Risque épidémique et biologique
Et le futur?

« Plus vous saurez regarder loin dans le passé, plus vous verrez loin dans le futur »

W Churchill

F-Xavier Lescure xavier.lescure@aphp.fr

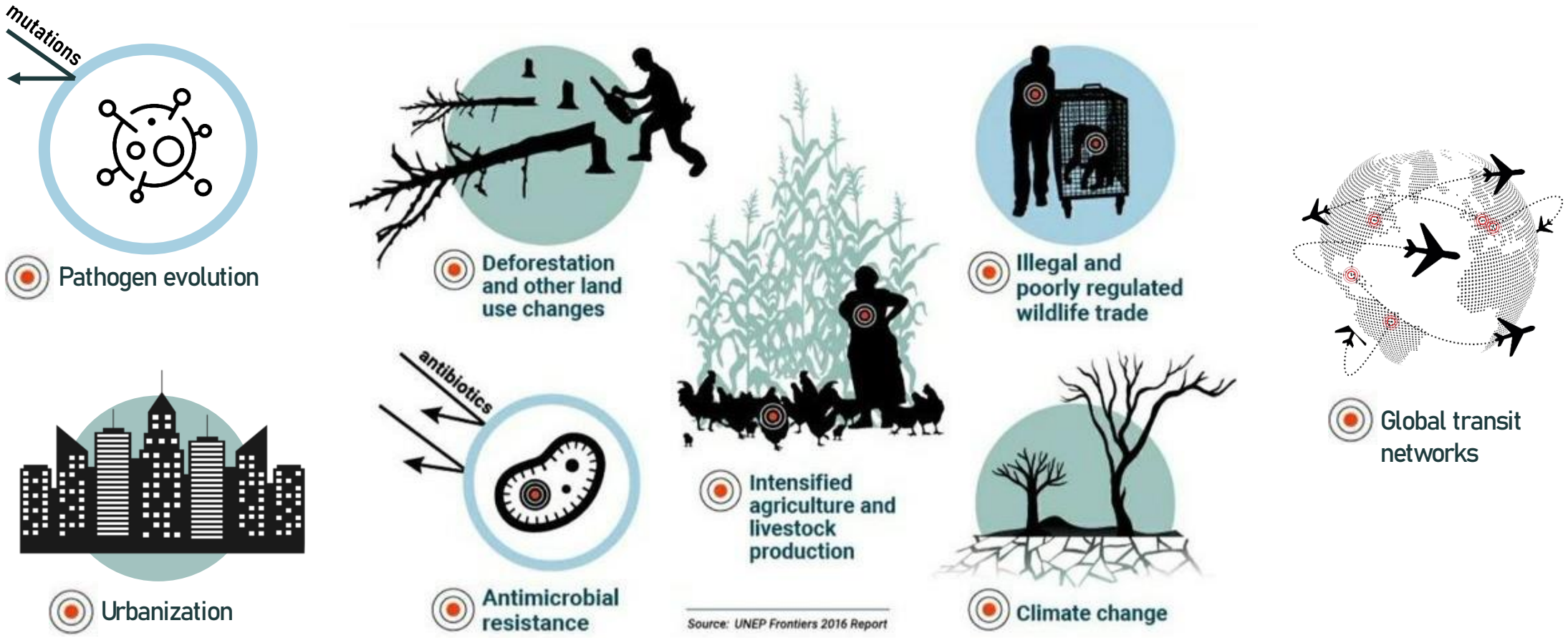
Service de maladies infectieuses et tropicales, hôpital Bichat, APHP, Paris

IAME, UMRS 1137, Inserm, Université de Paris cité

COVARS – COREB – EIS ESCMID

DOI <3 ans : ex conseiller Ministériel (2021-22)

Les facteurs qui influencent l'émergence des maladies infectieuses



260 virus de 25 familles sont connus pour être pathogènes à l'homme.
> 1 million d'espèces virales à découvrir chez les mammifères et les oiseaux

Impact du changement climatique sur le risque d'émergence
Mode de transmission

Le changement climatique affecte la transmission et la distribution de nombreuses maladies infectieuses.

Air-borne pathogens

Hausse de la température +
Hausse des précipitations +
Humidité relative +
Pollution atmosphérique +

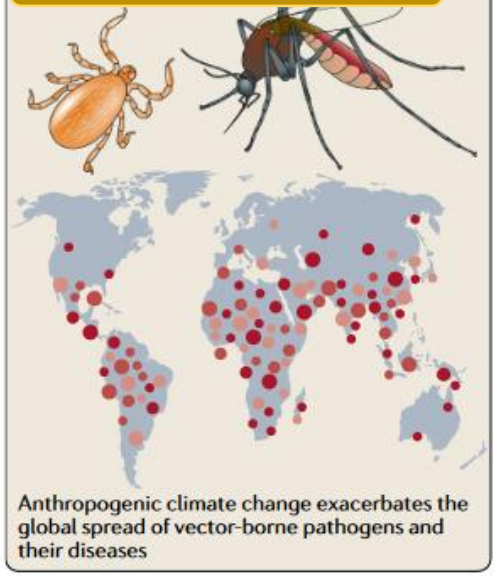
Animal-borne pathogens

Modification des flux migratoires +
Restriction / Expansion des zones habitables +

Water-borne pathogens

Elévation de la température Des océans +
Concentrations salines +
Pollution littoral +
Bouleversement de l'écosystème marin +

Vector-borne pathogens

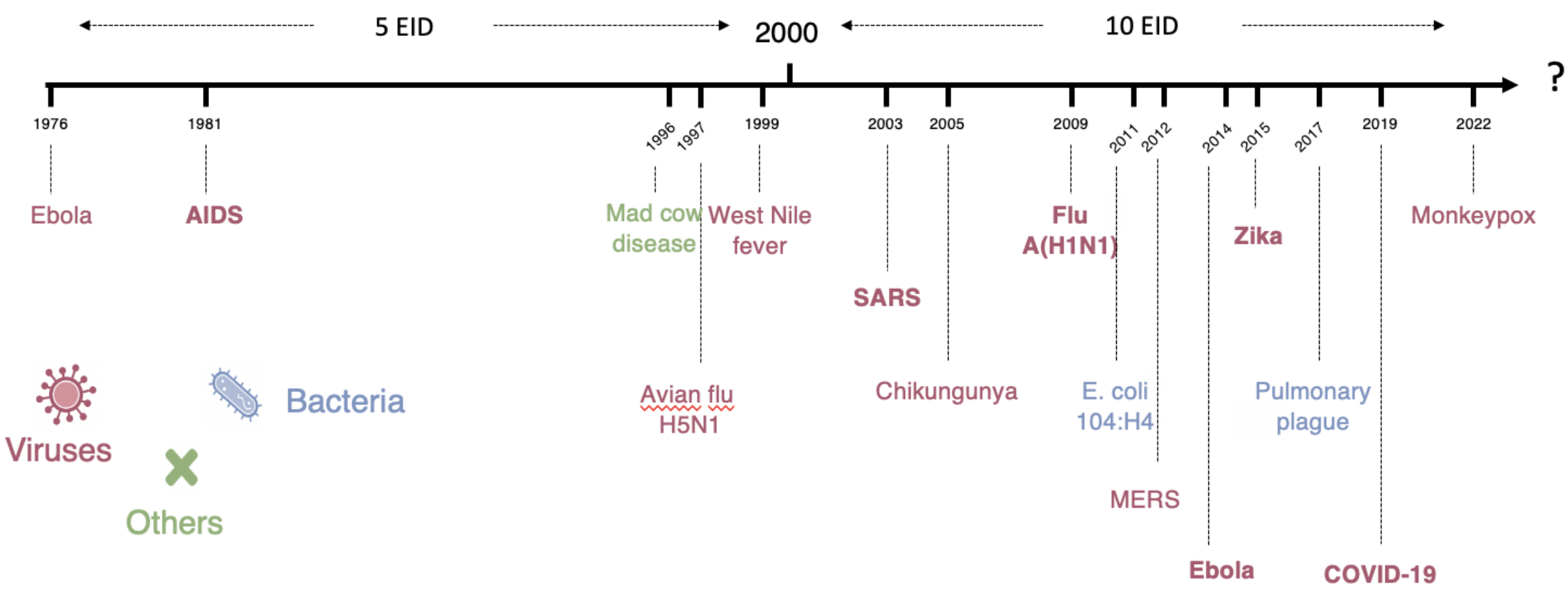


Climate change: an enduring challenge for vector-borne disease prevention and control. May 2020 – Nature Immunology.
Scientists' warning to humanity: microorganisms and climate change. September 2019 – Nature Microbiology.
Climate change increases cross-species viral transmission risk. April 2022 – Nature.
Infectious disease in an era of global change. April 2022 – Nature.
Environmental Predictors of Seasonal Influenza Epidemics across Temperate and Tropical Climates. March 2013 – PLOS Pathogens.
Detecting the impact of temperature on transmission of Zika, dengue, and chikungunya using mechanistic models. 2017 – PLOS NTD.
Warming temperatures could expose more than 1.3 billion new people to Zika virus risk by 2050. 2021 – Global Change Biology.
Viral respiratory infections in a rapidly changing climate. July 2023 – eBio Medicine.

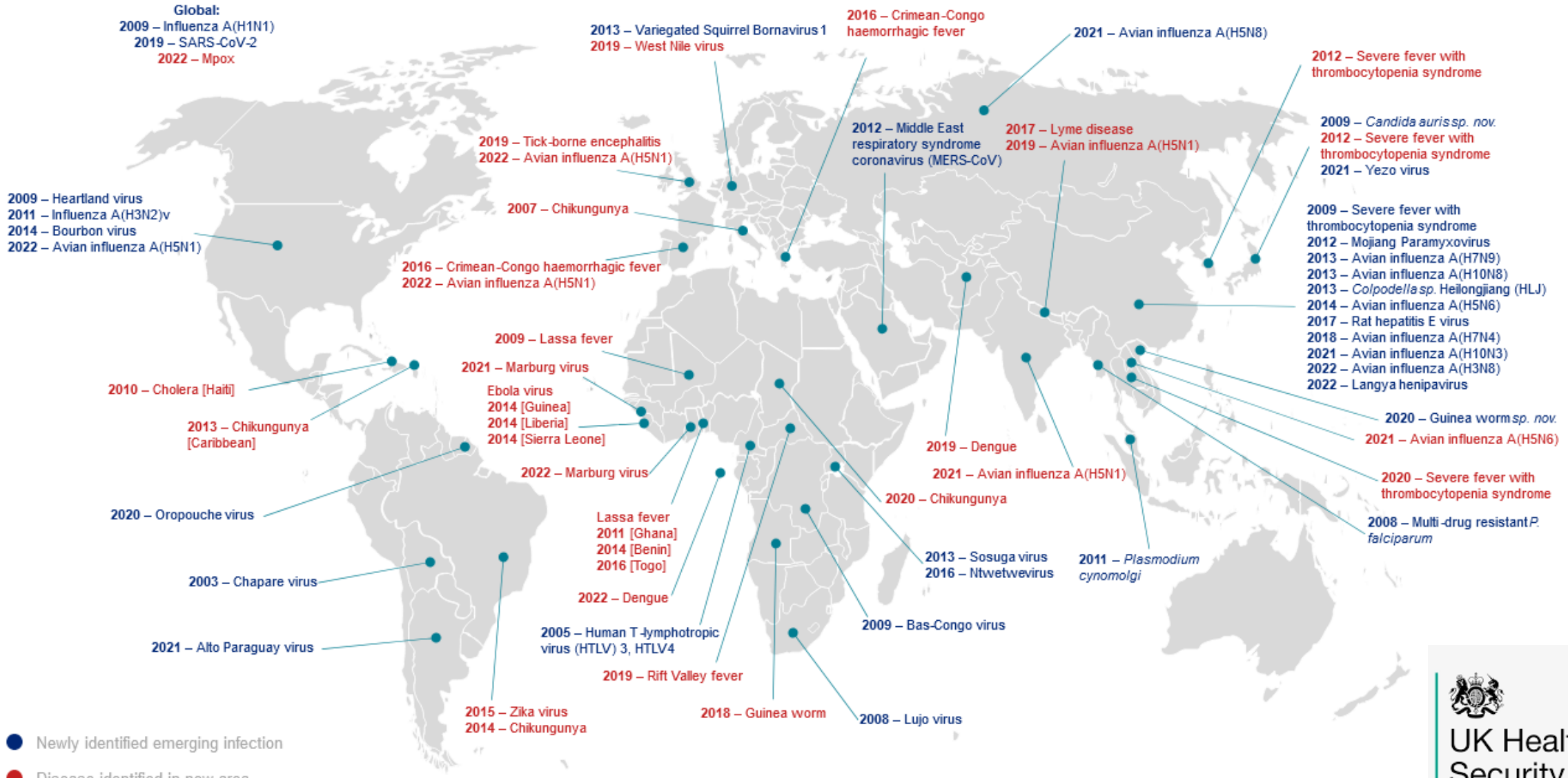
New pathogens ?

Fonte du permafrost

Emergences infectieuses depuis les 50 dernières années

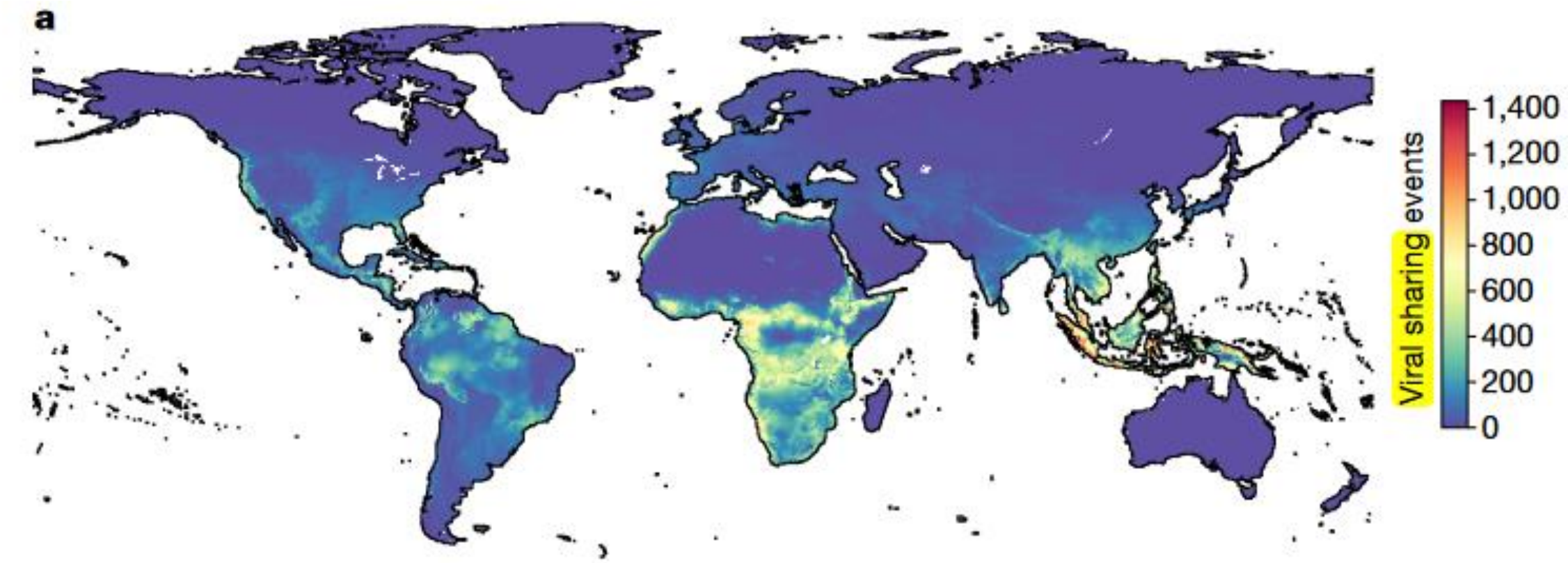


Emergences infectieuses et extensions géographiques 2003 - 2023



UK Health Security Agency

Impact du changement climatique sur le risque d'émergence
Hot spots

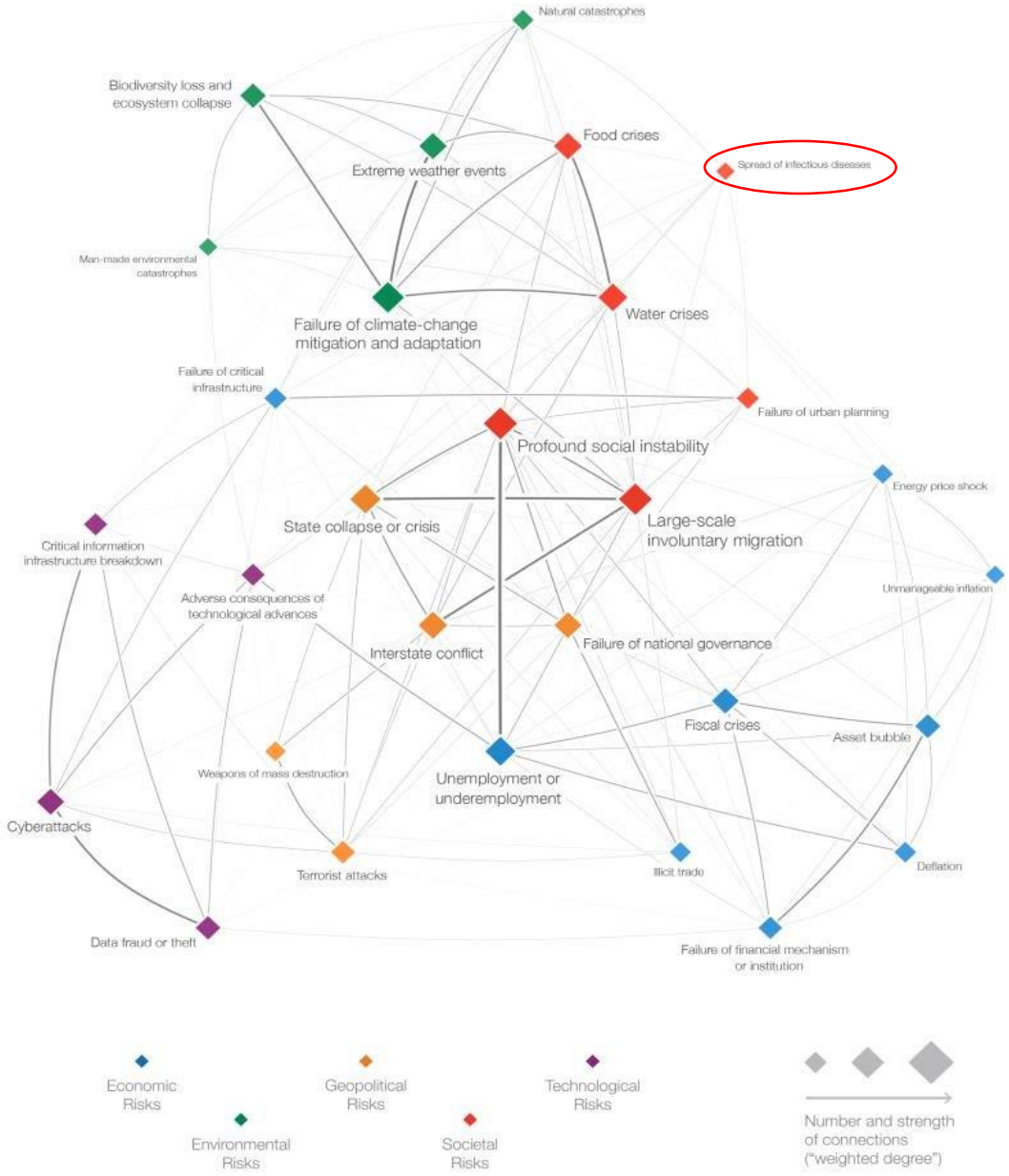


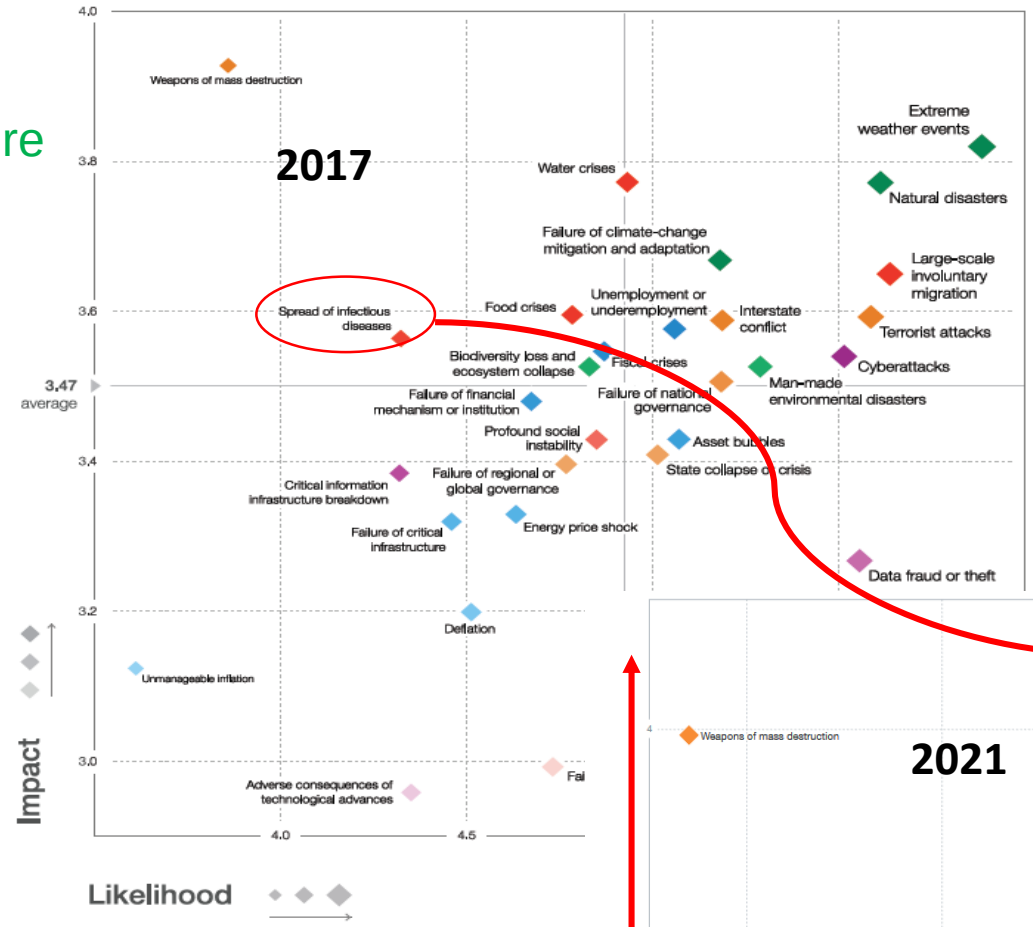
Source : Climate change increases cross-species viral transmission risk. April 2022 – Nature.

Prédictions du nombre de transmission d'un agent zoonotique aux humains en raison du changement climatique en 2070
(estimation à partir de 10.000 pathogènes et 3.000 mammifères)

Risques globaux:

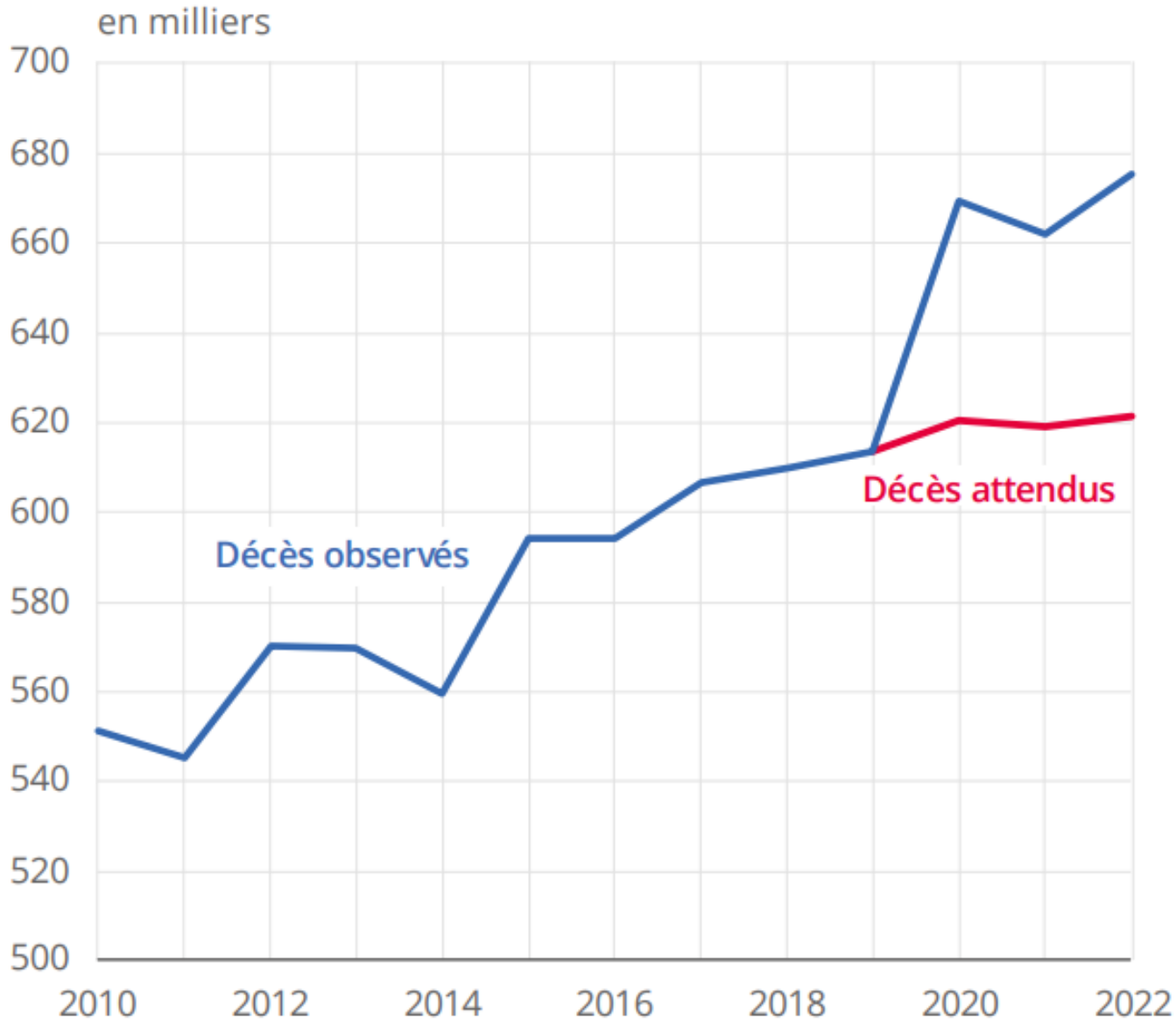
lien émergence-climat-biodiversité-crise alimentaire





World economic forum

Décès observés de 2010 à 2022 et attendus de 2020 à 2022



- 2020: +7,8 %
- 2021: +6,9 %
- 2022: +8,7 %

INSEE 2023

Le podium des « menaces » pour la France

COVARS
Comité de veille et d'anticipation des risques sanitaires

Transmission aérienne

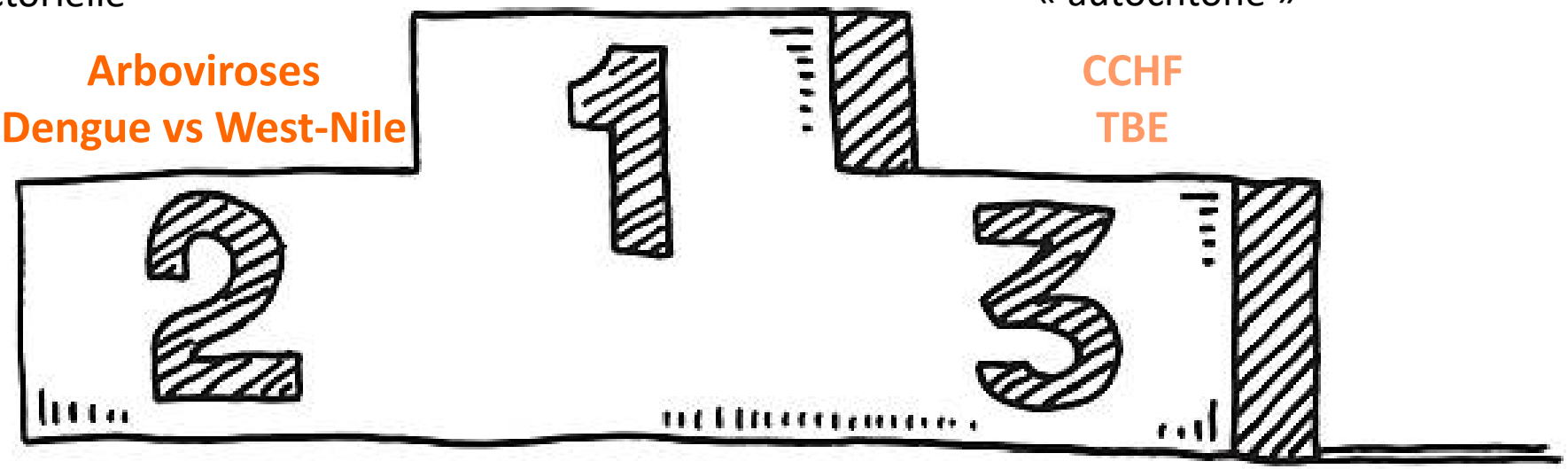
IRA pandémiques
Grippe vs coronavirus

Transmission vectorielle

Arboviroses
Dengue vs West-Nile

Diffusion « autochtone »

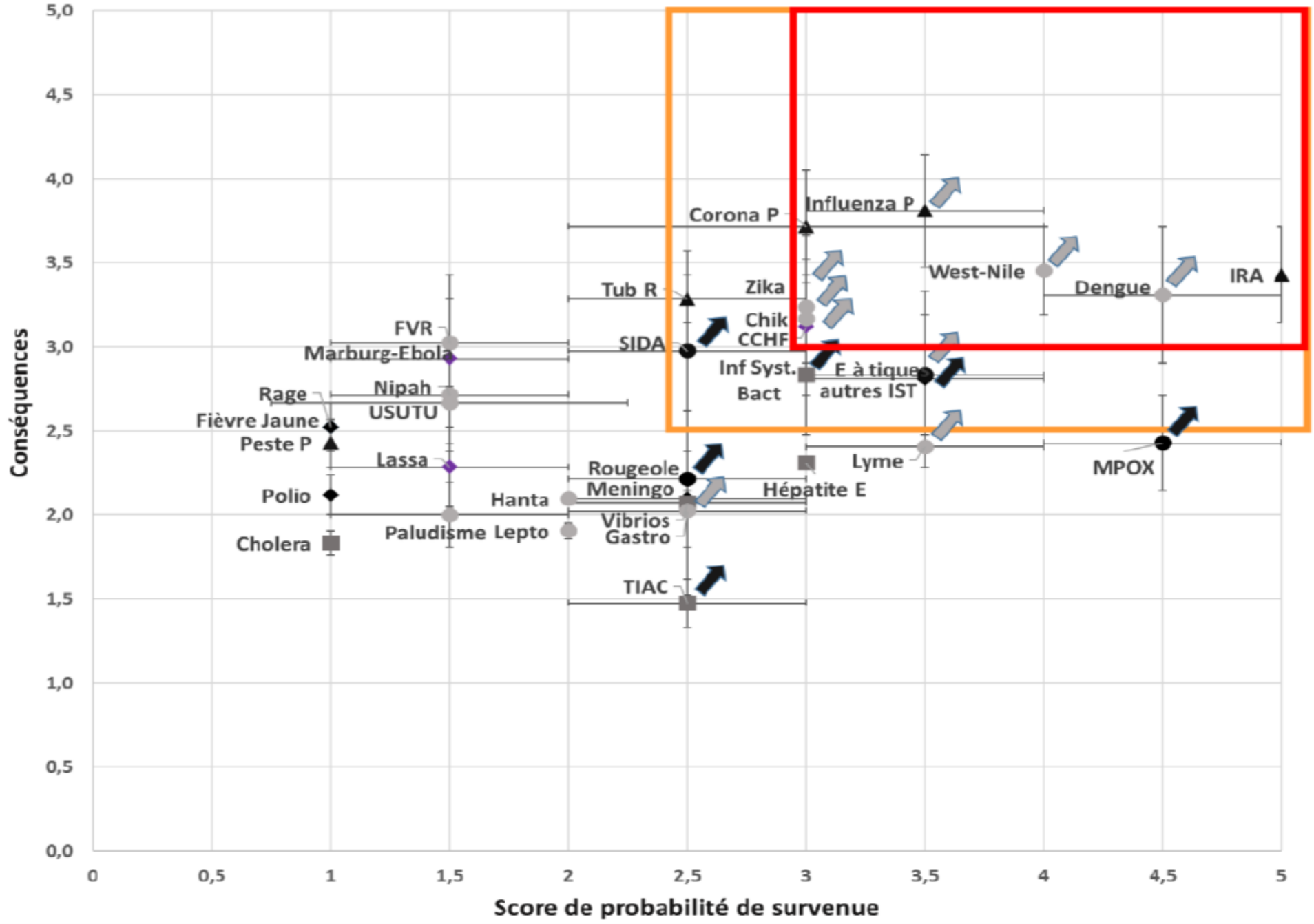
CCHF
TBE



Mesures pharmaceutiques
- *Vaccins*
- *Traitement préventif*
- *Traitement curatif*

Mesures non-pharmaceutiques
- *Restrictions sociales*
- *EPI*

Hexagone et Corse



Avian flu detected in Idaho dairy cows

Lisa Schnirring, March 29, 2024

Topics: Avian Influenza (Bird Flu)

SHARE

The Idaho State Department of Agriculture (ISDA) yesterday **announced** the detection of highly pathogenic avian influenza (HPAI) at a dairy cattle farm in Cassia County, bringing the number of affected states to four and adding more evidence the virus may be spreading cow-to-cow.

Earlier this week, the US Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) **announced** that an investigation into mysterious illnesses in dairy cows in three states—Kansas, New Mexico, and Texas—was due to HPAI and that wild birds are the source of the virus. Tests on samples from cows in Kansas and Texas revealed the H5N1 subtype.

Flu zoonotic risk

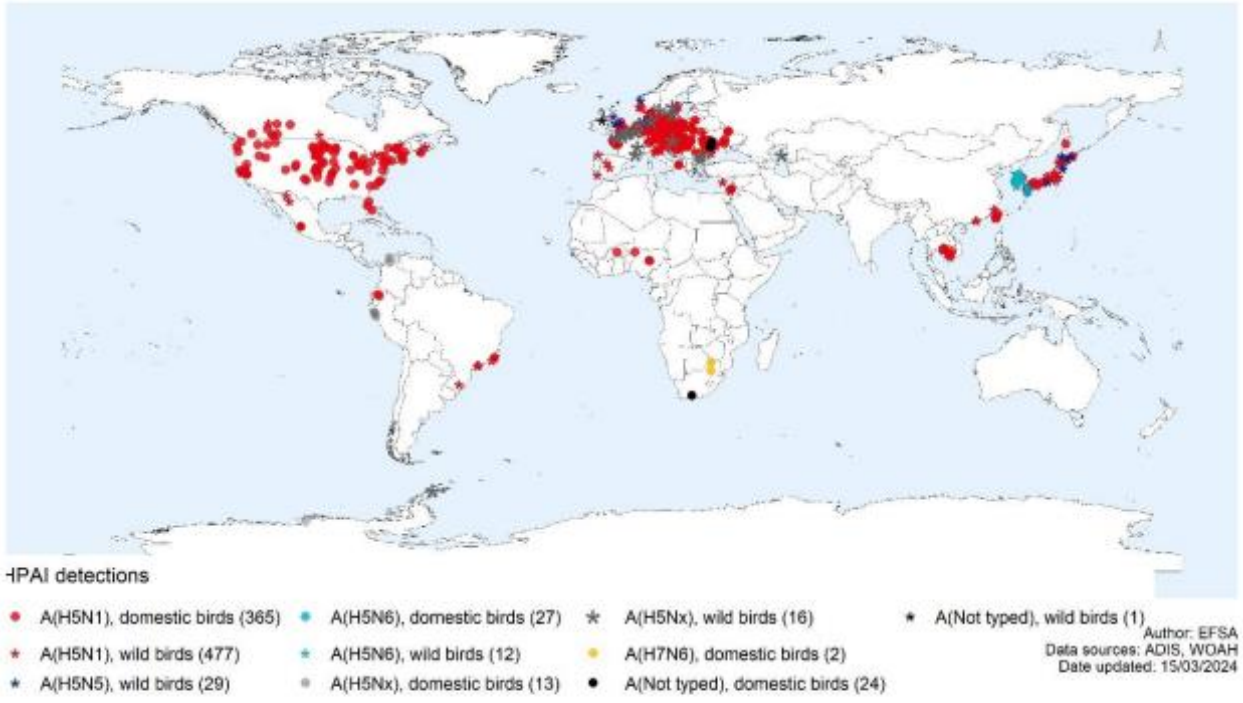
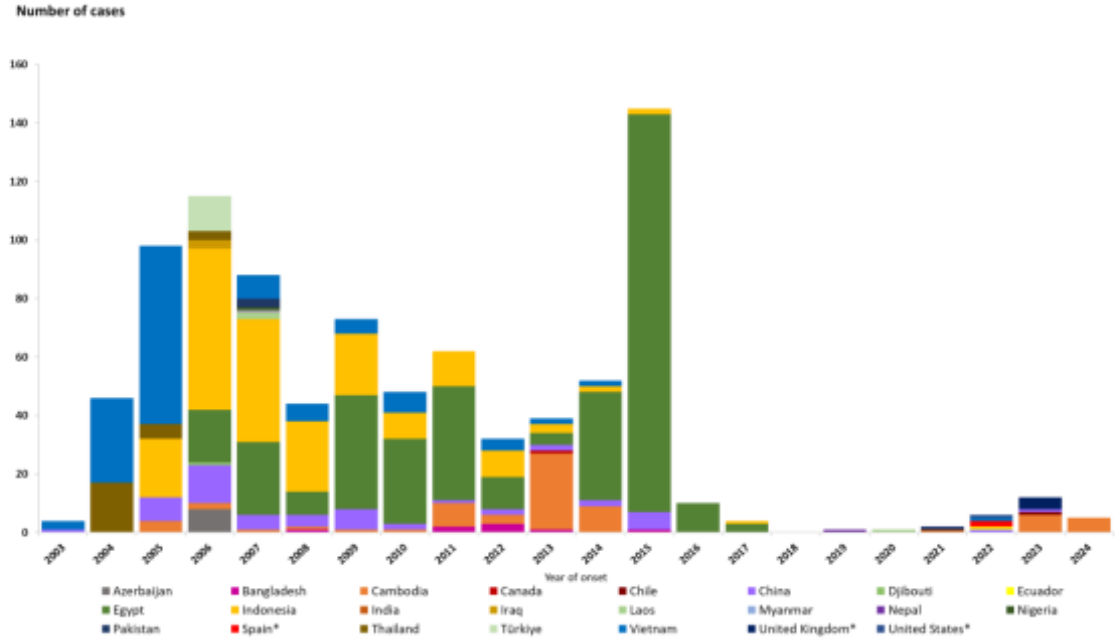


Figure 8: Geographic distribution, based on available geocoordinates, of HPAI virus detections reported worldwide in domestic (552) and wild (535) birds by virus type, from 2 December 2023 to 15 March 2024



*Includes detections due to suspected environmental contamination and no evidence of infection reported in 2022 from Spain (2) and the United States (1), and in 2023 from the United Kingdom (3, 1 inconclusive).

Figure 9: Distribution of confirmed human cases of A(H5N1) virus infection by year of onset and country, 2003–2024 (data as of 12 March 2024, n = 887)

Circulation all year round and no longer seasonal

Increasing diversity of bird species affected

very intense traffic worldwide

Increasing diversity of affected mammal species

Detection of mammalian adaptation mutations

CDC Confirms Human H5 Bird Flu Case in Missouri

STATEMENT

For immediate release: September 6, 2024

CDC Media Relations
(404) 639-3286
media@cdc.gov

September 6, 2024 -- CDC has confirmed a human case of avian influenza A(H5) ("H5 bird flu") reported by the state of Missouri. The case was identified through that state's seasonal flu surveillance system. The specimen was forwarded to CDC for confirmatory testing per usual protocols and confirmed yesterday. An investigation into the potential exposure is ongoing by the Missouri Department of Health and Senior Services (DHSS).

RELATED PAGES

Articles

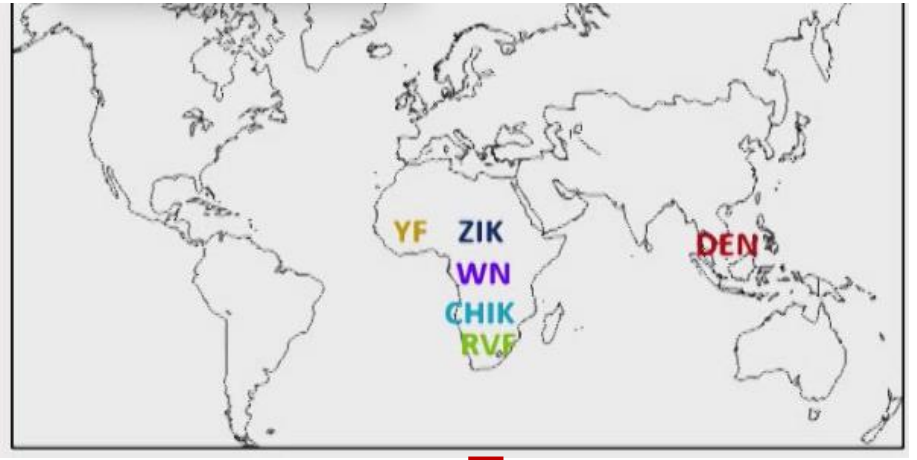
Youth E-Cigarette Use Drops to Lowest

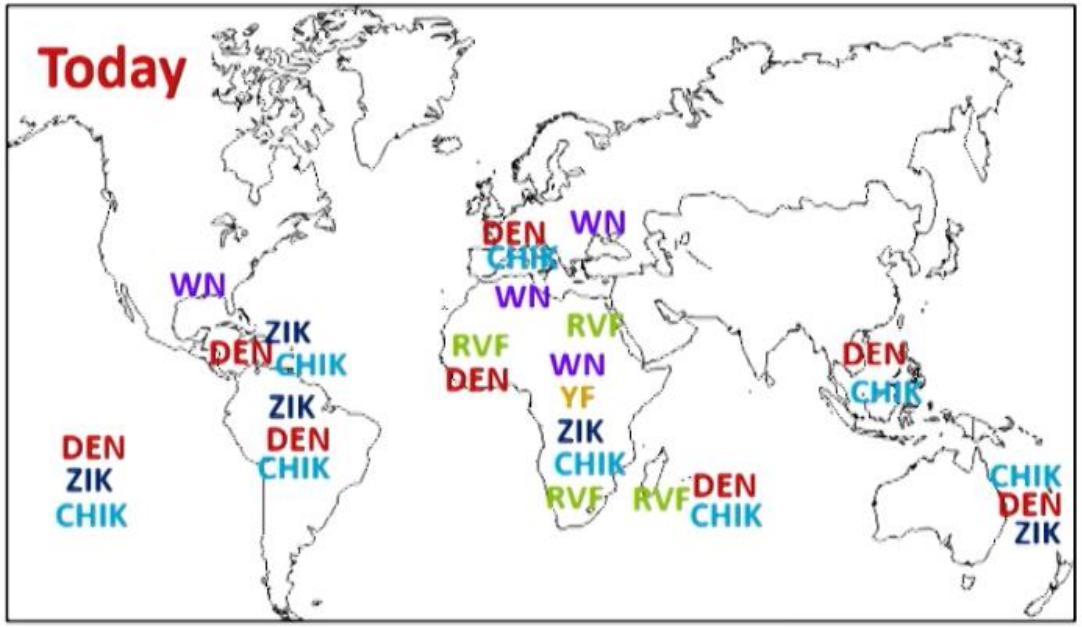
The panzootic spread of highly pathogenic avian influenza H5N1 sublineage 2.3.4.4b: a critical appraisal of One Health preparedness and prevention

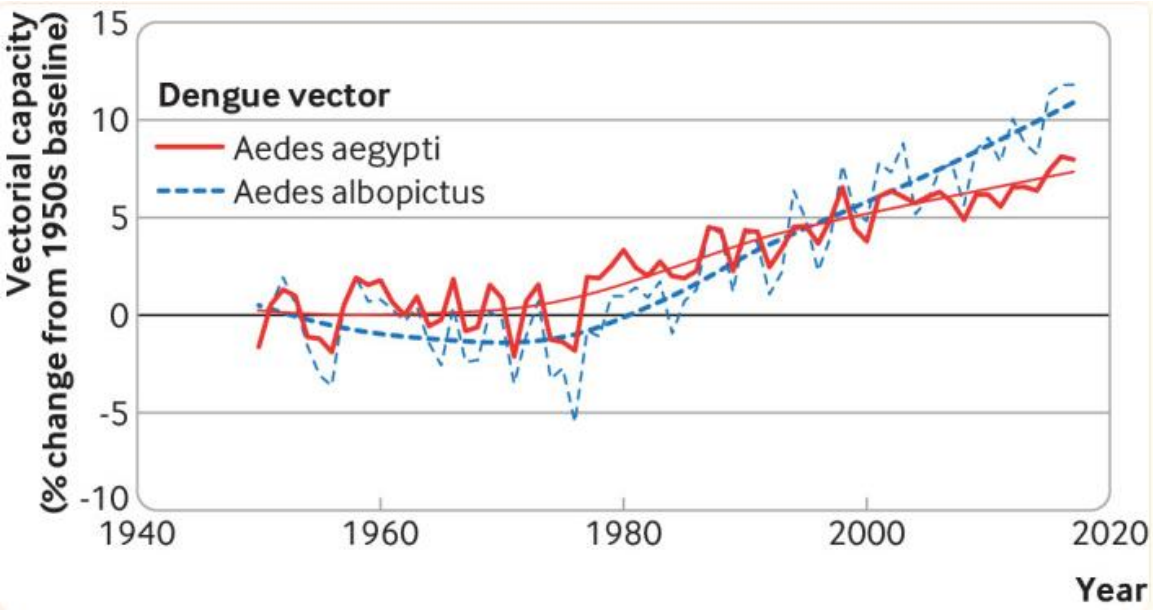
Marion P G Koopmans, Casey Barton Behravesh, Andrew A Cunningham, Wiku B Adisasmito, Salama Almuhairi, Pépé Bilivogui, Salome A Bukachi, Natalia Casas, Natalia Cediel Becerra, Dominique F Charron, Abhishek Chaudhary, Janice R Ciacci Zanella, Osman Dar, Nitish Debnath, Baptiste Dungu, Elmoubasher Farag, George F Gao, Margaret Khaitsa, Catherine Machalaba, John S Mackenzie, Wanda Markotter, Thomas C Mettenleiter, Serge Morand, Vyacheslav Smolenskiy, Lei Zhou, David T S Hayman on behalf of the One Health High-Level Expert Panel

Arbovirus

- « Arthropod-borne virus »
- Virus transmsis par piques d'arthropodes, tiques, moustiques
- Cause croissante de pathologies en Amérique et en Europe
- Causes croissantes d'encéphalites

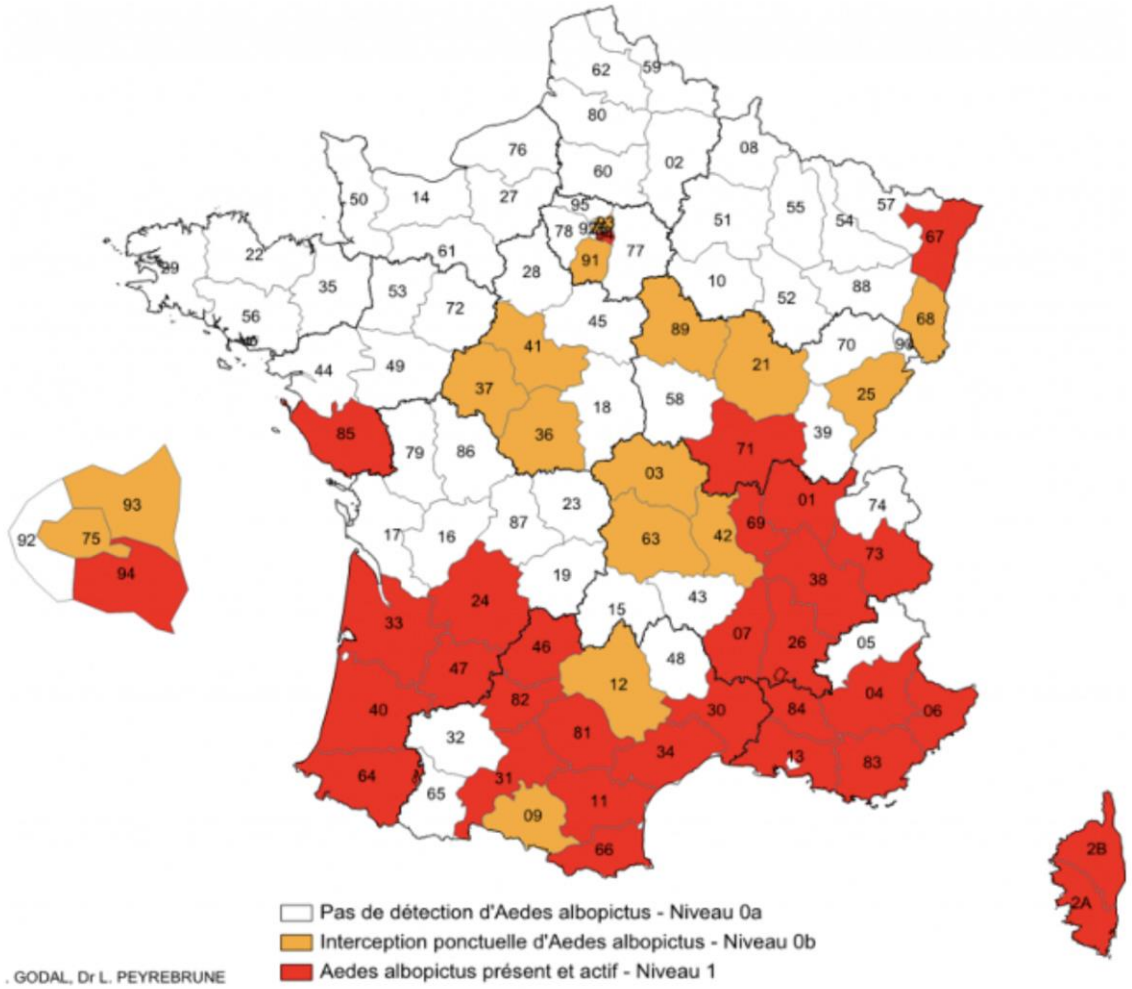


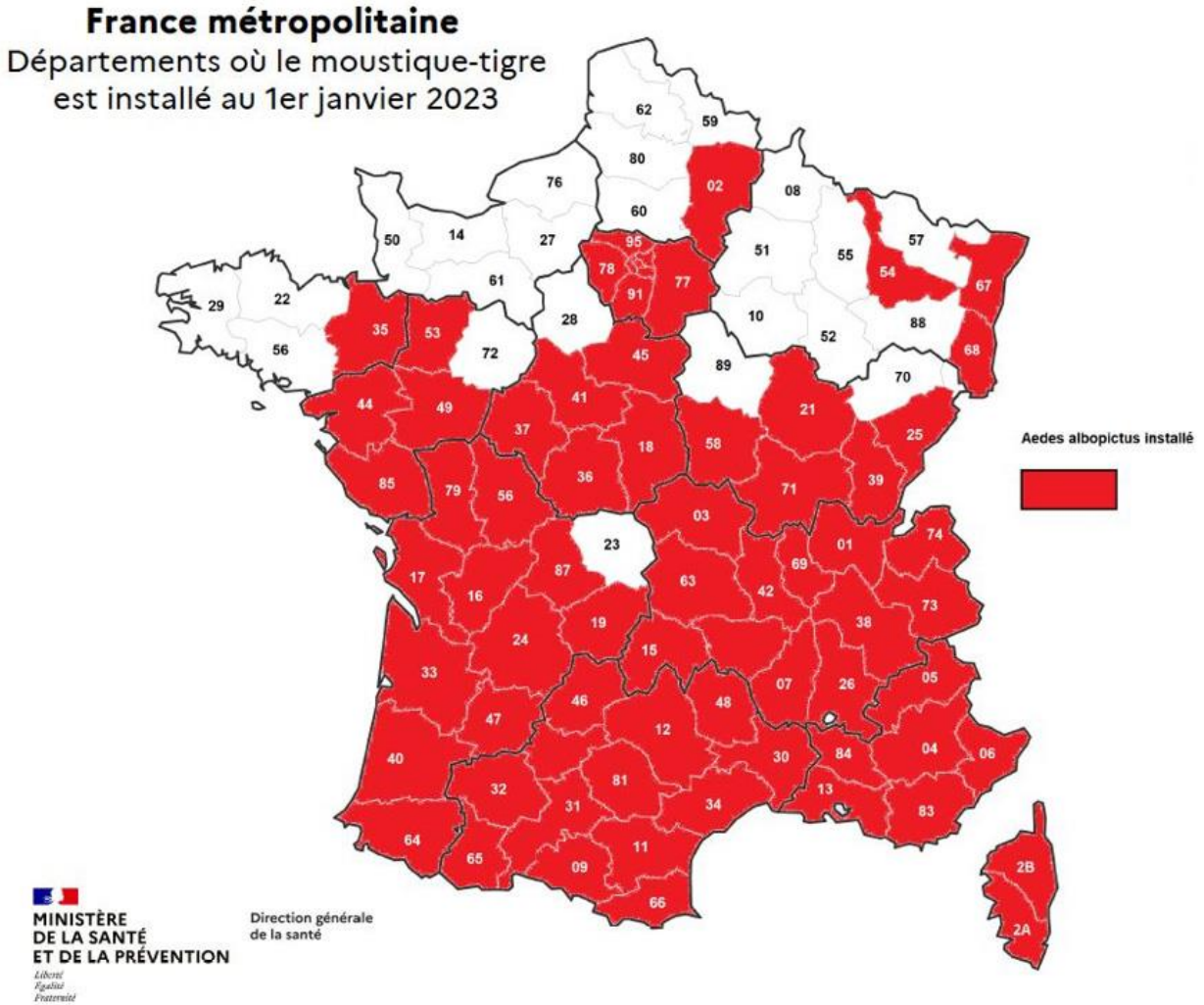




Doughty, Curr Neurol Neurosci Rep 2017
Murray, BMJ 2020

Moustique Aedes albopictus en France au 1er janvier 2016

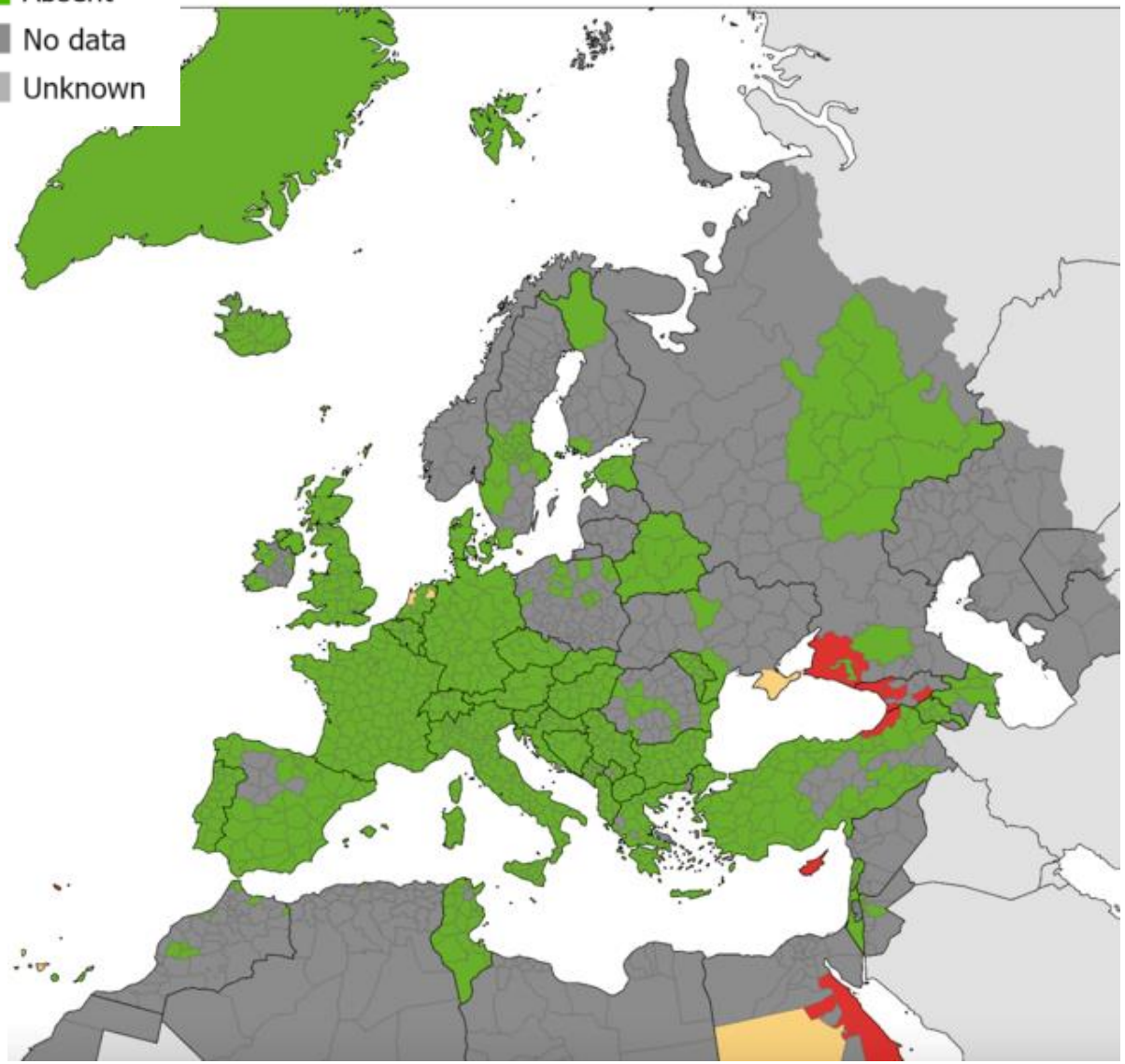




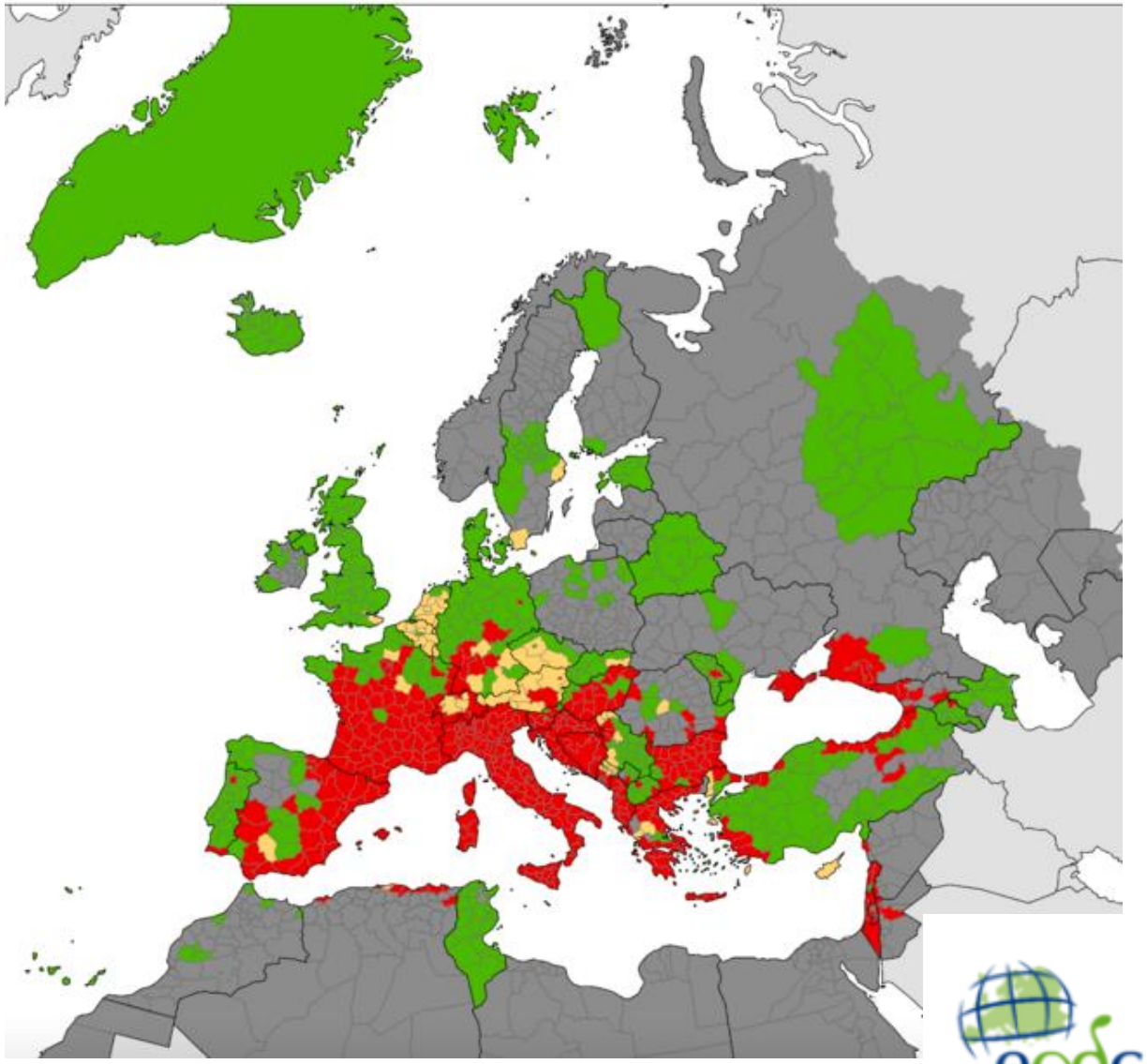
Legend

- Established
- Introduced
- Absent
- No data
- Unknown

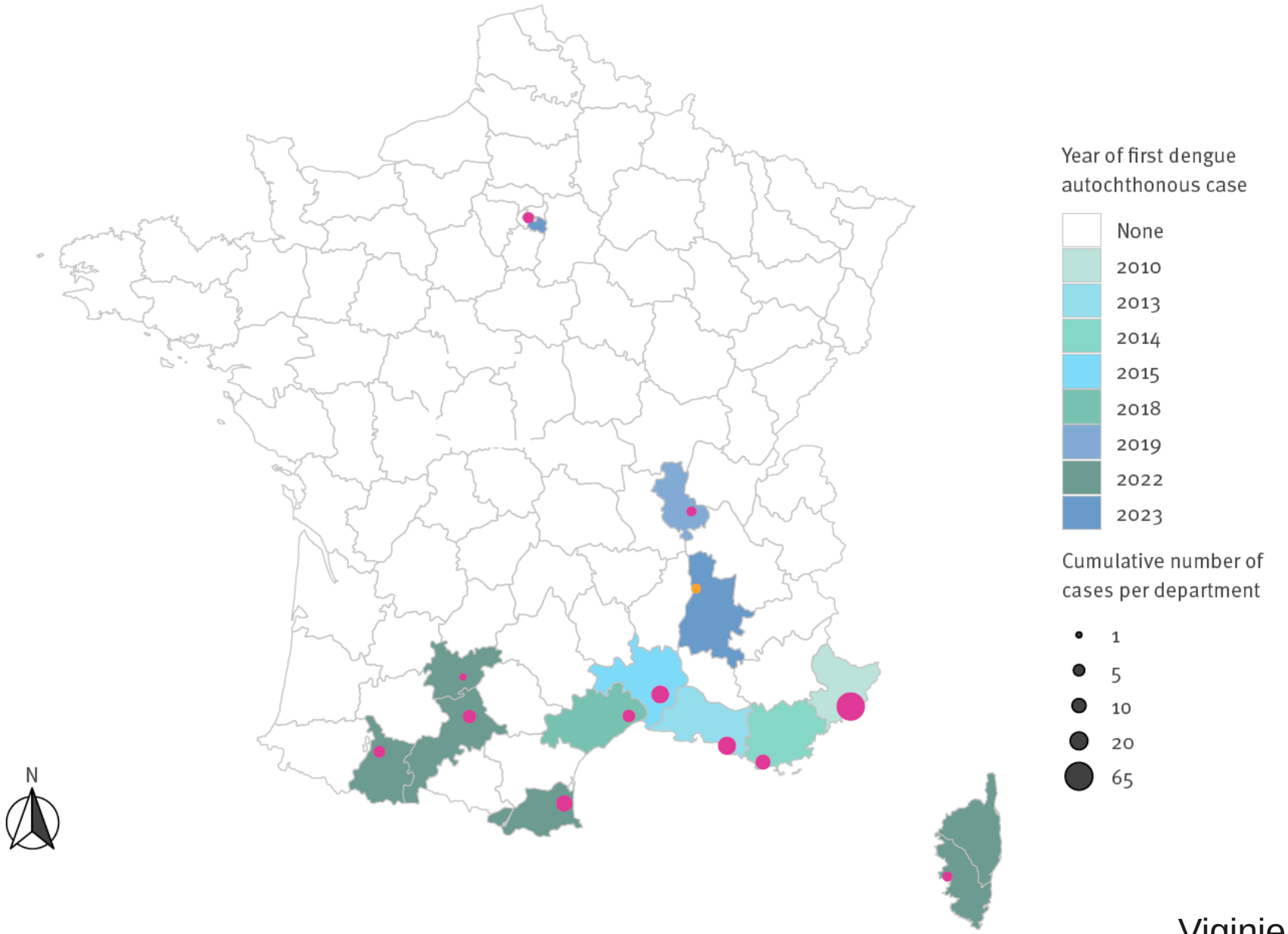
Aedes aegypti, October 2023



Aedes albopictus, October 2023



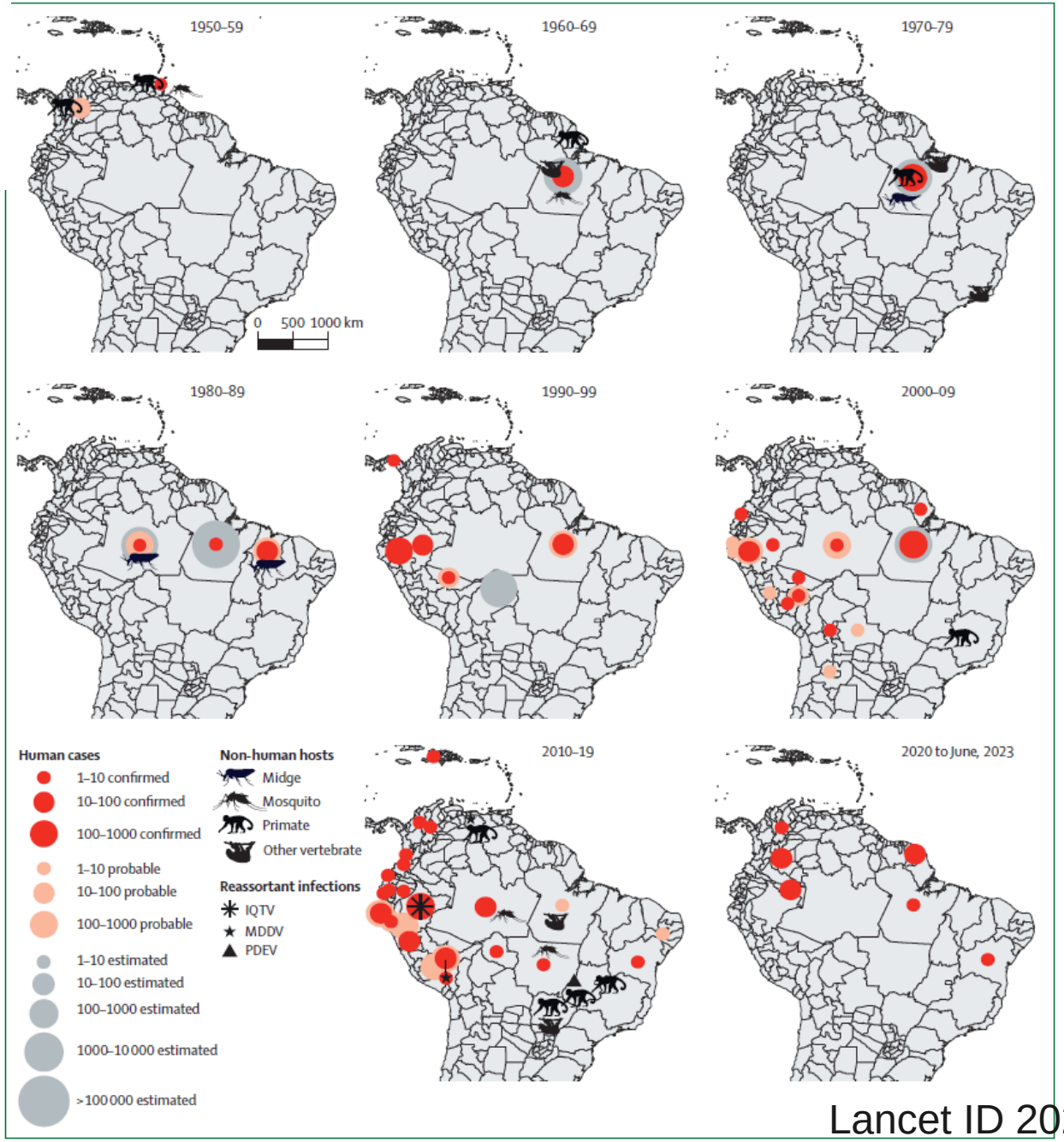
Reported autochthonous dengue cases per department in mainland France, 2010–2023 (n = 140 cases)



Viginier et al. Eurosurveillance 2024

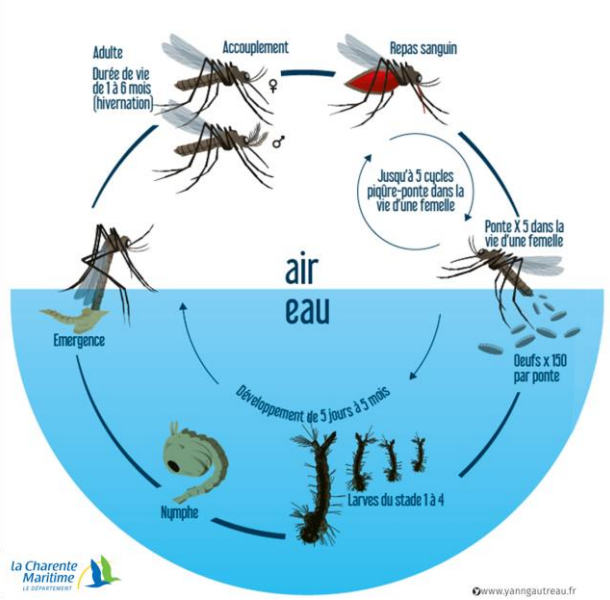
Emergence of Oropouche fever in Latin America: a narrative review

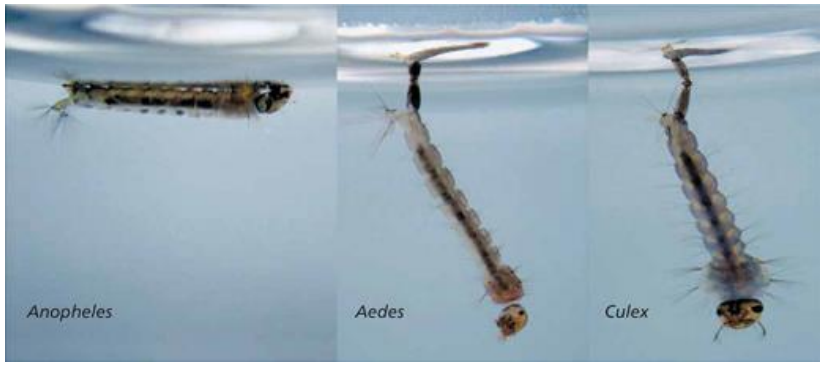
Konrad M Wesselmann, Ignacio Postigo-Hidalgo, Laura Pezzi, Edmilson F de Oliveira-Filho, Carlo Fischer, Xavier de Lamballerie, Jan Felix Drexler



Lancet ID 2024

		Dengue	Fièvre jaune	Chik	Zika	West Nile	Enc. Jap.	Toscana	TBE	CCHF
	*Aedes Albopictus*									
	*Aedes Aegypti*									
	*Culex*									
	*Phlebotome*									
	*Ixodes ricinus*									
	*Hyalomma*									



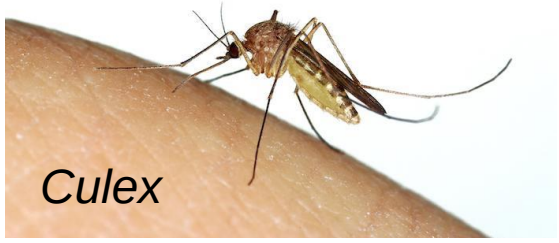


Pneu usé

Seau

Cuvette

Bouilloire



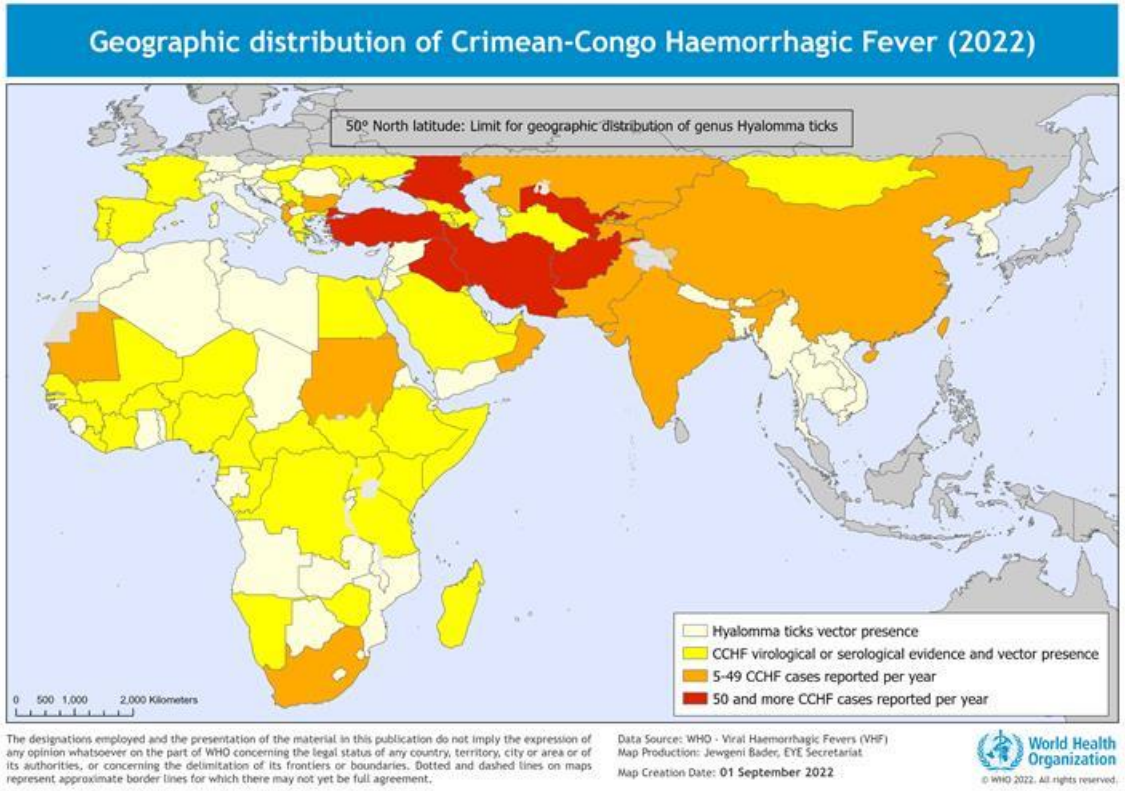
Canaris d'eau

Flaque d'eau

Boite de conserve

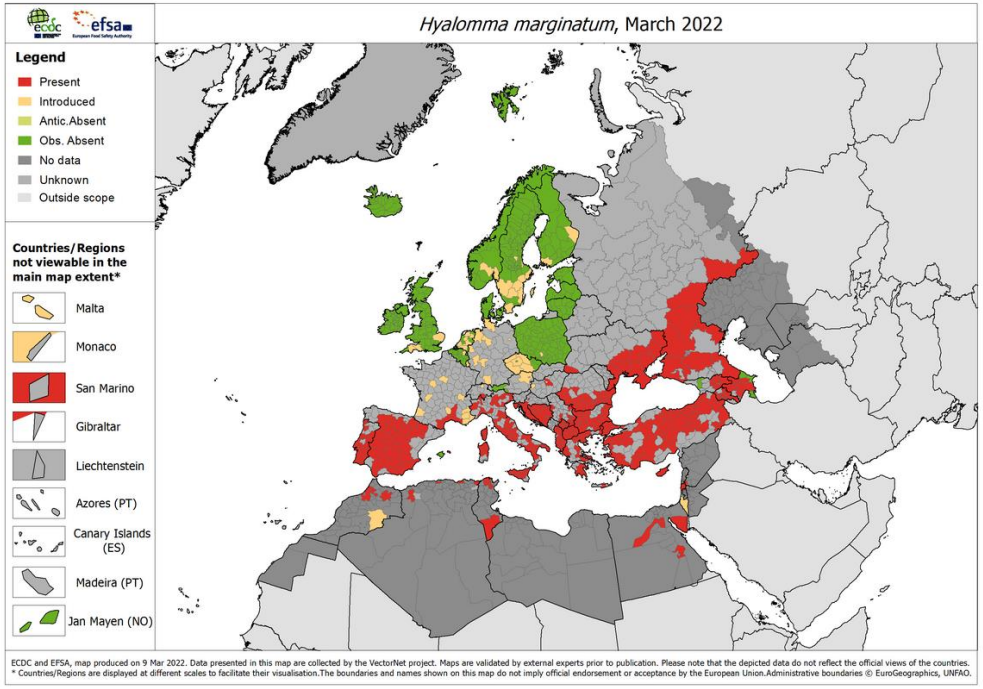
Pots de fleurs

FHCC

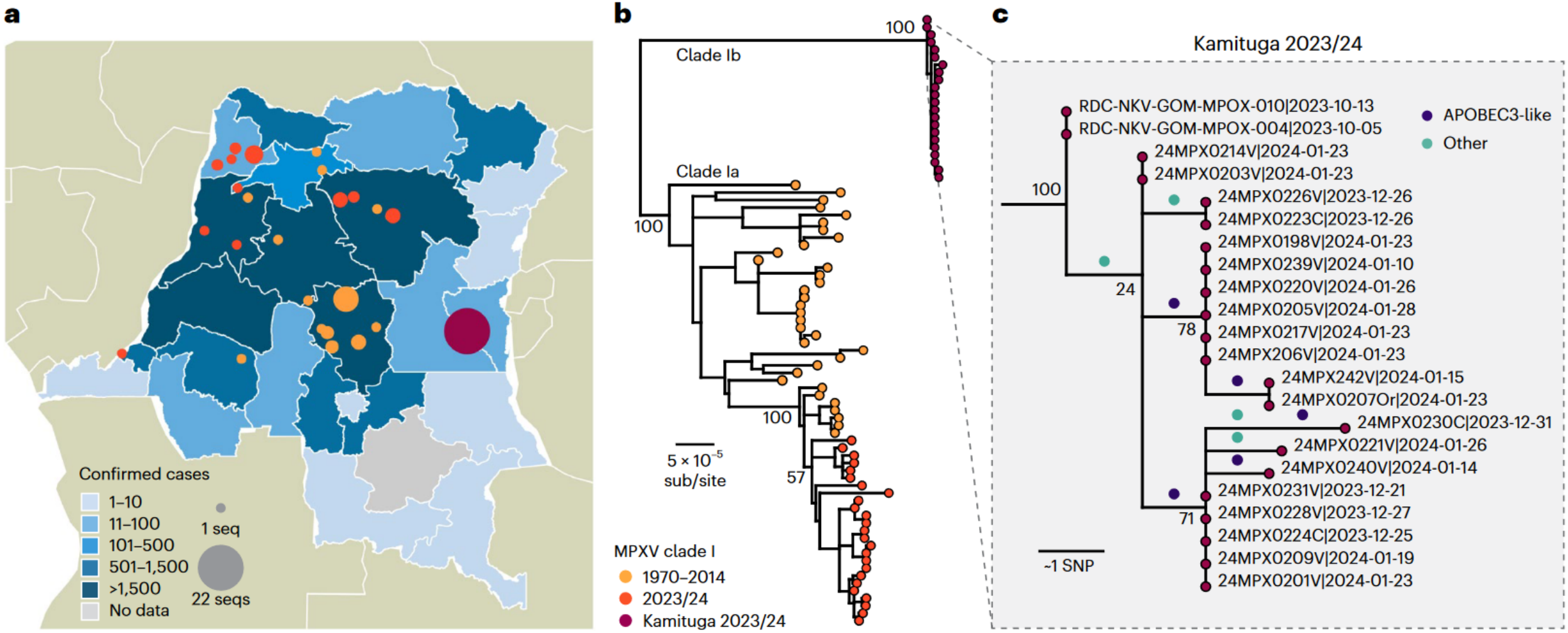


- Asie, Afrique, Balkans, Europe Sud / Est
- Depuis 2016, cas autochtones en Espagne
- Détection du virus de FHCC dans des tiques de l'espèce *Hyalomma marginatum* collectées sur des bovins des Pyrénées-Orientales
- Aucun cas autochtone détecté en France

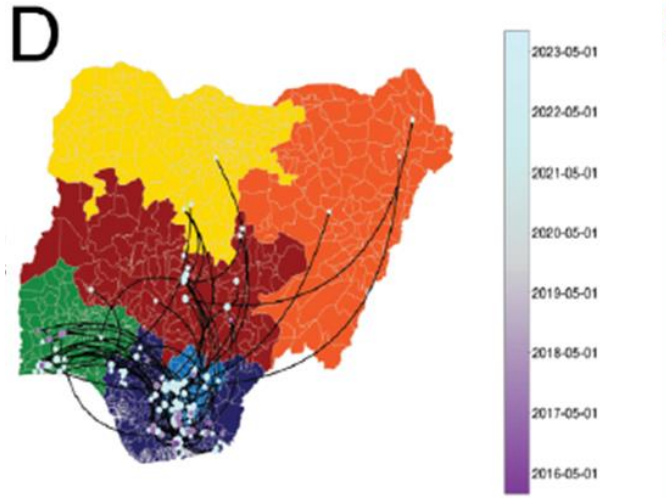
Figure 1. Regions of infection *(in orange)* for Crimean-Congo haemorrhagic fever cases infected via tick bites, EU/EEA, 2013–present

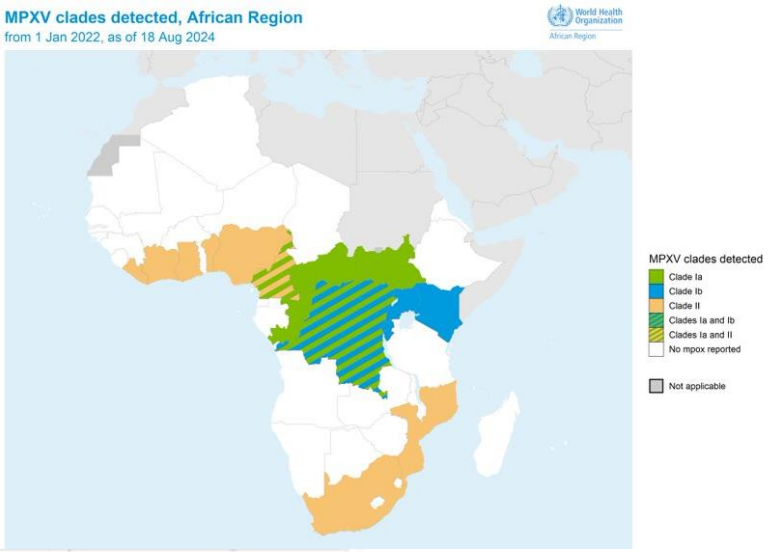


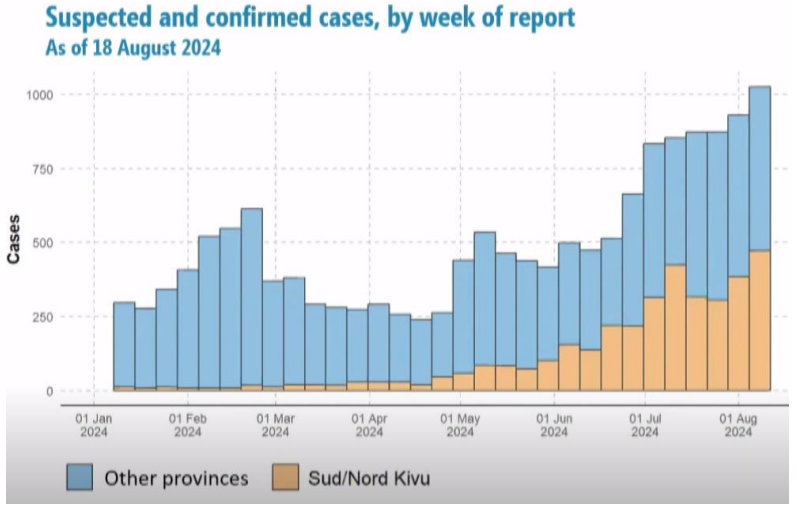
Sustained human outbreak of a new MPXV clade I lineage in eastern Democratic Republic of the Congo

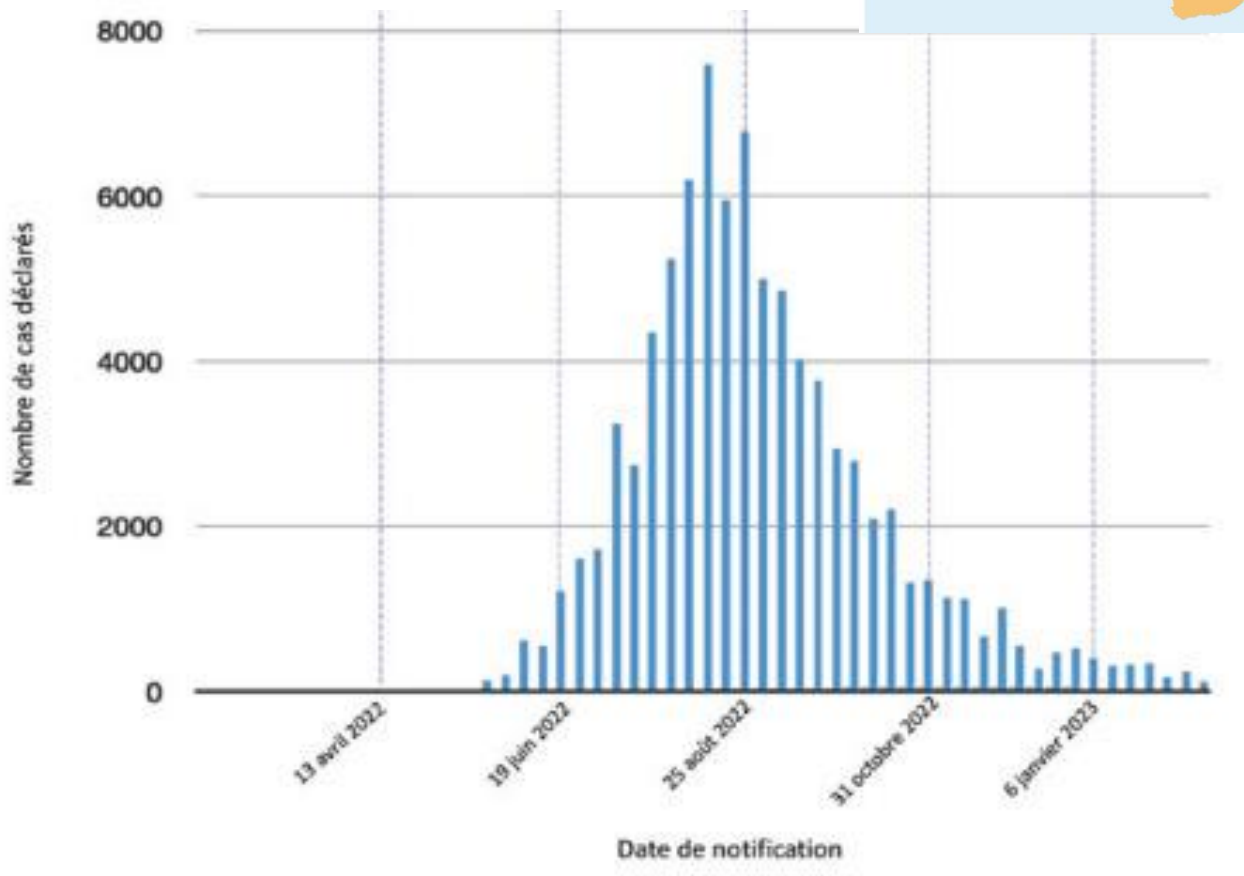


Vakaniaki et al. Nature medicine 2024


D
2023-05-01
2022-05-01
2021-05-01
2020-05-01
2019-05-01
2018-05-01
2017-05-01
2016-05-01


MPXV clades detected, African Region
from 1 Jan 2022, as of 18 Aug 2024
World Health Organization
African Region
MPXV clades detected
Clade Ia
Clade Ib
Clade II
Clades Ia and Ib
Clades Ia and II
No mpox reported
Not applicable


Suspected and confirmed cases, by week of report
As of 18 August 2024
Cases
1000
750
500
250
0
01 Jan 2024
01 Feb 2024
01 Mar 2024
01 Apr 2024
01 May 2024
01 Jun 2024
01 Jul 2024
01 Aug 2024
Other provinces
Sud/Nord Kivu


Nombre de cas déclarés
8000
6000
4000
2000
0
13 avril 2022
19 juin 2022
25 août 2022
31 octobre 2022
6 janvier 2023
Date de notification

?



Kivu, est de la RDC, début 2020


Conclusion

1. Leçons du COVID et autres phénomènes épidémiques
2. Amélioration des systèmes de surveillance sanitaire et des outils de modélisation
3. Prise en compte de la dimension « one health »
4. Amélioration et résilience de l'organisation des soins
5. Prise en compte de la modalité « gestion de crise »