Arbovirosi e cambiamenti climatici

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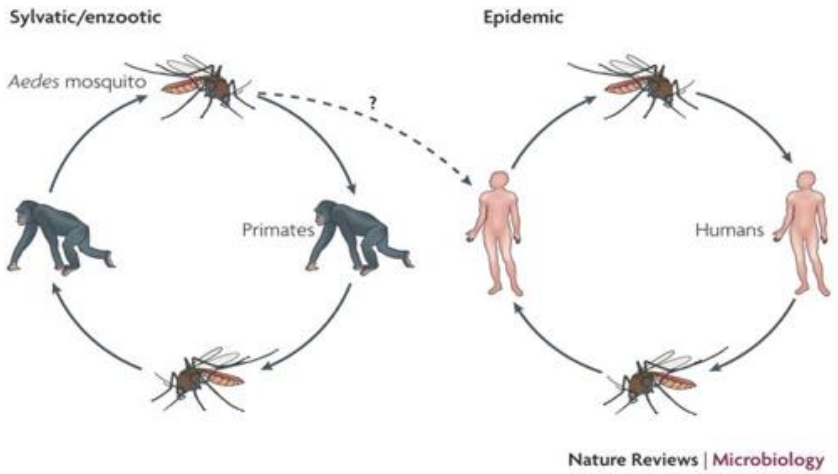
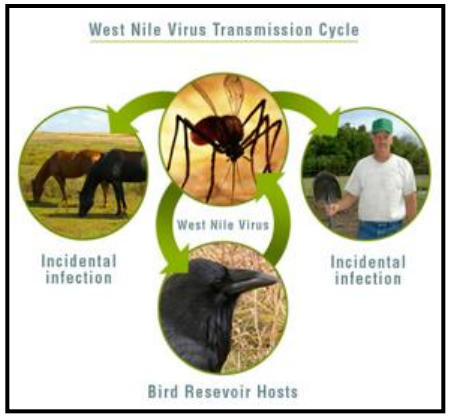
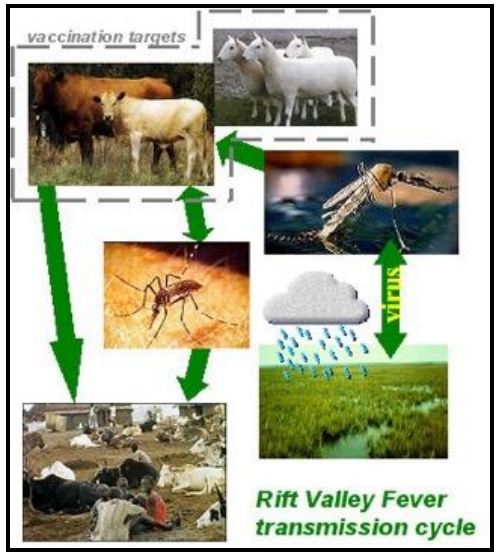
Malattie trasmesse da vettori (Vector-borne diseases, VBD)

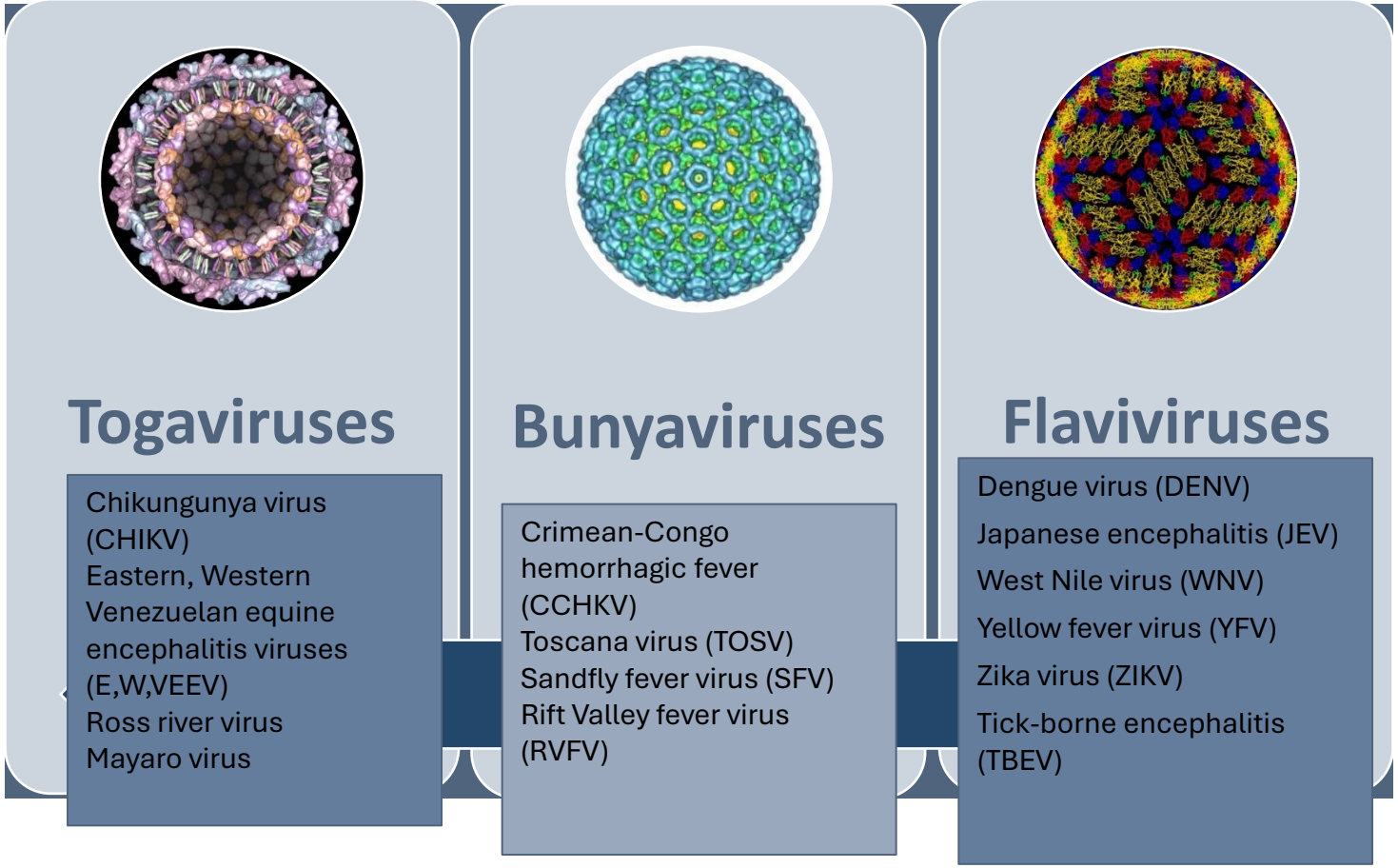
- ***Ar***thropod-***bo***rne viruses
- Richiedono la presenza di un artropodo ematofago per completare il ciclo vitale
- Spesso zoonosis – trasmissione uomo animale
- Almeno 500 specie virali
- 8 diverse famiglie, di cui 3 principali:
  Togaviridae, Flaviviridae, and Bunyaviridae







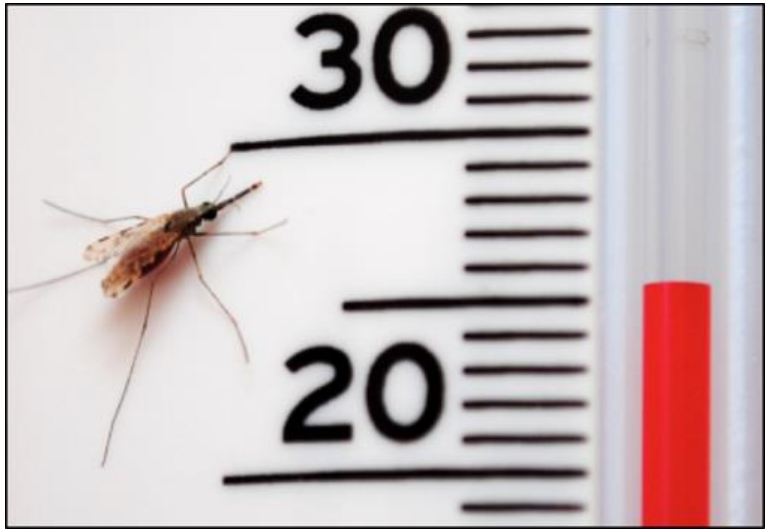
Arbovirus, 3 principali famiglie



Cause dell'espansione geografica delle arbovirosi

- Cambiamenti climatici
- Cambiamenti demografici (incremento demografico e della densità della popolazione)
  - Mutamenti ambientali
  - Fattori socioeconomici
  - Crescita della popolazione urbana
- Facilità di spostamento (globalizzazione)
- Evoluzione virale
- Mancanza di interventi efficaci di controllo vettoriale

Come i cambiamenti climatici influenzano il potenziale vettoriale per le VBD?



Temperatura e potenziale vettoriale

- Tasso di puntura
- Tasso di infezione del vettore
- Competenza del vettore
- Periodo di incubazione estrinseco
- Tasso di mortalità del vettore adulto
- Frequenza giornaliera di deposizione delle uova
- Sopravvivenza delle uova e delle larve
- Tasso di sviluppo del vettore

→ Processi temperatura dipendenti

Aedes

Aedes aegypti

eLIFE Research article Ecology | Epidemiology and global health

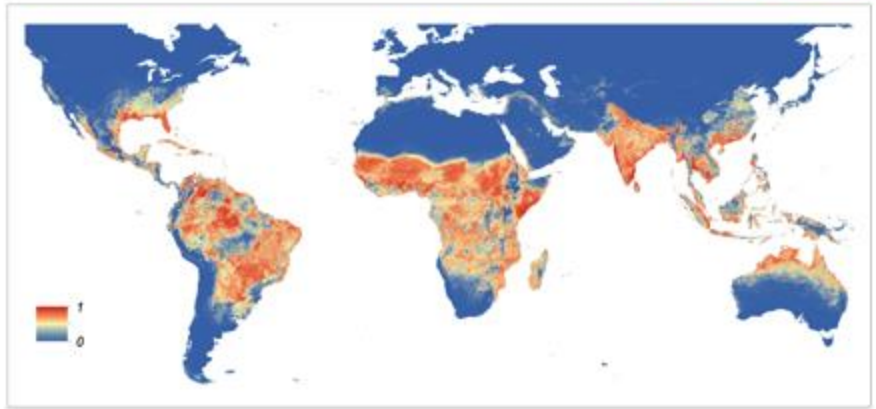


Figure 1. Global map of the predicted distribution of *Ae. aegypti*. The map depicts the probability of occurrence (from 0 blue to 1 red) at a spatial resolution of 5 km x 5 km.

DOI: 10.7554/eLife.08347.004

Aedes albopictus

eLIFE Research article Ecology | Epidemiology and global health

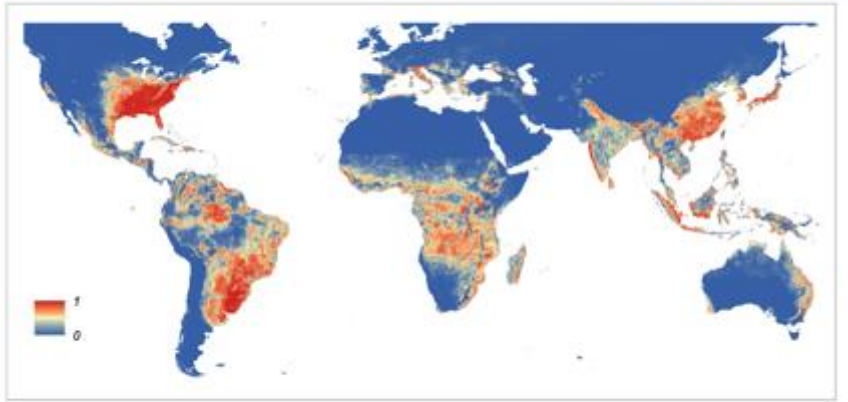


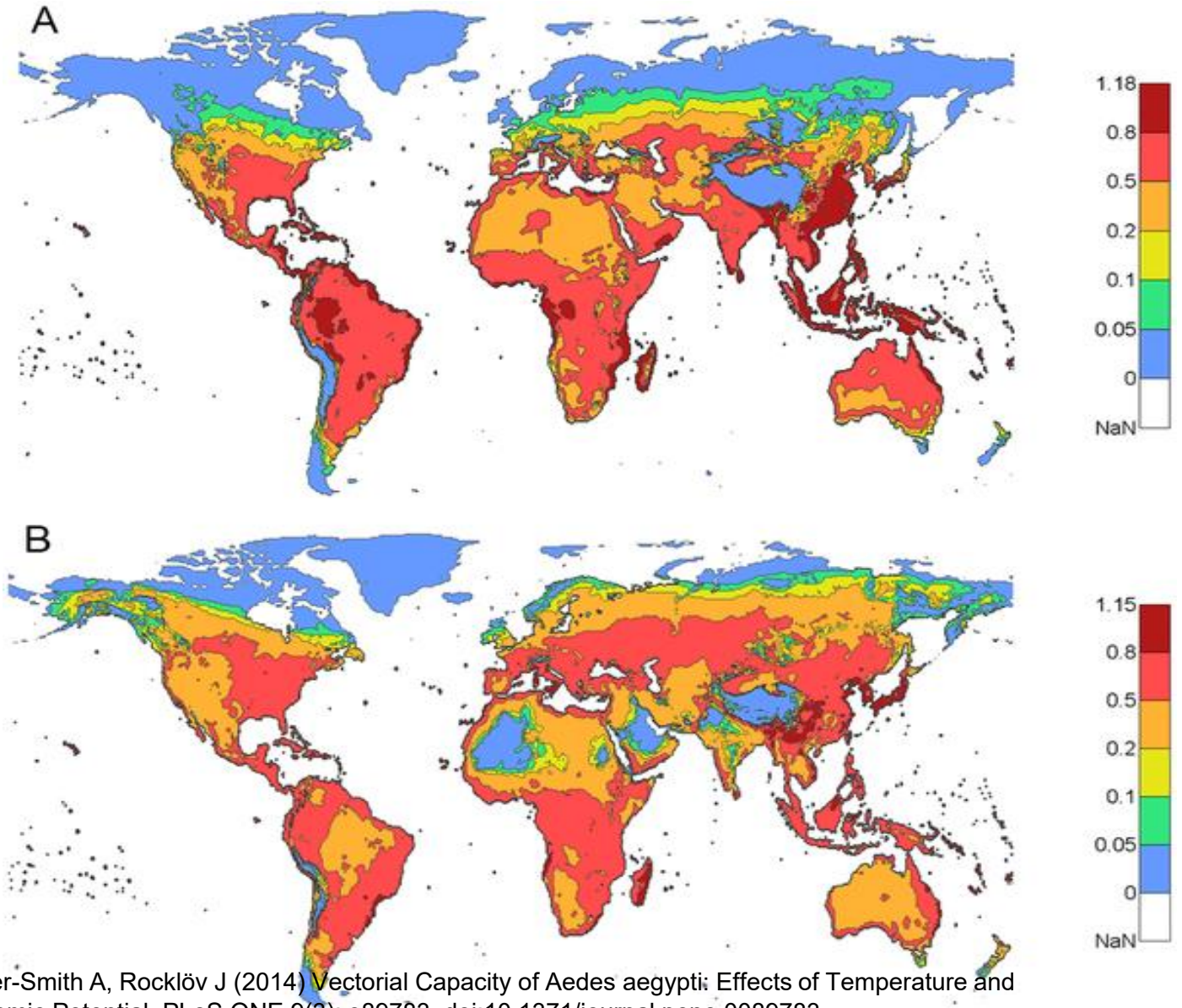
Figure 2. Global map of the predicted distribution of *Ae. albopictus*. The map depicts the probability of occurrence (from 0 blue to 1 red) at a spatial resolution of 5 km x 5 km.

DOI: 10.7554/eLife.08347.009

Capacità vettoriale

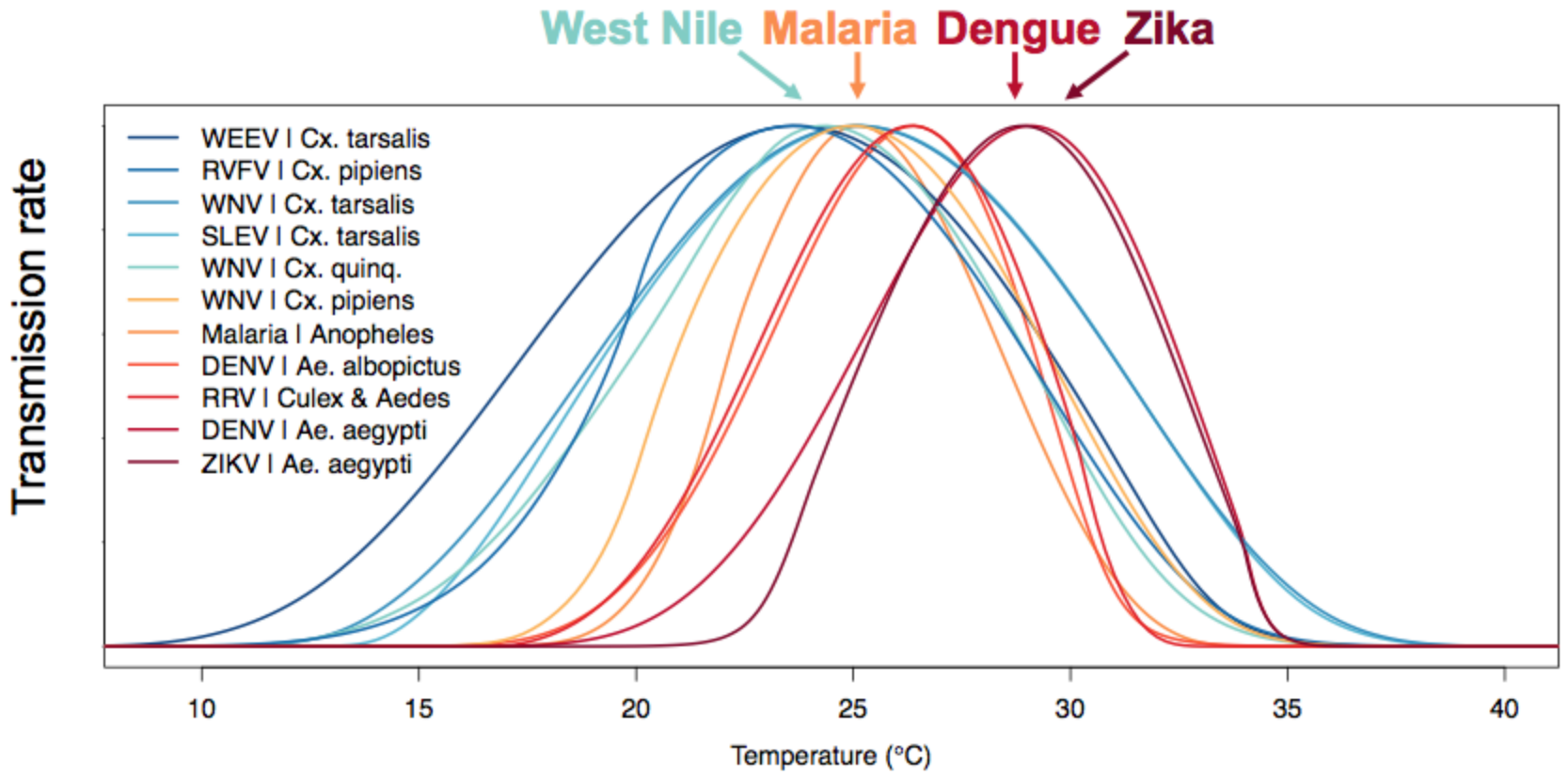
1980-2009

2070-2099



Liu-Helmersson J, Stenlund H, Wilder-Smith A, Rocklöv J (2014) Vectorial Capacity of Aedes aegypti: Effects of Temperature and Implications for Global Dengue Epidemic Potential. PLoS ONE 9(3): e89783. doi:10.1371/journal.pone.0089783
http://www.plosone.org/article/info:doi/10.1371/journal.pone.0089783

Il cambiamento climatico sposterà il peso globale delle arbovirosi?



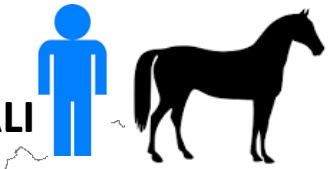
Mordecai et al. 2013, 2017, Johnson et al. 2015, Shocket et al. 2018, in prep, Tesla et al. 2018

WEST NILE
introduzione in Europa

VETTORI COMPETENTI LOCALI

AVIFAUNA STANZIALE

OSPITI ACCIDENTALI

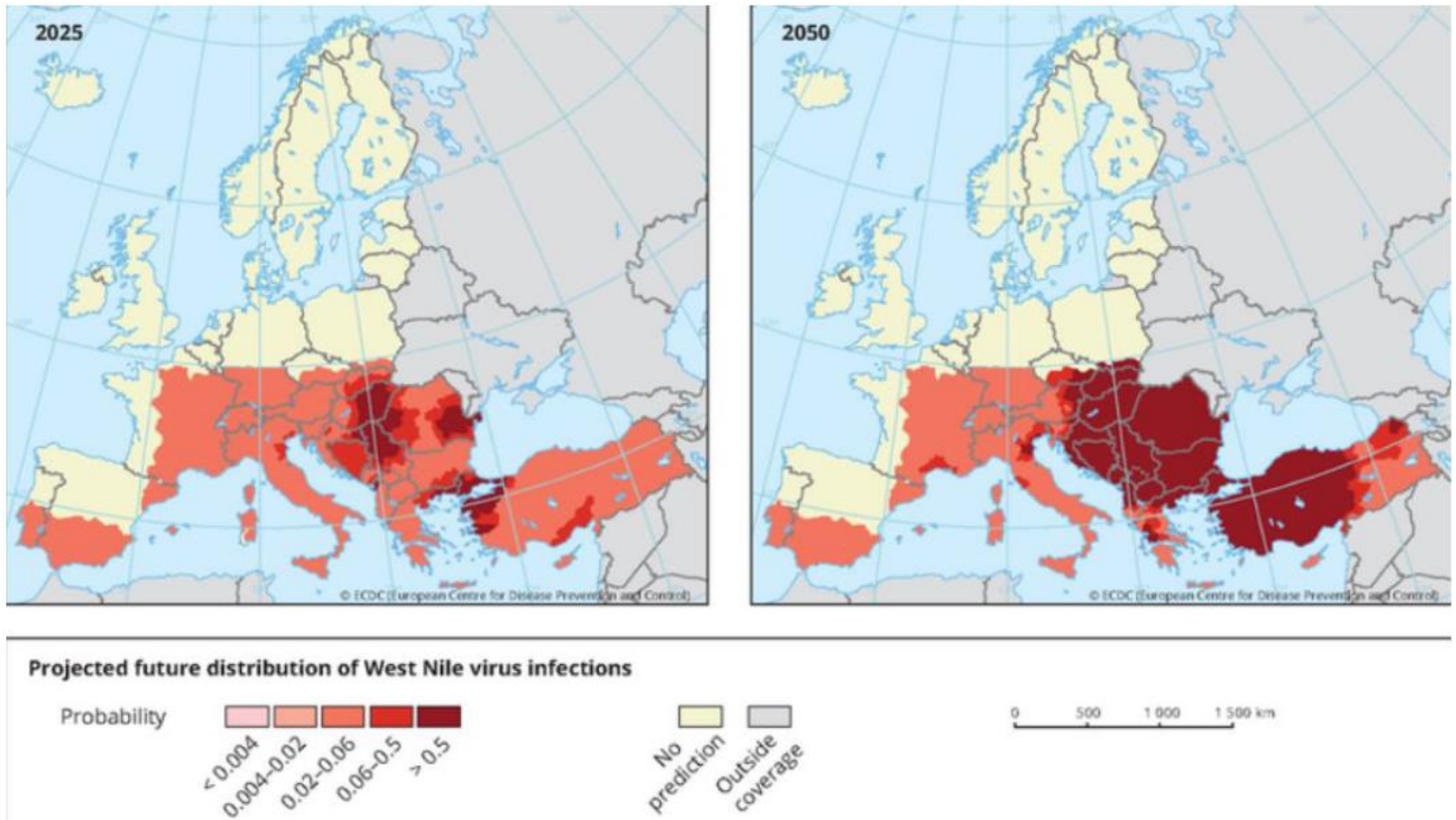


AREE ENDEMICHE

REGIONE DEL VENETO

VIVO BENE VENETO Piano Regionale Prevenzione del Veneto

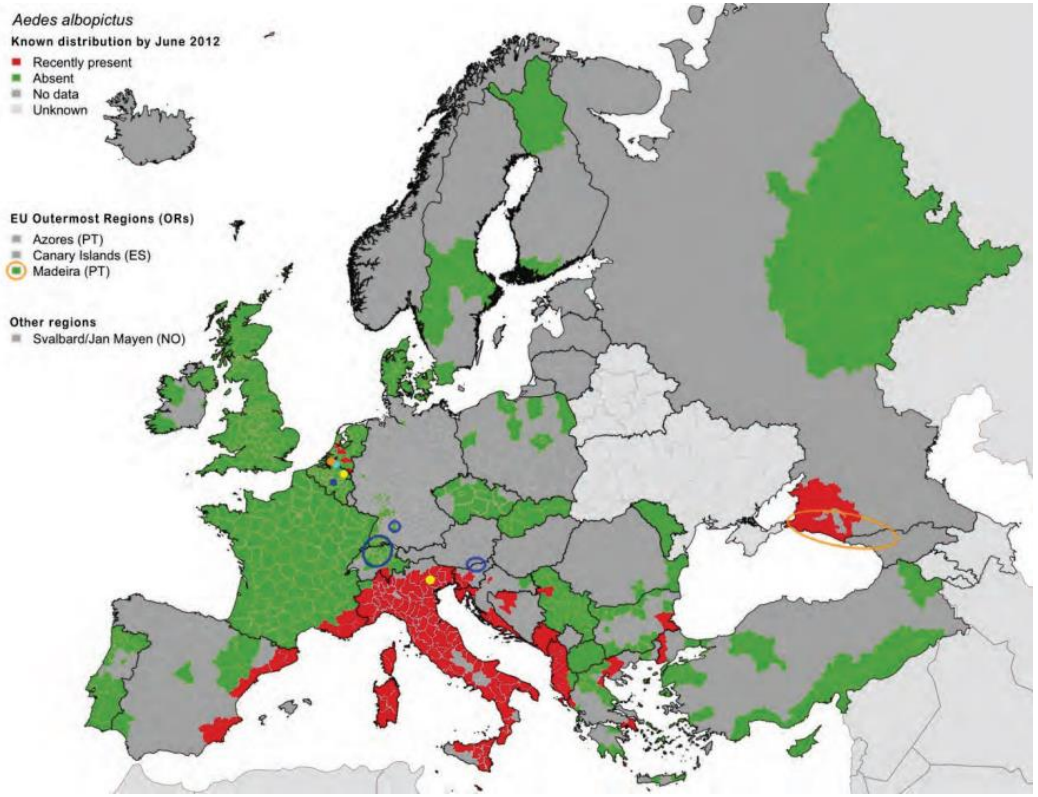
PROIEZIONE FUTURA - INFEZIONI DA WEST NILE VIRUS



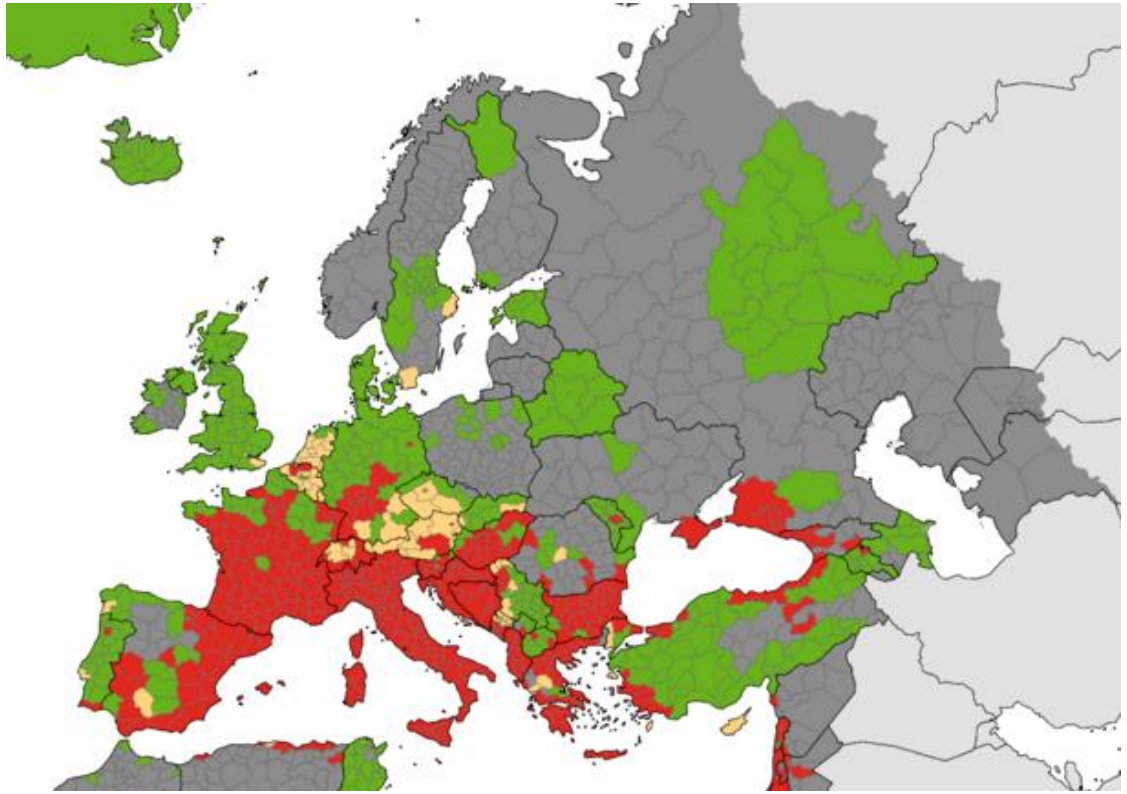
European Environment Agency, Projected future distribution of West Nile Virus infections, disponibile online https://www.eea.europa.eu/data-and-maps/figures/projected-future-distribution-of-west-1

Ma soprattutto…

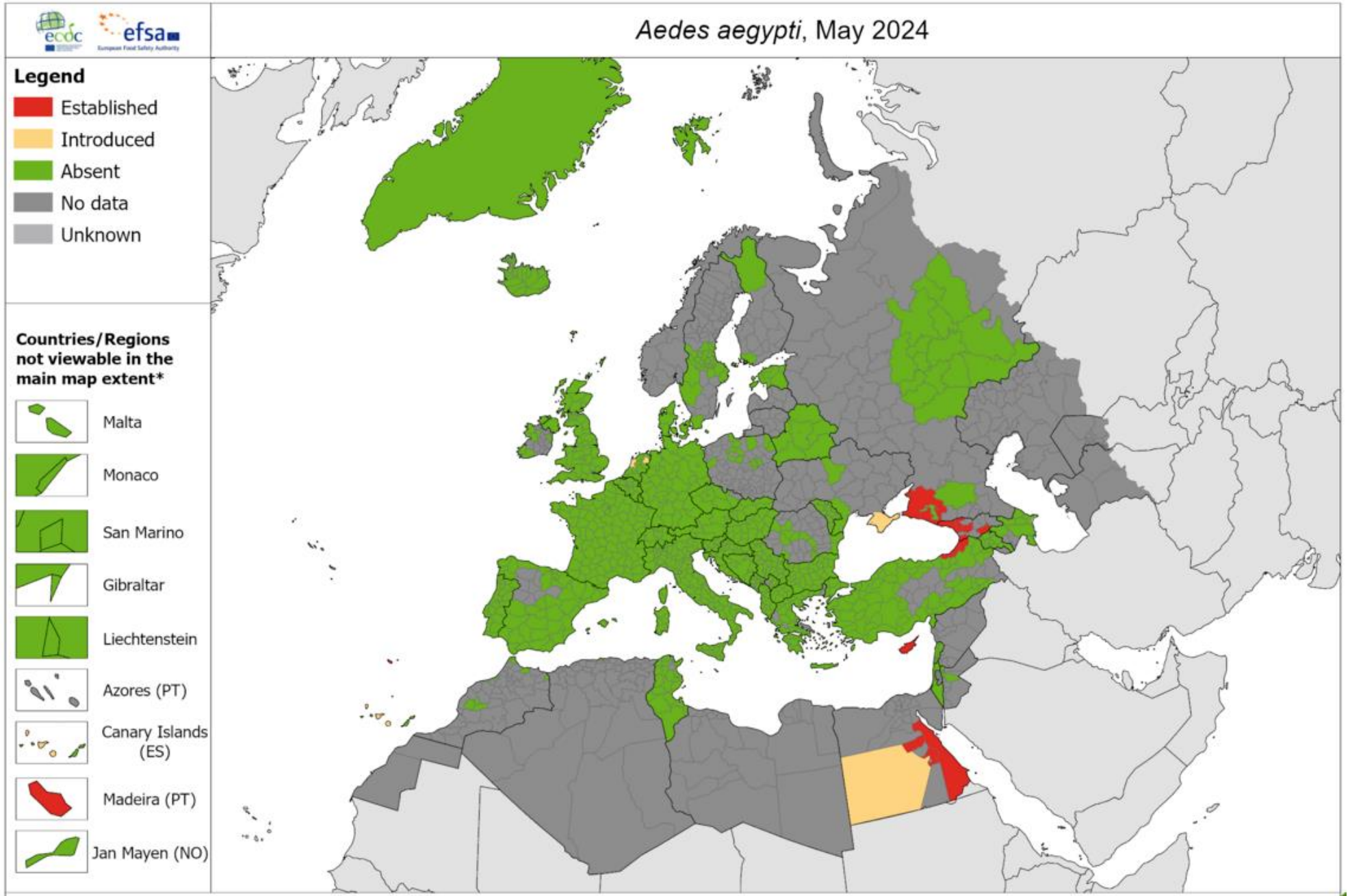
June 2012



July 2024

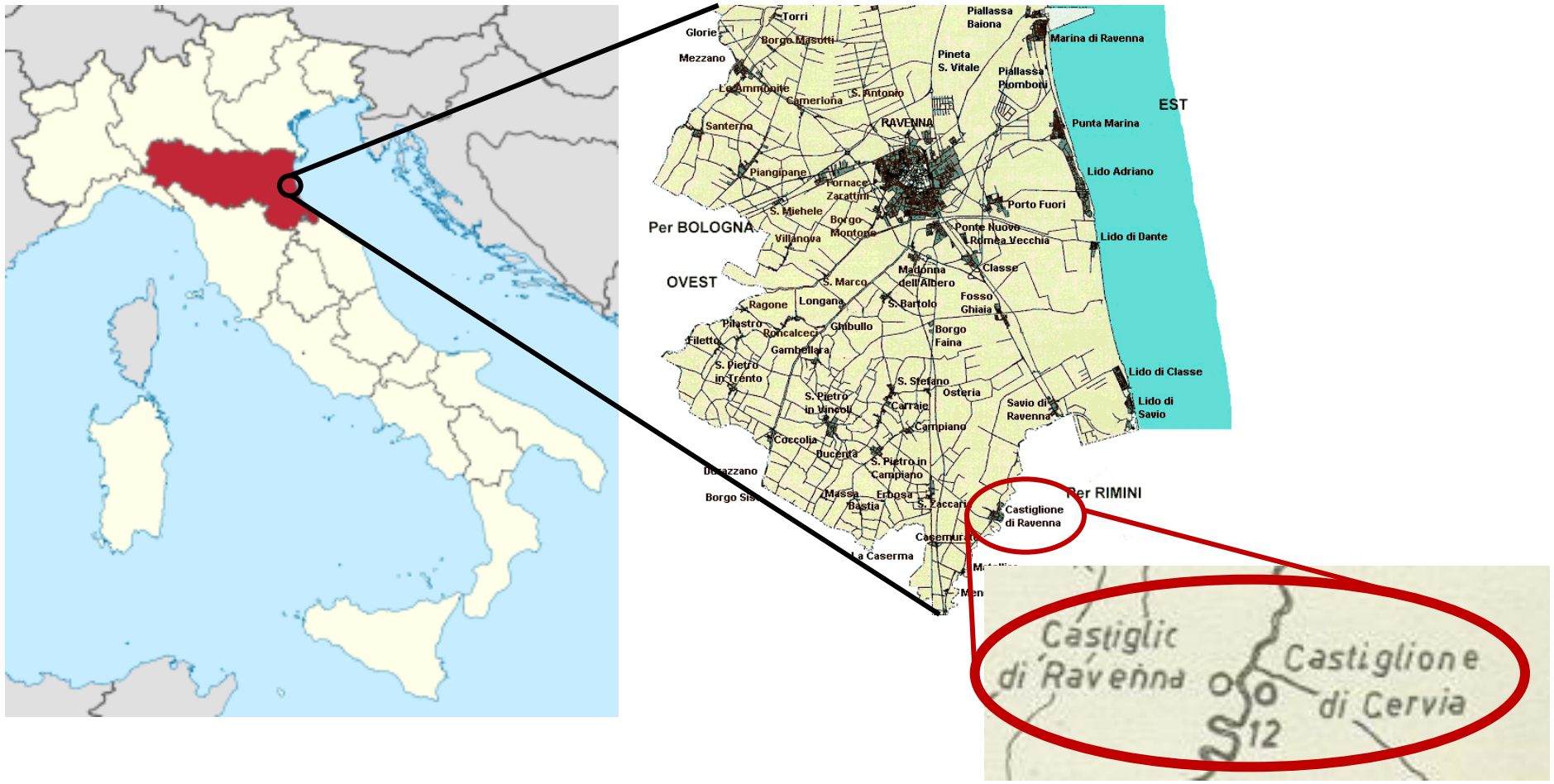


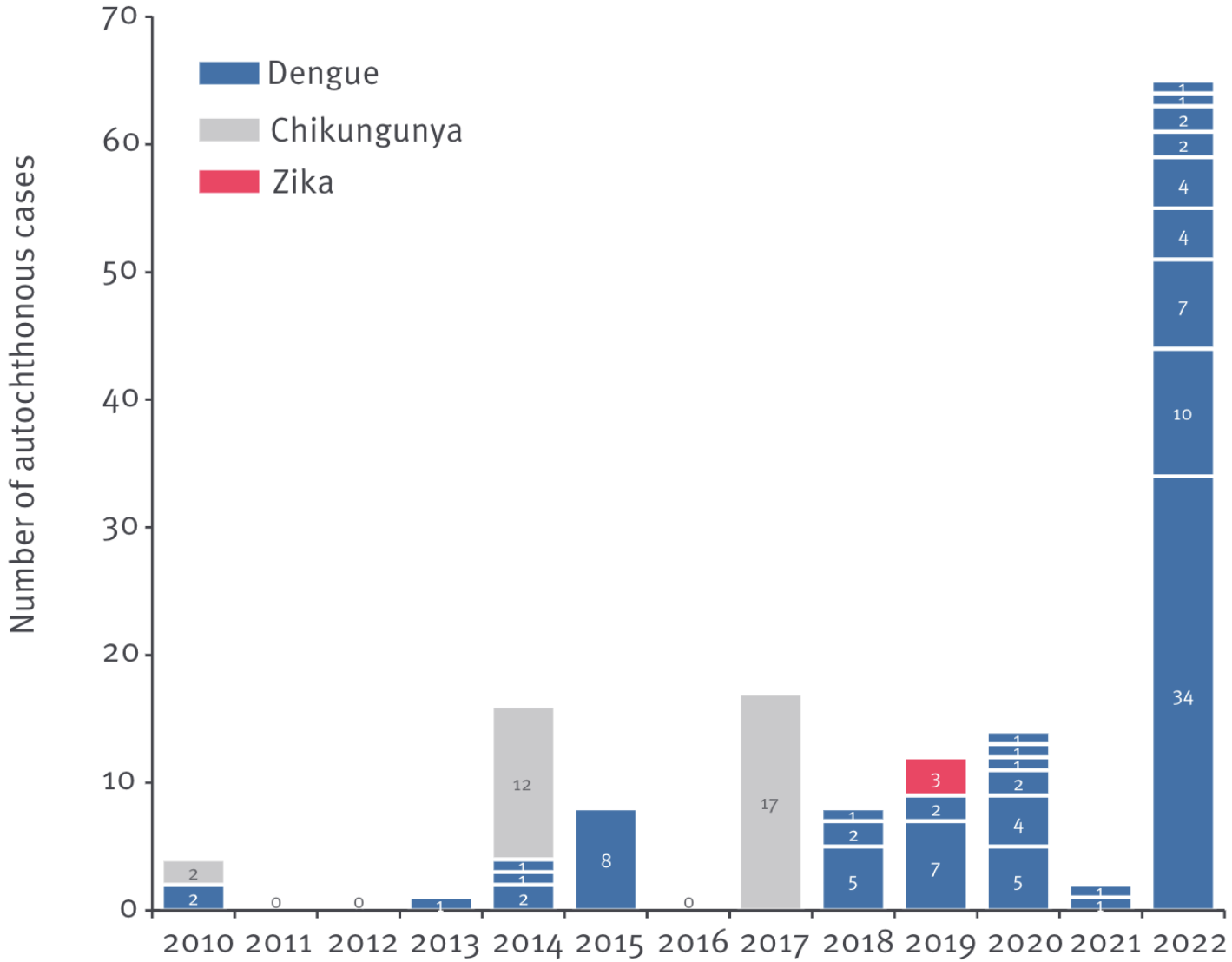
Aedes aegypti, May 2024



ECDC and EFSA, map produced on 22 May 2024. Data presented in this map are collected by the VectorNet project. Maps are validated by external experts prior to publication. Please note that the depicted data do not reflect the official views of the countries
* Countries/Regions are displayed at different scales to facilitate their visualisation.The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union.Administrative boundaries © EuroGeographics, UNFAO.

Epidemia di Chikungunya in Emilia-Romagna del 2007





Cochet et al. Eurosurveillance 2022

Transmission of autochthonous Aedes-borne arboviruses and related public health challenges in Europe 2007–2023: a systematic review and secondary analysis

Paolo Cattaneo,[a,i] Elena Salvador,[a,i] Mattia Manica,[b,i] Luisa Barzon,[c] Concetta Castilletti,[a] Francesco Di Gennaro,[d] Ralph Huits,[a] Stefano Merler,[b] Piero Poletti,[b] Flavia Riccardo,[e] Annalisa Saracino,[d] Francesco Segala,[d] Lorenzo Zammarchi,[f,g] Dora Buonfrate,[a,j] and Federico Gobbi[a,h,j,*]

Obiettivo primario:

- Descrivere le caratteristiche epidemiologiche della trasmissione autoctona delle arbovirosi trasmesse da zanzare *Aedes* in Europa

Obiettivi specifici:

- Stimare il numero medio di casi per outbreak
- Stimare la durata media di un outbreak
- Stimare il tempo medio impiegato dal sistema sanitario per rilevare un outbreak
- Determinare i fattori alla base della decisione medica di effettuare un test diagnostico per arbovirosi trasmesse da zanzare *Aedes*
- Stimare il tempo medio per implementare interventi di controllo dopo la diagnosi di arbovirosi autoctona da parte del sistema sanitario.

Screening della letteratura per informazioni epidemiologiche sulla trasmissione autoctona vettoriale di DENV, CHIKV o ZIKV, da gennaio 2007 a gennaio 2024.

Definizione di caso autoctono: Infezione confermata in un individuo senza storia di viaggio in aree endemiche, né storia di rapporti sessuali o trasfusioni con individui infetti nelle due settimane precedenti l'insorgenza dei sintomi.

Esclusi: Studi che riportino esclusivamente casi identificati retrospettivamente tramite analisi sierologiche.

Alcune definizioni…

Local transmission event (LTE): tutti i casi autoctoni di DENV, CHIKV o ZIKV a trasmissione vettoriale tra loro correlati epidemiologicamente, eccetto i casi in cui analisi molecolari abbiano dimostrato trattarsi di ceppi differenti.

Link epidemiologico: presenza di casi autoctoni nella medesima regione geografica nello stesso (sec. definizione NUTS-3), o in caso di contatti diretti tra due o più casi.

Primary case: l'individuo che ha importato l'infezione in Europa contraendola in un'area endemica, originando un LTE di DENV, CHIKV o ZIKV.

Index case: il primo caso autoctono diagnosticato in un LTE

First symptomatic case: il primo caso a sviluppare sintomi all'interno di un LTE, che può coincidere o meno con l'index case.

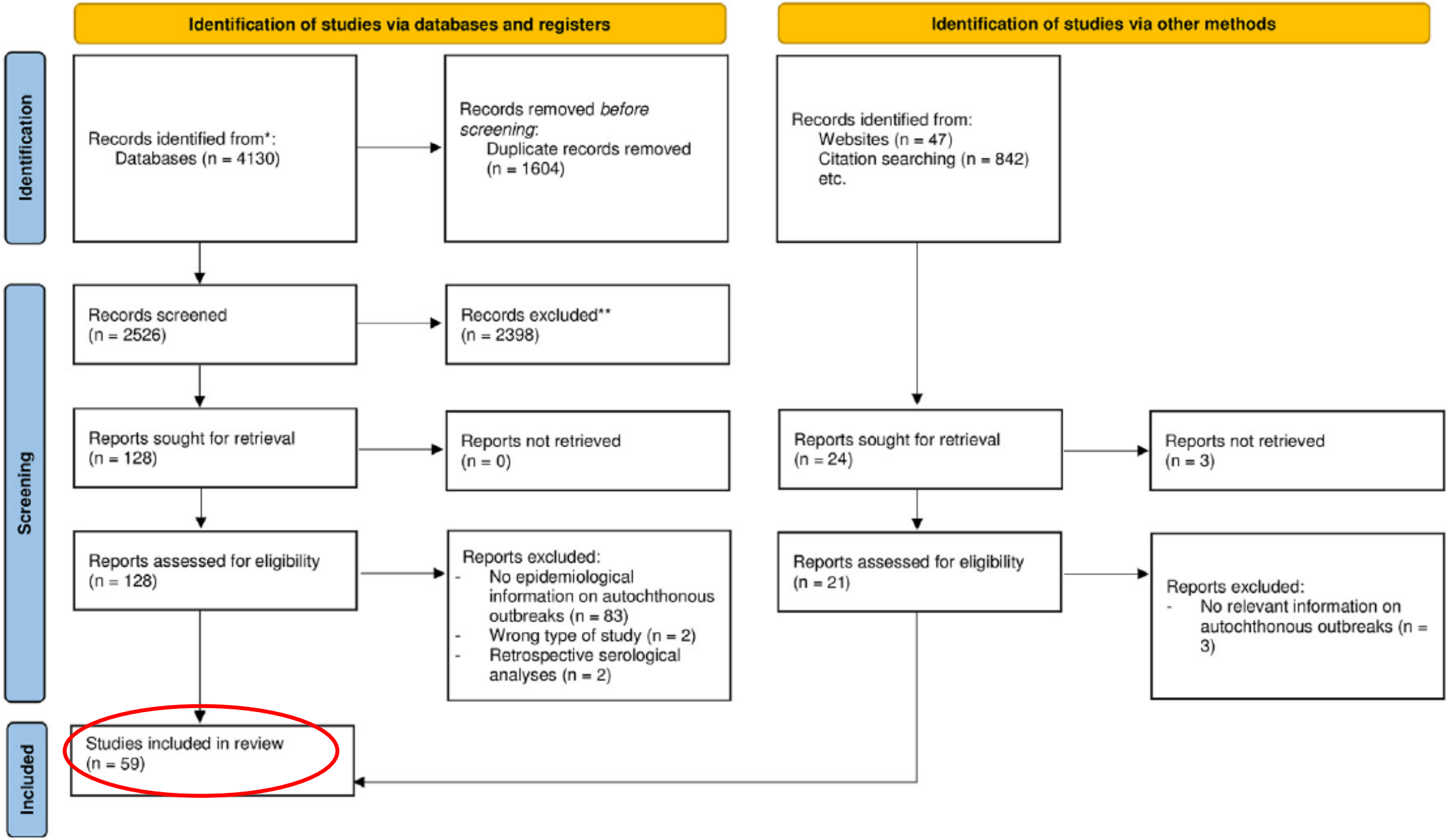
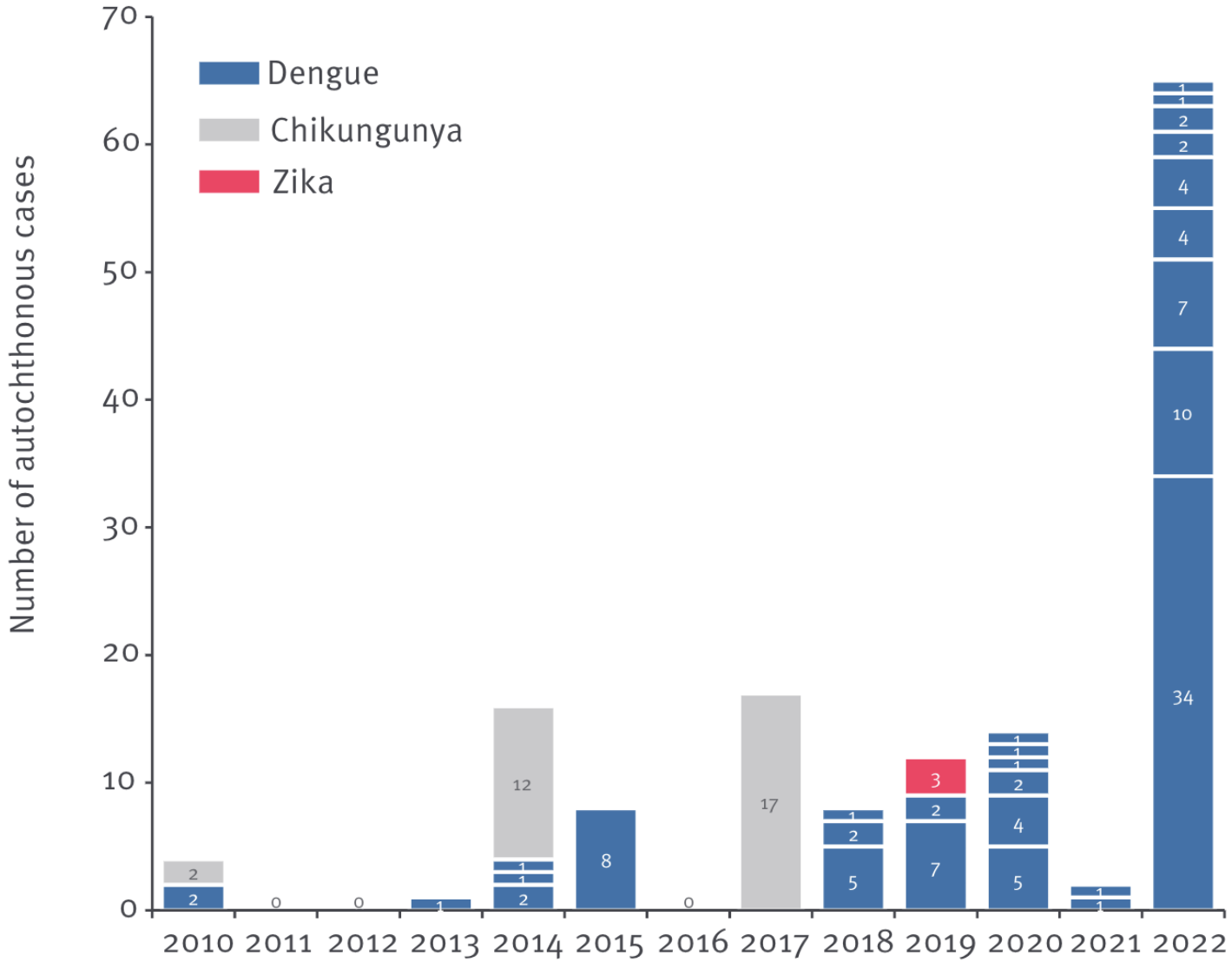

Identification of studies via databases and registers
Identification of studies via other methods
Identification
Screening
Included
Records identified from*:
Databases (n = 4130)
Records removed *before screening*:
Duplicate records removed (n = 1604)
Records identified from:
Websites (n = 47)
Citation searching (n = 842)
etc.
Records screened
(n = 2526)
Records excluded**
(n = 2398)
Reports sought for retrieval
(n = 128)
Reports not retrieved
(n = 0)
Reports sought for retrieval
(n = 24)
Reports not retrieved
(n = 3)
Reports assessed for eligibility
(n = 128)
Reports excluded:
- No epidemiological information on autochthonous outbreaks (n = 83)
- Wrong type of study (n = 2)
- Retrospective serological analyses (n = 2)
Reports assessed for eligibility
(n = 21)
Reports excluded:
- No relevant information on autochthonous outbreaks (n = 3)
Studies included in review
(n = 59)

Table 1. Number of reports and related cases/LTEs (local transmission events) per viral infection

	Number of reports	Total cases	Number of LTEs	Number of LTEs by country		Years of occurrence of LTEs
DENV	39*	1,346^	50	Croatia	1	2010
				France	37	2010, 2013, 2014, 2015, 2018, 2019, 2020, 2021, 2022, 2023
				Italy	6	2020, 2023
				Portugal (Madeira)	1	2012
				Spain	5	2018, 2019, 2022, 2023
CHKV	21*	515	5	France	3	2010, 2014, 2017
				Italy	2	2007, 2017
ZIKV	1	3	1	France	1	2019
Total	59*	1,864	56			

* A total of 59 reports are included in the meta-analysis; 2 reports deal with both DENV and CHIKV autochthonous outbreaks.

^ 266 cases from outbreaks in continental Europe; 1,080 cases from the DENV outbreak in Madeira.



Cochet et al. Eurosurveillance 2022

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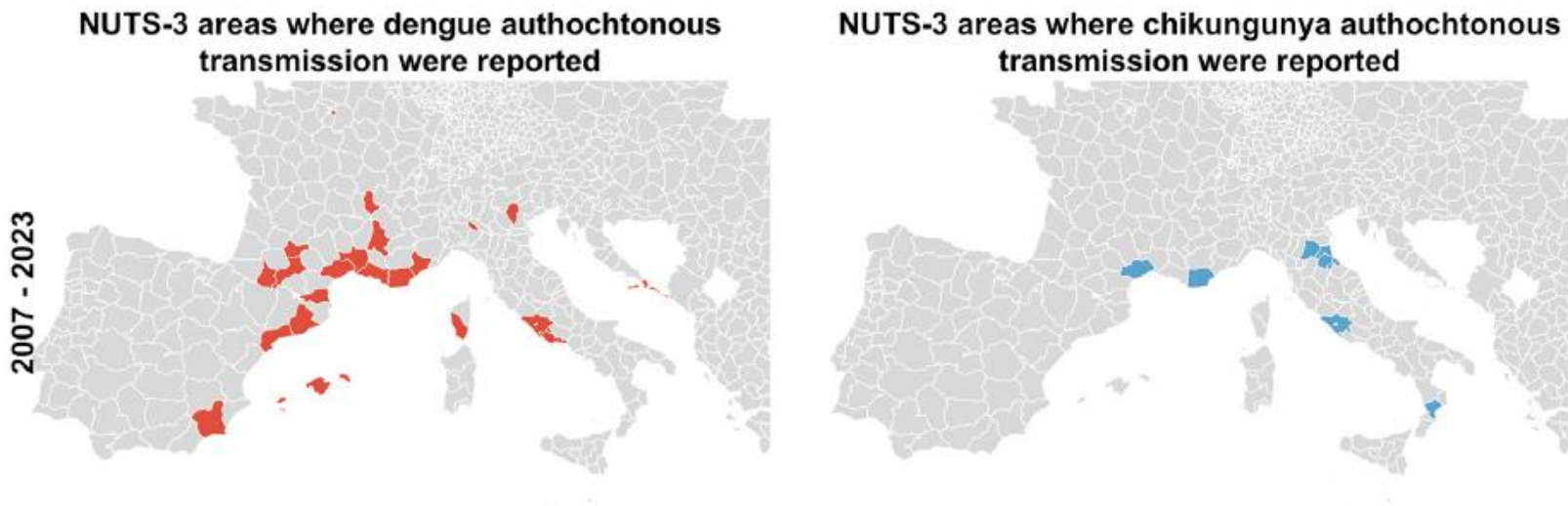
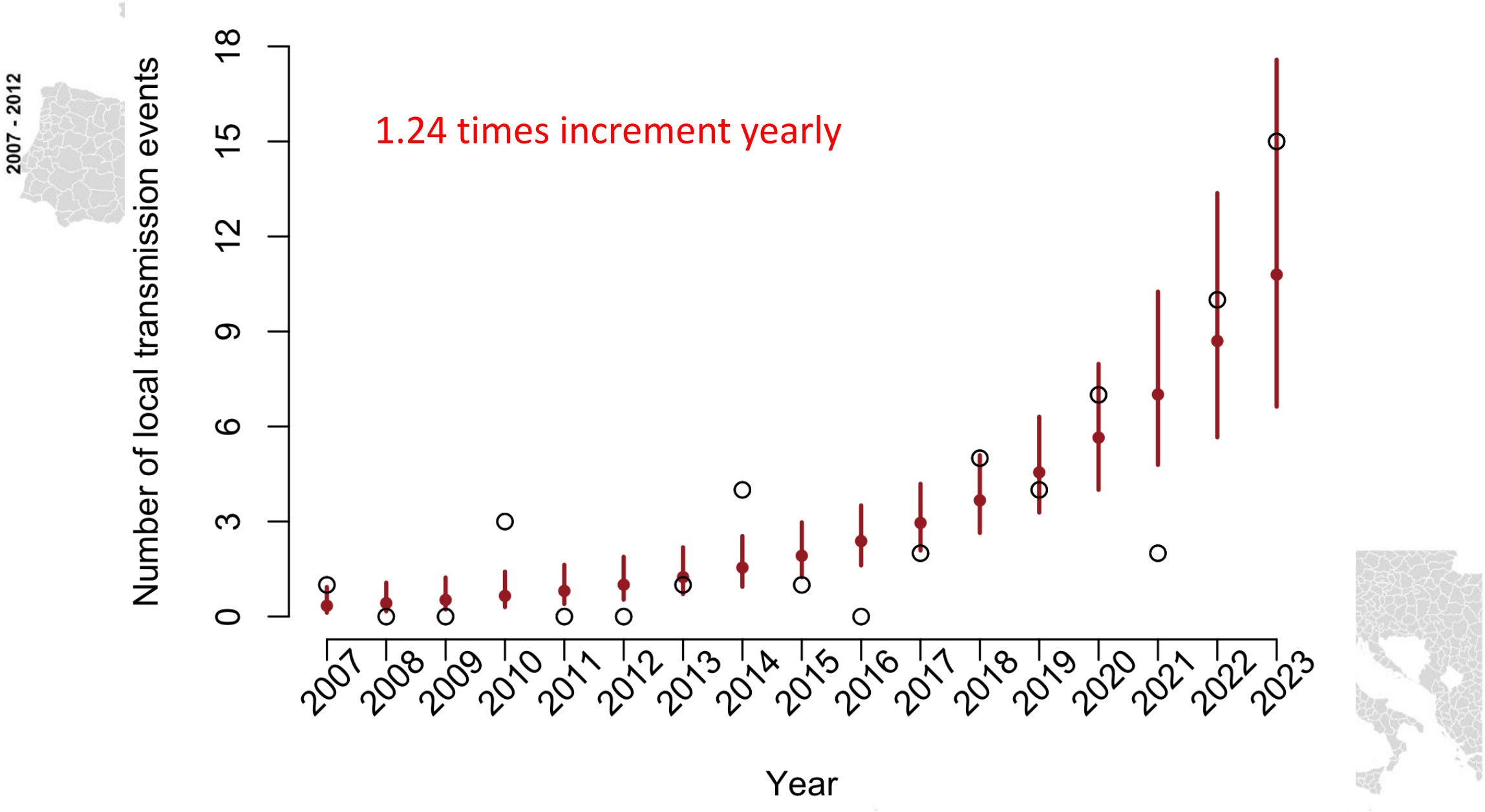
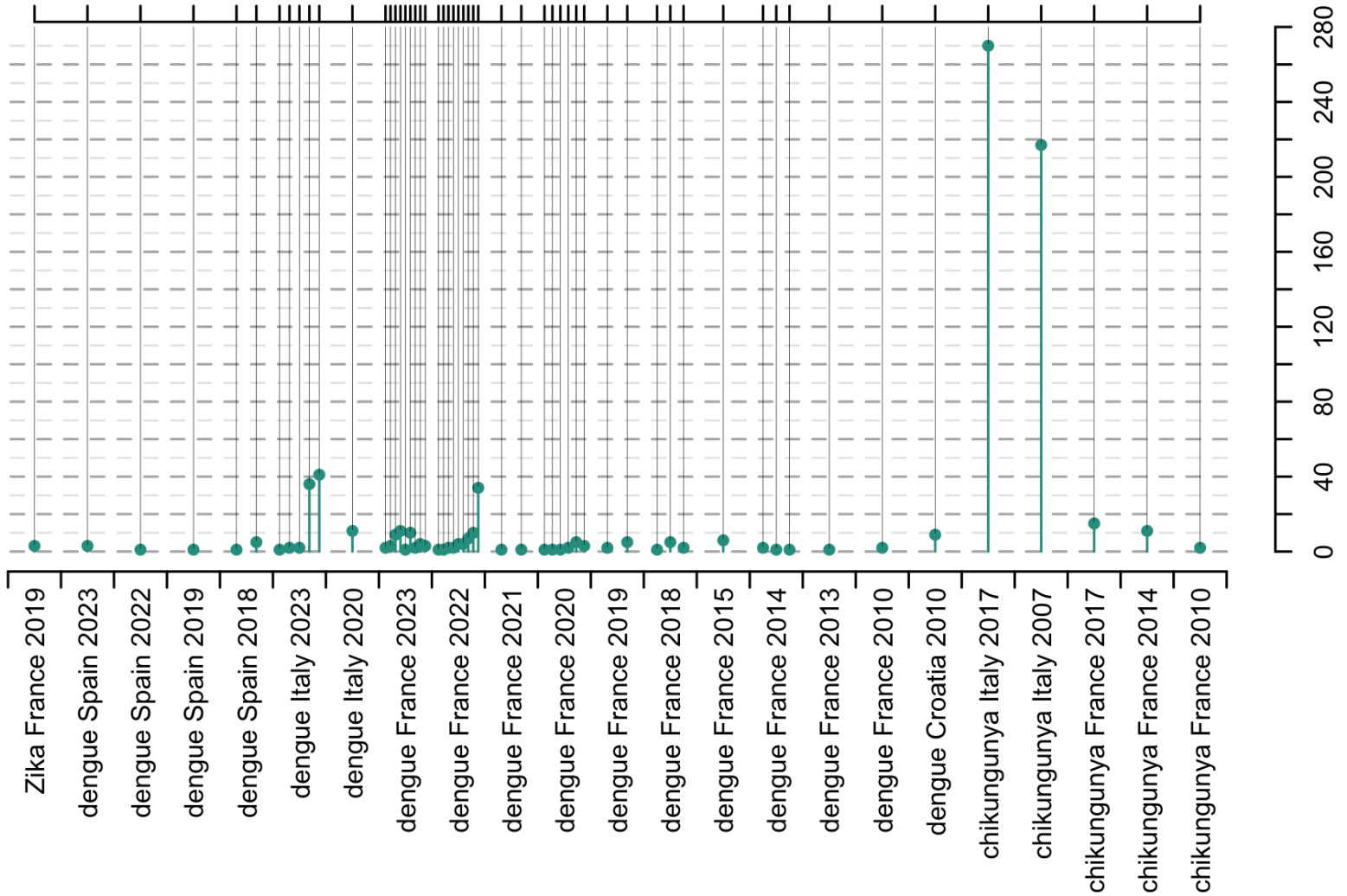
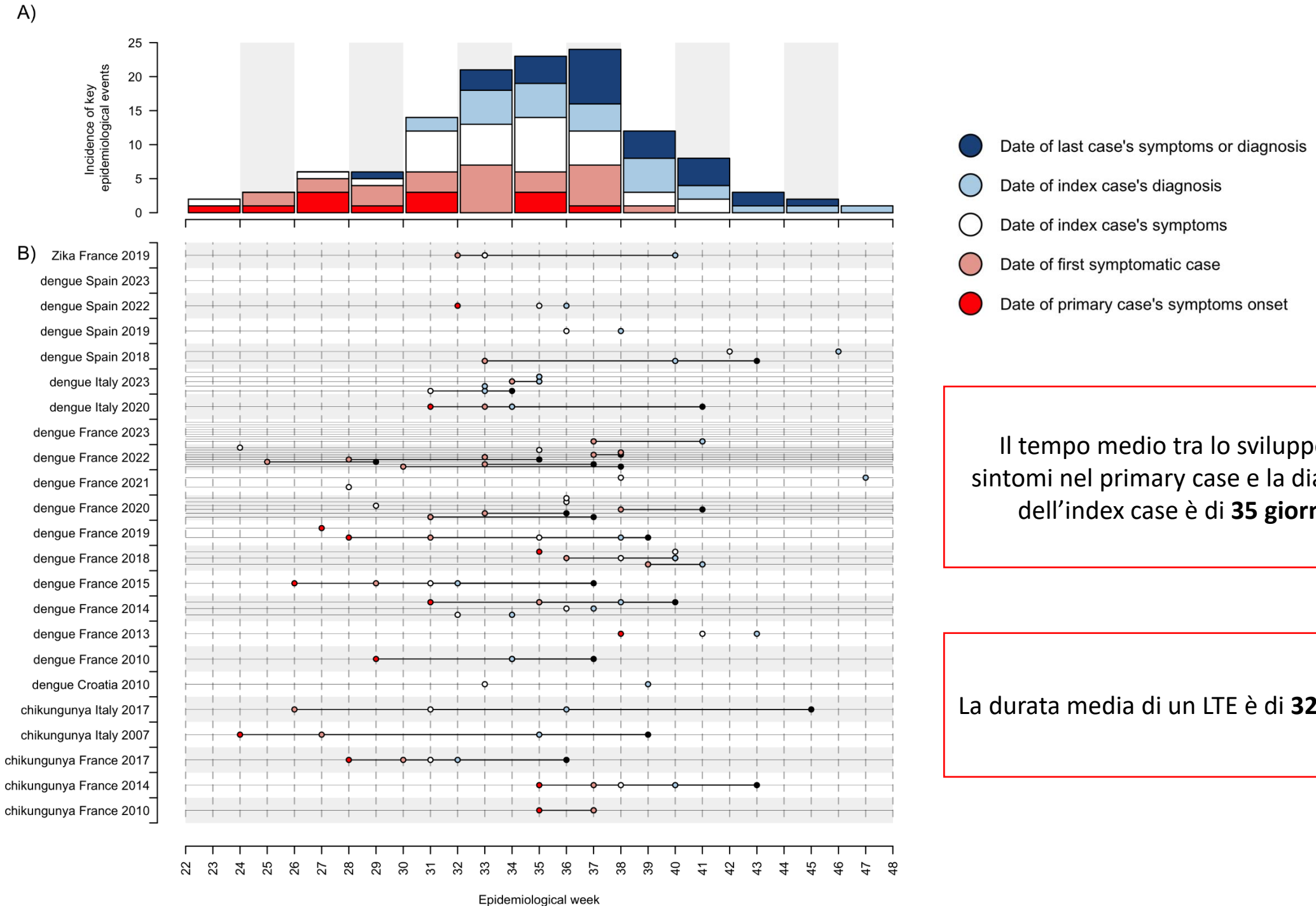

NUTS-3 areas where dengue authochtonous transmission were reported
NUTS-3 areas where chikungunya authochtonous transmission were reported
2007 - 2023


2007 - 2012
1.24 times increment yearly
Number of local transmission events
0
3
6
9
12
15
18
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Year

Il numero medio di casi per LTE è notevolmente maggiore in Italia



- 2 DENV cases per LTE on average (median)
- 15 CHIKV cases per LTE on average (median)



Il tempo medio tra lo sviluppo di sintomi nel primary case e la diagnosi dell'index case è di **35 giorni**.

La durata media di un LTE è di **32 giorni**.

- Il ritardo medio tra l'insorgenza dei sintomi nel primary case e la diagnosi dell'index case correla con la "grandezza" di un LTE (numero di casi diagnosticati) solo per CHIKV, e solo debolmente.

- Il primary case è stato identificato solo per il 35% degli LTE di DENV e l'80% di quelli di CHIKV.

- Le indagini diagnostiche per arbovirosi che hanno portato alla diagnosi dell'index case sono state richieste sulla base del sospetto clinic/bioumorale sono in una minoranza di casi.

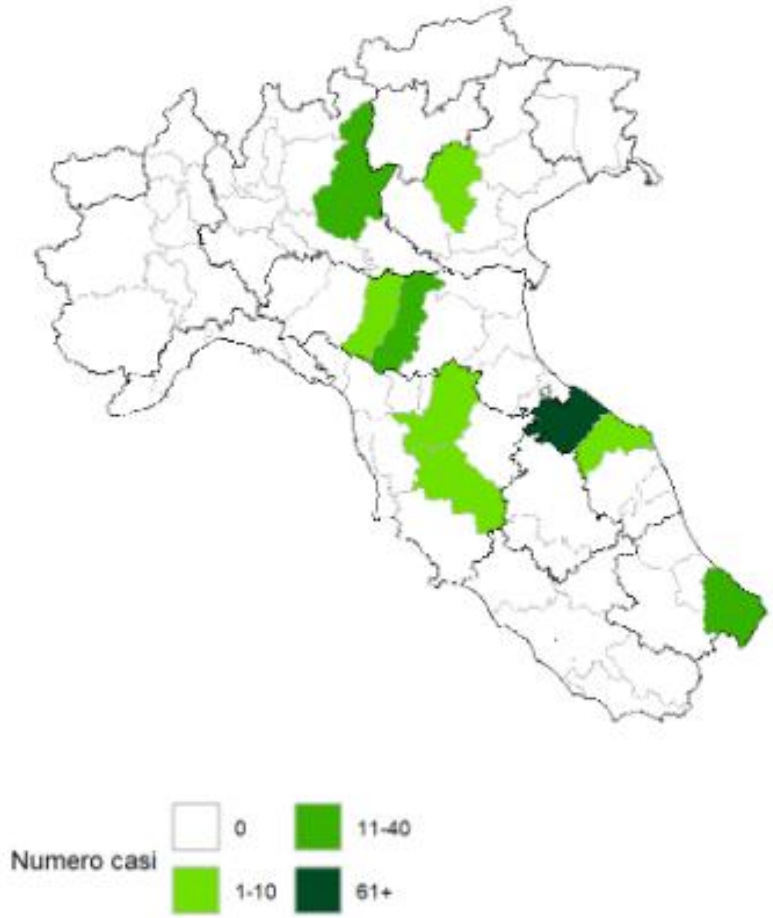
- Le informazioni sugli interventi di controllo da parte dei servizi di salute pubblica sono estremamente limitate (la data d'inizio è stata reperita solo per meno del 30% dei casi).

- Sulla base dei pochi dati disponibili, un ritardo maggiore nell'implementazione degli interventi di controllo non sembra correlare con un maggior numero di casi per LTE, né con una maggior durata dello stesso.

2024	France	Alpes-Maritimes (17 cases in 3 clusters), Drôme (2 cases), Hérault (3 cases in 2 clusters), Pyrénées-Orientales or Lozère (2 cases), Vaucluse (18 cases), Var (41 cases in 3 clusters) departments	83	Mid-June - October	[35-37]
2024	Italy	Abruzzo (15 cases), Emili (12 cases), the Marches (Veneto (1 case) regions*			
2024	Spain	Catalonia region (Tarrago			

https://www.ecdc.europa.eu/en/all-topics-z/dengue/surve

2024



www.epicentro.iss.it

Description and comparison of national surveillance systems and response measures for *Aedes*-borne diseases in France, Italy and Portugal: a benchmarking study, 2023

Emmanouil Alexandros Fotakis[1,2],*, Berta Grau-Pujol[1,3,4,*], David Kelly[1,5,*], Pedro Pinto Leite[3], João Vieira Martins[3], Maria João Alves[6], Marco Di Luca[2], Giulietta Venturi[2], Federica Ferraro[7], Florian Franke[5], Clément Pietin[8], Clémentine Calba[5], Tanja Charles[9], Flavia Riccardo[2,], Paula Vasconcelos[4,**], Lauriane Ramalli[5,**]**

1. ECDC Fellowship Programme, Field Epidemiology path (EPIET), European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden
2. Department of Infectious Diseases, Istituto Superiore di Sanità, Rome, Italy
3. Directorate of Information and Analysis, Directorate-General of Health, Lisbon, Portugal
4. Public Health Emergency Operations Centre, Directorate-General of Health, Lisbon, Portugal
5. Santé Publique France, French National Public Health Agency, Marseille, France
6. Centre for Vectors and Infectious Diseases Research, National Institute of Health Doutor Ricardo Jorge, Lisbon, Portugal
7. Ministry of Health, Rome, Italy
8. Department of Public Health and Environment, Agence Régionale de Santé, Provence Alpes-Côte d'Azur, France
9. Robert Koch Institute, Department for Infectious Disease Epidemiology Unit for crisis management, outbreak investigations and training programmes, Berlin, Germany

* These authors contributed equally to this work and share first authorship.
** These authors contributed equally to this work and share last authorship.

Correspondence: Pedro Pinto Leite (pedroleite@dgs.min-saude.pt)

Background: Regions of southern Europe are increasingly colonised by *Aedes albopictus*, with incidence of autochthonous dengue cases rising in recent years.

Aim: We describe and compare *Aedes*-borne disease (dengue, chikungunya and Zika) incidence from 2017 to 2023, and the surveillance systems and response measures operating in France, Italy and Portugal in 2023, to improve surveillance, prevention, preparedness and response in Europe.

Methods: We performed a benchmarking analysis to systematically capture the systems used in each country. We collected data from key-informant interviews, national guidelines, reports and scientific literature using a standardised questionnaire adapted from the European Centre for Disease Prevention and Control framework.

Results: All three countries have an integrated surveillance system for *Aedes*-borne diseases and share similarities in surveillance type, geographic coverage and case definitions. Differences entail mainly event-based and active surveillance activities. Geographic coverage of vector surveillance is national in France and Portugal but regional in Italy. In response to autochthonous transmission, all countries implement/foresee active case-finding and blood safety protocols, while France and Italy strongly rely on vector control. Upon vector detection in non-colonised areas, the three countries implement ad hoc entomological surveillance and vector control.

Conclusions: Surveillance systems and response measures in France, Italy and Portugal are broadly similar, with variations reflecting differences in healthcare system organisation (centralised in Portugal and France, regionalised in Italy), *Ae. albopictus* distribution and local transmission of *Aedes*-borne diseases. Risk-based surveillance, considering the national and cross-border epidemiological and entomological situations, can strengthen preparedness and early warning for *Aedes*-borne diseases in Europe.

Perché una diagnosi tempestiva delle arbovirosi?

- Gestione ottimale del paziente
  - Interventi terapeutici
  - Evitare indagini diagnostiche non necessarie
- Sanità pubblica
  - Interventi di controllo del focolaio
  - Rischio per i residenti o i viaggiatori
  - Maggior comprensione dell’epidemiologia e della catena di trasmissione
  - Avere dati adeguati su cui pianificare strategie di controllo future

DENGUE

Presentazione clinica

- Si stima che l'80 % delle infezioni siano asintomatiche
- Incubazione infezioni sintomatiche: 5-7 giorni (range 3-14 giorni)
- Sintomi più frequenti:
  - febbre alta improvvisa
  - cefalea severa
  - dolore retro-orbitale
  - artromialgie
  - rash maculare o maculopapulare dopo alcuni giorni
  - emorragie minori (petecchie, ecchimosi, porpura, epistassi, gengive sanguinanti, ematuria, etc)
- Clinica spesso ad andamento bifasico (breve remissione dopo il 3°giorno). La sintomatologia dura raramente più di 10 giorni. Convalescenza a volte prolungata e debilitante
- < 5% dei casi sintomatici decorre severamente. Possibile evoluzione fatale (<1%)

https://www.ecdc.europa.eu/en/dengue

Rash maculare dorso

Esami ematochimici

Sono di frequente riscontro:

- Leucopenia (ma più specifica neutropenia)
- Piastrinopenia
- Ipertransaminasemia

microorganisms

MDPI

Article

Arbo-Score: A Rapid Score for Early Identification of Patients with Imported Arbovirosis Caused by Dengue, Chikungunya and Zika Virus

Iacopo Vellere [1], Filippo Lagi [1,2], Michele Spinicci [1,3], Antonia Mantella [1], Elisabetta Mantengoli [2], Giampaolo Corti [1,2], Maria Grazia Colao [4], Federico Gobbi [5], Gian Maria Rossolini [1,4], Alessandro Bartoloni [1,3] and Lorenzo Zammarchi [1,3,*]

Table 3. Multivariable model and risk score for arbovirosis.

Variables	OR_a (95% CI)	*p*	Regression Coefficient	Risk Score Weight
Rash	23.46 (2.79–196.88)	0.004	3.15	1
Thrombocytopenia	0.47 (0.06–3.55)	0.463	−0.76	na
Leukopenia	54.93 (4.56–661.57)	0.002	4.01	2
Hypertransaminasemia	9.41 (1.23–71.66)	0.031	2.24	1
People returning from Africa	0.04 (0.00–12.18)	0.278	−3.10	na
Retro-orbital pain	2.82 (0.35–22.90)	0.331	1.04	na
Conjunctival hyperemia	0.80 (0.07–9.52)	0.862	−0.22	na
Myalgia	13.48 (1.97–92.17)	0.008	2.60	1
Respiratory symptoms	0.10 (0.01–0.74)	0.024	−2.26	−1

Footnotes: na, not applicable.

Diagnosi di Dengue

Diagnosi differenziale

Features	Zika	Dengue	Chikungunya
Fever	++	+++	+++
Rash	+++	+	++
Conjunctivitis	++	-	-
Arthralgia	++	+	+++
Myalgia	+	++	+
Headache	+	++	++
Hemorrhage	-	++	-
Shock	-	+	-

… ma anche: Morbillo, Rosolia, V° malattia, *Streptococcus* B emolitico gruppo A, Leptospirosi, Malaria


THANK
YOU
ASANTE
ASANTE
OBRIGADO
GRAZIE
KIITOS
MERCI
SPASIBO
MATONDO
MAMANA
MULTUMESC
MOCHCHAKKERAM
NIRRINGRAZZJAK
RAIBH MAITH AGAT
KIA ORA
MATUR NUWUN
TERMA KASIH
CHOKRANE
ARIGATO
DANKON
MULTUMESC
UA TSAUG RAU KOJ
DANK JE
SALAMAT
WELALIN
TERMA KAS!!!
VINAKA
JUSPAXAR
MAAKE
CAM ON BAN