



FROM MIRACLES TO MISTRUST: VACCINE HESITANCY IN THE DIGITAL ERA

Prof. Sheldon L. Kaplan's call for vaccine education

May
2025



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Dr. Sheldon L. Kaplan is Professor of Pediatrics-Administration at Baylor College of Medicine in Houston, Texas, where he serves as Head of the Section of Infectious Diseases in the Department of Pediatrics. He is also Chief of the Infectious Disease Service at Texas Children's Hospital.

A Missouri native, Prof. Kaplan earned his medical degree from the University of Missouri-Columbia School of Medicine. He completed his pediatric residency and a fellowship in Pediatric Infectious Diseases at St. Louis Children's Hospital and Washington University School of Medicine. He is board certified in both Pediatrics and Pediatric Infectious Diseases.

Prof. Kaplan's research focuses on serious pediatric infections, particularly those caused by *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Neisseria meningitidis*. He is actively involved in evaluating new antibiotics for children with infections due to drug-resistant bacteria.

A prolific contributor to the field, Prof. Kaplan has authored over 250 peer-reviewed articles and more than 140 invited publications, including book chapters and reviews. He has co-edited the 5th through 8th editions of *Feigin and Cherry's Textbook of Pediatric Infectious Diseases*, and currently serves as Editor-in-Chief of *Pediatrics*. He is also Co-Editor of the Pediatric Infectious Diseases section for *UpToDate*®

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LETTER FROM EDITOR

WELCOME TO OUR 11TH ISSUE OF VACCINES BEAT AND SUBSCRIBE FOR FREE!

In our *Coffee with the Expert* section, we were honored to have a conversation with Professor Sheldon Kaplan.

Professor Kaplan earned his MD from the University of Missouri–Columbia School of Medicine, followed by a residency in Pediatrics and a fellowship in Pediatric Infectious Diseases at Washington University School of Medicine.

He has built an exceptional career in Pediatric Infectious Diseases and vaccine-preventable illnesses, with a particular focus on infections caused by *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Neisseria meningitidis*. His work includes evaluating new antibiotics for children with drug-resistant infections, as well as studying the impact and effectiveness of pneumococcal and meningococcal conjugate vaccines in preventing invasive diseases in children.

Professor Kaplan has authored hundreds of scientific publications, served as Chief Editor of *Pediatrics*, and held the role of President of the Pediatric Infectious Diseases Society (USA). He currently serves as Professor of Pediatrics–Administration at Baylor College of Medicine in Houston, Texas.

Professor Kaplan discussed various factors contributing to vaccine hesitancy, its serious consequences, and potential strategies to address and overcome it.

In this edition's Editor's Corner, we explore the evolving global landscape of meningococcal disease and examine the current state of vaccine development and implementation.

In our Best Practice section, we offer a comprehensive analysis of the immense malaria burden in Africa, highlighting how the two currently available vaccines are helping to alleviate the crisis. We also explore the ongoing and future needs in the fight against this devastating disease.

As always, this issue features carefully curated and up-to-date information on the 'Latest Scientific Publications' along with the most recent and important 'News and Alerts'.

We hope you find this May issue both informative and engaging, and we look forward to continuing this shared commitment to advancing global health and building a healthier planet.



Enrique Chacon-Cruz, M.D., MSc
Chief Editor



Enrique Chacon-Cruz

Enrique Chacon-Cruz, M.D., MSc, Mexican-born medical doctor with a degree from Guadalajara, Mexico, and further specializations in Pediatrics and Infectious Diseases from institutions in Mexico City and the USA (Eastern Virginia Medical School). He also holds a Master's degree in Vaccinology and Drug Development from the University of Siena, Italy.

He is an Overseas Fellow of the Royal Society of Medicine of the United Kingdom and a member of several international associations in Infectious Diseases. Currently, he is the CEO and Founder of "Think Vaccines" (Research, Education, and Consultancy for Vaccines and Vaccinology) based in Houston, Texas.

With over 140 research items published and/or presented at international meetings and more than 500 international lectures, all focused on vaccines, vaccination, clinical trials, and vaccine-preventable diseases. The latter conducted independently or in association with the Centers for Disease Control and Prevention (CDC), the University of California in San Diego, Eastern Virginia Medical School, and several other institutions.

Additionally, he is a member of the Mexican Committee for the Elimination of Measles, Rubella, and Congenital Rubella, and the Scientific Committee on Health Issues of the Mexican Government in Baja-California. He is also the former Director of the Mexican Active Surveillance Network for Bacterial Meningitis and the former Head of the Pediatric Infectious Diseases Department and the Research Department at the General Hospital of Tijuana, Baja-California, Mexico.

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Coffee with the Expert

FROM MIRACLES TO MISTRUST: VACCINE HESITANCY IN THE DIGITAL ERA

Prof. Sheldon L. Kaplan's call for vaccine education

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Dr. Sheldon L. Kaplan is Professor of Pediatrics at Baylor College of Medicine in Houston, Texas, where he served as Head of the Section of Infectious Diseases in the Department of Pediatrics from 2008 to 2023 and Chief of the Infectious Disease Service at Texas Children's Hospital from 1981 to 2023.

A Missouri native, Prof. Kaplan earned his medical degree from the University of Missouri-Columbia School of Medicine. He completed his pediatric residency and a fellowship in Pediatric Infectious Diseases at St. Louis Children's Hospital and Washington University School of Medicine. He is board certified in both Pediatrics and Pediatric Infectious Diseases.

Prof. Kaplan's research focuses on serious pediatric infections, particularly those caused by *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Neisseria meningitidis*. He is actively involved in evaluating new antibiotics for children with infections due to drug-resistant bacteria.

A prolific contributor to the field, Prof. Kaplan



has authored over 250 peer-reviewed articles and more than 140 invited publications, including book chapters and reviews. He has co-edited the 5th through 9th editions of *Feigin and Cherry's Textbook of Pediatric Infectious Diseases*, and currently serves as Editor-in-Chief of *Pediatrics* and Co-Editor of the Pediatric Infectious Diseases section for *UpToDate*®.

Prof. Kaplan is a Past President of the Pediatric Infectious Diseases Society and has held key roles with the U.S. Food and Drug Administration and the American Board of Pediatrics, including chairing the Subboard of Pediatric Infectious Diseases.

He has received numerous accolades for his leadership and dedication to education, including the Arnold J. Rudolph Baylor Pediatric Award for Lifetime Excellence in Teaching (2011), the Distinguished Award for Education from the European Society for Paediatric Infectious

Diseases (2019), the Distinguished Physician Award from the Pediatric Infectious Diseases Society (2019) and the Award for Lifetime Contribution to Infectious Diseases Education from the Section on Infectious Diseases, American Academy of Pediatrics (2023). In recognition of his career and contributions, an Endowed Chair in his name has been established in the Department of Pediatrics at Baylor College of Medicine.

Vaccine hesitancy and its consequences

While some countries enforce mandatory vaccination policies, others allow exemptions based on a broader range of criteria. Previously, exemptions were typically limited to medical contraindications or documented religious beliefs. However, in recent years, personal belief exemptions—often based on non-scientific or loosely defined reasons—have become more common. This shift has led to geographic clusters of unvaccinated children, increasing the risk of vaccine-preventable disease outbreaks.

Despite decades of robust data confirming the safety and effectiveness of vaccines, vaccine hesitancy and refusal persist in certain groups. Religious objections and concerns about vaccine safety remain two of the most cited reasons for opting out of vaccination.

A significant turning point in the modern anti-vaccine movement, according to Prof. Kaplan, was the now-discredited claim linking the MMR (measles, mumps, rubella) vaccine to autism. This claim, originally published by Dr. Andrew Wakefield in *The Lancet*, was later retracted, but its impact continues to influence public perception. Another common concern among hesitant parents is the idea that administering multiple vaccines simultaneously might overwhelm a child's immune system.

“We know that from almost every scientific study that’s been done, that these vaccines are studied carefully. They’re safe and effective,” says Prof. Kaplan. To help parents understand the importance of vaccination, he often discusses the serious potential consequences of vaccine-preventable diseases. For example, pneumococcal meningitis—a condition preventable through vaccination—can lead to long-term complications, including hearing loss.

Prof. Kaplan emphasizes the goal of preventing pneumococcal infection and reassures parents that the pneumococcal vaccine is both safe and highly effective. Beyond protecting against invasive disease, it can also reduce the risk of conditions like acute otitis media and possibly acute sinusitis. “There are many benefits to the vaccine,” he notes, “with virtually no risk of adverse effects.”

“Not that they’re necessarily at increased risk, but why would you want to take any chance at all for your child to have another severe pneumococcal infection when it could be potentially prevented?” he points out.

The Internet and misinformation

The internet has given a platform to individuals without medical credentials to speak with unwarranted authority on important health issues—often with serious consequences. Under the guise of promoting science, many use this space to share personal opinions or unverified claims, lacking the medical expertise necessary to guide public understanding.

“Clearly the internet is a major factor in the spread of misinformation. It may be why we didn’t see this back in the 1970s, 1980s and 1990s— before the internet was developed. So unfortunately, on the internet, there’s no definite screen for accuracy,” Prof Kaplan points out.

Today, physicians often encounter patients who have searched the internet extensively, arriving at medical appointments with preconceived notions, self-diagnoses, and misinformation. This trend complicates the patient-physician relationship and undermines evidence-based guidance.

“So, without a doubt, the internet is a major factor in vaccine hesitancy,” Prof. Kaplan concludes.

Vaccine miracles

Despite overwhelming scientific and historical evidence that vaccines represent one of the greatest breakthroughs in preventing serious infectious diseases in both children and adults, Prof. Kaplan observes a growing distrust in the medical community and science more broadly.

He cites *Haemophilus influenzae* type b (Hib) as a striking example of the transformative power of

vaccines. “Before the H flu type b vaccine in our hospital, Texas Children’s Hospital, it would not have been uncommon to have two or three kids admitted every single night with H flu meningitis, H flu septic arthritis, maybe an epiglottitis. We used to have 150 kids a year admitted with invasive H flu type b disease,” he recalls.

The introduction of the conjugate Hib vaccine in the early 1990s changed everything.

“It was like a miracle. And the vaccine was so successful that I don’t see how anybody could want to not have their kid immunized to prevent H flu meningitis, which causes deafness in maybe 8 to 10% of kids, 5% of the kids die, maybe 15% of the kids have some serious intellectual deficit, maybe even hemiparesis or some other injury to their brain,” he states.

In the case of measles, emergency departments in children’s hospitals were once common sites of exposure. A child presenting with fever could sit in a waiting room with others before measles was even suspected—putting many others at risk.

“So, if we have everybody vaccinated, for the most part, or 95% of people vaccinated or kids vaccinated, those kinds of issues don’t pop up,” he notes.

Prof. Kaplan encourages families to speak with their pediatricians or family physicians and to seek information from reliable sources. He highlights the American Academy of Pediatrics (AAP) as a trusted resource, noting that the *Red Book*—the AAP’s authoritative guide on over 200 pediatric infectious diseases—has, for the past five years, included guidance on how healthcare providers can effectively communicate with vaccine-hesitant families. He emphasizes the importance of educating parents about the real risks of these diseases as a critical priority.

“They’ve never seen a kid who’s miserable with measles, or they don’t know anyone who’s ever had chickenpox. They’re not aware of anybody who’s had meningitis, bacterial meningitis,” he shares.

Are doctors losing the battle against anti-science?

One challenge in the fight against misinformation is that physicians are not typically trained as communicators. As a result, their ability to effectively convey complex scientific concepts may be limited—leaving space for misinformation to take hold and spread within public discourse.

“When someone asks us about how good vaccines are, we show data. They don’t care about the data. They don’t even understand the data,” Prof. Kaplan wonders. “It really is mysterious. I don’t quite understand it.” His observation underscores a growing disconnect between scientific evidence and public perception.

To address this divide, Prof. Kaplan believes there is a pressing need for improved communication strategies, stronger political will, and enhanced international cooperation.

“Clearly, infections in one part of the world can infect another part of the world very quickly,” he points out. “There’s no question that if there could be some more global approach to vaccine education, it would be certainly advantageous.”

The public health costs of vaccine-preventable diseases are also significant. Every illness requires resources for treatment, contact tracing, and containment—expenses that could be avoided with widespread immunization.

“And worldwide, I guess, if you multiply that all around the world, you could imagine how much money we’re spending that could be used for other purposes if everybody was immunized properly,” he concludes.



News & Alerts

MOST RELEVANT MONTHLY NEWS ON VACCINATION AND EMERGING DISEASES WITH BIBLIOGRAPHIC ALERTS

A summary of the latest News & Alerts in the fields of vaccinology, vaccines, vaccination, and vaccine-preventable diseases. We curate the latest information on regulatory updates, emerging trends, breakthroughs in vaccine technology, vaccine safety and efficacy, global immunization developments and outbreak alerts, as a resource to keep our community informed.

WHO's "World Health Assembly adopts historic Pandemic Agreement to make the world more equitable and safer from future pandemics".

-Agreement's adoption follows three years of intensive negotiation launched due to gaps and inequities identified in national and global COVID-19 response.

-Agreement boosts global collaboration to ensure stronger, more equitable response to future pandemics.

-Next steps include negotiations on Pathogen Access and Benefits Sharing system.

Published: May 20, 2025.

<https://www.who.int/news/item/20-05-2025-world-health-assembly-adopts-historic-pandemic-agreement-to-make-the-world-more-equitable-and-safer-from-future-pandemics>.

MEASLES - MOROCCO

Since late 2023, Morocco has been experiencing a widespread measles outbreak. Cases have been recorded across all regions of the country, particularly among children and people who are unvaccinated. In response, the Ministry of Health and Social Protection (MOHSP), in collaboration with relevant sectors, activated the National Center for Public Health Emergency Operations, launched urgent catch-up vaccination campaigns, and strengthened surveillance,

case management, and risk communication and community engagement efforts. Measles is a highly transmissible viral disease that can lead to severe complications and death. While Morocco has made significant progress toward measles elimination, the disease remains endemic in the country. The overall risk is assessed as moderate at the national level and moderate at the regional level, particularly given the risk of cross-border transmission in areas with low vaccination coverage.

Published: 13MAY25

<https://lnkd.in/ddqnwU32> - WHO - DON

Chikungunya - La Réunion and Mayotte

Since August 2024, widespread transmission of chikungunya virus disease has been documented in La Réunion as well as increasing locally transmitted cases in Mayotte. Although chikungunya outbreaks and endemic transmission occur annually in several countries and territories around the world, the Indian Ocean islands have not experienced major outbreaks for nearly two decades. In La Réunion, over 47 500 cases and twelve associated deaths have been reported as of 4 May 2025, with sustained high transmission across the island. In Mayotte, the first locally transmitted cases since 2005-2006 have been detected, raising concern about similar large outbreaks. Public health response measures,

including enhanced surveillance, vector control activities, and novel targeted vaccination efforts, have been implemented to contain the outbreaks, however further outbreak activity in the islands of the Indian Ocean can be expected.

Published: 12MAY25

https://lnkd.in/d3fYHG_E WHO-DON

MERS-CoV – SAUDI ARABIA

Between 1 March and 21 April 2025, the Ministry of Health (MoH) of the Kingdom of Saudi Arabia (KSA) reported nine cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection. Two of these cases died. Among the nine cases, a cluster of seven cases were identified in Riyadh, including six health and care workers who acquired the infection from caring for a single infected patient. The cluster was identified through contact tracing and subsequent testing of all contacts, with four of the six health and care workers being asymptomatic and two showing only mild, nonspecific signs. The notification of these cases does not change the overall risk assessment, which remains moderate at both the global and regional levels. These cases show that the virus continues to pose a threat in countries where it is circulating in dromedary camels and spilling over into the human population. WHO recommends implementation of targeted infection prevention and control (IPC) measures to prevent the spread of health-care-associated infections of MERS-CoV and onward human transmission

Published: 12MAY25

<https://lnkd.in/ddtkpFhc> WHO- DON

“US surpasses 1,000 measles cases in 2025, second worst year since disease was declared eliminated”.

Published: May 7, 2025.

<https://www.cnn.com/2025/05/07/health/measles-cases-one-thousand-us>.

“Epidemiological Update Measles in the Americas Region – 2 May 2025”.

In 2025, between epidemiological week (EW) 1 and EW 16, in the Americas Region, 2,325 measles cases have been confirmed, including four deaths, in Argentina (n= 22), Belize (n= 7), the

Plurinational State of Bolivia (n= 1), Brazil (n= 5), Canada (n= 1,069), Mexico (n= 421 cases, including one death), and the United States of America (n= 800, including three deaths) . This total represents an 11-fold increase compared to the 205 measles cases reported in the same period of 2024.

Published: May 2, 2025.

<https://www.paho.org/en/documents/epidemiological-update-measles-america-region-2-may-2025>.

“Rise in Cases of Preventable Diseases in the Americas (Pertussis)”.

Whooping Cough:

- United States: 8,485 cases have been reported in 2025—double the number from the previous year. Michigan recorded 497 cases, and Louisiana reported two infant deaths in the past six months.
- Mexico: As of April 2025, 809 cases of whooping cough and 48 deaths (all in infants under one year) have been confirmed. The government has implemented vaccination for pregnant women to protect newborns.
- Guatemala: Between January and March 2025, 14 suspected cases and 7 confirmed cases were reported, mainly in the departments of Sacatepéquez and Guatemala.
- Peru: 293 cases of whooping cough have been reported so far this year, with significant outbreaks in the Cusco and Loreto regions.

Published: May 2, 2025.

<https://aldianews.com/en/wellness/investigation/surge-illnesses>.

“Number of suspected measles cases decreased by 4.3% compared to the previous week in Vietnam”.

Since the beginning of 2025, the country has recorded 81,691 suspected measles cases in 63 provinces and cities. Compared to the time with the highest number of cases in the week, the number of cases recorded in the week has decreased by 30%.

Published: April 27, 2025.

<https://www.vietnam.vn/en/so-ca-nghi-mac-soi-giam-4-3-so-voi-tuan-truoc-do>.

“Flying malaria vaccines reach isolated Nigerian communities”. So far, this initiative has helped to reach 20,000 people with the first dose of the malaria vaccine in the state.

Published: April 22, 2025.

<https://www.gavi.org/vaccineswork/flying-malaria-vaccines-reach-isolated-nigerian-communities>.

“Takeda to launch Dengue vaccine in India next year”

Takeda, in partnership with BioE, plans to launch the Qdenga dengue vaccine within a year—an important milestone for a country burdened with thousands of dengue cases.

Published: May 1, 2025.

<https://timesofindia.indiatimes.com/india/dengue-vaccine-qdenga-to-launch-in-india-next-year/articleshow/120676872.cms>.

“Meningococcal Vaccines Market 2025-2032: Public Immunization Programs Drive Global Growth”.

Published: April 29, 2025.

<https://www.openpr.com/news/3991553/meningococcal-vaccines-market-2025-2032-public-immunization>

“Weekly Special Press Briefing on the mpox Outbreak and other Health Emergencies in Africa”.

Published: May 12, 2025.

<https://africacdc.org/news-item/weekly-special-press-briefing-on-the-mpox-outbreak-and-other-health-emergencies-in-africa-27/>.

WHO: “Yellow Fever: Region of the Americas”.

Published: May 16, 2025.

<https://www.who.int/emergencies/disease-outbreak-news/item/2025-DON570>.

“May 19 deadline to send letter to Congress for Lyme and TBD programs”.

Published: May 15, 2025.

<https://www.lymedisease.org/may-19-deadline-congress/>.

“WHO Director-General’s keynote address at the Building a Healthier Asia event – 6 May 2025”.

Published: May 6, 2025.

<https://www.who.int/director-general/speeches/detail/who-director-general-s-keynote-address-at-the-building-a-healthier-asia-event---6-may-2025>

“BactiVac, the Bacterial Vaccines Network”.

BactiVac, the Bacterial Vaccines Network, was established in August 2017 to address this gap. Its mission is to advance vaccine development against global bacterial infections in humans and animals, to reduce disease, death, and antimicrobial resistance, and thereby enhance economic development. BactiVac brings together academia, industry, policymakers and funders from high-income countries (HICs) and low- and middle-income countries (LMICs), in a network of 2060 members from 92 countries, including 51 % from LMICs and 15 % from industry. BactiVac supports vaccine development through Catalyst Project Awards and Catalyst Training Awards. This funding targets bottlenecks and capacity-building in vaccinology, particularly among LMIC early-career researchers.

Vaccine 2025; 57: 127210. <https://doi.org/10.1016/j.vaccine.2025.127210>

Published: May 31, 2025.

<https://www.sciencedirect.com/science/article/pii/S0264410X25005079>

“FDA gives full approval to Novavax COVID shot for high-risk groups”.

The vaccine is now approved for adults aged 65 and older, or for people ages 12 to 64 who have at least one health condition that puts them at higher risk of serious illness from COVID-19. Novavax’s shot is the only protein-based COVID vaccine available in the U.S. Until now, it had only been allowed for emergency use in people 12 and up.

Published: May 19, 2025.

<https://medicalxpress.com/news/2025-05-fda-full-novavax-covid-shot.html>

Latest Relevant Publications

LATEST PUBLISHED PAPERS AND COMMENTARIES FROM THE CHIEF EDITORS

Latest impactful scientific publications that stand out for their potential bearing on healthcare. We introduce groundbreaking research findings, innovative treatment modalities, results from phase 1 to 3 vaccine clinical trials, or paradigm-shifting discoveries that redefine our understanding of infectious diseases and therapeutic approaches for all vaccine-preventable diseases.

01

"Modeling Reemergence of Vaccine-Eliminated Infectious Diseases Under Declining Vaccination in the US".

Published: JAMA 2025; 24:e256495. <https://doi.org/10.1001/jama.2025.6495>

Editorial comment: A simulation model was used to assess the importation and dynamic spread of vaccine-preventable infectious diseases across 50 US states and the District of Columbia. The model was parameterized with data on area-specific estimates for demography, population immunity, and infectious disease importation risk. The model evaluated scenarios with different vaccination rates over a 25-year period. Inputs for current childhood vaccination rates were based on 2004–2023 data. The primary outcomes were estimated cases of measles, rubella, poliomyelitis, and diphtheria in the US. Based on estimates from this modeling study, declining childhood vaccination rates will increase the frequency and size of outbreaks of previously eliminated vaccine-preventable infections, eventually leading to their return to endemic levels.

02

"Modeling the impact of vaccine campaigns on the epidemic transmission dynamics of chikungunya virus outbreaks".

Published: Nat Med (2025). <https://doi.org/10.1038/s41591-025-03684-w>

Editorial comment: An impressive predictive model of lives saved and averted cases –among many other issues– of Ixchiq during an outbreak, using the last outbreak in Paraguay as an example. The authors found that this deployment strategy would have required 2.2 million doses and averted 34,200 (95% CI 30,500–38,100) cases, including 17,100 (95% CI 15,500–19,000) cases with chronic sequelae and 73 (95% CI 65–81) deaths. This is equivalent to 156 cases, 78 chronic cases and 0.33 deaths averted per 10,000 doses, representing 23% of the cases and deaths that occurred. If, by contrast, only 20% of the population had become vaccinated, then the campaign would have averted 11% of the cases and deaths that occurred. In a scenario in which vaccine deployment was only initiated 3 months after the outbreak was detected, a campaign with 40% coverage would have averted 13% of the cases and deaths that occurred. Assuming a higher vaccine efficacy of 98% results in 31% deaths averted (198 cases and 0.42 deaths averted per 10,000 doses used).

03

"Immunogenicity and Safety of Influenza and COVID-19 Multicomponent Vaccine in Adults ≥50 Years. A Randomized Clinical Trial".

Published: JAMA. Published online May 07, 2025. <https://doi.org/10.1001/jama.2025.5646>

Editorial comment: In this phase 3 study, including more than 8,000 participants > 50 years of age in the US, mRNA-1083 elicited noninferior immune responses against standard care immunization: licensed standard-dose or high-dose seasonal influenza vaccine (A/H1N1, A/H3N2, B/Victoria, B/Yamagata) co-administered with licensed SARS-CoV-2 (Omicron XBB.1.5) vaccine. The multicomponent vaccine mRNA-1083 had an acceptable tolerability and safety profile.

04

“BCG Revaccination for the Prevention of *Mycobacterium tuberculosis* Infection.**Published:** N Engl J Med 2025; 392:1789–1800. <https://doi.org/10.1056/NEJMoa2412381>

Editorial comment: In this phase 2b, double-blind, randomized, placebo-controlled trial to evaluate the efficacy of BCG revaccination, as compared with placebo, for the prevention of sustained QFT test conversion (primary end point) in QFT test-negative, human immunodeficiency virus (HIV)-negative adolescents, 1836 participants underwent randomization; 918 received the BCG vaccine, and 917 received placebo. After a median 30 months of follow-up, a sustained QFT test conversion was observed in 62 of 871 participants in the BCG-vaccine group and 59 of 849 participants in the placebo group. The hazard ratio for a sustained QFT test conversion (BCG vaccine vs. placebo) was 1.04 (95% CI, 0.73 to 1.48), for a vaccine efficacy point estimate of -3.8% (95% CI, -48.3 to 27.4). BCG revaccination in QFT-test negative, HIV-negative adolescents did not provide protection from sustained *M. tuberculosis* infection.

05

“Clinical presentation and epidemiological assessment of confirmed human mpox cases in DR Congo: a surveillance-based observational study”.**Published:** Lancet 2025; 405:10490: 1666–75. [https://doi.org/10.1016/S0140-6736\(25\)00152-7](https://doi.org/10.1016/S0140-6736(25)00152-7)

Editorial comment: This is a retrospective observational study, analysing PCR-confirmed mpox cases reported from sentinel health zones in seven provinces between Oct 1, 2023, and Sept 31, 2024 in the DR of Congo. Their results indicate concurrent mpox outbreaks in DR Congo, involving younger individuals, a higher proportion of women and girls, and distinct presentations with higher lesion counts and respiratory symptoms compared with clade 2b lineage B.1 outbreaks. The high proportion of infectious complications and case-fatality rates, especially in endemic regions, emphasise the need for timely antibiotic therapy and targeted vaccination to reduce morbidity and mortality.

06

“Infectious diseases prevention and vaccination in migrants in Latin America: The challenges of transit through the treacherous Darien gap, Panama”.**Published:** Travel Med Infect Dis 2025; 65: 102839. <https://doi.org/10.1016/j.tmaid.2025.102839>

Editorial comment: This review highlights several health challenges associated with the growing migration through Panama, with a particular focus on vaccination.

07

“Country-Specific Data and Priorities for Pertussis in Latin America: Recent Findings From the Global Pertussis Initiative”**Published:** Open Forum Infect Dis;12:ofaf154, <https://doi.org/10.1093/ofid/ofaf154>

Editorial comment: Pertussis continues to pose a considerable public health challenge in Latin America, particularly among infants, and efforts to increase vaccination coverage and strengthen surveillance are crucial to reducing the burden of disease in this region. Indeed, new vaccines reducing carriage and asymptomatic infections are needed on top of increasing coverage of the existing ones.

08

“Dengue virus infection in travellers after dengue vaccination, Germany 2023–2024”**Published:** J Travel Med 2025: taaf037, <https://doi.org/10.1093/jtm/taaf037>

Editorial comment: Authors acknowledge they DO NOT know the absolute number of vaccinations given to travelers in Germany. Cases may also have been reported without the vaccination status (the information on vaccination is only self-reported by cases in Germany) leading to an underestimation of vaccinated dengue cases.

Vaccinated travelers may be more likely to seek health care because they have a higher general health awareness or are less likely to seek care as they assume that they are protected from DENV due to the vaccination...

JC NOTE: MORE TRAVELERS AND FASE 4 DATA ARE NEEDED REPORTING DATA FROM ALL 4 STs.

09

“Characterization of serotype-specific Dengue virus T cell inhibition”

Published: J Infect Dis 2025: jiaf241. <https://doi.org/10.1093/infdis/jiaf241>

Editorial comment: DENV-2 and -3 are associated with more severe clinical disease than DENV-1 and -4; however, no biological explanation for this difference has been previously identified. Authors found that DENV-1 and -4 viral particles and env proteins blunt T cell responses by interfering with proximal TCR signaling while DENV-2 and -3 do not, potentially explaining DENV pathogenic outcomes in primary and secondary infection.

10

“Immunogenicity and safety of two versus three doses of 9-valent vaccine against Human papillomavirus (HPV) in women with HIV: the Papillon randomized trial”

Published: Clin Infect Dis 2025: ciaf241. <https://doi.org/10.1093/cid/ciaf241>

Editorial comment: Median age was 35 years, median CD4 count 649/ μ L, 16 missed M7 visit. In mITT, seroconversion was 97.7% for 2 doses and 97.9% for 3 doses, meeting the predefined non-inferiority criteria. At M7, antibodies titers against all vaccine genotypes were high in both groups (increase by 1.2-2.4 log10). There was no serious adverse event; participants with 3 doses experienced local reaction more frequently (82% versus 60% for 2 doses, $p=0.027$) with significantly more symptoms and longer duration.

In women with well-controlled HIV, 2 doses of HPV 9v-vaccine is non-inferior to 3 doses in terms of seroconversion and is associated with less reactogenicity

11

“Evaluating cross-protection: Meningococcal vaccines show effectiveness in gonorrhoea prevention – A systematic review and meta-analysis”

Published: Vaccine. 2025 May 6;56:127188. <https://doi.org/10.1016/j.vaccine.2025.127188>. Online ahead of print.

Editorial comment: While randomized clinical trials are necessary, the findings of this systematic review and meta-analysis highlight the potential effectiveness of OMV-based vaccines in terms of gonorrhea prevention.

12

“Could Intravenous Immunoglobulin Be an Alternative Therapy for Treating Infant Botulism in Areas Where Human Botulism Immunoglobulin Is Not Easily Available?: Our Experience in Andalusia, Spain”

Published: Pediatr Infect Dis J 2025; 44: e193-8. <https://doi.org/10.1097/INF.0000000000004727>

Editorial comment: IVIG may be an effective treatment for shortening the duration of illness in regions that are not readily accessible for HBIG, but further studies are needed. Although IB is rare, when it is suspected, antimicrobial therapy should be avoided as it may exacerbate paralysis by increasing the availability of neurotoxin for absorption.

13

“Clinical and regulatory development strategies for GBS vaccines intended for maternal immunisation in low- and middle-income countries”.

Published: Vaccine 2025; 127131. <https://doi.org/10.1016/j.vaccine.2025.127131>

Editorial comment: The World Health Organisation (WHO) aims to ensure equitable access to safe, effective, and affordable vaccines of assured quality in LMICs, by facilitating regulatory pathways. An alternate approval pathway, based on safety and an immunological endpoint thought to predict clinical benefit (commonly referred to as serological threshold of risk reduction [SToRR]), is being considered for GBS maternal vaccines. Since this approach is new to many LMICs regulators and policymakers, WHO organized consultative meetings at national, regional, and global levels to discuss the feasibility and potential challenges of approving a GBS vaccine based on safety and immunogenicity data alone. These consultations focused on evidence supporting SToRR, their use as endpoints to infer protection, and post-licensure requirements. The aim of the consultations was to reduce the delay between vaccine development, licensure, policy recommendations and use in high-burden LMICs.

14

“Helicobacter pylori Vaccine: Mechanism of Pathogenesis, Immune Evasion and Analysis of Vaccine Types”.

Published: Vaccines 2025; 13: 526. <https://doi.org/10.3390/vaccines13050526>

Editorial comment: A fine review that elaborates on the pathogenic mechanism and immune evasion mechanism of *H. pylori*, as well as various strategies adopted in vaccine development, including whole-cell vaccines, subunit vaccines, DNA vaccines, and live vector vaccines.

15

“Antibiotics in the global river system arising from human consumption”.

Published: PNAS Nexus, Volume 4, Issue 4, April 2025, pgaf096, <https://doi.org/10.1093/pnasnexus/pgaf096>

Editorial comment: The presence of antibiotics in surface waters poses significant risks to both aquatic ecosystems and human health, primarily due to their toxicity and their role in promoting antimicrobial resistance. Following human consumption and partial metabolism, antibiotic residues are excreted and undergo complex processes of accumulation and degradation as they move from wastewater systems into natural rivers. In a recent predictive modeling study, researchers estimated that approximately 6 million kilometers of rivers worldwide exceed antibiotic concentration thresholds considered safe for ecosystems and resistance prevention, particularly during periods of low streamflow. The main contributors to this pollution were identified as amoxicillin, ceftriaxone, and cefixime. Alarming, these findings suggest that human antibiotic consumption alone presents a considerable threat to rivers across all continents, with Southeast Asia experiencing the most extensive impact. With global antibiotic use having increased rapidly over the past 15 years—especially in low- and middle-income countries—there is an urgent need for new strategies to safeguard water quality and protect both human and environmental health.

16

“BactiVac, the Bacterial Vaccines Network”.

Published: Vaccine 2025; 57: 127210. <https://doi.org/10.1016/j.vaccine.2025.127210>

Editorial comment: BactiVac, the Bacterial Vaccines Network, was established in August 2017 to address this gap. Its mission is to advance vaccine development against global bacterial infections in humans and animals, to reduce disease, death, and antimicrobial resistance, and thereby enhance economic development. BactiVac brings together academia, industry, policymakers and funders from high-income countries (HICs) and low- and middle-income countries (LMICs), in a network of 2060 members from 92 countries, including 51 % from LMICs and 15 % from industry. BactiVac supports vaccine development through Catalyst Project Awards and Catalyst Training Awards. This funding targets bottlenecks and capacity-building in vaccinology, particularly among LMIC early-career researchers.

Editor's Corner

MENINGOCOCCAL DISEASE AND VACCINATION: TRENDS, CHALLENGES, AND ADVANCES IN VACCINATION

**Introduction**

Meningococcal disease (MD) was first documented in 1805 by Swiss physician Gaspard Vieusseux who described a *fièvre cérébrale maligne non contagieuse* (non-contagious malignant cerebral fever). It was not until 1887 that *Neisseria meningitidis* (*Diplococcus intracellularis meningitidis*) was cultured and identified as the

causative agent. Currently, there are 12 serogroups of *N. meningitidis* that have been identified. Serogroups A, B, C, W-135, Y and X represent the most common causes of invasive meningococcal disease. *N. meningitidis* is found with and without a capsule; however, pathogenic strains are always encapsulated. The polysaccharide capsule is an important defense mechanism for evading

the body's antibody and complement mediated defenses and inhibiting phagocytosis. MD rates are highest among infants and elderly, with a peak in incidence in young adults. Endemic MD more frequently affects infants and young children, whereas outbreaks occur at a higher rate in adolescents and young adults who are in turn the most important carriers. Age-related distribution is also seen in the etiological agent. Infants have a higher incidence of infection from serogroup B. Serogroup C affects adolescents and young adults and the elderly have an increased incidence of serogroups B and Y. MD presents with unique seasonal variations throughout the world. In sub-Saharan Africa (the Harmattan condition), the highest disease rates occur during the dry season and associated with outbreaks. In North America, however, disease rates spike in winter and spring, though lately there has been found an association of MD with the hot-dry Santa Ana winds from Southern California and North of Baja-California, Mexico.

Environmental and socioeconomic factors predisposing to infection have been described in several studies. Notably, low socioeconomic status, crowded living conditions, urban residence and exposure to tobacco smoke all enhance susceptibility to meningococcal infection, as well as immunodeficiencies, particularly humoral and/or complement-derived anomalies. Invasive meningococcal infection is responsible for a

wide clinical spectrum. Manifestations occur within 1–14 days of infection. Initial signs and symptoms mimic those of other bacterial infections, making prompt identification difficult. Meningitis occurs in 50–70% of cases. The most severe manifestation is septicemia, or meningococemia, which characteristically presents with abrupt onset of fever and a purpuric rash. Patients can develop fulminant meningococcal sepsis (FMS) within hours and may not present signs of meningitis. The disease can rapidly progress to septic shock, acute adrenal hemorrhage (known as Waterhouse-Friderichsen syndrome) and ultimately multiorgan failure. The overall mortality of MD is between 10 and 40%, even with aggressive treatment. Sequelae of MD can be as devastating as the disease itself and occur in 11–19% of survivors. Without treatment, MD almost invariably results in death or severe long-term sequelae.

Vaccines

Either as an endemic disease, or as a cause of devastating outbreaks, MD can be prevented by vaccines.

Currently there are three types of vaccines that are available for use:

polysaccharide, polysaccharide-protein conjugate and a multicomponent protein-based vaccine that covers serogroup B, as well as (Table 1).

Table 1. Some of the current Meningococcal Vaccines: Trade names, Components, Advantages/Disadvantages:

Polysaccharide:

Mengivac®	Serogroups A and C	Control outbreaks	Poor T-cell response Poor booster response Useless in infants
Menomune®	Serogroups A, C, W and Y	Control outbreaks	Poor T-cell response Poor booster response Useless in infants
AC Vax®	Serogroups A and C	Control outbreaks	Poor T-cell response Poor booster response Useless in infants
ACWY Vax®	Serogroups A, C, W and Y.	Control outbreaks	Poor T-cell response Poor booster response Useless in infants

Polysaccharide-conjugate (glycoconjugate):

Menjugate®	Serogroups A, C, W and Y.	Routine vaccination Control outbreaks	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups B and X not included
NeisVac-C®	Serogroup C	Routine vaccination Control outbreaks	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups A, B, Y, W and X not included
Menjugate®	Serogroup C	Routine vaccination Control outbreaks	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups A, B, Y, W and X not included
MenAfriVac®	Serogroup A	Routine Vaccination Control Outbreaks An extremely success in the Sub-Saharan Africa.	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups B, Y, W and X not included
Nimenrix®	Serogroups A, C, W and Y.	Routine vaccination Control outbreaks	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups B and X not included
Menveo®	Serogroups A, C, W and Y	Routine vaccination Control outbreaks	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroups B and X not included
Menactra®	Serogroups A, C, W and Y.	Routine vaccination C	Enhanced T-cell response Prolonged Immunogenicity Limited immunogenicity in infants < 9 months Serogroups B and X not included
Men5CV®	Serogroups A, C, W, Y and X	Control Outbreak Possibly for routine vaccination	Enhanced T-cell response Prolonged Immunogenicity Very immunogenic in infants Serogroup B not included Currently used only in Nigeria

Protein-based:

Trumenba®	Serogroup B	Routine vaccination Control outbreaks	Manufactured through reverse vaccinology Enhanced T-cell response Prolonged Immunogenicity Avoids antigenic mimicry between serogroup B protein and human antigens Potential variable cross protection vs. gonorrhea Limited to serogroup B
Bexsero®	Serogroup B	Routine vaccination Control outbreaks	Manufactured through reverse vaccinology Enhanced T-cell response Prolonged Immunogenicity Avoids antigenic mimicry between serogroup B protein and human antigens Variable cross protection vs. gonorrhea Limited to serogroup B

In addition, we currently have two pentavalent vaccines using four serogroups by glycoconjugation (A, C, Y, W) and serogroup B through reverse vaccinology, these are Penbraya® and Penmenvay®.

Surveillance

Active surveillance is the cornerstone in understanding epidemiological trends and implementing appropriate preventions. However, much of the world has yet to recognize the need for surveillance. Underreporting, absence of established surveillance systems, insufficient diagnostic methods, inconsistent case definitions and social afflictions all affect the overall understanding of MD. While there are several countries of Asia have implemented systems of surveillance, none have implemented active surveillance systems

Although reports of MD in India exist, researchers have stated that there is not reliable data upon which conclusions of epidemiology can be made due to inadequate surveillance systems. Countries in Latin America have also faced obstacles in implementing reliable surveillance systems and several countries have yet to establish an active system. Deficiencies in data have led to the false implication that MD is not a great burden and therefore does not require further action. This has been disproven by smaller studies that have reported substantially higher incidence of disease than national data.

Evolving disease

The epidemiology of MD is in constant evolution. Despite advances in prevention, diagnosis and treatment in the past century, MD remains a major threat to public health worldwide. With the implementation of vaccination programs, the etiology has shifted and new serogroups have emerged as important causes of MD. Currently serogroups B and C are responsible for most cases of MD worldwide. The impact that more effective and widely available vaccines will have on overall epidemiology has yet to be seen. Historical trends

indicate that with the control of one serogroup, another will emerge. This phenomenon is already being seen in Africa with serogroup X, accordingly, in April 2024, the World Health Organization (WHO) praised Nigeria for being the first country to roll out a “revolutionary” meningitis vaccine, Men5CV, which includes serogroup X, in addition to A, C, Y and W.

Climate change

Meningococcal disease is greatly affected by environmental factors. Several connections have been made between outbreaks of disease and changes in climate worldwide. In Africa, the onset of meningitis disease has been marked by the arrival of windy, dry and dusty conditions. This has also been published in North of Baja-California, Mexico.

Methods of predicting incidence of MD based

on current climate have been proposed, but have not yet been accepted. Recognizing the effect that the climate change has on infectious disease is important in maintaining control. It has been suggested that understanding climate change could prove useful in predicting epidemiological climate change.

Prevention of *Neisseria gonorrhoeae* With Meningococcal B Vaccine:

In a matched cohort study conducted from 2016 to 2020, researchers examined the association between the OMV-containing recombinant meningococcal serogroup B vaccine (4CMenB) and gonorrhea infection among adolescents and young adults enrolled in Kaiser Permanente Southern California. The study included 6,641 recipients of 4CMenB, matched to 26,471 recipients of the MenACWY vaccine. During the follow-up period, the incidence rates of gonorrhea per 1,000 person-

years (95% confidence intervals [CIs]) were 2.0 (1.3–2.8) for 4CMenB recipients and 5.2 (4.6–5.8) for MenACWY recipients. In adjusted analyses, gonorrhea rates were 46% lower among 4CMenB recipients compared to MenACWY recipients (hazard ratio [HR], 0.54; 95% CI, 0.34–0.86). In contrast, chlamydia rates were similar between the two groups (HR, 0.98; 95% CI, 0.82–1.17). In addition, two systematic reviews and meta-analyses, one conducted by researchers from Semmelweis University in Hungary and the other by a team from the University of West Attica in Greece, looked at studies that compared the incidence of gonorrhea in those who received OMV-based MenB vaccines and either unvaccinated individuals or recipients of other meningococcal vaccines, their results found that a cross protection to gonorrhea varied from 24 to 41%. These findings suggest that 4CMenB may provide cross-protection against gonorrhea, supporting the potential role of meningococcal B vaccination in gonorrhea prevention strategies.

Conclusion

A rapidly evolving landscape of technology has brought spectacular new developments to the medical world. In the past 100 years we have made significant advances in understanding and managing this disease. Despite advances, the management of MD remains a challenge. Developing consistent universal active surveillance systems is

essential in completely understanding the disease burden worldwide. Emphasis should be placed on understanding the environmental influences on MD, especially given the changing climate. Ignoring climate change could pose a great threat to the future management of infectious disease if the effects are not completely understood.

Novel technologies in vaccinology have led to the development of effective vaccines for serogroup B, a previously unobtainable feat. Aggressive vaccination campaigns across the world have alleviated the burden of disease. However, many countries still fail to recognize the importance of MD and have yet to include coverage against *N. meningitidis* in routine immunization schedules. Developing universal standards for prevention is the next step in managing MD in the future.



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Best Practice

MALARIA VACCINES: A GAME-CHANGER FOR AFRICA – AND BEYOND

**Malaria: A Persistent
Global Health Threat:**

Despite ongoing efforts, malaria is a life-threatening infectious disease caused by *Plasmodium* parasites (being *P. falciparum* the most lethal), transmitted to humans through the bites of infected female *Anopheles* mosquitoes. In 2023, an estimated 263 million cases of malaria were reported globally—an increase of 11 million from the previous year—while malaria-related deaths declined slightly, from approximately 600,000 to 597,000.

Despite decades of progress, malaria

remains a major global health challenge. Case incidence relative to the at-risk population was higher in 2023 than in 2019, underscoring the lasting impact of COVID-19-related disruptions to health services.

The burden of malaria continues to fall disproportionately on Africa, particularly among children. In 2023, countries in the WHO African Region accounted for 94% of all malaria cases and 95% of global malaria deaths.

Children remain the most vulnerable. In 2023 alone, approximately 432,000 children in Africa died from malaria, according to WHO estimates.

While malaria ranks as the third deadliest infectious disease globally, its effects extend far beyond mortality. The *Plasmodium* parasite can remain dormant in the liver for years before entering the bloodstream and triggering symptoms such as severe fatigue, seizures, breathing difficulties, abnormal bleeding, organ failure, cognitive impairment, and vision problems.

The costs of malaria are both direct and indirect. On one hand, there is the substantial investment required to prevent and treat the disease. On the other, the consequences of inadequate control are significant: lost education, lost income, increased caregiving burdens, and an estimated US\$ 12 billion in annual lost productivity worldwide.

Malaria Control: Progress and Persistent Challenges:

A major milestone in malaria prevention was the World Health Organization's October 2021 recommendation of the RTS,S/AS01 malaria vaccine for use in children. Between 2019 and 2023, the Malaria Vaccine Implementation Programme (MVIP) delivered the RTS,S vaccine to over 2 million children across Ghana, Kenya, and Malawi.

Independent evaluations of the pilot introductions in these countries demonstrated substantial public health impact, including:

- A 13% reduction in all-cause mortality among children eligible for vaccination;
- Significant decreases in hospitalizations due to severe malaria;
- Increased access to at least one malaria prevention intervention (either the vaccine or insecticide-treated nets), reaching over 90% of children.

The pilot programme concluded at the end of 2023, and all participating countries have continued their malaria vaccination efforts, marking an important step forward in the global fight against this deadly disease.

Malaria Vaccines: A Major Step Forward in Child Health

Both WHO-prequalified malaria vaccines—RTS,S/

AS01 and R21/Matrix-M—have demonstrated safety and efficacy in preventing malaria among young children. Phase 3 clinical trials show that each vaccine reduces malaria cases by over 50% during the first year following vaccination, a critical period when children are at highest risk of severe illness and death. A fourth dose administered in the second year of life helps prolong protection.

When administered seasonally in areas with highly seasonal malaria transmission—and alongside seasonal malaria chemoprevention—both vaccines have been shown to prevent up to 75% of malaria episodes.

The greatest impact is achieved when these vaccines are integrated into a broader malaria control strategy, combining WHO-recommended preventive, diagnostic, and treatment interventions tailored to local contexts.

As of April 2025, 19 countries have introduced malaria vaccination sub-nationally as part of routine childhood immunization programs, with further scale-up planned. With wide implementation, these vaccines are expected to save tens of thousands of young lives each year.

RTS,S has already shown a substantial reduction in malaria illness and mortality in large-scale pilot implementations. While RTS,S and R21 have not yet been compared in a head-to-head trial, both have demonstrated similarly strong protective effects. There is currently no evidence suggesting that one outperforms the other.

Together, the introduction and expansion of both malaria vaccines mark a significant advancement in global child health and malaria prevention.

Scaling Up Malaria Vaccines: Programmatic Considerations, Affordability, and Impact:

The choice of malaria vaccine for use in a country should be guided by programmatic needs, vaccine availability, and cost considerations. To support equitable access, Gavi, the Vaccine Alliance, has introduced a time-limited, exceptional co-financing policy to enhance affordability. Many Gavi-supported countries are expected to pay as little as US\$ 0.20 per dose for either RTS,S or R21.

Multiple modeling studies confirm the cost-effectiveness of malaria vaccines using standard health economic metrics. Although R21 is currently priced lower than RTS,S, both vaccines are estimated to be highly cost-effective—comparable to other malaria control interventions and more cost-effective than many childhood vaccines. Costing studies also show that the introduction costs of malaria vaccines are in line with those of other newly introduced vaccines.

WHO prequalified RTS,S in July 2022 and R21 in December 2023, confirming that both meet international standards of safety, efficacy, and quality.

As of April 2025, 19 African countries—including Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ghana, Kenya, Liberia, Malawi, Mozambique, Niger, Nigeria, Sierra Leone, South Sudan, Sudan, and Uganda—have begun integrating malaria vaccines into their routine childhood immunization programmes, aligned with their national malaria control strategies. Several more countries are expected to introduce and expand malaria vaccination throughout 2025. Introduction progress is publicly tracked via the malaria vaccine introduction dashboard.

Demand for malaria vaccines is unprecedented, with at least 30 countries in Africa planning national rollouts as part of their immunization and malaria control efforts. The availability of two WHO-prequalified vaccines—RTS,S and R21—helps ensure a sufficient and stable supply to meet this growing demand.

With wide implementation, these vaccines could save tens of thousands of young lives each year. Modeling estimates suggest that scaling up malaria vaccination in moderate and high transmission areas could prevent up to 500,000 child deaths by 2035.

Malaria Vaccine Implementation Programme (MVIP): Paving the Way for Broader Malaria Vaccine Use:

The Malaria Vaccine Implementation Programme (MVIP) in Ghana, Kenya, and Malawi concluded at the end of 2023, marking a major milestone in malaria prevention. All three countries

have continued offering the RTS,S malaria vaccine through their routine childhood immunization programmes, with ongoing support from Gavi, the Vaccine Alliance.

Launched in 2019, the MVIP was designed to assess the real-world public health impact and feasibility of RTS,S vaccine use in high-transmission settings. Over the course of the programme, more than 2 million children were vaccinated across the three pilot countries. The results were significant: a 13% reduction in all-cause mortality among vaccine-eligible children and a notable decline in hospitalizations for severe malaria.

The success of the MVIP and the operational insights gained played a critical role in informing global policy—including WHO's subsequent recommendation of the R21 malaria vaccine. Lessons learned from the MVIP also helped accelerate the development and deployment of additional malaria vaccines by identifying key implementation strategies and logistical considerations.

The programme was coordinated by the World Health Organization (WHO) and implemented in partnership with the Ministries of Health in Ghana, Kenya, and Malawi, along with PATH, UNICEF, and GSK. Funding was provided by Gavi, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and Unitaid.

Landscape and Classification of Malaria Vaccine Candidates

Malaria vaccine candidates are generally classified according to the stage of the *Plasmodium* parasite's life cycle they are designed to target. There are three main categories:

1. **Pre-erythrocytic vaccines:** These target the liver stage of the parasite, aiming to prevent infection before the parasite enters the bloodstream. Examples include:
 - Genetically attenuated sporozoites
 - Irradiated sporozoites
 - Subunit vaccines based on circumsporozoite protein (CSP), such as RTS,S and R21
2. **Erythrocytic (blood-stage) vaccines:** These

aim to control parasite replication in the blood and reduce disease severity. They include:

- Subunit vaccines targeting antigens such as apical membrane antigen 1 (AMA-1) and merozoite surface protein 1 (MSP-1)
 - Vaccines designed specifically for pregnancy-associated malaria, targeting proteins like VAR2CSA, which mediate placental sequestration
- 3. Transmission-blocking vaccines:** These target the sexual stages of the parasite in humans (gametocytes) or within the mosquito vector. While they do not protect the vaccinated individual, they help reduce community transmission by preventing the parasite from developing in mosquitoes after a blood meal.

Each class of vaccine targets a distinct phase of the parasite's complex asexual and sexual life cycle, using different antigens to elicit stage-specific immunity. Some combination strategies are also being explored to enhance protection across multiple stages of infection and transmission.

Conclusion:

To strengthen global efforts against malaria, future research must prioritize deeper investigations into the complex immunological mechanisms underlying cross-species protection, particularly in endemic regions. Although promising advances in vaccine technologies have emerged, critical challenges remain—chief among them are limited research funding, inequitable access to resources, and the need for stronger collaborative networks across disciplines and borders. Addressing these barriers is essential to accelerate progress. Enhancing the malaria vaccine portfolio and reinforcing existing preventive strategies must remain central pillars in the comprehensive global approach to effectively reduce malaria burden and save lives.

The Malaria Vaccine Coordination Team (MVCT)—co-chaired by Gavi and the WHO—convenes key stakeholders such as the Global Fund, UNICEF, PATH, the World Bank, and the Africa Centers for Disease Control and Prevention (Africa CDC) to align and coordinate immunization strategies. While this collaborative platform is crucial, continued efforts are needed to strengthen strategic and operational coherence across partners to maximize impact.

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VACCINES BEAT

Who we are

At Vaccines Beat, we understand that vaccines and immunization have become a crucial topic of discussion at the center of any public health analysis. Therefore, timely, relevant, accessible, and well-curated information for all vaccine preventable diseases is key to advancing better health policies.

For this reason, a team of passionate vaccine professionals has created Vaccines Beat and each month diligently works to share with the healthcare ecosystem information, knowledge, and insights to improve global health.

Vision

Vaccines Beat aims to become the beacon of insight in the public health ecosystem through its distinctive monthly newsletter. With an in-depth 360 perspective, carefully curated information and expert analysis, this novel platform fosters collaboration among a diverse global network of stakeholders.

Mission

Vaccines Beat's main task is to inform through the review of the most recent developments in vaccines, immunization, and vaccine preventable diseases. Our mission extends to sharing best practices from successful initiatives worldwide while building bridges through editorial collaboration with regional and international stakeholders.

Vaccines Beat highlights the importance of information sharing & collaborative efforts within the public health community to boost vaccination campaigns, R&D, public policy, access, awareness, and equity.

Vaccines Beat encourages stakeholders to take action and promote sustainable commitment with continued support through multi-stakeholder synergies.

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ISSN: 2997-2833

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