VACCINES BEAT

VACCINOLOGY AND DRUG DEVELOPMENT EDUCATION

The legacy of Prof. Sue Ann Costa Clemens

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"IMMUNIZATION IS A GLOBAL HEALTH AND DEVELOPMENT SUCCESS STORY SAVING MILLIONS OF LIVES EVERY YEAR"

WORLD HEALTH ORGANIZATION

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The legacy of Prof. Sue Ann Costa Clemens

Professor Sue Ann Costa Clemens is a leading expert in Pediatric Infectious Diseases, Vaccinology, and Global Health. She currently serves as Co-founder and Professor of the Master's Program in Vaccinology and Drug Development at the University of Siena, Professor of Global Health and Clinical Development at the University of Oxford, and Director of the Oxford Latin America Research Group. She is also Co-founder and Head of the Institute for Global Health at the University of Siena, Head of the Clinical and International Relations Department at the Carlos Chagas Institute in Rio de Janeiro, Brazil, and Senior Advisor for Vaccine Development at the Gates Foundation.

With over 25 years of experience, Prof. Costa has played a pivotal role in the development of more than 20 licensed vaccines and pharmaceuticals. Her contributions include the development of vaccines for rotavirus, HPV, pneumococcal conjugate (PCV), and COVID-19—that have saved millions of lives, reduced long-term disability, and significantly advanced global public health. She was one of the Principal Investigators (PI) for the Oxford/AstraZeneca COVID-19 vaccine and contributed to the development of the first vaccine to receive WHO Emergency Use Listing (EUL): the novel oral type 2 polio vaccine, of which already more than 1.5 billion doses have been distributed to contain cVDPV2 outbreaks.

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LETTER FROM EDITOR

WELCOME TO THE 12TH ISSUE OF *VACCINES BEAT* — JOIN US IN CELEBRATING OUR FIRST ANNIVERSARY!

In this special edition, we are honored to feature **Professor Sue Ann Costa Clemens** in our *Coffee with an Expert* section. Professor Costa Clemens is a globally recognized leader in Global Health, Vaccinology, and Pediatric Infectious Diseases. She holds appointments at both the University of Oxford and the University of Siena, where she serves as Head of the Institute for Global Health. Since 2012, she has also been a senior consultant for the Bill & Melinda Gates Foundation.

With over 25 years of experience, Professor Costa Clemens has contributed to the development of more than 20 globally licensed vaccines and pharmaceutical products—work that has saved millions of lives and prevented long-term complications and disabilities. In her insightful talk, she reflects on her journey as a physician and researcher, tracing her early steps into vaccinology and highlighting the evolution of the Master's in Vaccinology program at the University of Siena, now recognized as one of the world's premier academic programs in the field.

In this edition's *Editor's Corner*, we delve into the rising threats posed by **Dengue, Chikungunya, and Zika**, and examine the **WHO's Global Arbovirus Initiative** with a focus on the role of **vaccination** in mitigating these public health challenges.

Our *Best Practice* section offers a thorough analysis of **maternal immunization**, reviewing currently available vaccines for use during pregnancy and exploring promising candidates on the horizon.

In the *Guest Editor* section, we're pleased to feature **Dr. Rebecca C. Christofferson**, an epidemiologist, biostatistician, and Associate Professor at Louisiana State University's School of Veterinary Medicine. A leading expert in vector-borne and zoonotic diseases, Dr. Christofferson contributes a compelling article titled: *"Current Predictive Models, Vector Control, and Vaccines Must Work Together to Defeat Dengue."*

As always, this issue includes our carefully curated **Latest Scientific Publications** and timely **News and Alerts**, keeping you informed of the most important developments in the field.

We hope you find this anniversary edition both inspiring and informative. Here's to another year of advancing global health and building a healthier future together.

Thank you for being part of our journey!

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

Dr. 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.

Coffee with the Expert

VACCINOLOGY AND DRUG DEVELOPMENT EDUCATION

The legacy of Prof. Sue Ann Costa Clemens

Authors:
Enrique Chacon-Cruz, M.D., MSc
Felicitas Colombo, MPA

Professor Sue Ann Costa Clemens is a leading expert in Pediatric Infectious Diseases, Vaccinology, and Global Health. She currently serves as Co-founder and Professor of the Master's Program in Vaccinology and Drug Development at the University of Siena, Professor of Global Health and Clinical Development at the University of Oxford, and Director of the Oxford Latin America Research Group. She is also Co-founder and Head of the Institute for Global Health at the University of Siena, Head of the Clinical and International Relations Department at the Carlos Chagas Institute in Rio de Janeiro, Brazil, and Senior Advisor for Vaccine Development at the Gates Foundation.

With over 25 years of experience, Prof. Costa has played a pivotal role in the development of more than 20 licensed vaccines and pharmaceuticals. Her contributions include the development of vaccines for rotavirus, HPV, pneumococcal conjugate (PCV), and COVID-19—that have saved millions of lives, reduced long-term disability, and significantly advanced global public health. She was one of the Principal Investigators (PI) for the Oxford/AstraZeneca COVID-19 vaccine and contributed to the development of the first vaccine to receive WHO Emergency Use Listing (EUL): the novel oral type 2 polio vaccine, of which already more than 1.5 billion doses have been distributed to contain cVDPV2 outbreaks.

In recognition of her extraordinary contributions to science and public health, Prof. Costa was appointed Commander of the Order of the British Empire (CBE) by Queen Elizabeth II. She has also been twice honored by the Brazilian government with the Orders of Rio Branco and Medical Merit.

Beyond her scientific achievements, she has been deeply committed to education and capacity building in global health. She established the world's first pioneering Master's program in Vaccinology and Drug Development and has consistently supported initiatives in public health education, immunization awareness, and equitable vaccine access.

During the COVID-19 pandemic, she authored *History of a Vaccine*, with a foreword by the British

Ambassador to Brazil. She also contributed the chapter on clinical development to *The First 100% Brazilian COVID-19 Vaccine*.

Prof. Costa continues to advise major global health institutions, including serving as a Senior Advisor for the Gates Foundation, and was a member of the WHO Technical Advisory Group on Market Information for Access to Vaccines (TAG-MI4A). She also is member of scientific advisory boards of several pharmaceutical, academia and non governamental funding institutions.

Inspiration

Prof. Costa's commitment to public health began in childhood. Accompanying her father on visits to underserved communities and orphanages, she witnessed firsthand the realities of inequality. These visits were not just acts of charity, they involved hands-on engagement, such as reading to children and spending time with the elderly.

"Later on, I realized that was my first contact with public health. And since that time, I remember myself in the car with my father and thinking, why the world is so different? I mean, there are so many inequalities," she reflects.

These early experiences sparked a lifelong dedication to improving access to preventive care, treatment, and essential medicines for all.

"Then I decided to be a professor because I feel that I'm a scientist, a physician, but above all, an educator, a professor," she humbly recalls.

World's leading Master's in Vaccinology

As the driving force behind the Master's in Vaccinology and Drug Development at the University of Siena, Prof. Costa recognized a major gap: a lack of professionals trained in the full spectrum of clinical development—from concept to implementation.

"And I thought, we need to really train these people. We need to leave some legacy here," she reminisces.

That conviction deepened during a pivotal meeting in South Africa focused on financing vaccination for every child. There, she had the profound honor of meeting Nelson Mandela. At the same event, the Bill and Melinda Gates Foundation presented new initiatives to expand global health opportunities. Inspired by these experiences, Prof. Costa became determined to establish a high-quality, responsible academic program that would empower professionals with the tools to transform lives and drive change.

After three years of relentless work, the pioneering one-year Master's Program in Vaccinology at the University of Siena was launched.

"So we put together this blended curriculum, academia, industry, governments, public health authorities. It was really innovative," she explains.

She also saw stark contrasts in global vaccine development: while high-income countries are focused on innovation and technology, low- and middle-income countries (LMICs) often receive pre-developed solutions with limited involvement in earlier stages. As a result, they miss out on opportunities to fully understand or influence the scientific process.

"To elevate the scientific capacity in these countries means enabling them to contribute more effectively to global development," she emphasizes.

Prof. Costa also advocates for a holistic approach—one that includes surveillance, pathogen-sharing frameworks and manufacturing.

"Education," she says, quoting Mandela, "is the most powerful weapon to change the world." And within public health, she notes, "immunization remains one of the most cost-effective tools we have."

Clinical development

As the Master's in Vaccinology and Clinical Development evolved, Prof. Costa recognized the growing need to include drug development—particularly for LMICs. One strategic reason: sustaining research site readiness between vaccine trials.

"And it's most needed because vaccine trials are generally shorter and the drug trials are longer, as for chronic diseases and oncology, although it's a smaller sample size. But that keeps the site warm," she explains.

To address this, a dedicated module on drug development was integrated into the program's academic curriculum. The course emphasizes both hard and soft skills, equipping students not only to conduct rigorous clinical research but also to effectively communicate their findings. Students are trained to collect, critically analyze, and translate data for diverse audiences—from the scientific community to the general public.

The program also offers practical training in areas such as scientific writing and publishing, presenting at conferences, product launch and lifecycle management, medical affairs, crisis communication, and media engagement.

A key differentiator of this course is the guided internship, which offers students the opportunity to gain invaluable hands-on experience by spending 4 to 6 months in various departments of the program's educational partners and sponsors

"We have and have had some challenges. But I believe that, above all, we are very happy that virtually over 90 percent of our alumni are working in the field of the masters and in very prominent positions and with very little brain drain," proudly admits Prof. Costa.

The master's program has enrolled over 140 students from 49 countries. In addition, the Institute for Global Health has trained more than 1,100 professionals—primarily from LMICs—in various aspects of vaccine development through its specialized courses.

ChADoX vaccine platform

For more than a decade, the The Jenner Institute at the Univeristy of Oxford, has conducted numerous clinical trials of candidate viral-vectored vaccines targeting viruses (including coronaviruses), bacteria, and parasites such as malaria. Many of the most promising candidates utilize a modified chimpanzee adenovirus—a harmless version of a common cold virus—as a vector. This technology led to the development of the ChAdOx platform, featuring two versions: ChAdOx1 and ChAdOx2. These vaccines are produced using controlled manufacturing processes designed to enable rapid, large-scale production.

This platform has been deployed across multiple countries, saving countless lives. Prof. Costa recalls a pivotal moment when Oxford contacted her. At the time, she was a PI managing site readiness in seven Latin American countries for the Gates Foundation.

"To be honest, Oxford called me and said, 'We talked to the Gates Foundation. We learned you are in Brazil and we need high enrolling sites'," she recounts.

Prof. Costa coordinated three large-scale COVID-19 vaccine efficacy trials manufactured in Brazil and Latin America, with the Oxford/AstraZeneca vaccine as the flagship study. Thanks to the generosity of partnering institutions, philantrophy in Latin America, global collaboration, and an outstanding team of investigators, she successfully established six clinical trial sites from scratch in Brazil—four of which were led by women.

"So that shows that Latin America could quickly prepare, could answer to the pandemic, to a global health issue with quality because we were inspected by five stringent regulatory agencies and we passed it all," she says.

She adds that regulatory systems worldwide must become more interconnected. Drawing inspiration from the European Medicines Agency (EMA), she believes Latin America could benefit from a streamlined, joint regulatory review process.

"We are not there yet, but imagine if we had a joint review [system] and when we approve, our 'own regulatory office' approves, it is approved for the entire Latin America. That would be amazing, right? Why do we need to do the review in each and every country in Latin America?" she articulates.

Looking further ahead, she highlights the importance of shared pharmacovigilance.

"The country that introduces a vaccine first should share safety data with the rest, so we all learn together," she advises.

The importance of pandemic readiness training

Prof. Costa , who served on the WHO Technical

Advisory Group for Vaccine Information and Market Access and participated in the G7 meeting in Oxford during the COVID-19 pandemic, believes we are currently living in a state of "inter-pandemic" vulnerability.

"We're between epidemics and pandemics," she says. "The scientific community now needs to 'walk the talk' and implement the gaps that have been clearly identified in the post-pandemic assessments. We're not there yet."

She emphasizes that a vaccine construct alone is not enough.

"It doesn't help if you have a vaccine construct and you cannot go into the development phase and, moreover, go into market authorization," she explains. "You need to deliver it. And after delivering it, one needs access."

Following the COVID-19 pandemic, Prof. Costa and her team led several groundbreaking clinical trials focusing on efficacy, booster doses, persistence of immunity, and vaccine interchangeability—areas that had seen little exploration prior. She stresses that true pandemic preparedness must begin not just with vaccine design, but with strong surveillance systems.

"Pathogen sharing is something very important that we can answer to very quickly on the next pandemic. And there is not very well established regulatory frameworks yet," she says, calling for alignment across the entire health ecosystem.

She also raises concerns about manufacturing and access in LMICs. Without guaranteed market access, she highlights that there is little incentive for local production.

"Access is much more linked to all the other ecosystem— opinion leaders, governments— at all the different levels of governments and ministries. And how important is that our academia, our scientific institutions, our researchers, generate continuous data, quality data to inform the policy makers. This grants access," she affirms.

Prof. Costa highlights a common misconception in health policy: the overemphasis on ministries of health as the sole decision-makers. She urges greater recognition of the roles that ministries of finance, science, and technology play in pandemic preparedness and response.

Ultimately, she believes capacity building is the foundation of success. Training qualified experts from diverse backgrounds—who can serve as trusted advisors and generate robust, policy-relevant data—is essential to bridge science and policy.

The evolution of the master's program could lead to the creation of a hands-on development training hub—an environment where learners gain end-to-end practical experience, optimizing resources, quality, and time. Prof. Costa foresees a place where high-quality education meets scientific innovation and real-world implementation, preparing the next generation of leaders in vaccinology.

At the same time, this training hub would help develop local talent as future faculty, thereby multiplying resources and strengthening regional capacity. Expanding such programs to regions like Africa and Latin America has been a key objective.

"I think good science, [well-trained] people, and good knowledge overcomes bad politics," she concludes. "So we need to tackle this. And this is part of preparedness."

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 Position paper on Respiratory Syncytial Virus (RSV)

Published: May 30, 2025.

https://www.who.int/teams/immunization-vaccines-and-biologicals/policies/position-papers/respiratory-syncytial-virus

FDA OKs First Meningococcal Vaccine for Infants

Published: May 30, 2025.

The FDA has approved the first-ever meningococcal vaccine for babies as young as 6 weeks old.

Sanofi Pasteur's quadrivalent MenQuadfi shot was first cleared in 2020 for adults and children ages 2 years or older. It protects against invasive meningococcal disease (IMD) caused by the four most common strains of meningococcal bacteria (Neisseria meningitidis): A, C, W, and Y.

The approval was based on positive results from clinical studies involving 4,273 infants ages 6 weeks to 23 months, who received at least one dose of either a four-dose or two-dose series of MenQuadfi.

https://www.webmd.com/children/vaccines/news/20250530/fda-oks-first-meningococcal-vaccine-for-infants

Valneva Reports Positive Six-Month Antibody Persistence and Safety Phase 2 Results in Children for its Single-Shot Chikungunya Vaccine IXCHIQ®

Published: June 5, 2025.

In a Phase 2 clinical trial evaluating the safety and immunogenicity of two different dose levels of its single-shot, in 304 children, antibody levels remained high after six months, being higher and equally safe with the full dose, hence, this six-month data confirm full dose selection for pivotal Phase 3 trial.

https://valneva.com/press-release/valneva-reports-positive-six-month-antibody-persistence-and-safety-phase-2-results-in-children-for-its-single-shot-chikungunya-vaccine-ixchiq/

U.S. FDA Approves Merck's ENFLONSIA™ (clesrovimab-cfor) for Prevention of Respiratory Syncytial Virus (RSV) Lower Respiratory Tract Disease in Infants Born During or Entering Their First RSV Season

Published: June 9, 2025.

ENFLONSIA (clesrovimab-cfor) is Merck's extended half-life monoclonal antibody (mAb) indicated for passive immunization for the prevention of respiratory syncytial virus (RSV) lower respiratory tract disease in newborns and infants who are born during or entering their

first RSV season. ENFLONSIA is administered using non-weight-based dosing and is designed to provide direct, rapid and durable protection through 5 months, a typical RSV season. For infants born during the RSV season, ENFLONSIA is to be administered starting from birth. For infants born outside of the RSV season, ENFLONSIA should be administered prior to the start of their first RSV season. For infants undergoing cardiac surgery with cardiopulmonary bypass during or entering their first RSV season, an additional 105 mg dose is recommended as soon as the infant is stable after surgery.

https://www.merck.com/news/u-s-fda-approves-mercks-enflonsia-clesrovimab-cfor-for-prevention-of-respiratory-syncytial-virus-rsv-lower-respiratory-tract-disease-in-infants-born-during-or-entering-their-fir/#:~:text=ENFLONSIA%20%28clesrovimab%2Dcfor%29%20is,entering%20their%20first%20RSV%20season

Press Release: Sanofi accelerates global shipping of Beyfortus to prepare healthcare providers months ahead of 2025-2026 RSV season

Published: June 9, 20265.

Sanofi is shipping Beyfortus (nirsevimab) starting in early Q3 to ensure broad availability well ahead of the 2025-2026 respiratory syncytial virus (RSV) season, which typically starts in November and runs through March. Immunizations begin in early fall and these advance shipments provide confidence for healthcare providers to support their efforts.

https://www.sanofi.com/en/media-room/press-releases/2025/2025-06-09-05-00-00-3095598

WHO COVID-19 Global Situation

Published: May 28, 2025.

Since mid-February 2025, according to data available from sentinel sites, global SARS-CoV-2 activity has been increasing, with the test positivity rate reaching 11%, levels that have not been observed since July 2024. This rise is primarily observed in countries in the Eastern Mediterranean, South-East Asia, and Western Pacific regions. Since early 2025, global SARS-CoV-2 variant trends have slightly shifted. Circulation of LP.8.1 has been declining, and reporting of NB.1.8.1, a Variant Under Monitoring (VUM), is increasing, reaching 10.7% of global sequences reported as of mid-May.

https://www.who.int/emergencies/disease-outbreak-news/item/2025-DON572

Six babies with unvaccinated mothers born with measles in Canada

Published: June 9, 2025.

Ontario's chief medical officer of health says infections could have been prevented through routine vaccination.

https://www.theguardian.com/world/2025/jun/09/canada-measles-outbreak-infants

Merck Initiates Phase 3 Study Evaluating Dengue Vaccine Candidate

Published: June 12, 2025.

V181 is a live attenuated quadrivalent vaccine currently being investigated for the prevention of dengue disease caused by any of the four dengue virus types (DENV-1, DENV-2, DENV-3, and DENV-4). V181 is designed to be a single-dose vaccination and is being studied in individuals to provide protection against dengue, including severe forms, whether the individuals have been previously infected with the dengue virus or had no prior infections. Merck (NYSE: MRK), known as MSD outside of the United States and Canada, today announced the initiation of the MOBILIZE-1 Phase 3 clinical trial evaluating the safety, immunogenicity and efficacy of a single dose of V181.The study aims to enroll approximately 12,000 healthy individuals 2 to 17 years of age who will be randomized to receive either a single dose of V181 or placebo. The study is planned to include more than 30 trial sites in dengue endemic areas in the Asia-Pacific region, including Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam.

https://www.merck.com/news/merck-initiates-phase-3-study-evaluating-dengue-vaccine-candidate/

Sierra Leone Is Battling an Mpox Outbreak. What Happens Next Affects Us All

Published: June 11, 2025.

https://time.com/7291478/sierra-leone-mpox-outbreak-pardis-sabeti-christian-happi-essay/

The Philippines: DOH logs over 110K dengue cases from Jan. to May 2025

Published: June 5, 2025.

The Department of Health (DOH) has recorded over 110,000 cases of dengue across the country from January to May 10, 2025, according to a "24 Oras" report by Darlene Cay.

The most recent data from DOH showed that more than 19,000 cases were logged in Metro Manila from January to May 17, 2025. This shows a 224% increase compared to the same period in 2024.

https://www.gmanetwork.com/news/topstories/nation/948514/doh-logs-over-110k-dengue-cases-from-jan-to-may-2025/story/?amp

ECDC: Diphtheria strain involved in outbreaks among vulnerable (immigrants) populations across Europe between 2022 and 2025

Published: June 5, 2025.

https://www.ecdc.europa.eu/en/news-events/diphtheria-strain-involved-outbreaks-among-vulnerable-populations-across-europe-between

WHO Director-General's opening remarks at the Cholera Situation in Africa Emergency High-Level Meeting for Heads of State and Government – 4 June 2025

Published: June 4, 2025.

https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-cholera-situation-in-africa-emergency-high-level-meeting-for-heads-of-state-and-government---4-june-2025

Africa CDC Epidemic Intelligence Weekly Report, 1 Jun 2025

Published: June 2, 2025.

https://reliefweb.int/report/burundi/africa-cdc-epidemic-intelligence-weekly-report-1-jun-2025

Emerging Infectious Diseases to Watch in 2025

Published: June 7, 2025.

https://www.sciencenewstoday.org/emerging-infectious-diseases-to-watch-in-2025

Travel Health News

Published: June 12, 2025.

https://www.travelhealth.gov.hk/english/outbreaknews/2025/ond10June2025.html

What to Know About the New COVID Variant NB.1.8.1 (Nimbus) and How to Protect Yourself This Summer

Published: June 13, 2025.

A new COVID-19 variant, NB.1.8.1—nicknamed "Nimbus"—has emerged globally and is now spreading in the United States. This variant is a recombinant descendant of XDV.1.5.1, which itself stems from the Omicron lineage. Compared to current dominant Omicron subvariants such as JN.1 and LP.8.1, Nimbus carries several mutations that may enhance its ability to bind to human cells and potentially evade certain immune responses. According to the latest data from the U.S. Centers for Disease Control and Prevention (CDC), Nimbus accounted for approximately 37% of COVID-19 cases in the U.S. during the two-week period ending June 7. Internationally, NB.1.8.1 has been associated with a rise in infections, emergency department visits, and hospitalizations—particularly in China, where the variant was first identified. Clinically, NB.1.8.1 appears to cause more allergy-like symptoms, such as sneezing and nasal congestion. However, its overall symptom profile remains consistent with that of other recent COVID-19 variants. The encouraging news is that current vaccines continue to offer protection against severe disease caused by this new variant.

https://healthmatters.nyp.org/what-to-know-about-the-new-covid-variant-nb-1-8-1-known-as-nimbus-and-how-to-protect-yourself-this-summer/

WHO guidelines on meningitis diagnosis , treatment, and care

Published: June, 2025.

https://www.who.int/publications/i/item/9789240108042

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

Ware-Gilmore F, Jones MJ, Mejia AJ, Dennington NL, Audsley MD, Hall MD, Sgrò CM, Buckley T, Anand GS, Jose J, McGraw EA. **Evolution and adaptation of dengue virus in response to high-temperature passaging in mosquito cells.** *Virus Evol.* 2025 Apr 24;11(1):veaf016
doi: https://doi.org/10.1093/ve/veaf016

Editorial comment: The findings of this study suggest that viruses selected for growth at higher ambient temperatures may experience tradeoffs between thermostability and replication in Aedes aegypti and Aedes albopictus. Such associations might also have implications for the suitability of virus transmission under a changing climate.

02

Munro APS, Drysdale SB, Cathie K, Flamein F, Knuf M, Collins AM, Hill HC, Kaiser F, Cohen R, Pinquier D, Vassilouthis NC, Carreno M, Moreau C, Bourron P, Marcelon L, Mari K, Roberts M, Tissières P, Royal S, Faust SN. **HARMONIE Study Group. 180-day efficacy of nirsevimab against hospitalization for respiratory syncytial virus lower respiratory tract infections in infants (HARMONIE): a randomised, controlled, phase 3b trial.** *Lancet Child Adolesc Health.* 2025 Jun;9(6):404-412
doi: https://doi.org/10.1016/S2352-4642(25)00102-6

Editorial comment: HARMONIE is an ongoing, open-label, randomized, controlled phase 3b study conducted in France, Germany, and the UK. The trial enrolled infants aged 12 months or younger, born at a gestational age of at least 29 weeks, who were randomly assigned (1:1) to receive either a single intramuscular dose of nirsevimab (50 mg for infants <5 kg, or 100 mg for ≥5 kg) or standard care without RSV prophylaxis, prior to or during their first RSV season. Between August 8, 2022, and February 28, 2023, a total of 8,057 infants were randomized: 4,038 to the nirsevimab group and 4,019 to the standard care group. Over a follow-up of up to 180 days, RSV-associated lower respiratory tract infection hospitalizations occurred in 12 infants (0.3%) in the nirsevimab group versus 68 infants (1.7%) in the standard care group. This corresponds to a vaccine efficacy of 82.7% (95% CI: 67.8–91.5; p<0.0001). These findings support that nirsevimab provides consistent and durable protection against RSV-related hospitalization for at least six months.

03

Joseph-Munné J, Maya-Hoyos M, Saubi N, Perez S, Lopez MAM, Baron E, Soto CY. **Recombinant Mycobacterium bovis BCG-Based HIV Vaccine: Failures and Promising Approaches for a Successful Vaccine Strategy.** *Vaccines.* 2025; 13(6):606
doi: https://doi.org/10.3390/vaccines13060606

Editorial comment: Recombinant Bacille Calmette–Guérin (BCG) is a promising live-attenuated bacterial vector for HIV vaccine development due to its ability to robustly stimulate T-cell–mediated

immunity. This review provides a comprehensive analysis of the key factors influencing the design and optimization of recombinant BCG as a live vaccine platform, including: (i) expression vector systems; (ii) selection of HIV immunogens; (iii) promoter choice for regulated antigen expression; (iv) BCG strain selection and codon optimization; (v) plasmid genetic stability; (vi) the impact of pre-existing immunity, immunization route, and dosage; and (vii) safety considerations.

04

Hoefer A, Seth-Smith H, Palma F, Schindler S, Freschi L, Dangel A, Berger A, D'Aeth J, Cordery R, Delgado-Rodriguez E, Gruner E, Flury D, Hinic V, Kofler J, Lienhard R, Mariman R, Nolte O, Schibli A, Toubiana J, Traugott M, Jacquinet S, Indra A, Fry NK, Palm D, Sing A, Brisse S, Egli A. **2022 European Diphtheria Consortium. Corynebacterium diphtheriae Outbreak in Migrant Populations in Europe**. *N Engl J Med*. 2025 Jun 4
doi: https://doi.org/10.1056/NEJMoa2311981

Editorial comment: This publication reports 346 confirmed cases of diphtheria among migrants in Europe. Of these, 268 cases (77.5%) presented with cutaneous diphtheria, 53 (15.3%) with respiratory diphtheria—including 11 (3.2%) with pseudomembrane formation—and 9 (2.6%) with both respiratory and cutaneous manifestations. Genomic analysis identified four major genetic clusters of Corynebacterium diphtheriae, indicating a multiclonal outbreak. The presence of each cluster across multiple European countries highlights repeated cross-border transmission. The high number of infections among migrants raises significant public health concerns, particularly in light of emerging antimicrobial resistance that may compromise first-line treatment options. These findings underscore the urgent need to expand diphtheria vaccination coverage globally, including consideration of DPT (diphtheria, pertussis, tetanus) immunization for all migrants upon arrival.

05

Fisman D, Pérez-Rubio A, Postma M, Smith DS, Mould-Quevedo J. **Maintaining the value of influenza vaccination - the shift from quadrivalent to trivalent vaccines: an expert review.** *Expert Rev Vaccines*. 2025 Dec;24(1):499-508
doi: https://doi.org/10.1080/14760584.2025.2515597

Editorial comment: This review provides an expert perspective on the sustained value of seasonal influenza vaccines as they transition from quadrivalent to trivalent formulations, based on apparent elimination of the B/Yamagata strain from circulation and subsequent advice from the World Health Organization (WHO) to remove the B/Yamagata.

06

Skinner J, Kayentao K, Ongoiba A, Healy SA, Hu Z, Preston AC, Niangaly A, Schwabl P, Cisse H, Doumbo S, Doumtabe D, Traore A, Li S, Peterson ME, Seilie AM, Chavtur C, Staubus W, Chang M, Kelley K, Traore H, Djiguiba A, Keita M, Ouattara A, Doucoure M, Keita M, Diarra D, Sylla M, Diakite D, Konate M, Traore S, Zéguimé A, Dolo A, Neafsey DE, Murphy SC, Traore B, Seder RA, Crompton PD. **Anti-sporozoite monoclonal antibody for malaria prevention: secondary efficacy outcome of a phase 2 randomized trial**. *Nat Med*. 2025 Jun 3
doi: https://doi.org/10.1038/s41591-025-03739-y

Editorial comment: CIS43LS is a long-acting monoclonal antibody specific for the Plasmodium falciparum circumsporozoite protein expressed on sporozoites. In this study, the authors analyzed 5,015 dried blood spot samples collected prior to administration of CIS43LS or placebo and then biweekly over a 6-month malaria season. At 6 months, the efficacy of CIS43LS in preventing Plasmodium falciparum infection, as detected by qRT-PCR and assessed using a time-to-event analysis, was 87.4% for the 40 mg/kg dose (adjusted 95% confidence interval [CI], 79.5–92.3; P < 0.001) and 77.0% for the 10 mg/kg dose (adjusted 95% CI, 65.0–84.0; P < 0.001), compared to placebo. In a post hoc analysis using a gametocyte mRNA-specific qRT-PCR assay, 6-month efficacy against gametocytemia was 87.7% for 40 mg/kg (adjusted 95% CI, 75.6–93.8; P < 0.001) and 73.0% for 10 mg/kg (adjusted 95% CI, 54.0–84.0; P < 0.001), relative to placebo. These findings demonstrate that a single dose of anti-sporozoite monoclonal antibodies can provide durable, sterile protection against P. falciparum infection, highlighting their potential to significantly reduce malaria burden and interrupt transmission.

07

Yoshizawa K, Muranaka E, Hase R, Namiki M, Hanayama S, Ozawa Y, Furukawa S, Kikkawa Y. **Emergence of Japanese encephalitis in a previously non-reported area: Three consecutive annual cases from a tertiary center in Narita, Chiba, Japan**. *J Infect Chemother.* 2025 Jun;31(6):102706
doi: https://doi.org/10.1016/j.jiac.2025.102706

Editorial comment: This study reports three consecutive cases of JE in a single hospital in Narita over three years. Although the PCR test confirmed the diagnosis in one case, the PCR was negative and IgM captured ELISA in the reference laboratory confirmed the diagnosis in the other two cases. These cases suggest that the number of JE patients may be underestimated in Japan. Physicians should consider JE as a differential diagnosis, when encountering the cases of encephalitis or meningitis with unknown etiology during the warm season even in the area where JE has not been reported.

08

Choi ANX, Gubler DJ, Ooi EE. **Genetics of dengue epidemics**. *Trends Microbiol.* 2025 Jun 5:S0966-842X(25)00154-4
doi: https://doi.org/10.1016/j.tim.2025.05.007

Editorial comment: This review explores how genetic changes influence dengue virus (DENV) fitness and investigates their association with specific outbreaks, with a particular focus on cases where the biological impact of these mutations has been experimentally characterized. The findings reveal that most of the relevant genetic alterations occurred in the nonstructural genes and untranslated regions (UTRs) of the DENV genome—areas often overlooked due to the predominant focus on the envelope (E) gene in sequencing efforts. As a result, key genetic features contributing to past epidemics may have been missed by E gene analysis alone. The review underscores the need for a more systematic and comprehensive genomic approach to better understand the genetic drivers of dengue epidemics and to support the development of early warning systems.

09

Rezahosseini O, Bazargan A, Eiberg MF, Korsgaard AP, Niyati R, Ekenberg C, Nielsen LN, Harboe ZB. **Safety and Immunogenicity of Co-Administration of Herpes Zoster Vaccines with Other Vaccines in Adults: A Systematic Review and Meta-Analysis**. *Vaccines*. 2025; 13(6):637
doi: https://doi.org/10.3390/vaccines13060637

Editorial comment: This meta-analysis evaluated geometric mean concentration (GMC) ratios and vaccine response rates (VRRs) for the recombinant zoster vaccine (RZV), using the Hartung–Knapp adjustment. The findings demonstrated that co-administration of RZV with other vaccines is both safe and immunogenic.

10

Lambach P, Silal S, Sbarra AN, Koh M, Aggarwal R, Farooqui HH, Flasche S, Hogan AB, Kim SY, Leung K, Moss WJ, Portnoy A, Sheel M, Wang XY. **Report from the World Health Organization's immunization and vaccines-related implementation research advisory committee (IVIR-AC) meeting, virtual gathering, 17-21 February 2025**. *Vaccine*. 2025 Jun 9;61:127384
doi: https://doi.org/10.1016/j.vaccine.2025.127384

Editorial comment: The Immunization and Vaccines-related Implementation Research Advisory Committee (IVIR-AC) is the World Health Organization's (WHO) principal advisory body for the independent review of research evaluating the impact and value of vaccines, with a particular emphasis on transmission and economic modeling. During its first semi-annual meeting of 2025—held on 17–21 February and supplemented by ad hoc sessions on 5 February, 11 April, and 14 April—IVIR-AC provided detailed feedback and recommendations across seven key sessions. This report summarizes the discussions and outcomes of those sessions. Topics included immunization research priorities in the WHO Eastern Mediterranean Region; multi-model comparisons of typhoid conjugate vaccine schedules; a malaria intervention modeling analysis; a full value assessment of invasive non-typhoidal Salmonella (iNTS) vaccination; evaluation of next-generation influenza vaccines; vaccine impact modeling aligned with the Immunization Agenda 2030 (IA2030); and assessment of combination vaccine strategies.

11

Anastassopoulou C, Panagiotopoulos AP, Ferous S, Poland GA, Dodick DW, Tsakris A. **RSV vaccines and Guillain-Barré syndrome: Insights into an emerging concern**. *Vaccine*. 2025 Jun 3;61:127338
doi: https://doi.org/10.1016/j.vaccine.2025.127338

Editorial comment: The recent approval of three distinct RSV vaccines represents a major milestone in reducing RSV-related morbidity and mortality. However, post-marketing surveillance has identified an increased incidence of Guillain-Barré syndrome (GBS) following vaccination, raising important safety concerns. This is particularly relevant given that GBS occurs more frequently in individuals over 65 years of age—the primary target population for RSV vaccination. This overlap necessitates careful risk-benefit evaluation. While the protective benefits of RSV vaccines are well established, ongoing safety surveillance and in-depth investigation of rare adverse events such as GBS remain critical to sustaining public confidence and maximizing public health impact.

12

Homsi MR, Underwood C, Caniza MA, Davey-Rothwell MA. **Immunization coverage for children with cancer in Latin America and the Caribbean can be improved through strategic coordination of existing global agendas**. *Hum Vaccin Immunother.* 2025 Dec;21(1):2509472
doi: https://doi.org/10.1080/21645515.2025.2509472

Editorial comment: This study highlights the importance of integrating immunizations into national childhood cancer treatment policies and strengthening existing vaccination surveillance platforms to address critical gaps and better support this often-overlooked population with focus on Latin America.

13

Miranda RN, Simmons AE, Li MWZ, Gebretekle GB, Xi M, Salvadori MI, Warshawsky B, Wong E, Ximenes R, Andrew MK, Sander B, Singh D, Wilson S, Tunis M, Tuite AR. **Cost-Utility Analysis of COVID-19 Vaccination Strategies for Endemic SARS-CoV-2**. *JAMA Netw Open*. 2025 Jun 2;8(6):e2515534
doi: https://doi.org/10.1001/jamanetworkopen.2025.15534

Editorial comment: This study presents a static, individual-based, probabilistic cost-utility model, informed by recent data on COVID-19 epidemiology, vaccine characteristics, and associated costs. The analysis was conducted over a 15-month time horizon (July 2024 to September 2025), using a simulated cohort of 1 million individuals reflective of the Canadian population, stratified by age and the presence or absence of at least one chronic medical condition. Among the modeled population, annual vaccination for adults aged 65 years and older consistently emerged as a cost-effective strategy, with incremental cost-effectiveness ratios (ICERs) below CAD $50,000 per quality-adjusted life-year (QALY) gained across a range of assumptions. In contrast, strategies involving a second dose for this age group or extending vaccination to younger individuals—especially those with chronic conditions—generally resulted in ICERs exceeding CAD $50,000 per QALY. Overall, this economic evaluation supports the cost-effectiveness of targeted COVID-19 vaccination programs focused on high-risk groups. Additionally, optimizing the timing of vaccination efforts was shown to further enhance cost-effectiveness as COVID-19 continues to evolve into an endemic disease.

Editor's Corner

THE INCREASING THREAT OF DENGUE, CHIKUNGUNYA AND ZIKA, THE WHO'S GLOBAL ARBOVIRUS INITIATIVE AND VACCINATION

Introduction:

Arboviruses (arthropod-borne viruses) are a group of viruses transmitted to humans through the bites of infected arthropods—primarily mosquitoes, but also ticks, fleas, and gnats. There are over 130 known arboviruses that can cause disease in humans, many of which pose serious public health threats, particularly in tropical and subtropical regions.

The majority of human arboviral infections are caused by viruses belonging to three main genera:

1. Flavivirus

- Yellow fever virus

- West Nile virus
- Zika virus
- Dengue virus
- Japanese encephalitis virus
- Zika virus

2. Togavirus

- Ross River virus
- Eastern equine encephalitis virus
- Western equine encephalitis virus
- Chikungunya virus

3. Bunyavirus

- California encephalitis virus
- La Crosse virus
- Jamestown Canyon virus
- Oropouche virus (Orthobunyavirus)

While arboviruses are primarily transmitted through the bites of infected insects, several other modes of transmission have been documented, including:

- Blood transfusion
- Organ transplantation
- Sexual contact
- Vertical transmission (from mother to child during pregnancy or childbirth)

Understanding these viruses and their transmission dynamics is critical for effective surveillance, prevention, and outbreak response strategies.

Human to human transmission of most arboviruses through casual, everyday contact has not been documented.

Disease burden:

Particularly dengue, yellow fever, chikungunya and Zika viruses are all current public health threats in tropical and sub-tropical areas where approximately 3.9 billion people live. The frequency and magnitude of outbreaks of these arboviruses, particularly those transmitted by *Aedes* mosquitoes, are increasing globally, fueled by the convergence of ecologic, economic and social factors.

Recent global data reveal a substantial surge in dengue cases worldwide. Over 7.6 million infections have been reported, including 3.4 million laboratory-confirmed cases, 16,000 classified as severe, and approximately 3,000 associated deaths. While the Chikungunya virus (CHIKV) and Zika virus (ZIKV) also continue to circulate, their case numbers remain significantly lower, with an estimated 250,000 and 7,000 reported cases, respectively.

In the Americas, the Pan American Health Organization/World Health Organization (PAHO/WHO) have reported a total of 3,125,386 arboviral infections. Of these, dengue accounts for the vast majority—approximately 90% (2,811,452 cases)—followed by Chikungunya at 8.8% (273,685 cases), and Zika at 1.3% (40,249 cases).

The Global Arbovirus Initiative:

The Global Arbovirus Initiative, launched on 31 March 2022, represents a comprehensive, cross-sectoral effort spearheaded by the World Health Organization (WHO). It brings together the WHO Health Emergencies Program, the Department of Control of Neglected Tropical Diseases, and the Immunization, Vaccines and Biologicals Department, in collaboration with an expanding network of international, multisectoral partners.

The initiative is built around key strategic pillars that provide a framework for its objectives and priority actions. These focus on monitoring risk, strengthening pandemic prevention and preparedness, enhancing early detection and response capabilities, and fostering a global coalition of stakeholders.

By integrating efforts across sectors, the initiative aims to enhance coordination, communication, capacity building, and research. Ultimately, it seeks to bolster global preparedness and response systems to mitigate the growing threat posed by emerging and re-emerging arboviruses with epidemic and pandemic potential.

The Global Arbovirus Initiative is structured around six strategic pillars:

1. Monitor risk and anticipate outbreaks,
2. Reduce the risk of local epidemics,
3. Strengthen vector control measures,

4. Prevent and prepare for pandemics,
5. Enhance innovation and promote new approaches, and
6. Build a coalition of partners to support coordinated action.

Prevention:

Aside from vaccination, the most effective way to prevent arboviral infections is by avoiding insect bites, particularly in regions with high rates of transmission.

Personal Protection Against Insect Bites:

Individuals can reduce their risk of bites by:

- Using insect repellent on exposed skin and clothing
- Wearing long-sleeved shirts and long pants when outdoors
- Tucking pants into socks to prevent insects from reaching the skin
- Wearing light-colored clothing, which makes insects easier to spot

Reducing Mosquito Breeding Sites:

Mosquitoes breed in standing water. Minimizing stagnant water in and around the home is a key strategy to reduce mosquito populations.

Practical steps include:

- Removing or regularly emptying containers that collect rainwater (e.g., buckets, flowerpots, birdbaths)
- Drilling drainage holes in the bottom of outdoor containers
- Cleaning gutters to ensure proper water flow and drainage
- Avoiding the use of old tires in landscaping, which can collect water
- Maintaining pools and hot tubs with proper cleaning and chlorination

While these measures have demonstrated effectiveness, they remain insufficient to fully control these diseases in endemic regions and during outbreaks. Therefore, the continued development and deployment of vaccines against these viruses are essential to achieving sustainable disease control.

Vaccines against dengue virus (DENV), CHIKV and ZIKV:

DENV:

The chimeric live-attenuated vaccine CYD-TDV (Dengvaxia®), developed by Sanofi Pasteur, was first licensed in 2015 for use in Mexico, the Philippines, Brazil, and later in over 20 additional countries. The vaccine is based on a yellow fever 17D virus backbone engineered to express dengue virus (DENV) structural genes, creating a chimeric construct designed to induce immunity against all four DENV serotypes. However, the vaccine's efficacy has been shown to vary depending on several factors, including DENV serotype, the individual's serostatus at the time of vaccination, geographic region, and age. Importantly, CYD-TDV is indicated only for individuals who are seropositive for dengue at the time of vaccination. Its use in DENV-naive individuals is not recommended due to the increased risk of severe dengue illness following subsequent natural infection—a phenomenon attributed to antibody-dependent enhancement (ADE).

Qdenga® (TAK-003) is a live-attenuated, tetravalent dengue vaccine developed by Takeda. The vaccine uses a DENV-2 genetic backbone to construct chimeric viruses representing all four dengue serotypes. Specifically, the structural pre-membrane (prM) and envelope (E) genes of DENV-2 were replaced with those from DENV-1, DENV-3,

and DENV-4 to generate the respective serotype-specific components, while DENV-2 remained in its native form. Pooled data from Phase 2 and 3 clinical trials conducted across multiple countries in individuals aged 4 to 60 years demonstrate that TAK-003 is well tolerated regardless of age, sex, or baseline dengue serostatus. In a Phase 3 trial involving children and adults living in dengue-endemic areas, TAK-003 demonstrated over 70% efficacy during the first-year post-vaccination, independent of prior dengue exposure. Further results from a three-year Phase 3 trial conducted in eight countries across Asia and Latin America revealed sustained protection. Two doses of TAK-003 provided a cumulative efficacy of 62.0% against virologically confirmed dengue and 83.6% against hospitalized dengue. Efficacy by serotype in dengue-exposed individuals ranged from 52.3% against DENV-3 to 80.4% against DENV-2. Among seronegative participants, protection was considered adequate for DENV-1 and DENV-2, but insufficient against DENV-3. The low incidence of DENV-4 in the study population prevented a reliable assessment of efficacy against that serotype. Some of the countries where Qdenga® has been approved include Brazil, Argentina, Indonesia, Thailand, and also recommended as a traveler's vaccine in Canada, the UK, and many other European countries.

A live-attenuated tetravalent dengue vaccine (LATV) represents another promising strategy, developed by the National Institute of Allergy and Infectious Diseases (NIAID/NIH). The LATV candidates, TV003 and TV005, consist of four recombinant live-attenuated dengue virus components: *rDEN1Δ30*, *rDEN2/4Δ30*, *rDEN3Δ30/3Δ31*, and *rDEN4Δ30*. These formulations have demonstrated a robust and balanced immune response after a single dose, inducing trivalent or tetravalent neutralizing antibodies in most participants. Although a single primary dose has shown strong immunogenicity, the potential benefit of a booster regimen is still under evaluation, particularly in individuals with pre-existing dengue immunity. The Butantan Institute® in Brazil, in collaboration with the NIH, is producing and testing this vaccine under the name Butantan-DV® in dengue-endemic populations with high baseline seropositivity. The vaccine is currently undergoing Phase 3 clinical trials. In a two-year follow-up analysis, a single dose of Butantan-DV® demonstrated 89.5% efficacy against symptomatic DENV-1 and 69.6% against DENV-2, regardless of participants' baseline serostatus. Due to the absence of DENV-3 and DENV-4 cases during the study period, efficacy against these serotypes could not be assessed.

V181 is a live attenuated quadrivalent vaccine currently being investigated for the prevention of dengue disease caused by any of the four dengue virus types (DENV-1, DENV-2, DENV-3, and DENV-4). V181 is designed to be a single-dose vaccination and is being studied in individuals to provide protection against dengue, including severe forms, whether the individuals have been previously infected with the dengue virus or had no prior infections. Merck (NYSE: MRK), known as MSD outside of the United States and Canada, just announced the initiation of the MOBILIZE-1 Phase 3 clinical trial evaluating the safety, immunogenicity and efficacy of a single dose of V181. Both Merck and Instituto Butantan's investigational vaccines are derived from materials licensed from the U.S. National Institutes of Health (NIH).

Other dengue vaccine candidates—including subunit, inactivated, DNA, and mRNA-based platforms—are currently in various stages of clinical development, representing innovative approaches aimed at improving safety, immunogenicity, and accessibility.

CHIKV:

VLA1553, developed by Valneva®, is a single-dose, live-attenuated vaccine designed to provide broad protection against all circulating strains of chikungunya virus (CHIKV). The vaccine is derived from the LR2006 OPY1 strain, which belongs to the East/Central/South African (ECSA) genotype. A key attenuation feature is a 61–amino acid deletion in the nsP3 gene, essential for viral replication, which significantly reduces the virus's virulence while maintaining immunogenicity.

In clinical trials, VLA1553 demonstrated excellent immunogenicity, with 98.9% of participants achieving seroconversion following a single dose. The immune response was durable, with 96.3%

retaining protective levels of neutralizing antibodies up to 180 days post-vaccination. Long-term data showed that neutralizing antibodies remained above protective thresholds for up to two years, with no serious long-term adverse events reported.

The vaccine was generally well tolerated. Reported side effects were mostly mild to moderate and included headache, fever, arthralgia, and myalgia.

In November 2023, VLA1553 was approved by the U.S. FDA under the trade name Ixchiq®, initially indicated for travelers. It was subsequently authorized in Canada and Europe in June 2024. While approval for adolescents aged ≥12 years is underway, both the European Medicines Agency (EMA) and the U.S. FDA have paused recommendations for adults over 65 years pending further investigation into rare severe adverse events reported in this age group, including some during the outbreak on La Réunion Island. It is important to note that a causal link between these events and the vaccine has not yet been established. Regulatory review of Ixchiq® is ongoing in the United Kingdom and Brazil, where a Phase 3 clinical trial in adolescents (VLA1553-321) is currently underway. Additionally, a Phase 2 clinical trial evaluating the safety and immunogenicity of two dose levels of a single-shot vaccine in 304 children showed that antibody levels remained high at six months. The full dose demonstrated both superior immunogenicity and a comparable safety profile, supporting its selection for the pivotal Phase 3 trial.

Virus-like particles (VLPs) represent a major advancement in vaccine development, offering strong immunogenicity while maintaining an excellent safety profile due to the absence of viral genetic material. A notable VLP-based chikungunya vaccine candidate, VRC-CHKVLP059-00-VP, was developed using structural polyprotein genes—including capsid, E3, E2, 6K, and E1—from the Senegal 37997 strain of CHIKV. Now marketed under the trade name Vimkunya® by Bavarian Nordic, this vaccine was approved by the U.S. FDA in February 2025 and subsequently authorized by the European Medicines Agency (EMA) for individuals aged 12 years and older. Like other leading candidates, Vimkunya® is administered as a single-dose vaccine, making it a promising option for broad deployment in endemic and non-endemic settings alike.

Other CHIKV vaccine candidates—including live-attenuated, viral vector, and mRNA-based platforms—are currently in various stages of clinical development, reflecting a diverse and evolving landscape in the pursuit of effective chikungunya prevention.

ZIKV:

Currently, there is no approved vaccine for Zika virus; however, multiple candidates are advancing through clinical development. One notable example is VLA1601 (Valneva®), an inactivated vaccine platform that is currently in Phase 2 clinical trials. In addition to inactivated vaccines, a diverse array of platforms is being explored, including live attenuated, mRNA, chimeric, DNA, subunit, viral vector, and virus-like particle (VLP) vaccines, reflecting a broad and innovative approach to Zika virus prevention.

Conclusions:

Arboviruses, particularly those transmitted by mosquitoes, are responsible for millions of infections and thousands of hospitalizations and deaths worldwide. While non-vaccine preventive measures remain important and can be effective, they are insufficient to fully control these infections and their associated diseases. Vaccines against DENV and CHIKV have demonstrated high efficacy and safety profiles, offering significant promise in disease control. However, for ZIKV and many other arboviruses, vaccine development is still in progress, with encouraging but preliminary results.

The WHO Global Arbovirus Initiative, structured around six strategic pillars, represents a critical step forward in the comprehensive control of arboviral diseases. Yet, as with all public health challenges, achieving equitable progress is essential. This includes equitable access and investment in education, vaccine manufacturing, surveillance systems, laboratory capacity, infrastructure scale-up, regulatory frameworks, and political commitment, among many other factors. Only through addressing these multifaceted needs can we hope to effectively combat arbovirus threats worldwide.

Bibliography:
7. \WHO Global Arbovirus Initiative. Accessed: June 3, 2025. https://www.who.int/initiatives/global-arbovirus-initiative.
8. Huang YS, Higgs S, Vanlandingham DL. Emergence and re-emergence of mosquito-borne arboviruses. Curr Opin Virol. 2019 Feb;34:104-109. doi: 10.1016/j.coviro.2019.01.001.
9. Tajudeen YA, Oladunjoye IO, Mustapha MO, Mustapha ST, Ajide-Bamigboye NT. Tackling the global health threat of arboviruses: An appraisal of the three holistic approaches to health. Health Promot Perspect. 2021 Dec 19;11(4):371-381. doi: 10.34172/hpp.2021.48.
10. Wang M, Liu K, Guo D, Lv Y, Wang X. Arbovirus Infections and Epigenetic Mechanisms; a Potential Therapeutic Target. Rev Med Virol. 2025 May;35(3):e70033. doi: 10.1002/rmv.70033.
11. Pereira CAM, Mendes RPG, Silva PGD, Chaves EJF, Pena LJ. Vaccines Against Urban Epidemic Arboviruses: The State of the Art. Viruses. 2025 Mar 6;17(3):382. doi: 10.3390/v17030382.
12. Bernasconi V, Kristiansen PA, Whelan M, Román RG, Bettis A, Yimer SA, Gurry C, Andersen SR, Yeskey D, Mandi H, Kumar A, Holst J, Clark C, Cramer JP, Røttingen JA, Hatchett R, Saville M, Norheim G. Developing vaccines against epidemic-prone emerging infectious diseases. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 2020 Jan;63(1):65-73. doi: 10.1007/s00103-019-03061-2.
13. Ahola T, Couderc T, Ng LF, Hallengärd D, Powers A, Lecuit M, Esteban M, Merits A, Roques P, Liljeström P. Therapeutics and vaccines against chikungunya virus. Vector Borne Zoonotic Dis. 2015 Apr;15(4):250-7. doi: 10.1089/vbz.2014.1681.
14. Kok BH, Lim HT, Lim CP, Lai NS, Leow CY, Leow CH. Dengue virus infection - a review of pathogenesis, vaccines, diagnosis and therapy. Virus Res. 2023 Jan 15;324:199018. doi: 10.1016/j.virusres.2022.199018.
15. Poland GA, Kennedy RB, Ovsyannikova IG, Palacios R, Ho PL, Kalil J. Development of vaccines against Zika virus. Lancet Infect Dis. 2018 Jul;18(7):e211-e219. doi: 10.1016/S1473-3099(18)30063-X.
16. Côrtes N, Lira A, Prates-Syed W, Dinis Silva J, Vuitika L, Cabral-Miranda W, Durães-Carvalho R, Balan A, Cabral-Marques O, Cabral-Miranda G. Integrated control strategies for dengue, Zika, and Chikungunya virus infections. Front Immunol. 2023 Dec 18;14:1281667. doi: 10.3389/fimmu.2023.1281667.
17. Prasad V, Kaslow DC, Yang S. Pausing Chikungunya Vaccination and Accelerated Approval. *JAMA*. Published online June 05, 2025. doi:10.1001/jama.2025.9393.
18. Valneva Reports Positive Six-Month Antibody Persistence and Safety Phase 2 Results in Children for its Single-Shot Chikungunya Vaccine IXCHIQ®. Accessed June 5, 2025. https://valneva.com/press-release/valneva-reports-positive-six-month-antibody-persistence-and-safety-phase-2-results-in-children-for-its-single-shot-chikungunya-vaccine-ixchiq/.
19. Merck Initiates Phase 3 Study Evaluating Dengue Vaccine Candidate. Last accessed June 12, 2025. https://www.merck.com/news/merck-initiates-phase-3-study-evaluating-dengue-vaccine-candidate/

Best Practice

PROTECTING TWO LIVES: THE ESSENTIAL ROLE OF VACCINATION IN PREGNANCY

Introduction:

Globally 2.3 million children died in the first 28 days of life in 2022. There are approximately 6500 newborn deaths every day, amounting to 47% of all child deaths under the age of 5 years. Most neonatal deaths (75%) occur during the first week of life, and about 1 million newborns die within the first 24 hours. Among neonates, the leading causes of death include premature birth, birth complications (birth asphyxia/ trauma), neonatal infections and congenital anomalies, which collectively account for almost 4 in every 10 deaths in children under 5 years of age. It is worth noting that although the rates for the leading causes of neonatal deaths have declined globally since 2000, they accounted for the same proportion of under-5 deaths – 4 in 10 – in 2000 and 2022. The vast majority of newborn deaths take place in low and middle-income countries. Access to and availability of quality health care continues to be a matter of life or death for mothers and newborns globally.

Nonetheless, global data demonstrating the effectiveness and real-world impact of maternal immunization remain limited and not widely accessible.

Just as an example, in 2018, approximately 25 000 newborns died from neonatal tetanus, a 97% reduction from 1988 when an estimated 787 000 newborn babies died of tetanus within their first month of life, before universal tetanus vaccination was implemented during pregnancy.

In addition, pregnancy is a known risk factor for developing more severe illness following infections such as Influenza, COVID-19, Hepatitis A, Hepatitis E, and others. Therefore, maternal immunization should aim to protect not only the newborn but also the mother.

Mechanisms in which vaccination during pregnancy protects the neonate:

Several studies suggest that the newborn's immune system is 'untrained' or 'immature,' possibly due to the prioritization of nutrient resources for the rapid development of the central nervous system, among other proposed theories. What is well established, however, is that neonates are significantly more susceptible to infections compared to older children and adults. In this context, immediate protection through maternally derived antibodies—via maternal immunization—may represent the most effective early-life protective strategy.

1. Maternal and fetal circulations are separated by a layer of villous trophoblastic cells. Immunoglobulin G (IgG) is actively transported across the syncytiotrophoblast via neonatal Fc receptor (FcRn)-mediated transcytosis. This process is further supported by Hofbauer cells and IgG-containing vesicles, which help protect the antibodies from proteolytic degradation. Altogether, this finely tuned mechanism represents a remarkable natural immunological system designed to provide passive immunity to the fetus—a true biological work of art.

2. Maternal IgA antibodies induced by vaccination can be transferred to the newborn through breast milk, providing immune protection at mucosal surfaces, particularly in the infant's gastrointestinal tract. Evidence supports that this form of passive immunity occurs following maternal vaccination against pathogens such as influenza, COVID-19, and others.

3. Protecting the mother from severe illness—such as influenza or COVID-19—not only safeguards her well-being but also indirectly protects the newborn from a range of complications, including preterm birth and even neonatal death. Ensuring maternal health is, therefore, a critical strategy for improving neonatal outcomes.

4. Herd effect: Vaccinating the mother can contribute to indirect protection of the infant through reduced transmission risk among close contacts and caregivers. This herd effect lowers the likelihood that the infant—or other infants in the household or community—will be exposed to infection.

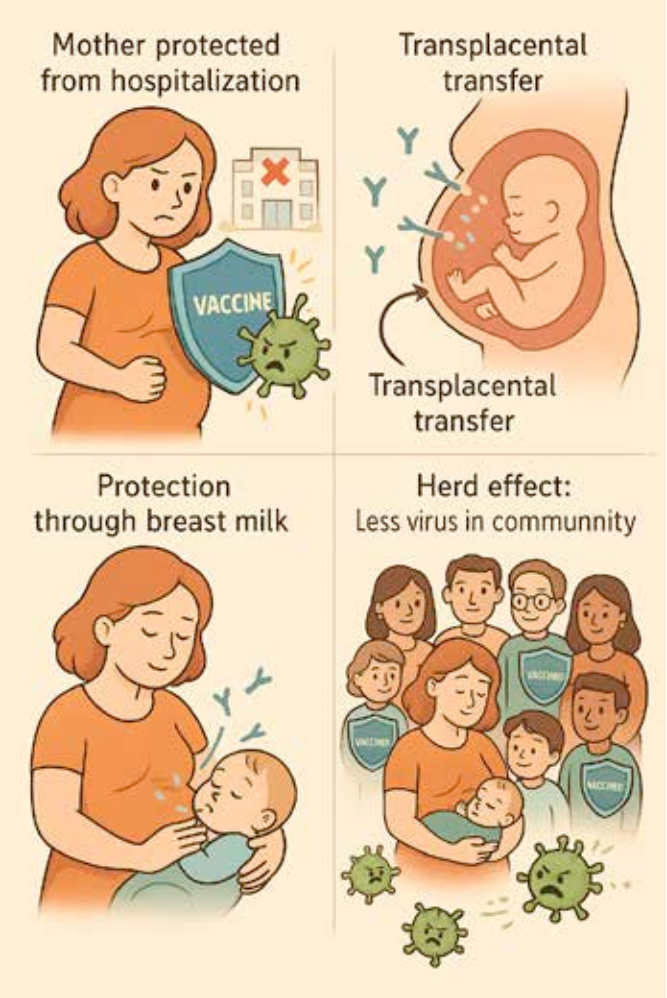

Figure 1, mechanisms in which vaccination during pregnancy protects the neonate:

Safety:

Pharmacovigilance is a pivotal aspect of all vaccination programs, but in the context of pregnancy, safety considerations are even more critical due to the need to protect both the mother and the fetus. This heightened concern may have contributed to the slower development and approval of vaccines specifically for use during pregnancy.

Live attenuated vaccines are generally contraindicated during pregnancy due to theoretical concerns regarding fetal risk. However, available evidence does not indicate significant adverse effects on the fetus following inadvertent administration of these vaccines. Consequently, the contraindication of vaccines such as measles-mumps-rubella (MMR) during pregnancy is largely precautionary. Notably, unintentional immunization with MMR-containing vaccines during pregnancy is not considered an indication for pregnancy termination.

In summary, the use of live attenuated vaccines during pregnancy requires a highly individualized and cautious benefit-risk assessment. Key considerations include the mother's risk of developing severe disease after a confirmed or high-risk exposure—such as an unvaccinated, immunocompromised pregnant woman in close contact with a confirmed measles case—and the gestational age, given the heightened risk of teratogenic effects during the first trimester.

There is one vaccine that has been associated with a slightly increased risk of preterm birth—the respiratory syncytial virus (RSV) vaccine. However, this risk is extremely low, and the substantial benefit of protecting the infant from severe RSV disease, including a significantly reduced risk of hospitalization during the first six months of life, outweighs the potential concern. Current evidence supports the continued use of the RSV vaccine in pregnancy as a valuable tool for neonatal protection.

Current vaccines available during pregnancy:

- Diphtheria and tetanus: Either as DT or DTaP.
- Pertussis: As DTaP.
- Influenza.
- COVID-19.
- RSV.
- Hepatitis-A (not routinely recommended, but preterm labor occurs in more than 60% of cases in addition to other potential complications).

Future candidates for vaccination during pregnancy:

- Group B *Streptococcus* (maybe soon to be implemented).
- Cytomegalovirus.
- Zika virus.
- Lassa fever.
- Hepatitis-E.

Vaccine uptake during pregnancy, a barrier:

Numerous studies have demonstrated variable uptake of vaccines during pregnancy. In the United Kingdom, for example, coverage of maternal influenza and pertussis vaccination declined during the COVID-19 pandemic—from 71% to 61% for influenza, and from 44% to 35% for pertussis. Surveys of both healthcare providers and the general population have revealed concerningly low awareness and acceptance of maternal vaccines, particularly for pathogens like influenza and COVID-19, which significantly impact maternal and neonatal health. These findings highlight persistent gaps in knowledge regarding the safety and effectiveness of approved vaccines during pregnancy, underscoring the need for targeted education and outreach.

Conclusion:

Maternal immunization should be recognized as a pivotal public health intervention worldwide. To fully realize its potential, several key challenges must be addressed: expanding the inclusion of pregnant individuals in clinical trials, strengthening post-approval safety surveillance through robust cohort studies, enhancing education to improve awareness and acceptance, and ensuring equitable investment—particularly in low- and middle-income countries (LMICs). Addressing these barriers is essential not only to reduce neonatal and infant mortality, but also to protect the health of pregnant women and those of reproductive age.

Bibliography:
1. Male V, Jones CE. Vaccination in pregnancy to protect the newborn. Nat Rev Immunol. 2025 Apr 23. doi: 10.1038/s41577-025-01162-5.
2. Omer SB, Clark DR, Madhi SA, Tapia MD, Nunes MC, Cutland CL, Simões EAF, Aqil AR, Katz J, Tielsch JM, Steinhoff MC, Wairagkar N; BMGF Supported Maternal Influenza Immunization Trials Investigators Group. Efficacy, duration of protection, birth outcomes, and infant growth associated with influenza vaccination in pregnancy: a pooled analysis of three randomised controlled trials. Lancet Respir Med. 2020 Jun;8(6):597-608. doi: 10.1016/S2213-2600(19)30479-5.
3. Vygen-Bonnet S, Hellenbrand W, Garbe E, von Kries R, Bogdan C, Heininger U, Röbl-Mathieu M, Harder T. Safety and effectiveness of acellular pertussis vaccination during pregnancy: a systematic review. BMC Infect Dis. 2020 Feb 13;20(1):136. doi: 10.1186/s12879-020-4824-3.
4. Kontovazainitis CG, Katsaras GN, Gialamprinou D, Mitsiakos G. Covid-19 vaccination and pregnancy: a systematic review of maternal and neonatal outcomes. J Perinat Med. 2023 Feb 17;51(7):823-839. doi: 10.1515/jpm-2022-0463.
5. Röbl-Mathieu M, Kunstein A, Liese J, Mertens T, Wojcinski M. Vaccination in Pregnancy. Dtsch Arztebl Int. 2021 Apr 16;118(15):262-268. doi: 10.3238/arztebl.m2021.0020.
6. Etti M, Calvert A, Galiza E, Lim S, Khalil A, Le Doare K, Heath PT. Maternal vaccination: a review of current evidence and recommendations. Am J Obstet Gynecol. 2022 Apr;226(4):459-474. doi: 10.1016/j.ajog.2021.10.041.
7. Rand CM, Olson-Chen C. Maternal Vaccination and Vaccine Hesitancy. Pediatr Clin North Am. 2023 Apr;70(2):259-269. doi: 10.1016/j.pcl.2022.11.004.
8. Razai MS, Mansour R, Ravindran P, Freeman S, Mason-Apps C, Morris J, Majeed A, Ussher M, Hargreaves S, Oakeshott P. Facilitators and barriers to vaccination uptake in pregnancy: A qualitative systematic review. PLoS One. 2024 Apr 19;19(4):e0298407. doi: 10.1371/journal.pone.0298407.
9. Arora M, Lakshmi R. Vaccines - safety in pregnancy. Best Pract Res Clin Obstet Gynaecol. 2021 Oct;76:23-40. doi: 10.1016/j.bpobgyn.2021.02.002.
10. WHO: Updates on monitoring safety during pregnancy and breastfeeding projects: PERLA and COVID-19 pregnancy cohort study. https://www.who.int/groups/global-advisory-committee-on-vaccine-safety/topics/pregnancy-and-lactation/vaccines.
11. Chittajallu LVS, Kaku R, Kondadasula P, Lim JY, Zhumabekova A. Safety and Efficacy of Vaccines During Pregnancy: A Systematic Review. Cureus. 2025 Jan 9;17(1):e77176. doi: 10.7759/cureus.77176.
12. WHO: Newborn mortality. March 2024. https://www.who.int/news-room/fact-sheets/detail/newborn-mortality.
13. WHO: Tetanus. July 2024. https://www.who.int/news-room/fact-sheets/detail/tetanus.
14. CDC Guidelines for vaccinating pregnant women. July 2024. https://www.cdc.gov/vaccines-pregnancy/hcp/vaccination-guidelines/index.html.
15. Healthline: Can Hepatitis A affect pregnancy? July 2023. https://www.healthline.com/health/hep-a-pregnancy.
16. WHO: Immunization, vaccines and biologicals: Group B Streptococcus. https://www.who.int/teams/immunization-vaccines-and-biologicals/diseases/group-b-streptococcus-(gbs).
17. Kirsty Le Doare, Virginia Benassi, Marco Cavaleri, Godwin Enwere, Birgitte Giersing, David Goldblatt, Paul Heath, Joachim Hombach, Richard Isbrucker, Kostas Karampatsas, Shabir A. Madhi, Annelies Wilder Smith. Clinical and regulatory development strategies for GBS vaccines intended for maternal immunisation in low- and middle-income countries. Vaccine. 2025: 127131. https://doi.org/10.1016/j.vaccine.2025.127131.
18. AJMC: Infant RSV Hospitalization Rates Drop in First Season With Widespread Preventive Product Use. https://www.ajmc.com/view/infant-rsv-hospitalization-rates-drop-in-first-season-with-widespread-preventive-product-use.
19. CDC: Respiratory Virus Hospitalization Surveillance Network (RESP-NET). https://www.cdc.gov/resp-net/dashboard/index.html.
20. Raut S, Apte A, Srinivasan M, Dudeja N, Dayma G, Sinha B, Bavdekar A. Determinants of maternal influenza vaccination in the context of low- and middle-income countries: A systematic review. PLoS One. 2022 Jan 26;17(1):e0262871. doi: 10.1371/journal.pone.0262871.

Guest Contributors

NO SILVER BULLETS: WHY PREDICTIVE MODELS, VECTOR CONTROL, AND VACCINES MUST WORK TOGETHER TO DEFEAT DENGUE

by Rebecca C. Christofferson, PhD

Dengue virus (DENV) represents one of the most significant hurdles to global health security. Increasingly driven by urbanization, climate change, and the expansion of permissive ecologies for its vectors (*Aedes aegypti* and *Aedes albopictus* mosquitoes) DENV outbreaks are becoming more frequent, widespread, and difficult to predict. Historical successes in reducing mosquito populations through larval source reduction, insecticide spraying, and community engagement have yielded measurable successes against transmission. However, reliance on vector control alone is increasingly strained by insecticide resistance, urban infrastructure challenges, and the limits of public health capacity. To move from reactive crisis response to proactive outbreak prevention, we must augment traditional tools with two more complementary interventions: predictive modeling and vaccination.

Mathematical models have become powerful tools for helping us understand and plan for DENV outbreaks. These models use real-world data streams from a myriad of courses, such as weather patterns, mosquito surveillance data, and human demography and mobility to estimate how and where the virus might spread. Some models focus on big-picture trends, like what might happen if a new vaccine is introduced, while others zoom in on specific scenarios to see how outbreaks might unfold. For instance, in Miami, models have shown that the timing and location of even a single infected person arriving (especially when mosquito numbers are high) can make the difference between an outbreak occurring at all, an outbreak being relatively minor, or an outbreak becoming a big public health threat. Even beyond predicting where and when outbreaks might happen, models are useful for testing what different strategies, like vaccination or mosquito control, might actually achieve. For example, models can show that even when a DENV vaccine coverage isn't perfect, combining it with even modest mosquito control can make a real difference in lowering transmission. These kinds of models help public health officials make informed decisions, especially when resources are tight and timing matters.

Of course, models are only as good as the data they use. Models need accurate information about how the virus spreads, how mosquitoes behave, and how people interact with both. Unfortunately, there are still important gaps in this data. A recent review found that more than 90% of mosquito-virus combinations haven't been tested in the lab at all (Carlson et al, 2023). Closing these gaps by improving how we connect lab findings to real-world disease modeling is key to making predictions more useful.

Vaccination: A Vital Tool, But Not the Only One

Vaccines are among the most powerful tools for long-term dengue prevention, but their development and implementation have faced significant challenges. Dengvaxia, the only currently licensed DENV vaccine to date, is

recommended solely for individuals with prior dengue infection due to an elevated risk of severe disease in dengue-naïve recipients. As a result, pre-vaccination screening is required to confirm prior exposure, an added layer of complexity that has hindered deployment, particularly during outbreaks in areas like Puerto Rico, where perceived risk is low and access to rapid diagnostics is limited.

Recently, Sanofi announced that it will discontinue production of Dengvaxia. However, other candidates are advancing. Takeda's live attenuated vaccine, already licensed in multiple countries and recommended by WHO for children aged 6-16 in high-transmission areas, offers protection regardless of prior exposure. Merck is currently evaluating a similar live attenuated candidate in Phase 3 trials.

Modeling studies underscore the importance of incorporating even moderately efficacious vaccines into outbreak mitigation strategies. While no vaccine is perfect, models show that combining immunization with vector control can significantly reduce transmission, particularly when deployed strategically in space and time.

Working Together: Models + Vaccines + Vector Control

On their own, neither models nor vaccines are sufficient to control dengue. But when integrated with vector control, these tools form a synergistic system. Mathematical and epidemiological models can identify optimal timing and geographic targets for vaccination, especially where vector control is inadequate or herd immunity is low. In turn, vaccination data, such as age-specific immunity profiles and coverage rates, feed back into models, refining their predictive power and enhancing real-time decision-making. This iterative feedback loop strengthens outbreak forecasting and supports adaptive, evidence-based response strategies.

Conclusion

With DENV on the rise, driven by climate change, expanding mosquito habitats, and increased urbanization, we must deploy every tool at our disposal. Predictive models and vaccines are no longer optional; they are critical pillars of an integrated response strategy. But no single approach can succeed in isolation. Vector control remains foundational, but its limits are increasingly worrisome. Models offer foresight, allowing us to target interventions where and when they matter most. Vaccines, while imperfect, can shift the dynamics of transmission and reduce the human toll.

To make the most of these tools, we need to treat them as parts of a dynamic, interconnected system. That means investing not just in better data and diagnostics, but also in translational research that connects laboratory findings to real-world applications. It means strengthening surveillance, improving access to vaccines, and designing policy frameworks that can rapidly adapt to changing risk landscapes.

The path forward is clear: defeat dengue not with silver bullets, but with a coordinated arsenal, models that guide, vaccines that protect, and vector control that contains. By aligning these strategies through robust data and sustained political commitment, we can shift from reacting to outbreaks to preventing them, and move closer to long-term control, and eventual elimination, of dengue as a global health threat.

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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