A grayscale, high-magnification microscopic image of coronavirus particles. The particles are spherical with a distinct outer layer and numerous spike-like projections extending from their surface. They are scattered across the frame, with some appearing more prominent than others. A thin, vertical green line is positioned to the left of the main title text.

DR D. NUCKCHADY  
SPECIALIST IN  
INTERNAL MEDICINE  
AND INFECTIOUS  
DISEASES

# Infectious diseases, post-COVID-19 – what next?

Impossible  
to predict  
the future –  
disease X



World Health  
Organization

Health Topics ▾

Countries ▾

Newsroom ▾

Emergencies ▾

## WHO to identify pathogens that could cause future outbreaks and pandemics

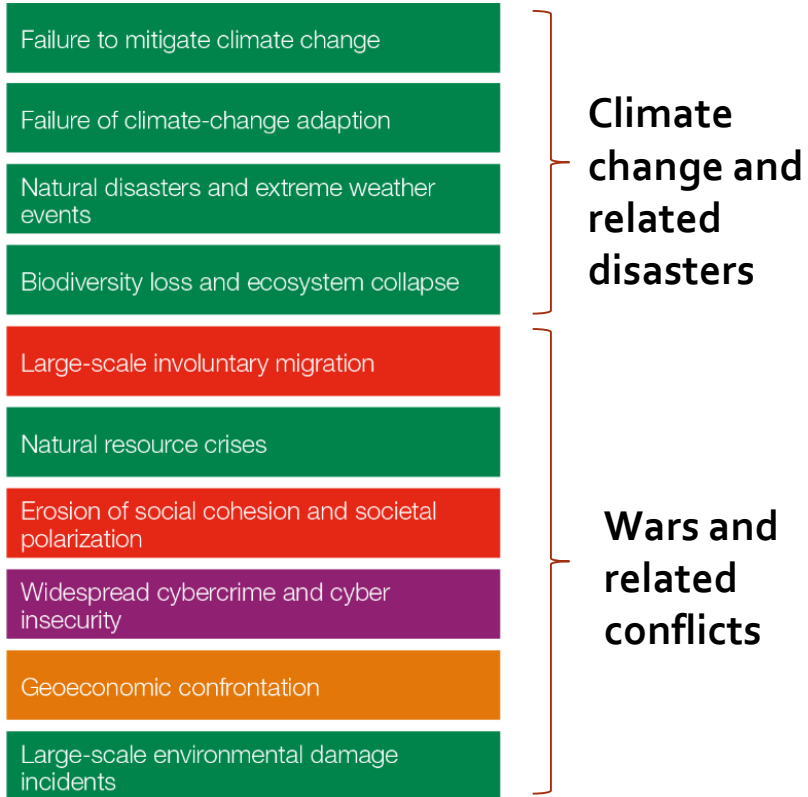
21 November 2022 | News release | Geneva | Reading time: 1 min (388 words)

WHO is launching a global scientific process to update the list of priority pathogens—agents that can cause outbreaks or pandemics—to guide global investment, research and development (R&D), especially in vaccines, tests and treatments.

Starting with a meeting held last Friday, 18 November, WHO is convening over 300 scientists who will consider the evidence on over 25 virus families and bacteria, as well as “Disease X.” Disease X is



WHAT DOES THE WORLD  
PREDICT?



# WORLD ECONOMIC FORUM 2023: TOP 10 THREATS IN THE NEXT 10 YEARS

---

Climate change

---

Conflict

---

Inequality in healthcare

---

Poor access to medication  
supplies

---

Epidemics of infections

WHO – TOP 5 URGENT  
HEALTH CHALLENGES FOR  
THE NEXT DECADE

# WHO – INFECTIONS THAT SHOULD KEEP US UP AT NIGHT (SIMILAR LIST TO GAVI)

## 2019

- Global influenza pandemic
- Antimicrobial resistance (AMR)
- Ebola
- Dengue
- HIV

## 2023

- Nipah
- Crimean-Congo hemorrhagic fever
- Lassa fever
- Rift Valley Fever
- Zika virus
- Ebola / Marburg
- MERS
- SARS

# ScienceNews – pandemics are the number 3 threat to civilization

**ScienceNews**  
INDEPENDENT JOURNALISM SINCE 1921

ALL TOPICS LIFE HUMANS EARTH SP

COLUMN SCIENCE & SOCIETY

## Here are the Top 10 threats to the survival of civilization

From aliens and asteroids to pandemics, war and climate change, life as we know it is at risk



By Tom Siegfried  
Contributing Correspondent

APRIL 4, 2023 AT 7:00 AM

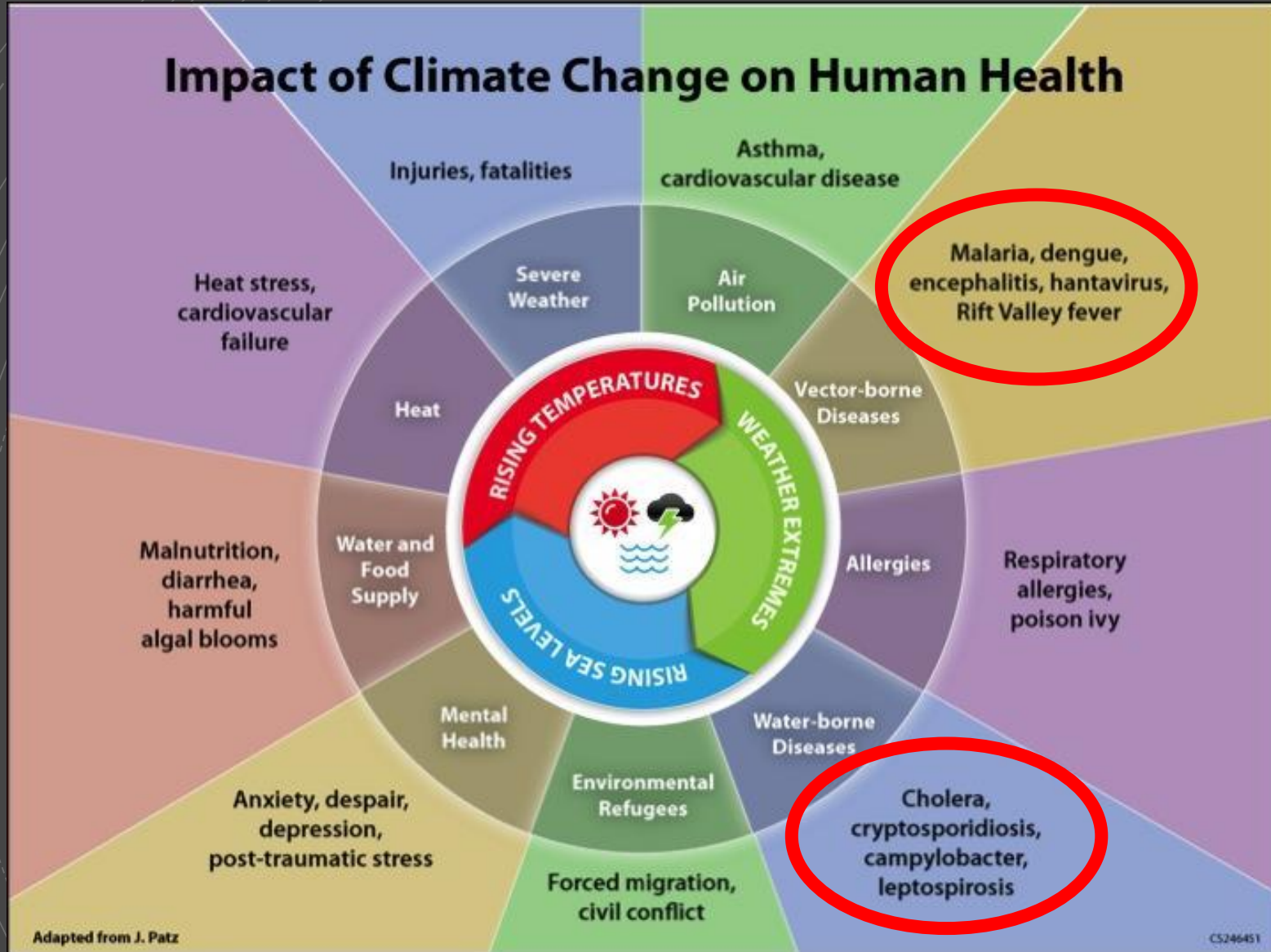
- Climate change
- Nuclear war
- Pandemics
- Misuse of social media / societal collapse
- Quantum computing / artificial intelligence

# Effect of climate change





# Impact of Climate Change on Human Health





## Worst-ever U.S. West Nile virus outbreak potentially linked to a wetter-than-average 2021 Southwest monsoon

BY KAREN HOLCOMB

PUBLISHED JULY 21, 2022

# WNV in Mauritius?

> [J Med Virol. 1994 Dec;44\(4\):379-83. doi: 10.1002/jmv.1890440411.](#)

## Hepatitis C and arboviral antibodies in the island populations of Mauritius and Rodrigues

T F Schwarz <sup>1</sup>, G Dobler, S Gilch, G Jäger

- 3.8% of sera in Mauritius and 0.9% of sera in Rodrigues were positive for WNV Ab in 1994 (tested by a German team)

## **Should we be worried?**

22% of horses had antibodies for West Nile Virus in Mauritius in 2010 (published in 2017)

samples per study site (West Nile, 2010, 303 horses). NS stands for number, Pos for positive and NS for not sampled.

	Madagascar		Reunion		Mauritius		Seychelles		Total	
	N=119		N=98		N=77		N=9		N=303	
Variables	Pos horse s/ Total nb	Pos/Total nb Pos (%)	Pos horse s/ Total nb	Pos/Total nb Pos (%)	Pos horse s/ Total nb	Pos/Total nb Pos (%)	Pos horse s/ Total nb	Pos/Total nb Pos (%)	Pos horse s/ Total nb	Pos/Total nb Pos (%)
Age group (yrs)										
1-5	9/28	16.36	NS	NS	0/10	0	NS	NS	9/38	10.84
6-10	17/42	30.91	0/12	0	10/38	58.82	0/3	0	27/95	32.53
11-15	15/25	27.27	4/38	57.14	7/22	41.18	4/6	100	30/91	36.15

Cardinale E, Bernard C, Lecollinet S, Rakotoharinome VM, et al. West Nile virus infection in horses, Indian ocean. *Comp Immunol Microbiol Infect Dis.* 2017 Aug;53:45-49. doi: 10.1016/j.cimid.2017.06.006

# Tick-borne diseases are increasing too



RESEARCH ARTICLE | [Open Access](#) | CC BY ND

## Climate change in the Arctic: Testing the poleward expansion of ticks and tick-borne diseases

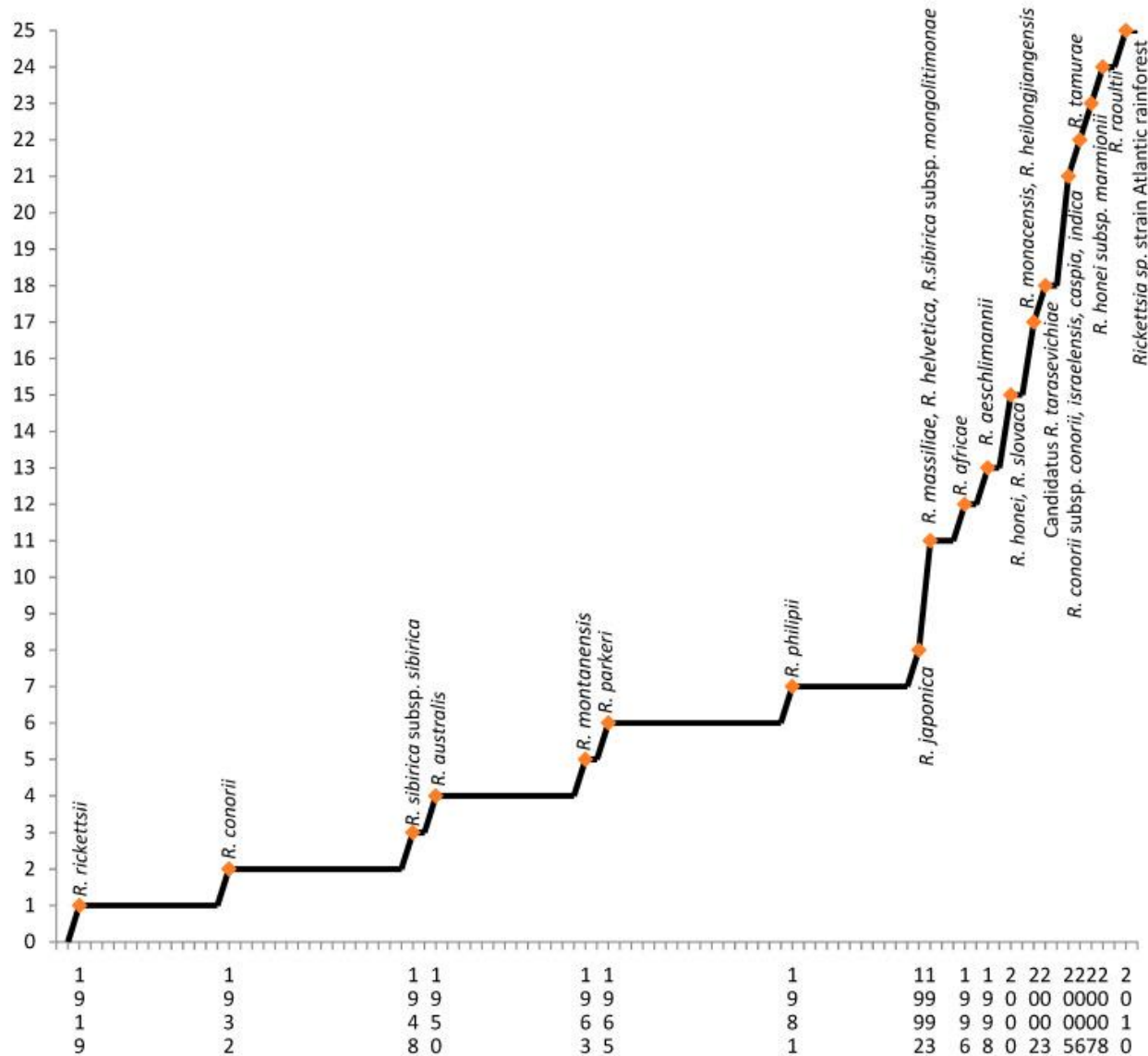
Karen D. McCoy , Céline Toty, Marlène Dupraz, Jérémy Tornos, Amandine Gamble, Romain Garnier, Sébastien Descamps, Thierry Boulonier

First published: 26 January 2023 | <https://doi.org/10.1111/gcb.16617> | Citations: 1

> [Environ Health Perspect.](#) 2019 Oct;127(10):107014. doi: 10.1289/EHP5668. Epub 2019 Oct 31.

## Predicted Northward Expansion of the Geographic Range of the Tick Vector *Amblyomma americanum* in North America under Future Climate Conditions

Irina Sagurova <sup>1</sup>, Antoinette Ludwig <sup>2</sup>, Nicholas H Ogden <sup>2</sup>, Yann Pelcat <sup>2</sup>, Guillaume Dueymes <sup>1</sup>, Philippe Gachon <sup>1, 3</sup>



Number of known species of rickettsia that can infect humans discovered from 1919 to 2010



## Floods – gastroenteritis: Cholera

**Promed – HAV, *Escherichia coli*, salmonella non-typhi, cryptosporidiosis, etc.**

# Cholera in Africa

**86,951** confirmed case(s), **116,953** suspected case(s)  
**3,181** human deaths (**CFR: 1.6%**)

Agent/Pathogen	<b>Vibrio cholerae</b>	First Reported	<b>6-Jan-2023</b>	Previous Report Update	<b>27-Oct-2023</b>
First Occurred	<b>1-Jan-2023</b>	Country	<b>Multiple Countries</b>	Location	<b>18 MS</b>
Source	<b>Ministry of Health</b>	GeoScope	<b>MODERATE</b>	Human Risk Assessment	<b>MODERATE</b>
Animal Risk Assessment	<b>MODERATE</b>				

203,904 cases of cholera (confirmed + suspected) from Jan 2023 to Nov 2023 in Africa



[mBio](#). 2019 Jul-Aug; 10(4): e01397-19.

PMCID: PMC6650554

Published online 2019 Jul 23. doi: [10.1128/mBio.01397-19](https://doi.org/10.1128/mBio.01397-19)

PMID: [31337723](https://pubmed.ncbi.nlm.nih.gov/31337723/)

## On the Emergence of *Candida auris*: Climate Change, Azoles, Swamps, and Birds

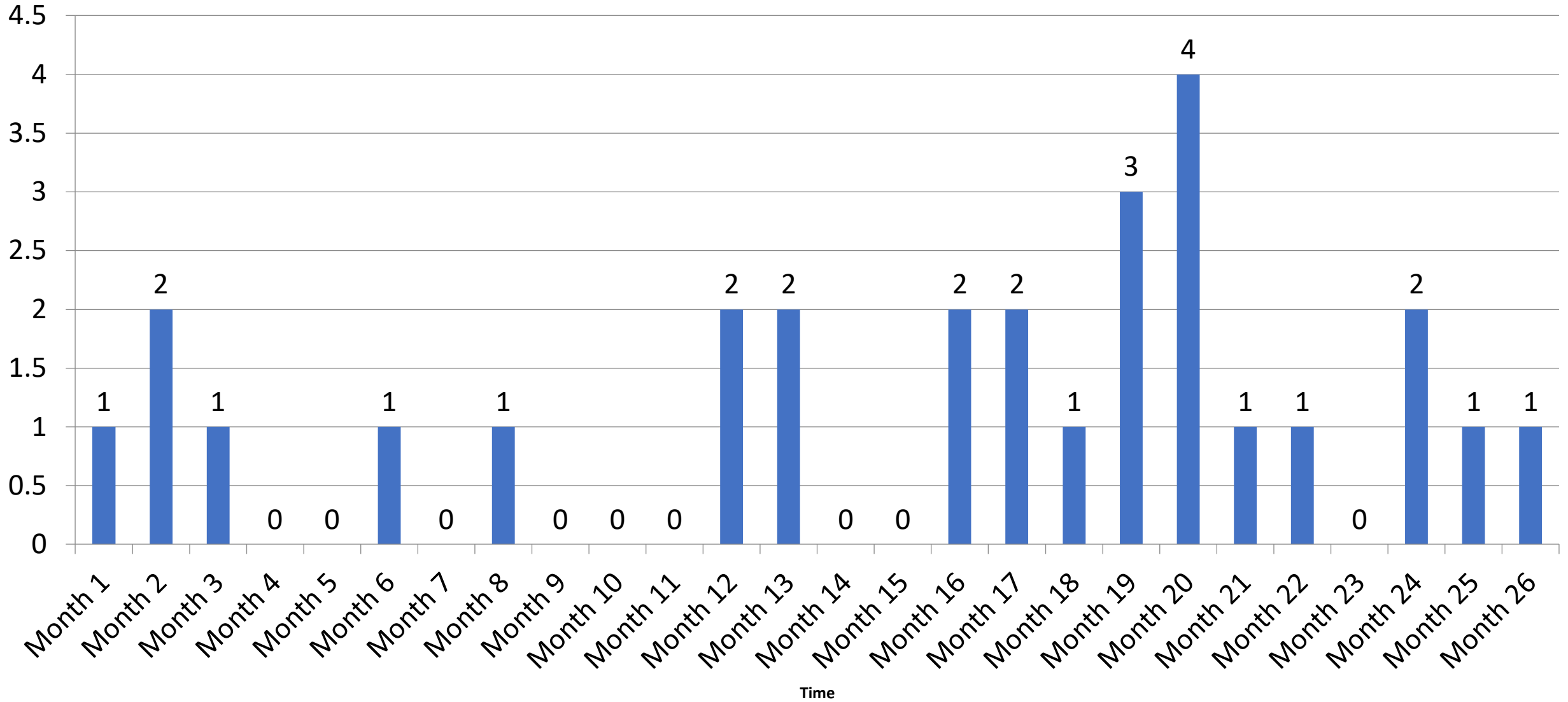
[Arturo Casadevall](#),<sup>✉a</sup> [Dimitrios P. Kontoyiannis](#),<sup>b</sup> and [Vincent Robert](#)<sup>c</sup>

James W. Kronstad, Editor

James W. Kronstad, University of British Columbia;

**Resistant to multiple anti-fungals**

# Number of CAURIS in ICUs from 01-09-21 till 31-10-23

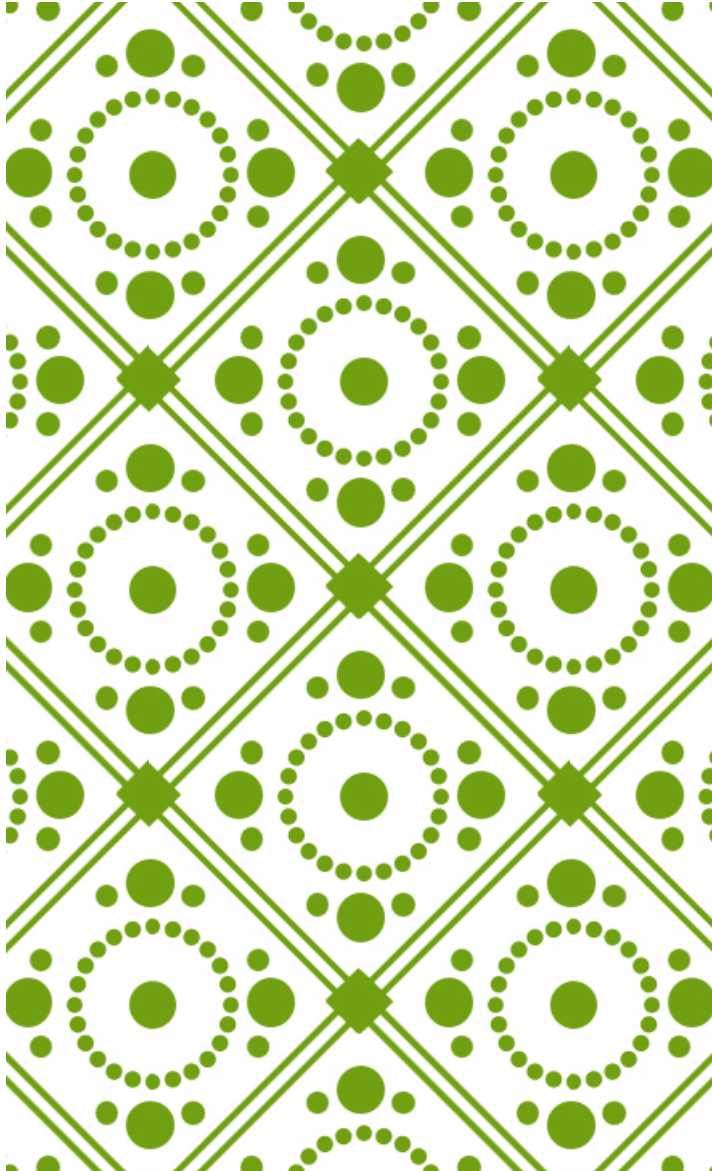


Data from Central Health Lab

# Global outbreaks after COVID-19

**Mpox – Declared  
public health  
emergency of  
international concern  
by WHO (PHEIC)**

**Hepatitis of unknown  
origin in children  
(another worldwide  
outbreak)**



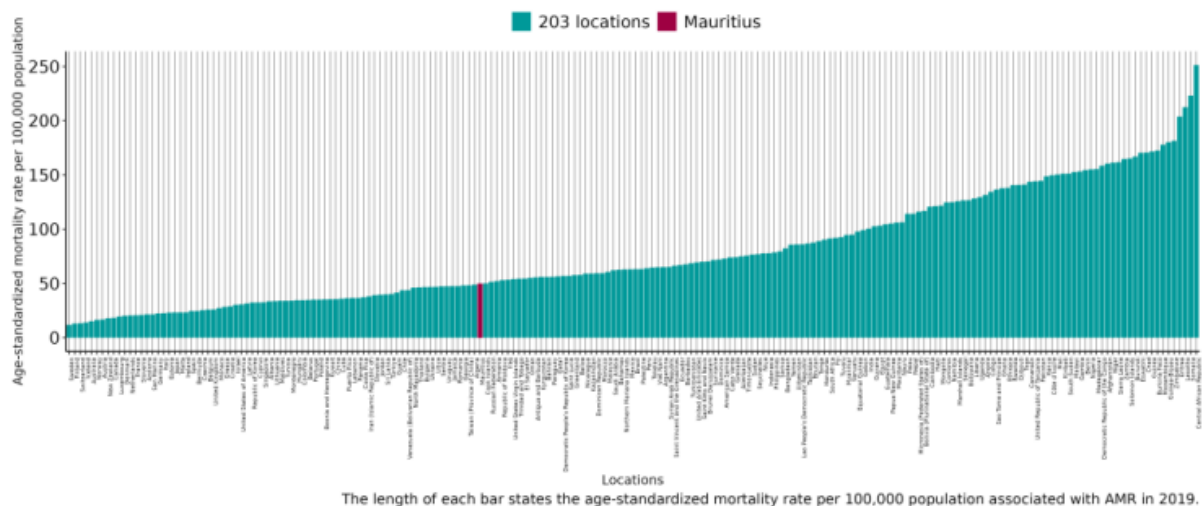
# TOP THREE INFECTIOUS THREATS TO MAURITIUS FOR THE NEXT 5 YEARS

---

## AMR burden in Mauritius

- In **Mauritius** in 2019, there were **203** deaths attributable to AMR and **772** death associated with AMR.
- **Mauritius** has **the 75th highest** age-standardized mortality rate per 100,000 population associated with AMR across 204 countries.

Figure 2. Age-standardized mortality rate associated with AMR in 2019 for 204 locations:



► Based on local study using 2016 data: 883 deaths in Mauritius associated with AMR

MORTALITY FROM AMR IN MAURITIUS — IHME / GRAM / GBD

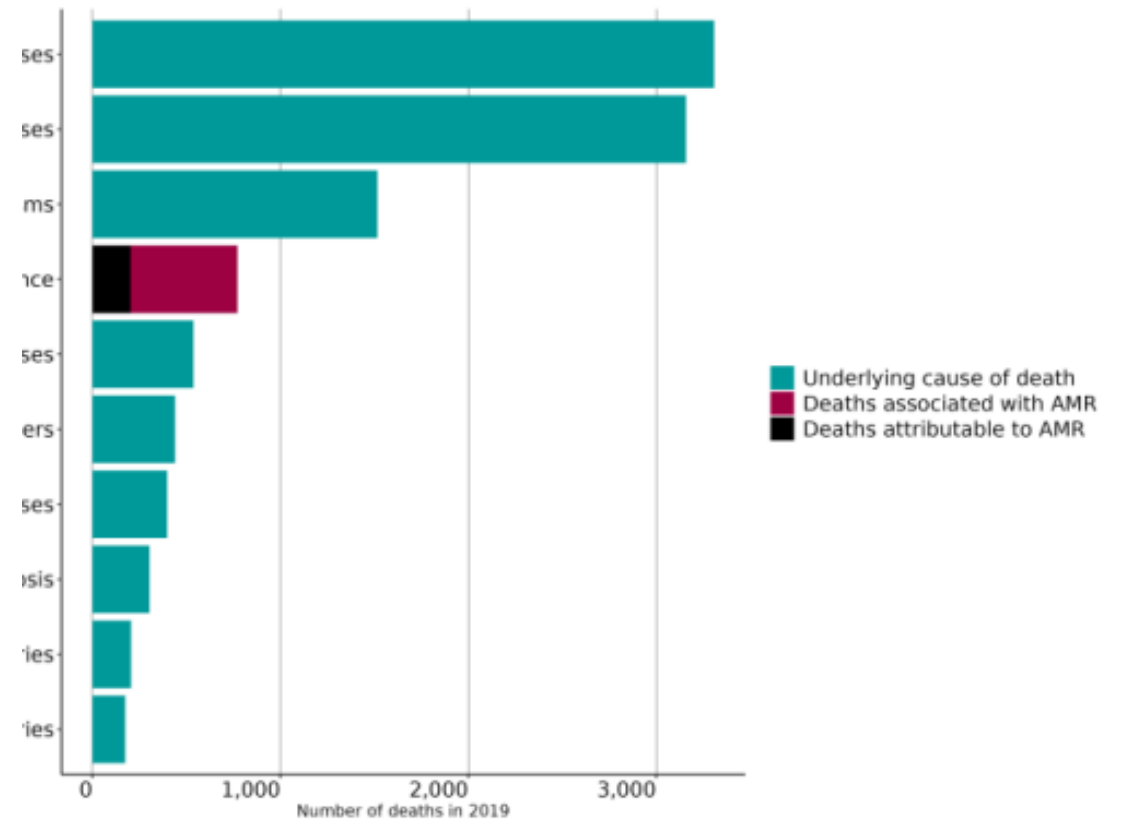
# FOURTH HIGHEST CAUSE OF DEATH IN MAURITIUS

More deaths than all the notifiable infections in Mauritius combined

After cardiovascular disease, diabetes and neoplasms

Number of AMR deaths in Mauritius is higher than deaths from cardiovascular diseases, neurological disorders, digestive diseases and tuberculosis, and unintentional injuries.

AMR in context with other causes of death in 2019,



Number of deaths by GBD cause and those associated with/attribution to AMR in 2019.

H5N1

81 countries now affected

26 species of mammals  
have been infected in 2023



Home Health Topics Countries Newsroom Emergencies

Home / News / Ongoing avian influenza outbreaks in animals pose risk to humans

## Ongoing avian influenza outbreaks in animals pose risk to humans

### Deadly Bird Flu Outbreak Is The Worst In U.S. History

A highly contagious strain of avian influenza has killed more birds in the country than any past flare-up.

By Hilary Hanson

0.4% to 10% of people infected with COVID-19 can be infected with influenza

Animals like minks can also be co-infected – antigenic shift?

## COVID-19 and Influenza Co-infection: A Systematic Review and Meta-Analysis



Masoud Dadashi<sup>1,2</sup>



Saeedeh Khaleghnejad<sup>3</sup>



Parisa Abedi Elkhichi<sup>3,4</sup>



Mehdi Goudarzi<sup>3</sup>



Hossein Goudarzi<sup>3</sup>



Afsoon Taghavi<sup>5</sup>



Maryam Vaezjalali<sup>3</sup>



Bahareh Hajikhani<sup>3\*</sup>

<sup>1</sup> Department of Microbiology, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran

<sup>2</sup> Non Communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran

<sup>3</sup> Department of Microbiology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>4</sup> Medical Microbiology Research Center, Qazvin University of Medical Sciences, Qazvin, Iran

<sup>5</sup> Department of Pathology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran



**EPICENTER OF  
THE OUTBREAK  
HAS MOVED  
FROM ASIA TO  
EUROPE AND  
AFRICA IN 2023**

30-60% mortality rate in humans

High basic reproductive number of  
seasonal influenza

Vaccine and antivirals are available  
– efficacy?

[Health Topics](#) ▾[Countries](#) ▾[Newsroom](#) ▾[Emergencies](#) ▾[Home](#) / [News](#) / [Vector alert: Anopheles stephensi invasion and spread](#)

# Vector alert: *Anopheles stephensi* invasion and spread

26 August 2019 | News release | Reading time: 1 min (278 words)

*Anopheles stephensi*, a highly competent vector of *Plasmodium falciparum* and *P. vivax*, is considered an efficient vector of urban malaria. Until 2011, the reported distribution of *An. stephensi* was confined to certain countries in South-East Asia and large parts of the Arabian Peninsula. Since then, the vector has been reported from Djibouti (2012), Ethiopia (2016), Sri Lanka (2017) and most recently from the

Alert by WHO in  
2019 – spread of  
mosquitoes to  
Africa

# Public health impact of the spread of *Anopheles stephensi* in the WHO Eastern Mediterranean Region countries in Horn of Africa and Yemen: need for integrated vector surveillance and control

[Samira M. Al-Eryani](#) , [Seth R. Irish](#), [Tamar E. Carter](#), [Audrey Lenhart](#), [Adel Aljasari](#), [Lucia Fernández Montoya](#), [Abdullah A. Awash](#), [Elmonshawe Mohammed](#), [Said Ali](#), [Mohammed A. Esmail](#), [Abdulhafid Hussain](#), [Jamal G. Amran](#), [Samatar Kayad](#), [Mujahid Nouredayem](#), [Mariam A. Adam](#), [Lina Azkoul](#), [Methaq Assada](#), [Yasser A. Baheshm](#), [Walid Eltahir](#) & [Yvan J. Hutin](#)

[Malaria Journal](#) **22**, Article number: 187 (2023) | [Cite this article](#)

Yemen – 50% rise in malaria in 2020 and 40x rise in malaria in Djibouti (about 10 years after introduction of *Anopheles stephensi*)

# WHO initiative to stop the spread of *Anopheles stephensi* in Africa

2023 update

SHOULD MAURITIUS BE PREPARED?

## *An Invasive Mosquito Threatens Catastrophe in Africa*

A malaria-carrying species that thrives in urban areas and resists all insecticides is causing outbreaks in places that have rarely faced the disease.

This mosquito is also often resistant to multiple insecticides

And malaria is becoming resistant to artemisinin

# First Malaria Cases Reported in U.S. in 20 Years. Here's What to Look Out For



**In 2023**



# Top three infectious challenges facing Mauritius for the next 5 years

---

# Bangladesh dengue deaths top 1,000 in worst outbreak on record

*Dhaka (AFP)* – More than 1,000 people in Bangladesh have died of dengue fever this year, the country's worst recorded outbreak of the mosquito-borne disease, which is increasing in frequency due to climate change.

Issued on: 02/10/2023 - 11:51 Modified: 02/10/2023 - 12:42 ⌚ 3 min

Expansion in territory of *Aedes sp.*

30x more dengue cases being reported since 50y ago

Expect outbreaks in Mauritius

Mortality rate is low in Mauritius

## Syphilis in Babies Reflects Health System Failures

Tailored strategies can address missed prevention opportunities during pregnancy

[View All Topics](#)

Updated Nov. 7, 2023 | [Print](#)

**10x**

Over 10 times as many babies were born with syphilis in 2022 than in 2012.

**9 in 10**

Timely testing and treatment during pregnancy might have prevented almost 9 in 10 (88%) cases in 2022.

**2 in 5**

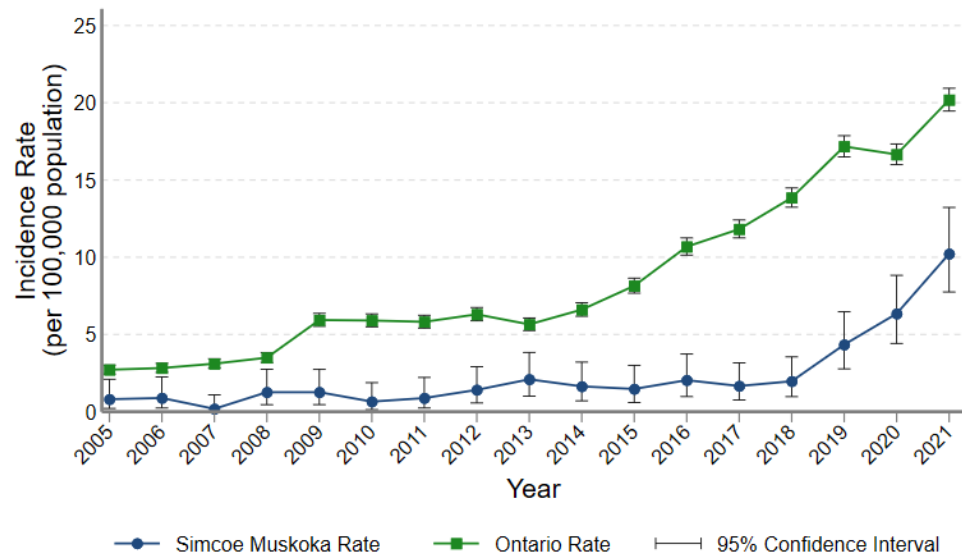
Two in 5 (40%) people who had a baby with syphilis did not get prenatal care.



Highest peak  
in last 20  
years in  
Canada

---

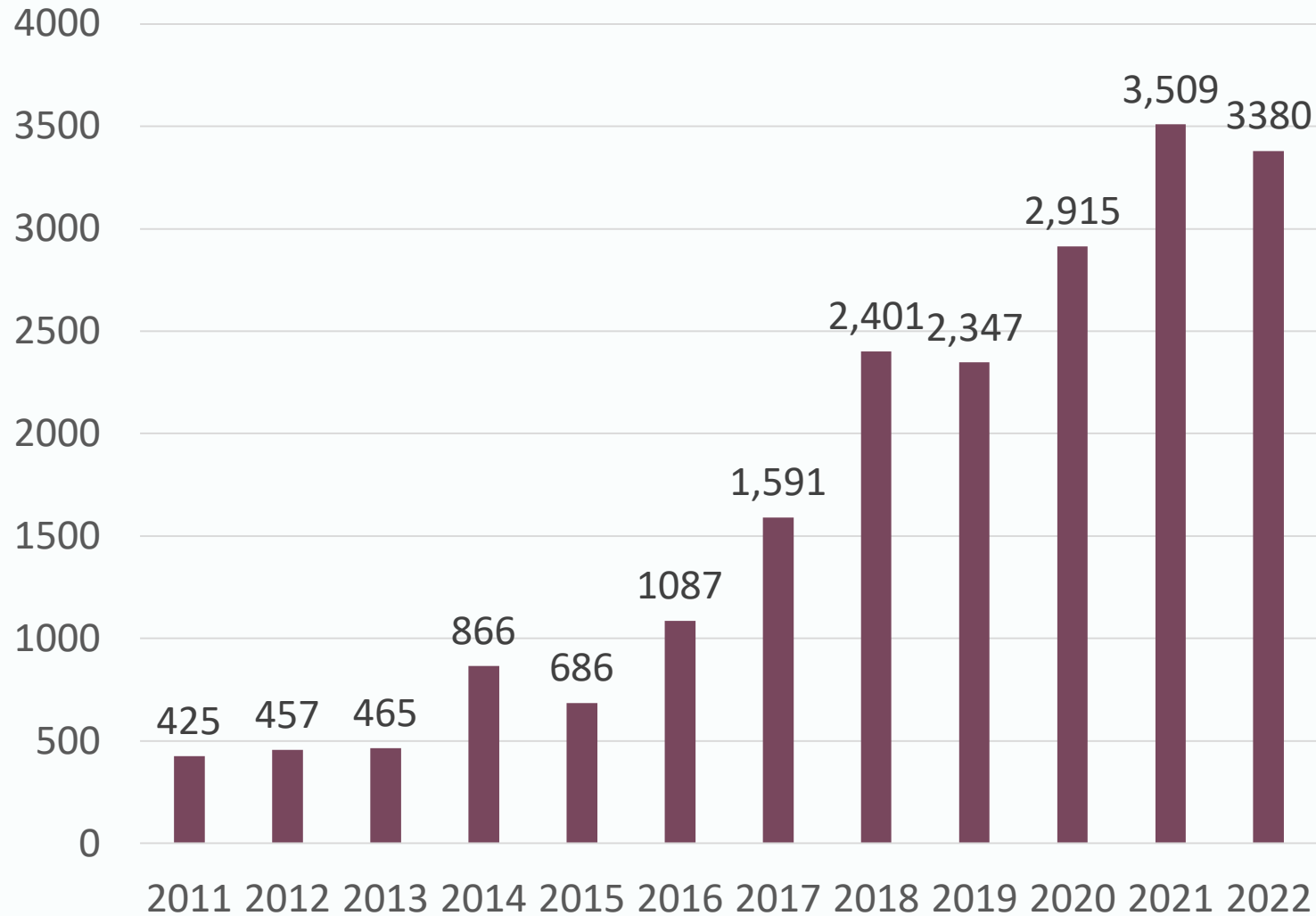
Age-Standardized Incidence Rate of Infectious Syphilis  
in Simcoe Muskoka and Ontario, 2005-2021



Data Source: Integrated Public Health Information System (iPHIS), extracted 26 Jul 2022

Note: Includes confirmed cases of primary, secondary and early latent syphilis.  
Case definition updated in 2004, 2009, 2010, 2011 and 2014.

## No. of syphilis cases



---

No. of cases of syphilis notified in Mauritius since 2011 (Health Statistics)

## Syphilis among pregnant women in Mauritius

---

– Rise from 1.2% pregnant F to 4% in 7 years

Year	2015	2016	2017	2018	2019	2020	2021	2022
No of tests	10,950	11,257	12,087	11,047	11,996	11,151	9,282	9,867
No. found positive	132	178	249	303	471	435	397	390
Positivity Rate(%)	1.2	1.6	2.1	2.7	3.9	3.9	4.3	4.0

# Poor use of vaccines (e.g., vaccine hesitancy)

## Global measles threat continues to grow as another year passes with millions of children unvaccinated

[العربية](#)[中文](#)[Français](#)[Русский](#)[Español](#)

16 November 2023 | Joint News Release | Reading time: 2 min (597 words)

Following years of declines in measles vaccination coverage, measles cases in 2022 have increased by 18%, and deaths have increased by 43% globally (compared to 2021). This takes the estimated number of measles cases to 9 million and deaths to 136 000 – mostly among children – according to a [new report from the World Health Organization \(WHO\) and the U.S. Centers for Disease Control and Prevention \(CDC\)](#).

### Media Contacts



**WHO Media Team**

Email: [mediainquiries@who.int](mailto:mediainquiries@who.int)

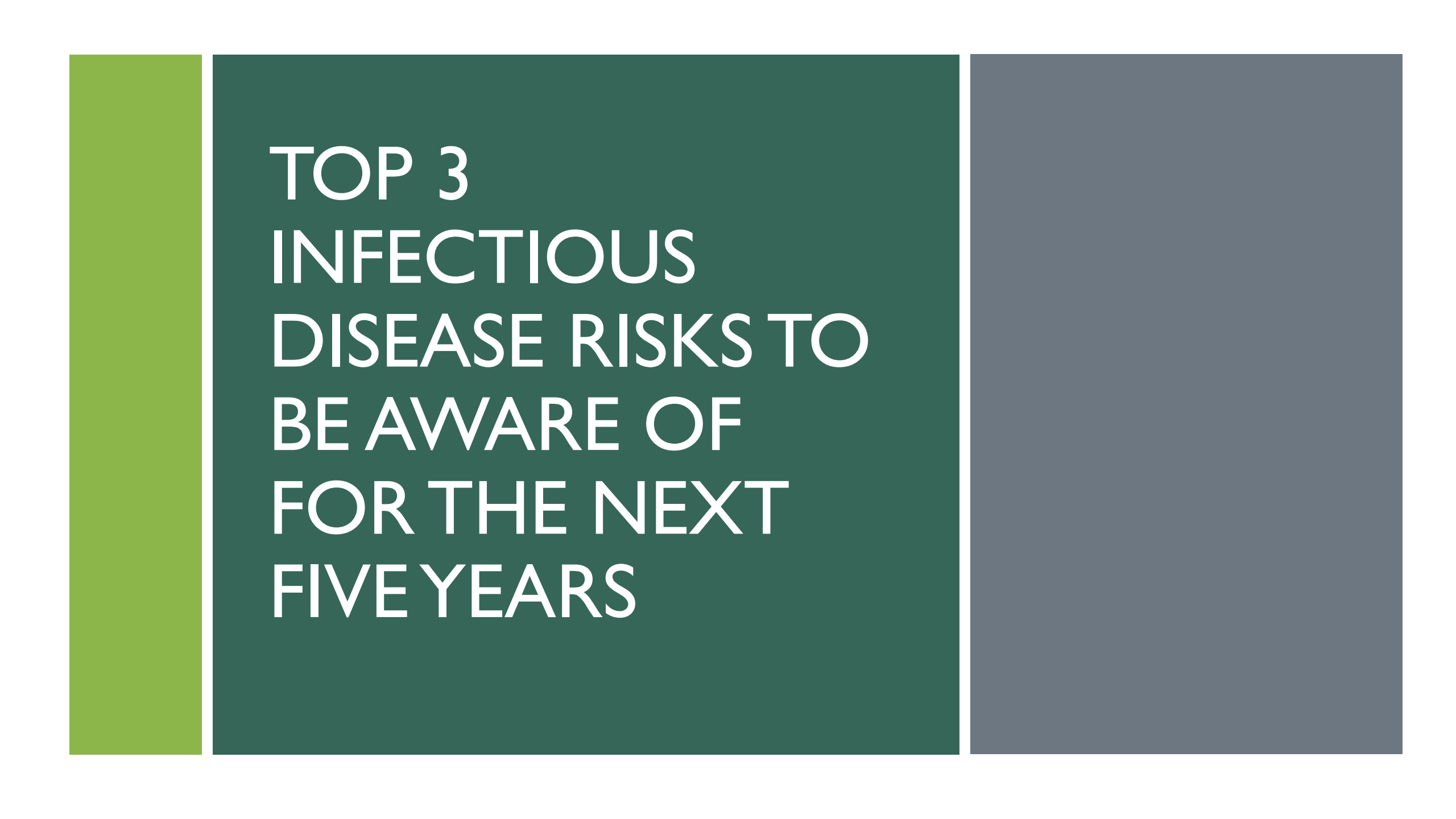
37 countries with outbreaks of measles in 2022

18% increase in no. of cases + 43% increase in deaths compared to 2021

# Medical supply disruptions / rise in price of medications

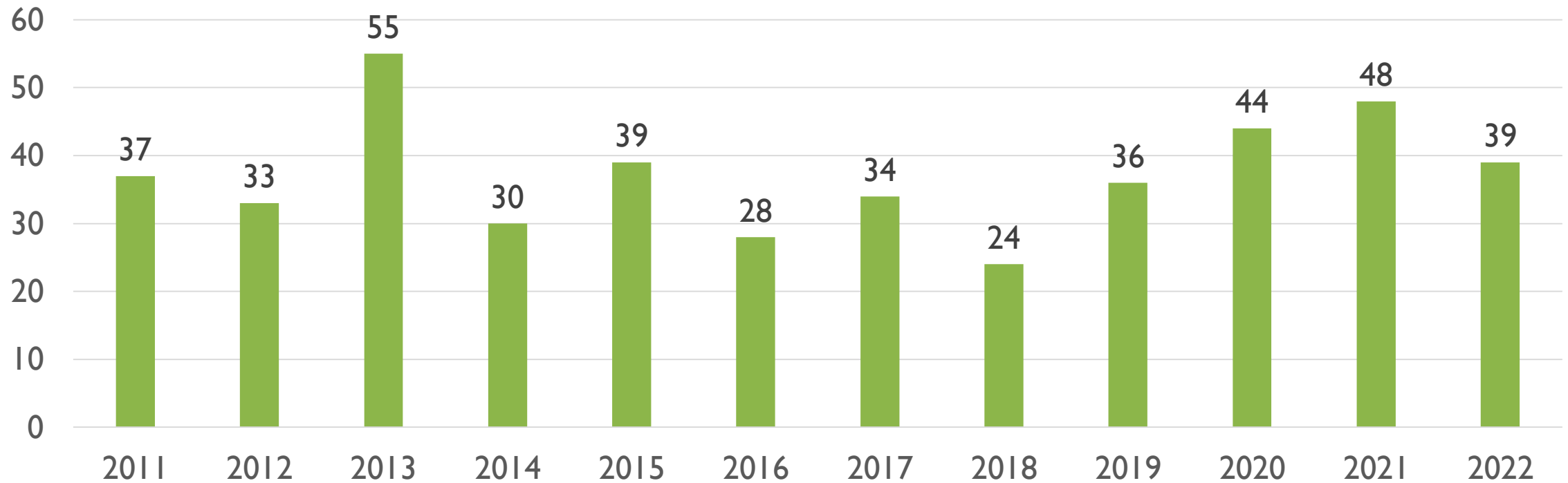
---





TOP 3  
INFECTIOUS  
DISEASE RISKS TO  
BE AWARE OF  
FOR THE NEXT  
FIVE YEARS

No. of notified cases of leptospirosis in Mauritius



**LEPTOSPIROSIS – RISE OF RAIN AND RODENTS**

Sewage  
surveillance of  
polio

Vaccine-derived  
mostly

INFECTIOUS DISEASE

## Polio is found in the U.K. for the first time in nearly 40 years. Here's what it means

JUNE 22, 2022 · 7:19 PM ET



Michaela Doucleff



AUGUST 19, 2022 | 6 MIN READ

## First U.S. Polio Case in Nearly a Decade Highlights the Importance of Vaccination

An unvaccinated person in New York State's Rockland County developed paralysis from a polio infection, emphasizing the need to target vaccination efforts to vulnerable communities

BY SARA REARDON



# POST-COVID SYNDROME / LONG COVID

New variants of COVID



## CONCLUSION

- Major threat: AMR, pandemic H5N1 and malaria
- Be prepared for: dengue, syphilis and vaccine-preventable diseases
- Be aware of: leptospirosis, poliomyelitis and long COVID



Questions?