EMPHNET
The Eastern Mediterranean
Public Health Network

Technical Guidance for Introducing Pertussis Maternal Tdap Immunization in EMR Countries



Developed based on the proceedings of the Pertussis Roadmap Meeting, Amman, Jordan, January 19–21, 2026

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Executive Summary

Pertussis remains an important public health concern in the Eastern Mediterranean Region (EMR), particularly among infants younger than six months. Maternal immunization with Tdap is an important strategy to provide early protection to infants during this vulnerable period.

Since late 2023, EMPHNET has been implementing the initiative “The Way Forward for Pertussis Control in EMR: Focus on Maternal Immunization,” with a focus on advancing maternal vaccination as a strategy to reduce pertussis-related morbidity and mortality among young infants. As part of the ongoing initiative, EMPHNET convened a first regional meeting in Amman, Jordan, in August 2024 to review the epidemiology and surveillance of pertussis, available vaccination strategies, and key considerations for maternal immunization.

Building on these ongoing activities, EMPHNET convened a follow-up meeting in Amman, Jordan, from 19–21 January 2026, bringing together international and regional experts and representatives from targeted countries in the EMR. The meeting focused on supporting countries in developing practical, country-specific roadmaps for advancing the introduction of maternal Tdap immunization.

This document represents a further step in this ongoing initiative and presents technical guidance for countries in the EMR considering the introduction of maternal Tdap immunization. It provides a practical framework to support countries in assessing their context, informing policy and decision-making, planning implementation, and identifying key actions and considerations for the successful introduction and scale-up of maternal Tdap vaccination. The guidance is intended to support national stakeholders in adapting the recommended approaches to their respective epidemiological, policy, health-system, and programmatic contexts.

Epidemiological Overview (2019–2025)

Globally, reported pertussis cases increased from 190,475 in 2000 to 941,582 in 2024[1] [1], resulting in an increase in incidence from 33.5 to 137 per 1,000,000 total population[2]. In 2025, there were more than 264 000 cases of pertussis globally[3]. Pertussis outbreaks have been reported in at least 42 countries. The post-COVID resurgence is driven by multiple converging factors: return to normal social interactions post-pandemic, declining vaccination coverage (DTP1 from 89% to 85%; DTP3 from 84% to 79% between 2019–2024), accumulation of susceptible individuals, and the potential emergence of antimicrobial resistance (Macrolide)[4]-[5].

The Eastern Mediterranean Region (EMR) has experienced a dramatic post-COVID resurgence, with almost 10 000 pertussis cases were reported in the Region between 2019 to 2024, 42% of them in children less than 12 months old. In 2024, 52% of the 6225 cases were laboratory confirmed[6].

Countries without documented high case numbers may still have substantial hidden burden due to surveillance gaps — Jordan, for example, reported approximately 3,000 suspected cases in 2025 but only 3 laboratory-confirmed cases, illustrating the scale of underreporting (Map 1).

[1] "Epidemiological Update Pertussis (Whooping Cough) in the Americas Region - 25 March 2026 - PAHO/WHO | Pan American Health Organization." Accessed: Apr. 08, 2026. [Online]. Available: https://www.paho.org/en/documents/epidemiological-update-pertussis-whooping-cough-americas-region-25-march-2026

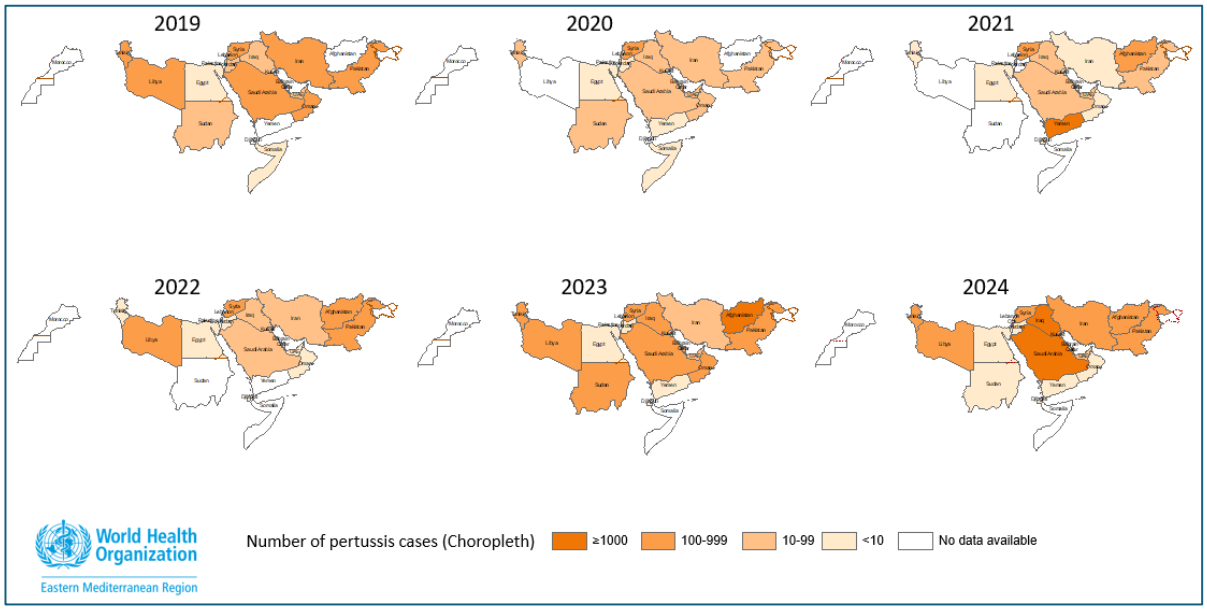
[2] Pertussis - number of reported cases. Accessed: Apr. 09, 2025. [Online]. Available: https://www.who.int/data/gho/data/indicators/indicator-details/GHO/pertussis-number-of-reported-cases

[3] Pertussis - number of reported cases. Accessed: Apr. 09, 2025. [Online]. https://www.who.int/data/gho/data/indicators/indicator-details/GHO/pertussis-number-of-reported-cases

[4] P. Fu *et al.*, "Pertussis upsurge, age shift and vaccine escape post-COVID-19 caused by ptxP3 macrolide-resistant Bordetella pertussis MT28 clone in China," *Clin. Microbiol. Infect.*, vol. 30, no. 11, pp. 1439–1446, Nov. 2024, doi: 10.1016/j.cmi.2024.08.016

[5] L. Ma, A. Caulfield, K. K. Dewan, and E. T. Harvill, "Pertactin-Deficient Bordetella pertussis, Vaccine-Driven Evolution, and Reemergence of Pertussis," *Emerg. Infect. Dis.*, vol. 27, no. 6, pp. 1561–1566, Jun. 2021, doi: 10.3201/eid2706.203850.

[6] WHO Immunization Data portal - Eastern Mediterranean Region," Eastern Mediterranean Region Reported cases of vaccine-preventable diseases (VPDs). Accessed: Aug. 28, 2024. [Online]. Available: https://immunizationdata.who.int/dashboard/regions/eastern-mediterranean-region



Map 1.Pertussis cases reported by countries in EMR, 2019-2024 [7]

The geographic distribution in the EMR demonstrates that pertussis resurgence is a regional phenomenon affecting both high-income and conflict-affected countries, indicating that the drivers extend beyond healthcare system capacity alone.

Between 2019-2024, the DTP1 coverage decreased from 89% to 85%, and DTP3 coverage from 84% to 79%[6]. Discrepancies exist among countries, with several EMR countries showing notable annual fluctuations.

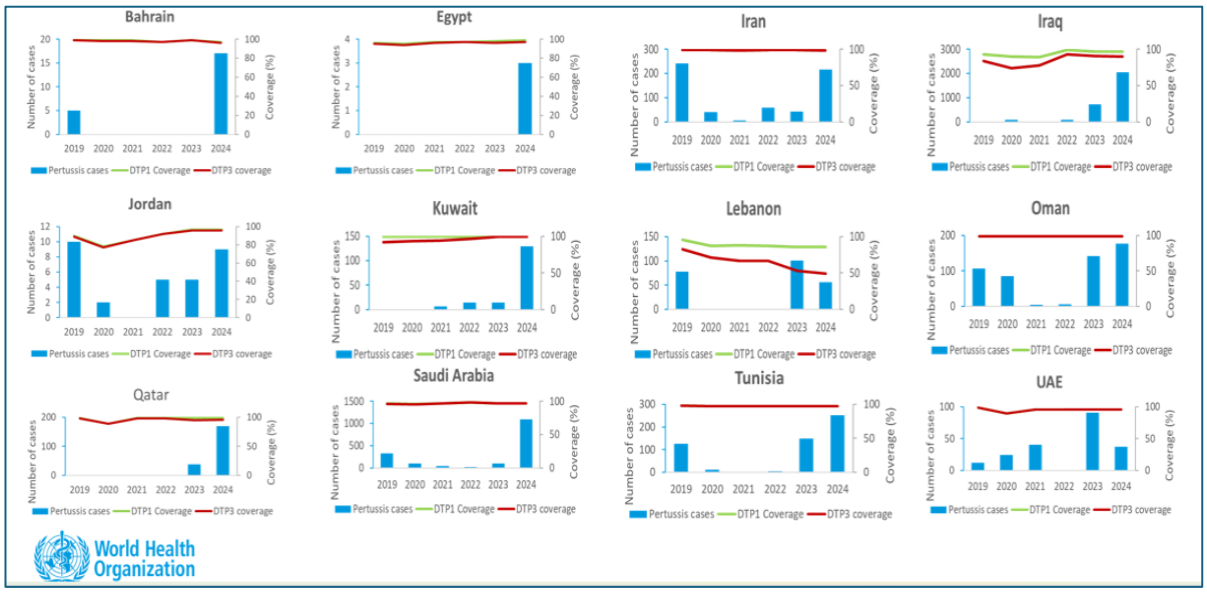


Figure 1.DTPcV coverage and pertussis cases reported by country in EMR 2019-2024 [7]

During the same period, almost 10 000 pertussis cases were reported in the Region, 42% of them in children less than 12 months old. In 2024, 52% of the 6225 cases were laboratory confirmed[7].

Pertussis remains an important cause of morbidity among infants younger than 2 months in the EMR, as demonstrated by recent studies.

A systematic review of 36 studies in the EMR underlined that the incidence of PCR-confirmed pertussis among children with suspected pertussis varied significantly, from 6.7% to 8.9% (Morocco 2018–2019) to 50.4% and 51.6% (Palestine 2004–2008) among children < 12 and < 6 months, respectively, and between 16.3% (Tunisia 2007–2016) to 73.0% (Morocco 2013–2015) in children < 2 months. Age distribution data indicated the highest burden was in infants < 2 months regardless of the population studied[8] . In Tehran, Iran, 20.1% (40/199) of infants ≤6 months presenting with cough and a pertussis-like symptom were confirmed to have Bordetella pertussis infection[9]. In Pakistan, prospective community surveillance identified pertussis in 8 of 2,021 infants, corresponding to an incidence of 3.96 per 1,000 infants (95% CI: 1.84–7.50), with a median age at diagnosis of 18 days[10]. In Morocco, a retrospective analysis of admissions to a university hospital in Rabat between 1 January 2021 and 30 June 2023 found a sharp increase in pertussis cases beginning in December 2022, with pertussis accounting for 85.4% of positive samples. Most cases (78.2%) occurred among infants younger than 3 months[11].

Scientific evidence demonstrates that infants remain particularly vulnerable to vaccine-preventable infections during the early-life period before completion of primary vaccination, highlighting the importance of preventive strategies that provide protection before routine infant vaccination begins.

Preventing the severe and fatal forms of Pertussis among infants too young to receive their primary series of pediatric Pertussis containing vaccines is feasible through Maternal Tdap vaccination. Vaccination of pregnant women is the most cost-effective

[7] Summary report on the meeting of the Regional Immunization Technical Advisory Group (RITAG) for the Eastern Mediterranean Region. Cairo: WHO Regional Office for the Eastern Mediterranean; 2026. Licence: CC BY-NC-SA 3.0 IGO.
[8] Saad, R.K., Khader, Y., Munoz, F.M. *et al.* Burden of pertussis in infants in the Eastern Mediterranean Region and the impact of maternal vaccination: a systematic review. *BMC Public Health* **25**, 268 (2025). https://doi.org/10.1186/s12889-025-21329-y
[9] Noel, G., Lotfi, M.N., Mirshahvalad, S. *et al.* Hospital-based prospective study of pertussis in infants and close contacts in Tehran, Iran. *BMC Infect Dis* **21**, 586 (2021). https://doi.org/10.1186/s12879-021-06266-6
[10] Omer SB, Kazi AM, Bednarczyk RA, Allen KE, Quinn CP, Aziz F, Sial K, Phadke VK, Tondella ML, Williams MM, Orenstein WA, Ali SA. Epidemiology of Pertussis Among Young Pakistani Infants: A Community-Based Prospective Surveillance Study. Clin Infect Dis. 2016 Dec 1;63(suppl 4):S148-S153. doi: 10.1093/cid/ciw561. PMID: 27838667; PMCID: PMC5106628.
[11] Bennai, R.M.; Zouaki, A.; El Amin, G.; Rahani, A.; Zirar, J.; Seffar, M.; Soully, K.; Mahraoui, C.; Kabbaj, H. Pertussis outbreak in children hospitalized in Rabat (Morocco). Diagn. Microbiol. Infect. Dis. 2024, 109, 116225, https://doi.org/10.1016/j.diagmicrobio.2024.116225.

additional strategy for preventing disease in infants too young to be vaccinated and is more effective and favourable than cocooning[12].

In the absence of national evidence, the available global strong scientific evidence can be considered by NITAGs to recommend maternal vaccine introduction and improvement of national pertussis lab based surveillance.

Despite the notable gaps in surveillance and laboratory confirmation capacity, it is critical for countries not to delay maternal Tdap introduction while waiting for surveillance systems to be fully optimized. The scientific evidence — available from both regional and global — is sufficient to support health authorities and NITAGs in making an informed decision about Pertussis maternal vaccination. Ongoing improvements in surveillance and laboratory confirmation should proceed in parallel with — not as a prerequisite for — introducing Pertussis maternal vaccination. Their role is essential in supporting implementation by helping identify susceptible populations, detect outbreaks, and guide targeted interventions.

[12] "Pertussis vaccines: WHO position paper – August 2015." Accessed: Oct. 03, 2024. [Online]. Available: https://www.who.int/publications/i/item/WHO-WER9035

Immunological Mechanism of Maternal Vaccination

Maternal vaccination represents a unique immunological strategy that leverages the natural transfer of antibodies from mother to fetus during pregnancy. When pregnant women receive Tdap vaccination, they produce antibodies against pertussis, tetanus, and diphtheria that cross the placenta and provide passive immunity to the newborn during the critical first months of life — before the infant can receive their own vaccinations[10-13].

Mechanism of protection:

Active IgG transfer occurs primarily during the third trimester, when the placental transfer mechanism is most efficient

Maternal antibodies provide immediate protection to the newborn, filling the vulnerability gap between birth and the infant's first vaccine doses

The vulnerability window — birth to 6–8 weeks of age — is the period of highest mortality risk for pertussis in infants

Optimal timing for maximum antibody transfer: 27–36 weeks of gestation

Duration of maternal antibody protection: approximately 3 months post-birth[10-14]

This passive immunity is particularly crucial for pertussis, where infants under 3 months face the highest risk of severe disease and death, and where no other effective preventive strategy exists.

Meta-analysis data from 7 randomized controlled trials and 10 case-control studies (2014–2024) confirms 85% vaccine effectiveness (95% CI: 78–89%) in protecting infants under 3 months of age[15]. Critically, this evidence base also demonstrates no significant association with serious adverse events in infants (RR = 0.76, 95% CI: 0.46–1.24) or in pregnant women (RR = 1.22, 95% CI: 0.83–1.81), providing robust justification for maternal Tdap programs and directly addressing the safety concerns that contribute to vaccine hesitancy in the region.

[13] CDC, “Tdap Vaccination for Pregnant Women,” Whooping Cough (Pertussis). Accessed: Apr. 09, 2026. [Online]. Available: https://www.cdc.gov/pertussis/vaccines/tdap-vaccination-during-pregnancy.html
[14] CDC, “Tdap Vaccination for Pregnant Women,” Whooping Cough (Pertussis). Accessed: Apr. 09, 2026. [Online]. Available: https://www.cdc.gov/pertussis/vaccines/tdap-vaccination-during-pregnancy.html
[15] Shi Q, Li J, Hu Q, Cheng C, Yang K, Li X, Song X, Chen S, Duan G. Efficacy, Immunogenicity, and Safety of Pertussis Vaccine During Pregnancy: A Meta-Analysis. Vaccines (Basel). 2025 Jun 20;13(7):666. doi: 10.3390/vaccines13070666. PMID: 40733643; PMCID: PMC12298825.



Effectiveness Evidence from Meta-Analysis

Safety and efficacy of antenatal pertussis vaccination is well-documented in meta-analysis, demonstrating its role in establishing critical immunological protection for infants who are too young to be directly immunized.

Robust empirical evidence is available to support the implementation of maternal pertussis vaccination programs and offer a strong basis for policy development in regions that have not yet adopted this preventive strategy.

Latin American Experience — Model for Middle-Income Countries

Latin America was among the first regions globally to recognize and respond to the vulnerability of young infants to pertussis through maternal vaccination. Argentina's experience was described as a leading example of the first middle-income country in Latin America that has introduced the vaccine for pregnant women 15 years ago along with the United States and United Kingdom. In 2011–2012, Argentina experienced its largest pertussis outbreak in decades, resulting in a high number of infant fatalities. Driven by the goal of preventing Pertussis mortality among infants too young to be vaccinated, in February 2012, Argentina became the first country in Latin America to implement a universal vaccination strategy for pregnant women against pertussis, which involves providing Tdap starting at 20 weeks of pregnancy[16]. Between 2012 and 2019, other countries from Latin America followed Argentina's path in Pertussis maternal vaccination[17] and demonstrated evidence of its effectiveness in reducing pertussis morbidity and mortality among young infants (Figure 2- Table 1).

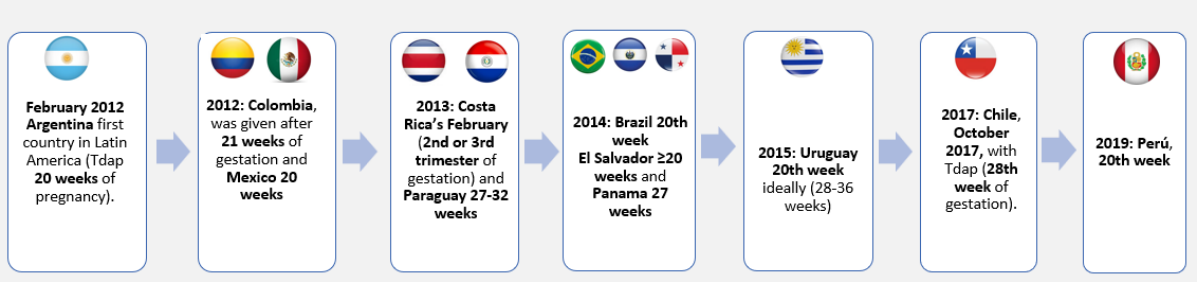


Figure 1. Latin American Maternal Tdap Adoption Timeline

Table 1. Vaccine Effectiveness Evidence from Latin America

Country	Effectiveness / Impact	Source
Argentina	80.7% VE (95% CI: 52.1%–92.2%); 87% case fatality rate reduction	Romanin V, *Clin Infect Dis* 2020[18]
Brazil	82.6% effectiveness in infants <8 weeks	Case-control study, São Paulo[19]

[16] Programa Nacional de Control de Enfermedades Inmunoprevenibles/Ministerio de Salud de la Nación Argentina. Fundamentos de la vacunacion de mujeres embarazadas con vacuna triple bacteriana acelular (dTpa). Available at: http://www.msal.gob.ar/images/stories/bes/graficos/0000000439cnt-2011-10_lineamientos-vacuna-dTpa-embarazadas.pdf. Accessed 7 November 2017

[17] Gentile A, Castellano VE, Ulloa-Gutierrez R, Dueñas L, Torres JP, Izquierdo G, Mariño AC, Pujadas Ferrer M, Jarovsky D, Ochoa TJ, Araya Yampey SA, Díaz Ortega JL, Norero X, Sáez-Llorens X, Ávila-Agüero ML. Pertussis Vaccination During Pregnancy: Regional Situation and Impact of Implementation on National Immunization Programs in Latin America. Pediatr Infect Dis J. 2025 Feb 1;44(2S):S80-S84. doi: 10.1097/INF.0000000000004598. Epub 2025 Feb 14. PMID: 39951079.

[18] V. Romanin *et al.*, "Maternal Vaccination in Argentina: Tetanus, Diphtheria, and Acellular Pertussis Vaccine Effectiveness During Pregnancy in Preventing Pertussis in Infants <2 Months of Age," *Clin. Infect. Dis. Off. Publ. Infect. Dis. Soc. Am.*, vol. 70, no. 3, pp. 380–387, Jan. 2020, doi: 10.1093/cid/ciz217.

[19] E. G. Fernandes *et al.*, "The effectiveness of maternal pertussis vaccination in protecting newborn infants in Brazil: A case-control study," *Vaccine*, vol. 37, no. 36, pp. 5481–5484, Aug. 2019, doi: 10.1016/j.vaccine.2019.03.049.

Colombia	87.5% decrease in incidence in children <12 months; 54.4% in infants ≤6 weeks	Time-series analysis, Bogotá[20]
Costa Rica	Reduction in hospitalizations and deaths; some years reporting zero pertussis deaths	National surveillance data

The Latin American experience is particularly relevant as it demonstrates that effective maternal immunization programs is achievable through:
(1) integration with antenatal care is essential for success.
(2) rapid impact is achievable within 1–2 years of program introduction.
(3) political commitment and integration into essential services can sustain programs even through economic challenges.

Argentina is an example of a middle-income country that has been able to implement a successful strategy for primary prevention through vaccines, making it a health policy. The epidemiological situation was analyzed after this strategy was implemented, finding[21]:

Age shift in cases: Median age increased from 3 months (pre-implementation) to 9 months (post-implementation), indicating effective early protection

Hospitalization reduction: From 86.9% to 67.6% of cases requiring hospitalization due to Pertussis

ICU admission reduction and shorter length of stay

Complication reduction: Apnea, pneumonia

Mortality reduction: Up to 87% reduction in fatality rate across all ages due to Pertussis

Coverage-incidence correlation: Statistical modelling shows inverse correlation between maternal vaccination coverage and incidence in infants <6 months

Subnational heterogeneity: Provinces with low coverage continue to experience outbreaks even when national coverage is high

[20] G. Carrasquilla et al., "Incidence and mortality of pertussis disease in infants <12 months of age following introduction of pertussis maternal universal mass vaccination in Bogotá, Colombia," Vaccine, vol. 38, no. 46, pp. 7384–7392, Oct. 2020, doi: 10.1016/j.vaccine.2020.07.046.
[21] C. Vizzotti et al., "Impact of a maternal immunization program against pertussis in a developing country," Vaccine, vol. 34, no. 50, pp. 6223–6228, Dec. 2016, doi: 10.1016/j.vaccine.2016.10.081.

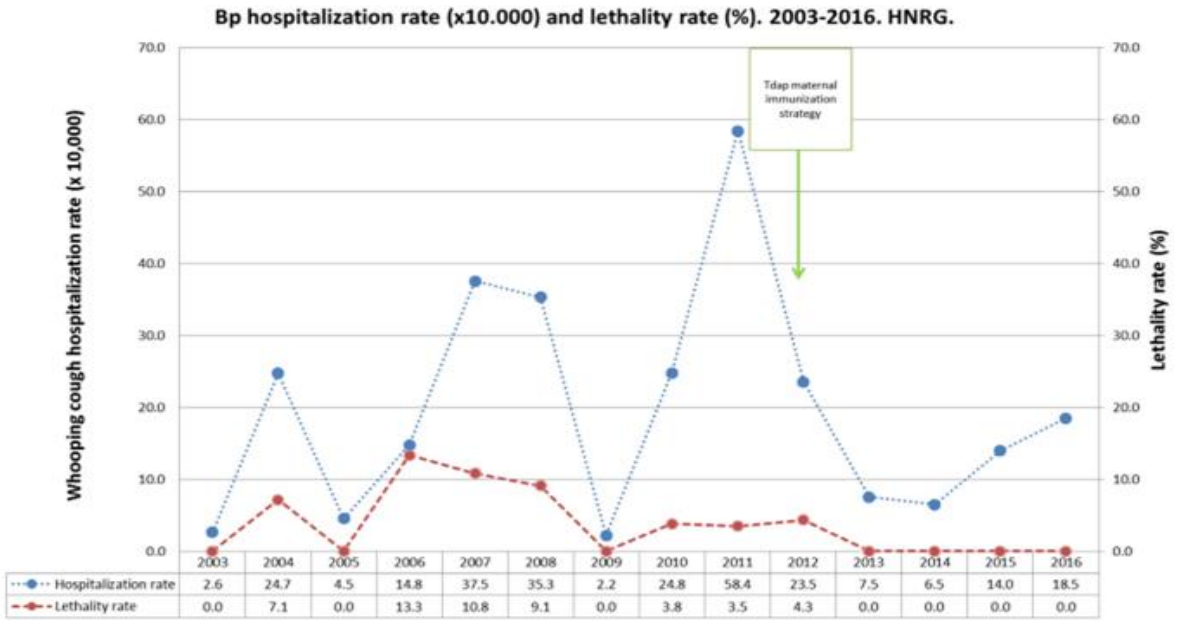


Figure 3. Temporal series of hospitalized cases for whooping cough (x 10,000) and lethality (%). Years 2003-2016.

Argentina provides an example of a middle-income country that successfully implemented a vaccine-based primary prevention strategy and integrated it into national health policy.

Achieving this objective required coordinated efforts across all levels of the health system, from frontline healthcare teams to central authorities. The involvement of scientific societies and key opinion leaders, together with the support of the media and increased community awareness and demand for vaccination, also played an important role in the successful implementation of the strategy.



The unified messaging strategy — "Protect the baby before birth" — combined with a dedicated hotline for clinicians and pregnant women, proved highly effective in building program acceptance.

Pertussis control in Latin America and Argentina currently faces several emerging challenges that may undermine the effectiveness of existing prevention and treatment strategies[22]:

- **Emergence of macrolide-resistant strains:**
  Macrolide-resistant Bordetella pertussis strains have been detected in Brazil, Mexico, Peru, and the United States since 2024, raising concerns about the effectiveness of standard treatment approaches (Table 2).

Table 2. Macrolide Resistance: Key Parameters

Parameter	Detail
First detection	2024
Geographic distribution	Brazil, Mexico, Peru, United States
Genetic mechanism	Mutations in the 23S rRNA gene
Affected treatments	Azithromycin, clarithromycin, erythromycin (standard macrolide treatment)
Accelerating factor	Widespread antibiotic use during COVID-19 pandemic
Regional alerts	PAHO epidemiological alerts issued June–July 2024

- **Genetic mechanism of resistance:**
  Resistance has been associated with mutations in the 23S rRNA gene, which can reduce susceptibility to commonly used macrolide antibiotics, including azithromycin, clarithromycin, and erythromycin.

- **Increased antibiotic exposure:**
  Widespread antibiotic use during the COVID-19 pandemic may have contributed to selective pressure favouring the emergence and spread of antimicrobial-resistant strains.

[22] Pan American Health Organization. PAHO calls for strengthened vaccination and surveillance amid the spread of antibiotic-resistant pertussis in the Americas [Internet]. Washington, D.C.: PAHO; 2025 Aug 26 [cited 2026 Sep 22].

- **Strengthened surveillance and vaccination:**
  PAHO issued epidemiological alerts in June and July 2024, emphasizing the need to strengthen pertussis surveillance, vaccination programs, and timely public-health responses.

- **Heterogeneity in vaccination coverage:**
  Differences in maternal vaccination uptake remain a major challenge. For example, the 2024–2025 pertussis outbreak in Mexico occurred in the context of reported maternal Tdap coverage of only 35.7%, highlighting the potential consequences of suboptimal vaccination uptake.

Countries planning to introduce maternal Tdap should integrate antimicrobial resistance monitoring into their post-introduction surveillance frameworks from the outset.

The global transmission dynamics of pertussis suggest that EMR countries should anticipate the potential emergence of resistant strains within the region. This risk underscores the urgency of implementing maternal vaccination proactively—before resistant strains become established—and of strengthening laboratory surveillance systems to incorporate genomic monitoring.

Country-Specific Experiences in Implementing Maternal Tdap Vaccination in the EMR

A systematic review on studies on pertussis burden in infants or maternal vaccination in the EMR highlighted the lack of research and implementation of maternal pertussis vaccination programs in the EMR[6].

Through the participation of countries in workshops under the Pertussis Control Initiative led by EMPHNET, and the exchange of experiences and information among country participants, a deeper understanding was gained of country-specific experiences. Below are some examples that include lessons learned from countries that have implemented maternal Tdap vaccination.

Oman — Regional Excellence Model

Table 3. Oman Maternal Tdap Program: Key Parameters

Parameter	Detail
Introduction year	2021 (post-COVID scaling)
Original timing	28 weeks gestation
Revised timing (2024)	22 weeks gestation — preponed due to premature births in unvaccinated mothers
Coverage achieved	94% — highest in region
Impact	68% case reduction
Financing	Free for all Omani and non-Omani (since 2023)

Oman's achievement of 94% coverage represents a benchmark for the region and demonstrates that high-coverage maternal Tdap programs are achievable in the EMR context.

Oman's revision from 28 to 22 weeks is consistent with UK-HSA evidence showing that earlier vaccination better protects preterm infants and provides more opportunities for vaccination. This is not contradictory to WHO guidance, which recommends vaccination in the 2nd or 3rd trimester, at least 15 days before end of pregnancy.

The following six strategic pillars underpinning Oman's success provide a replicable framework:

- Integration with other ANC services, by leveraging existing Td program by replacing one dose with Tdap (minimal additional system changes)
- Securing equitable access and financing;
- Reaching target population, by implementing measures to reduce missed opportunities, particularly for women referred to secondary and tertiary care
- Building acceptance and demand; through regular healthcare worker training for improved counselling
- Recording and tracking; through achieving surveillance excellence: weekly public health rounds, e-notification systems, designated focal points
- monitoring and supervision including continuous AEFI reporting through quarterly national reviews, linkage between maternal vaccination and infant outcomes

Bahrain — Recent Introduction

Table 4. Bahrain Maternal Tdap Program: Key Parameters

Parameter	Detail
Introduction year	December 2024
Timing	27th–36th week of gestation (2nd or 3rd trimester)
Coverage	>50% and increasing
Integration	Combined with influenza vaccination program
Delivery	Primarily through primary care settings
Safety profile	No adverse events reported

Bahrain's experience offers several important lessons for countries in the planning phase. First, integration with an existing maternal immunization program — in this case, influenza vaccination — significantly simplifies implementation by leveraging established workflows, trained staff, and existing patient trust. Second, the absence of reported adverse events in the initial post-introduction period reinforces the vaccine's safety profile in the regional context. Third, achieving over 50% coverage in the initial months of implementation demonstrates that rapid uptake is achievable when the program is well-integrated into routine care.

Tunisia — Comprehensive Implementation Roadmap

Following the 2023–2024 pertussis epidemic, which extended over a two-year period, the Ministry of Health adopted the recommendations of the Technical Vaccination Committee. Tunisia subsequently introduced Tdap vaccination for pregnant women, with vaccination recommended during the third trimester at prenatal consultations, between 27 and 32 weeks of gestation, in accordance with the January 2026 ministerial decision. The immediate postpartum period at maternity facilities also provides an additional opportunity for catch-up vaccination.

This approach represents a comprehensive strategy for pertussis prevention by strengthening protection during pregnancy and providing additional opportunities for vaccination around the time of delivery.

Additionally, Tunisia's administration of DTaP-IPV for school-aged children represents a comprehensive, multi-pronged approach to pertussis control that addresses vulnerability across multiple age groups simultaneously.

Tunisia's experience also highlights the importance of anticipating procurement and supply-chain requirements and maintaining flexibility to address potential vaccine supply challenges.

Key challenge — acceptance:
As Tunisia follows a protection-at-birth approach, and therefore, most pregnant women are not considered to require additional tetanus vaccination, as the majority have already received five effective doses of tetanus-containing vaccines during childhood through the Expanded Programme on Immunization (EPI) and subsequently through school-based vaccination programmes. Nevertheless, a key challenge in Tunisia will be to communicate the distinct benefits of maternal Tdap vaccination and encourage women who have already completed their tetanus immunization schedule to receive a Tdap dose during every pregnancy. This anticipated challenge underscores that communication strategy development must be treated as a critical path activity, not a secondary concern.

Iraq — Case Study in Evidence-to-Implementation Gap

With 2,044 pertussis cases reported in 2024—the highest reported burden in the region—and approximately 50% occurring among infants younger than three months, the introduction of maternal Tdap vaccination has been considered as a potential strategy to strengthen protection during the first months of life, with implementation dependent on national policy decisions.

Table 5. Iraq Maternal Tdap Program: Current Status

Parameter	Detail
Epidemiological burden	2,044 cases (2024) — highest in region
Age distribution	50% of cases in infants <3 months
NITAG status	Unanimous approval obtained
MOH status	Ministerial decision pending

The completed preparatory activities include:
- Multidisciplinary team formulated for maternal pertussis vaccination planning
- Qualitative research on target population concerns, beliefs, and behaviours
- Operational and logistical assessment of implementation strengths and challenges
- Healthcare worker assessment

- Training modules developed and implemented
- Community influencers identified; targeted messages and materials developed

Iraq's situation illustrates a critical risk: the gap between technical readiness and political decision-making can cost infant lives. Every month of delay translates into preventable infant morbidity and mortality. Regional and international partners should prioritize advocacy support to accelerate this decision, using the epidemiological data and the precedent of neighbouring countries (Oman, Bahrain) as compelling evidence for immediate action.

Libya — NITAG Evidence-to-Recommendation Process

Libya's national seroprevalence study — finding that most pregnant women at delivery were seronegative for Bordetella pertussis antibodies — provides locally generated evidence of the highest quality for policy decision-making. This finding directly demonstrates that Libyan newborns are born without maternal antibody protection, making them maximally vulnerable to pertussis in their first weeks of life[23].

Libya's approach of generating national evidence while simultaneously advancing the EtR framework provides a model for other countries where locally generated data may strengthen the political case for implementation:

- NITAG worked on every domain of the Evidence-to-Recommendation (EtR) framework, supported by global, regional, and local evidence
- NITAG recommendations transmitted to the National Communicable Disease Control Center for further discussion with the Ministry of Health
- Additional NITAG recommendations include national registry of pregnant women, active safety surveillance, free access call centre at Libyan CDC, national education campaigns

The variation in recommended gestational timing across countries (22 weeks in Oman, 27–32 weeks in Tunisia, 27–36 weeks in Bahrain, from 20 weeks in Argentina) reflects the range of evidence-based approaches within the WHO-recommended window of the 2nd or 3rd trimester. None of these approaches is contradictory to WHO guidance. Countries should select their recommended timing window based on their specific epidemiological context, preterm birth rates, and ANC visit patterns, within the WHO-recommended framework.

[23] **Abusrewil S, Gawass M, Alhudiri I, et al.** *Seroprevalence of Bordetella pertussis antibodies in Libyan pregnant women at the time of delivery.* **Vaccine: X.** 2025;25:100695. doi: **10.1016/j.jvacx.2025.100695**

Anticipated Enablers and Barriers for Maternal Tdap Vaccination in the Region

The introduction and implementation of maternal pertussis immunization differ across the region, reflecting varying levels of progress as well as a combination of shared and country-specific challenges and enabling factors.

Healthcare Provider Awareness Gaps

In Saudia Arabia, following the MoH recommendation for maternal pertussis immunization with combined tetanus-diphtheria-acellular pertussis vaccine (Tdap) during every pregnancy in June 2019, an online survey conducted in November-December 2020 among 60 obstetricians/gynecologists revealed that fewer than 50% survey respondents considered maternal immunization as part of their role, and only 47% were aware of the national recommendation. Additionally, only 3% of the recruited 401 pregnant women from the Taif region had the vaccine during previous pregnancies[24].

This finding has clear programmatic implications: healthcare provider education and empowerment should be considered a foundational component of any maternal Tdap implementation strategy. The knowledge–practice gap identified in Saudi Arabia is likely reflective of broader trends across the EMR. When healthcare providers—who represent the most trusted source of vaccine-related information—lack awareness of recommendations or do not perceive maternal immunization as part of their role, pregnant women are unlikely to receive adequate counselling or be offered vaccination.

The issuance of a national recommendation should be sustained by active and continuous engagement of healthcare providers to ensure its effective translation into practice.

Awareness and Acceptance and pregnant women and women of reproductive age

A study conducted among 401 pregnant women in the Taif region of Saudi Arabia found that only 3.7% had received the Tdap vaccine during previous pregnancies. Most participants at all educational levels did not believe in the safety of vaccination during pregnancy as fundamental misconceptions about vaccine safety during

[24] F. S. Alshahrani, A. N. Elnawawy, and A. M. Alwadie, “Awareness and Acceptance of Pertussis Vaccination Among Pregnant Women in Taif Region, Saudi Arabia: A Cross-Sectional Study,” *Cureus*, vol. 15, no. 7, p. e41726, Jul. 2023, doi: 10.7759/cureus.41726.

pregnancy were widespread. Women without college degrees, those unemployed, or not receiving regular salaries were less likely to intend to vaccinate[18].

Evidence from single national studies and systematic review on the Pertussis burden of diseases in the EMR indicate that a large proportion (30–60%) of women of reproductive age across the EMR have limited or incorrect knowledge about pertussis disease, its transmission, and the protective role of Tdap vaccination[6]. These knowledge gaps are similar to those observed worldwide, being particularly pronounced in rural communities with limited access to health information, underserved populations with lower socioeconomic status and educational attainment as well as areas with weak health systems where routine antenatal care may not include comprehensive vaccine counselling.

Common knowledge deficits:

- Lack of awareness that pertussis is a serious disease for infants
- Misunderstanding about how pertussis spreads
- Incorrect beliefs that pertussis is only a childhood disease
- Confusion about timing and safety of vaccination during pregnancy
- Assumption that natural immunity is sufficient
- Distrust — whether based on historical experiences or misinformation — creating resistance

Higher education and socioeconomic status were shown to correlate with greater acceptance for maternal Tdap. Similarly, women who recognized the potential threat posed by pertussis to newborns were more likely to accept vaccination[19]. Confidence in vaccine safety during pregnancy is also strong predictor of acceptance[21].

Addressing the vaccine hesitancy requires targeted, culturally tailored communication strategies rather than generic vaccine promotion, with a focus on directly addressing the specific safety concerns and perceptions prevalent within each community.

Pertussis maternal immunization provides a good opportunity for updating the national communication strategy to enhance awareness and vaccine demand creation, underlining the safety and effectiveness of maternal Tdap vaccination for both mothers and infants.

National communication strategies and country-specific interventions are warranted to clearly convey to the public that Tdap is not a new vaccine, but rather a substitution of the maternal Td vaccination with Tdap.

Healthcare advice and vaccine confidence

Studies show that 78% to 93% of pregnant or postpartum women say they would receive a vaccine recommended by their provider, regardless of influence from other sources such as family, friends or online resources[25]. Healthcare providers who are adequately trained, empowered, and consistently motivated to recommend Tdap at every antenatal visit serve as critical amplifiers of program impact. Conversely, providers who lack awareness of recommendations or are hesitant to advocate for vaccination represent missed opportunities that cannot be effectively compensated for through other communication channels alone.

Social and Cultural Barriers:

Social and Cultural Barriers are common for other vaccines recommended during pregnancy[26]:

- Stigma and community judgment about vaccination during pregnancy
- Widespread myths about vaccine side effects amplified through social media
- Patriarchal decision-making structures where women lack autonomy over health decisions
- Restrictions on women's mobility limiting access to healthcare facilities
- Traditional views that pregnancy is a "natural" state requiring no medical intervention
- Cultural taboos about discussing pregnancy and reproductive health

The main pillar for scaling up vaccination uptake would be strengthening risk communication and community engagement, as well as sensitization of target community and healthcare workers about the importance of vaccinating with Tdap at every pregnancy.

Emphasizing that this is an extended use of an already existing vaccine with well-documented safety and effectiveness, particularly for infants, is a message that needs to be continuously communicated to all target audience including pregnant women, their partners and their families, OB/GYN, midwives, vaccinators, etc..

Policy and Healthcare System Limitations:

- Inconsistent national policies — lack of clear, universal recommendations across the region
- Poor integration of Tdap into antenatal care protocols
- Poorly performing antenatal care country programs

[25] Healy CM. Pertussis vaccination in pregnancy. *Hum Vaccin Immunother.* 2016;12(8):1972–1981. doi:10.1080/21645515.2016.1171948.
[26] V. Male and C. E. Jones, “Vaccination in pregnancy to protect the newborn,” *Nat. Rev. Immunol.*, vol. 25, no. 9, pp. 649–661, Sep. 2025, doi: 10.1038/s41577-025-01162-5.

- Insufficient funding and limited budget allocation for maternal immunization programs
- Healthcare worker training gaps — providers lack knowledge and skills to counsel and administer maternal vaccines
- Supply chain challenges — inconsistent vaccine availability at service delivery points
- Fragmented services — immunization and antenatal care often operate as separate programs

Individual Barriers:

- Knowledge gaps about pertussis severity and Tdap safety
- Safety concerns about potential harm to the fetus or pregnancy complications
- Limited autonomy in health decision-making

Technical Guidance For Implementing Maternal Tdap Vaccination With Governance Framework

Maternal immunization platforms are already established across the EMR, particularly for tetanus-diphtheria (Td) vaccination during pregnancy. Healthcare providers are experienced in administering vaccines to pregnant women, and existing cold chain systems are designed to accommodate maternal vaccines. Antenatal care (ANC) service delivery platforms already incorporate vaccination checkpoints, and routine health information systems capture maternal immunization data.

The introduction of Tdap vaccination during pregnancy should not be classified as a novel vaccine deployment; rather, it is an extension of an existing, well-established vaccine to a new target population.

This distinction is operationally significant, as it substantially reduces complexity across key implementation domains, including regulatory approval processes, healthcare provider training, and risk communication. Accordingly, the foundational infrastructure is in place; implementation of Tdap requires targeted adaptation and integration rather than the development of new systems.

The technical guidance is organized into five sequential but overlapping phases, from initiation to full program operation, with ongoing monitoring and evaluation thereafter.

This timeframe represents an optimal scenario of 15 months; in practice, the duration may extend depending on country-specific factors, including institutional capacity, availability of financial resources, regulatory processes, and operational readiness.

Each phase has defined objectives, key activities, responsible entities, and measurable deliverables. The governance framework runs across all phases, providing the coordination architecture that holds the program together.

Key implementation advantages that simplify this roadmap:

- The vaccine is already included in national Expanded Programme on Immunization (EPI) schedules and has a well-established safety profile
- Existing maternal Td vaccination platforms provide a ready-to-use delivery infrastructure

- Existing cold chain and supply chain systems can be utilized with minimal adaptation
- No new infrastructure is required, as delivery can be integrated into established antenatal care (ANC) platforms
- Regulatory approval pathways are more streamlined compared to those required for new vaccine introductions
- Comprehensive evidence has already been synthesized by EMPHNET, eliminating the need for additional systematic reviews[6]
- Regional implementation experiences (e.g., Oman, Bahrain, Tunisia) offer directly applicable operational templates
- Recommendations on bolstering regional efforts towards strengthening maternal Tdap immunization in the EMR has been put forward by EMPHNET[27].

Phase 1: Policy and Decision-Making

A. Objective

Securing a formal national policy recommendation for maternal Tdap vaccination, grounded in the existing evidence base and adapted to the national context, with a clear pathway to ministerial decision and budget commitment.

B. Practical Steps

Applying the Evidence-to-Recommendation (EtR) Framework

The Evidence-to-Recommendation (EtR) framework is the World Health Organization (WHO) methodology used by National Immunization Technical Advisory Groups (NITAGs) to convert scientific evidence into policy recommendations. For maternal Tdap vaccination, countries are not required to undertake new systematic reviews, as the EMPHNET evidence base already provides pre-synthesized, high-quality evidence that can be directly adapted into national EtR frameworks[6] (Table 7).

Structured networking and capacity-building initiatives should be leveraged to facilitate knowledge exchange, promote peer learning, and accelerate uptake where needed. Targeted support should focus on clearly defined gaps, strengthening technical capacity, enhancing evidence interpretation, and streamlining decision-making processes.

[27] Haddad, N., Munoz, F., Mohseni, E. *et al.* A key to combating pertussis through maternal immunization in the Eastern Mediterranean Region: recommended action points from the Expert Network Meeting (ENM) on pertussis maternal immunization. *J Health Popul Nutr* (2026). https://doi.org/10.1186/s41043-026-01413-8

Adapt EMPHNET Evidence to National Context (Weeks 1–6)

Review EMPHNET systematic review findings and extract relevant meta-analyses on safety and efficacy
Identify national burden data to complement regional evidence
Document country-specific epidemiological context

Complete National EtR Template (Weeks 5–10)

Use WHO EtR template adapted for national context
Populate with EMPHNET evidence for each domain
Add country-specific considerations: equity, feasibility, resource use, values and preferences

NITAG Deliberation and Recommendation (Weeks 9–14)

Present completed EtR to NITAG with structured agenda
Facilitate deliberation on each domain
Formulate recommendation (strong or conditional) with documented rationale

Documentation and Dissemination (Weeks 13–16)

Document rationale and decision process for transparency
Prepare executive summary for Ministry of Health leadership
Communicate recommendation to all relevant stakeholders)

Table 7. How EMPHNET documents map to EtR domains

EtR Domain	EMPHNET Resource	National Application
Problem Priority	EMPHNET Systematic Review + "The Way Forward" [6-23]	Regional pertussis epidemiology; disease burden in infants <6 months
Benefits & Harms	EMPHNET Systematic Review + "The Way Forward"	Comprehensive effectiveness, impact, and safety evidence
Evidence Certainty	EMPHNET Systematic Review	Pre-assessed evidence quality; solid global evidence base
Values & Preferences	Country-specific assessment required	To be assessed nationally through surveys or consultations
Resource Use	Simplified national budget impact analysis	Focus on budget impact rather than full cost-effectiveness modeling
Equity	"The Way Forward" + Country assessment	Global experiences plus national equity considerations
Acceptability	"The Way Forward" + Country assessment	Regional implementation experiences plus national context
Feasibility	"The Way Forward" + Country assessment	Implementation experiences from comparable countries

Countries are required to undertake context-specific assessments, including cost and resource use analysis, evaluation of local values and preferences, examination of equity implications, and determination of national feasibility.

NITAG Capacity Strengthening

Strengthening Technical Expertise

- Integrate obstetrics and gynecology (OBGYN) specialists as permanent or ad hoc members of National Immunization Technical Advisory Group structures
- Ensure representation of neonatology and antenatal care (ANC) focal points in technical deliberations
- Engage pediatric infectious disease experts to support evidence interpretation and risk assessment
- Utilize EMPHNET's consolidated evidence synthesis to avoid duplication of systematic review processes

Data Access and Review Systems

- Institutionalize quarterly Expanded Programme on Immunization (EPI) coverage dashboards for systematic NITAG review
- Present routine pertussis surveillance summaries at each NITAG session to support evidence-informed decision-making
- Conduct periodic assessments of diagnostic capacity and data quality assurance mechanisms

- Establish linkages with national statistical systems to ensure accurate denominator estimation and coverage calculations

Financing and Cost-Effectiveness Considerations

Given the low cost of Tdap vaccine, extensive global evidence of impact, and use of existing infrastructure, complex cost-effectiveness studies are not necessary. Countries should focus on a simple budget impact analysis and leverage existing economic evidence from comparable settings.

Why full cost-effectiveness studies may not be required:

- Vaccine cost is relatively low compared to other new vaccine introductions
- Extensive global evidence already demonstrates cost-effectiveness
- Regional countries (Oman, Bahrain, Tunisia) are already implementing successfully
- Primary costs are vaccine procurement — other costs are minimal due to the existing platform
- Demonstrated health impact (preventing infant deaths and hospitalizations) provides a clear value proposition

Simplified economic assessment — four components:

- **Basic Budget Impact Analysis:** Estimate total vaccine costs based on the number of pregnant women, plus small additional costs for using existing antenatal care (ANC) systems. This includes limited expenses for refresher training, communication/IEC materials, and minor adjustments to delivery and logistics within current services.
- **Comparison with Treatment and Response Costs:** Compare program costs with the much higher costs of treating infant pertussis cases, including hospital care, ICU admissions, and routine clinical management. Also include costs of outbreak response activities and indirect costs such as lost caregiver productivity and household financial burden.
- **Use of Existing Evidence:** Rely on available economic studies from similar countries and settings, along with World Health Organization cost-effectiveness guidance. Where possible, use regional experience to avoid duplicating detailed local modelling.
- **Clear Value Proposition:** Highlight that the intervention prevents expensive ICU admissions, reduces infant deaths, and protects the most vulnerable group, while also strengthening routine maternal and child health services.

Key messages for Ministry of Finance engagement:

- This is not a new vaccine introduction requiring substantial investment, but rather an extension of an existing, well-established vaccine to a new target population.
- It leverages existing tetanus-diphtheria (Td) maternal immunization infrastructure, with no need for additional cold chain equipment or new service delivery platforms.



- Incremental costs are minimal, as only refresher-level training is required and existing documentation and reporting systems are already in place.
- The intervention is cost-saving in the long term by preventing high-cost outcomes such as infant pertussis hospitalizations and intensive care unit (ICU) admissions, where prevention is more cost-effective than treatment.
- Regional implementation experience already exists, with multiple countries in the region successfully operationalizing the approach.
- There is strong global evidence supporting return on investment, including endorsement through World Health Organization recommendations.

Phase 2: Governance and Coordination Framework

A. Objective

Establishing a multi-stakeholder governance mechanism to coordinate implementation across all relevant ministries, technical programs, and partner organizations, ensuring clear roles, accountability, and decision-making pathways throughout the process.

This structure should prioritize the use and adaptation of existing institutional arrangements and coordination platforms, rather than creating new bureaucratic layers, to enable efficient integration, faster execution, and reduced administrative burden.

B. Practical Steps

Governance Architecture

The maternal Tdap program should be embedded within existing immunization and maternal health governance frameworks, with clearly defined coordination mechanisms between them.

Maternal Immunization Steering Committee

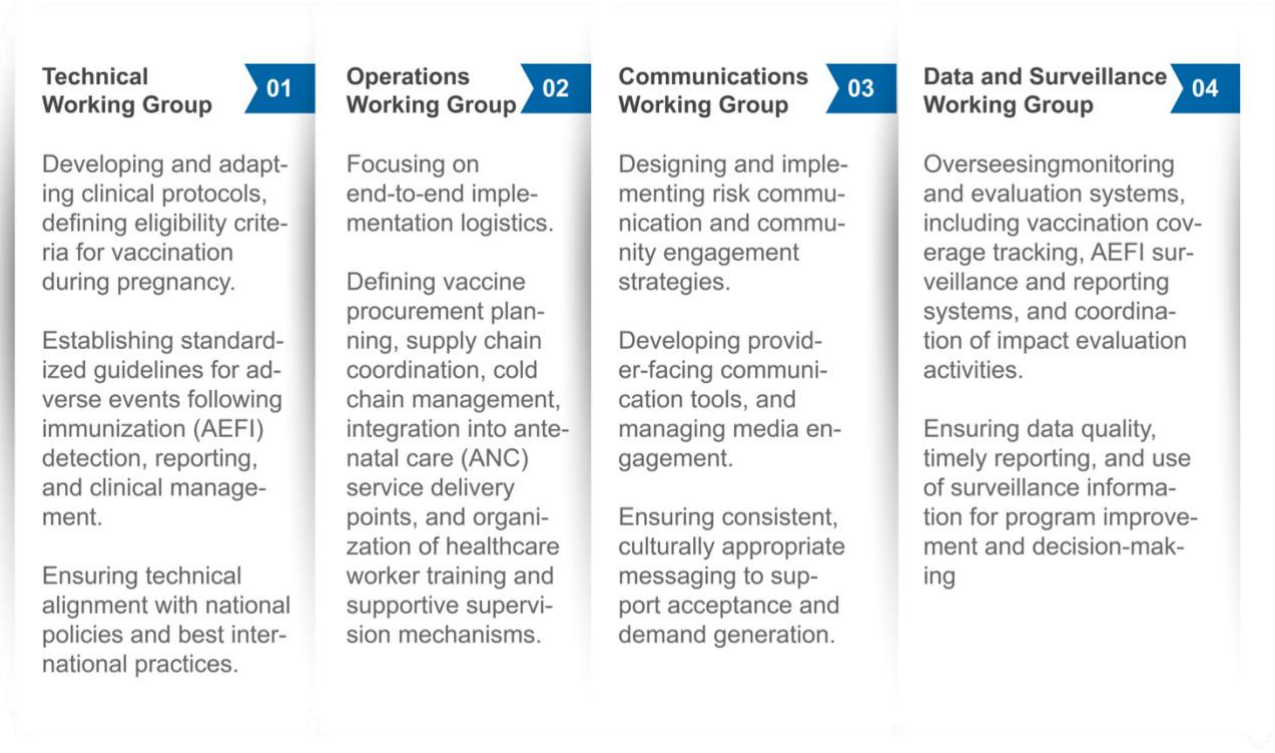
If a maternal immunization technical committee does not already exist, governments are strongly recommended to establish one within existing ones, to oversee and coordinate all aspects of program implementation, ensuring alignment across sectors and timely resolution of operational issues. Where such a structure already exists, it should be expanded to include the relevant proposed stakeholders and functions.

In either case, the technical committee should provide overall strategic guidance and monitor implementation progress. A proposed composition is suggested in the table below.

Table 8. Proposed composition, roles and responsibilities of the Maternal Immunization Technical Committee

Member	Role	Accountability	Primary Responsibilities
EPI Program Director	Chair	Overall program coordination	Vaccine supply, cold chain management, coverage monitoring, AEFI reporting
MCH/ANC Program Director	Co-Chair	Service delivery integration	Service delivery platform, provider counselling, ANC protocol integration
NITAG Secretariat Representative	Technical advisor	Evidence and policy alignment	Provide technical immunization policy advice
Regulatory Authority Representative	Regulatory compliance	Procurement and pharmacovigilance	Procurement authorization, pharmacovigilance, AEFI investigation
National Laboratory Director	Surveillance	AEFI and resistance monitoring	Pertussis confirmation, resistance monitoring, AEFI investigation support
Scientific Society Representative (OBGYN)	Clinical guidance	Provider training and protocols	Clinical guidance development, provider training support, professional endorsement
Communications Unit Lead	Demand generation	Community engagement and messaging	Community campaigns, provider communication, media engagement
Private Sector Liaison (where applicable)	Service delivery alignment	Private sector reporting and integration	Service delivery alignment, data reporting, referral pathways

The Maternal Immunization Steering Committee may be further structured into specialized technical working groups to ensure efficient implementation and clear delineation of responsibilities across key functional areas.



Phase 3: Operational Readiness

A. Objective

Strengthening and preparing the health system for effective implementation by ensuring adequate vaccine stock management, sufficient cold chain capacity, and the development of comprehensive training packages for health care providers.

This should be complemented by enhancements to digital systems to support efficient vaccine management, service delivery, monitoring, and reporting, as well as improvements in denominator estimation to enable accurate target population estimates, coverage calculations, and performance monitoring.

B. Practical Steps

Team Building and Coordination

- **Strengthen ANC–EPI–surveillance coordination:** Strengthen coordination between antenatal care (ANC), the Expanded Programme on Immunization (EPI), and surveillance teams to ensure that maternal vaccination is effectively integrated into routine antenatal services and linked to disease surveillance and monitoring systems.
- **Identify focal points and establish communication mechanisms:** Clear communication channels should be established to ensure timely sharing of

implementation updates, surveillance findings, operational challenges, and decisions among national, subnational, and facility-level stakeholders.

- **Define roles and responsibilities clearly:** Clearly define the roles, responsibilities, and accountability of each stakeholder involved in planning, implementation, monitoring, and evaluation.

Vaccine Stock Management

- **Forecast needs based on ANC attendance:** Estimate vaccine requirements using antenatal care (ANC) attendance data and expected numbers of eligible pregnant women.
- **Establish buffer stocks and distribution schedules:** Maintain appropriate buffer stocks and establish regular distribution schedules to prevent stock-outs and ensure timely vaccine availability.
- **Align procurement with target population estimates:** Align vaccine procurement quantities with reliable target population estimates and projected demand to optimize supply and minimize wastage.

Cold Chain Capacity

- **Regular capacity assessments:** Conduct regular assessments of cold chain capacity to identify gaps in equipment, storage space, and operational capacity.
- **Monitor temperature compliance at ANC sites:** Regularly monitor and document temperature conditions at ANC sites to ensure vaccines are stored within the recommended temperature range.
- **Upgrade equipment where needed:** Upgrade or replace cold chain equipment where gaps are identified to ensure adequate vaccine storage capacity and compliance with required standards.

Training Package Development

- **Develop maternal Tdap-specific training:** Develop a standardized training package tailored to maternal Tdap vaccination, covering key technical, clinical, and operational aspects of implementation.
- **Include eligibility criteria, counseling, and AEFI management:** Ensure the training addresses eligibility criteria, effective counselling and communication with pregnant women, vaccine administration, and the identification, reporting, and management of adverse events following immunization (AEFI).
- **Conduct refresher sessions for all relevant staff:** Conduct regular refresher training sessions for all health care workers involved in antenatal care, immunization, vaccine management, and surveillance to maintain knowledge and implementation readiness.

Digital Systems Enhancement

- **Upgrade ANC registries for vaccination tracking:** Enhance antenatal care (ANC) registries to capture maternal Tdap vaccination status, including vaccination dates, eligibility, and follow-up information.
- **Ensure interoperability between EPI and MCH systems:** Establish interoperability between Expanded Programme on Immunization (EPI) and Maternal and Child Health (MCH) information systems to enable seamless data exchange, reduce duplication, and support accurate monitoring of vaccination coverage.
- **Train healthcare workers on digital tools:** Train relevant healthcare workers on the use of updated digital systems and tools for recording, reporting, tracking, and monitoring maternal Tdap vaccination.

Denominator Estimation Improvement

- **Use ANC attendance data and pregnancy registries:** Use antenatal care (ANC) attendance data and pregnancy registries to generate reliable estimates of the eligible pregnant population and establish accurate vaccination targets.
- **Link with national statistics:** Link population and pregnancy estimate with national statistical systems to improve the accuracy and consistency of target population denominators.
- **Validate completeness and accuracy:** Regularly assess and validate the completeness and accuracy of denominator data to ensure reliable vaccination coverage estimates and support evidence-based program planning.

Phase 4: Service Delivery and Implementation

A. Objective

Integrating maternal Tdap vaccination into routine antenatal care (ANC) services, ensuring that eligible pregnant women receive vaccination as part of standard ANC care in a timely, accessible, and sustainable manner.

B. Practical Steps

ANC Schedule Integration

- **Add Tdap to routine ANC checklists:** Incorporate Tdap vaccination into routine ANC checklists to ensure that vaccination eligibility and status are assessed during each relevant visit.



- **Optimal timing: 27–36 weeks gestation:** Ensure that eligible pregnant women are offered Tdap during the recommended 27–36-week gestational window, in line with national guidelines.
- **Coordinate with existing ANC visits:** Align Tdap vaccination with scheduled ANC visits to minimize additional visits and facilitate timely vaccination.
- **Ensure vaccine availability at all ANC sites:** Maintain adequate Tdap vaccine availability at all ANC sites to support uninterrupted access and prevent missed vaccination opportunities.

Healthcare Worker Preparation

- **Train midwives, obstetricians, and ANC nurses:** Provide targeted training to all health care providers involved in ANC and maternal vaccination to ensure they have the knowledge and skills required for effective Tdap delivery.
- **Focus on eligibility assessment and counseling:** Strengthen providers' capacity to assess vaccination eligibility and provide clear, evidence-based counseling to pregnant women on the benefits, safety, and timing of Tdap vaccination.
- **AEFI recognition and management:** Train health care workers to recognize, document, report, and appropriately manage adverse events following immunization (AEFI), in accordance with national protocols.
- **Documentation and reporting procedures:** Ensure that health care workers are familiar with standardized procedures for documenting Tdap vaccination and reporting vaccination data through existing health information and immunization systems.

Implementation Readiness Indicators

Indicators specific to the readiness of maternal immunization form are further developed in the WHO Maternal immunization country readiness: a checklist approach[28] [21].

Table 8. Implementation of Readiness Assessment Framework

Domain	Indicator
Policy framework	Clear national recommendations established
Healthcare system	Integration into antenatal care protocols
Provider capacity	Training programs operational

[28] M. L. Giles, E. M. Mason, P. Lambach, and C. Mantel, "Maternal immunization country readiness: a checklist approach," *Hum. Vaccines Immunother.*, vol. 16, no. 12, pp. 3177–3183, Dec. 2020, doi: 10.1080/21645515.2020.1750248.

Supply chain	Vaccine availability assured
Surveillance	AEFI monitoring systems functional
Communication	Culturally appropriate campaigns launched and pertussis lab based surveillance improved
Data systems	Coverage tracking and monitoring operational

Community Engagement and Communication

- **Promote risk communication and community engagement:** Revise Risk Communication and Community Engagement plans and activities, as well as Information, Education, and Communication materials and key dissemination messages, to ensure alignment with program objectives and target population needs.
- **Address cultural and gender-based barriers with community engagement** — Engage key community stakeholders — including religious leaders, women's organizations, and community health workers — and develop culturally appropriate messaging that frames vaccination as a component of maternal responsibility (e.g., "protect the baby before birth"). In settings where a well-established Td vaccination programme is already in place, transitioning to Tdap is not expected to require an extensive communication strategy, given the comparable safety profiles of the two vaccines. In addition, Tdap has been widely implemented globally, with substantial evidence supporting its safety and effectiveness. Consequently, communication activities can be streamlined and focused on reinforcing existing evidence and programme continuity, rather than positioning Tdap as a newly introduced vaccine.
- Key Messages should focus on Safety for mother and baby, Protection for newborns, optimal timing importance and Integration with routine care

AEFI Surveillance Integration

- **Ensure robust surveillance before rollout:** Strengthen baseline surveillance systems in-parallel with rollout to enable timely detection and monitoring of pertussis trends and potential vaccine-related safety signals.
- **Link ANC facilities to the national AEFI system:** Ensure that all ANC facilities are connected to the national AEFI surveillance and reporting system to facilitate timely identification, notification, investigation, and follow-up of adverse events.
- **Prepare communication plans for safety concerns:** Develop clear communication plans and key messages to address potential vaccine safety concerns and support timely, consistent, and evidence-based communication with health care providers and communities.

- **Establish rapid response mechanisms:** Establish mechanisms for the rapid investigation, risk assessment, and management of reported safety events to enable timely and coordinated responses.

Phase 5: Monitoring, Evaluation and Continuous Improvement

A. Objective

Establishing a robust performance monitoring system to track implementation progress, assess vaccination coverage and program outcomes, and identify areas requiring corrective action.

B. Practical Steps

Key Performance Indicators

Coverage Indicators

- Tdap coverage by trimester
- Coverage by geographic area
- Coverage by age group and parity

Quality Indicators

- Missed opportunities for vaccination
- Stock-out frequency and duration
- Cold chain compliance rates
- AEFI reporting rates

System Performance

- **ANC–EPI coordination effectiveness:** Monitor the effectiveness of coordination between ANC and EPI teams to ensure seamless planning, service delivery, and follow-up.
- **Healthcare worker confidence levels:** Assess healthcare workers' confidence and readiness to deliver maternal Tdap vaccination and address questions or concerns from pregnant women.
- **Community acceptance rates:** Monitor community acceptance of maternal Tdap vaccination to identify perceptions, concerns, and barriers that may affect uptake.

Post-Introduction Evaluation (PIE)

Conduct at 6-12 months post-implementation to assess coverage, safety, acceptability, identify implementation challenges, and recommend program adjustments.

Share regional data to support other countries' decision-making

Facilitate the systematic sharing of regional data to inform country-level decision-making by establishing a structured regional learning network. Countries with established programs — such as Oman and Bahrain — should be leveraged as implementation models for countries in earlier planning stages, including Iraq, Libya, and Jordan

Conclusion

This strategic roadmap emphasizes that introducing Tdap vaccination in pregnant women is a **simplified extension of existing vaccine programs** rather than a complex new vaccine introduction.

Key simplifications:

1. **Existing Td platform** provides ready infrastructure
2. **EMPHNET evidence** will reduce efforts and save time
3. **EtR framework** can be populated with pre-analyzed evidence
4. **Regional experiences** inform feasibility and acceptability
5. **Low vaccine cost** means complex cost-effectiveness studies are unnecessary
6. **Exceptional impact (90-95% effectiveness)** provides compelling value proposition

The exceptional impact of maternal Tdap vaccination - preventing up to 90-95% of pertussis cases in young infants during their highest mortality risk period - makes this one of the most cost-effective interventions for preventing infant deaths.

By leveraging established systems, infrastructure, expertise, and **comprehensive evidence already compiled by EMPHNET**, countries can efficiently implement this life-saving intervention while protecting newborns from

For policymakers, the strategic value of maternal Tdap vaccination extends well beyond pertussis control. Implementing this program strengthens the broader maternal immunization infrastructure, providing a platform to accommodate future maternal vaccines such as RSV and optimized influenza immunization. Investments in provider training, supply chain adaptation, and communication strategies for Tdap build institutional capacity that benefits the entire maternal immunization program. This multiplier effect ensures that the overall return on investment from maternal Tdap introduction surpasses its direct impact on pertussis alone.

The convergence of these findings presents a compelling opportunity for action. The documented regional resurgence, clear identification of vulnerable populations, strong regional and global evidence, demonstrated, evidence of rapid impact, and improved understanding of awareness gaps and barriers all lead to the same conclusion: implementation should not be delayed.

Countries that postpone action will continue to face preventable infant mortality from a disease for which a safe, effective, and affordable preventive strategy is readily available.