



Update 143 FHP-Update 22 November 2023



News:

- **FHPB:** The next iteration of the [NATO HEALTH SURVEILLANCE AND MULTINATIONAL MANAGEMENT OF EPIDEMIC CRISIS FOR OPERATIONAL AND STRATEGIC MEDICAL LEADERS](#) (MED-MS-31669) and [NATO HEALTH INVESTIGATION AND MANAGEMENT IN DEPLOYMENTS](#) (HEIMDAL) (MED-MS-42191) is now open for registration at the NATO MilMedCoE webpage.
- **ESCAID:** The [European Scientific Conference on Applied Infectious Disease Epidemiology](#) (ESCAID) is running in Barcelona and online from 22-24 November 2023. The scientific content of the conference primarily consists of plenary sessions, and oral and poster abstract presentations.
- **UN:** More than 100 employees of the UN's Palestinian refugee agency (UNRWA) have been killed in five weeks of Israeli bombardment and siege of the Gaza Strip. The war – which began after Hamas gunmen attacked Israel on 7 October, killing 1,400 people, the majority civilians, according to Israeli officials – has been the deadliest ever for UN personnel, [according to UN Secretary-General António Guterres](#).
- **WHO, UNICEF, Gavi:** launches a report on the [Eliminate Yellow Fever Epidemics \(EYE\) Strategy](#), following its mid-term evaluation in 2022. The evaluation report shows that despite the significant achievements of the Strategy, there are challenges. Key gaps include low prioritization of yellow fever due to competing public health priorities in countries.
- **ECDC:** has previously raised the alarm on the increasing [threat of antimicrobial resistance](#), estimating that over 35 000 people die annually from infections resistant to antibiotics in the European Union (EU), Iceland, and Norway. In a concerted effort to address this growing public health issue, [the Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach](#) was adopted on 13 June 2023, which included five targets to be achieved by 2030, building on a 2019 baseline.
- **ECDC:** published an [executive summary](#) that showcases results derived from 2022 antimicrobial resistance (AMR) data, sourced from invasive isolates reported to both the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) network and the European Antimicrobial Resistance Surveillance Network (EARS-Net). The results from CAESAR and EARS-Net clearly show that AMR remains widespread in the WHO European Region.
- **WHO:** certified [Belize as malaria-free](#) as of June 2023, adding the country to the official list of malaria-free countries and territories.
- **Amnesty International:** has called on Pakistan to stop “the continued detentions, deportations and widespread harassment of Afghan refugees”. More than 170,000 Afghans have returned to Afghanistan since mid-September, when the Pakistani government issued a 1 November [deadline](#) for all those without the right documentation to leave. The Taliban has set up transit centres near border crossing points, dispatched military vehicles to transport returnees, and set up mobile health centres for returnees, as concerns grow of a border refugee crisis.
- **DEMOCRATIC REPUBLIC OF THE CONGO:** [Pregnant women are to be offered free healthcare](#) in 13 out of 26 regions by the end of the year in a bid to cut the country's high rates of maternal and neonatal deaths. Plans to extend the scheme across the entire country are tempered by concerns over the availability of sufficient trained staff and medical facilities.

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ESCAIDE

European Scientific Conference on
Applied Infectious Disease Epidemiology

22-24 November 2023

in Barcelona & online



Recommended composition of influenza virus vaccines for use in the 2024 southern hemisphere influenza season

as of September 2023

WHO will make a recommendation in February 2024 relating to vaccines that will be used for the Northern hemisphere (NH) 2024–2025 influenza season. For countries in tropical and subtropical regions, WHO recommendations for influenza vaccine composition are available on the WHO Global Influenza Programme website.

Seasonal influenza activity

From February through August 2023, influenza activity was reported in all zones and the number of detections was comparable to the same reporting period in 2022. However, the predominant virus varied among transmission zones and between countries.

In Africa, influenza A and B viruses co-circulated, with predominance of influenza A and roughly equal circulation of influenza A(H1N1)pdm09 and A(H3N2) across the continent.

In Asia, influenza virus detections peaked in March and declined to low levels by May. Most detections were reported from Eastern Asia, where activity peaked in March with co-circulation of both subtypes and a predominance of A(H1N1)pdm09.

In Europe, influenza B predominated with co-circulation of A(H1N1)pdm09 and some detections of A(H3N2) viruses. In Eastern, Northern and South-West Europe, influenza B activity peaked in February and declined by June. Influenza A activity declined between February and May and remained low throughout the rest of this reporting period.

In the Americas, influenza activity varied by transmission zone.

In North America, there was a decline in influenza A activity from February to March and thereafter activity remained at inter-seasonal levels with a predominance of A(H1N1)pdm09 viruses. Influenza B activity increased during the reporting period, peaked in April and declined by July.

In Central America and the Caribbean, influenza activity peaked in June with a predominance of A(H1N1)pdm09 and co-circulation of influenza B viruses. In Tropical South America, an influenza B epidemic occurred with a peak in March followed by a steady decline to the end of this reporting period.

In Temperate South America, influenza virus detections peaked in May with predominance of A(H1N1)pdm09 and little influenza B or A(H3N2) activity.

In Oceania, influenza detections peaked in June with influenza A and B viruses co-circulating. A predominance of A(H1N1)pdm09 was observed.

Influenza A

Globally, influenza A virus detections outnumbered influenza B virus detections. Influenza A(H1N1)pdm09 and A(H3N2) viruses were reported in most transmission zones and A(H1N1)pdm09 was more frequently detected in all continents. However, in Eastern, Middle and Southern Africa, and Southern and Western Asia more A(H3N2) viruses were detected.

Source: [WHO](#)

Influenza B

Globally, influenza B virus detections were lower than those for influenza A. However, in some regions, influenza B predominated, including Europe, Northern Africa and Tropical South America. All circulating influenza B viruses, where lineage was confirmed by GISRS laboratories, belonged to the B/Victoria/2/87 lineage.

Recommended composition of influenza virus vaccines

The vast majority of the **A(H1N1)pdm09** viruses collected since 1 February had HA genes belonging to **clade 5a.2 (i.e., 6B.1A.5a.2)**. Subclade 5a.2a viruses were mainly detected in Africa, Asia, Europe and Oceania, while subclade 5a.2a.1 viruses were mainly detected in North America, Central America and South America. The vast majority of **A(H3N2)** viruses collected since 1 February 2023 have HA genes derived from **clade 2 (i.e., 3C.2a1b.2a.2)** and have diversified into several new subclades.

All circulating **influenza B viruses** characterized since 1 February 2023 were of the **B/Victoria/2/87 lineage**. Most recent viruses expressed HA genes belonging to **subclade 3a.2 (i.e., 1A.3a.2)**. A few viruses belonging to **clade 1A.3** were detected in North and Central America.

The **absence** of confirmed detection of naturally occurring **B/Yamagata lineage viruses** is indicative of **very low risk** of infection by B/Yamagata lineage viruses. Therefore, it is the opinion of the WHO influenza vaccine composition advisory committee that **inclusion of a B/Yamagata lineage antigen in quadrivalent influenza vaccines is no longer warranted**, and every effort should be made to exclude this component as soon as possible.

For trivalent vaccines for use in the 2024 southern hemisphere influenza season, the WHO recommends the following:

Egg-based vaccines

- an **A/Victoria/4897/2022 (H1N1)pdm09-like virus**;
- an **A/Thailand/8/2022 (H3N2)-like virus**; and
- a **B/Austria/1359417/2021 (B/Victoria lineage)-like virus**.

Cell culture- or recombinant-based vaccines

- an **A/Wisconsin/67/2022 (H1N1)pdm09-like virus**;
- an **A/Massachusetts/18/2022 (H3N2)-like virus**; and
- a **B/Austria/1359417/2021 (B/Victoria lineage)-like virus**.

The recommendation for the B/Yamagata lineage component of quadrivalent influenza vaccines remains unchanged from previous recommendations:

- a **B/Phuket/3073/2013 (B/Yamagata lineage)-like virus**.

Detailed information by country of the extent of seasonal influenza activity and type/subtype of viruses worldwide is available on the WHO website: <https://www.who.int/tools/flunet>

Genetic and antigenic characteristics of zoonotic influenza A viruses and development of candidate vaccine viruses for pandemic preparedness

as of September 2023

The development of influenza candidate vaccine viruses (CVVs), coordinated by WHO, remains an essential component of the overall global strategy for influenza pandemic preparedness.

The cited WHO document summarizes the genetic and antigenic characteristics of recent zoonotic influenza viruses and related viruses circulating in animals that are relevant to CVV updates.

Influenza A(H5)

Since their emergence in 1997, highly pathogenic avian influenza (HPAI) A(H5) viruses of the A/goose/Guangdong/1/96 haemagglutinin (HA) lineage have become enzootic in some countries, have infected wild birds and continue to cause outbreaks in poultry and sporadic human infections across a wide geographic area.

Influenza A(H5) activity from 21 February to 25 September 2023

Eleven human infections or detections with A/goose/ Guangdong/1/96-lineage viruses have been reported in this period. Since 2003, 3 A(H5), 7 A(H5N8), 88 A(H5N6) and 878 A(H5N1) human infections have been reported. **Since February 2023**, A/goose/Guangdong/1/96-lineage A(H5) viruses have been **detected** in both **domestic and wild birds** in many countries, with **spillover to mammals**.

Genetic and antigenic characteristics of influenza A(H5) viruses

Four A(H5N6) human infections were identified in **China**, **2** A(H5N1) infections in **Cambodia**, **one** A(H5N1) infection in **Chile** and **4** A(H5N1) detections in the **United Kingdom** of Great Britain and Northern Ireland. The majority of cases reported **exposure to poultry**. One each of the A(H5N1) and A(H5N6) cases were **fatal**, one A(H5N1) and 3 A(H5N6) cases were **severe**. One of the cases from Cambodia and the 4 individuals from the United Kingdom of Great Britain and Northern Ireland were **asymptomatic**. The viruses from humans in Chile, China, and the United Kingdom of Great Britain and Northern Ireland from which sequence information was available (n=8) belonged to **clade 2.3.4.4b**.

Influenza A(H5) candidate vaccine viruses

Based on current genetic, antigenic, and epidemiologic data, **no new CVVs are proposed**. The available and pending A(H5) CVVs are listed in **Table 2 at the source**.

Influenza A(H3N8)

Diverse A(H3) viruses circulate in wild birds in many regions of the world. A(H3N8) infections have been detected in dogs, donkeys, horses, pigs, poultry, seals and wild birds. A(H3N8) viruses with genes encoding internal proteins derived from A(H9N2) viruses have been detected in poultry in China since 2021. Prior to this reporting period 2 human infections have been reported in China in 2022.

Influenza A(H3N8) activity from 21 February to 25 September 2023

There has been **one report of a fatal human infection** with an A(H3N8) virus in China, a woman with a history of poultry exposure.

Genetic and antigenic characteristics of influenza A(H3N8) viruses

Genetic analyses of the HA of the A(H3N8) virus from the **human case confirmed** it was **genetically related** to the A(H3N8) viruses **causing disease in humans in 2022**.

Influenza A(H3N8) candidate vaccine viruses

Based on the available genetic, antigenic, and epidemiologic data, **no new CVVs are proposed**. The available and pending A(H3N8) CVVs are listed in Table 3 in the source.

Influenza A(H7)

Influenza A(H7) viruses are maintained in waterfowl and occasionally spillover to poultry populations with the associated disease ranging from mild to severe. A total of **1568 laboratory-confirmed human infections** with avian influenza **A(H7N9)** virus of the A/Anhui/1/2013- lineage, including 616 fatal cases (CFR: 39%), have been reported to WHO since early 2013. The last case of human infection with avian influenza A(H7N9) reported to WHO in the Western Pacific Region was in 2019.

Influenza A(H7) activity from 21 February to 25 September 2023

No A(H7N9) human infections were reported in this period. A/Anhui/1/2013-lineage A(H7N9) viruses were reported in chickens and environmental samples from China. In May 2023, a genetically distinct HPAI A(H7N6) virus emerged in poultry in South Africa and continues to circulate.

Influenza A(H7N9) candidate vaccine viruses

Based on the current epidemiologic and virologic data, **no new A(H7) CVVs are proposed**. Available A(H7) CVVs are shown in Table 4 in the source.

Influenza A(H9N2)

Influenza A(H9N2) viruses are **enzootic in poultry** in many parts of **Africa, Asia and the Middle East**. Since the late 1990s, when the first human infection was identified, **sporadic detections** of A(H9N2) viruses in **humans** and pigs have been reported, with associated **mild disease** in most human cases and no evidence for human-to-human transmission.

Influenza A(H9N2) activity from 21 February to 25 September 2023

Five A(H9N2) human infections have been identified in China in this period. All the infected individuals reported exposure to poultry, had mild disease and subsequently recovered.

Genetic and antigenic characteristics of influenza A(H9N2) viruses

Sequence information was available for 4 of the 5 viruses detected in humans.

Influenza A(H9N2) candidate vaccine viruses

Based on the available genetic, antigenic, and epidemiologic data, a new CVV that is antigenically like A/Anhui-Tianjiaan/11086/2022 is proposed. The available and pending A(H9N2) CVVs are listed in Table 6 in the source.

Find information for **Influenza A(H1)v5** and **Influenza A(H1)v5** in the source.

Source: [WHO](#)

Detailed information by country of the extent of seasonal influenza activity and type/subtype of viruses worldwide is available on the WHO website: <https://www.who.int/tools/flunet>

Ending disease in Africa: responding to communicable and noncommunicable diseases, progress report

The pathway for effective disease management adopted by the UCN Cluster is based on three core strategies: eradication, elimination, and control. Of these, eradication is the most desirable.

Significant progress has been made in the eradication of three priority diseases from the African Region.:

- In August 2020, the region was **certified as free of wild poliovirus**.
- **Dracunculiasis** (or Guinea worm disease) is on the **verge of eradication**, with only 13 human cases reported in 2022, the lowest annual figure since 1986 when global eradication efforts began.
- While progress in the region remains mixed, **yaws eradication is achievable**, with 12 Member States expected to be certified by the end of 2023.

Immunization:

Due to the increase in immunization coverage, considerable progress has been made among the diseases targeted for elimination.

- The **hepatitis B vaccine** is included in the **routine immunization** schedules of all 47 Member States and as of 2022, 16 countries and areas provide a birth dose of the vaccine to all newborns.
- The region has seen extraordinary progress in **malaria elimination**. Case incidence fell by 39% between 2000 and 2019.
- Despite competing priorities in a challenging time, significant progress has been made towards the elimination of **maternal and neonatal tetanus**. As of December 2022, 42 countries and areas in the region have validated elimination, up from 30 in 2013.
- Even though no country in the region has yet been verified for **measles elimination**, six countries and areas have made sustained progress and will most likely achieve verification in the next 3–5 years.
- There has been significant progress in reducing the number of new **meningitis cases** over the past 20 years. Between 2010 and 2019, 24 of the 26 countries in the meningitis belt conducted immunization campaigns either nationwide or in high-risk areas resulting in the **near elimination of group A meningococcal meningitis**.
- By the end of 2022, almost **all yellow fever high- risk countries** had introduced **routine yellow fever vaccination** at the national level.

Neglected tropical diseases (NTDs)

- As of 2023, human **African trypanosomiasis** has been **eliminated as a public health problem in seven countries**, and **five more countries** are **eligible for validation**.
- **Leprosy** cases decreased between 2012 and 2021, and **eight Member States** have reported **no new local cases** of leprosy among children for at least five years.

Neglected tropical diseases (NTDs)

To date, **four countries** and areas have been officially validated for elimination of at **least one of the five priority preventive chemotherapy neglected tropical diseases**:

- **lymphatic filariasis** (Malawi and Togo);
- **trachoma** (Gambia, Ghana, Malawi, and Togo).
- **All endemic countries** in the region have **completed mapping for lymphatic filariasis, schistosomiasis, and soil-transmitted helminths**.
- Work is underway to complete the mapping of **onchocerciasis and trachoma** – two of the major causes of blindness in the region.
- **Togo** stands out globally as one country that has **successfully eliminated four neglected tropical diseases**.

Priority health concerns

- **HIV/AIDS** continues to be a devastating public health problem in the African Region, between 2010 and 2021, the number of new HIV cases decreased by 44% and the number of people dying from HIV-related causes declined by 55%.
- **Tuberculosis (TB) and TB/HIV** interventions averted estimated 16 million deaths between 2000 and 2021. In 2021, the African Region passed the 2020 milestone of the End TB Strategy, with a 22% reduction in new cases compared with 2015.
- **Viral hepatitis**; as of 2021, 27 countries and areas have a national programme either as a standalone programme or integrated into HIV services, 21 countries have a national strategic plan, and 17 countries have testing and treatment guidelines.

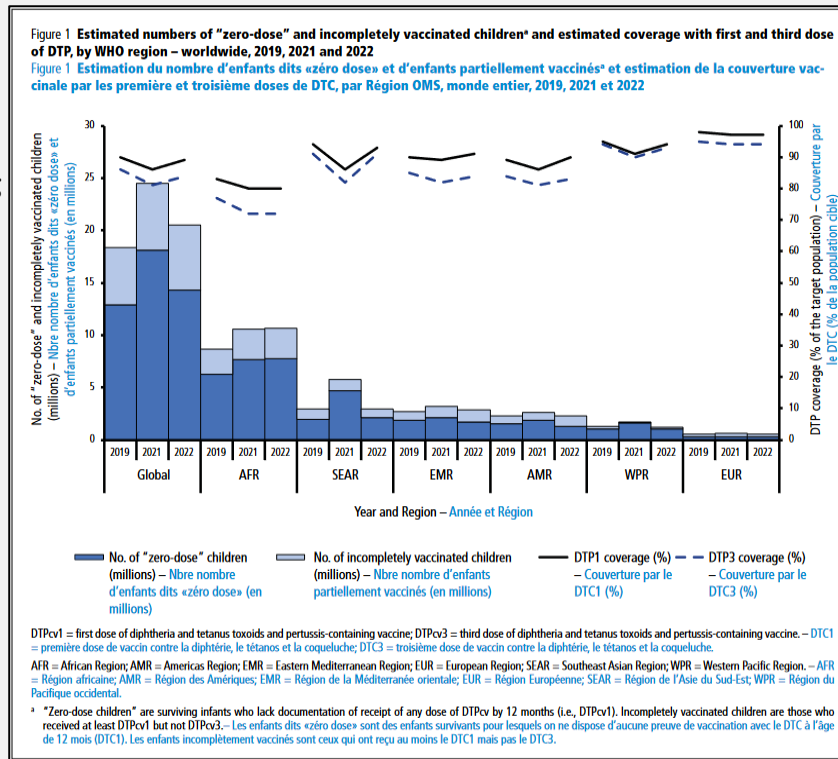
Noncommunicable disease (NCD)

- **The WHO Package of Essential Noncommunicable Disease Interventions (WHO PEN) for primary care in low-resource settings**, was implemented by an increasing number of countries.
- **Cervical cancer control including vaccination**, has been improved with 24 countries and areas introducing the human papillomavirus (HPV) vaccine into their **national immunization programmes**. **Screening** for cervical cancer is **available in 34 Member States** and **16 countries** have incorporated **HPV DNA testing** into their national programmes.
- Five countries have developed national treatment guidelines for **childhood cancer**.
- All countries and areas implementing WHO PEN have included prevention and care for **diabetes**.
- At least 66% of countries have guidelines for the integration of **mental health into primary health care** 82% of countries are providing **training for primary health care worker**.

Routine vaccination coverage – worldwide, 2022

In 2020, the World Health Assembly endorsed the Immunization Agenda 2030 (IA2030), the 2021–2030 **global strategy** for a world in which everyone, everywhere, at every age **fully benefits from vaccines**.

Worldwide, coverage with ≥ 1 dose **diphtheria-tetanus-pertussis-containing vaccine (DTPcv1)** increased from 86% in 2021 to 89% in 2022, remaining below the 90% coverage achieved in 2019. Estimated DTPcv3 coverage increased from 81% in 2021 to 84% in 2022 but also remained below the 2019 coverage of 86%. Worldwide in 2022, 14.3 million children were not vaccinated with DTPcv1, a 21% decrease from 18.1 million in 2021 but an 11% increase from 12.9 million in 2019. Most children (84%) who did not receive DTPcv1 in 2022 lived in **low- and lower-middle-income countries**.



Global immunization rates **recovered from the reduced levels** associated with the coronavirus disease 2019 (COVID-19) pandemic in 2022, but **progress was unevenly distributed**, especially in low-income countries.

Urgent action is needed to provide incompletely vaccinated children with **catch-up vaccinations** that were missed during the pandemic, restore national vaccination coverage to pre-pandemic levels, strengthen immunization programmes to build resilience to future unforeseen public health events, and further improve coverage to protect children from vaccine-preventable diseases.

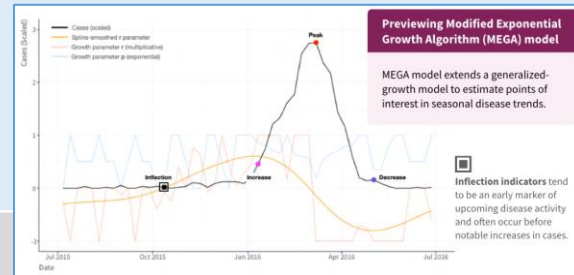
The vaccines **reviewed in the study** include those usually provided in **national routine immunization programmes during the first year of life**: bacilli Calmette-Guérin (BCG); DTPcv1, a third DTPcv dose (DTPcv3); hepatitis B birth dose (HepB-BD) and a third dose (HepB3); a third dose of Haemophilus influenzae type b (Hib) vaccine (Hib3); a first dose of measles-containing vaccine (MCV1); a third dose of pneumococcal conjugate vaccine (PCV3); a third dose of polio vaccine (Pol3); the last dose of rotavirus vaccine (Rota, last); and a first dose of rubella-containing vaccine (RCV1).

The vaccines reviewed also include those **provided after the first year of life**: a second dose of MCV (MCV2) and the first and last doses of human papillomavirus (HPV) vaccine (HPV, first; HPV, last).

Table 2 Vaccination coverage by dose in series, vaccine and WHO Region, worldwide, 2022
 Tableau 2 Couverture vaccinale par dose du schéma vaccinal, par vaccin et par Région OMS, ensemble du monde, 2022

Vaccine – Vaccin	Vaccination coverage (%) ^{b, c, d} – Couverture vaccinale (%) ^{b, c, d}							
	No. of countries with vaccine schedule ^a – Nbre de pays ayant un calendrier vaccinal ^a	Global – Ensemble du monde	AFR	AMR	EMR	EUR	SEAR	WPR
BCG	155 (80)	87	80	87	90	93	91	92
DTP1 – DTC1	194 (100)	89	80	90	91	97	93	94
DTP3 – DTC3	194 (100)	84	72	83	84	94	91	93
HepB BD – DN de HepB	103 (53)	45	18	65	32	42	58	80
HepB3	190 (98)	84	72	83	84	91	91	93
Hib3	193 (99)	76	72	83	84	0	91	32
HPV first ^e – HPV première dose ^e	130 (67)	21	33	68	2	37	5	5
HPV last ^f – HPV dernière dose ^f	130 (67)	15	22	52	0	32	3	3
MCV1	194 (100)	83	69	84	83	93	92	92
MCV2	188 (97)	74	45	76	78	91	85	91
PCV3 – VPC3	157 (81)	60	68	78	55	83	58	23
Pol3	194 (100)	84	71	82	85	94	91	91
RCV1	173 (89)	68	36	84	42	93	92	92
Rota last ^g – Rota dernière dose ^g	120 (62)	51	51	74	58	31	68	4

Can modelled indicators predict the timing of seasonal influenza activity?



Introduction

As the influenza season picks up in the northern hemisphere, delays in indicator-based surveillance reporting can make it difficult to predict when seasonal influenza will depart from baseline activity and reach epidemic levels. In this report we describe the Modified Exponential Growth Algorithm (MEGA) which allows us to identify early indicators of influenza activity that may help inform upcoming increases and peaks in seasonal epidemics. All flu data used for this analysis were sourced from WHO's FluNet.

Current relevance

- **Northern hemisphere season:** Many countries within the northern hemisphere are approaching seasonal influenza epidemic activity soon/within the next months.
- **Influenza patterns:** Seasonal dynamics continue to evolve since the implementation and removal of non-pharmaceutical interventions during the acute phase of the COVID-19 pandemic. Given that epidemic patterns in seasonal influenza still differ substantially from pre-COVID-19 pandemic trends, ongoing monitoring of the timing of influenza activity is necessary.

Public health and policy sector relevance

Having advance warning of the start of increased influenza activity is important for proactive public health measures like the planning of vaccination campaigns and resource management.

Pharmaceutical and life sciences relevance

Early awareness of how the influenza season is progressing in varying locations is advantageous for efficient resource allocation, including the production, distribution and promotion of influenza vaccines, antiviral treatments, and other medical countermeasures.

Method overview and rationale

Detecting early season activity

Previous reports have used thresholding methods such as the Moving Epidemic Method (MEM)¹ to detect early influenza season activity, which works well when there are minimal reporting delays. However, when reporting delays are present, the MEM method is disadvantageous because signals needed for adequate assessment of epidemic levels of disease activity are often too late to be actionable as they rely on lagged data. Instead of relying solely on methods that are dependent on examining raw case volume and percent positivity, the MEGA model leverages exponential growth modelling to detect changes in calculated exponential growth parameters that often occur before notable increases in case volume.

MEGA model basic structure

The MEGA model is an extension of a two-parameter generalized-growth model developed by Viboud and colleagues² to characterize the early ascending phase of infectious disease outbreaks. The equation for the generalized-growth model is as follows:

$$\frac{dC(t)}{dt} = C'(t) = rC(t)p$$

- Where:
- $C'(t)$ is the incidence curve over time
 - t is the current point in time
 - r is the multiplicative growth parameter
 - p is the exponential growth parameter

MEGA model outputs

The MEGA model also modifies the original generalized-growth model to calculate a time series for each parameter r and p for the entire time series of seasonal disease data for an individual country, and uses this to estimate the location of points of interest in the time series (for both cases and percent positivity) including:

- **Inflection indicators** where the r parameter trend moves from negative to positive. Inflection indicators tend to be an early marker of upcoming seasonal disease activity and often occur before notable increases in case activity.
- **Increase indicators** that mark current/upcoming increases in seasonal disease activity. These increases may be large or small and cannot alone be taken as an indication that seasonal activity has 'started'; however, they may be useful as a monitoring measure.
- **Decrease indicators** that mark current/upcoming decreases in seasonal disease activity. Like the increase indicators, these decreases may be large or small and cannot alone be taken as an indication that seasonal activity has ended; however, they may be useful as a monitoring measure.
- **Peaks** in seasonal disease activity.

A rolling method is used to calculate these parameters for each point in the time series, with a window of five total time points centered around the current time point. This means that these values cannot be calculated for the most recent two points of data; however, the timing of the inflection indicator is usually far enough in advance that this delay does not pose a meaningful barrier to usefulness. A graphical example of these indicators can be found in the figure above.

Key observations

Many factors can affect the timing and severity of influenza seasons in the northern and southern hemispheres. Adding to this complexity, the cyclical timing of seasonal influenza has been markedly different than pre-pandemic trends since influenza began to circulate globally in 2021 following the lifting of non-pharmaceutical interventions and travel restrictions.

Many countries (in addition to some of those shown in these early results) have displayed shorter cycles of seasonal influenza activity, as measured by the periods of time between the MEGA model's inflection and peak indicators). This may be due to the decreased population immunity following the acute phase of the COVID-19 pandemic. Previous studies highlighted the gradual return to pre-pandemic timing of seasonal epidemics in the southern hemisphere, which suggests we may observe a similar pattern this year in the northern hemisphere.

Takeaways

- Based on early model results, influenza activity is predicted to increase exponentially in the coming weeks in four of the six countries detailed in this report, potentially reaching peak influenza activity in mid to late January 2024.
- This type of prediction is complicated by pandemic-related changes in seasonal influenza dynamics, in which seasonal cycles of activity appear to be timed more closely together

References

- **1** Vega, T., Lozano, J.E., Meerhoff, T., Snacken, R., Mott, J., Ortiz de Lejarazu, R. and Nunes, B. (2013), *Influenza surveillance in Europe: establishing epidemic thresholds by the Moving Epidemic Method*. *Influenza and Other Respiratory Viruses*, 7: 546-558. <https://doi.org/10.1111/ir.11750-2659.2012.00422.x>
- **2** Viboud, C., Simonsen, L., & Chowell, G. (2016). A generalized-growth model to characterize the early ascending phase of infectious disease outbreaks. *Epidemics*, 15, 27-37.

Other Infectious Disease Outbreaks and disasters – Asia



Record smog –air pollution - India

New Delhi has taken the drastic step of limiting vehicle usage in the city after pollution rates hit record highs for three consecutive days. Smog in the Indian capital is so “severe”, with the air packed with toxic pollutants, that schools have had to close. As the Washington Post reported, seasonal fires, construction dust, and vehicle pollution have made it so bad that the haze in northern India can now be seen from space. The Indian and Chinese populations have the highest exposures to unsafe levels of air pollution (both at 99%), but it is an increasing problem globally, including in Europe.

Source: [NewsMedia](#), [NewsMedia](#), [NewsMedia](#), [NewsMedia](#)

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Source: [NewsMedia](#), [NewsMedia](#), [NewsMedia](#), [NewsMedia](#)

West Nile - Parkistan

The first historical West Nile virus (WNV) case and death has been laboratory confirmed in Peshawar village, located in the northwestern province of Khyber Pakhtunkhwa in Pakistan.

The affected individual was an 80-year-old female who has passed away (unspecified date). According to a media report, on October 2023, the local health department sent at least five laboratory samples to the Public Health Reference Laboratory at the Khyber Medical University for testing multiple pathogens including Nipah virus for which all tested negative. Laboratory samples were taken from five hospitalized individuals across an unspecified period of time who presented with fever, vomiting, headaches, muscle pain, and fatigue.

In Pakistan, cases of WNV have been poorly documented, however, serological evidence in humans and vector competence for WNV in Pakistan has been reported as early as 1982. In recent years, WNV has been identified in horses and humans in Pakistan and its neighbouring countries, Iran, Afghanistan, and India as a cause of human encephalitic disease. Surveillance studies in these surrounding countries report WNV circulation in several Culex species as well as several wild, migratory, and domestic birds and water fowl. In Pakistan, a scientific study conducted on animals revealed an 81.5% seroprevalence of the virus among horses and donkeys in Punjab and 49.6% in equines in Khyber Pakhtunkhwa. Furthermore, scientific research published in 2018 indicated active and persistent circulation of WNV in humans in the southern region of Pakistan between 2015-2016.

Source: [Promed](#)

Unknown Respiratory Illness - China

On 21-Nov-2023, local media sources have reported an ongoing outbreak of pneumonia of unknown cause over an unspecified period of time among children in China.

To date, there is very limited information reported, however, several media sources report that children’s hospitals in Beijing, Liaoning, and other locations (not specified) are overwhelmed with sick children. In addition, some symptoms among the affected include a high temperature (fever) and many of those affected are reported to have developed pulmonary nodules on X-Rays, however, there is no official disclosure of the situation.

The total number of children and the age range affected has not been reported and further details have not been provided. Reports have indicated that school teachers of the affected children have also been affected with pneumonia.

Latest known measures: Some school classes have been cancelled while other schools and classes are reported to be on the verge of suspension. Students have been asked to request a leave of absence if they are experiencing symptoms such as fever, cold, and/or cough.

There is very limited information about the probable cause of this outbreak. Unknown pneumonia events require close monitoring and early release of information to better assess the potential of human-to-human transmission through the respiratory route and the further risks of disruption to local and regional public health. The cases reported span a widespread area, as Beijing and Liaoning are almost 800 km apart. Reports do not specify whether diagnostic testing has been conducted. Over recent years, the incidence of respiratory illnesses in China have been low due to the epidemic prevention and control measures that were in place related to the COVID-19 pandemic; however, with the relaxation of these measures at the beginning of 2023, the number of infections may significantly increase this year. Increasing trends in the incidence of mycoplasma pneumonia, influenza, and bronchopneumonia have already been reported in China this year.

Source: [Promed](#)

Zika - India

On 04-Nov-2023, several cases of Zika Virus (ZIKV) infections have been reported in employees of a local district court in the costal municipality of Thalassery (Tellicherry), Kerala State, India.

All affected individuals were court employees. Further demographic information was not specified. At least 55 employees reported general symptoms. These include headache, eye irritation, joint and body pains, fever, and itching. It is unclear how many of the affected individuals presented with these symptoms and whether they are experiencing illness due to a common agent. At least ten blood samples were sent to the National Institute of Virology at Alappuzha for testing. Of which, eight have been confirmed positive for ZIKV.

Source: [NewsMedia](#), [NewsMedia](#), [NewsMedia](#)

Earthquake - Nepal

At least 150 people have been killed by a 6.4-magnitude earthquake in western Nepal centred around Karnali province. A further 170 people have been injured. The majority of the deaths were in Jarakot district, where 105 people were confirmed killed. The World Health Organization reports that since the initial 3 November quake, there have been at least 382 aftershocks, which are forcing people to spend nights outside as the temperatures drop.

Source: [WHO](#), [NewsMedia](#)

Other Infectious Disease Outbreaks - Americas



Scrub Typhus - United States – Study data

A research paper published on emerging infectious diseases in August 2023 found the presence of the bacteria that causes scrub typhus in the United States for the first time. The findings were published after the bacteria *Orientia tsutsugamushi* was detected in free-living *Eutrombicula* chigger mites samples in the state of North Carolina. **No human cases have been identified so far.**

The counties in North Carolina that had positive chigger samples include: Gates, Scotland, Stanley, Wake, and Warren counties.

Source: [EID Journal CDC](#)

Malaria – United States

A new autochthonous (locally-acquired) malaria case has been confirmed in the United States. This new case was confirmed in a press release on 04-October-2023 by the Arkansas Department of Health (ADH) in the Saline County and is due to *Plasmodium vivax*. This marks the first locally-acquired malaria case in the state of Arkansas after at least 50 to 60 years. The individual has no history of travel outside of the U.S. However, there has been no disclosure if the individual has travelled to other U.S. to states with recent locally-acquired confirmed malaria cases. The official release has also highlighted that there have been five additional malaria cases in the state among individuals with recent history of travel outside the U.S. (unspecified locations).

In 2023 in total 10 locally-acquired cases, no death have been reported for the US. All individuals have been treated and recovered. Cases were reported from: Sarasota County, Florida state (10-July-2023): seven cases, Cameron County, along the southern border of Mexico, Texas (23-June-2023): one case, National Capital Region, Maryland (18-August-2023): one case and Saline County, southwest of Little Rock, 2.5 hours away from Memphis, Arkansas (04-October-2023): one case.

Source: [Arkansas Department of Health](#)

Dengue – United States

A locally-acquired case of dengue virus (DENV) infection has been confirmed for the first time in Long Beach, California; this marks the second ever locally-acquired case of DENV in California.

The Health Department has not specified how or when they became aware of the case, however, they report that the affected individual has recovered at home and no suspected cases have been identified. As of 01-Nov-2023, the Health Department's Vector Control team reported that no mosquitos collected in the region have tested positive for DENV.

Source: [City of Long Beach](#), [Health Service LB](#), [CDC](#)

Dengue – Bonaire, Saint Eustatius and Saba

On 9-Nov-2023, government officials of Saint Eustatius confirmed the first two lab-confirmed cases of dengue on the island, however, there has been no declaration of an outbreak. No further information was provided on individual cases; whether cases are autochthonous or travel-associated, or close contacts. The island's Public Health Department has, as a precaution, disinfected the immediate surrounding areas of the confirmed cases. In addition, proactive plans have been prepared for medical personnel to manage any new cases that may arise.

Source: [NewsMedia](#)

Cholera – Hispaniola; Haiti

After more than 3 years with no cases, on 1 October 2022 Haiti national authorities reported two confirmed cases of cholera in the greater Port-au-Prince area. On October 20, the Dominican Republic Vice-Ministry of Collective Health and the General Directorate of Epidemiology of the Ministry of Health (MoH) confirmed the first imported case of cholera.

Source: [PHAO](#)

Measles – Americas

After the WHO Region of the Americas was declared measles-free in September 2016, a steady increase in imported measles cases from other WHO Regions and between countries within the Region of the Americas was observed between 2017-2019. The highest regional incidence rate was reported in 2019, with 21.5 cases per million population. The increase in cases was related to measles outbreaks reported in Brazil and the Bolivarian Republic of Venezuela, which contributed to 93% of the cases reported during that period. Due to COVID-19 measures in 2020, the number of confirmed measles cases decreased by 2.7 times compared to 2019, with outbreaks reported in Argentina and Mexico. The year 2023 was characterized by being the year with the lowest number of reported measles cases. With confirmed cases in Canada (8), Chile (1) and United States of America (29).

Source: [PHAO](#)

SARS-CoV-2 variant classification – EU

- Since the last update on 27 October 2023, and as of 13 November 2023, no changes have been made to ECDC's classifications for variants of concern (VOCs), variants of interest (VOIs), variants under monitoring (VUMs), or de-escalated variants.
- **XBB.1.5-like+F456L** variants currently dominate the global and EU/EEA SARS-CoV-2 variant landscape. As of 6 November 2023, for week 42 (16 October 2023 to 22 October 2023). XBB.1.5-like lineages are circulating in a median proportion of 67% in EU/EEA countries (range: 32–76%). The overall proportion of XBB.1.5-like+F456L lineages levelled off in the EU/EEA, with stable trends observed over the past few weeks.
- **XBB.1.5-like+L455F+F456L** variants show an increasing trend in all countries in EU/EEA with sufficient reporting, with a median proportion of 17% (range: 26–50%). The lineages mainly present in this umbrella are HK.3 lineages and GK* lineages.
- **BA.2.86** is an emerging SARS-CoV-2 lineage characterised by a high number of spike mutations that are distinct from ancestral BA.2 and currently circulating XBB-derived variants. BA.2.86 is circulating in low proportions in the EU/EEA (median 8% in the EU/EEA overall). However, BA.2.86, including its sub-lineages, is the most rapidly increasing variant in the EU/EEA, with increasing trends observed in the last few weeks.

Other Infectious Disease Outbreaks - Europe



Toscana Virus Infection - Spain

Toscana Virus (TOSV) infection has been laboratory-confirmed for the first time in Spain through a retrospective study of patients with meningitis of unknown etiology between 2015 and 2019. Among 23 of such meningitis cases, TOSV was identified in eight individuals. All the affected individuals were male, with median age: 39 years (range: 15-78 years). Of these eight cases, five lived in an urban setting, three occurred in autumn and only one recalled insect bites.

To date, the unique known transmission to humans and other vertebrates is through the bite of an infected female sand fly belonging to competent species within the genus *Phlebotomus*. However in March 2023, a possible case in Italy where sexual transmission may have been implied was reported.

Animal reservoir hosts are not yet described. Humans and other vertebrates, including dogs are commonly considered as dead-end hosts. Thus, these do not develop significant viremia or excrete virus following infection.

Source: [ProMed](#)

Crimean-Congo Hemorrhagic Fever (CCHF) - France

On 6-October-2023 Public health authorities in France confirmed for the first time the presence of the Crimean-Congo hemorrhagic fever (CCHF) virus in ticks (*Hyalomma marginatum*) collected on cattle raised in the Eastern Pyrenees department that borders north-east Spain. While to date, **no human cases have been detected**, this event highlights there is a risk of its occurrence.

While this type of tick has been present in Corsica (a French island in the Mediterranean sea) for decades, it was only detected on the Mediterranean coast in 2015. Future investigations will seek to find out whether the circulation of the virus is more widely distributed among ticks in the south of France.

Source: [SantePubliqueFrance](#), [ProMed](#)

Cryptosporidiosis - United Kingdom

Since mid-September, health authorities have reported an unprecedented rise in diarrheal illness caused by *Cryptosporidium* species (often referred to as crypto). Further, official information indicates that the October peak saw a threefold rise in cases above what is expected for this time of year.

Health authorities have indicated that while it's unclear the underlying cause of the significant upsurge in cases, significant case clusters do not explain the excess. Thus far, questionnaires have indicated that international travel and swimming (either in the U.K. or abroad) could be linked to the excess in cases above expected levels.

Source: [NewsMedia](#), [Eurosurveillance](#), [UK Parliament](#)

Salmonella Enteritidis – Multi-country

Between January and October 2023, 14 EU/EEA countries, the UK and the US reported 335 cases related to this outbreak. Chicken meat and chicken meat products (kebab) are the likely source of a multi-country outbreak caused by three types of *Salmonella* Enteritidis. While food traceability data points to producers located in Poland (7 producers) and Austria (1 producer), no microbiological evidence of a contamination at their facilities has been found. Scientists expect that new cases are likely to occur in this multi-country outbreak as the source has not yet been identified. EFSA and ECDC experts recommend further investigations to identify the potential locations within the chicken meat production chain where the contamination may have occurred.

Source: [ECDC](#)

Overview of respiratory virus epidemiology - EU/EEA

By the end of week 45 (ending 12 November 2023), rates of respiratory illness (influenza-like illness (ILI) and/or acute respiratory infection (ARI)) in the community were increasing in many EU/EEA countries. Rates of severe acute respiratory infection (SARI) cases presenting to secondary care were comparable to the same time last year.

SARS-CoV-2 continued to circulate at higher levels than respiratory syncytial virus (RSV) and seasonal influenza. Countries reported a mix of increasing and decreasing trends for SARS-CoV-2 activity and severity. RSV activity continued to increase, with the highest impact among children aged 0–4 years. Seasonal influenza activity remained at a low level, although there is evidence of increasing geographical spread in some countries.

Source: [ECDC](#)

Meningococcal Meningitis - France

France is experiencing an "unprecedented rebound" in meningitis cases. While 298 cases were recorded between January and September 2019, 421 cases have already been recorded between January and September 2023.

This represents a 40% increase even though the winter peak is not reached.

Alongside a decrease in general immunity during the COVID-19 pandemic, as a result of a lack of exposure to the bacteria, there was also a 20% drop in vaccinations against meningococcal C during the first lockdown. Therefore experts are calling for an updated vaccination strategy.

Source: [InstitutePasteur](#), [NewsMedia](#)

Multistate outbreak with *Salmonella* Strathcona – Multi-country

Since 1 January and as of 13 November 2023, 149 cases of *Salmonella* Strathcona have been reported in Austria (17), Finland (2), Czechia (13), Denmark (4), France (9), Germany (47), Italy (34), Luxembourg (1), Norway (1), the United Kingdom (13), and the United States (8). Most cases have been reported between August and October 2023. This constitutes a multi-country outbreak with genetically closely related cases reported since 2011. Based on available information and repeated, seasonally detected occurrence of cases, it is likely that there is a common source of fresh product. The risk for new infections remains as long as the seasonal deliveries of contaminated produce continue. New outbreaks are likely to occur in future seasons until the contaminated vehicle or source has been identified, traced back, and control measures implemented.

S. Strathcona is a rare serotype in the EU/EEA. In 2022, 89 cases were reported in the EU/EEA. A marked increase was noted between 2018 and 2019, when 28 and 98 cases were reported respectively. Since 2019, the trend has been stable.

Microbiological evidence indicates a common source. Epidemiological and microbiological data indicate that the most plausible hypothesis of vehicle of infection could be tomatoes, but this hypothesis needs further investigation.

The risk for new infections remains as long as the seasonal deliveries of contaminated produce continues. New outbreaks are likely to occur in future seasons until the contaminated vehicle has been identified, traced back and control measures implemented.

Source: [ECDC](#)

Other Infectious Disease Outbreaks - Africa



Source: [WHO](#)

Plague - Madagascar

Suspected cases of plague were detected in Ankazobe municipality in the Analamanga central highlands region at the end of September and start of October 2023. As of 2 October, five suspected cases were under investigation. Samples had been sent to the Pasteur Institute in Madagascar and control measures were introduced in Ankazobe municipality.

Source: [SSHAP](#)

Diphtheria - Nigeria

A worrying spike in diphtheria cases has been recorded across several states in northwest Nigeria. Latest figures show that at least 562 people have died from the bacterial infection since December 2022, the vast majority of them children under 14 years of age. MSF medical teams have admitted more than 12,000 patients so far this year in Kano state, which is the most affected. MSF teams are also treating diphtheria patients in the states of Borno and Bauchi. However, low vaccination rates in Nigeria are making it much more difficult to save lives and stop the epidemic. In Kano state, only about 25 percent of the patients admitted to MSF facilities had been partially or fully vaccinated for diphtheria, which reflects the alarmingly low vaccination coverage. Only 15 percent of the patients that MSF has treated for diphtheria at Gwange Pediatric Hospital in Maiduguri, in Borno state, were fully vaccinated.

The Nigerian health authorities, World Health Organization and UNICEF have now launched a vaccination campaign in three phases, targeting 14 states.

Source: [MSF](#), [reliefweb](#), [reliefweb](#),

Diphtheria in Niger

Niger is one of three West African countries (Niger, Nigeria, Guinea), currently grappling with a diphtheria outbreak. Three months after the initial report of the first diphtheria case, the outbreak continues to show an upward trend and has spread to new districts. Suboptimal vaccination coverage remains a major contributing factor to the increase in cases. The Government of Niger, along with its partners, should urgently implement measures to reach unvaccinated children (those with zero doses) in the remaining affected settings and initiate catch-up interventions to improve overall coverage.

Cholera - Mozambique

Mozambique is currently grappling with a protracted cholera outbreak. Furthermore, 17 of the affected districts have reported cases of acute watery diarrhea, a situation projected to worsen in the coming months due to flooding and existing poor sanitation conditions. The Government of Mozambique, along with its partners, should maintain surveillance, laboratory capacity, risk communication, and community engagement activities to efficiently manage this outbreak.

Chikungunya – Burkina Faso

On 6 September 2023, the reference laboratory for viral haemorrhagic fevers confirmed a case of chikungunya in a patient from the Pouytenga health district whose sample was collected as part of sentinel surveillance for dengue and other arboviruses. As of 15 October 2023, 282 PCR-confirmed cases and 0 deaths have been reported, including 75 cases in week 41.

Humanitarian crisis - Ethiopia

The current humanitarian crisis in Ethiopia, primarily driven by the Sudanese conflicts, continues to generate a significant resource gap to address the needs of refugees, returnees, and asylum seekers. Inadequate essential medical supplies, water, and malnutrition therapeutic kits, pose a serious challenge to the well-being of the affected population. Resource mobilization is of utmost urgency to alleviate suffering and strengthen public health interventions to control epidemic-prone diseases.

Aside these increasing challenges, disease outbreaks remain a significant concern in these camps and points of entries. As of 8 October 2023, Cholera has affected 2 884 people, resulting in 46 deaths, throughout the West Gondar Zone in the Amhara region. Malnutrition is showing a gradual increase with nine of 148 children screened having moderately acute malnourishment and two with severe acute malnourishment. As of 13 October 2023, there has been a tremendous surge in malaria cases, with over 60 000 cases and 27 deaths reported nationwide. Additionally a measles outbreak is ongoing with over 300 reported cases.

Measles – Democratic Republic of the Congo

Measles outbreak is still ongoing in the Democratic Republic of the Congo (DRC). A total of 286 out of 572 health zones have had measles outbreaks since the start of this year. As of week 39, (ending 1 October), a total of 247 160 suspected measles cases and 4 567 deaths (CFR 1.8%) have been reported, 6 227 have been investigated of which 3 429 were IgM positive for measles, and 583 were IgM positive for rubella

Measles - Mauretania

Mauritania has been experiencing a measles outbreak since early 2023. A total of 20 districts have reached the epidemic threshold, including four currently experiencing an outbreak (Kaédi, Ksar, Monguel et Rosso). As of 17 September 2023, the country has reported 730 suspected cases of measles (269 confirmed, including 173 laboratory- confirmed cases and 96 epidemiologically linked cases). Five deaths, including two community deaths, have been reported among confirmed cases

Diphtheria - Mauretania

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Meningitis - Niger

A meningitis outbreak was been declared in the Dungass health district in Zinder region. The first case was reported on 31 October 2022 and confirmed on 23 November 2022, with Neisseria meningitidis identified as the causative agent. As of 16 October 2023, 2 261 suspected cases of meningitis, including 736 laboratory-confirmed cases and 129 deaths (CFR 5.7%) were reported.

Other Infectious Disease Outbreaks – Africa/Eastern Mediterranean Region



West Nile - Pakistan

The first historical West Nile virus (WNV) case and death has been laboratory confirmed in Peshawar village, located in the northwestern province of Khyber Pakhtunkhwa in Pakistan.

The affected individual was an 80-year-old female who has passed away (unspecified date). According to a media report, on October 2023, the local health department sent at least five laboratory samples to the Public Health Reference Laboratory at the Khyber Medical University for testing multiple pathogens including Nipah virus for which all tested negative. Laboratory samples were taken from five hospitalized individuals across an unspecified period of time who presented with fever, vomiting, headaches, muscle pain, and fatigue. The initial laboratory dispatched specimens to the National Institute of Health (NIH) in Islamabad, which issued test results on 23-Oct-2023, and one of the samples corresponding to the aforementioned women tested positive to WNV.

In Pakistan, cases of WNV have been poorly documented, however, serological evidence in humans and vector competence for WNV in Pakistan has been reported as early as 1982. A scientific study conducted on animals revealed an 81.5% seroprevalence of the virus among horses and donkeys in Punjab and 49.6% in equines in Khyber Pakhtunkhwa.

Source: [ProMed](#)

Acute watery diarrhoea/cholera – EMRO

As of 15 October 2023, globally, a total of 29 countries reported AWD/cholera outbreaks. In the Eastern Mediterranean Region of WHO, 9 countries namely, Afghanistan, Iraq, the Islamic Republic of Iran, Lebanon, Pakistan, Somalia, Sudan, Syria, and Yemen have reported acute watery diarrhoea (AWD)/ suspected cholera cases during 2022. In 2023, 8 out of these 9 countries continued to report AWD/ suspected cholera cases in 2023, however, cholera outbreak in Lebanon was officially announced as closed on 5th June 2023.

Source: [NewsMedia](#)

Country	Indicator	Cumulative	Week 36	Week 37	Week 38	Week 39	Week 40	Week 41	Trend
Afghanistan	Cases	185446	6922	6557	5874	5464	5051	3691	
	Deaths	86	6	0	3	2	1	0	
Pakistan	Cases	128	3	0	0	0	2	3	
	Deaths	0	0	0	0	0	0	0	
Somalia	Cases	14191	167	174	186	223	231	308	
	Deaths	38	2	0	0	2	2	1	
Sudan	Cases	1337	64	52	101	168	175	279	
	Deaths	66	4	2	7	14	11	12	
Syria	Cases	147290	4163	4300	3979	4538	3775	3439	
	Deaths	4	0	0	0	0	0	0	
Iraq	Cases	1270	Only cumulative number of cases and deaths was received						
	Deaths	6	Only cumulative number of cases and deaths was received						
Yemen	Cases	5623	Only cumulative number of cases and deaths was received						
	Deaths	7	Only cumulative number of cases and deaths was received						

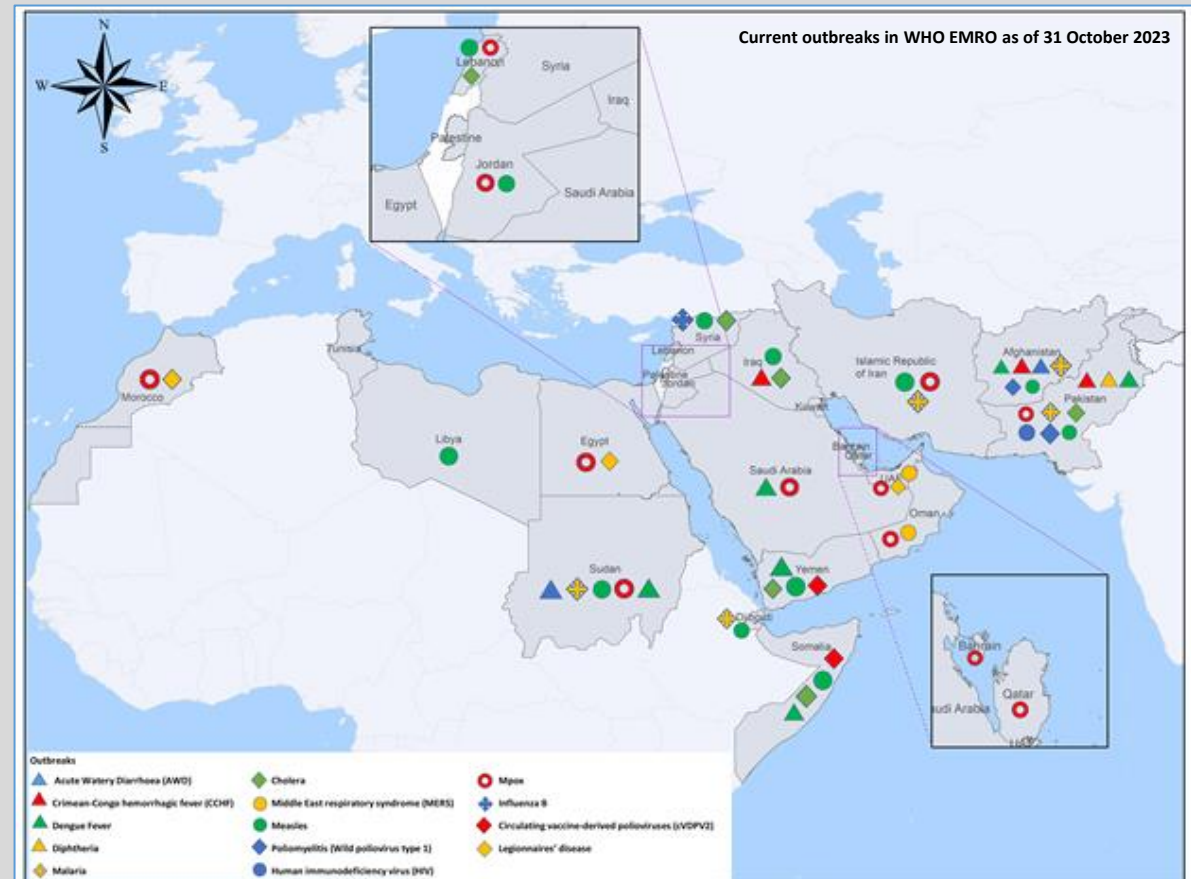
Table 1: Number of cases, deaths and trend of AWD/suspected cholera cases reported from 7 member states in the EMR, January-September 2023

Polio – Pakistan

The Health Ministry on Saturday reported the fifth poliovirus case in the country this year. According to reports, a 31-month-old child has been diagnosed with poliovirus in in Gaddap Town of Karachi. Sindh’s caretaker Health Minister Dr Nadeem Jan said that steps were being taken on a priority basis to combat poliovirus. The Health Ministry had on November 2 confirmed that poliovirus had been detected in environmental sample taken from Karachi district.

“This virus is genetically related to the poliovirus cluster in Afghanistan,” a spokesperson for the Ministry had said. Last year, at least 20 poliovirus cases were reported across Pakistan.

Source: [NewsMedia](#)



**NATO Health Surveillance and Multinational Management of Epidemic
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and

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*Merry Christmas
and*



*a
Happy New Year!*