



FROM GENETIC ENGINEERING TO GLOBAL IMMUNIZATION

Prof. Mariagrazia Pizza reflects on three decades of innovation

October
2025

From Genetic Engineering to Global Immunization

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on three decades of innovation**



Dr. Mariagrazia Pizza is Professor of Microbiology and Co-Director of the Centre for Bacterial Resistance Biology (CBRB) at Imperial College London. A world-renowned expert in vaccine development, she played a key role in the creation of the first genetically detoxified pertussis vaccine and has since led numerous groundbreaking bacterial vaccine projects including the Meningococcal B (MenB) vaccine, based on a reverse vaccinology approach. In 2023, she was bestowed the IVI-SK Bioscience Park MahnHoon Award for her outstanding contributions to global vaccine development.

Born in Eboli, Italy, Prof. Pizza studied Chemistry and Pharmaceutical Sciences at the University of Naples Federico II. Her thesis focused on the structural analysis of opioid peptides using nuclear magnetic resonance. Motivated by a family member's illness, she pursued further training in pharmaceutical design and molecular biology at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany.



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LETTER FROM EDITOR

LETTER FROM THE EDITORS. 16TH ISSUE, OCTOBER – 2025

In our *Coffee with an Expert* section, we had the distinct honor of speaking with Professor Mariagrazia Pizza. Dr. Mariagrazia Pizza is Professor of Microbiology and Co-Director of the Centre for Bacterial Resistance Biology (CBRB) at Imperial College London, South Kensington Campus. Before joining Imperial, she served as Senior Scientific Director for Bacterial Vaccines at GSK and Head of Research at the GSK Vaccine Institute for Global Health (GVGH). With over 30 years of experience in vaccine R&D, Dr. Pizza has led multiple bacterial vaccine programs and collaborated with leading vaccinologists worldwide, including the development of the first acellular pertussis vaccine. She pioneered the reverse vaccinology approach that led to the discovery and development of the Meningococcal B vaccine, introduced in the UK in 2015 for newborns. Dr. Pizza has authored over 250 publications, holds 70 patents, and received multiple honors, including the IVI-SK Bioscience Park MahnHoon Award (2023). She is an elected member of EMBO, the European Academy of Microbiology, and the Academia Europaea, as well as Fellow of the American Academy of Microbiology and member of WHO's PDVAC. Her current research focuses on *Klebsiella pneumoniae*, investigating new virulence factors and antigens to guide future vaccine strategies against multidrug-resistant pathogens.

In this edition's Editor's Corner, we explore "*Understanding the Antivaccine Movement: Sentiments, Hesitancy, Misinformation, and Strategies for Evidence-Based Communication.*" The article begins with a concise overview of antivaccine groups, illustrated with examples linked to specific diseases, and then delves into current trends in vaccine hesitancy, online misinformation, political influences, and related challenges. It concludes by highlighting potential solutions such as community engagement, balancing data with empathy, and addressing vaccine fatigue to strengthen public trust in immunization.

Our *Best Practice* section presents the current Influenza vaccination for the 2025–2026 season in the Northern Hemisphere and the 2026 season in the Southern Hemisphere in the context of potential B/Yamagata lineage extinction.

Finally, in our *Guest Contributor* section, we are delighted to feature an insightful editorial by Dr. Rolando Ulloa-Gutierrez, from the Hospital Nacional de Niños "Dr. Carlos Sáenz Herrera", and member of the Academia Nacional de Medicina de Costa Rica. Dr. Ulloa-Gutierrez is also the leader of REKAMLATINA and the Multisystem inflammatory syndrome in children (MISC) in Latin American network, with hundreds of international publications, whom summarizes the current situation of MISC and why children need to be vaccinated vs SARS-CoV-2.

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 October 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



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, member of the Immunization Committee of the European Society of Medicine and Overseas Fellow, Royal Society of Medicine, United Kingdom. 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.

Editorial disclaimer: "The author/s assumes no responsibility or liability for any errors or omissions in the content of this publication. The information contained in this publication is provided on an "as is" basis with no guarantees of completeness, accuracy, usefulness or timeliness. The purpose of Vaccines Beat is purely academic, sponsors do not contribute to its content."

Coffee with the Expert

FROM GENETIC ENGINEERING TO GLOBAL IMMUNIZATION

Prof. Mariagrazia Pizza reflects on three decades of innovation

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Dr. Mariagrazia Pizza is Professor of Microbiology and Co-Director of the Centre for Bacterial Resistance Biology (CBRB) at Imperial College London. A world-renowned expert in vaccine development, she played a key role in the creation of the first genetically detoxified pertussis vaccine and has since led numerous groundbreaking bacterial vaccine projects including the Meningococcal B (MenB) vaccine, based on a reverse vaccinology approach. In 2023, she was bestowed the IVI-SK Bioscience Park MahnHoon Award for her outstanding contributions to global vaccine development.

Born in Eboli, Italy, Prof. Pizza studied Chemistry and Pharmaceutical Sciences at the University of Naples Federico II. Her thesis focused on the structural analysis of opioid peptides using nuclear magnetic resonance. Motivated by a family member's illness, she pursued further training in pharmaceutical design and molecular biology at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany.

In 1986, she joined a vaccine research center in Siena, where she contributed to the development of a novel pertussis vaccine based on a genetically detoxified pertussis toxin. This formulation proved to be both safer and more immunogenic than existing options, offering effective protection for infants. Building on this success and leveraging advancements in



genome sequencing, she pioneered the use of reverse vaccinology to develop a vaccine against *Neisseria meningitidis* serogroup B (MenB).

Prof. Pizza's work in reverse vaccinology led to the discovery of new bacterial antigens and the development of the first MenB vaccine, now licensed in over 50 countries and used in national immunization programs, including the UK, where it was introduced in 2015. The vaccine remains the only approved MenB vaccine for infants, demonstrating an efficacy rate of 71% to 95%.

Before joining Imperial College, Prof. Pizza served as Senior Scientific Director of Bacterial Vaccines at GSK and Head of Research at the GSK Vaccine Institute for Global Health (GVGH), where she led strategic initiatives in global vaccine innovation. Over her 30+ year career, she has collaborated with leading scientists worldwide and has been instrumental in characterizing the structural and immunological properties of several key vaccine antigens.

She is an elected member of EMBO (European Molecular Biology Organization), the European Academy of Microbiology, and the Academia Europaea. She is also a Fellow of the American Academy of Microbiology, Vice Chair of the Bacteriology Division of the International Union of Microbiological Societies (IUMS), and a member of the WHO Product Development for Vaccines Advisory Committee (PDVAC). She has received numerous international awards and honors in recognition of her scientific achievements.

With over 250 peer-reviewed publications and co-inventorship on more than 70 patents, Prof. Pizza is widely regarded as one of the world's foremost scientists in the field of vaccine research and development.

Her current research focuses on *Klebsiella pneumoniae*, a multidrug-resistant Gram-negative bacterium recognized as a major global health threat. Her lab aims to identify novel virulence factors and antigens to better understand the mechanisms of *Klebsiella* pathogenesis and inform the design of future vaccine strategies.

Personal Journey

Prof. Mariagrazia Pizza was inspired to study pharmaceutical chemistry due to a long history of illness in her family. From a young age, she held onto the hope that one day, a medicine might exist that could miraculously make everything better.

"Now, with the age, I know that it was impossible to find something that can really transform everything. But at least you can try to do something that helps society. This was my dream," she recalls.

After completing her university studies, Prof. Pizza became fascinated by the emerging field of genetic engineering, which was gaining momentum at the time. This led her to pursue further studies in genomics and genetics at the European Molecular Biology Laboratory (EMBL) in Heidelberg.

A few years later, back in Italy, she began her career in the private sector, working on vaccine development.

"I started working on pertussis and I've been lucky because that project has been really

getting me in love with vaccines," she says.

Captivated by the impact and potential of her work, she never returned to academia full time. Instead, she has spent the past 30 years in Siena, leading and contributing to numerous vaccine research projects.

Pertussis vaccine milestones

Prof. Pizza joined the pertussis vaccine project in the laboratory of Prof. Rino Rappuoli, where the team had successfully sequenced the operons containing the gene for pertussis toxin. Drawing on her background in genetic engineering, she led a project focused on creating a genetically detoxified version of pertussis toxin.

"The idea was that, since Pertussis toxin was inactivated by chemical detoxification as other vaccines like diphtheria and tetanus, we wanted to see whether we could make a better immunogen by changing only some of the amino acids important for the enzymatic activity," she explains.

Since the 3D structure of pertussis toxin had not yet been resolved, long before technologies like AlphaFold, Prof. Pizza's team relied on predictive modeling. They noted that pertussis toxin shares the same enzymatic mechanism as other well-known bacterial toxins, such as diphtheria, cholera, and *Pseudomonas* exotoxin. Despite targeting different host proteins, these toxins all exhibit ADP-ribosyltransferase activity, the ability to transfer an ADP-ribose group to a host protein.

"It's an enzyme that allows the ADP ribose to be added to a target protein. So for example, the target protein of cholera and heat-labile toxin are obviously different. In fact, this difference explains why cholera or E.coli infection causes diarrhea," she points out.

Through site-directed mutagenesis, the team introduced various mutations into the catalytic domain of the toxin. Among these, they identified one mutant with two key amino acid changes that completely eliminated toxicity in vitro and in animal models while preserving strong immunogenicity.

"Based on this finding, we published the results in a high-impact journal and started, in the

meantime, the development of the toxin that was manufactured at a larger scale,” Prof. Pizza says.

In clinical trials, the team tested two formulations: one with the genetically detoxified pertussis toxin alone, and another in combination with filamentous hemagglutinin (FHA) and pertactin (69K). Both formulations were evaluated in clinical trials, and the trivalent version was tested in efficacy trials in comparison with the trivalent formulation containing the chemically detoxified toxin and the whole-cell pertussis vaccines.

“The real milestone has been to demonstrate that only by changing two amino acids without changing the overall structure of an antigen you can get high quality of antibodies. These antibodies recognized the native toxin [better] resulting in [superior] neutralization. Beautiful,” she smiles, humbly acknowledging what many consider a foundational moment in rational antigen design.

While genetically modified pertussis vaccines have since improved, Prof. Pizza points out that for years, whole-cell pertussis vaccines were perceived as overly reactogenic due to side effects. This led to a preference for acellular, protein-based vaccines. In her view, the problem was not toxicity itself but the inconsistency of strains and production processes used in early whole-cell vaccines.

“Now that manufacturing processes are more consistent, the reactogenicity we see is often linked to stronger immune activation, which is actually a good sign for vaccine efficacy,” she notes.

However, a significant concern remains: acellular pertussis vaccines do not prevent colonization. The bacteria continue to circulate, even among vaccinated individuals, which has become a major public health issue in recent years.

The challenge lies in inducing a Th17 response after just one dose. But if additional antigens are needed beyond those in the acellular formulation, a simple priming dose with whole cell vaccine might not be enough. This leads to a dilemma: combining different formulations for priming and boosting could improve efficacy,

but the cost and complexity of manufacturing such a strategy would be significant.

“This is my only doubt. And this really needs to be tested. But it’s a very good idea,” she claims, adding that it’s very difficult to develop vaccines that use different formulations for prime and boost. “The production costs would be extremely high.”

Ultimately, the underlying mechanisms for inducing immunity that blocks colonization remain unclear. Some systemic vaccines, such as those against meningococcus (e.g., MenACWY), appear to reduce nasopharyngeal carriage, but it’s not fully understood how.

“In my view, it’s not just about conjugation. It’s more about how potent your antigen is in triggering a strong systemic response, strong enough that antibodies can transudate to the mucosa,” she shares.

Developing the Meningococcal B vaccine

As is often the case in groundbreaking science, when Prof. Mariagrazia Pizza began working on the Meningococcal B (MenB) vaccine, she had no certainty about the project’s success. What the team did know, however, was that sequencing the bacterial genome had become possible. And that alone was a game changer.

“The idea was: if we have a genome, we have access to everything that a bacterium can express. We essentially have access to a catalogue of all the potential proteins this bacteria can express,” she recalls.

The challenges were immense. The *Neisseria meningitidis* genome contains around 2,000 genes, a massive dataset to analyze. Because a vaccine requires antigens that are accessible to the immune system, the team focused on identifying proteins that were likely surface-exposed. Through this genomic screening, they discovered 600 potential surface antigens.

“That was really shocking, as you can imagine. Because 600, you cannot just make your selection by looking at the computer,” she shares. “You really need to then express these proteins, to purify them, to immunize mice, and to see whether they

induce a protective immune response.”

Another major hurdle was the genetic variability of *N. meningitidis*, particularly for MenB strains that differ widely between regions and countries. Ensuring broad, global protection required a new approach to epidemiological assessment. The team developed an entirely new assay, robust, standardized, and easy to implement across laboratories worldwide. The strength of this new epidemiology tool was unprecedented, as it provided access to the predicted coverage of this novel vaccine and became the foundation for the regulatory submissions.

“This has been unique because it has made possible the introduction of this data into a regulatory files. This data has [supported] the registration of the vaccine in the different countries,” she notes.

The MenB vaccine, which also provides some cross-protection against the other meningococcal serogroups, was first licensed in Europe, followed by the United States. Since then, it has been approved in many other countries and incorporated into national immunization programs.

“For me it’s deeply emotional to see that this vaccine is now saving lives,” she proudly says. And even more meaningful as it offers some protection against gonorrhea, as many retrospective studies suggests.

Future of novel vaccine platforms

From mRNA and structural vaccinology to reverse vaccinology and genetically modified bacterial viruses, a growing array of innovative

technologies is transforming vaccine development. While no single platform offers a universal solution, Prof. Pizza believes that the future lies in embracing a diverse set of tools, including AI, to drive vaccine innovation forward.

“We cannot say there will be one unique technology for all future vaccines,” she explains. “We need to have a combination: reverse vaccinology, structural vaccinology, adjuvants, glyconjugation, RNA, viral vectors,. We have to test all these platforms to understand which ones [lead] the way to find the ideal vaccines for the future.”

Prof. Pizza continues to explore how vaccines can serve as a key strategy in tackling the growing global crisis of antimicrobial resistance (AMR). As a Professor of Microbiology, she is also deeply committed to educating the next generation of scientists.

“I really believe there’s so much for young people to learn about vaccines,” she shares. “Especially now, when misinformation is such a big issue.”

She emphasizes the need for bright, ethical, and skilled individuals. People with “good minds, good hands, and good ideas” to carry the torch of vaccine development into the future.

“We often forget what diseases like diphtheria or polio even look like—because they’ve largely disappeared, thanks to vaccines,” she notes. “What I always tell my students, and I truly believe this, is: we are lucky, we don’t see these diseases anymore because, fortunately, everyone has been vaccinated. It is something we should never forget”



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.

Nipah virus outbreak in Kerala, India.

The Lancet Infectious Diseases,
Volume 25, Issue 10, e548.
Published: October 2025. [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(25\)00560-2/abstract?dgcid=raven_jbs_etoc_email](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(25)00560-2/abstract?dgcid=raven_jbs_etoc_email)

Measles outbreaks in Kyrgyzstan.

The Lancet Infectious Diseases,
Volume 25, Issue 10, e550.
Published: October 2025.
<https://www.thelancet.com/action/showCitFormats?doi=10.1016%2FS1473-3099%2825%2900559-6&pii=S1473-3099%2825%2900559-6>

China reports chikungunya outbreak.

The Lancet Infectious Diseases,
Volume 25, Issue 10, e551
Published: October 2025.
<https://www.thelancet.com/action/showCitFormats?doi=10.1016%2FS1473-3099%2825%2900558-4&pii=S1473-3099%2825%2900558-4>

MEDPAGE TODAY: HPV Shot May Protect Unvaccinated Women Too.

From 2006 to 2023, the adjusted proportion of vaccinated women in the U.S. who were positive for the high-risk HPV-16 and HPV-18 types dropped 98.4%. The proportion of unvaccinated adolescent girls and young women who were positive for at least one of those HPV types dropped 71.6%. However, social trends and disruptive policies

could lead to a drop in HPV vaccination rates.
Published: September 29, 2025.

https://www.medpagetoday.com/pediatrics/vaccines/117706?xid=nl_mpt_DHE_2025-09-29&mh=78b9d767668ebce981a6966b422f64c4&zdee=gAAAAABm4ueYkZNJlwY53sI1rG6_jN7FF2M3EgH5lRHuJb_i8iGzNJ1mRKgUOMs1nOzVDpd2wgb-woUDLozoQ4y0Z5pYMM_74peOnIDehyX-K-eODyiUPmc%3D&utm_source=Sailthru&utm_medium=email&utm_campaign=Daily%20Headlines%20Evening%20-%20Randomized%202025-09-29&utm_term=NL_Daily_DHE_dual-gmail-definition

Valneva Reports 95% Seroresponse Four Years After Single Shot of Chikungunya Vaccine IXCHIQ®.

Among the 254 healthy adults still followed in the trial, 95% maintained neutralizing antibody titers well above the seroresponse threshold 4 years after the single-dose vaccination. Persistence of antibodies in older adults (age 65+) was comparable to younger adults (18-64 years of age) in terms of geometric mean titers (GMTs) and seroresponse rates (SRRs).
Published: September 30, 2025.
<https://www.biospace.com/press-releases/valneva-reports-95-seroresponse-four-years-after-single-shot-of-chikungunya-vaccine-ixchiq#:~:text=Long%2Dlasting%20antibody%20persistence%20was,and%20seroresponse%20rates%20%28SRRs%29>

Has Chikungunya Become Endemic in Southern France.

In mid-September 2025, the French Health Ministry reported 97 new locally acquired cases of Chikungunya in thirty-eight active clusters. The largest cluster is located in Antibes and consists of 87 cases. This area of France's Mediterranean coast is a popular vacation destination, located between Cannes and Nice.

Published: September 22, 2025.

<https://www.vax-before-travel.com/2025/09/22/has-chikungunya-become-endemic-southern-france>

WHO: Highlights from the Meeting of the Strategic Advisory Group of Experts (SAGE) on Immunization 22-25 September 2025. Included topics were COVID-19, new vaccines for TB, combination vaccines, polio, malaria and AH5 influenza vaccines.

Published: September 2025, however, final publication until December 5, 2025.

chrome-extension://efaidnbnmnibpcjpcglclefindmkaj/https://cdn.who.int/media/docs/default-source/2021-dha-docs/highlights-final-1.pdf?sfvrsn=663ed653_1

WHO: Cholera upsurge (20021 – present).

Sixty countries reported cases in 2024, an increase from 45 in 2023. The burden of the disease remained concentrated in Africa, the Middle East, and Asia, which collectively accounted for 98% of all reported cases. These trends continue into 2025. This increase in outbreaks and cases is stretching the global capacity to respond. There is a shortage of cholera tools, including vaccines. WHO considers the current global risk from cholera as very high and is responding with urgency to reduce deaths and contain outbreaks in countries around the world.

Published: September 25, 2025.

<https://www.who.int/emergencies/situations/cholera-upsurge>

Paraguay measles outbreak: Citizens are urged to stay up-to-date on their vaccinations.

To date, the number of confirmed cases of measles in the country amounts to 45: 43 from San Pedro distributed in Tacuatí (21), Nueva Germania (14) and Santa Rosa del Aguaray (8); and 2 from Central.

Published: October 3, 2025.

<https://outbreaknewstoday.substack.com/p/paraguay-measles-outbreak-citizens>

[paraguay-measles-outbreak-citizens](https://outbreaknewstoday.substack.com/p/paraguay-measles-outbreak-citizens)

Gavi: Why vaccines matter for children.

10 facts about vaccines, child survival and global progress.

Published: September 22, 2025.

<https://www.gavi.org/vaccineswork/why-vaccines-matter-children#:~:text=Over%20the%20past%2050%20years,nearly%2094%20million%20lives%20saved>

CEPI backs new research into vaccines against multiple deadly filoviruses.

Supported by up to \$18 million in CEPI funding, researchers will design and test innovative vaccine constructs that could offer broad, all-in-one protection against viruses such as Zaire ebolavirus, Marburg virus, Sudan ebolavirus, and even yet-unknown filoviruses that may spill over from animals to humans in the future. Using advanced artificial intelligence, the team will design immunogens—the components that trigger immune protection—capable of targeting multiple filoviruses. These will be combined with a ferritin-based protein nanoparticle platform to generate a range of vaccine candidates, which will undergo preclinical testing to establish proof of concept. The most promising candidate will be developed to a stage ready for rapid entry into Phase I clinical trials in the event of an emerging outbreak. The ferritin nanoparticle platform is well-suited for low- and middle-income countries, as it does not require complex frozen storage. It has already shown positive safety results in Phase I trials for influenza and COVID-19 vaccines.

Published: October 5, 2025.

<https://cepi.net/cepi-backs-new-research-vaccines-against-multiple-deadly-filoviruses>

Infection Control Today: Measles in October 2025: Why Outbreaks Are Surging—And What Is Changing Now.

As of October 1, 2025, the US reported 1,544 confirmed cases across 41 states, the highest national tally in more than three decades; 86% of cases are linked to recognized outbreaks, underscoring sustained transmission in undervaccinated communities.

Published: October 7, 2025.

<https://www.infectioncontrolday.com/view/measles-october-2025-why-outbreaks-are-surging-what-is-changing-now>

WHO: Chikungunya virus disease – Global situation.

In 2025, a resurgence of chikungunya virus (CHIKV) disease was noted in a number of countries, including some that had not reported substantial case numbers in recent years. Between 1 January and 30 September 2025, a total of 445 271 suspected and confirmed CHIKV disease cases and 155 deaths were reported globally from 40 countries, including autochthonous and travel imported cases.

Published: October 3, 2025.

<https://www.who.int/emergencies/disease-outbreak-news/item/2025-DON581>

Mwamba D, Mboussou F, Akilimali P, Ngandu C, Impouma B, Ihekwaazu C, Kamba SR, Janabi MY. New Ebola virus disease outbreak in the Democratic Republic of the Congo: early response guidance. Lancet. 2025 Oct 3:S0140-6736(25)01950-6.

doi: 10.1016/S0140-6736(25)01950-6.

Epub ahead of print. PMID: 41052511

Bangladesh launches typhoid vaccination drive to combat drug-resistant threat.

Bangladesh launched a nationwide vaccination campaign on Sunday to protect millions of children from typhoid, a deadly and increasingly drug-resistant disease that poses a growing public health threat. The month-long campaign aims to immunize around 50 million children aged between nine months and 15 years with a single dose of the Typhoid Conjugate Vaccine (TCV). Approved and pre-qualified by the World Health Organization (WHO), the vaccine provides protection for up to five years and is being administered free under the government's Expanded Programme on Immunization (EPI).

Published: October 12, 2025.

<https://www.reuters.com/business/healthcare-pharmaceuticals/bangladesh-launches-typhoid-vaccination-drive->

[combat-drug-resistant-threat-2025-10-12/](#)

PAHO releases new guides to help combat vaccine misinformation.

The Pan American Health Organization (PAHO) launched six new guides designed to support health workers and other professionals in identifying and responding to vaccine misinformation—a growing phenomenon that threatens to undermine confidence in immunization and jeopardize public health progress across the Region.

Published: October 7, 2025.

[https://www.paho.org/en/news/7-10-2025-paho-releases-new-guides-help-combat-vaccine-misinformation.](https://www.paho.org/en/news/7-10-2025-paho-releases-new-guides-help-combat-vaccine-misinformation)

Annual COVID Vaccines Protect People against Severe Disease, Even with Prior Immunity.

A new study shows that receiving an updated COVID vaccine reduced people's risk of severe disease and death in all age groups, regardless of immunity from prior infection or vaccination.

Published: October 8, 2025.

<https://www.scientificamerican.com/article/new-study-finds-annual-covid-vaccines-protect-people-against-severe-disease/>

Japan declares a flu epidemic — what this means for other nations. Researchers say that the number of infections for this time of year is unusual.

Japan's health authorities have declared an influenza epidemic, with thousands of people infected with the respiratory virus. The number of infections for this time of year is unusual, say researchers, and could seed outbreaks in countries that are heading into winter in Asia and Europe — although it is unlikely to become a global pandemic.

Published: October 14, 2025.

<https://www.nature.com/articles/d41586-025-03367-z>



Latest Relevant Publications

LATEST PUBLISHED PAPERS AND COMMENTARIES FROM THE CHIEF EDITOR

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

Granskog L, Saadeh K, Lorenz K, Quint J, Salih T, Lo T, Jacobson K, Ramos M, Chapman E, Snyder RE, Lewnard JA. **Effect of JYNNEOS vaccination on mpox clinical progression: a case-control study.** *Lancet Infect Dis.* 2025 Oct;25(10):1106–1115.

doi: [https://doi.org/10.1016/S1473-3099\(25\)00180-X](https://doi.org/10.1016/S1473-3099(25)00180-X)

Editorial comment: This case-control study analyzed data from public health surveillance interviews of individuals with mpox in California. Among 3,043 cases, 114 (3.7%) had received pre-exposure vaccination and 214 (7.0%) had received post-exposure vaccination only. Among 1,566 controls, 285 (18.2%) had received pre-exposure vaccination and 146 (9.3%) post-exposure vaccination only. The estimated vaccine effectiveness (VE) against disease progression was 58.8% (95% CI: 50.3–65.9) for pre-exposure vaccination and 15.9% (95% CI: 3.3–26.8) for post-exposure vaccination. Among people without HIV, pre-exposure VE against progression was 66.6% (95% CI: 56.8–74.2), compared with 44.8% (95% CI: 27.5–58.0) among those with HIV. Pre-exposure vaccination was also associated with strong protection against progression to severe illness requiring hospitalization (VE: 85.4%; 95% CI: 54.3–95.3).

02

Folegatti PM, Pepin S, Tabar C, Fries K, Talanova O, See S, Essink B, Bertoch T, Drazan D, Natalini Martínez S, Konieczny M, Kaas-Leach K, De Bruijn I. **Comparative assessment of immunogenicity and safety of recombinant influenza vaccine in children, adolescents, and adults: results from a phase 3, immunobridging, open-label, non-randomised study.** *Lancet Infect Dis.* 2025 Oct;25(10):1097–1105.

doi: [https://doi.org/10.1016/S1473-3099\(25\)00153-7](https://doi.org/10.1016/S1473-3099(25)00153-7)

Editorial comment: The recombinant influenza vaccine (RIV) is licensed for adults ≥18 years but not for children. This phase 3, non-randomised, immunobridging, open-label study assessed immune responses and safety in participants aged 9–17 years versus 18–49 years across 36 centres in Europe and the USA during the 2022–23 influenza season. Between Oct 27, 2022, and May 1, 2023, 1,308 participants were enrolled and 1,299 (99%) vaccinated (641 aged 9–17 years; 658 aged 18–49 years). At day 29, the paediatric-to-adult HAI GMT ratios were 2.0 (95% CI 1.7–2.3), 3.3 (2.8–3.9), 1.6 (1.4–1.8), and 1.2 (1.1–1.4) for A/H1N1, H3N2, B/Victoria, and B/Yamagata, respectively. Differences in seroconversion rates were 1.9 (–2.8 to 6.6), –0.6 (–4.4 to 3.2), 3.3 (–1.6 to 8.1), and 14.3 (9.2 to 19.3). Safety profiles were comparable between age groups.

03

Jongihlati B, Segall N, Block SL, Absalon J, Perez J, Munson S, Sanchez-Pearson Y, Simon R, Silmon de Monerri NC, Radley D, McLaughlin LC, Gaylord M, Gruber WC, Jansen KU, Scott DA, Anderson AS. **Safety and immunogenicity of a booster dose of a novel hexavalent group B streptococcus conjugate vaccine in healthy, non-pregnant adults: a phase 2, open-label extension of a phase 1/2 randomised controlled trial.** *Lancet Infect Dis.* 2025 Oct;25(10):1138–1148.

doi: [https://doi.org/10.1016/S1473-3099\(25\)00216-6](https://doi.org/10.1016/S1473-3099(25)00216-6)

Editorial comment: This phase 2, open-label extension of a phase 1/2 trial at four US sites evaluated the safety, tolerability, and immunogenicity of a booster dose (20 µg capsular polysaccharide per serotype) of the hexavalent group B streptococcus (GBS6) conjugate vaccine, with or without aluminium phosphate (AlPO₄). Of 297 participants from the base study, 151 received a booster (76 with AlPO₄, 75 without) a median of 2.4 years after primary vaccination. One month post-booster, serotype-specific anti-CPS IgG responses were two- to 18-fold higher (GMC range 6.025–60.304 µg/mL) than after the primary dose (0.365–35.173 µg/mL), with GMFRs of ~10- to 59-fold across serotypes and formulations. The booster was well tolerated, and immune responses exceeded those seen after the primary dose.

A single 20 µg GBS6 booster given ~2 years after primary vaccination in healthy, non-pregnant adults was safe and induced strong, durable immune responses.

04

Kulkarni PS, Zaman K, Desai SA, Bharati S, Goswami DR, Sharmeen AT, Rana S, Haque W, Khandelwal A, Manney S, Tyagi P, Gairola S, Zade JK, Pisal SS, Dhere RM, Poonawalla CS, Lamberigts C, Parulekar V, Potey AV. **Safety and immunogenicity of a reduced-dose inactivated poliovirus vaccine versus a full-dose inactivated poliovirus vaccine in infants in Bangladesh: a double-blind, non-inferiority, randomised, controlled, phase 3 trial.** *Lancet Infect Dis.* 2025 Oct;25(10):1128–1137.

doi: [https://doi.org/10.1016/S1473-3099\(25\)00215-4](https://doi.org/10.1016/S1473-3099(25)00215-4)

Editorial comment: Replacing oral polio vaccine with inactivated polio vaccine (IPV) is essential to prevent vaccine-derived poliovirus transmission. This trial compared the safety and immunogenicity of a dose-sparing IPV (ds-IPV) versus full-dose IPV in Bangladeshi infants. Between Jan 9, 2022, and Apr 29, 2023, 1,072 infants were randomized to ds-IPV (n=801) or IPV (n=267); 1,052 completed the study. Seroconversion rates for ds-IPV and IPV were 96% vs 97% for type 1 (difference –0.55%, 95% CI –3.05 to 1.95), 95% vs 98% for type 2 (–3.83%, –6.48 to –1.19), and 97% vs 98% for type 3 (–0.78%, –2.73 to 1.16). Both vaccines were well tolerated.

Three intramuscular doses of ds-IPV were safe and immunologically non-inferior to full-dose IPV, suggesting dose-sparing formulations could offer a cost-effective option for immunisation programmes.

05

Zeitouni J, Osazuwa-Peters N, Dundar Y, Zimet G, Varvares MA. **Two decades of the HPV vaccine: its promise, progress, prospects, projections, and posterity.** *Lancet Reg Health Am.* 2025 Sep 15;51:101243.

doi: <https://doi.org/10.1016/j.lana.2025.101243>

Editorial comment: Since its FDA approval in 2006, the HPV vaccine has transformed prevention of cervical, oropharyngeal, and other HPV-associated cancers in the U.S. While 78.2% of adolescents have initiated and 62.9% completed vaccination, support for the vaccine remains critical. State-level action is key, as federal guidance from HHS is advisory. Only five states and territories have school-entry HPV vaccination requirements, with varying enforcement, contributing to wide completion disparities— from 79.8% in Massachusetts to 39.1% in Mississippi. Evidence shows that school-entry mandates can markedly increase uptake. As the vaccine nears its twentieth anniversary, achieving the Healthy People 2030 goal of 80% series completion requires robust state policies and sustained access to ensure ongoing prevention of HPV-related cancers.

06

Gentile A, Juárez MDV, Lucion MF, Gregorio G, López O, Fernández T, Gioiosa A, Lobertti S, Pejito N, López L, Ensínck G. **Maternal Immunization With RSVpreF Vaccine: Effectiveness in Preventing Respiratory Syncytial Virus-associated Hospitalizations in Infants Under 6 Months in Argentina: Multicenter Case-control Study.** *Pediatr Infect Dis J.* 2025 Oct 1;44(10):988–994.

doi: <https://doi.org/10.1097/INF.0000000000004878>

Editorial comment: Starting in March 2024, Argentina introduced the bivalent RSVpreF vaccine for pregnant women between 32.0 and 36.6 weeks of gestation during the RSV season. This study aimed to evaluate the effectiveness of maternal immunization in preventing RSV-associated hospitalizations among infants under 6 months of age, comparing those born to vaccinated versus unvaccinated women, using a nested case-control design with a test-negative approach. Maternal RSV vaccination was less common among RSV cases than among controls (17.6% vs. 44.8%; $P < 0.001$). Among infants with RSV, those born to vaccinated mothers required fewer days of oxygen therapy (4 vs. 7 days; $P < 0.001$) and had shorter hospital stays (5 vs. 8 days; $P < 0.001$). The crude effectiveness of maternal RSV immunization in infants under 6 months was 68.2% (95% CI: 33.1%–84.9%), and 78.7% (95% CI: 51.4%–90.7%) after adjustment for age <3 months, prematurity, and chronic respiratory disease.

07

DeSieghardt A, Ding L, Ermel A, Franco EL, Dagnall C, Brown DR, Yao S, Kahn JA. **Population-Level Effectiveness and Herd Protection 17 Years After HPV Vaccine Introduction.** *JAMA Pediatr.* 2025 Sep 29.

doi: <https://doi.org/10.1001/jamapediatrics.2025.3568>

Editorial comment: This cross-sectional study analyzed data from six surveillance studies conducted between 2006 and 2023, including sexually experienced adolescent girls and young women aged 13–26 years recruited from clinical settings. Participants were classified as vaccinated if they had received at least one HPV vaccine dose. Effectiveness and herd protection were assessed by comparing the prevalence of vaccine-type HPV across 2-valent (2vHPV), 4-valent (4vHPV), and 9-valent (9vHPV) vaccines between vaccinated and unvaccinated participants. Prevalence in vaccinated participants from studies 2–6 was compared with unvaccinated participants from study 1. Inverse probability of treatment weighting with propensity scores was used to balance participant characteristics across waves. Among 2,335 participants (mean age 18.9 ± 2.7 years), vaccine-type HPV positivity declined sharply over time. In vaccinated participants, prevalence decreased from 27.7% to 0.4% for 2vHPV (relative reduction 98.4%), 35.4% to 2.1% for 4vHPV (94.2%), and 48.6% to 11.8% for 9vHPV (75.7%). Among unvaccinated participants, prevalence decreased from 25.8% to 7.3% for 2vHPV (71.6%), 25.3% to 6.1% for 4vHPV (75.8%), and 42.7% to 31.1% for 9vHPV (27.2%). Seventeen years after HPV vaccine introduction, population-level effectiveness and herd protection remain robust, even among sexually experienced adolescent girls and young women at higher risk who may not have completed the full vaccine series.

08

Celis-Salinas Juan C, Ramirez-Garcia EA, Fiestas-Solorzano VA, Casapia-Morales M. **Twenty-five years of pertussis outbreaks in the Peruvian Amazon: a call to strengthen equity in vaccination and control.** *The Lancet Regional Health – Americas.* 2025 Sep; 51: 101255.

doi: <https://doi.org/10.1016/j.lana.2025.101255>

Editorial comment: In this descriptive report, the authors detail a significant pertussis outbreak in Peru. National incidence rose from 3.9 cases per million in 2023 to 7.4 in 2024 and 57.5 by epidemiological week 33 of 2025, totaling 1,956 confirmed and probable cases with a case-fatality rate of 1.28%. Children under 12 years accounted for 70.5% (1,379/1,956) of cases, and 73.4% (1,436/1,956) occurred in the Amazonian region of Loreto, where 23 of the 25 deaths (92%) were reported. None of the deceased had received pertussis vaccination, and most were younger than one year.

09

Saif-Ur-Rahman KM, King C, Whelan SO, Blair M, Donohue S, Madden C, Kothari K, Sommer I, Harder T, Dauby N, Moustsen-Helms IR, Ruta S, Frère J, Schönfeld V, Poukka E, Lutsar I, Olsson K, Melidou A, Adel Ali K, Dwan K, Devane D. **Efficacy and safety of respiratory syncytial virus vaccines.** *Cochrane Database Syst Rev.* 2025 Sep 29;9(9):CD016131.

doi: <https://doi.org/10.1002/14651858.CD016131>

Editorial comment: In this Cochrane study, the authors systematically reviewed CENTRAL, MEDLINE, Embase, ClinicalTrials.gov, and WHO ICTRP from 2000 to April 2024, following standard methodology. RSV prefusion vaccines were shown to reduce RSV-associated lower respiratory tract illness and acute respiratory illness in older adults, with little to no difference in serious adverse events (SAEs). Maternal vaccination with RSV F protein-based vaccines reduced medically attended and severe RSV-associated lower respiratory tract illness in infants, also with little to no difference in SAEs among mothers or infants.

10

Barrenechea GG, Sanchez R, Calderon OC, Buffone OR, Bastos LS. **Characterization of the most austral autochthonous dengue outbreak reported in the world (city of Bahía Blanca, Argentina, January–June 2024). A cross-sectional study.** *The Lancet Regional Health – Americas.* 2025; 51: 101254.

doi: <https://doi.org/10.1016/j.lana.2025.101254>

Editorial comment: The aim of this study was to provide an epidemiological description of the first recorded dengue outbreak at the southernmost latitude on the planet. In Bahía Blanca (Buenos Aires, Argentina), dengue virus circulation was documented between January 1 and June 10, 2024. A total of 94 laboratory-confirmed cases were identified among 470 suspected cases. Of these, 63 were classified as autochthonous and 28 as imported. Both DENV-1 and DENV-2 serotypes were detected in these cases. This study offers clear evidence of dengue fever expanding into latitudes previously considered outside the known transmission range in Argentina. The documentation of dengue emergence in new geographic areas underscores the urgent need for public health authorities to implement preventive measures and policies to mitigate the growing disease burden.

11

Chen CH, Chen CL, Su LH, Chen CJ, Tsai MH, Chiu CH. **The microbiological characteristics and diagnosis of *Streptococcus pneumoniae* infection in the conjugate vaccine era.** *Hum Vaccin Immunother.* 2025 Dec;21(1):2497611.

doi: <https://doi.org/10.1080/21645515.2025.2497611>

Two pneumococcal conjugate vaccines (PCVs), Editorial comment: PCV15 and PCV20, were licensed in June 2021. PCV15 includes two additional serotypes (22F and 33F) beyond those contained in PCV13, while PCV20 adds seven more (8, 10A, 11A, 12F, 15B, 22F, and 33F), together accounting for approximately 30% of invasive pneumococcal disease (IPD) cases in adults. In June 2023, the U.S. Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP) recommended the use of either PCV15 or PCV20 for all children under 5 years of age, as well as for those aged 2–18 years with underlying risk conditions. Subsequently, in June 2024, the FDA approved PCV21 for adults aged ≥18 years. In October 2024, ACIP expanded its recommendations, endorsing either PCV20 or PCV21 alone, or PCV15 followed by PPSV23, for adults aged ≥50 years and for those aged 19–49 years with risk conditions. These developments underscore the rapidly evolving landscape of pneumococcal vaccination. This review explores the molecular epidemiology of pneumococcal infections, recent advances in diagnostic approaches, and the expected public health impact of these new vaccines in reducing the burden of pneumococcal disease.

12

Cotet IG, Mateescu DM, Ilie, Cristina Guse AC, Pah AM, Badalica-Petrescu M, Iurciuc S, Craciun ML, Buleu F, Tudoran C. **Systematic Review and Meta-Analysis of Myocarditis: Prevalence and Diagnostics in COVID-19: Acute, Post-COVID, and MIS-C (2020–2025).** *J Clin Med* 2025; 14: 7008.

doi: <https://doi.org/10.3390/jcm14197008>

Editorial comment: The authors conducted a systematic review and meta-analysis of 54 studies encompassing 32,500 patients, stratified by acute COVID-19, post-COVID, and MIS-C phases. The pooled prevalence of myocarditis was 1.2% (95% CI: 0.8–1.6) during acute COVID-19, 7.4% (95% CI: 5.1–9.8) in the post-COVID phase, and 39.8% (95% CI: 32.4–47.2) in MIS-C. Major cardiac outcomes included reduced left ventricular ejection fraction (LVEF) in 22% of cases and ventricular arrhythmias in 15%. Overall, the prevalence of myocarditis in COVID-19 varies significantly across clinical phases and diagnostic methods. These findings underscore the need for careful cardiac screening, particularly in MIS-C and selected post-COVID or athlete populations, as well as the importance of standardized diagnostic criteria and long-term follow-up. Importantly, the data further support vaccination of adolescents and children, who represent the population with the highest risk of COVID-19-related myocarditis.

13

Zeevat F, Luttjeboer J, Korsten K, van Boven M, Postma MJ, van der Pol S, Boersma C. **Evaluating cost-effectiveness of RSV vaccination strategies for older adults in the Netherlands.** *Vaccine*. 2025 Sep 26;65:127735.

doi: <https://doi.org/10.1016/j.vaccine.2025.127735>

Editorial comment: In this study, a static decision tree cost-effectiveness model was developed to compare no vaccination with several RSV vaccination strategies for Dutch adults over six RSV seasons. The strategies evaluated included vaccinating adults aged ≥ 60 years, ≥ 75 years, and those aged ≥ 75 years combined with high-risk individuals aged 60–74 years. Each strategy was assessed using two- and three-year vaccination intervals. Vaccinating individuals aged ≥ 75 years and high-risk adults every three years was projected to prevent approximately 19,000 general practitioner visits, 3,300 hospitalizations (including 245 intensive care admissions), and 870 deaths in the first year. This approach was estimated to avert €29.5 million in healthcare costs and €6.3 million in productivity losses, yielding a gain of 2,900 QALYs. The strategy was determined to be cost-effective, with an average cost-effectiveness ratio (ACER) of €30,804 per QALY gained.

14

Cerqueira-Silva T, Rodrigues LC, Pearce N, Teixeira MG, Costa MDCN, Cardim L, Boaventura VS, Lawlor DA, Barreto ML, Paixao ES. **Perinatal outcomes of symptomatic chikungunya, dengue and Zika infection during pregnancy in Brazil: a registry-based cohort study.** *Nat Commun*. 2025 Aug 5;16(1):7207.

doi: <https://doi.org/10.1038/s41467-025-62640-x>

Editorial comment: This Brazilian study used a linked population-based cohort from 2015 to 2020, including 6,993,395 live births. Among these, 6,066 ($<0.1\%$) mothers had chikungunya, 19,022 (0.3%) had dengue, and 8,396 (0.1%) had Zika during pregnancy. Symptomatic maternal chikungunya was associated with preterm birth (HR 1.10; 95% CI 1.01–1.22), low Apgar score at 5 minutes (1.44; 1.14–1.82), and neonatal death (1.50; 1.15–1.96). Dengue was linked to preterm birth (1.07; 1.02–1.12), low birth weight (1.10; 1.04–1.15), congenital anomalies (1.19; 1.03–1.37), and low Apgar score (1.26; 1.09–1.45). Zika infection was associated with all adverse outcomes, particularly congenital anomalies, with more than double the risk (2.36; 1.91–2.67) compared to unexposed pregnancies. These findings underscore the significant impact of arboviral infections during pregnancy and highlight the need for effective prevention strategies to protect maternal and neonatal health.

15

Genovese G, Rizzo CE, Genovese C. **Health Technology Assessment of mRNA Vaccines: Clinical, Economic, and Public Health Implications.** *Vaccines*. 2025; 13(10):1045.

doi: <https://doi.org/10.3390/vaccines13101045>

Editorial comment: Health Technology Assessment (HTA) is a multidisciplinary approach that evaluates the clinical, social, organizational, economic, ethical, and legal implications of healthcare technologies by assessing their efficacy, safety, cost, and broader impact. In healthcare, “technology” encompasses any tool used in practice, including pharmaceuticals and vaccines. HTA examines both the current and potential effects of technology across its life cycle. In this context, mRNA vaccines represent an innovative platform offering high efficacy, safety, scalability, and rapid development. Their success during the COVID-19 pandemic highlighted not only their clinical value but also their contribution to healthcare resilience and economic efficiency. Looking forward, mRNA platforms hold great promise for preventing other infectious diseases and for developing therapeutic vaccines against cancer and autoimmune disorders.

16

Kuo T-H, Chen Y-C. **Biotechnology and the Future of Vaccines—From Novel Routes and Vectors to Safety, Efficacy, and Global Impact.** *Vaccines*. 2025; 13(10):1043.

doi: <https://doi.org/10.3390/vaccines13101043>

Editorial comment: This is an excellent review of current, novel, and future vaccine platforms, with a strong emphasis on vector-based vaccines and their potential global impact.

17

Domingo JL. **Differentiating COVID-19 vaccine-related adverse events from long COVID: A comprehensive review of clinical manifestations, pathophysiology, and diagnostic approaches.** *Vaccine*. 2025 Oct 11;66:127842.

doi: <https://doi.org/10.1016/j.vaccine.2025.127842>

Editorial comment: Through a comprehensive literature search (PubMed, Scopus, and Web of Science) covering December 2020 to June 2025 and including peer-reviewed studies, clinical trials, and cohort analyses, this review confirms that COVID-19 vaccines maintain a strong safety profile, with rare adverse events such as myocarditis and thrombosis with thrombocytopenia syndrome. In contrast, long COVID affects approximately 10–40% of SARS-CoV-2 survivors, most commonly presenting with fatigue, cognitive dysfunction, and dyspnea.

18

Chacon-Cruz E, Lopatynsky-Reyes E. **Infectious Diseases and Cancer: The Role of Vaccination.** *Med Res Arch*. 2025; 13.

doi: <https://doi.org/10.18103/mra.v13i9.6928>

Editorial comment: This editorial explores the role of infections in cancer, addressing not only pathogens directly involved in oncogenesis, but also how certain respiratory viruses—such as influenza—can promote cancer dissemination, a recent finding. The article further discusses how vaccines and immunization strategies can disrupt these processes, reinforcing the profound value of vaccination in preventing not only infections, but also infection-related and infection-triggered cancers.

19

Rodriguez-Morales AJ, Torres-Hernández D, Guevara ME, Chang-Cojulun A, Brea-Del Castillo J, Rios-Blanco R, Mérida-Barrios MI, Palmieri M, Avila-Agüero ML. **Yellow fever in children and adolescents amid the South American outbreak, 2024/2025.** *New Microbes New Infect.* 2025 Sep 3;67:101635.

doi: <https://doi.org/10.1016/j.nmni.2025.101635>

Editorial comment: Yellow fever (YF) in South America follows cyclical outbreak patterns that have influenced public health policies for over a century. The ongoing resurgence during 2024–2025 marks the largest epidemic wave in Colombia in more than two decades and continues to impact neighboring countries, particularly Brazil and Peru. Despite this, children and adolescents—one of the most vulnerable groups—remain underrepresented in research and public discussion. This review focuses on the clinical and epidemiological features of YF among children and adolescents during the 2024–2025 South American outbreak.

20

Chen, W.H., Barnes, R.S., Sikorski, M.J. *et al.* **A combination typhoid and non-typhoidal Salmonella polysaccharide conjugate vaccine in healthy adults: a randomized, placebo-controlled phase 1 trial.** *Nat Med.* 2025 Oct.

doi: <https://doi.org/10.1038/s41591-025-04003-z>

Editorial comment: The authors conducted a first-in-human, randomized, placebo-controlled phase 1 trial to evaluate the safety and immunogenicity of the Trivalent Salmonella Conjugate Vaccine (TSCV). Twenty-two healthy adults aged 18–45 years were randomly assigned to receive 6.25 µg TSCV (n = 8), 12.5 µg TSCV (n = 10), or placebo (n = 4). For each of the three polysaccharides, immune responses—defined as ≥4-fold increases over baseline—were observed in all (100%) vaccine recipients, with no responses in the placebo group. The study met its prespecified immunogenicity endpoints, and no serious adverse events were reported.

21

Polisky V, Littmann M, Triastcyn A, Horn M, Georgiou A, Widenmaier R, Anspach B, Tahrat H, Kumar S, Buser-Doepner C, Geldsetzer P, Van Duijn CM, Schwab P. **Varicella-zoster virus reactivation and the risk of dementia.** *Nat Med.* 2025 Oct 6.

doi: <https://doi.org/10.1038/s41591-025-03972-5>

Editorial comment: In this study, the authors present a large-scale longitudinal analysis of health records from over 100 million individuals in the United States, showing a consistent association between varicella-zoster virus (VZV) reactivation and dementia. This relationship persisted after adjusting for nearly 400 covariates, including demographics, comorbidities, medications, and healthcare-related factors. Recurrent herpes zoster (HZ) was linked to a higher dementia risk compared to a single episode, while HZ vaccination was associated with a lower risk relative to the 23-valent pneumococcal polysaccharide vaccine.



Editor's Corner

UNDERSTANDING THE ANTIVACCINE MOVEMENT: SENTIMENTS, HESITANCY, MISINFORMATION, AND STRATEGIES FOR EVIDENCE-BASED COMMUNICATION

**Introduction**

Between 1974 and 2024, vaccination is estimated to have prevented 154 million deaths, including 146 million among children under the age of 5, of which 101 million were infants under 1 year old. Additionally, during this 50-year period, vaccination has contributed to the gain

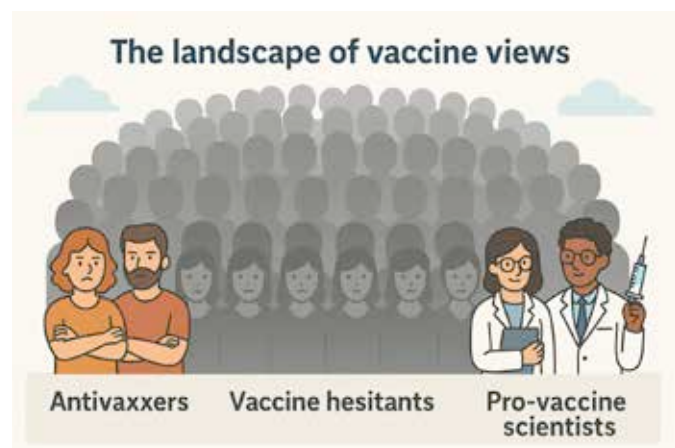
of 9 billion life-years and 10.2 billion years of full health. These achievements position vaccines and immunization as one of the most impactful healthcare interventions, second only, perhaps, to access to potable water.

In 2011, the WHO's Strategic Advisory Group of

Experts (SAGE) on Immunization established the Working Group on Vaccine Hesitancy, defining it as “complex and context-specific,” varying across time, place, and vaccine. By 2019, the WHO had identified vaccine hesitancy as one of the top 10 threats to global health.

International movements opposing science and vaccines have existed since the introduction of the smallpox vaccine. These movements emerge in waves, spreading rapidly and leaving behind a persistent “gray zone” of vaccine hesitancy. This hesitancy is counterbalanced only by scientific evidence and real-world data. Importantly, individuals in this gray zone—the vaccine-hesitant—represent a critical group. By addressing their concerns with accurate information and evidence-based communication, they can be guided toward acceptance, ultimately improving vaccination coverage and saving more lives.

This narrative review addresses vaccine hesitancy by examining five illustrative cases—smallpox, pertussis, measles, human papillomavirus (HPV), and SARS-CoV-2—followed by an analysis of underlying causes and potential interventions targeting this large “gray zone” of vaccine hesitancy, with an extensive focus on communication, and miscommunication.



Smallpox

Widespread smallpox vaccination began in the early 1800s, following Edward Jenner’s landmark cowpox experiments, which demonstrated that infection with cowpox lymph could protect against smallpox. Though revolutionary, Jenner’s

ideas immediately faced public criticism.

The Vaccination Act of 1853 mandated vaccination for infants up to 3 months old, and the 1867 Act extended the requirement to children up to 14 years, imposing penalties for refusal. These laws fueled strong resistance, as many citizens demanded control over their own bodies and their children’s health. In response, the Anti-Vaccination League and the Anti-Compulsory Vaccination League emerged, alongside a surge of anti-vaccination journals.

The Leicester Demonstration (UK) in March of 1885 became one of the most infamous protests, drawing 80,000–100,000 demonstrators who paraded with banners, a child’s coffin, and an effigy of Jenner himself.

Pertussis:

Vaccination with diphtheria and tetanus toxoids combined with whole-cell pertussis (DTP) was introduced into the Expanded Program on Immunization (EPI) in 1974. By the early 1980s, mass vaccination had drastically reduced pertussis-related morbidity and mortality.

However, as the disease burden declined, public attention shifted toward concerns about vaccine safety. Reports of adverse events—widely covered by the media in the United States and the United Kingdom—led to reduced acceptance, and in some countries, complete rejection of whole-cell pertussis (wP) vaccines. Consequently, vaccination coverage dropped, precipitating major epidemics in 1977–79 and 1981–83, with over 65,000 cases and 12 deaths reported in 1978 alone.

In Japan, vaccination was suspended in 1975 following two suspected vaccine-related deaths and subsequent publicity. Within two years, pertussis incidence surged, resulting in approximately 40 deaths. These outbreaks underscore the serious consequences of declining coverage with an effective vaccine, with the true mortality likely underestimated due to under recognition of infant cases.

By the 1980s, widespread publicity linked wP vaccination to seizures and encephalopathy. Although subsequent studies (Jale et al., 1994; Barlow et al., 2001; Ray et al., 2006) conclusively

refuted these associations, the damage was lasting—public mistrust persisted, and resistance to wP vaccination continues in some populations.

Measles and “the Wakefield fraud”

Between 1974 and 2024, measles vaccination alone is estimated to have saved over 97 million lives, the majority in children.

Nearly 25 years after the DTP controversy, vaccine skepticism re-emerged in England, this time targeting the measles, mumps, and rubella (MMR) vaccine. In 1998, Andrew Wakefield suggested a possible association between MMR vaccination, bowel disease, and autism. He later claimed the vaccine had not been adequately tested prior to widespread use. Media amplification of these claims fueled public fear and confusion about vaccine safety.

In 2004, *The Lancet* expressed regret for publishing Wakefield’s paper, and in 2010 formally retracted it after the UK General Medical Council found Wakefield guilty of serious professional misconduct, including undisclosed financial conflicts of interest. That same year, Wakefield was removed from the UK medical register. In 2011, the *BMJ* published investigative reports demonstrating that Wakefield had falsified data and sought to profit financially from his claims.

Since then, numerous high-quality studies have examined the safety of the MMR vaccine, and none have found any association with autism.

HPV Vaccination: Autoimmune Diseases, Sexuality, and Other Concerns

Extensive research has assessed the potential association between HPV vaccination and autoimmune or neurological disorders. Collectively, these studies included over 3 million adult women, nearly 1 million adolescent girls, 600,000 boys, and more than 250,000 younger girls. While small signals have been reported for conditions such as Raynaud’s disease, type 1 diabetes, vitiligo, and narcolepsy, no causal link with HPV vaccination has been established.

A common parental concern is whether vaccination between ages 9 and 12 is necessary, as children are not yet sexually active. Questions about potential promotion of early sexual activity

or promiscuity frequently arise. However, evidence consistently shows that HPV vaccination does not alter sexual behavior. Importantly, vaccination prior to sexual debut provides the greatest protection, as HPV exposure can occur soon after first sexual contact, and the timing of this varies across individuals, cultures, and countries. Moreover, while HPV is primarily transmitted sexually, non-sexual transmission—via fomites, shared clothing, horizontal, and even vertical routes—has also been reported. Vaccination at younger ages ensures durable immunity before exposure, making early immunization (starting at age 9) optimal. In this context, it is possible to vaccinate too late, but never too early.

Another misconception is that HPV vaccination may cause ovarian failure. A large 2018 study of nearly 20,000 women aged 11–34 found no association between adolescent HPV vaccination and ovarian failure, reaffirming the vaccine’s safety.

COVID-19 Vaccination: From Preventing Millions of Deaths to Fears of the Vaccine Itself

Between 2020 and 2024, COVID-19 vaccination is estimated to have prevented 2.53 million deaths worldwide—equivalent to one life saved for every 5,400 doses administered. Approximately 82% of these lives were saved through vaccination prior to viral exposure. Notably, 57% of prevented deaths occurred during the Omicron phase, and 90% were among individuals aged ≥60 years. In total, vaccination preserved an estimated 14.8 million years of life, corresponding to one year of life saved for every 900 doses delivered.

Despite this impact, the rollout of COVID-19 vaccines coincided with the rise of “health freedom” political activism, particularly within far-right movements in the United States. This movement discouraged vaccination, contributing to an estimated 200,000 preventable deaths among unvaccinated Americans in 2021–2022. Antivaccine activism has since emerged as a major lethal force in that country.

Globally, vaccine confidence has also declined. In the UK, the proportion of adults who believed vaccines were safe and effective fell from 90% in 2018 to 70% in 2023, according to the Vaccine

Confidence Project (London School of Hygiene and Tropical Medicine). A similar downward trend was observed in 52 of 55 countries surveyed since 2019. Complementary polling by YouGov found that the share of adults who believe vaccines have undisclosed harmful side effects rose from 19% in 2019 to 30% in 2024.

Internet age and misinformation

Since the emergence of social media in the early 2000s, concerns have grown about the rapid spread of health-related rumors and misinformation. Surveys conducted by the UK Health Security Agency, U.S. institutions, and others report that 20–30% of parents encountered online content that made them question vaccines—a sharp increase from just 6% the previous year.

As social media platforms evolved from niche communities into central components of the global media landscape, the dynamics of misinformation shifted dramatically. Now somebody in one corner of the world can post something and, within seconds, millions elsewhere can see it. It is not just the speed, but also the unprecedented reach of misinformation that puts us in entirely uncharted territory.

Politics

Recent political shifts within federal health leadership have raised concerns about the influence of antivaccination rhetoric in major countries' health agencies. Changes in advisory committee composition, including the replacement of scientific experts with individuals linked to antivaccine activism or potential conflicts of interest, mark a departure from prior evidence-based practice.

These developments illustrate how political decisions can shape public health policy and communication. The risk is that antivaccination sentiment may gain greater visibility and legitimacy, both domestically and internationally. If questionable or low-quality science is promoted through official channels, it could undermine trust in federal health institutions, complicate science communication, and contribute to vaccine hesitancy worldwide.

Exploring Solutions to Vaccine Hesitancy

Measuring vaccine hesitancy is key. Because directly “combating” antivaccine movements is not feasible, efforts should instead focus on understanding the population-specific drivers of vaccine uptake. This requires distinguishing between vaccine hesitancy and external barriers such as access.

Several new tools are being developed to address this need. The Vaccine Barriers Assessment Tool, for example, is designed to evaluate both acceptance- and access-related barriers to childhood vaccination in Australia and New Zealand, with potential for adaptation to other contexts, including low- and middle-income countries and across different populations (e.g., school-age children, adults) and vaccines (e.g., influenza, COVID-19). Similarly, the World Health Organization's Working Group on the Behavioral and Social Drivers of Vaccination is developing standardized quantitative and qualitative instruments to measure these drivers globally.

Such tools can help detect emerging trends in vaccine accessibility and acceptance. Critically, understanding why specific groups or individuals fail to receive recommended vaccines is essential for designing and evaluating cost-effective, tailored strategies to improve uptake.

Communication and community engagement

Research confirms provider recommendation to vaccinate is one of the key drivers of vaccine uptake, with different approaches taken by providers. Presumptive communication assumes people are ready to vaccinate (“We’re going to be ...”), whereas participatory communication asks people if they want to vaccinate (“Did you want to ...”). Studies have suggested a presumptive approach is associated with higher uptake of childhood vaccines (observational studies) or adolescent HPV vaccines (randomized controlled trial).

Motivational interviewing offers a more structured counseling approach designed to guide people towards change by exploring and enhancing internal motivation.

In recent years, a growing number of entities

have misrepresented themselves as scholarly journals, seeking financial gain without adhering to accepted standards of academic publishing. The proliferation and increasing boldness of these predatory outlets highlights the urgent need to expose their practices and to consider concrete actions that stakeholders can take to counter their deceptive activities.

Data vs. sentiments

Sentiment analysis is one of the most widely studied applications in Natural Language Processing (NLP). It enables the computation of sentiment scores, transforming large volumes of unstructured text into structured, quantifiable opinions. A common approach involves counting the number of positive and negative words in a document to derive an overall sentiment score. Typically, each positive word contributes +1, while negative words contribute -1, depending on the chosen method (Qorib M, et al.).

The Relative Proportional Difference (RPD) ranges from -1 to 1 and is defined as:

$$\text{Sentiment} = \frac{P - N}{P + N}$$

where **P** denotes the number of positive words and **N** the number of negative words in the text.

$$\text{RPD Sentiment} = \frac{20 \text{ studies showing } 80\% \text{ vaccine efficacy} - 20 \text{ blogs showing vaccine toxicity}}{20 \text{ studies showing } 80\% \text{ vaccine efficacy} + 20 \text{ blogs showing vaccine toxicity}}$$

Let us now insert the variables based on the reader's perspective:

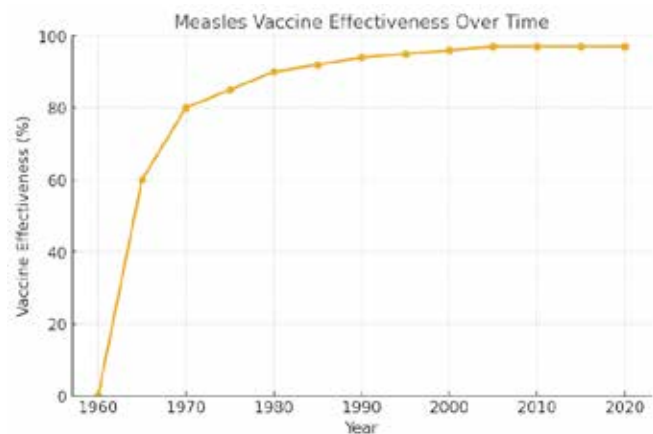
- Scientist perspective: "A blog is not equivalent to a scientific publication, and the reported RPD is not well measured."
- Non-scientist perspective (A): "The RPD is 0.5 (<1), but I would like to see the proportions and the 'intensity' of toxicity."
- Non-scientist perspective (B): "The RPD is 0.5 (<1); this suggests the vaccine is more toxic than effective. However, I would like to know more about the source mentioned in the blogs."
- Non-scientist perspective (C): "The RPD is 0.5 (<1), so the vaccine is evidently more toxic than effective."

For now, let us set aside the algebra and simply

present these two variables. Both the graph and the image are intended only as illustrative tools for the purposes of this column.

A plot:

Measles real-life effectiveness over time, published by WHO



And an image

A case of febrile seizures in a child, erroneously attributed by the author to the measles vaccine.

- Scientist perspective: "The plot clearly demonstrates that the measles vaccine is effective. The baby's febrile seizures are most likely the result of an acute viral infection, not the vaccine."
- Non-scientist perspective (A): "I can see that the measles vaccine appears effective, but it still seems like it can cause a baby to develop seizures."
- Non-scientist perspective (B): "The idea of having a baby with seizures most likely caused by the vaccine is terrible, and I do not understand the plot."

- Non-scientist perspective (C): “Data can always be manipulated, but the baby with seizures is real.”

The rise of instant information, the decline of sustained critical thinking

Over the past decade, the volume of available information has grown exponentially; however, much of it is generated by unverified sources and delivered in short formats, such as blogs or clips lasting only one to two minutes. Younger audiences, in particular, are more likely to consume these brief messages than to engage with longer, evidence-based explanations. This trend is shaping the thinking of millions, discouraging both self-criticism and external scrutiny of the information received—largely because such critical processes require time and effort, and may even force us to confront how media organizations manipulate public perception.

This phenomenon is closely tied to emotions, which are triggered more rapidly than rational thought. As a result, emotionally charged content often outpaces reflective reasoning, making individuals more vulnerable to misinformation. Recognizing these dynamic highlights the importance of fostering critical thinking and promoting evidence-based communication, so that voices are raised in support of facts rather than falsehoods.

Vaccine fatigue

Vaccine fatigue can be defined as inaction toward vaccine information, instructions, or recommendations, often resulting from perceived burden or burnout. This phenomenon became globally evident during the COVID-19 pandemic. Several

antecedents have been identified, including:

- High frequency of immunization demands
- Misconceptions regarding disease severity and the need for vaccination
- Concerns about vaccine side effects
- Lack of trust in government and media

A comprehensive understanding of these factors can help governments and health authorities design more effective countermeasures to limit the impact of vaccine fatigue. By addressing these drivers, societies can reduce the risk of escalating vaccine fatigue into outright vaccine hostility, ultimately supporting stronger and more sustainable immunization programs.

Conclusions

Vaccine hesitancy is dynamic and continuously evolving—an issue made particularly visible during the COVID-19 pandemic. To address it effectively, open and ongoing dialogue about vaccination is essential to identify and respond to emerging concerns early. Physicians and other health care providers remain among the most trusted sources of medical advice, but overcoming mistrust also requires deeper understanding of the roots of misinformation, misperceptions, and contextual barriers.

Meeting this challenge calls for country- and region-specific policies and protocols, reinforced by skilled science communicators, to build trust and promote evidence-based reasoning over emotionally charged, unscientific, and potentially harmful misinformation. For these efforts to succeed, strategies must be consistent, proportionate, and **easily understood**, ensuring stronger and more resilient public health systems.

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Best Practice

INFLUENZA VACCINATION FOR THE 2025–2026 SEASON IN THE NORTHERN HEMISPHERE AND THE 2026 SEASON IN THE SOUTHERN HEMISPHERE IN THE CONTEXT OF POTENTIAL B/ YAMAGATA LINEAGE EXTINCTION



Introduction

1. Key Strains Since 2009.

Following the 2009 H1N1 pandemic, several influenza strains have established global circulation as seasonal viruses:

- A(H1N1)pdm09: The 2009 pandemic strain transitioned into a seasonal virus and continues to circulate, commonly referred to as seasonal H1N1.
- A(H3N2): A major seasonal strain, characterized by frequent antigenic drift and the emergence of new variants each year.
- Influenza B: Two lineages, B/Yamagata and B/Victoria circulated.

Annual Variability

- Seasonal influenza vaccines are reformulated each year to target the most prevalent strains identified through global surveillance.
- The World Health Organization (WHO) reviews circulating strains and issues vaccine composition recommendations twice annually.

Current Trends

- A(H1N1)pdm09 remains a significant contributor to seasonal influenza activity.
- A(H3N2) and both B lineages continue to evolve, posing challenges for vaccine effectiveness and shaping public health strategies.

2. The decline and potential extinction of Influenza B/Yamagata.

Before the emergence of SARS-CoV-2, the B/Victoria and B/Yamagata influenza virus lineages generally co-circulated, without a consistent pattern of alternation between influenza seasons. B/Yamagata viruses tend to infect adults and older individuals more often than the B/Victoria lineage, which mostly infect children and adolescents.

From 2012 to 2017, B/Yamagata viruses accounted for more global infections than B/Victoria viruses. However, in the two years immediately preceding the COVID-19 pandemic, this trend reversed: the B/Victoria lineage became dominant,

with the ratio of B/Yamagata to B/Victoria declining to 1:4.5 in 2018 and 1:19.3 in 2019.

Epidemiological surveillance during the COVID-19 pandemic has shown a marked decline in circulation of the influenza B Yamagata lineage, suggesting a significant shift in the epidemiology of influenza B viruses (IBVs). Multiple factors may underlie this decline, including changes in viral fitness, host immunity profiles, inter-lineage competition, and stochastic fluctuations in transmission. As the virus undergoes repeated antigenic changes, its capacity to efficiently infect hosts and sustain transmission may diminish, contributing to the apparent disappearance of B/Yamagata strains. In addition, competition with other influenza viruses—both the alternate B/Victoria lineage and influenza A subtypes—likely further accelerated this decline, raising the possibility of lineage extinction.

However, declaring the B/Yamagata lineage extinct would be premature. Circulation may currently persist at very low levels, below the detection threshold of existing surveillance systems, or in regions with limited surveillance coverage. This leaves open the possibility of a future resurgence of the B/Yamagata lineage.

As a result, since last year international health authorities—including the WHO, CDC (USA), EMA, and others—have recommended excluding the B/Yamagata lineage from the quadrivalent influenza vaccine. Current guidance supports the use of a trivalent formulation containing A(H1N1)pdm09, A(H3N2), and B/Victoria.

Quadrivalent vaccines, where the transition to trivalent vaccines is not yet complete, contain a 4th component – a B/Yamagata lineage virus (B/Phuket/3073/2013-like virus), however, there will no longer be updated recommendations for the B/Yamagata lineage component.

Current recommendations for Influenza vaccination in the Northern Hemisphere:

WHO:

–Egg-based vaccines:

- an A/Victoria/4897/2022 (H1N1)pdm09-like virus.

- an A/Croatia/10136RV/2023 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

-Cell culture, recombinant protein or nucleic acid-based vaccines:

- an A/Wisconsin/67/2022 (H1N1)pdm09-like virus.
- an A/District of Columbia/27/2023 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

CDC (USA):

-Egg-based vaccines:

- an A/Victoria/4897/2022 (H1N1)pdm09-like virus.
- an A/Croatia/10136RV/2023 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus

-Cell- or recombinant-based vaccines:

- an A/Wisconsin/67/2022 (H1N1)pdm09-like virus.
- an A/District of Columbia/27/2023 (H3N2)-like virus,
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

EMA:

-Egg-based based vaccines:

- an A/Victoria/4897/2022 (H1N1)pdm09-like virus.
- an A/Croatia/10136RV/2023 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

-Cell-based vaccines:

- an A/Wisconsin/67/2022 (H1N1)pdm09-like virus.
- an A/District of Columbia/27/2023 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

Current recommendations for Influenza vaccination in the Southern Hemisphere

WHO:

- Egg-based vaccines:

- an A/Missouri/11/2025 (H1N1)pdm09-like virus.
- an A/Singapore/GP20238/2024 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

-Cell culture, recombinant protein or nucleic acid-based vaccines:

- an A/Missouri/11/2025 (H1N1)pdm09-like virus.
- an A/Sydney/1359/2024 (H3N2)-like virus.
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

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Guest Contributors

COVID-19 VACCINE PREVENTS MULTISYSTEM INFLAMMATORY SYNDROME (MIS-C)

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Pediatric vaccination against SARS-CoV2 infection and COVID-19 has shown worldwide multiple benefits, including disease prevention, transmission, complications, hospitalizations, associated-health care costs, and long-term sequelae. In the post-pandemic era, prevention of Multisystem Inflammatory Syndrome (MIS-C) and Long COVID are still one of the most important reasons to vaccinate children.

MIS-C is a complication and life-threatening condition occurring approximately four weeks after SARS-CoV2 infection in children and adolescents, and less commonly in adults.^{1,2} This inflammatory condition, clinically resembles Kawasaki Disease (KD) and most of its associated complications are cardiovascular, including myocardial dysfunction and cardiogenic shock. Treatment options include intravenous immunoglobulin (IVIG), steroids, and other immunomodulatory agents.³⁻⁵ Overall, severe disease and mortality rates are higher in children from developing versus developed countries.⁶ Long-term impact and sequelae can range from mild to severe,⁷ therefore studies involving big number of patients or multicenter/multinational studies.

REKAMLATINA (Red de Enfermedad de Kawasaki en América Latina) is a multinational multicenter research network that was established in June 2013 to study the epidemiology of KD among hospitalized children at the main pediatric or referral centers in Latin America, where most children with KD are treated.^{8,9} This large network is integrated by pediatricians, pediatric infectious disease, cardiology, rheumatology, immunology,

allergology, emergency and critical care subspecialists. After MIS-C was initially described in Europe, we started to collect retrospective and prospective information of children presenting with MIS-C at our REKAMLATINA hospitals, supported by our multi-specialty expertise.¹⁰ We analyzed information obtained during 3 years from children admitted at 87 participant hospitals from 16 countries in Latin America.

In the general epidemiologic study of MIS-C in our region,¹¹ we reported 1,239 children with MIS-C at 16 countries from August 2020 to June 2022. In this study, we found that the mean duration of fever was 5 days at the time of diagnosis which implies a late recognition, based on the classic WHO and CDC definitions of MIS-C. Of concern, 589 (47.5%) patients required admission to an intensive care unit. The overall death rate in this study was 4.88%, which is higher when compared to developed countries. Specifically, a fatality rate of 3,39% was seen for those initially diagnosed with MIS-C but increased to 8.85% for those children whose diagnosis at admission was not MIS-C.

From that cohort study,¹¹ subsequent specific analysis have been made and published.¹²⁻¹⁵ In a sub analysis of that cohort, 590 (48%) of patients with MIS-C required admission to an intensive care unit,¹² and the case fatality rate was 4.8%, which is almost five times higher than that reported in North America and Europe. These children had more myocardial dysfunction (20% versus 4%), 83.4% required vasoactive drugs and 43.4% mechanical ventilation. We found that children over six years of age, with shock,

seizures and more inflammation, were at higher risk of PICU admission. In another sub analysis of MIS-C patients, we found that 17,1% developed Macrophage Activation Syndrome (MAS),¹³ which itself has significant morbidity and mortality rates. Not surprisingly, the combination of both entities increases the rate of complications and deaths. We found that MAS in MIS-C patients increases the fatality rate to 12%.

In another study looking at social health determinants in our MIS-cohort,¹⁴ we found that food insecurity, larger distance from a health center, not owning a car to transport the child to a hospital, payment by other means, or having a home in poor condition were associated with decreased left ventricular ejection fraction, shock, transfusion, and need for respiratory support. This is another example of the importance of COVID vaccination in children to prevent these complications. Finally, in a very novel study, we published the largest study on machine learning models through early, easily obtainable clinical parameters to predict

multiple adverse outcomes in children with MIS-C and made them available for routine use through a web-based real-time application.¹⁵ This model can help the clinician risk stratify MIS-C patients, providing personalized care that could improve patient outcomes.

Our Latin American experience as well as that from other latitudes show how severe MIS-C can be in children, highlighting the importance to vaccinate them to prevent this life-threatening condition. Soon after COVID vaccines were available, we showed in an international study that in children who had a previous MIS-C episode it was safe to immunize them with COVID vaccines.¹⁶ In a recent publication, it was shown that children vaccinated against COVID, do not have higher risk to develop Kawasaki disease or MIS-C.¹⁷ Instead, the beneficial impact of vaccination to prevent hospitalizations due to MIS-C, as well as associated complications including deaths, has been show in both multicenter and multinational studies.¹⁸⁻²²

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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.

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