مجلس الصحة
لدول مجلس التعاون
Gulf Health Council

GCDC
المركز الخليجي للوقاية من الأمراض ومكافحتها
Gulf Center for Disease Prevention and Control

ANNUAL REPORT

Public Health Emergency Intelligence

2024

This Annual Report (2024) was produced by the Gulf Center for Disease Prevention and Control's Public Health Emergency (PHE) Department. 2024 was marked by many notable outbreaks and infectious disease trends, from emerging and reemerging vector-borne and zoonotic diseases to endemic influenza-like illnesses (ILIs) and vaccine-preventable diseases.

In this report, we summarize the work conducted by the PHE team in 2024 including: signals identified, Events of Regional Interest that produced Rapid Risk Assessments on infectious disease outbreaks around the world and provide a summary of other notable infectious disease trends observed in 2024.

This report aims to highlight not only the epidemiological situation of these events but also public health interventions, mitigation measures, scientific research, and advancements in both treatment and vaccines. It seeks to provide a well-rounded understanding to public health officials, government representatives, the population of the GCC region, and the general public globally on the current state of infectious disease events and threats, and where future ones may lead.

The development of this report was led by Naif Alharbi, Lubna Al Ariqi, Hamad Alsaab and Leena Zeyad. Support and contributions were provided from Katrin Leitmeyer.

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Epidemic Intelligence in the Gulf CDC

One of the Gulf CDC's strategic objectives is to enhance preparedness, early detection, and rapid response to health hazards in the Gulf region, as part of objective 2 – sharing early notifications to countries - of the Public Health Emergencies department. Therefore, Gulf CDC established, in late 2022, an epidemic intelligence (EI) system and rapid risk assessment (RRA) system to scan for, collect, filter, collate, and validate EI signals from a variety of official and non-official sources. These were further enhanced using artificial intelligence and social listening platforms in 2023.

The short-listed signals are shared with the GCC member states weekly and discussed with the Public Health Emergency Network, which is technical teams from the departments of communicable disease, International health regulations (IHR), and public health labs from all six GCC member states (MS), in a weekly roundtable meeting for evaluation, input, and discussion. This weekly channel enabled all six countries and the Gulf CDC to further discuss any topic or epidemic signals that are not captured through the systems. Statistics on the EI and RRA systems are shown below.

34	195
Roundtable meetings in 2024	Roundtable participants

In 2024, there were 6 signals that were considered “events of regional interest” and subsequently were monitored in-depth and discussed for 1-7 months, depending on the severity and reach of the event. These events were included in the RRA system and were covered by in-detail rapid risk assessment reports and monthly reports. The Gulf CDC has engaged subject matter experts as well as the Network from the GCC MS for review and input. The RRAs are produced to include some proposed actions and recommendations for the GCC MS’s further consideration and national assessment.

In 2024, the Gulf CDC published 12 monthly reports, summarizing key signals, potential threats and events of regional interest captured by the Gulf CDC PHE team, and 52 weekly reports, summarizing key signals on a week over week basis to present to the PHEN for discussion. The monthly reports were published on the Gulf CDC website whereas the weekly reports were discussed in weekly PHEN meetings.

Finally, the Gulf CDC’s EI and RRA systems have been covered by internal SOPs and implemented advanced IT solutions and dashboards that include the use of artificial intelligence. The Gulf CDC has produced an RRA Technical Guide for the GCC MS that has been reviewed in collaboration with 9 global or regional public health agencies for international standards. In this annual report, the Gulf CDC reports the diseases that have been assessed in RRAs in 2024 with the most updated and available epidemic information as well as information extracted from the rapid risk assessment reports.

2024 Overview

Disease signals detected

CRNE signals detected

Potential threats identified

Events of regional interest monitored

56

Detected signals in GCC countries in 2024

158

Covered locations

The PHE team at the GULF CDC monitors for all hazards that can affect public health, including infectious diseases in humans and animal, environmental hazards, drug or food poisoning, food contamination, chemical hazards, infectious environmental samples, and natural disasters.

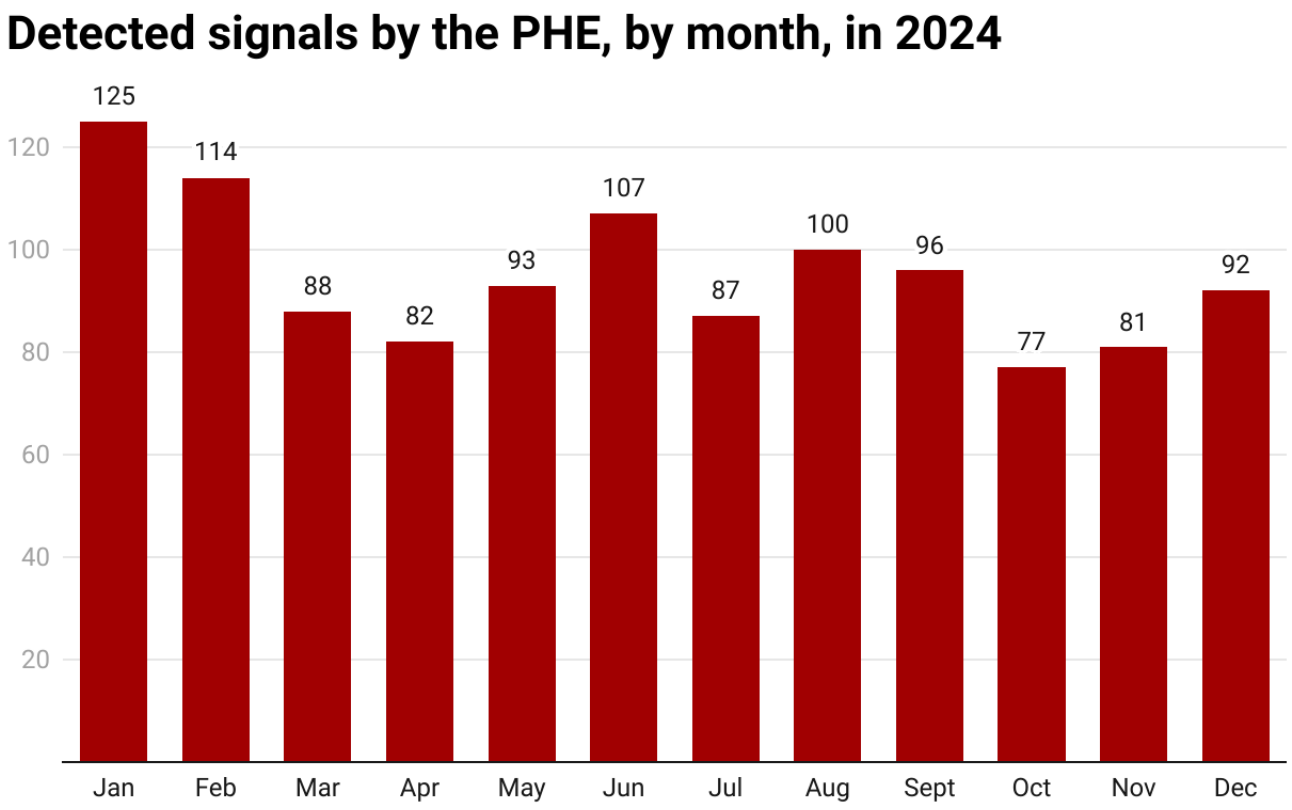


Figure 1: Detected signals by month in 2024
Signals include food poisoning and contamination, chemical hazards, infectious environmental samples, natural disasters and others.

Figure 2: Proportion of detected signals by type of hazard, 2024 compared to 2023

The Gulf CDC reviews and verifies multiple sources to validate the accuracy of data being collected and shared with GCC member states. In 2024, signals were detected using the following sources.

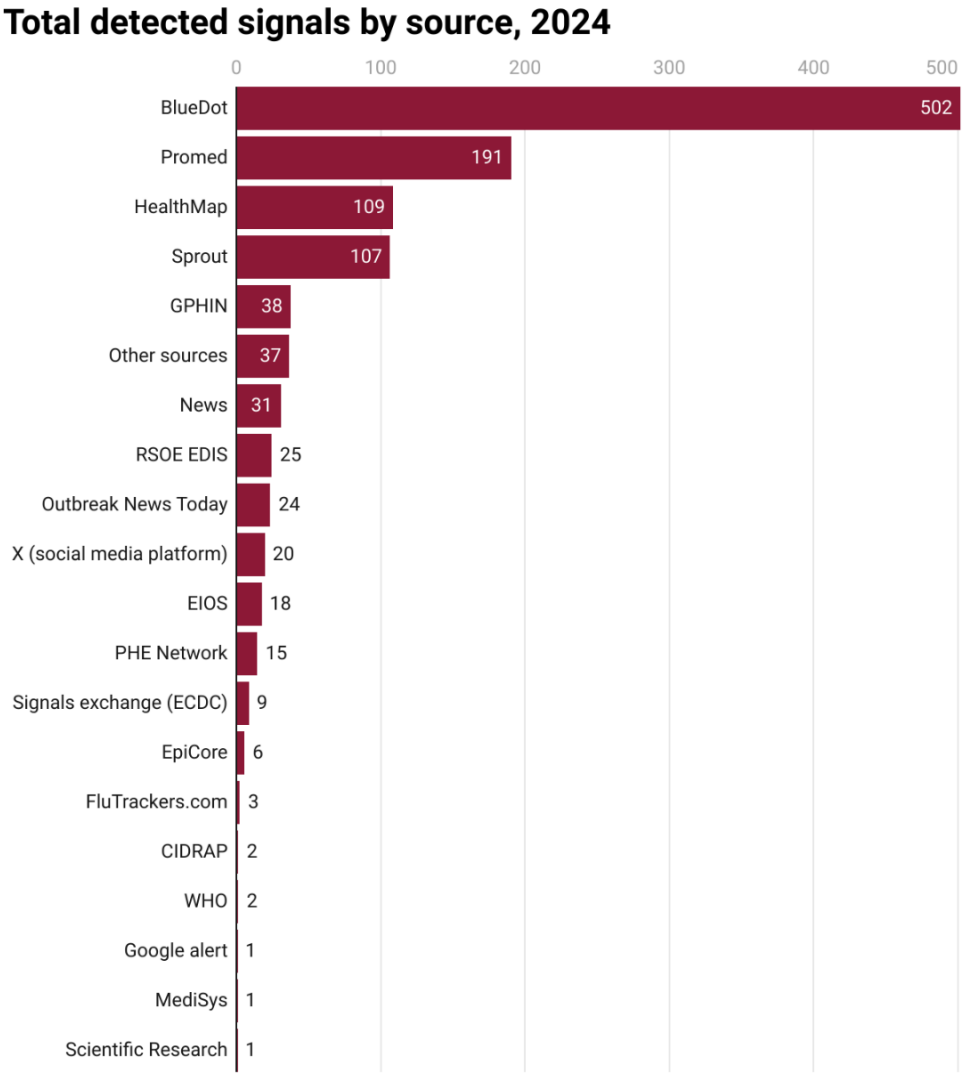


Figure 3: Total detected signals by source, 2024

Definitions

The below is a list of commonly referred to terms and keywords in the annual report.

Gulf Public Health Emergency Network (PHEN)

A group of technical individuals within GCC health authorities, nominated to represent each GCC country. The composition typically includes International Health Regulations Focal Point, Ministry of Health Communicable Disease Directors and National Public Health Laboratory Directors or appointed representatives on their behalf. The Gulf CDC serves as the Network's secretariat with the PHE Department Director chairing the network meetings.

Hazard

A source/incident that has the potential to cause morbidity (including injury) or mortality in an exposed human population.

Signal

An incident/situation involving a hazard that has occurred. Signals are typically news/updates identified through Event-Based Surveillance and Indicator-Based Surveillance, utilizing both official and non-official sources. Signals can be of a disease origin or a CRNE (Chemical, Radiological, Nuclear, or Environmental) origin.

Potential Threat

Any threat that has been confirmed by the PHEN to have the potential to pose a near-future risk to the GCC countries' populations and could be monitored closely by Gulf CDC for 2 weeks.

Event of Regional Interest

Any threat, inside or outside the GCC, that has been identified by the Public Health Emergency Network to pose a certain type of risk for the GCC countries' public health. For these threats, Gulf CDC produces regular risk assessments and recommendations for their control, as well as enhances daily monitoring of it to provide regular situational updates to the GCC countries.

Rapid Risk Assessment

A prompt evaluation of the level of health risk in relation to a verified acute event within a short time frame, mainly for situation update, risk level determination and recommendation to support the GCC countries in risk communication and management.

GULF CDC Risk Scale					
Negligible	Very Low	Low	Moderate	High	Critical

Country names in this report are as per the UN list

Events of Regional Interest

In 2024, the Gulf CDC identified 6 events of interest to the Gulf Region. 3 of these events were global: Avian Influenza H5N1, measles, and mpox. These represent global communicable diseases that are expected to continue affecting countries around the world in 2025. The other 3 events occurred in Africa, including diphtheria in West Africa, yellow fever in South Sudan, and Marburg in Rwanda.

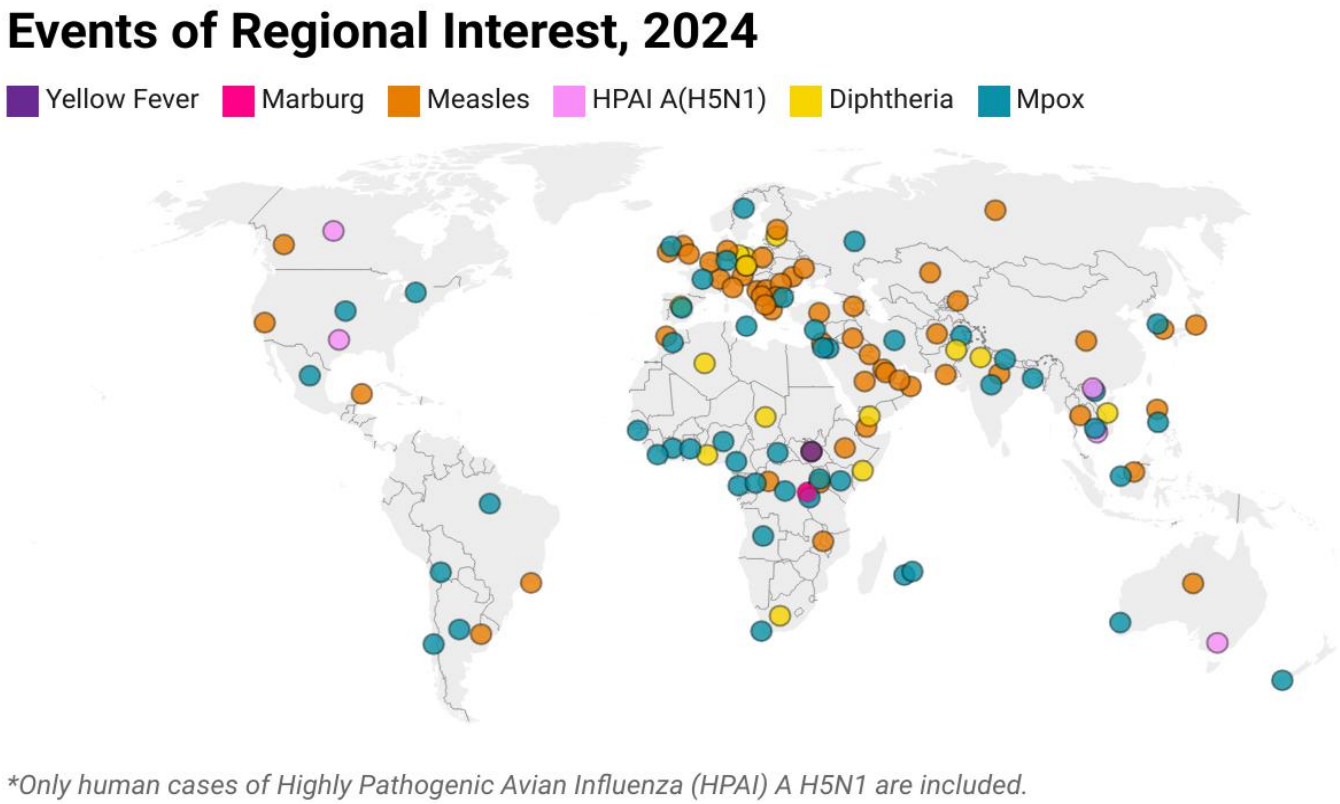
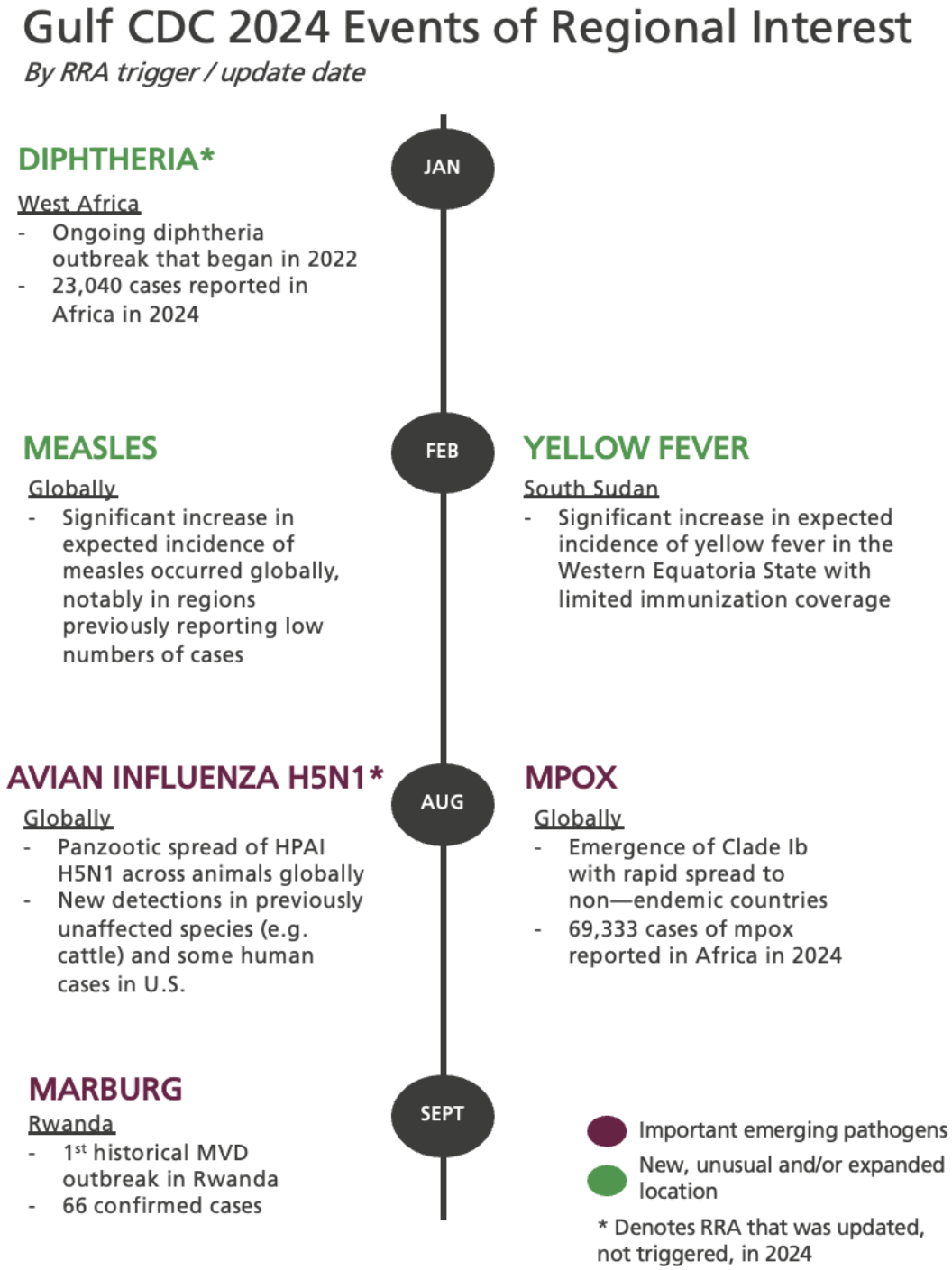


Figure 4: Geographic distribution of signals detected for the 6 events of regional interest, 2024

This map represents signals captured by the Gulf CDC PHE team regarding the 6 events of regional interest in 2024. It does not represent number of cases or all reported cases of the 6 diseases globally.

The below timeline of events outlines when the Gulf CDC triggered or updated an RRA in response to emerging pathogens or unusual activity / expansion of endemic pathogens.



Global Events of Regional Interest

Avian Influenza H5N1

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT

- **Risk Question:** What is the likelihood of HPAI H5N1 human-to-human transmission occurring in the GCC countries and what is the impact of that transmission?
- **Impact:** Moderate. Despite the global unavailability of specific antiviral drugs for HPAI H5N1, case management capacities of the GCC countries for influenza infections are generally high.
- **Likelihood:** Unlikely. The likelihood of HPAI H5N1 importation to the GCC countries from the United States is unlikely given the low number of cases. Further, there is no evidence of human-to-human transmission at this time.

Please refer to the Gulf CDC Rapid Risk Assessment: Highly Pathogenic Avian Influenza H5N1 from 6 August 2024 further details.

TRIGGER DATE	18 May 2023, updated 6 August 2024
REASON FOR TRIGGER	The Gulf CDC re-opened this event due to an increase in Avian Influenza cases in previously unaffected species in the United States and the corresponding increase in human cases.

KEY STATS

80

Confirmed human cases of H5N1 globally in 2024

Situational Highlights for Avian Influenza H5N1

Epidemiological situation in humans

In 2024 [1], there were 6 countries that confirmed human cases of Avian Influenza H5N1; United States (66), Cambodia (10), Australia (1), Canada (1), China (1), and Vietnam (1).

- 10 states [2] in the United States had confirmed human cases in 2024; California (38), Washington (11), Colorado (10), Michigan (2), Iowa (1), Missouri (1), Oregon (1), Texas (1), Wisconsin (1).

- The first human case associated with the dairy cattle outbreak [3] was reported in Texas, United States on 1 April 2024, in an individual reporting mild symptoms including conjunctivitis. This strain contained a known marker of mammalian adaption (the PB2 E627K mutation). Since then, at least three other states (California, Colorado, and Michigan) have reported human cases associated with genotype B3.13 including among workers on several affected poultry facilities where testing has occurred.
    - The 2024 annual cumulative influenza A(H5N1) case count reported in the United States is the second largest to have ever been reported at a national level (following Egypt with 136 [4] reported human cases in 2015).

- In 2024, Cambodia [5] reported 16 cases of HPAI H5N1 (10 confirmed) in humans, continuing a trend observed since early 2023.
    - The re-emergence of human infections of H5N1 follows a nine-year hiatus since the last confirmed case. With the resurgence of cases, genome sequencing revealed that the underlying cause is a novel re-assortment composed of a combination of an older clade 2.3.2.1c, which has been circulating in Asia since 2013, and clade 2.3.4.4b. (causing the global panzootic).
    - This novel re-assorted influenza virus has been detected across the Greater Mekong Subregion (GMS) [6], causing infections in both humans and poultry since mid-2022. The introduction and widespread circulation of this re-assorted influenza A(H5N1) virus into the GMS poses a significant risk to both animal and human health, given the historical impact of HPAI outbreaks in the region. Further, this reassortment event indicates not only the adaptive capacity of the virus but also the ever-present risk of the emergence of new, potentially more virulent strains.

Epidemiological situation in animals

In March 2024, the first confirmed dairy cattle [3] infected with avian influenza A(H5N1) in the country were reported in Texas, United States.

- Prior to this, cattle were assumed to have low susceptibility to influenza A viruses. Reports as early as February 2024 and preliminary phylogenetic analysis of cattle illness in Texas, Kansas, and New Mexico suggest the illness may have spread as early as late 2023 or early 2024.
- The initial epidemiological studies [7] implicated cattle movements and shared resources (personnel and/or equipment) in the spread. They also found infected wild birds, a skunk, and several domestic cats on and around affected premises.
- The isolated virus was identified as clade 2.3.4.4b genotype B3.13 (recombinant of genotype B3.7 and a low pathogenic avian influenza virus).
- As of December 2024, 774 affected livestock herds [8] across 16 states in the United States with the B3.13 genotype have been confirmed including among cattle, goats, and alpaca.

Modes of transmission:

The mode(s) of transmission [3] between infected cattle and cattle to human remains unconfirmed, while milking processes and cleaning of related environments have been suggested as high-risk for exposure due to the high concentration of virus in milk.

- Agricultural exposure to infected cattle, or poultry (particularly during depopulation of infected poultry flocks) is associated with most human cases.

- Notably, some cases have been reported outside these settings, including two cases in children lacking direct exposure to infected animals/poultry.
- There is no evidence to date that suggests human-to-human transmission has occurred among any of the human cases reported in North America.

- The increasing probability and duration of exposure between infected animals and humans in agriculture and recreational settings highlight the continued risk for further cases, mammalian adaptation and reassortment events.
  - The recent human cases with unconfirmed/unknown sources of exposure raises concerns for heightened risk of environmental exposure due to the circulation of the virus among wild and/or peridomestic animals, and animal products.
- Continued disease activity during the concurrent human influenza season provides increased opportunity for recombination with other circulating influenza viruses and a human adapted strain arising with pandemic potential.

Vaccine information

As part of pandemic preparedness activities, the United States CDC and the World Health Organization (WHO) regularly collaborate to develop candidate vaccine viruses [9] (CVVs) for novel avian influenza viruses with pandemic potential.

- In 2023, an experimental vaccine known as H1ssF-3928 mRNA-LNP (also known as the "pan-flu" vaccine [10]) underwent Phase 1 trials to test for its safety and efficacy. The mRNA-based vaccine has garnered much attention as a universal flu vaccine with potential to prevent a future flu pandemic, reduce the need for yearly flu-vaccine campaigns, and increase flu vaccine production speed.
  - The vaccine targets the hemagglutinin stem proteins, which are similar across different types of flu viruses. In contrast, traditional flu vaccines typically target the NA protein, which is known to evolve and drift independently from HA, increasing the need for updated yearly vaccines
  - The vaccine targets the hemagglutinin stem proteins [11], which are similar across different types of flu viruses. In contrast, traditional flu vaccines typically target the NA protein, which is known to evolve and drift independently from HA, increasing the need for updated yearly vaccines.
  - The Phase 1 clinical trials deemed the H1ssF-3928 mRNA vaccine to be safe [12], well-tolerated, and elicited the desired broad antibody response.25 The responses were durable, with neutralizing antibodies observed for over one year after vaccination

- The United States government has two attenuated CVVs kept on reserve to be used to manufacture H5N1 vaccines for human use, if influenza A (H5N1) virus begins to spread via human-to-human transmission.
  - In May 2024, the WHO provided an interim assessment [13] of the genetic and antigenic characteristics of H5N1 clade 2.3.4.4b isolated from the affected dairy cattle and humans in Texas compared to CVVs.
    - They found that based on available genetic, antigenic and epidemiologic data, the current CVVs were adequate and no new CVVs were proposed.
    - This means that there are CVVs available to scale up to mass vaccine production if needed.

- In July 2024, the WHO launched [14] a new project aiming to accelerate the development and accessibility of human avian influenza (H5N1) mRNA vaccine candidates for manufacturers in low- and middle-income countries.
    - The Argentinian manufacturer Sinergium Biotech will lead this effort leveraging the WHO and the Medicines Patent Pool (MPP) mRNA Technology Transfer Programme. [15]

Mpox

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT

- **Risk Question:** What is the likelihood of importing a mpox clade 1b case into the GCC causing an occurrence of subsequent cases in the GCC in the next 3 months?
- **Impact:** Moderate, With the low transmission potential of the virus in the Gulf communities, and the high national capacities established for mpox prevention, detection and control, the level of potential impact of mpox has been characterized as moderate.
- **Likelihood:** Likely, as there is a large volume of travelers to the Gulf from countries reporting mpox Clade 1b cases, it is likely that unlinked cases/clusters to be detected within the next 3 months.

Please refer to the Gulf CDC Rapid Risk Assessment on mpox (14 August 2024) for further details.

TRIGGER DATE	14 August 2024
REASON FOR TRIGGER	The Gulf CDC triggered this event due to an increase in the expected incidence of epidemic activity. On the same day, the World Health Organization (WHO) declared mpox as a public health emergency of international concern (PHEIC) for the second time.
EVENT STATUS	This event remains open given the high number of cases that continue to be reported and the multiple internationally exported cases in the last months of 2024.

KEY STATS

69,333 Cases of Mpox reported in Africa in 2024	**9** Countries outside Africa reporting imported cases of Clade Ib

Situational Highlights for Mpox

Epidemiological situation

Mpox Clade Ib spread across the African region to non-endemic countries, with exported cases appearing in distant countries including in Asia, Europe and North America, leading the WHO and Africa CDC to declare a PHEIC in August 2024.

- The first cluster of cases for the mpox outbreak was detected [16] in Kwango province in the Democratic Republic of Congo (DRC) in April 2023, where sexual transmission of the virus was first documented.
- The novel Clade Ib strain appears to have first emerged in a mining town in South Kivu province in September 2023, and spread through sexual contact, with the initial cluster of cases being in adults, including sex workers.
    - One study showed that Clade Ib has less genetic diversity than Clade Ia [17], indicating that Clade Ia has had multiple zoonotic introductions in different locations. Furthermore, Clade Ib has a higher number of mutations including deletions that may facilitate human-to-human transmission. Therefore, it is thought that the Clade Ia and Ib outbreaks in the DRC emerged independently of each other.
    - Clade Ib spread relatively rapidly within the population and mining community in South Kivu, and then to bordering countries that are non-endemic to mpox Clade I.

Mpox situation in Africa

Most cases [18] have been reported and confirmed in the DRC in 2024, but neighbouring countries like Burundi and Uganda have reported and confirmed a high number of cases. Additionally, most cases have been detected in children under the ages of 15, indicating that the predominant mode of transmission is likely through direct close contact.

- It is likely that reported cases are underestimates due to a lack of testing and surveillance capacity as well as stigmatization of sexual activity. While mpox clade Ib cases are continuing to increase rapidly in some countries such as Uganda and in the DRC generally, reported cases in South Kivu, where the outbreak originated, have been plateauing.
- According to Africa CDC [19], between epidemiological weeks 1 and 52 of 2024 there were a total of 72,506 cases of mpox reported in the region, of which 16,309 were laboratory confirmed, and 1,288 deaths.

Total mpox cases in Africa in 2024

Country	Confirmed	Deaths
Angola	4	0
Burundi*	2,861	1
Cameroon	9	2
Central African Republic	88	3
Congo	23	0
Côte d'Ivoire	107	1
Democratic Republic of the Congo*	11,503	1,271
Gabon	2	0
Ghana	5	0
Guinea	1	0
Kenya*	31	1
Liberia	63	0

Mauritius	1	0
Morocco	2	0
Nigeria	167	0
Rwanda*	59	0
South Africa	25	3
Uganda*	1,353	6
Zambia	3	0
Zimbabwe	2	0

**Country has confirmed at least one case of mpox clade Ib.*

- According to the WHO [18], 12 countries in Africa are in active outbreak (cases reported in the last 6 weeks), 4 are in control phase (cases reported in the past 90 days) and 6 have had cases reported since 2022, but not in the last 90 days.

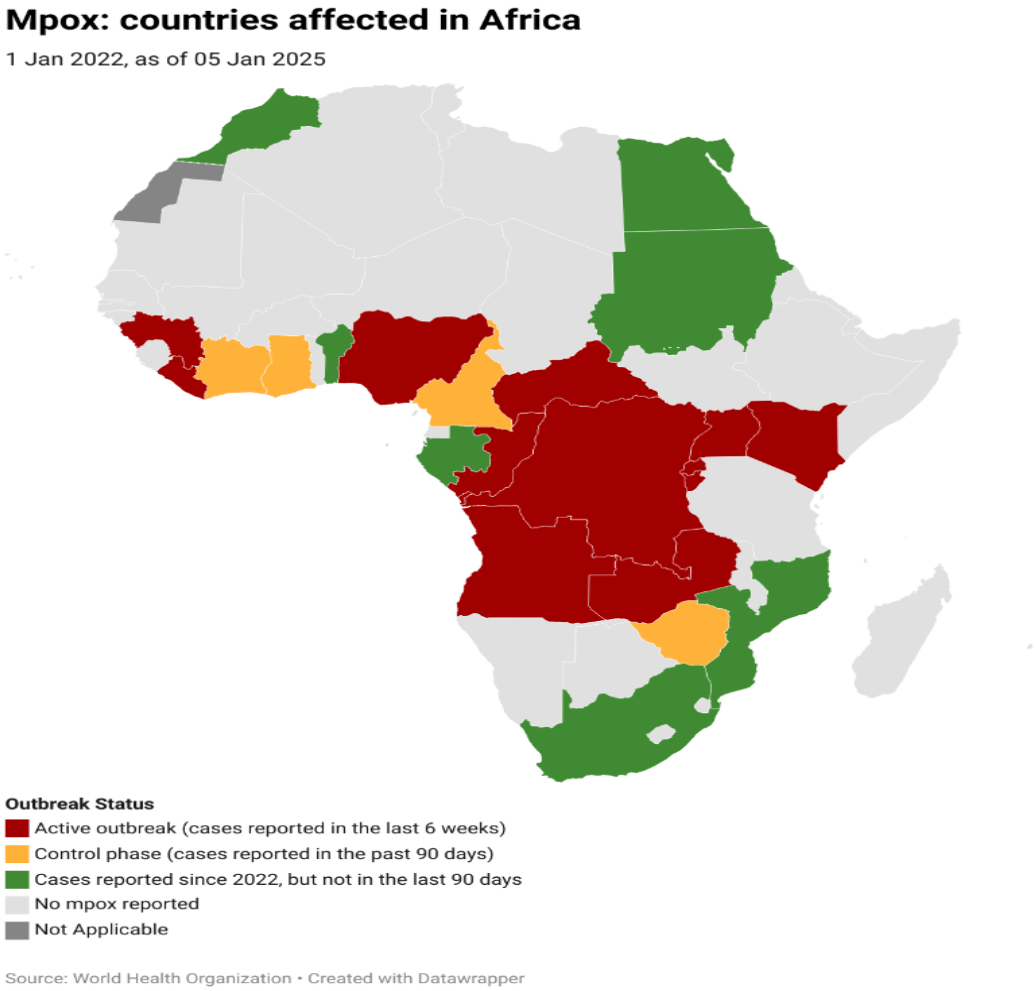


Figure 5: Mpox: countries affected in Africa from 1 Jan 2022, as of 05 Jan 2025

Mpox Clade Ib situation in the GCC

- Oman [20] was the only GCC country that reported mpox Clade Ib cases in 2024. According to the WHO, Oman reported its first imported case of mpox Clade Ib on 10 December 2024.

Mpox Clade Ib situation internationally

- Imported cases of mpox Clade Ib have also been reported in countries outside of the African region [21]. Furthermore, the index cases in the United Kingdom (UK) and Germany were associated with clusters arising from household transmission.

Country	Reported Cases of mpox Clade Ib in 2024
Belgium	2
Canada	1
Germany	6
India	1
Oman	1
Pakistan	1
Sweden	1
Thailand	1
United Kingdom*	5
United States	1

*While most cases have been imported, the United Kingdom has reported household contact cases

Vaccine information

- When the Africa CDC declared mpox a Public Health Emergency of Continental Security (PHECS) [22], it immediately signed a partnership agreement with the European Commission's Health Emergency Preparedness and Response Authority (HERA) and Bavarian Nordic to provide over 215,000 doses of the Modified Vaccine Ankara – Bavarian Nordic (MVA-BN®) vaccine to oversee equitable distribution of the vaccines across member states.
- Additionally, WHO's Access and Allocation mechanism [23] allocated an initial 899,000 mpox vaccine doses for 9 countries in Africa, with most of the doses going to the DRC. An additional 5 million vaccines doses were expected to be allocated by the end of 2024 including 3 million doses of the LC16 vaccine and 2 million doses of the MVA-BN vaccine.
    - Approximately 52,000 people have already been vaccinated in the DRC though many more vaccines are needed to contain the outbreak. Clinical trials for medican countermeasures (MCMs) are also being undertaken in the DRC to facilitate the development of MCMs against mpox. Recently, a new real-time PCR [24] has also been approved for emergency use listing by WHO, with results available immediately for improved outbreak control.
- In September 2024, the WHO announced the MVA-BN® vaccine as the first vaccine against mpox to be added to its prequalification list. The MVA-BN® vaccine is the only FDA and EMA-approved mpox vaccine. In November, the WHO granted emergency use [25] for the LC16m8 mpox vaccine, making it the second mpox vaccine to be supported by the WHO.
    - In addition, the Africa CDC announced a collaboration with Bavarian Nordic [26] to support its pledge to deliver 10 million mpox vaccine doses by 2025.

- Of note, the MVA-BN® vaccine is effective at protecting against mpox Clade II and is expected to work well for mpox Clade I, based on cross-protection afforded between orthopoxviruses, as outlined in an August 2024 WHO position paper. [27] The increase in mpox incidence in humans in recent years has been associated with declining population immunity to orthopoxviruses after cessation of worldwide smallpox vaccination.
    - Surveillance data [27] from the DRC indicated that among individuals born before 1980, people vaccinated against smallpox with first-generation vaccinia-based smallpox vaccines had a 5.2-fold lower risk of being infected with mpox than those unvaccinated (0.78 versus 4.05 per 10,000), which represented a pre-exposure vaccine effectiveness against mpox of 80.7% (95% CI: 68.2–88.4%).
    - Another surveillance [27] study among 338 subjects in the same country suggested that Dryvax, a first-generation vaccinia-based smallpox vaccine, was 85% effective against mpox.

Treatment information

In August and December 2024, interim analysis data from two clinical trials [28] (PALM007 and STOMP) to evaluate the safety and efficacy of tecovirimat (a type of medicine that is used to treat smallpox in humans) in persons with mpox became available.

- The analysis showed that while tecovirimat was safe, it did not reduce the time to resolution of mpox lesions among participants who were randomized to receive tecovirimat or placebo.
- However, the study found 1.7% overall mortality, which was lower than the mpox mortality of 3.6%, showing that better outcomes among people with mpox can be achieved when they are hospitalized and provided high-quality supportive care, as all study participants were admitted to a hospital for at least 14 days.

- To date, there is no proven effective antiviral treatment for mpox.

Measles

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT

- **Risk Question:** What is the risk of a significant number of measles cases being imported into the GCC Region in the upcoming 6 months, in terms of the likelihood and impact of the importation?
- **Impact:** Moderate, MMR immunization is high as of 2022 but varies across countries. Current and upcoming mass gathering events pose a particular risk to increased transmission of measles from imported cases for unvaccinated or not-fully vaccinated populations.
- **Likelihood:** Highly likely, due high travel volume from endemic regions and countries reporting an increase in measles cases. The magnitude of the impact of measles on the GCC countries is moderate, due to varying immunization coverage across the region potentially exacerbated by upcoming mass gatherings. There is a moderate level of confidence due to the availability of relevant data.

Please refer to the Gulf CDC Rapid Risk Assessment on measles (19 February 2024, updated 21 March 2024) for further details.

TRIGGER DATE	19 February 2024
REASON FOR TRIGGER	The GULF CDC EI team escalated the measles outbreaks globally from a potential threat to a threat of regional interest on 19 February 2024 because of an increase in the expected incidence of measles globally. Of note, the Gulf CDC monitored the increase in cases in several high-connectivity and neighbouring countries.

KEY STATS

320,790 Reported measles cases globally in 2024	**1,769** Reported measles cases in GCC countries in 2024

Situational Highlights

Global epidemiological situation

In 2024, continued trends of measles outbreaks were reported globally. This is partly due to postponed or missed measles vaccine doses, because of vaccination campaign delays that continue after the COVID-19 pandemic and to increasing vaccine hesitancy.

- The patterns from 2022 and 2023 of above historical-average cases of measles continued into 2024.
  - According to official WHO data [29], the reported measles cases in 2024 were comparable to 2023.
  - The first 4 months of 2024 saw an average of 53,797 suspected measles cases globally, with the highest reporting coming from the European, Eastern Mediterranean and African WHO regions.
  - As of July 2024, global reporting levels have reduced significantly below the 2023 reporting levels at the same time, although this may be because of underreporting.

GCC and neighbouring countries epidemiological situation

In 2024, GCC countries reported a total of 1,769 measles cases (a 37.2% decrease from 2023) according to official WHO data [29]. The regional decrease is mainly a result of a 48.4% in cases in Saudi Arabia.

GCC country	Reported measles cases in 2023	Reported measles cases in 2024
UAE	506	571
Bahrain	3	7
Saudi Arabia	2,162	1,116
Oman	25	22
Qatar	116	46
Kuwait	6	7

- **Yemen** reported a suspected 33,000 cases of measles [30] between January and 27 November 2024, with 280 associated deaths.
  - In parallel to the measles outbreak, Yemen is facing multiple outbreaks of vaccine-preventable diseases, including cholera, circulating vaccine-derived poliovirus type 2 (cVDPV2), diphtheria, malaria and dengue fever.
- **Pakistan** reported a suspected 23,596* cases of measles in 2024, demonstrating a 34.7% increase from 2023. Pakistan has a measles and rubella vaccine campaign planned for late 2025, targeting over 29 million people, aged 9-59 years [29].
- **Iraq** reported a suspected 32,179* cases in 2024, a ~230% increase from 2023. [29]

**Please note these data are likely underestimates (due to delays in reporting), as Iraq had 0 cases reported in November and December 2024 and Pakistan had 0 cases reported in December 2024 per official WHO data.*

Localized Events of Regional Interest

Diphtheria

West Africa

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT

- **Risk Question:** What is the risk of a significant number of diphtheria cases being imported into the GCC region in the upcoming 6 months, in terms of the likelihood and impact of importation?
- **Impact:** Minor, rare disease in the Gulf Region and immunization coverage estimates for diphtheria, tetanus toxoid, and pertussis (DTP) in 2022 are high but vary across GCC countries
- **Likelihood:** Likely, due to significant population movement between GCC countries and regions where high diphtheria activity is reported.

Please refer to the GULF CDC Rapid Risk Assessment on diphtheria (10 December 2023, updated 31 January 2024) for further details.

TRIGGER DATE	23 November 2023, updated 31 January 2024
REASON FOR TRIGGER	The Gulf CDC detected a significant increase in diphtheria cases on 24 October 2023 in Nigeria, making the outbreak the largest documented on the African continent.

KEY STATS

23,040
Reported cases across Africa in 2024

78%
Of all reported cases are in Nigeria

Situational highlights for diphtheria

Epidemiological situation

Since 2023 and throughout 2024, several countries in West Africa experienced sustained outbreaks of diphtheria.

- According to Africa CDC [19], as of 3 January 2025 there were a total of 23,040 reported cases (11,202 confirmed human cases and 11,955 suspected cases) and 599 deaths (Case Fatality Ratio (CFR): 5.35%) in 6 African countries.

- Nigeria is the most severely affected country, accounting for 78% of cases and 70% of deaths. Officials estimate the toll could be much higher across regions unable to detect many cases and deaths.

Diphtheria case and death by African country reporting, 2024

Country	Cases (reported)	Deaths
Chad	2,625	78
Gabon	13	0
Guinea	2,869	17
Mauritania	40	3
Niger	746	29
Nigeria	16,864	472

Vaccination information

In response to the ongoing outbreak in Nigeria, the US CDC is [31] working in collaboration with the federal government of Nigeria to tackle the burden of zero-dose children (children who were yet to receive any vaccines on the routine immunisation schedule) in the country.

- According to GAVI, the Vaccine Alliance [32], in 2023 Nigeria accounted for the highest burden of zero-dose children globally with 2.2 million zero-dose children. Only 36% of Nigerian children aged 12-23 months have received all the recommended vaccinations.
- According to a WHO AFRO Health Emergency Situation Report from May 2024 [33], there are ongoing challenges with vaccination campaigns of the DTP vaccine. Despite the mainly affected countries receiving a combined 2.7 million doses from GAVI, the mass vaccination campaigns have been delayed.
- According to data published by the WHO and UNICEF in July 2024 [34] on immunization coverage, the number of children globally who received 3 doses of the DTP vaccine in 2023 stalled at 84%.
    - Additionally, and of increasing concern, the number of children who did not receive a single dose of the vaccine increased from 13.9 million in 2022 to 14.5 million in 2023.
    - These trends demonstrate that global immunization coverage has still not returned to 2019 levels, highlighting challenges with disruption in healthcare services, logistical delivery, vaccine hesitancy and inequities in access to services.

Historical situation

According to the WHO, in the decade between 2013 and 2023 [35], diphtheria had become relatively uncommon in the African region. On average, just under 3,000 cases were reported per year during that time across the region.

- High regional vaccination coverage with DTP3 as considered to be responsible for the low incidence of disease.
- According to WHO/UNICEF estimates of National Immunization Coverage (2013-2022), coverage of the first dose of diphtheria, tetanus and pertussis vaccine (DTP1) and DTP3 averaged 80.5% and 73% respectively.
- In 2022, a total of 910 diphtheria cases were reported to WHO AFRO through the international Health Regulations (IHR) system or to the VPD Programme of the regional office.

Yellow Fever

South Sudan

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT – 01 February 2024

- **Risk Question:** What is the risk of one case of Yellow Fever (YF) being imported into the GCC Region from South Sudan in the upcoming 3 months, in terms of likelihood and impact of the importation?
- **Impact:** Moderate, due to severity of disease and low rate of immunization against yellow fever among GCC country populations. Robust vector control measures are in place to combat mosquito-borne diseases.
- **Likelihood:** Unlikely, there is a low number of travelers forecasted to travel between South Sudan and GCC countries, and South Sudan MOH has reported that entry and exit screening is in place as all travelers are requested to present their yellow fever vaccination cards.

Please refer to the Gulf CDC Rapid Risk Assessment (01 February 2024) for further details.

TRIGGER DATE	01 February 2024
REASON FOR TRIGGER	This event was categorized as an event of regional interest as it highlighted the possibility of a larger ongoing outbreak and potential risk of further spread of yellow fever in South Sudan.

KEY STATS

139
Reported yellow fever cases in 2024

4.3%
Case fatality ratio

Situational highlights for Yellow Fever

Epidemiological situation

On 24 December 2023, the Ministry of Health in South Sudan confirmed [36] an outbreak of yellow fever in Yambio County, Western Equatoria State, located close to the border with the DRC.

- The event was closed on 29 November 2024 by the WHO AFRO office after 2 incubation periods had passed [37] with no new cases reported.
- The total number of reported cases were 139, including 136 suspected cases and 3 laboratory-confirmed cases.

- A total of 6 deaths were reported (CFR 4.3%)
- South Sudan continues to experience a humanitarian crisis across the country, and several concurrent outbreaks occurred throughout 2024 [37], including measles, cholera, hepatitis E, malaria and poliomyelitis (cVDPV2). This may result in undetected transmission and cases, with limited resources available for surveillance, contact tracing and limited healthcare capacity.

Vaccination information

In February, the Ministry of Health, in collaboration with the World Health Organization, UNICEF and other partners initiated a reactive yellow fever vaccination campaign [38] as part of preventive response intervention.

  - The campaign targeted approximately 610,000 individuals (between the ages of 9 months to 65 years) in the affected counties.
  - As of 18 April, 465,798 individuals in the 5 specified counties in Western Equatoria state were vaccinated (77% of the targeted population)
- In addition to the reactive yellow fever vaccination campaign, response activities (coordination, surveillance, laboratory, case management, risk communication and community engagement, vaccination, infection prevention and control, etc.) are being reinforced by State Ministry of Health and supported by several partners.

Yellow fever in the African region

According to the WHO [39], 12 countries in Africa in addition to South Sudan (Burkina Faso, Cameroon, the Central African Republic, Chad, Republic of the Congo, Côte d'Ivoire, Democratic Republic of the Congo, Guinea, Niger, Nigeria, Togo and Uganda) reported probable and confirmed cases of yellow fever in 2023 and early 2024.

  - Many affected countries have suboptimal surveillance capacity, with data fragmentation, limited integration with routine surveillance and clinical systems, and lack standardized case definitions, contributing to underreporting, increase mortality and increased difficulty in risk mitigation.

Marburg

Rwanda

Negligible	Very Low	Low	Moderate	High	Critical

GULF CDC RISK ASSESSMENT OF THIS EVENT – 01 October 2024

- **Risk Question:** What is the risk of one case of Marburg virus disease (MVD) being imported into the GCC Region from Rwanda in the upcoming month, in terms of the likelihood and impact of the importation?
- **Impact:** Minor, given that GCC countries have high reported capacities for detecting and responding to epidemic-prone diseases, the GCC health systems have been exposed to scenarios of importation of viral hemorrhagic fever, meaning that similar control measures and precautions will likely be implemented for the current outbreak.
- **Likelihood:** Unlikely, due to the current scale of the outbreak, and the limited direct travel links to the GCC region.

Please refer to the Gulf CDC Rapid Risk Assessment on Marburg (1 October 2024) for further details.

TRIGGER DATE	29 September 2024
REASON FOR TRIGGER	The Gulf CDC EI team escalated the Marburg outbreak in Rwanda to an event of regional interest due to the Marburg outbreak reported by the Rwandan Ministry of Health on 17 September. Marburg virus is an epidemic-prone disease, with a high CFR and severity level, requiring swift preparedness and vigilance.

KEY STATS

1st
historical MVD outbreak recorded in Rwanda

66
Confirmed MVD cases

Situational highlights for Marburg

Epidemiological situation

The outbreak, confirmed on 27 September, was the first historical Marburg virus disease (MVD) outbreak recorded in Rwanda.

- The outbreak resulted in 66 confirmed cases (including 15 fatalities) [40], yielding a CFR of approximately 23%, lower than the historical range of 24-88% for Marburg virus outbreaks.
- Nearly 80% of the infections occurred among healthcare workers [41] who provided clinical care to infected individuals.

- Rwandan health authorities, in collaboration with the WHO and other partners, mounted a robust response encompassing surveillance, testing, infection prevention and control, contact tracing, clinical care, and public awareness initiatives.
    - The deployment of WHO experts, regional first responders, and strong national mobilization were key factors in the successful containment of the outbreak.
    - These efforts significantly curbed the outbreak, with cases halving in the second week and declining by 90% thereafter.
    - Early medical care and public health interventions are credited with lowering the CFR as compared to the historical range.
- The WHO and Rwanda's Ministry of Health continue collaborative efforts to maintain vigilance for potential flare-ups and to support comprehensive care programs for survivors to manage post-recovery effects.

Historical trends

17 MVD outbreaks have been reported globally. Including this one, there have been 6 MVD outbreaks since 2017 [42].

- 2024 – Rwanda
- 2023 – Equatorial Guinea and Tanzania
- 2022 – Ghana
- 2021 – Guinea
- 2017 – Uganda

- Continued human contact and changes in climate patterns that may affect the habitat and migration of carrier fruit bats could lead to increased zoonotic transmission, and therefore frequent outbreaks of hemorrhagic fever viruses.

Vaccination information

9 days after the outbreak was declared, the Rwanda Biomedical Centre began a vaccine clinical trial in partnership with Sabin Vaccine Institute [43].

- Part A of the trial assessed the vaccine's safety, tolerability and immunogenicity, while Part B aimed to evaluate efficacy.
    - In total, 3 shipments of vaccines totalling approximately 2,700 doses were delivered between 5 October and 1 November 2024.
    - 1,700 vaccines were administered, while 1,000 are being stored
    - Rwanda engaged in the Phase 2 rapid response open-label trial (RBC-001 Part A) with a single-arm protocol for adults over 18 years in an outbreak setting.
    - High-risk individuals, primarily healthcare workers given the outbreak location, were vaccinated at trial sites with Sabin's single-dose cAd3-Marburg vaccine.
- Part B of the protocol was not initiated as the outbreak was subsiding by the time it could have been implemented.
- Additionally, a Phase 2 Marburg vaccine trial in Uganda and Kenya was underway at the time of the Rwandan outbreak. Interim results are expected in 2025, and Sabine is expected to conduct a similar-stage trial in the United States in 2025.

Vaccine-preventable disease trends in 2024

According to the WHO, in 2023 there were 14.5 million zero-dose children [44] globally. The disruptive effects on immunization caused by the COVID-19 pandemic continue to be present, half a decade after it first emerged. Examples previously mentioned in the Events of Regional Interest section include high reports of measles cases occurred globally in 2024, and continued diphtheria outbreaks in West African countries.

In 2024, there was an observed resurgence of poliovirus infections in areas with low-vaccination coverage. Additionally, environmental detection of vaccine-derived polio has been occurring in countries with historically little to no circulation. In parallel, the multi-country outbreak cholera outbreak that began in 2021 continued, with 33 countries reporting cholera outbreaks in 2024. The COVID-19 pandemic's disruption of vaccination campaigns continued to impact countries worldwide, particularly those most vulnerable to disease spread due to humanitarian crises, struggling health care systems and political instability.

Poliovirus

Disease Trends and Situational Highlights

Polio remains a significant global health challenge, despite decades of eradication efforts that have significantly reduced its incidence. The disease is still classified as a PHEIC by the WHO, highlighting the ongoing threat it poses. Recent data reveal a troubling resurgence, with wild poliovirus cases increasing by more than 250% in endemic countries such as Afghanistan and Pakistan [45] in 2023. Moreover, outbreaks of vaccine-derived poliovirus (VDPV) are being reported in 46 countries, many of which had not seen cases for decades.

This resurgence of poliovirus is particularly alarming as the virus has re-emerged in non-endemic countries such as Vietnam, and Venezuela. In addition, some countries that have reported sporadic cases over the past five to ten years have now been reporting increasing cases without clear evidence of slowing down.

The situation in Europe regarding polio is unusual and concerning, marked by recent detections of vaccine-derived poliovirus type 2 (VDPV2) in wastewater [46] across multiple countries, including Spain, Poland, Germany, the UK, and Finland. While no paralytic cases have been reported, the presence of these isolates indicates the virus is spreading in communities, raising questions about its origin and transmission routes. It is believed that the positive wastewater samples found in Europe have been shed by travelers from areas that use the oral polio vaccine.

Factors such as suboptimal vaccination coverage, vaccine hesitancy, and disruptions from global crises exacerbate the risk, bringing polio closer to becoming a global threat through rapid international spread. Even a single case of polio poses a significant threat, as it indicates potential undetected

transmission in the population. The scale of the event is further emphasized by projections that failure to control the virus could lead to 200,000 polio cases [47] annually within the next decade.

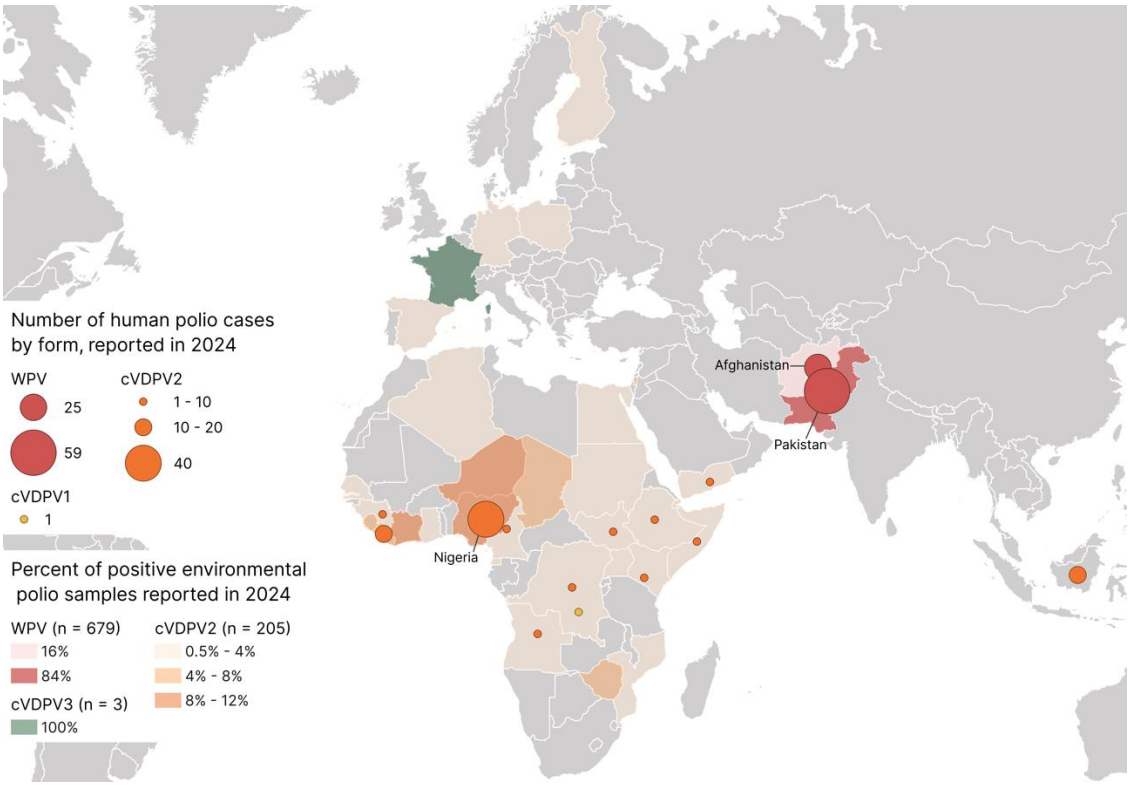


Figure 6: Number of polio cases and positive environmental samples recorded in 2024, Global Polio Eradication Initiative [45]

Preparedness and Response

Efforts to eradicate polio hinge on mass vaccination campaigns and improved public health infrastructure. The availability of two effective vaccines—oral polio vaccine (OPV) and inactivated polio vaccine (IPV)—remains the cornerstone of prevention. Public health responses have included intensified vaccination drives in endemic and at-risk countries, environmental surveillance to detect poliovirus circulation, and international collaborations led by organizations like the WHO.

In 2023, efforts were ramped up in high-risk regions such as Afghanistan, Pakistan, and parts of Africa, where vaccination campaigns aim to achieve the 95% coverage threshold recommended by the WHO to prevent outbreaks. Despite these measures, challenges persist due to conflict, natural disasters, and insufficient healthcare access in some affected areas. Improving coverage in countries such as Afghanistan and Pakistan are also hampered by lack of awareness of the dangers of polio and parental refusal to vaccinate due to religious beliefs.

Moreover, violence against health workers [48] has led to deaths of over 200 polio team workers during approximately the last decade in Pakistan and may be a growing threat in Afghanistan under Taliban control. Public health authorities elsewhere are also addressing vaccine-derived outbreaks

through targeted immunization efforts and improved hygiene and sanitation measures to curb virus transmission in vulnerable communities.

European countries are ramping up wastewater surveillance, reviewing vaccination records, and monitoring for missed paralytic cases. Spain, Poland, and Germany have intensified efforts, with Catalonia reporting no new detections since September. The European Centre for Disease Prevention and Control (ECDC) [46] has urged broader surveillance across the region. While most experts believe the virus will die out in affected European countries, some suggest considering the novel oral polio vaccine (nOPV2) alongside inactivated polio vaccine (IPV) if circulation persists, despite its controversial status in polio-free regions.

Cholera

Disease Trends and Situational Highlights

There has been an ongoing multi-country outbreak of cholera affecting a total of 33 countries globally in 2024. According to a WHO report [49] published on 18 December 2024, between January and 24 November 2024, there have been 733,956 reported cases and 5,162 associated deaths. The Eastern Mediterranean Region has reported the highest cases with 554,434 across eight countries. In 2024, the most severely impacted countries include Yemen, Afghanistan, and Pakistan.

Cholera has been surging globally [50] since 2021, with 473,000 cases reported to WHO in 2022, and over 700,000 cases reported in 2023. Several of the outbreaks have high case fatality rates, exceeding the 1% threshold used as an indicator for early and adequate treatment of cholera patients. These trends are tragic given that cholera is a preventable and treatable disease and that cases had been declining in previous years.

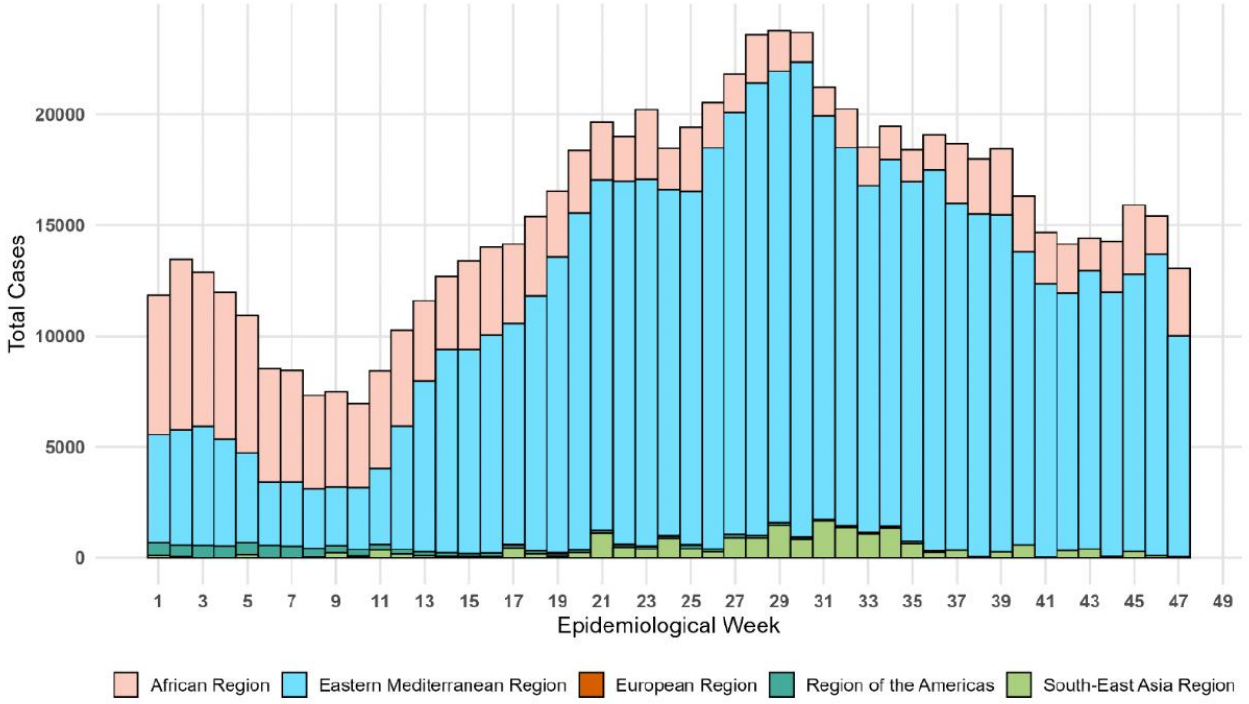


Figure 7: Cholera cases by epidemiological week, 1 January to 24 November 2024, WHO [49]

Preparedness and Response

A significant gap [50] exists between the number of available vaccine doses and the current demand, putting unprecedented strain on the global stockpile. Between 2021 and 2023, requests for vaccine doses to respond to outbreaks exceeded the total number requested in the previous decade. Currently, there are 3 WHO pre-qualified oral cholera vaccines [51]: Dukoral ®, Shanchol™ and Euvichol®. All three vaccines require two doses for full protection.

Due to the ongoing shortage and the two-dose vaccines available, in October 2022, the International Coordinating Group (ICG) [52] – the overseer of the global cholera vaccine stockpile - recommended a single-dose regimen, reducing from the long-standing two-dose regimen. In 2023, around 36 million doses were produced, while 14 countries in need of cholera response reported a combined requirement of 72 million doses for a one-dose strategy. These figures likely underestimate the actual need.

Preventive vaccination campaigns were delayed conserving doses for urgent outbreak control, creating a cyclical challenge. Although the shift to a one-dose strategy allowed more people to be protected and more outbreaks to be addressed, reverting to the two-dose regimen and resuming preventive campaigns would provide longer-lasting protection.

Global vaccine production is projected to have reached 37-50 million doses in 2024, but this will likely remain insufficient to meet the needs of millions affected by cholera. only one manufacturer, EuBiologics, produces the single-dose vaccine, and while the company is working to increase output,

much more is required. New manufacturers of other single-dose cholera vaccines are not expected to enter the market before 2025, and their involvement needs to be expedited.

In April 2024, a new oral vaccine for cholera [53] received prequalification by the WHO. The inactivated oral vaccine Euvichol-S has a similar efficacy to existing vaccines but a simplified formulation, allowing opportunities to rapidly increase production capacity. The new oral vaccine is manufactured by the same manufacturer, EuBiologics, of the existing cholera vaccines in the market.

The WHO is supporting many countries being severely affected by cholera outbreaks. As of November 24, a total of 42 experts [49] have been deployed through both the Global Outbreak Alert and Response Network (GOARN) and Standby Partners (SBP) network to support cholera response efforts in 13 countries (Cameroon, Comoros, Ethiopia, Haiti, Kenya, Lebanon, Malawi, Myanmar, Mozambique, Sudan, Turkey, Zambia, and Yemen). Their areas of focus include health operations, case management, epidemiology, social anthropology, information management, operations/logistics support, and partner coordination.

Climate Change and its Effect on Communicable Diseases

Climate factors such as precipitation, flooding, temperature, and humidity [50] influence the ability of vectors such as mosquitos, ticks, and midges to transmit vector borne disease to humans through: increasing the season and geography available for active periods and breeding, accelerating development rates for vectors and shortening incubation periods, increasing vector ability to carry viral particles, and providing ideal conditions for vectors to proliferate [51]. This burden is further influenced by human behaviours such as land-use, urbanization, socio-economic status, resource allocation, and global travel that further facilitate human, animal, and vector interactions.

Below, major events related to zoonotic and vector-borne disease are discussed in relation to aforementioned climate factors. Throughout 2024, the Gulf CDC PHE system detected many signals illustrating the effects of climate change.

Zoonoses

As has been previously written in this report, two events of regional interest were of zoonotic nature – avian influenza and Marburg.

Avian Influenza

As global climate conditions change, avian migratory patterns and routes begin to change, leading to large – scale population shifts occurring in more temperate avian species [54] and therefore diseases, begin to emerge in new regions, geographies, and populations. Highly pathogenic H5N1 is a prime example of an emerging zoonotic disease that has global spread not only in humans, but also in animal populations such as elephant seals, polar bears, poultry and cattle herds as seen in the United States. Further discussion of human cases has been previously mentioned above.

Factors of climate change that impact the spread of avian influenza include:

- Warmer winters and earlier onset of spring allows for moisture-reliant pathogens to survive for longer periods of time, while cooler and wetter conditions enhance the ability of influenza viruses from bird droppings to survive in water.

- Changing climates impact the rates of recombination events between various viral strains. Depending on the recombination event, there is potential for changes that support more efficient human-to-human transmission of the virus.
- Changing migratory patterns may bring diseases from wild populations to local wildlife, and becoming closer in proximity to human populations.

Filoviruses

The 2024 Marburg outbreak in **Rwanda** marked the first MVD outbreak in Rwanda, and the third MVD outbreak in the last 2 years. Although the origin of the outbreak is uncertain, researchers state that environmental threats such as climate change and deforestation efforts have increased human exposure to animals that can pass on [55] infection. Filovirus outbreaks have been increasing in the last decade [56], the 2022 Ebola outbreak in **Uganda**, and 3 Marburg outbreaks in 2023 and 2024 in countries that had never reported Marburg cases **(Equatorial Guinea, Tanzania and Rwanda)**. including the longest and most deadly Ebola outbreak in West Africa from 2014-2016, the 2022 Ebola outbreak in Uganda, and 3 Marburg outbreaks in 2023 and 2024 in countries that had never reported Marburg cases (Equatorial Guinea, Tanzania and Rwanda).

Vector-borne Diseases

Recent re-emergence and increase in spread of vector-borne diseases such as Oropouche is one example of how climate can increase the disease burden of a vector-borne disease. Oropouche is a febrile illness caused by the Oropouche virus (OROV) [57], which spreads to humans through the bites of infected biting midges, and possibly mosquitos. It is mostly present in South America and the Caribbean. In 2024, over 10,000 cases were reported, including in areas in Latin America that had previously not reported cases of Oropouche. Increased cases of OROV have been potentially linked to deforestation practices and land- use changes in the Amazon basin [55], further discussed below.

Additional examples include the proliferation of chikungunya, dengue and Zika. Furthermore, areas that are endemic for these arboviral diseases have reported elevated levels of cases related to changing weather patterns. In the United States, mosquito populations that have the ability to carry dengue, chikungunya and malaria have been expanding northwards, where they have previously been unable to inhabit [58]. Although cases are sporadic in these regions, the threat of local transmission remains due to the risk of importation from travellers arriving from endemic countries and an established mosquito population.

Particularly in between 2023-2024, the strong weather pattern El Nino caused increased [57] temperatures and humid environments, providing ideal conditions for mosquito proliferation. As a result, mosquito survival through winter months has increased, allowing for longer periods of transmission and virus development. As illustrated in the following table, 2024 saw high volumes of reported cases, new locally acquired cases and re-emerging outbreaks for vector-borne diseases.

The below table collates global indicator-based surveillance data reported in 2023 and 2024. Discrepancies in reporting and the true number of cases is possible given a difference in reporting structures and accessibility to healthcare centres or laboratories for diagnosis. Not all datasets are available globally.

Disease	Global Epidemiological data	Countries experiencing new locally acquired cases/ re-emerging outbreaks	Countries experiencing high number of cases
Dengue (2024) [59]	Over 14,000,000 reported cases and over 10,000 reported deaths	Uruguay Argentina Hong Kong (potentially imported) Iran Central African Republic California, United States Tuscany, Italy	Brazil Paraguay Peru Argentina Guatemala Honduras France (imported cases) United States (imported cases) India Philippines China Bangladesh Nepal
Chikungunya (2024) [59]	Estimated 480,000 cases and over 200 associated deaths	Ile-de-France, France Reunion India (possible new variant)	Brazil Pakistan
Malaria (2023) [60]	Estimated 263,000,000 cases and 597,000 associated deaths		Madagascar Ethiopia
Oropouche (2024) [61]	Over 11,600 cases, and two deaths.	Barbados Panama Dominican Republic Cuba	Brazil Peru Colombia Bolivia
West Nile (2024) [62]	Approximately 3,500 cases and 244 deaths	Albania Jordan Barbados	India Israel
Yellow Fever (2023) [63]	476 cases		South Sudan
Zika (2024) [64]	Over 43,000 Zika cases *(PAHO region and India only)*		India [65] Colombia

Malaria

Globally, there has been a resurgence of malaria cases in recent years. Several factors have influenced this resurgence, including the development of antimicrobial resistant strains, and warming temperatures that accelerate the development of parasites that cause malaria.

This global resurgence can be illustrated by the following examples from 2024.

- From January to October 2024, **Ethiopia** reported over 7.3 million malaria cases [66].
    - Notably, four regions accounted for 81% of the reported cases and 89% of health facility malaria deaths (Oromiya, Amhara, Southwest and South Ethiopia Regional State).
- In **Madagascar,** cases are reported to have exceeded the national epidemic threshold [67].

- The country reported 2.8 million cases in 2023, a significant increase from the 1.7 million cases recorded in 2022.

- In **Italy**, recent mosquito studies have identified the presence of *Anopheles sacharovi* [60] in the Apulia region of southern Italy.
  - Previously, *An. sacharovi* was an important malaria vector in Europe and was widespread in Italy, particularly in the north-eastern coastal regions. This mosquito species was last detected in Italy over 50 years ago.
- In 2023, changing climate in **Pakistan** led to extreme rainfall affecting several areas of the country, intensifying the severity of monsoon season.
  - Following these floods, a major malaria epidemic ensured, leading to a five-fold increase in cases in 2023 compared to cases reported in 2022 [68].
  - In 2024, the province of Khyber Pakhtunkhwa reported over 54,000 cases of malaria from January to September [69].
- The WHO announced that more than one million suspected cases of malaria have been detected in **Yemen** since the beginning of 2024 [70].
  - The deterioration of sanitation services has led to an increased risk of waterborne diseases. Stagnant water resulting from floods has created breeding grounds for mosquitoes, increasing the risk of malaria and dengue outbreaks.

Dengue

Dengue is the world's most widespread and rapidly increasing vector-borne disease. 2024 was a record-breaking year for dengue cases, following the trend from 2023. There has been a combination of record-high incidence and geographical expansion of cases into non-endemic regions including countries where either local transmission of dengue is being reported for the first time or has re-emerged after eradication.

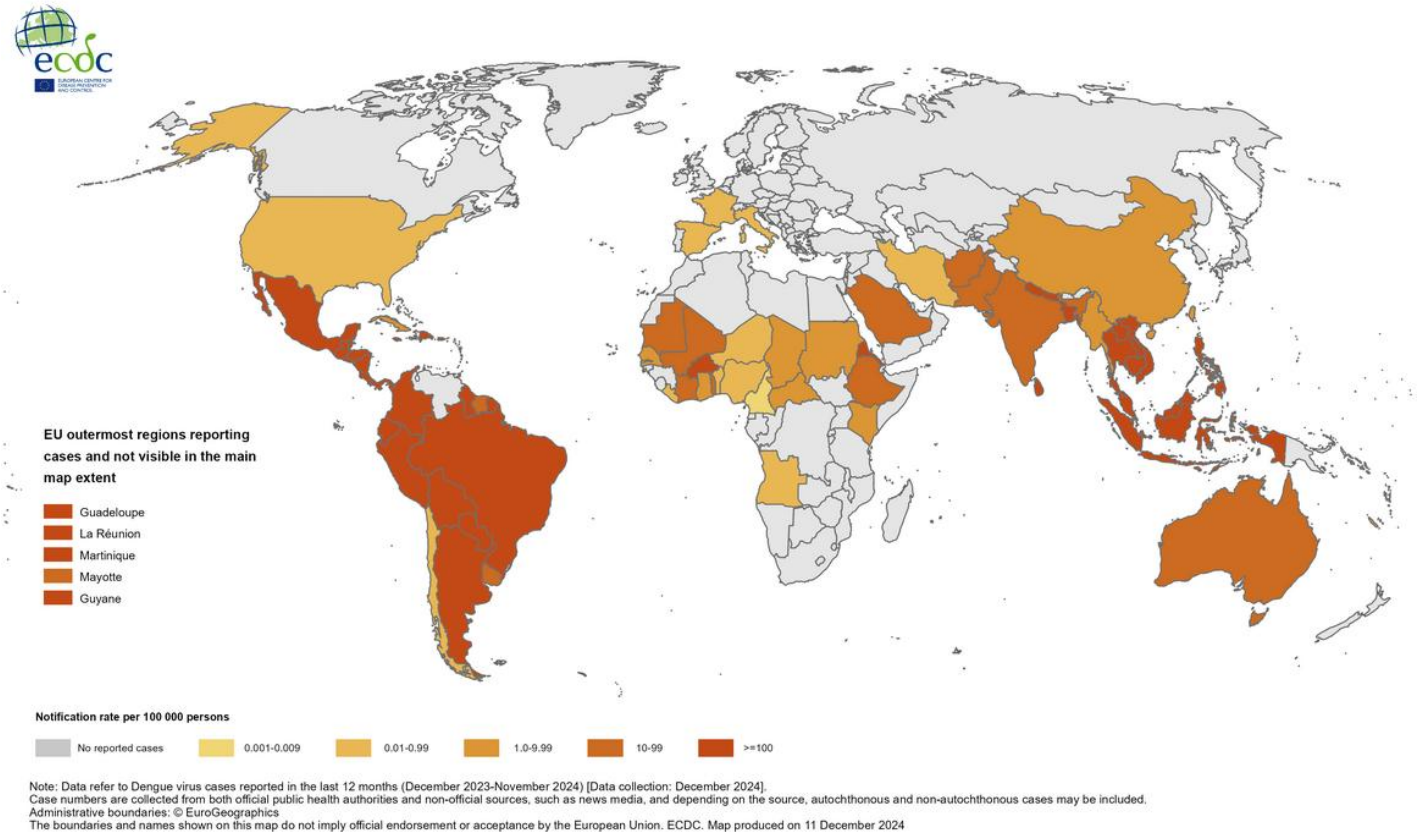


Figure 8: 12-month dengue virus disease case notification rate per 100,000 population, December 2023 – November 2024, European Centre for Disease Prevention and Control. [71]

The widespread and increasing nature of dengue can be illustrated by the following examples from 2024.

- In the **United States,** there have been 6,076 locally acquired cases reported in 2024 in 5 jurisdictions [72] up 316% from 1,462 locally acquired cases reported in 2023.
    - The State of California reported cases of locally acquired dengue in 2024 for the second year in a row. These cases, among individuals with no history of travel, provide evidence for the existence of the vector and circulation of the dengue virus (DENV).
- The first two locally acquired dengue cases [73] recorded in **Iran** were reported in June in Bandar-Lengheh, Hormozgan Province. As of 13 October 2024, 76 locally acquired cases have been reported.
    - These first autochthonous dengue cases are unusual but not unexpected, given an increased importation trend of cases and the presence of the mosquito vector in the country.
    - Entomological surveillance has established the presence of *A. aegypti* and *A. albopictus* mosquitoes in the provinces of Sistan and Balouchistan, Hormozgan, Bushehr, Khuzastan, and Gilan.
- As of 5 November 2024, **France** has reported 85 locally acquired cases [74] of dengue, the highest number of local dengue cases reported in a year.
    - This marks a 77% increase from 45 locally acquired cases in 2023, and 23% from 65 cases in 2022.

- Locally acquired cases are not unexpected in France given the establishment of *A. albopictus* across a large part of the country
- As of 5 November, 213 locally acquired dengue cases [75] have been reported in **Italy** in 2024. No locally acquired cases were reported in 2021 and 2022 while in 2023, 82 locally acquired cases were reported.

Oropouche

Between January and August 2024, more than 8,000 cases and 2 deaths were confirmed in the Americas, with most cases being reported in Brazil (9,563 confirmed cases), Peru (936 confirmed cases), Cuba (603 confirmed cases), and Bolivia (356 confirmed cases). Environmental and climate conditions have shifted, allowing the virus vector *Culivoides paraensis,* to be able to inhabit more northern, non-endemic regions [76]:

- The WHO [61] notes that as of 25 November 2024, there have been 11,634 confirmed human Oropouche cases including two deaths in the Regions of the Americas in 2024.
  - Imported cases have been reported from the **Cayman Islands** (1 case), **Canada** (2 cases), the **United States** (94 cases) and a few countries in the **European Region** (30 cases).
- Of note in 2024, **Brazil** has confirmed vertical transmission of the virus [77] with two cases of fetal deaths and one case of congenital anomaly. While **Cuba** confirmed a case of congenital anomaly in September 2024.

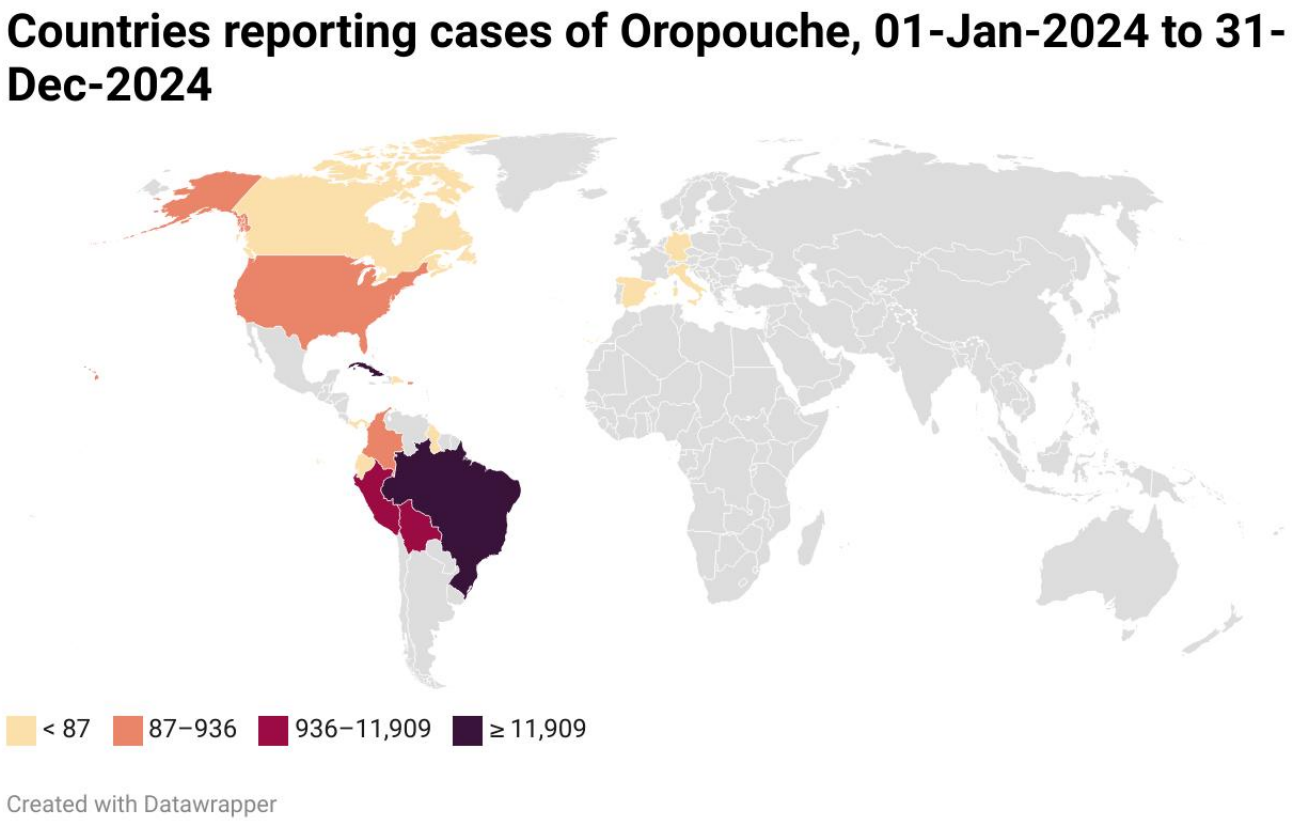


Figure 9: Countries reporting cases of Oropouche, 2024

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Acknowledgements

The production of this annual epidemic intelligence report was made possible through the collaboration and contributions of multiple individuals and organizations. Thus, the Gulf CDC is grateful to, and would like to acknowledge, all contributing individuals and organizations for their expertise and dedication to epidemic intelligence that were essential to our collective efforts in detecting, monitoring, and preparing for potential public health threats to the GCC region.

The Gulf CDC is grateful for insights on GCC countries' capacities and national data provided by members of the Public Health Emergency Network members. This provided valuable contextual understanding that enhanced the PHE team's assessment of risk posed by the hazards detected.

In addition, the Gulf CDC acknowledges the insights provided by international and GCC subject matter experts on reviewing risk assessment reports and on sharing best practices and lessons learned to improve preparedness for the hazards detected.

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