



WS 3 – How to tackle challenges related to the emerging tiger mosquitoes and related arboviruses



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Public Health Department, Emilia-Romagna Region
Italy



How to implement
health and wellbeing policies
on climate change

15-17 September 2025

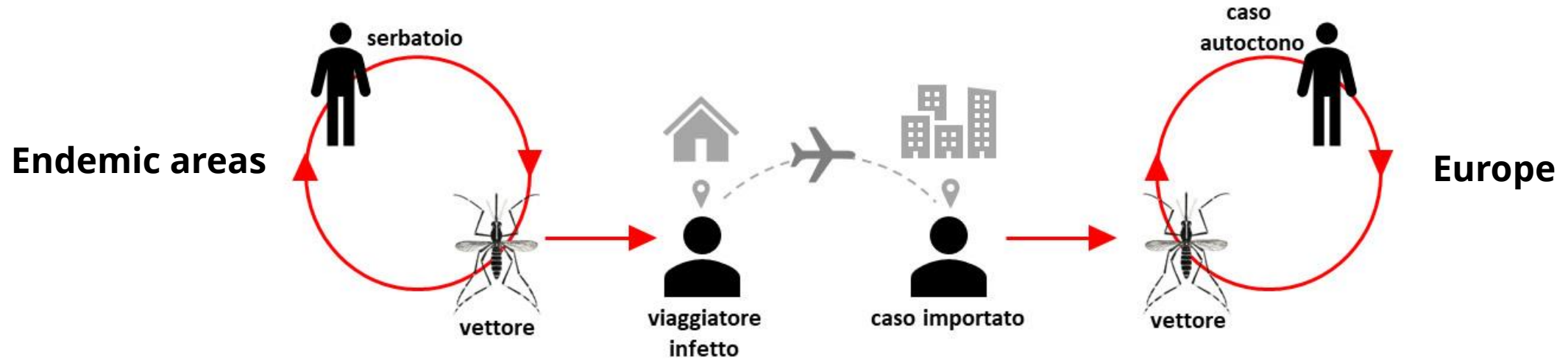
Simon Bolivarlaan, 17 - Brussels



Flanders
State of the Art

Chikungunya
Dengue
Zika virus

Aedes albopictus borne-diseases



An uninfected mosquito feeds on a person who has CHIKV circulating in their blood and ingest the virus.

The virus then replicates in the mosquito over several days, enters its salivary glands, and can be transmitted into a new human host when the mosquito bites them.

The virus again begins to replicate in this newly infected person and reaches high concentrations in their blood, at which point they can further infect other mosquitoes and perpetuate the transmission cycle



European Centre for Disease Prevention and Control

An agency of the European Union

World Mosquito Day 2025: Europe sets new records for mosquito-borne diseases - ECDC supporting Member States in adapting to 'new normal'

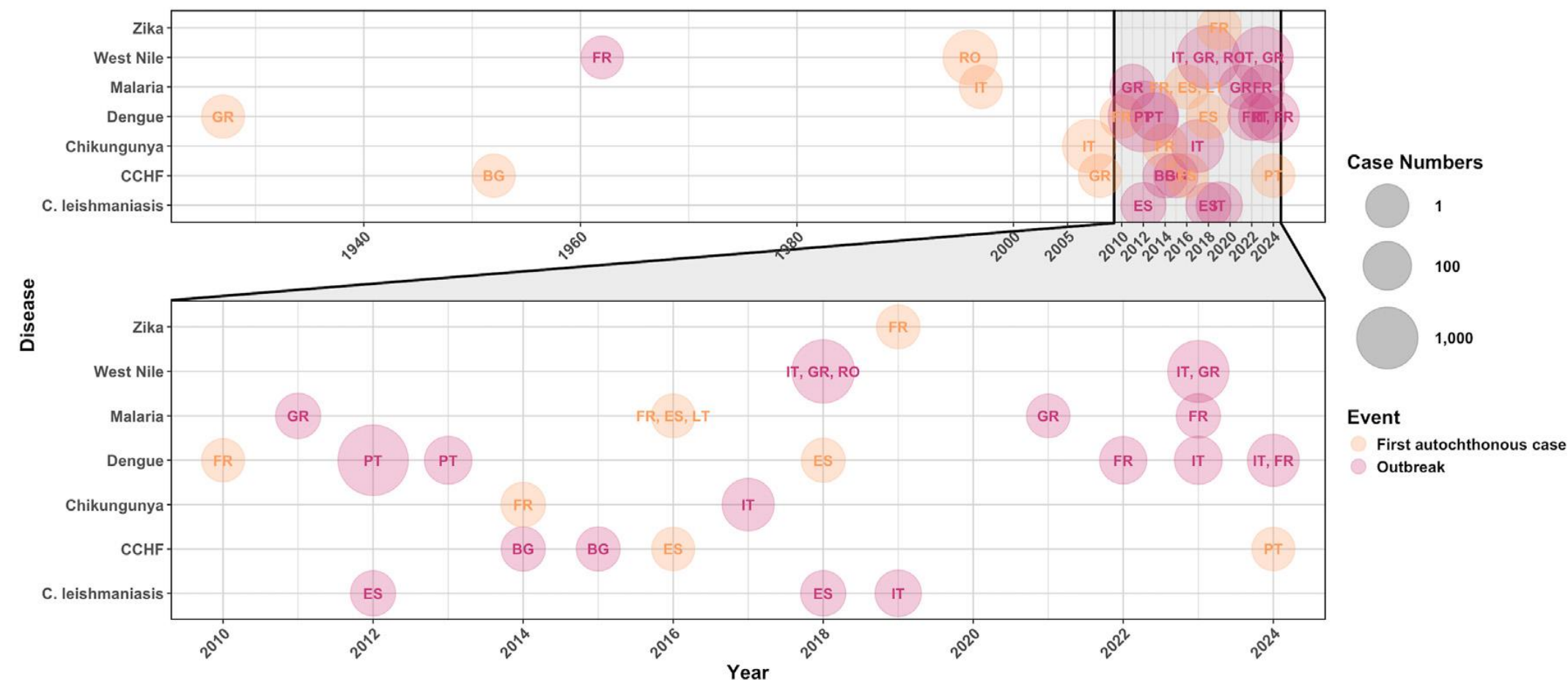
20 Aug 2025 Press Release

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'Europe is entering a new phase — where longer, more widespread and more intense transmission of mosquito-borne diseases is becoming the new normal. ECDC is working closely with all Member States to provide tailored support and timely public health guidance to strengthen Europe's response.'

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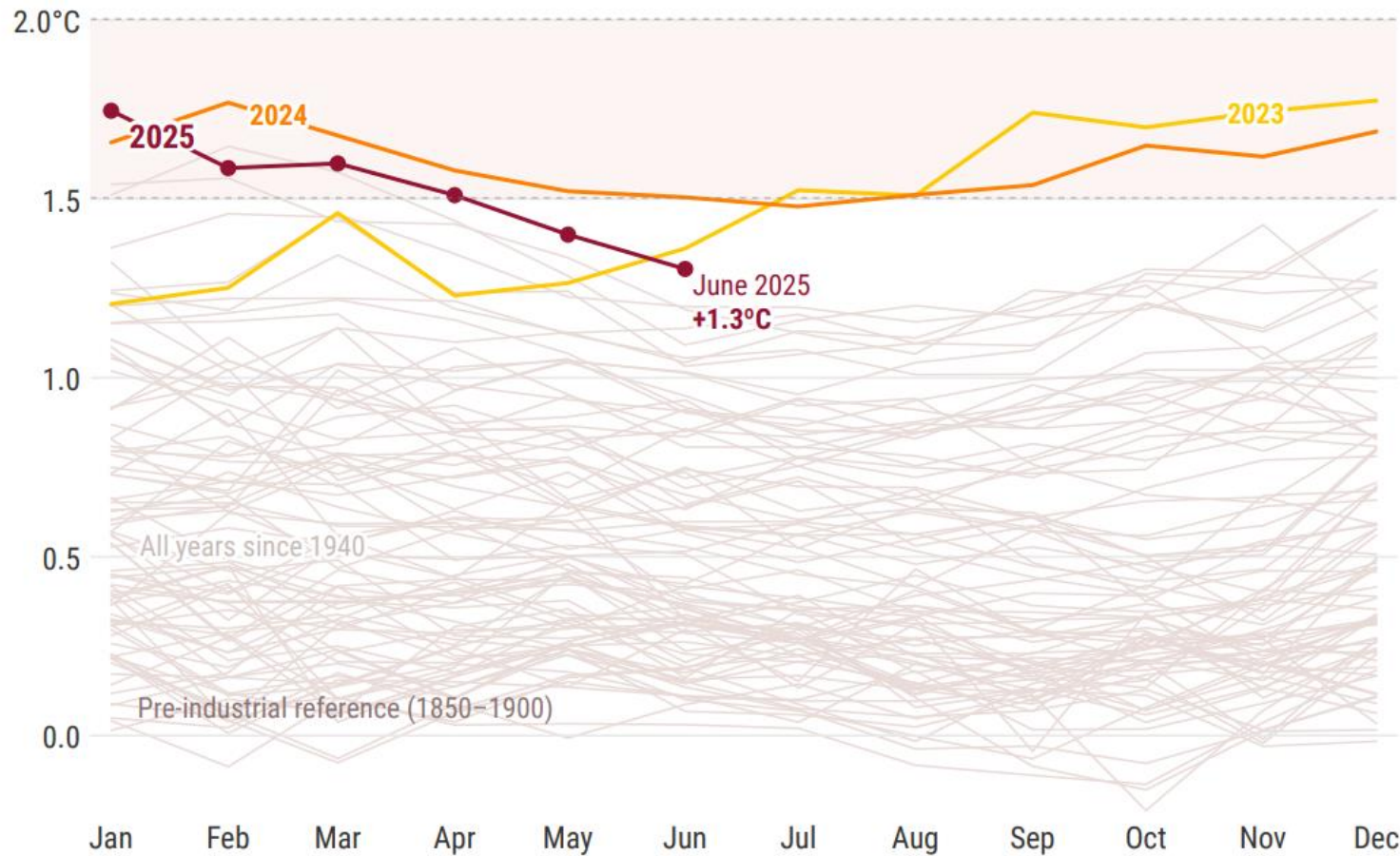
Cronology of indigenous VBD cases/outbreaks in Europe



A convergence of ecologic, economic and social factors has resulted in a marked increase in VBD introductions and transmission in Europe over the last two decades

Monthly global surface air temperature anomalies

Data source: ERA5 • Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF



Average temperature over European land for June 2025:

- 18.46°C, 1.10°C above the 1991-2020 average for June
- the fifth-warmest June in the record.

In Western Europe as a whole:

- June 2025 the warmest on record
- average temperature of 20.49°C, 2.81°C above the 1991–2020 average.
- the previous June record set was in 2003 with 20.43°C.



PROGRAMME OF
THE EUROPEAN UNION



IMPLEMENTED BY



Mean summer temperature showed a strikingly high Hazard Ratio of 1.55 (95% CI 1.30–1.85) per 1°C increase ($p < 0.0001$).

Warmer summer temperatures significantly amplify outbreak risk.

Impact of climate and *Aedes albopictus* establishment on dengue and chikungunya outbreaks in Europe: a time-to-event analysis

Zia Farooq*, Leo Segelmark*, Joacim Rocklöv, Kate Lillepold, Maquines Odhiambo Sewe, Olivier J T Briet, Jan C Semenza

www.thelancet.com/planetary-health Vol 9 May 2025

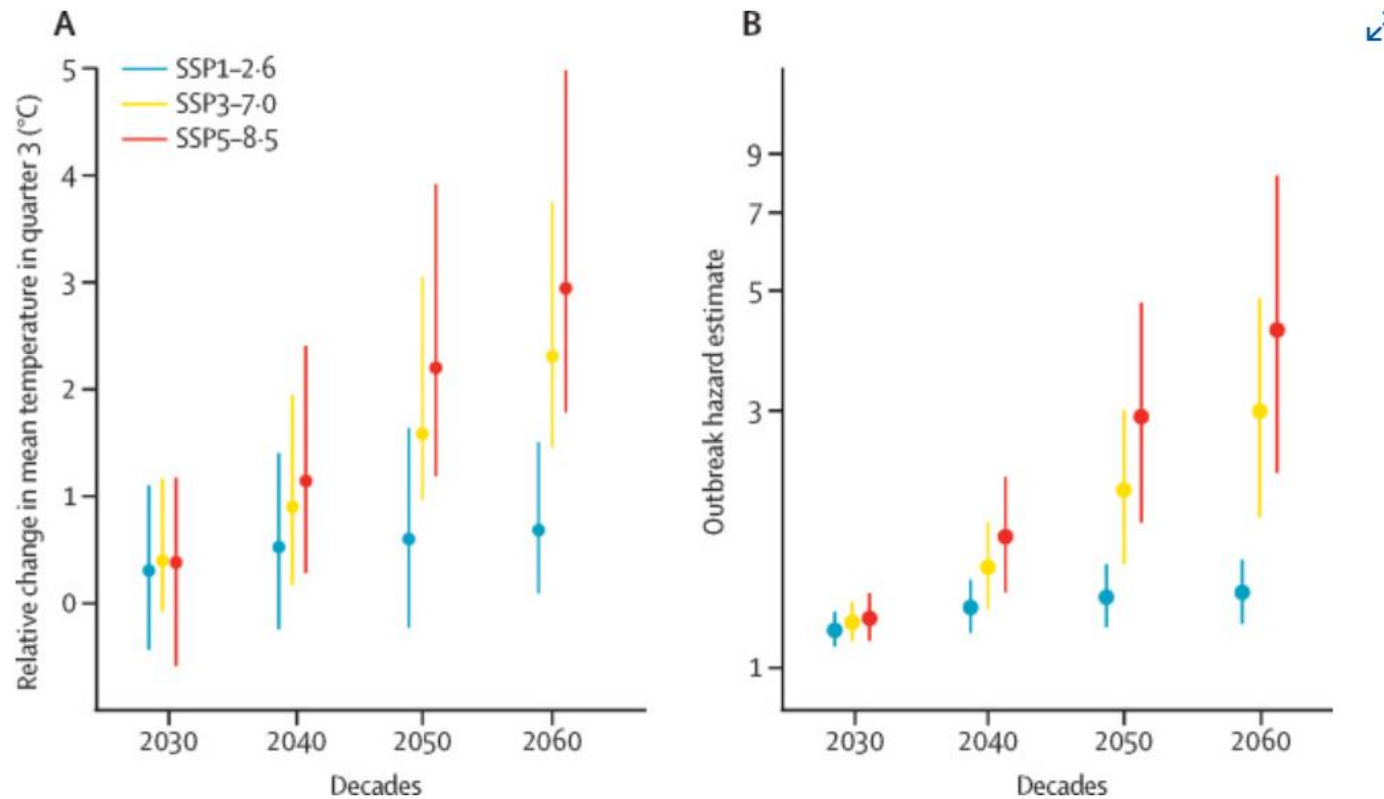
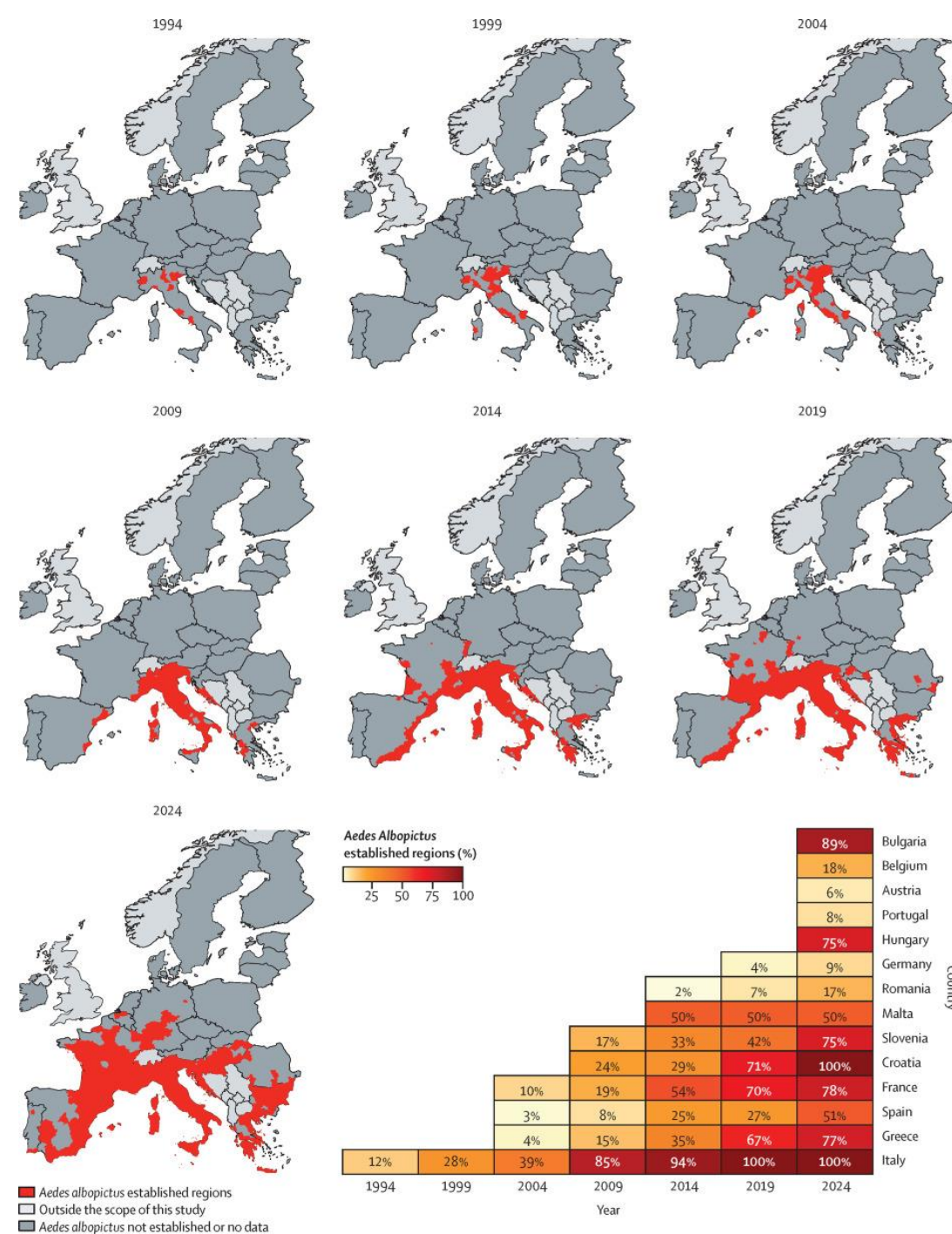


Figure 5 Projected change in mean summer temperature (°C) compared with the baseline period (1990–2024) under three climate change scenarios (SSP1–2.6, SSP3–7.0, and SSP5–8.5) from the 2030s to the 2060s at a decadal scale (A), and the projected relative change in outbreak hazard estimates for NUTS 3 regions with established *Aedes albopictus* populations driven by changes in the chosen variables (B)



Ae albopictus was first introduced in 1990 in Genova, Italy.

It appeared in France only in 1999.

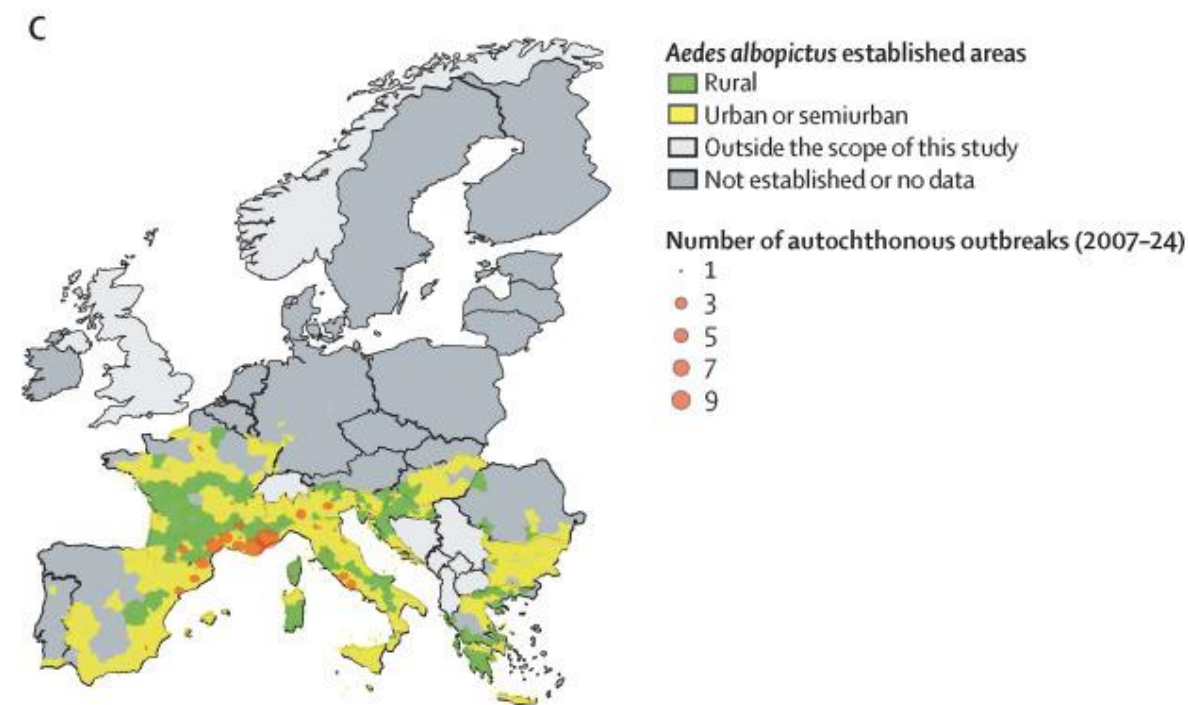
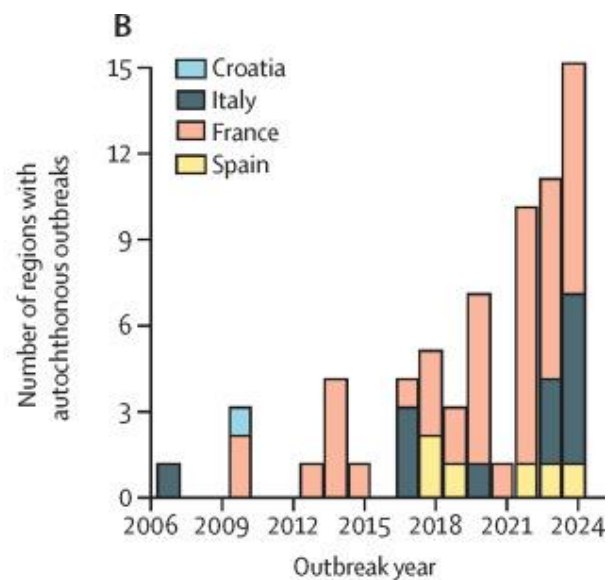
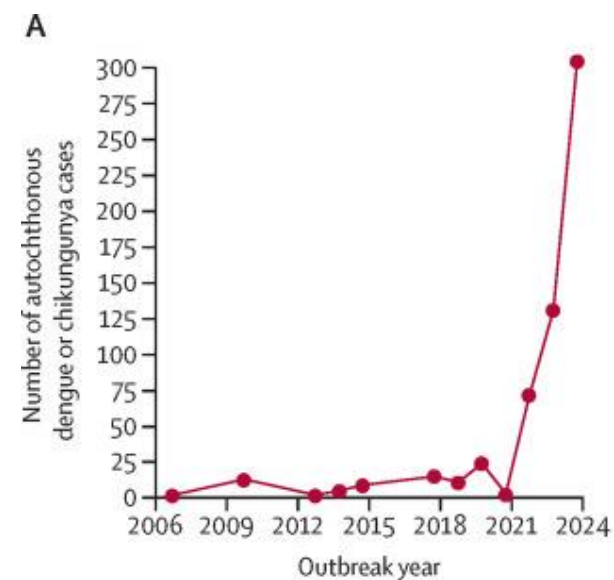
By 2010 it was established (with evidence of local reproduction and overwintering) in 129 regions across seven countries.

In 2024 fourteen countries

Impact of climate and *Aedes albopictus* establishment on dengue and chikungunya outbreaks in Europe: a time-to-event analysis

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Until 2024, there have been 66 autochthonous dengue and chikungunya outbreaks in the EU

In 2024, there were a total of 304 dengue cases; a historic peak compared with the combined total of 275 cases in the previous 15 years

Autochthonous outbreaks have been reported in four countries: Croatia, Italy, France, Spain

75% of affected areas are urban or semi-urban areas

Impact of climate and *Aedes albopictus* establishment on dengue and chikungunya outbreaks in Europe: a time-to-event analysis

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Seasonal surveillance of chikungunya virus disease in the EU/EEA, weekly report



European Centre for Disease Prevention and Control

An agency of the European Union

Week 37, 2025

Based on data submitted up to 10 September 2025

Epidemiological summary

Since the beginning of 2025 and as of 10 September 2025, two countries in Europe have reported cases of chikungunya virus disease: **France** (383) and **Italy** (167).

In the past week, France has reported 82 new locally acquired¹ cases of chikungunya virus disease. The cumulative number of locally acquired cases in France has reached 383, distributed across 37 clusters. Twenty-six clusters are currently active. The largest cluster is located in Bergerac and consists of 54 cases.

Italy reported 60 new locally acquired cases of chikungunya virus disease. The total number of locally acquired cases in Italy is 167, distributed across four clusters. Three clusters are currently active. The largest cluster is located in Carpi, San Prospero and Soliera, and consists of 134 cases.

208

Casi*

47% | 53%

Maschi | Femmine*

60 anni

Età mediana*

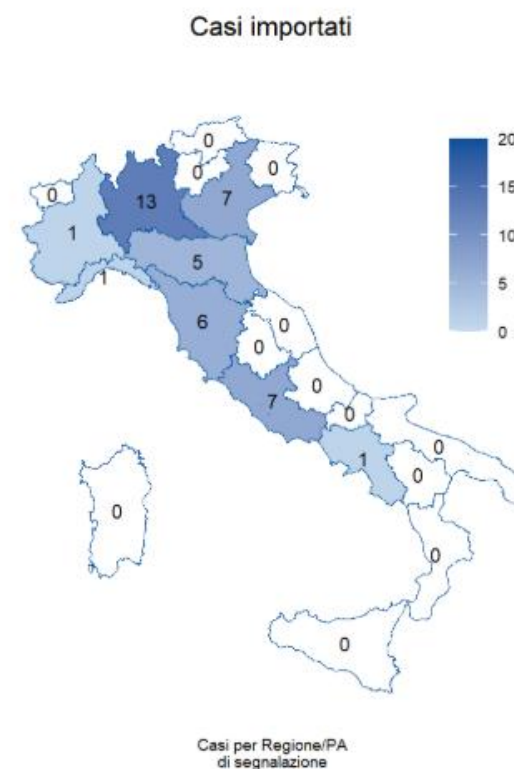
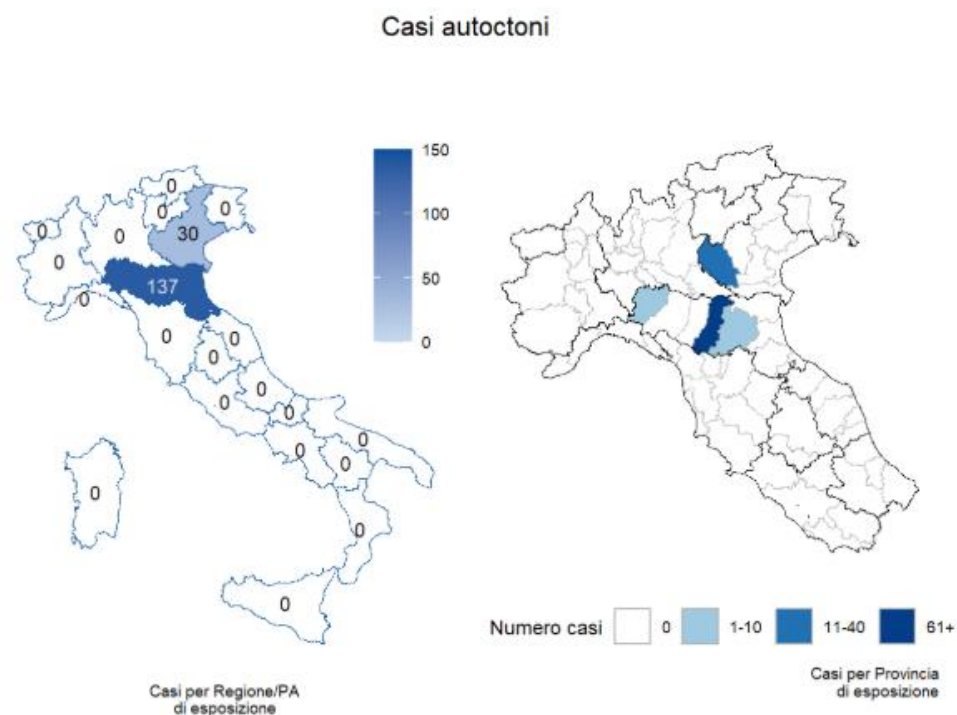
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Decessi*

167 casi | 41 casi

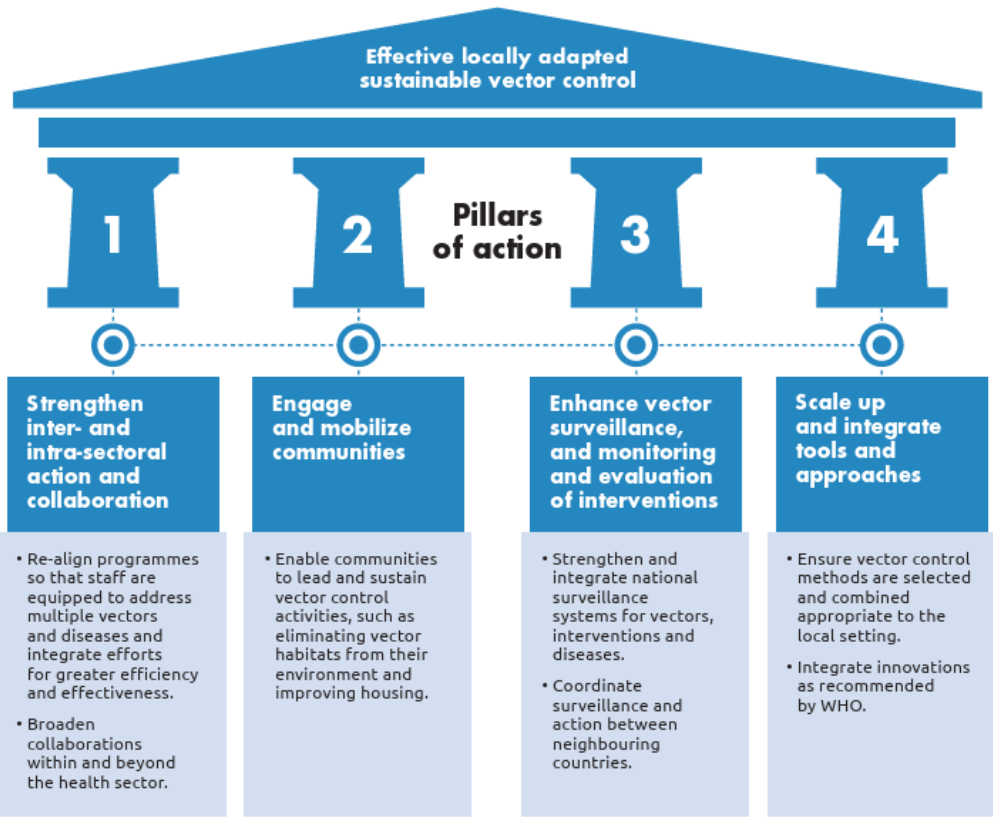
Autoctoni | Importati*

*Dati in fase di consolidamento

Casi per Regione/PA di diagnosi*

A GAME-CHANGING APPROACH

Key priority actions are outlined that will increase capacity, improve surveillance and better coordinate and integrate action across sectors and diseases.



Foundation

A Enhance vector control capacity and capability

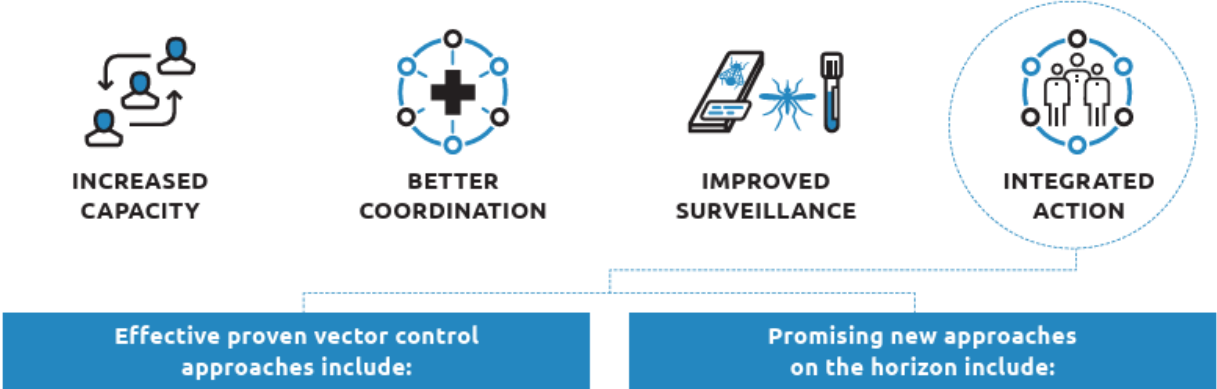
- Increase the number of public health entomologists worldwide.
- Ensure appropriate field and laboratory capacity to strength vector surveillance and control.

B Increase basic and applied research, and innovation

- Aggressively pursue research on promising innovations to build strong evidence base.
- Investigate better ways to implement existing tools and strategies.

WHAT IS COMPREHENSIVE VECTOR CONTROL?

For most vector-borne diseases, prevention by targeting vectors is the first and best approach. Millions of people have already benefitted from vector control, with major reductions in malaria, Chagas disease and onchocerciasis. But vector control has not been used to its full potential or sustained for maximum impact on other diseases. A comprehensive approach is required that enables:



GLOBAL VECTOR CONTROL RESPONSE 2017–2030

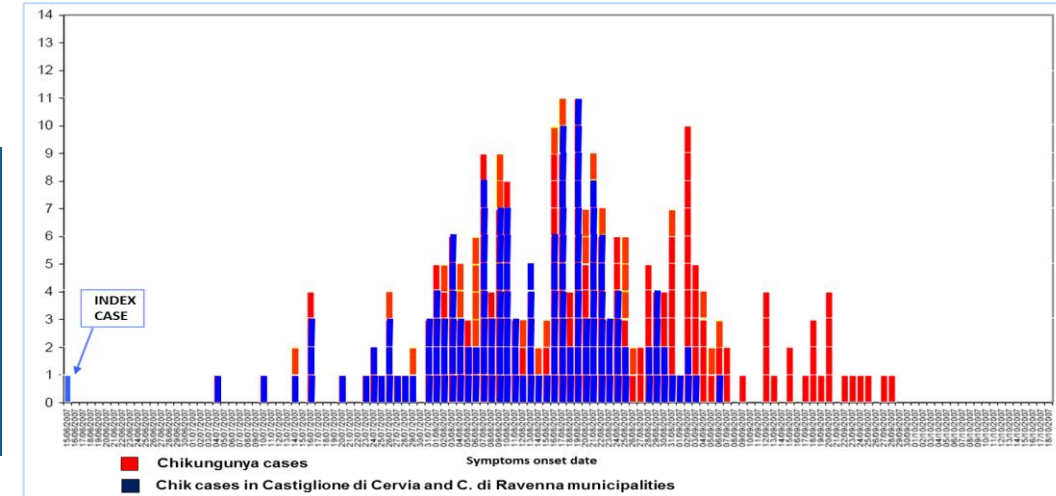


Regional Plan for VBD prevention

History

2007 – CHIKUNGUNYA OUTBREAK

- **217** confirmed cases ChikV (lab test)
- **30** probable cases ChikV (no lab confirmation)
- **4** involved Provinces (Ravenna, Forlì-Cesena, Rimini, Bologna)



2008	First Regional Plan in Emilia-Romagna for <i>Aedes</i> spp control and Chikungunya and Dengue prevention (March 2008 - Deliberative act of the regional government)
	August 2008 Detection of WNV circulation Specific surveillance plan for West Nile Disease (WND) in Emilia-Romagna
2011	For the first time the regional plan is integrated with the aim of surveillance and control of Chikungunya, Dengue e West Nile Disease
2013	The regional plan covers other VBD : TosV, UsuV
2016	The regional plan activates Zika virus surveillance
2018	Recrudescence of WNV circulation: the regional plan is strengthened with vector control interventions on areas where fragile people live (hospitals and retirement homes)
2020	National prevention, surveillance and response plan for arboviral diseases 2020-2025 , approved by the State-Regions and Autonomous Provinces Conference on 15 January 2020

Regional Plan for VBD prevention

A **One-Health approach** involving Public Health, Veterinary, Entomological and Environment Services.

- ✓ Human Surveillance
- ✓ Entomological surveillance
- ✓ Ornithological surveillance only for West Nile-Usutu

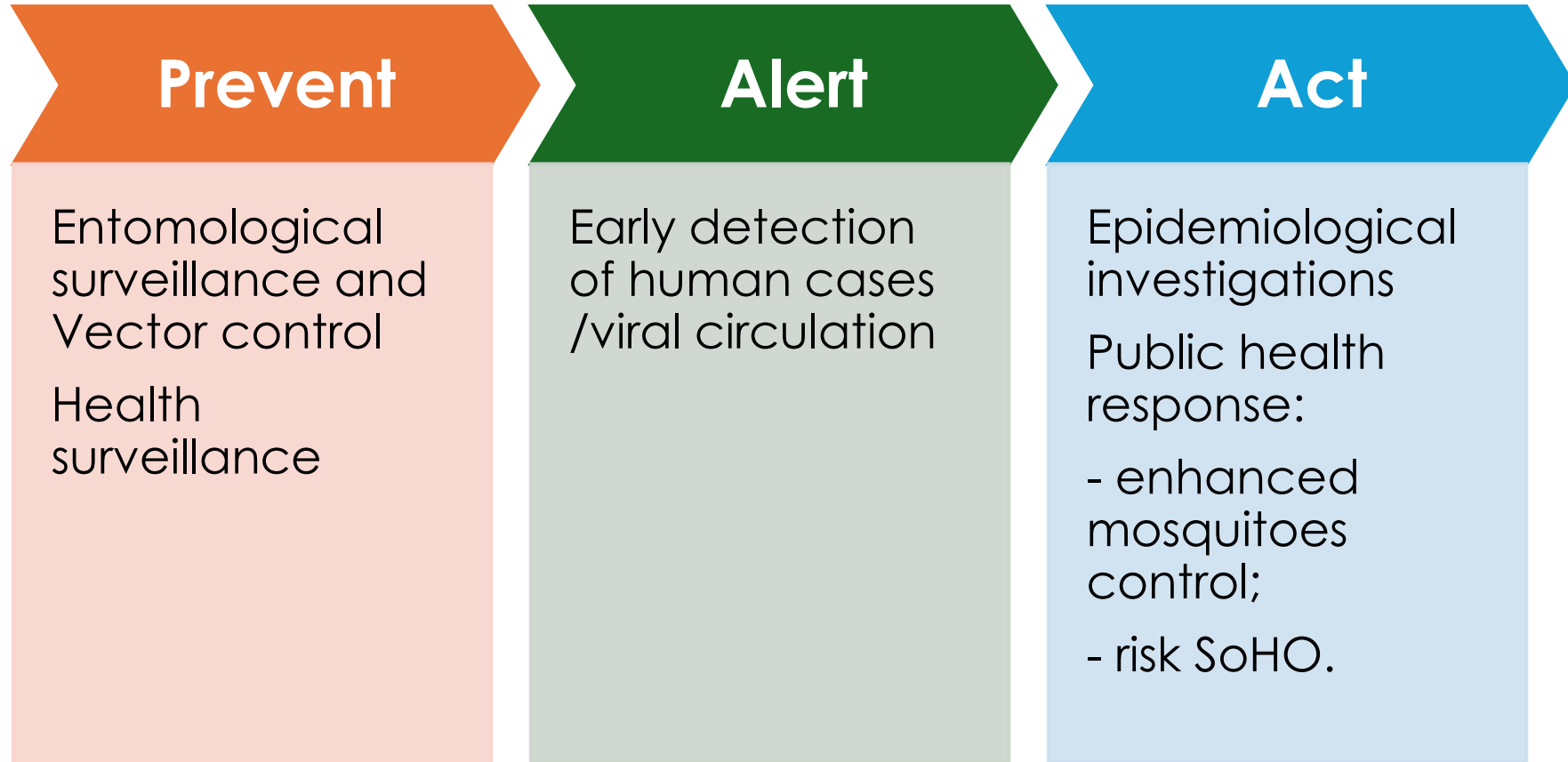
It is aimed to **early detect virus circulation**, to permit a rapid **risk assessment** and to prevent the risk of human transmission

Specific objectives:

- ✓ Early detection of virus circulation through targeted surveillance activities to inform the adoption of public health measures
- ✓ Timely and co-ordinate implementation of preventive measures and effective exchange of information among all the interested parties
- ✓ Prevention of the risk of human infection through mosquito biting and SoHO (blood, cells...)
- ✓ Co-ordinate management of outbreaks

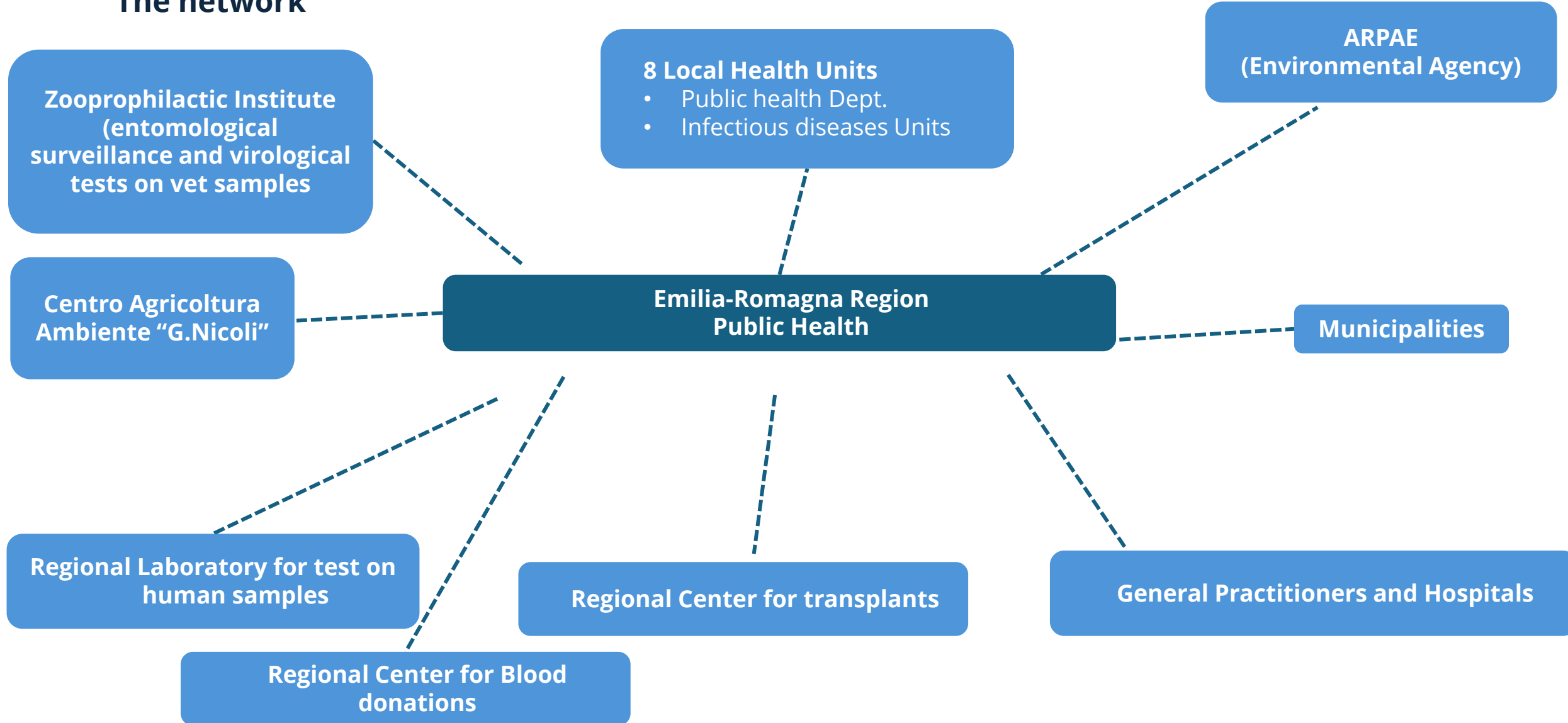
Regional Plan for VBD prevention

Strategy



Regional Plan for VBD prevention

The network



Regional Plan for VBD prevention

Who does what

- **Scientific working group** organizes entomological and ornithological (WNV) surveillance, define the level of risk in case of viral circulation, manage research project to improve the system
- **Regional Committee** supports in preparation of administrative acts and guidelines
- **Local Public Health Departments** manage health surveillance system and report cases; support Municipalities on vector control
- **Regional Laboratories** for human surveillance (Bologna) and entomological/vet surveillance (Reggio Emilia)
- **Municipalities** organize standard vector control measures and the extraordinary protocol when requested by Local Health Authority

Regional Committee:

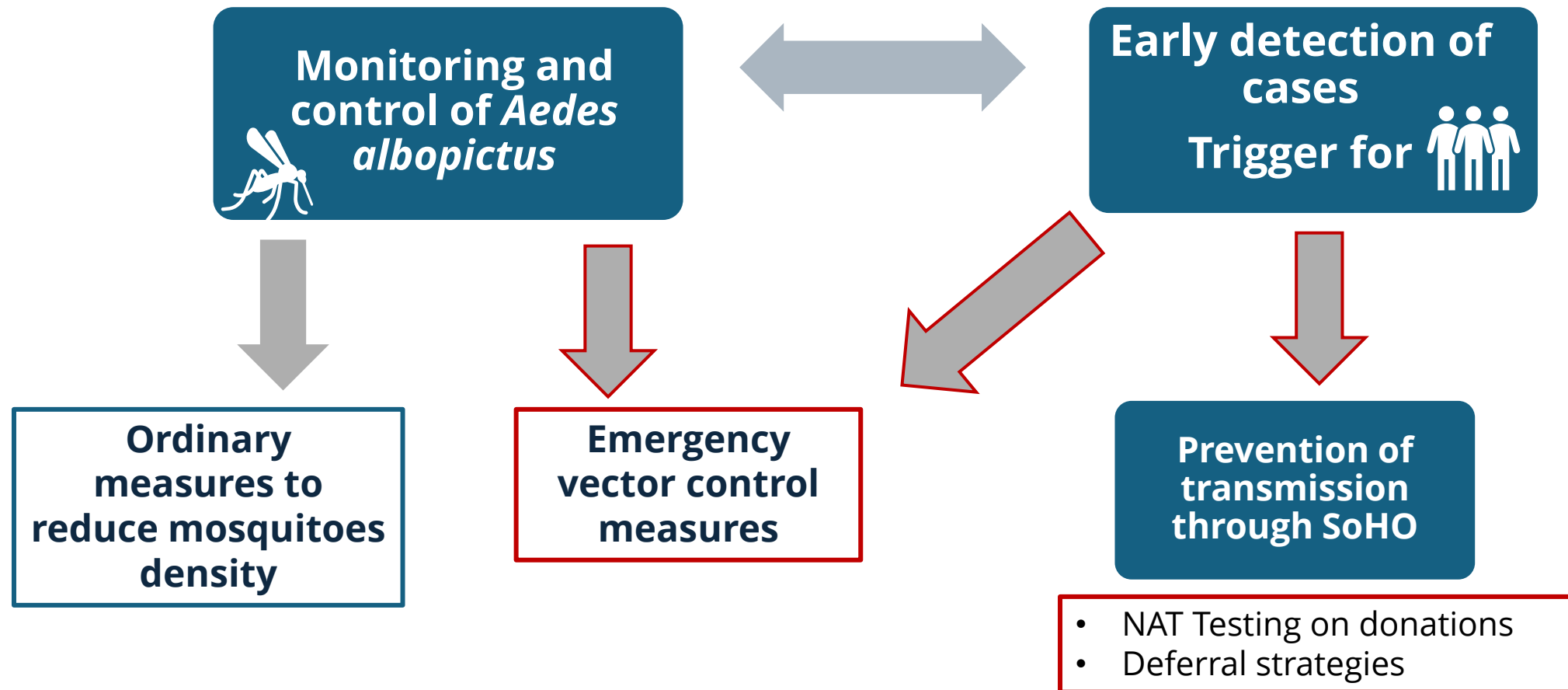
- Scientific working group
- 8 Local Public health Departments
- 18 Municipalities
- Experts from Environmental Agency (regional and national)

Scientific working group:

- Entomologists
- Epidemiologists
- Veterinarians
- Public Health Doctor

Regional Plan for Chikungunya, Dengue, Zika control

Strategy



Regional Plan for Chikungunya, Dengue, Zika control

Early detection of cases

To identify both

- **imported cases** (people who have contracted the disease abroad)
- **any related indigenous cases** (people who have contracted the disease in Emilia-Romagna), in the event in which one or more initial cases might go unnoticed

Early detection of cases



Prevent

Enhanced surveillance

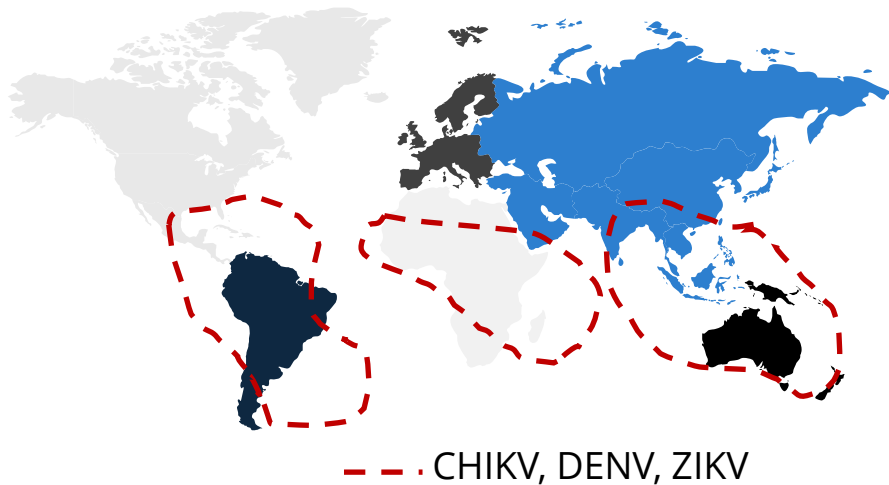
May 1 – October 31



Regional Plan for Chikungunya, Dengue, Zika control

Case definition

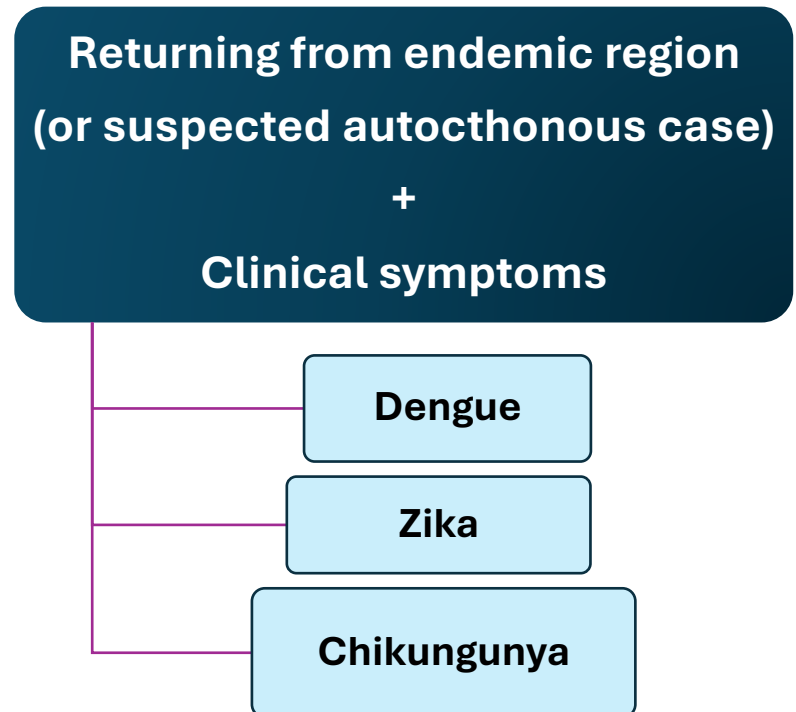
Geographical distribution



Clinical manifestations

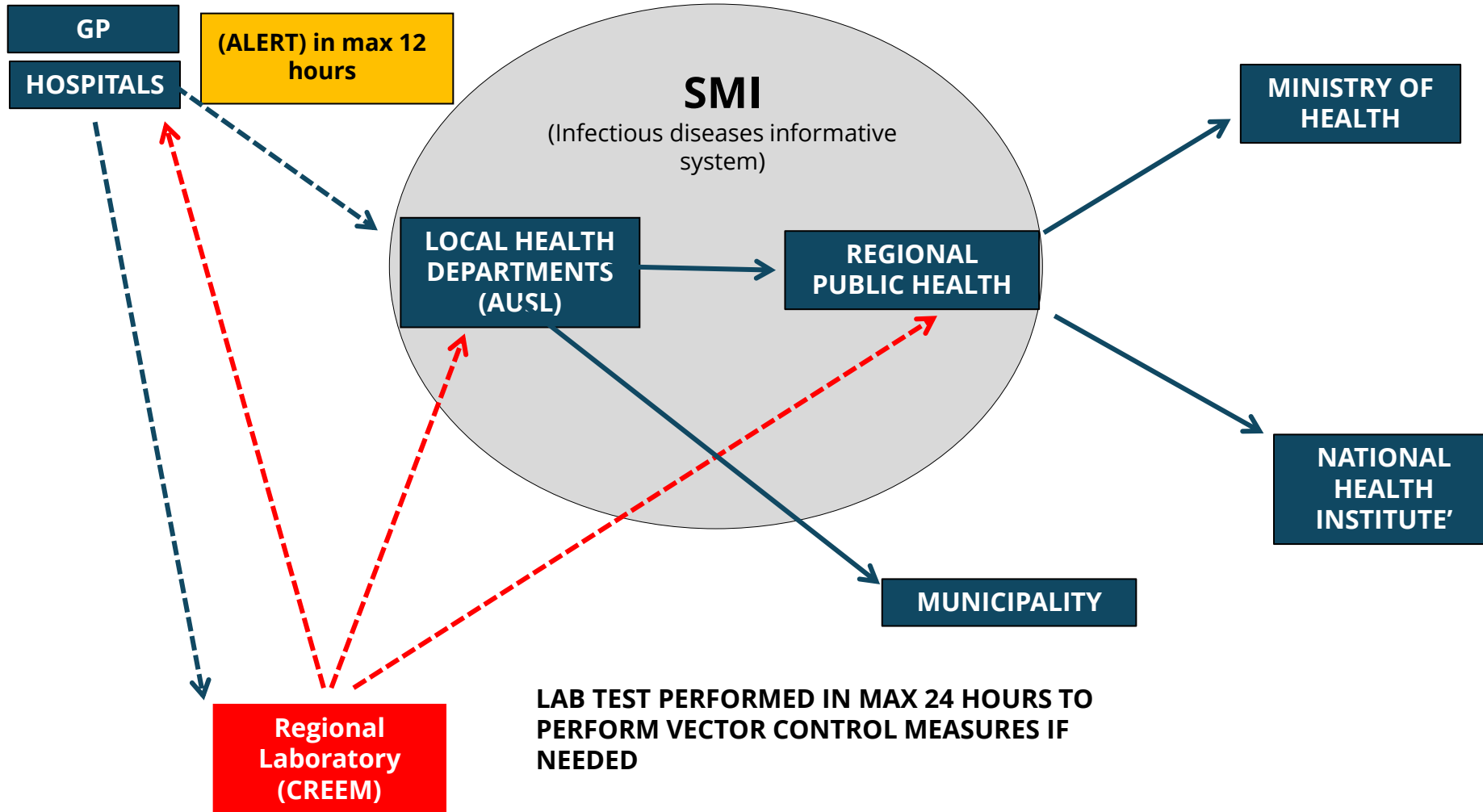
- Febrile illness
- Rash
- Arthralgia and/or myalgia
-

Multiplex diagnostic algorithms - syndromic approach -



Regional Plan for Chikungunya, Dengue, Zika control

Flow chart for health surveillance



Alert

Regional Plan for Chikungunya, Dengue, Zika control

Mosquitoes surveillance and control: ordinary measures

- Risk assessment and monitoring by ovitraps (*Aedes albopictus*).
- Standard control measures in public and private areas
- Citizens engagement

Prevent

Enhanced surveillance

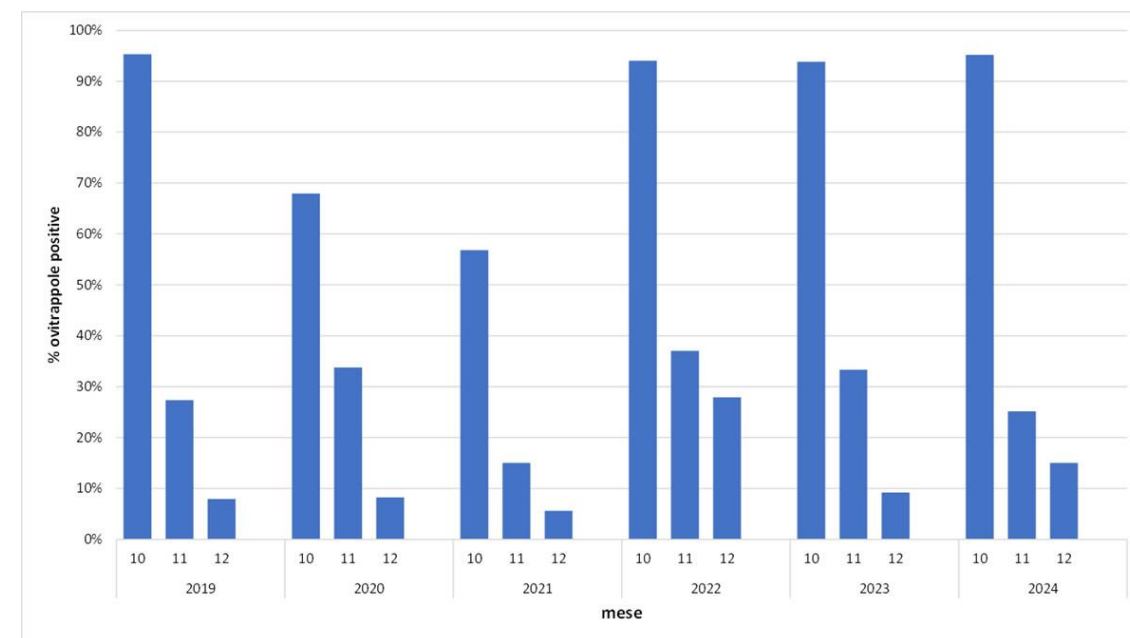
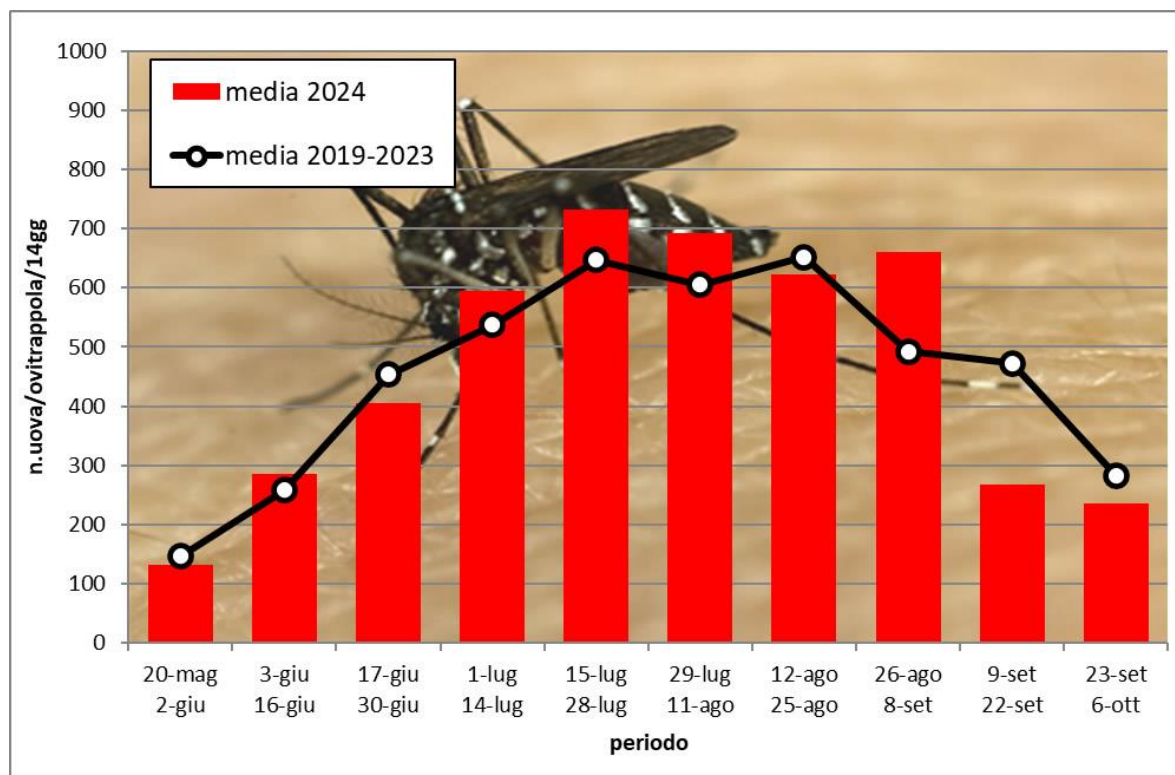
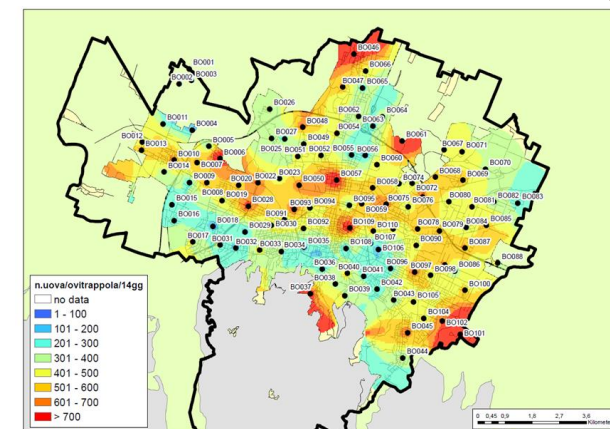
May 1 – October 31



Prevent

Risk assessment and monitoring

- 755 Ovitrap traps located in 10 Provincial capitals (May-September);
- 110 traps from October to April
- Samples are collected every 2 weeks and analysed by the labs of the regional environmental agency;
- Data are published on the website www.zanzaratigreonline.it



Prevent

Standard control measures in public and private areas with community participation

- Periodical larvicide use in public road drains: 5-7 times April – October
- In Em.-Rom. the **number of public road drains** is estimated at around **1.300.000**
- Communication and citizens involvement (partnership with schools and local NGOs)



Regional Plan for Chikungunya, Dengue, Zika control

Prevention of the risk of transmission

ENHANCED SURVEILLANCE – seasonal period of vector activity

- When a probable or confirmed case is detected, an **epidemiological enquiry** is conducted to collect useful informations to risk management and to detect other cases;
- Local health departments alert the Municipality where the case lives to activate **emergency vector control** measures
- If an autochthonous case is detected an **active surveillance** has to be conducted with the collaboration of GP and hospitals.

Alert

Act



Act

Emergency control measures in an area of 200 m of radius around confirmed or suspected cases of Chik/Dengue/Zika

- Larvicide distribution in road drains, streets and private areas
- Door-to door interventions for elimination of breeding sites
- For 3 nights in succession use of fast acting adulticides applied by truck mounted atomizer or backpack mist blower



Act

Quality control of treatment efficacy

The regional technical group organizes a quality control by skilled entomologists:

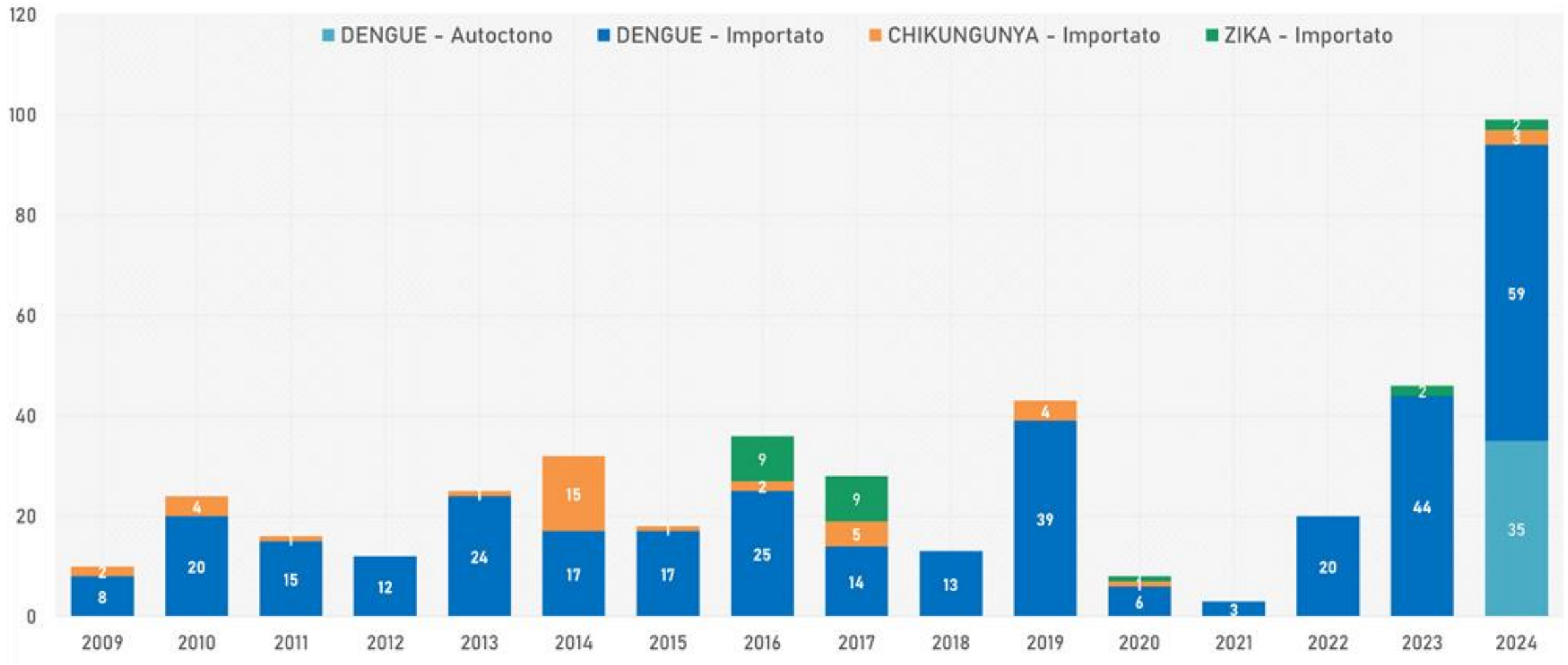
- ✓ To check efficacy of door-to-door interventions (*% of drains with larvae 3°-4° stage or pupae must not be >5%; all potential breeding sites removed*)
- ✓ To check efficacy of adulticides (*HLC_ Human landing Collection*)



Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

until 2023 only imported cases; in 2024 two clusters with autochthonous transmission of Dengue



Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2024 Autochthonous outbreaks

1. **Two confirmed Dengue cases:** one **autochthonous** and one **imported; one probable imported** case. Familial cluster (grandmother, mother and kid)
2. **Large Dengue outbreak** related to a larger one in Marche Region: **35 confirmed** cases and **9 probable**

2025 Autochthonous outbreaks

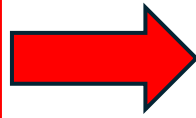
1. **Three confirmed Dengue cases** all **autochthonous** (no index case detected)
2. **Two autochthonous confirmed Chik** plus the **imported** index case
3. **Ongoing Chik Outbreak**

Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2024 Second Cluster of Dengue in a small municipality, Cavezzo

17/09/2024 Confirmed dengue case
Woman, 63 years old
No travel abroad
Symptoms: fever and arthralgia
Onset: September 6
Hospitalization: September 15



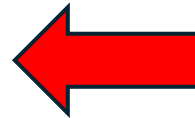
17/09/2024 Emergency control measures in a radius of 200 m around the living place of the suspected case.



22/09/2024: further 3 cases detected; no travel abroad, living near the case 1



23/09/2024: Meeting with Regional and Local health authority; Mayor and technicians; skilled entomologists; mosquito control company



Offered diagnostic testing to all residents who recalled having symptoms or who had traveled to endemic areas in the previous weeks

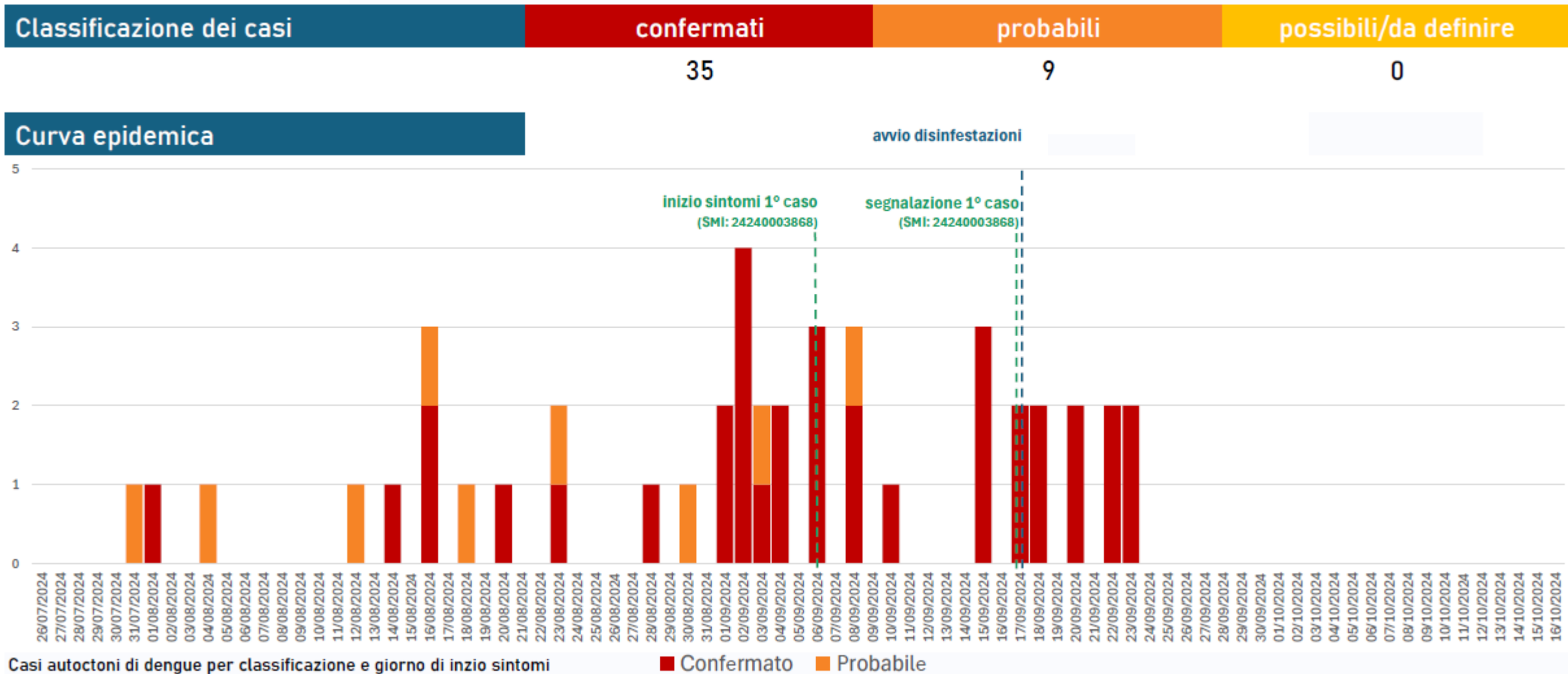
Progressive expansion of the disinfestation plan throughout the city

Mosquito collection (HLC) for viral isolation and genomic sequencing

Regional Plan for VBD prevention

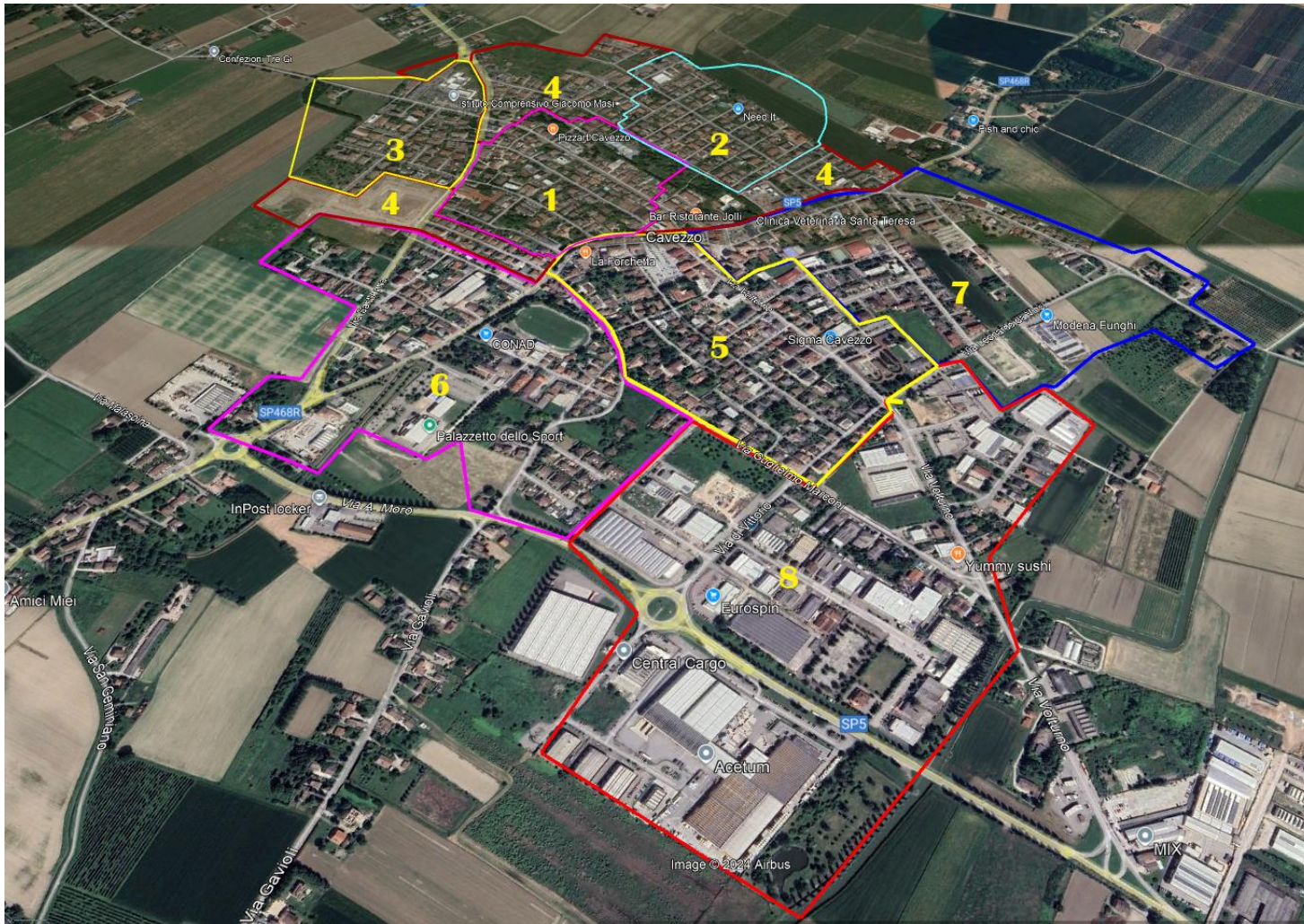
Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2024 Second Cluster of Dengue in a small municipality, Cavezzo



Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2024 Second Cluster of Dengue in a small municipality, Cavezzo



Temporal sequence with which disinfection was implemented in the different areas of the city.

Area 1: September 17 first day
Area 8: October 8 last day

Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2025 Cluster of Chikungunya in Carpi (medium town: 80.000 inhabitants)

09/08/2025 Confirmed Chik case
Woman, 48 years old
No travel abroad
Symptoms: fever and arthralgia
Onset: August 7



11/08/2025:

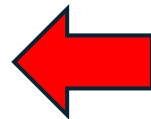
- Activation of Crisis Unit with Regional and Local health authority; Mayor and technicians; skilled entomologists
- Further 2 cases: the parents of 1st onset August 4
- Emergency control measures in a radius of 100 m around the living place of the suspected case.



12/08/2024: further 3 cases detected; no travel abroad, living near the case 2nd or relatives. Emergency control measure in a new area



Since 13/08/2025: Daily Crisis Unit meeting at noon to monitor the outbreak, share information, decide the areas interested by vector control



Offered diagnostic testing to all residents who recalled having symptoms or who had traveled to endemic areas in the previous weeks

Progressive expansion of the disinfestation plan throughout the city

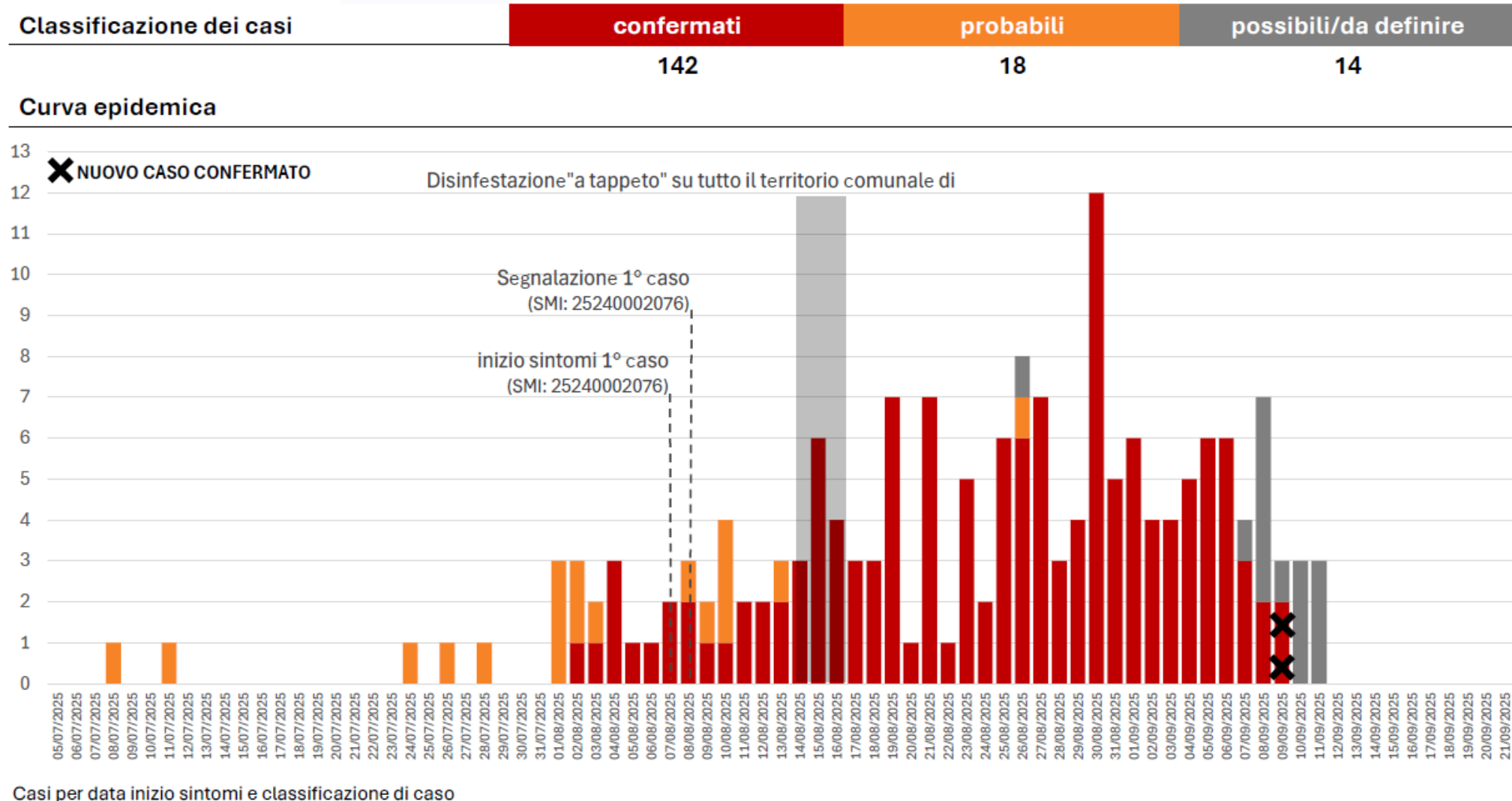
Mosquito collection (HLC) for viral isolation and genomic sequencing

Citizen engagement: communication and free offer of larvicidal products

Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2025 Cluster of Chikungunya (Carpi and secondary outbreaks)



Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2025 Cluster of Chikungunya (Carpi and secondary outbreaks)

Sesso		Età mediana	Ricoverati		Decessi
45,0%	55,0%	62	6	3,8%	0
M	F				

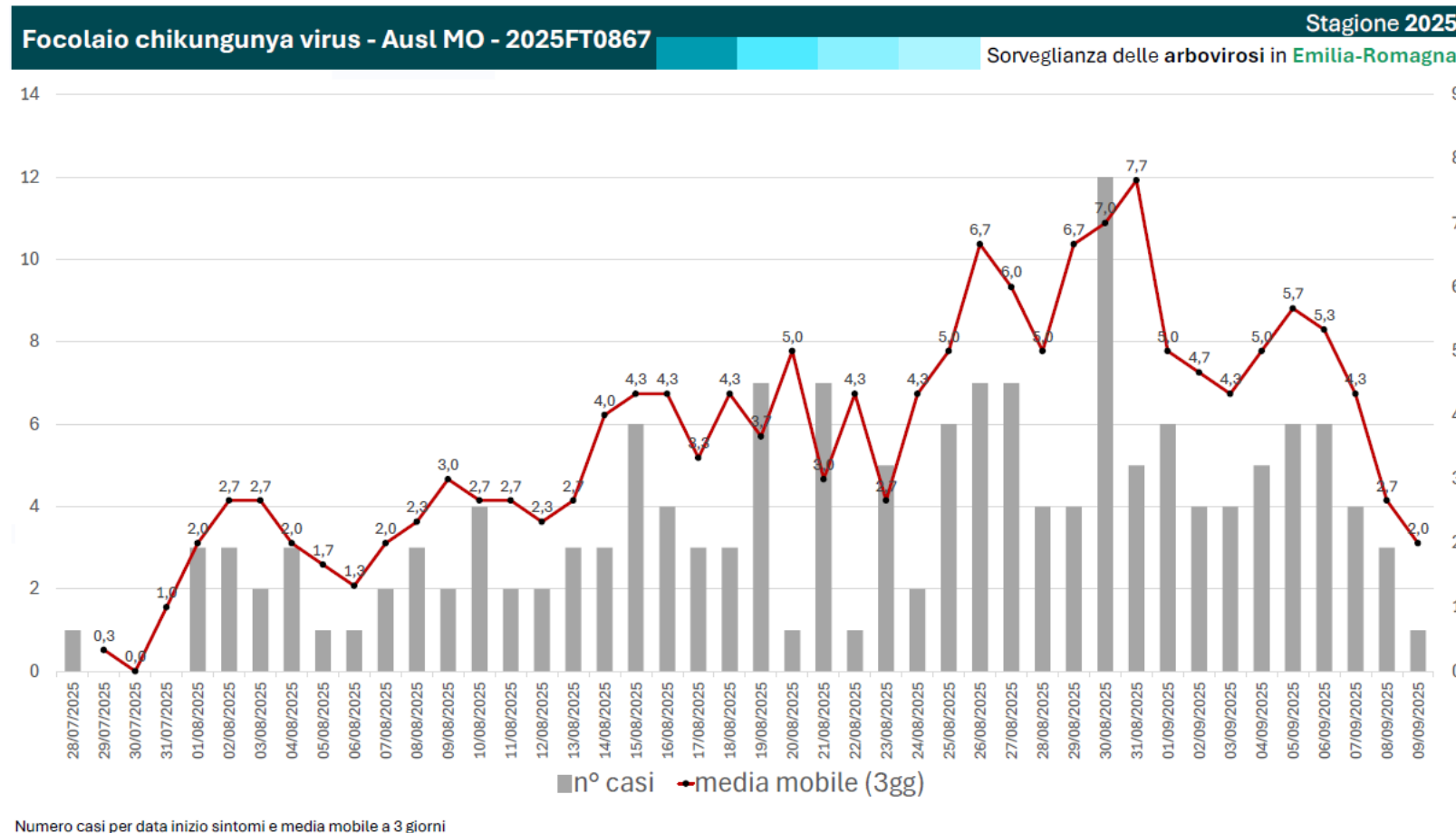
% residenti	Età	Ricovero - SI		Ricovero - NO		Totale	
		n	%	n	%	n	%
7,8%	0-9	1		1		2	1,3%
9,6%	10-19	0		10		10	6,3%
10,3%	20-29	0		3		3	1,9%
11,5%	30-39	0		9		9	5,6%
14,0%	40-49	2		16		18	11,3%
16,2%	50-59	0		29		29	18,1%
30,6%	60+	3		86		89	55,6%
Totale		6	3,8%	154	96,3%	160	

Sintomi	n	%
Febbre	152	95,0%
Artralgia	150	93,8%
Astenia	116	72,5%
Rash Cutaneo	110	68,8%
Mialgie	89	55,6%
Cefalea	78	48,8%

Regional Plan for VBD prevention

Epidemiology : Chikungunya, Dengue e Zika cases in Emilia-Romagna

2025 Cluster of Chikungunya in Carpi (medium town: 80.000 inhabitants)



the outbreak is still active but is in regression

Regional Plan for VBD prevention

2025 Cluster of Chikungunya in Carpi (medium town: 80.000 inhabitants)



STRENGTHS

Crisis Unit and Institutional coordination

Availability of staff

Organizational and operational capacity

Communication to citizens

Integration between services in the Municipality

Strong link between the regional and the local level

One Health approach



OPPORTUNITIES

WEAKNESSES



Work Overload (stress and fatigue)

Feeling of frustration because the effort seems useless

Risk assessment and management of treatment priorities

Not always timely communication of cases from ER to PH

Financial aspects

Few available pest control companies

Citizens engagement

THREATS



SWOT Analysis

Prevent

Risk assessment of *Aedes aegypti* introduction and application of a surveillance protocol



Bologna Airport - Ravenna Port - 3 logistics hub

1. CONTEXT ANALYSIS

Flights and routes from countries in which *Ae. aegypti* is present;
Goods at risk and their origin;
Suitable conditions for the establishment of *Ae. aegypti*;
Quality of mosquito control

2. RISK IDENTIFICATION

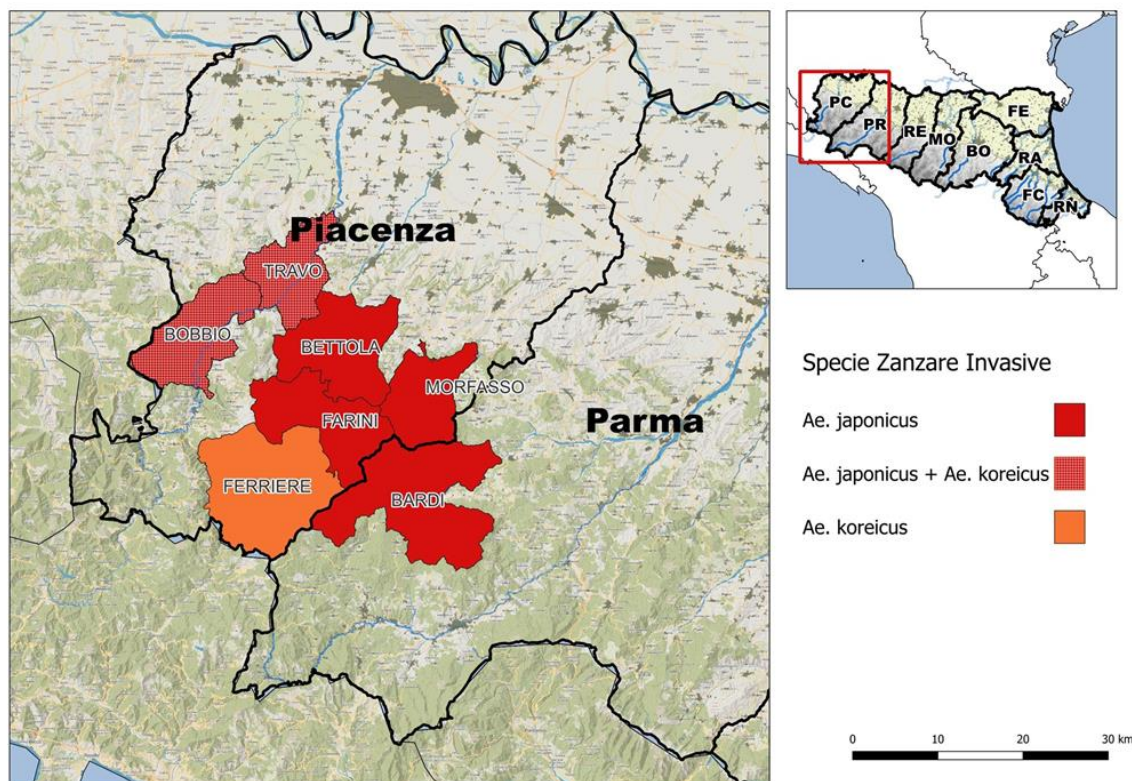
The risk is assessed by crossing the elements identified in the previous step 1 with the information obtained during the inspections at the airport and port

3. SURVEILLANCE PROTOCOL

Monitoring with ovitraps
Larval sampling in drains and in any other occasional breeding sites
Inspection of goods at risk that travel without suitable "disinsection" certification carried out at the origin

Prevent

New invasive species detected: *Ae. japonicus* – *Ae. koreicus*



May 2025 first detection of the 2 species in the northern-west part of the region

In Italy, specimens of *Ae. japonicus* were found for the first time in 2015 on the border with Austria. Since 2018 it has appeared in Veneto and subsequently in Lombardy, Piedmont and Liguria.

Ae. koreicus was found in Italy for the first time in 2011 in Veneto, from where it spread to Lombardy and Liguria

To improve

- To map and limit resistance to adulticides
- Misting systems
- Sterile Insect Techniques
- Modelling the seasonal dynamics of *Ae. albopictus* populations

To improve

Use of adulticides: Pyrethroid resistance

Medical and Veterinary Entomology

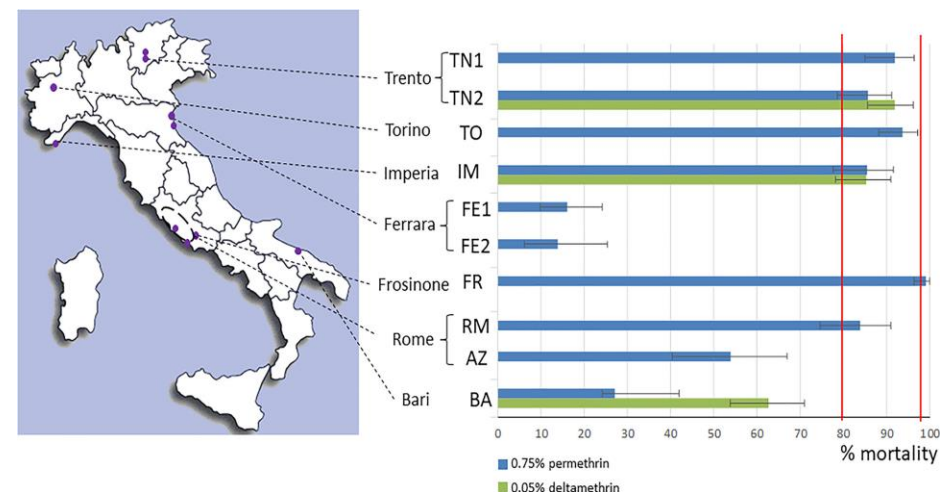


Short Communication | [Open Access](#) |

First evidence of pyrethroid resistance in Italian populations of West Nile virus vector *Culex pipiens*

Verena Pichler, Carola Giammarioli, Romeo Bellini, Rodolfo Veronesi, Daniele Arnoldi, Annapaola Rizzoli, Riccardo Paolo Lia, Domenico Otranto, Marco Ballardini, Pietro Cobre, Paola Serini ... [See all authors](#)

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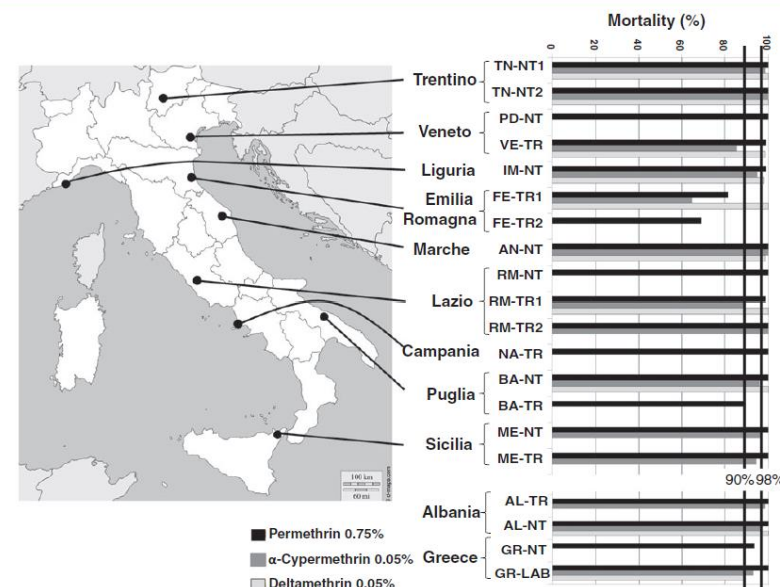
Research Article

Received: 5 October 2017 | Revised: 18 December 2017 | Accepted article published: 26 December 2017 | Published online in Wiley Online Library:

(wileyonlinelibrary.com) DOI 10.1002/ps.4840

First evidence of resistance to pyrethroid insecticides in Italian *Aedes albopictus* populations 26 years after invasion

Pest Manag Sci 2018; 74: 1319–1327



To improve

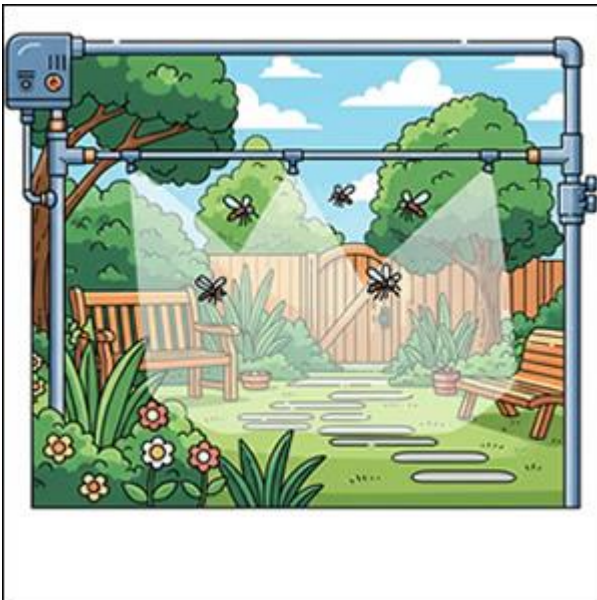
Use of adulticides: misting systems in gardens

Position on Misting Systems



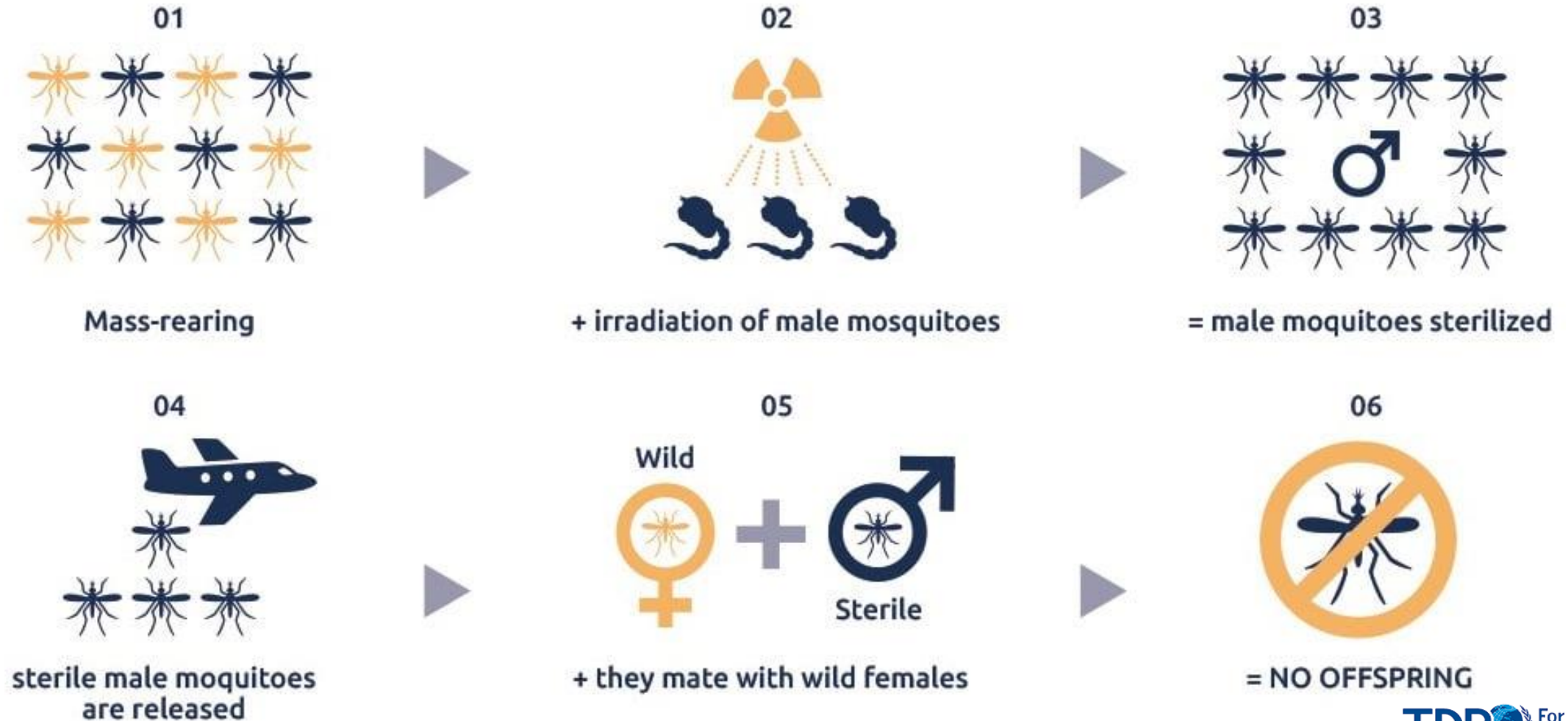
The application of pesticides through these misting systems will have several undesirable effects.

1. Unnecessary insecticide use.
2. Lack of efficacy data.
3. Non-target impacts.
4. Promotion of insecticide resistance.
5. Risk of pesticide exposure.
6. Incompatible with integrated pest management practices.



New methods for vector control

Sterile Insect Technique to control dengue, Zika and chikungunya

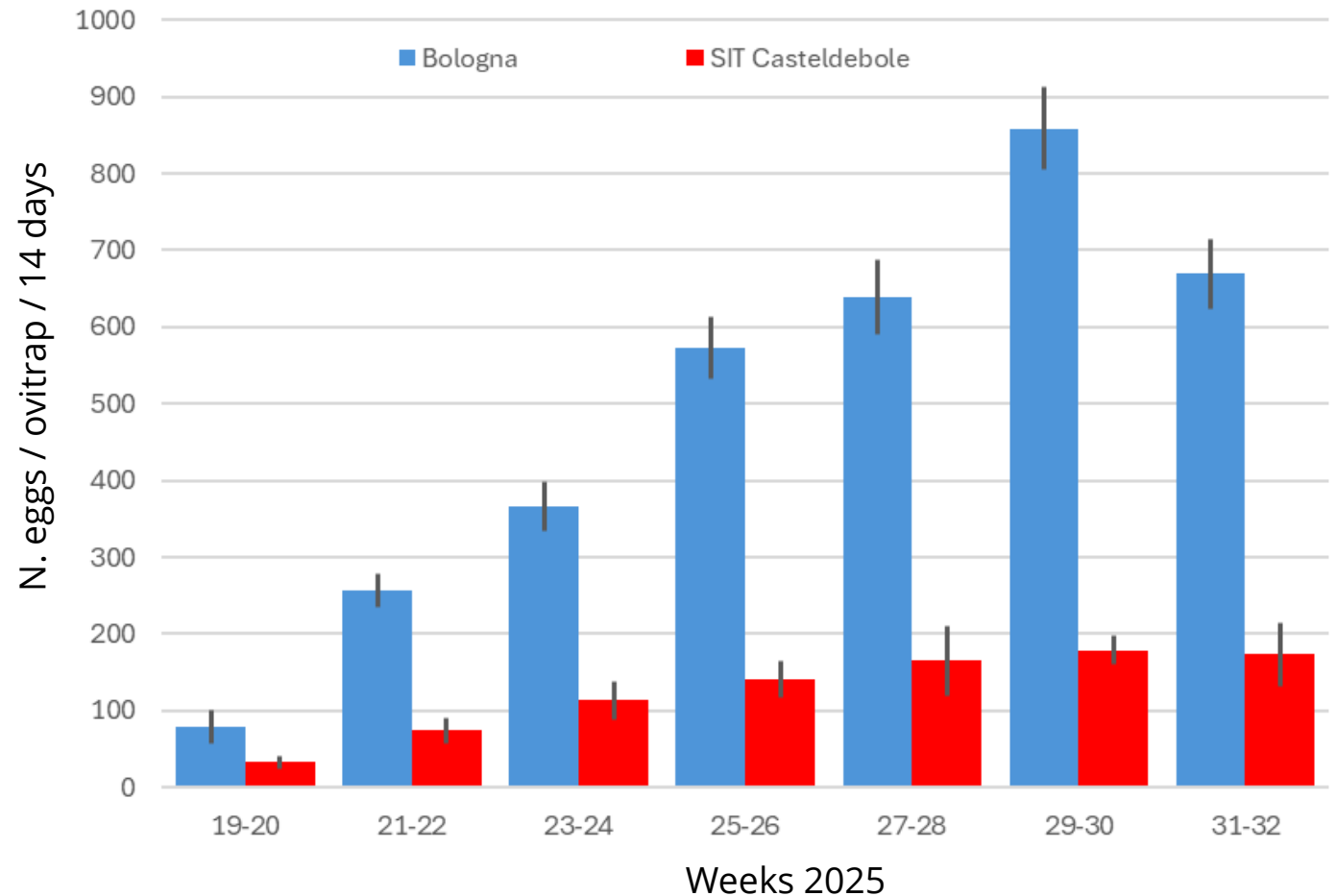
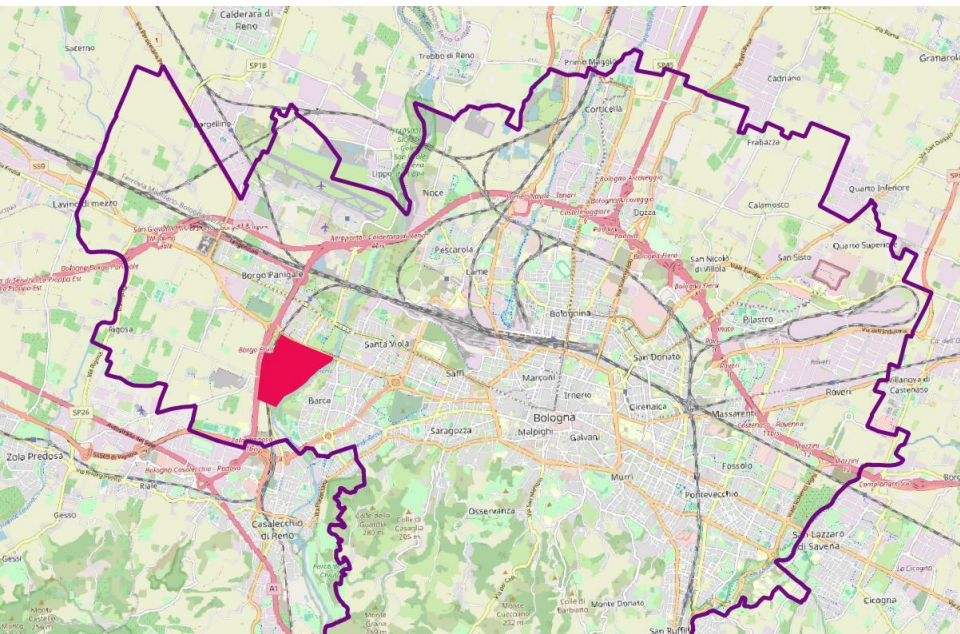


To improve

New methods for vector control

A pilot project of sterile insect technique against *Ae. albopictus* in Bologna – 2025

Efficacy of the treatment in the area compared to the whole town



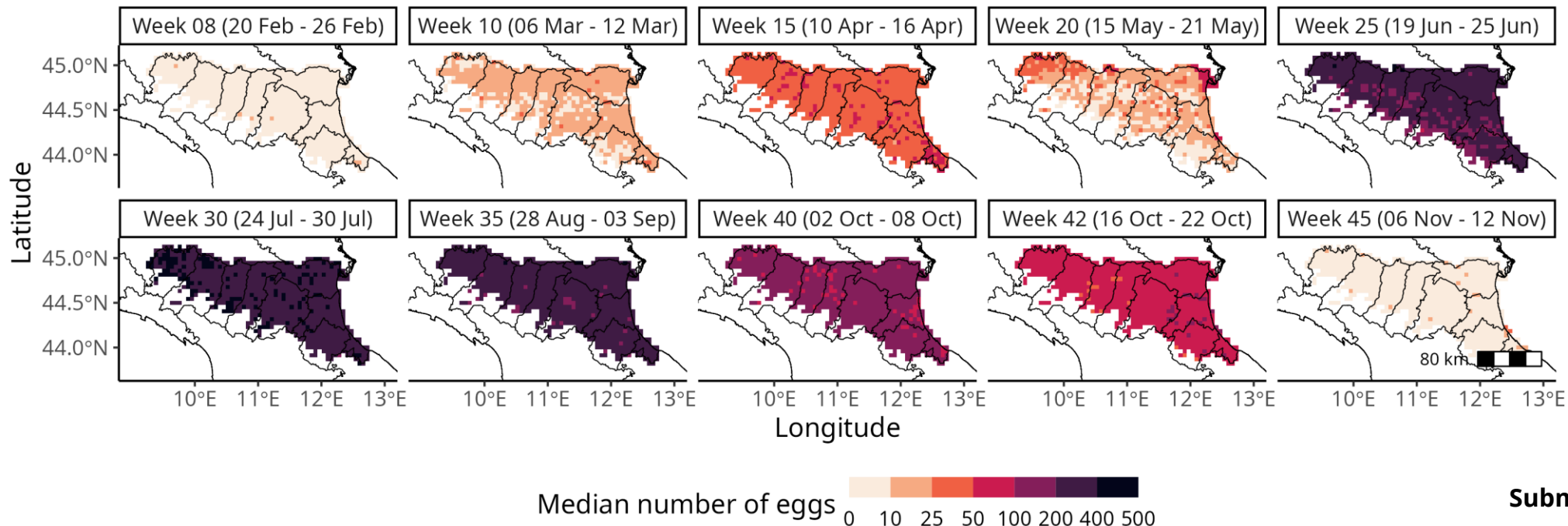
To improve

Predicting models

A stacked machine learning approach to predict the distribution and abundance of *Ae. albopictus*, based on ovitrap data and environmental covariates

Data:

- Ovitrap data from 2010 to 2023
 - Air temperature, photoperiod and precipitation,
 - Urbanisation index (ESA CCI land cover)
- Seasonality and cyclic patterns incorporated using Fourier series



Collaboration:

- Emilia-Romagna Region,
- University of Trento,
- Fondazione Mach,
- Centro Agricoltura Ambiente (CAA),
- HydroMeteoClimate Service of Emilia-Romagna

Submitted to Ecological Informatics

To improve

Lessons Learned and Challenges to Reverse the Trend

In today's hyper-connected, globalized world, we have learned to expect old diseases to re-emerge, new ones to emerge, and to spread rapidly across the globe.



Once introduced into and adapted to an environment, zoonotic agents are unlikely to be eliminated from an area.



International cooperation and collaboration are critical to developing and maintaining effective early warning disease detection and emergency response systems.

Although preparedness and response plans are generally in place, they are often implemented only late due to the political and economic implications of the decision to declare a state of emergency.

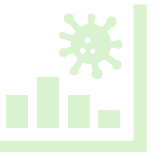


As a result, problems that should remain local have the potential to spread quickly and easily.



We need to focus on prevention. Local public health infrastructure must be rebuilt and maintained in order to contain disease outbreaks as local public health events instead of letting them spread around the world via modern transportation.

The public and the press require accurate and reliable information in order to prevent panic and overreaction.



Thank you

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<http://www.zanzaratigreonline.it/>