlooks ahead."

At the same time, Ghana is rolling out other new vaccines, including HPV in 2024 and a planned hepatitis B birth dose in 2026. These overlapping commitments heighten the pressure on national budgets. Sustaining the malaria vaccine will depend on ensuring a timely and reliable flow of domestic funds to support every link in the delivery chain, from procurement to the last-mile cold chain.

LESSONS LEARNED

LEVERAGING EXISTING PLATFORMS

The six-month CWC visit was already established for vitamin A supplementation and growth monitoring, making it a logical point for malaria vaccine integration. This reduced the burden of creating new appointments and helped normalize the vaccine within the child health schedule. When asked about recommendations for countries seeking to roll out the malaria vaccine, Dr. Mohammed explained, "Countries should look at already existing schedules... If it is aligned along those lines, then the challenge is lesser compared to when it is a fresh schedule."

STRONG GOVERNANCE, STAKEHOLDER ENGAGEMENT, AND COMMUNICATION

Strong governance anchored the rollout, with the Health Sector Coordinating Committee, ICC for Immunization, NITAG, and a Malaria Vaccine Technical Working Group guiding implementation. Stakeholder engagement reached Parliament, chiefs and queen mothers, professional associations, and media editors. A crisis communication plan and trained spokespersons at national and regional levels helped counter misinformation.

SURVEILLANCE AND SUSTAINABILITY

One of the major successes of the pilot highlighted by Dr. Naziru Mohammed was the strengthening of vaccine safety monitoring systems. As part of the pilot program, Ghana established a technical advisory committee to regularly assess severe adverse events and trained health staff in surveillance. Dr. Mohammed noted, “It was during the period of the pilot that we had quite significant support to strengthen our vaccine safety surveillance activities... We trained a lot of the staff around the vaccine safety monitoring system, and we also trained spokespersons to address misinformation. That was a huge success.” These investments have created sustainable systems now supporting both malaria vaccine expansion and broader immunization goals. With Ghana set to fully transition from Gavi support by 2030, such systems will be critical to sustaining immunization delivery under domestic financing.

CONSIDERATIONS FOR FUTURE VACCINE DELIVERY

Looking ahead to future vaccine introductions, EPI staff emphasized the importance of prioritizing combination vaccines over adding multiple injections or extra visits. As Dr. Mohammed explained, “Caregivers generally prefer combination vaccines... the multiplicity of injections sometimes serves as a barrier. Combination products could free up cold chain space, reduce handling costs, and improve acceptance.” Both he and Dr. Kutsoati noted that combination vaccines can improve adherence while reducing strain on families and the health system.

Bangladesh: Sustainability of Introducing a New Visit

KEY TAKEAWAYS

- **Bangladesh introduced a new visit** into their routine EPI at 18 weeks but were **unable to sustain the touchpoint** due to dropout and low coverage.
- **A lack of awareness among caregivers and operational constraints** emerged as primary drivers behind the reversal of the change.

BACKGROUND AND RATIONALE

In 2015, Bangladesh introduced pneumococcal conjugate vaccine (PCV) as a three-dose series at 6, 10, and 18 weeks and full-dose inactivated poliovirus vaccine (IPV) as a single dose at 14 weeks as part of its EPI (29,30). The 18-week visit for PCV dose 3 was a new visit, as the prior schedule only included the oral polio vaccine (OPV) and the Pentavalent vaccine both delivered at 6, 10, and 14 weeks (31). According to the program stakeholders that we interviewed, the 18-week visit was added to avoid giving three injections at 14 weeks (Penta3, IPV, and PCV dose 3), which health workers expected would be unacceptable to caregivers (29). However, this approach proved unsustainable and in 2017 the 18-week visit was removed and PCV dose 3 was moved to 14 weeks (Table 3). We spoke with Dr. Tajul Bari, who was the EPI manager at the time of PCV introduction, to better understand the rationale for eliminating the 18-week touchpoint.

Table 3. Changes in Bangladesh EPI schedule.

Week	Before 2015	2015-2017	2017-Present
6	OPV1; PENTA1	OPV1; PENTA1; PCV dose 1	OPV1; PENTA1; PCV dose 1; fIPV1
10	OPV2; PENTA2	OPV2; PENTA2; PCV dose 2	OPV2; PENTA2; PCV dose 2
14	OPV3; PENTA3	OPV3; PENTA3; IPV	OPV3; PENTA3; PCV dose 3; fIPV2
18	-	PCV dose 3	-

COVERAGE IMPACT OF THE 18-WEEK VISIT

WHO data from the first year of PCV introduction in 2015 exhibited high dropout at the 18-week PCV dose 3 visit. Coverage estimates showed 90% for dose 1, 75% for dose 2, and only 48% for dose 3 (15). While some dropout is expected in multi-dose series, according to Dr. Bari, this was substantially

greater than for other series with a third dose administered at the existing 14-week visit. Coverage improved dramatically after PCV dose 3 was moved to the established 14-week visit in 2017. By 2019, official WHO estimates reported 99% for doses 1 and 2 and 93% for dose 3 (15). Dr. Bari described this shift as a sustainable solution with little concern for future dropout.

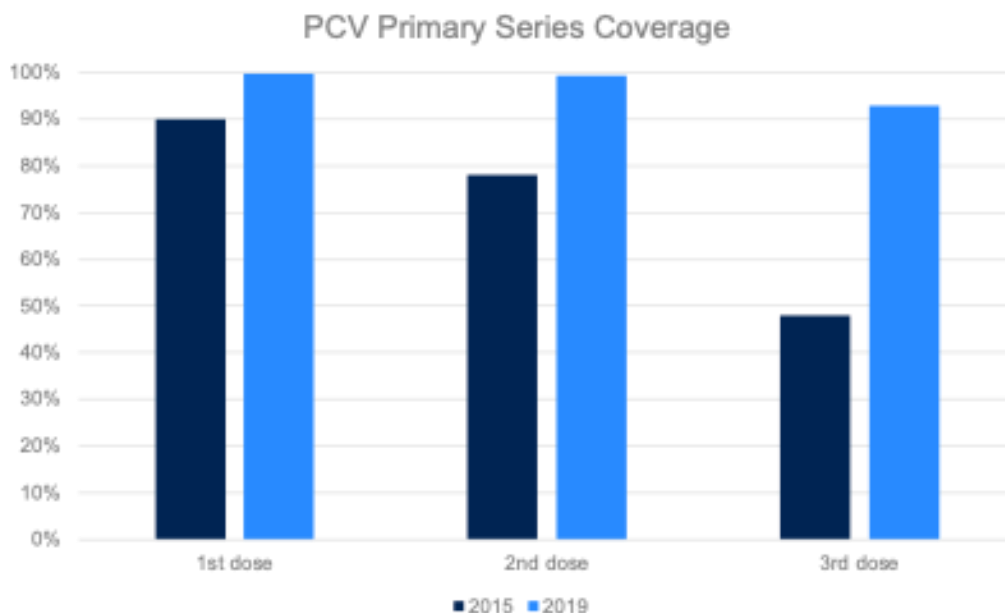


Figure 8. Coverage in 2015 showed high dropout at the 18-week PCV dose 3 visit. After shifting PCV dose 3 to 14 weeks in 2017, PCV coverage had improved substantially by 2019.

CHALLENGES WITH INTRODUCING A NEW PLATFORM FOR PCV

During our conversation, Dr. Bari confirmed that the main challenge with introducing a new 18-week touchpoint for PCV dose 3 was the substantial dropout. This ultimately became the primary driver for the National Committee for Immunization Practice (NCIP) to shift the third dose to 14 weeks in 2017.

He noted that many caregivers were not aware of the newly added 18-week visit, which contributed substantially to missed doses. Dr. Bari stated that Bangladesh's health system could not accommodate the workforce demands of the new 18-week visit due to a shortage of healthcare professionals and family welfare staff. The additional visit also placed a marked burden on frontline workers, who were already stretched thin due to personnel shortages. Beyond staffing, there were also financial and operational constraints, as budgets had to be adjusted to cover the costs of administering the vaccine at a new visit.

Together, these challenges underscored the difficulty of sustaining an additional vaccination platform and ultimately led to changing the PCV schedule to align with the 14-week visit.

LESSONS LEARNED AND LOOKING AHEAD

Although concerns around administering three injections in a single visit were cited as the main reason PCV dose 3 was originally placed at 18 weeks, three injectables per visit are now standard in Bangladesh's early-childhood schedule. At the same time as the PCV dose 3 schedule change in 2017, a full-dose IPV shortage prompted a shift from a single full-dose IPV to two fractional doses (fIPV) at 6 and 14 weeks. As a result, the schedule calls for three injections (Penta, PCV, and fIPV) at 6 and 14 weeks.

According to Dr. Bari, three injections are acceptable to caregivers and providers but represent the upper limit of acceptability in Bangladesh. Looking ahead in Bangladesh, new vaccines added to the schedule, such as the typhoid vaccine, will be co-administered with MR1 at 9 months starting October 2025. Bangladesh also plans to transition to an IPV-only series and phase out OPV by 2027. The government's stated preference is to add new antigens to existing visits rather than create additional early-childhood touchpoints. It remains unclear whether, if more vaccines are introduced, Bangladesh would exceed three injections per visit, establish a new visit, or prioritize combination vaccines to minimize the number of injections.

South Africa – “Forced Switch” to a New

MCV Schedule

KEY TAKEAWAYS

- The MCV schedule shift in South Africa was driven by logistics, manufacturing, and regulation – not epidemiology or schedule optimization.
- EPI visits serve as child wellness platforms in LMICs, where **more touchpoints can strengthen care.**

EXPERT INSIGHT

Much of the detail in this case study is drawn from interviews with Dr. Rudzani Muloiwa, Head of Pediatrics at Red Cross Children’s Hospital in Cape Town, deputy chair of South Africa’s National Advisory Group on Immunizations (NAGI), and co-director of Vaccines for Africa, as well as Dr. Haroon Saloojee, neonatologist, community pediatrician at the Wits School of Medicine in Johannesburg, and member of NAGI.

“FORCED SWITCH”

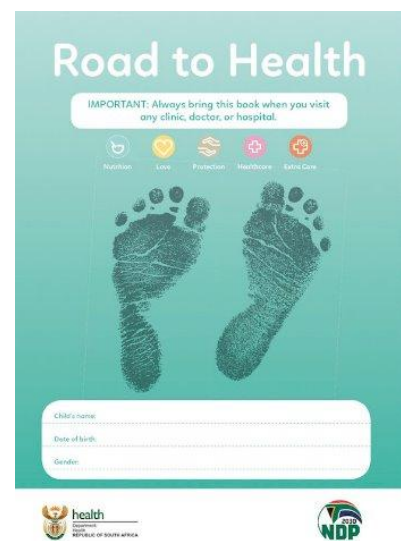
In 2016, South Africa changed its measles vaccination schedule from 9 and 18 months to 6 and 12 months (32). According to experts, the shift was primarily driven by logistical, supply, and regulatory constraints rather than by epidemiological factors. At this time, South Africa chose to prioritize administering a standalone measles vaccine to avoid transitioning to a combination measles-rubella (MR) or measles-mumps-rubella (MMR) due to concern that introducing rubella into the schedule without achieving high coverage could inadvertently increase congenital rubella syndrome (CRS) (32). According to Dr. Muloiwa, during that time, coverage for the second dose of measles at 18 months was only about 56%, which fell short of the 80% coverage threshold considered safe for adding rubella and avoiding a rise in CRS.

The main driver of the change arose when the vaccine manufacturer (Sanofi/Pasteur) South Africa was using discontinued supplying a standalone measles vaccine product. The country then switched to a new product (MeasBio vaccine) manufactured in Indonesia. However, the new measles vaccine was not approved by the South African Health Products Regulatory Authority for co-administration with any other vaccine. Because the previous schedule involved co-administration of measles with the

third dose of PCV at nine months, the change drove South Africa to reposition the measles series to 6 and 12 months so that it could be given on its own. This created two new visits in South Africa's well-child schedule. Dr. Muloiwa, described this change as a "forced switch," emphasizing that the shift was driven by supply and regulatory constraints rather than an intentional effort to optimize the schedule. This framing differs from the literature, which often highlights the 2009–2011 measles outbreak affecting infants under nine months as the main driver (32–34). While outbreaks may have provided additional justification, expert consensus points to the supply and regulatory issues as the true catalyst (34).

EPIDEMIOLOGICAL CONTEXT

Since the schedule change, experts have suspected that measles incidence may be shifting toward school-aged children due to waning immunity from earlier vaccination, though they noted that no confirmatory data are available. While lower antibody titers and recurrent outbreaks have been observed since 2016, both Dr. Muloiwa and Dr. Saloojee emphasized that the epidemiological pattern points more to under-immunization than to problems with the new schedule or vaccine product (35). They noted that South Africa has struggled with low routine vaccination coverage for many years and often turn to vaccination campaigns to combat outbreaks (36). However, these campaigns have not been able to overcome the problem of under-immunization through routine services. This cycle is driven by missed opportunities at routine visits, especially during sick visits where vaccination is overlooked; failures to use South Africa's Road to Health booklet; vaccine stockouts; and more recent disruptions from COVID-19 and rising hesitancy. Both experts stressed that these systemic gaps, rather than the schedule change itself, are the main drivers of outbreaks.



LESSONS LEARNED AND LOOKING AHEAD

Dr. Muloiwa noted that while under-immunization has remained a consistent challenge in South Africa, improvements in measles vaccination coverage over the past decade made it possible to shift from standalone measles to MR, which are delivered at the 6- and 12-month visits. The national immunization coverage for both MCV1 and MCV2 was estimated at 86% in 2022 (35). While the new MR vaccines are approved for co-administration with other vaccines and could allow a return to the 9- and 18-month schedule, experts expressed a strong preference for retaining the 6- and 12-month visits. From a platform perspective, stakeholders in South Africa view vaccination visits not only as opportunities to deliver antigens, but also as critical touchpoints for broader child health interventions

such as growth monitoring, vitamin A supplementation, breastfeeding counseling, and TB screening. For this reason, pediatricians in South Africa advocate for retaining multiple additional visits in the schedule, as more contact points create opportunities for consistent care and early detection of malnutrition, developmental delays, or other issues. As Dr. Muloiwa emphasized, the highest cost of vaccines lies in building and maintaining this infrastructure, making it essential to leverage these visits for multiple services. Sustaining the additional touchpoints is therefore seen as an important way to strengthen adherence to well-child visits and expand the benefits of the immunization platform beyond vaccination alone.

Opportunities for Continued Learning

Malaria vaccine rollout offers an opportunity for continued learning in identifying facilitators and barriers or adding new vaccine visits, particularly the six-month visit which many countries have introduced for malaria vaccines. To this end, we consulted with Dr. Saira Nawaz, Project Director for the Routine Immunization Strengthening Program (RISP) Learning Consortium at PATH, who also contributes to Gavi's Malaria Vaccine Programme Learning Agenda. Dr. Nawaz highlighted two ongoing global initiatives that will be particularly relevant for understanding how six-month visits can be implemented and how new interventions can be integrated. Both initiatives center on strengthening routine immunization platforms while using the malaria vaccine introduction as a catalyst for broader health system improvements.

The first is **Gavi's Malaria Vaccine Programme Learning Agenda**, which brings together four learning partners working across different geographies, including PATH in Burkina Faso and Mozambique. The initiative is designed to conduct implementation research on how malaria vaccine delivery can be integrated within existing child health services to improve uptake of the full four-dose schedule. Strategies being tested range from linking malaria vaccine contacts with nutrition support or catch-up immunizations, to embedding vaccine delivery into broader child health and malaria prevention touchpoints at the community level. Although the program only recently launched, early outputs are expected soon, with the current project cycle scheduled to end in December 2025. This work will help determine whether malaria vaccine contacts can reliably serve as a platform for other essential services, while also shedding light on how integration affects adherence to the full malaria vaccine series.

The second is the **Routine Immunization Strengthening Program (RISP) Learning Consortium**, which operates in fragile and under-immunized contexts such as Pakistan, Afghanistan, Chad, the Central African Republic, the Democratic Republic of Congo, Guinea, Niger, Somalia, South Sudan, and Syria. Its purpose is to generate and share data-driven lessons on how routine immunization programs function under stress, the barriers they face, and which strategies improve coverage most effectively. Early learnings indicate that reinforcing fixed-site delivery produces more durable improvements than one-off campaigns, which can divert staff and weaken services. Evidence also underscores that stronger routine immunization systems are essential for sustaining uptake of new vaccines, including malaria, and that system-strengthening requires stable financing and coordination with governments. In places like DRC and Chad, where RISP collaborates directly with ministries of health, early insights will be particularly relevant for understanding how the malaria vaccine can be delivered through routine platforms in contexts with weaker health infrastructure.

Discussion and Recommendations

The findings from the landscape review, literature, and case studies collectively highlight the six-month visit as a critical but underutilized platform for strengthening child health. While many Gavi-supported countries still lack a formalized visit at this age, nearly half have introduced interventions built around malaria vaccination, vitamin A supplementation, or growth monitoring at the six-month time point. In several contexts, the malaria vaccine has been the primary driver for establishing this new touchpoint, creating an important opportunity to integrate additional services.

Experiences from case study countries demonstrate the potential benefits and challenges with adding a six-month visit to deliver integrated child health services. Ghana illustrates how a pre-existing well-child visit combined with strong community engagement can support sustained uptake, though financial pressures associated with Gavi transition pose risks for long-term sustainability. Myanmar provides an example of resilience, showing that integration of vaccines with nutrition services is possible even in fragile political and economic environments. By contrast, Bangladesh underscores the difficulty of sustaining new visits that are not perceived as essential by caregivers. Finally, South Africa shows how external disruptions and logistics, such as supply constraints, can sometimes overpower epidemiologic considerations and lead to schedule changes. These experiences confirm that while the six-month visit has potential value, its success depends on broader system capacity and program design.

From a policy perspective, the six-month visit should be positioned as a platform for integrated service delivery rather than as a vaccine-specific encounter. This requires cross-program coordination between immunization, nutrition, and maternal and child health programs. It also necessitates sustained financing, as illustrated by Ghana, where increased domestic co-financing obligations have created strain during scale-up. In addition, early planning for data collection and monitoring is essential. The malaria vaccine rollout represents a unique opportunity to systematically track adherence at six months, and current learning agenda activities provide a foundation for generating evidence across multiple contexts.

Several practical recommendations for implementation in low- and middle-income countries emerge from this analysis. Vaccination should serve as the central feature of the visit, given consistent evidence that immunizations drive attendance more effectively than non-vaccine services. Interventions should be bundled to maximize efficiency, with particular emphasis on vitamin A supplementation, which remains poorly covered when delivered through campaigns or later visits. Strong community engagement is necessary to build awareness and trust, using locally adapted communication strategies. Health system investments in cold chain, logistics, and information systems

are critical to sustain routine delivery. Finally, the malaria vaccine should be leveraged as a natural marker to monitor adherence, enabling programs to refine strategies as coverage expands.

Limitations

Several limitations should be acknowledged in interpreting the findings of this review and case studies.

First, adherence data are imperfect and incomplete. For many interventions, particularly vitamin A supplementation and growth monitoring, coverage estimates are either unavailable or reported across broad age ranges that do not align with a six-month visit. Where adherence data exist for vaccines such as malaria, denominators vary by country and are often incomplete, limiting the ability to make cross-country comparisons. While the malaria vaccine offers promise as a useful marker of adherence in the future, implementation is too recent to provide reliable long-term trends.

Second, even in contexts where a six-month visit is formally recommended, there is little evidence on attendance. Multiple delivery mechanisms—routine visits, campaigns, and community health worker outreach—complicate the ability to use intervention coverage data as a proxy for visit adherence. This makes it difficult to attribute observed outcomes to the presence or absence of a six-month touchpoint.

Third, data gaps are significant. Most published evidence comes from early rollout experiences and qualitative insights were only gathered from a few SMEs for a small number of case study countries, which constrains the ability to draw broader generalizations. Findings are often highly context-specific and sometimes contradictory, underscoring the need for context-specific learning.

Finally, the recency of the malaria vaccine introduction further limits the evidence base. Early insights are drawn from short observation windows and remain sensitive to supply dynamics, programmatic disruptions, and definitional differences. Longitudinal monitoring will be essential to assess adherence, sustainability, and the true value of the six-month visit as a platform for integrated child health services.

Conclusion

The six-month visit is emerging as an important opportunity to strengthen child health services. Vaccines remain the strongest driver of caregiver attendance, and integration of additional interventions—particularly vitamin A supplementation—can help close longstanding service gaps. Experiences from early adopter countries demonstrate both the potential benefits and the challenges of introducing and sustaining a new visit, with outcomes heavily shaped by system capacity, financing, and community engagement.

To support uptake and adherence, programs should prioritize vaccination as the central component of the visit, bundle services to maximize efficiency, and invest in community communication and health system infrastructure. Ensuring sustainability will require strong cross-program coordination, early planning for domestic financing, and robust monitoring systems.

Next steps include strengthening surveillance of six-month visit adherence in priority countries and collaborating with initiatives such as the GAVI Malaria Vaccine Learning Agenda to capture lessons from malaria vaccine integration. Continued investment in evidence generation will be critical to assess feasibility, effectiveness, and long-term sustainability across diverse contexts. As malaria vaccine rollout expands, it provides a timely opportunity to assess the feasibility and value of the six-month visit as a platform for integrated child health delivery.

References

1. World Health Organization and the United Nations Children's Fund (UNICEF). Improving the health and wellbeing of children and adolescents: guidance on scheduled child and adolescent well-care visits. [Internet]. Geneva; 2023. Report No.: ISBN (WHO) 978-92-4-008533-6 (electronic version). Available from: <https://iris.who.int/bitstream/handle/10665/376159/9789240085336-eng.pdf?sequence=1>
2. IPUMS-DHS. WHO Vaccination Schedules and Updates [Internet]. [cited 2025 Sept 18]. Available from: <https://www.idhsdata.org/idhs/vaccines.shtml>
3. Hodges MH, Sesay FF, Kamara HI, Nyorkor ED, Bah M, Koroma AS, et al. Integrating Vitamin A Supplementation at 6 months into the Expanded Program of Immunization in Sierra Leone. *Matern Child Health J*. 2015 Sept;19(9):1985–92.
4. Major step in malaria prevention as three West African countries roll out vaccine | WHO | Regional Office for Africa [Internet]. 2025 [cited 2025 Sept 18]. Available from: <https://www.afro.who.int/news/major-step-malaria-prevention-three-west-african-countries-roll-out-vaccine>
5. Hassan IA, Araoye JB, Olawuyi DA, Effiong FB. Malaria vaccine implementation in Nigeria: Addressing the coverage challenges within the national immunization program for high impact. *Vaccine*. 2025 Aug 13;61:127376.
6. Gaël Bitá AI, Agbornkwai, Azike chukuwchindun B, Dakenyo NRD, Assiene JG. Auctores. [cited 2025 Sept 18]. Community Engagement in Routine Vitamin A Supplementation: Opportunity for first Contact for Children 6-11 Months of Age in the two Health Districts in Far North Cameroon. Available from: <https://www.auctoresonline.org/article/community-engagement-in-routine-vitamin-a-supplementation-opportunity-for-first-contact-for-children-6-11-months-of-age-in-the-two-health-districts-in-far-north-cameroon>
7. How will Cote d'Ivoire roll out the malaria vaccine? [Internet]. [cited 2025 Sept 18]. Available from: <https://www.gavi.org/vaccineswork/how-will-cote-d-ivoire-roll-out-malaria-vaccine>
8. Kalid M, Osman F, Sulaiman M, Dykes F, Erlandsson K. Infant and young child nutritional status and their caregivers' feeding knowledge and hygiene practices in internally displaced person camps, Somalia. *BMC Nutr*. 2019 Dec 17;5:59.
9. United Nations Children's Fund. Approaches to the delivery of Vitamin A supplementation in Eastern and Southern Africa. UNICEF Eastern and Southern Africa Regional Office; 2024.
10. Milligan P, Fogelson. Statistical report, Malaria Vaccine Pilot Evaluation (MVPE), analysis of data to month 46. Faculty of Epidemiology and Population Health, London School of Hygiene & Tropical Medicine; 2024 Feb.
11. Gavi and Côte d'Ivoire commit to a successful programmatic and financial transition [Internet]. 2025 [cited 2025 Sept 18]. Available from: <https://www.gavi.org/news/media-room/gavi-and-cote-divoire-commit-successful-programmatic-and-financial-transition>
12. Poe A, Emily, Aurora, Aung HT, Reh ASE, Grissom B, et al. Struggling to resume childhood vaccination during war in Myanmar: evaluation of a pilot program. *International Journal for Equity in Health*. 2024 June 13;23(1):121.

13. UNICEF. Myanmar: WHO and UNICEF estimates of immunization coverage: 2021 revision [Internet]. 2022. Available from: <https://data.unicef.org/wp-content/uploads/2022/07/mmr.pdf>
14. World Health Organization - MYANMAR. Myanmar Expanded programme on Immunization (EPI) Factsheet 2024 [Internet]. WHO; [cited 2025 Sept 22]. Available from: <https://www.who.int/publications/i/item/myanmar-epi-factsheet-2024>
15. WHO. Immunization Data. [cited 2025 Sept 22]. WHO Immunization Data Portal. Available from: <https://immunizationdata.who.int/global>
16. WHO. Myanmar: WHO and UNICEF estimates of immunization coverage: 2023 revision [Internet]. 2024. Available from: https://cdn.who.int/media/docs/default-source/country-profiles/immunization/2024-country-profiles/immunization-2024-mmr.pdf?sfvrsn=9701f6f6_3&download=true
17. Ghana Health Service. The First Monitoring and Supervision for Maternal and Child Health Record Book national roll-out [Internet]. Japan International Cooperation Agency; Available from: https://www.jica.go.jp/project/english/ghana/010/materials/c8h0vm0000fec7eb-att/banner_05.pdf
18. Ministry of Health/Ghana Health Service. User Guide for Maternal and Child Health Record Book [Internet]. 2021 Sept. Available from: https://www.jica.go.jp/oda/project/1700198/news/___icsFiles/afieldfile/2024/06/10/user_guide.pdf
19. Leaving No Child Behind: The Story of Ghana's Measles-Rubella Vaccine Campaign | WHO | Regional Office for Africa [Internet]. 2025 [cited 2025 Sept 18]. Available from: <https://www.afro.who.int/photo-story/leaving-no-child-behind-story-ghanas-measles-rubella-vaccine-campaign>
20. Ghana Expands Malaria Vaccine Rollout [Internet]. [cited 2025 Sept 18]. Available from: <https://www.unicef.org/ghana/press-releases/ghana-expands-malaria-vaccine-rollout>
21. Malaria vaccine implementation programme (MVIP) [Internet]. [cited 2025 Sept 18]. Available from: <https://www.who.int/groups/global-advisory-committee-on-vaccine-safety/topics/malaria-vaccines/malaria-vaccine-implementation-programme>
22. Ghana targets more children in malaria immunization expansion | WHO | Regional Office for Africa [Internet]. 2023 [cited 2025 Sept 18]. Available from: <https://www.afro.who.int/countries/ghana/news/ghana-targets-more-children-malaria-immunization-expansion>
23. WHO recommends groundbreaking malaria vaccine for children at risk [Internet]. [cited 2025 Sept 18]. Available from: <https://www.who.int/news/item/06-10-2021-who-recommends-groundbreaking-malaria-vaccine-for-children-at-risk>
24. Adjei MR, Tweneboah PO, Bawa JT, Baafi JV, Kubio C, Amponsa-Achiano K, et al. Trend of RTS,S vaccine uptake in the malaria vaccine implementing programme (MVIP) pilot regions, Ghana; 2019-2022. *Heliyon*. 2024 Oct 15;10(19):e38858.
25. World Health Organization. WHO Immunization Data portal: Malaria vaccination coverage [Internet]. 2025 [cited 2025 Sept 18]. Available from: <https://immunizationdata.who.int/global/wiise-detail-page/malaria-vaccination-coverage?CODE=GHA&ANTIGEN=&YEAR=>

26. PATH. Malaria vaccines: RTS,S and R21 [Internet]. 2024. Available from: https://media.path.org/documents/Product_info_fact_sheet_RTSS-R21_March_2024.pdf
27. Adeshina OO, Nyame S, Milner J, Milojevic A, Asante KP. Barriers and facilitators to nationwide implementation of the malaria vaccine in Ghana. *Health Policy Plan*. 2022 Sept 9;38(1):28–37.
28. Rolling out vaccines to beat malaria together: Time to harness the power of immunisation for a malaria-free future [Internet]. 2025 [cited 2025 Sept 18]. Available from: <https://www.gavi.org/news-resources/resources/knowledge-products/rolling-out-vaccines-beat-malaria-together-time-harness-power-immunisation-malaria-free-future>
29. Estivariz CF, Snider CJ, Anand A, Hampton LM, Bari TI, Billah MM, et al. Lessons Learned From the Introduction of Inactivated Poliovirus Vaccine in Bangladesh. *J Infect Dis*. 2017 July 1;216(suppl_1):S122–9.
30. Mohd. Noorul Huq D. Minutes of the meeting of Scientific and Technical Sub-Committee of National Committee for Immunization Practice (NCIP) [Internet]. Government of the People's Republic of Bangladesh, Directorate of Health Services Expanded Programme on Immunization (EPI); Available from: https://www.nitag-resource.org/sites/default/files/a86525ef73147d9bc335261011e5ee1b165484bd_1.pdf
31. Government of People's Republic of Bangladesh. Comprehensive Multi-Year Plan of the National Immunization Program of Bangladesh 2011-2016 [Internet]. 2011 May. Available from: <https://www.gavi.org/sites/default/files/document/comprehensive-multi-year-plan-for-2011-2016pdf.pdf>
32. Hong H, Makhathini L, Mashele M, Malfeld S, Motsamai T. Annual Measles and Rubella Surveillance Review, South Africa, 2017. *National Institute for Communicable Diseases (NICD) Communicable Diseases Surveillance Bulletin*. 2017;16(2):64–77.
33. Varma A, Bolotin S, De Serres G, Didierlaurent AM, Earle K, Frey K, et al. What is the current evidence base for measles vaccination earlier than 9 months of age?: Report from an informal technical consultation of the World Health Organization. *Vaccine*. 2025 May 31;57:127187.
34. Mutsaerts EAML, Nunes MC, Bhikha S, Ikulinda BT, Boyce W, Jose L, et al. Immunogenicity and Safety of an Early Measles Vaccination Schedule at 6 and 12 Months of Age in Human Immunodeficiency Virus (HIV)-Unexposed and HIV-Exposed, Uninfected South African Children. *J Infect Dis*. 2019 Sept 26;220(9):1529–38.
35. Oduoye MO, Zuhair V, Marbell A, Olatunji GD, Khan AA, Farooq A, et al. The recent measles outbreak in South African Region is due to low vaccination coverage. What should we do to mitigate it? *New Microbes and New Infections*. 2023 Sept 1;54:101164.
36. Outbreak Unit, Division of Public Health Surveillance and Response; Center for Vaccine and Immunology. Measles Vaccine Frequently Asked Questions [Internet]. National Institute for Communicable Diseases; 2017. Available from: https://www.nicd.ac.za/wp-content/uploads/2017/08/Measles-Vaccine-FAQ-_20170828.pdf