
WNV in Donors, the Italian Experience



Flavia Riccardo

Department of Infectious Diseases, Istituto Superiore di Sanità

Italy

Declaration of interest

No conflict declared

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Internal use



Italian Ministry of Health

**Department of
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*Giovanni Rezza
Francesco Maraglino
Federica Ferraro*



**National Centres for Blood
and Transplant Safety**

Blood Safety

*Ilaria Pati
Simonetta Pupella*

Transplant Safety

Letizia Lombardini



**ISS Arboviroses team at the
Department of Infectious
Diseases**

Head of Department

Anna Teresa Palamara

**Epidemiological
Surveillance:**

*Antonino Bella
Martina Del Manso
Patrizio Pezzotti
Flavia Riccardo*

**National Reference
Laboratory:**

*Antonello Amendola,
Claudio Argentini,
Cristiano Fiorentini,
Claudia Fortuna,
Giulia Marsili,
Giulietta Venturi.*

**Entomological
surveillance:**

*Daniela Boccolini
Marco Di Luca
Francesco Severini
Luciano Toma*



**IZZSS network coordinated by the
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Virology:

*Federica Monaco,
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Maria Goffredo.

Epidemiology

Paolo Calistri

GIS

Annamaria Conte

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www.iss.it/malattie-infettive

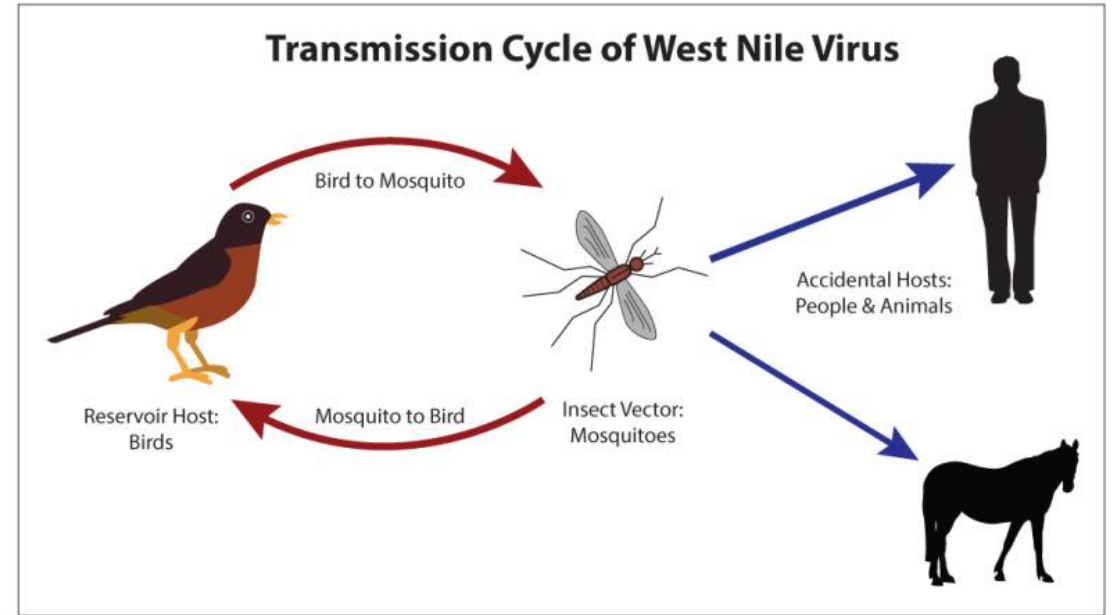
...and all Italian Regions and Local Health Units



DIPARTIMENTO
MALATTIE INFETTIVE

Outline

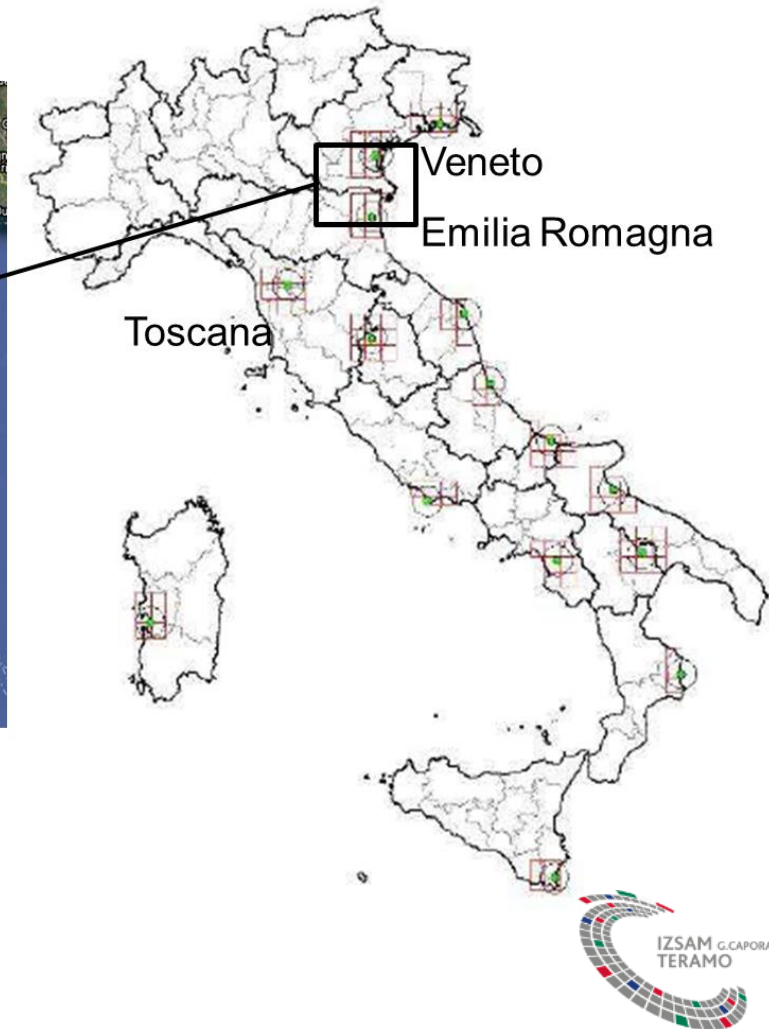
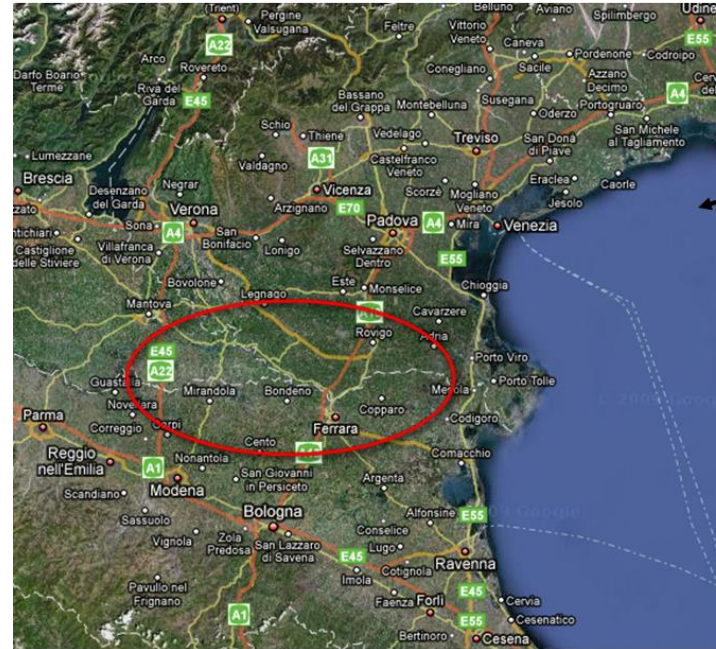
- WNV in Italy: an epidemiological overview
- The surveillance network and the monitoring of donors
- Conclusions



Transmission Cycle of West Nile Virus. Contributed Illustration by Bryan Parker. Source: <https://www.ncbi.nlm.nih.gov/books/NBK544246/figure/article-31340.image.f1/>

The first human outbreak - 2008

- 12 horses with neurological symptoms (6 lab confirmed) belonging to 8 different stables (Ferrara and Bologna); 1 positive horse in a 20 horse sample (Rovigo)
- 6 crows and 7 magpies positive in the province of Ferrara;
- Three confirmed human cases (Emilia Romagna: Bologna and Ferrara); 2 confirmed human cases (Veneto)



Yearly detection of circulation

- Progressive increase in affected areas
- On average 60 locally acquired human cases every year, mostly in the North of the country
- First exceptional circulation in 2018

SURVEILLANCE

Epidemiology of human West Nile virus infections in the European Union and European Union enlargement countries, 2010 to 2018

Johanna J Young^{1,2}, Joana M Haussig^{1,2}, Stephan W Aberle³, Danai Pervanidou⁴, Flavia Riccardo⁵, Nebojša Sekulić⁶, Tamás Bakonyi¹, Céline M Gossner¹

1. European Centre for Disease Prevention and Control (ECDC), Solna, Sweden

2. These authors contributed equally to this article and share first authorship

3. Center for Virology, Medical University of Vienna, Vienna, Austria

4. Hellenic National Public Health Organization, Athens, Greece

5. Istituto Superiore di Sanità, Rome, Italy

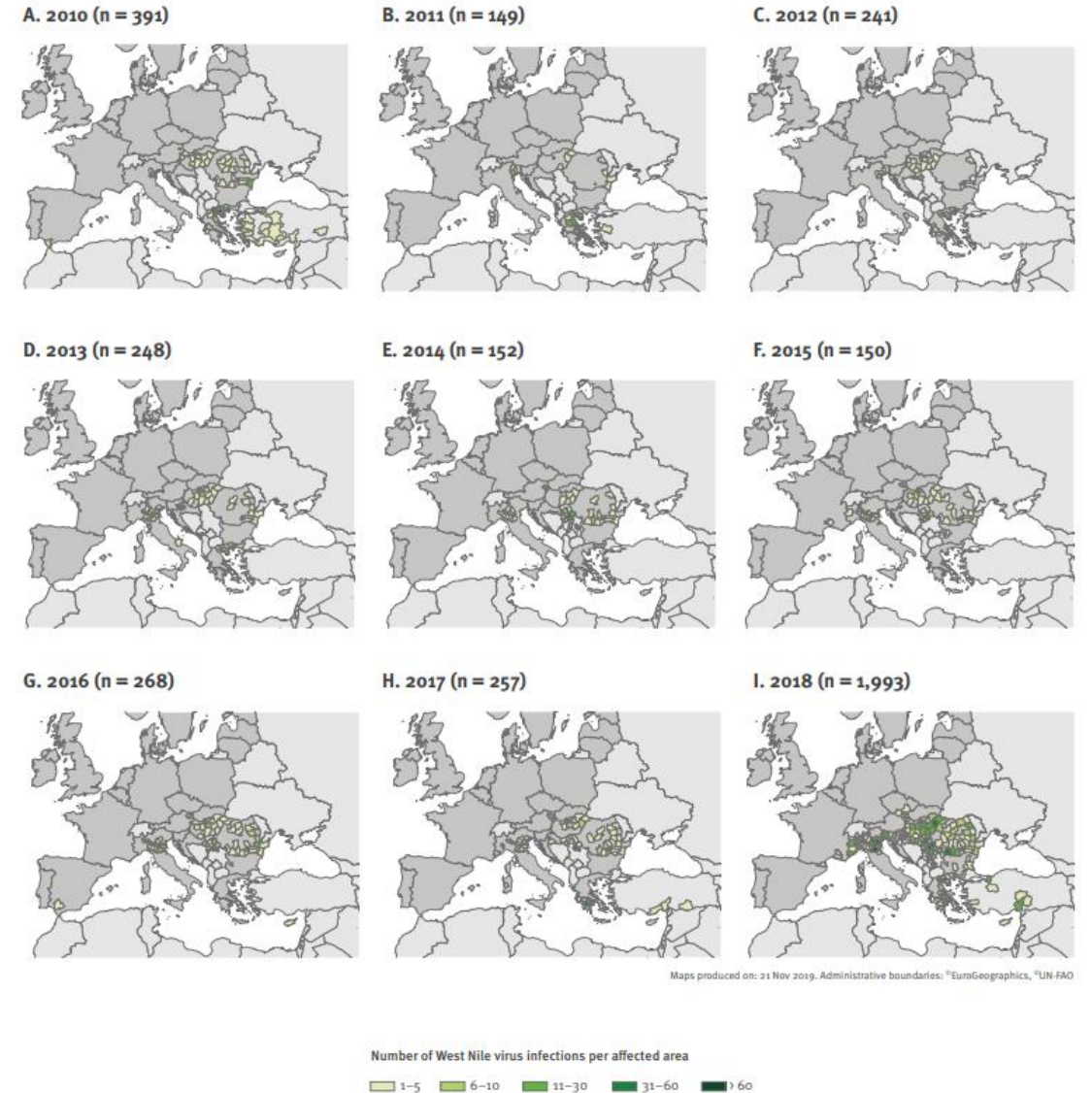
6. Institute for Public Health of Montenegro, Podgorica, Montenegro

Correspondence: Joana M. Haussig (Joana.Haussig@ecdc.europa.eu)

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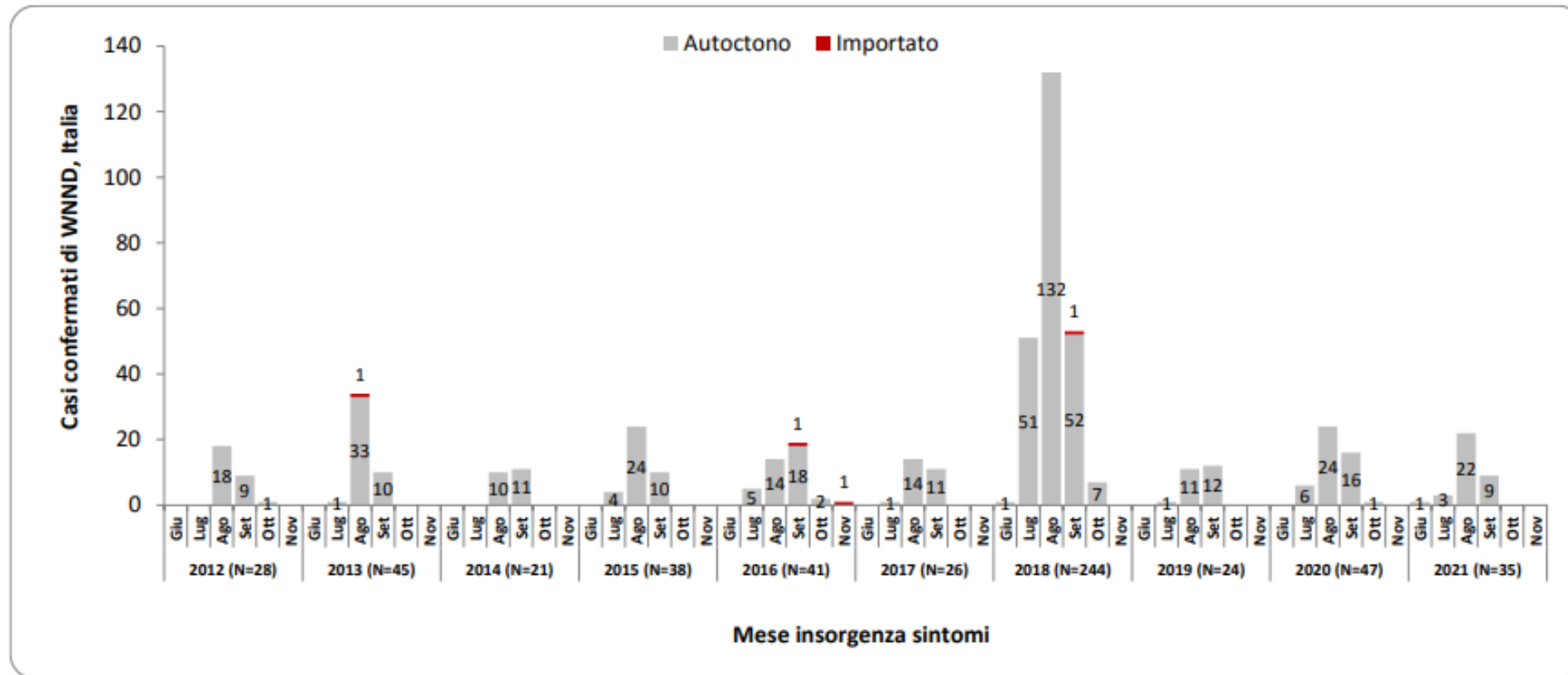
Young Johanna J, Haussig Joana M, Aberle Stephan W, Pervanidou Danai, Riccardo Flavia, Sekulić Nebojša, Bakonyi Tamás, Gossner Céline M. Epidemiology of human West Nile virus infections in the European Union and European Union enlargement countries, 2010 to 2018. Euro Surveill. 2021;26(19):pii=2001095. <https://doi.org/10.2807/1560-7917.ES.2021.26.19.2001095>

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As of 2021

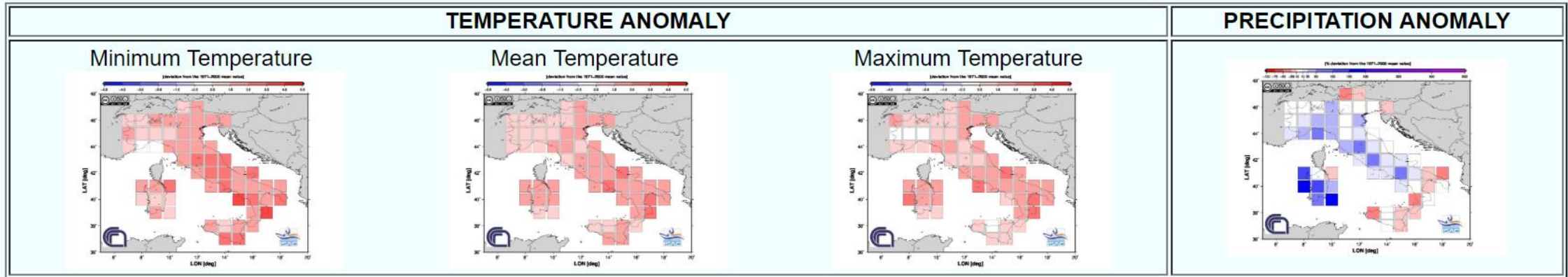
Distribution of confirmed human WNND cases by month of symptom onset and year, Italy 2012-2021



What was special in 2018 in Italy?

(Winter:DJF; Spring:MAM; Summer:JJA; Autumn:SON)

SPRING 2018



http://www.isac.cnr.it/climstor/climate_news.html

- Early detection of WNV circulation (early June)
- Climate anomalies: higher-than-average temperatures in the month of April, preceded and followed by heavy rains across the country
- Hypothesized: early and rapid increase in the mosquito population density and possibly an early amplification of viral transmission in the enzootic cycle

How does the 2022 transmission season compare with 2018?

- Higher number of confirmed human cases notified (after consolidation)
- Increased number and proportion of WNND

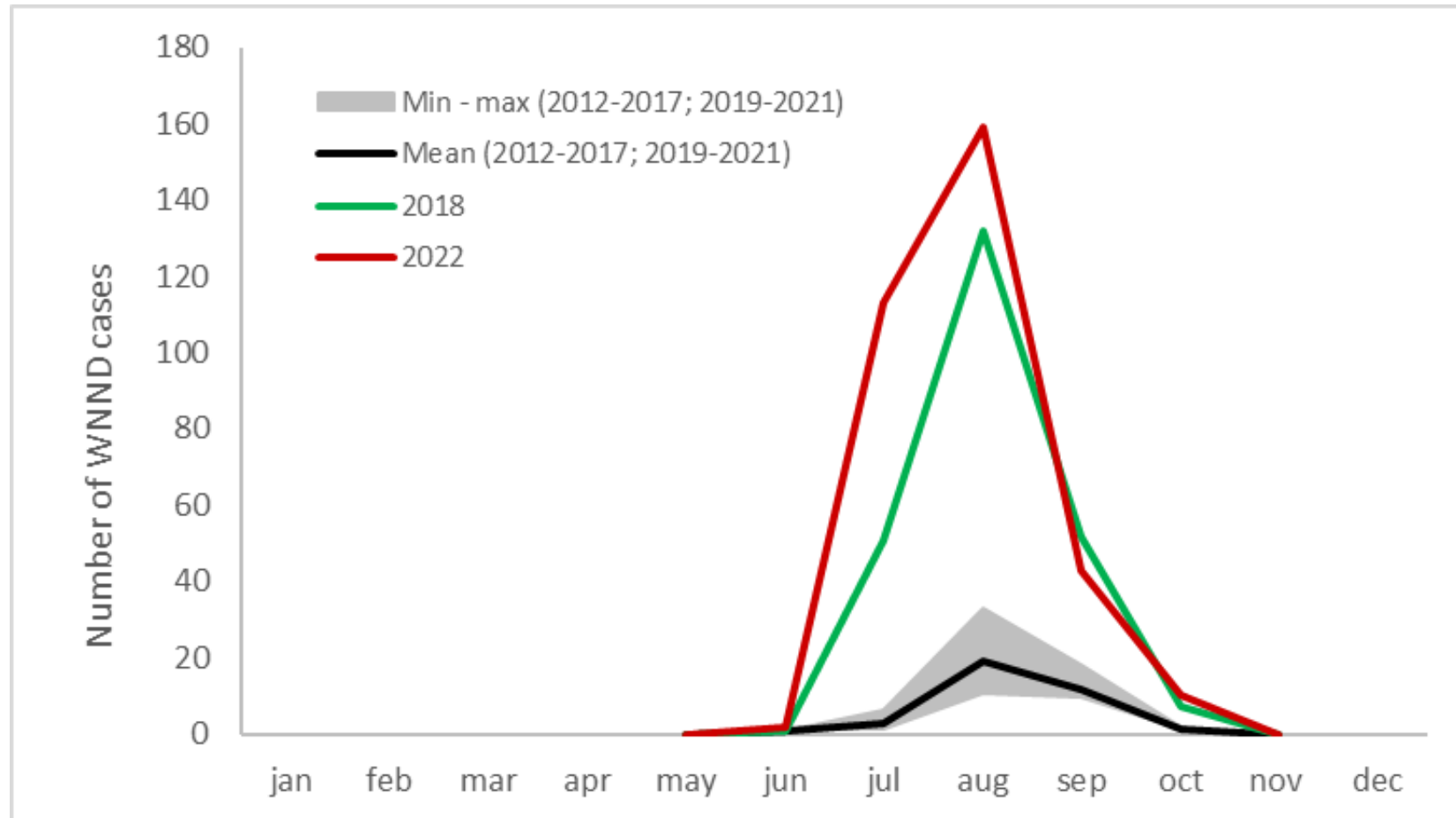
Number of confirmed WNV infections, Italy	2018		2022*	
	N	%	N	%
Blood donor/asymptomatic	68	11,0	107	14,8
Fever	306	49,5	273	37,8
Symptoms not specified	NA	NA	16	2,2
WNND	244	39,5	327	45,2
Total	618		723	
WNV associated deaths	49	7,9	49	6,8

*Consolidated as of 9 May 2023

How does the 2022 transmission season compare with 2018?

Early detection of WNV circulation (early June)

Rapid increase in human cases in July 2022



2022 data consolidated as of 9 May 2023

What was special in 2022 in Italy?

- Early detection of WNV circulation (early June) as in 2018
- Different climate anomalies: higher-than-average temperatures in the context of persistent lower-than-average rainfall in May and June (severe droughts in the Po valley where WNV primarily circulates), followed by severe thunderstorms and floods from the beginning of July.

«Comparative analysis of the distribution of WNV-1 and WNV-2 infections among WNND cases, WNF cases and WNV-positive blood donors showed that patients with WNND were more likely to have WNV-1 infection than blood donors (odds ratio 3.44; 95% CI 95% 1.54 to 8.24; $p = 0.0043$).

In wild birds WNV-1 had higher infectious rate (IR) and showed a more rapid expansion than WNV-2.

The distribution of the two lineages was more even in mosquitoes, but with a trend of rapid increase of WNV-1 IR over WNV-2. »

> J Travel Med. 2022 Nov 4;taac125. doi: 10.1093/jtm/taac125. Online ahead of print.

Rapid spread of a new West Nile virus lineage 1 associated with increased risk of neuroinvasive disease during a large outbreak in northern Italy, 2022: One Health analysis

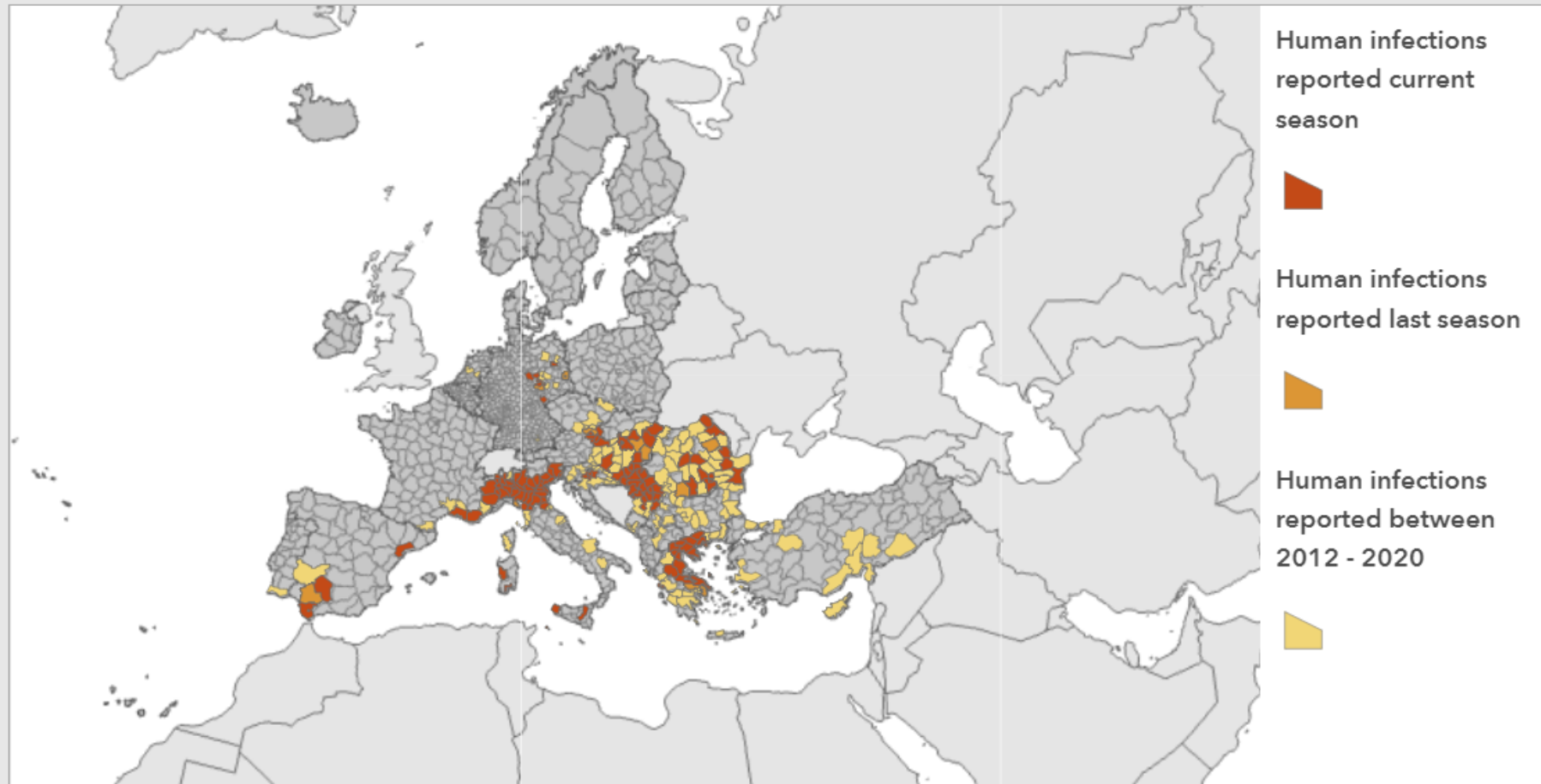
Luisa Barzon ^{1 2}, Monia Pacenti ², Fabrizio Montarsi ³, Diletta Fornasiero ³, Federica Gobbo ³, Erika Quaranta ³, Isabella Monne ³, Alice Fusaro ³, Andrea Volpe ¹, Alessandro Sinigaglia ¹, Silvia Riccetti ¹, Emanuela Dal Molin ¹, Sorsha Satto ², Vittoria Lisi ², Federico Gobbi ⁴, Silvia Galante ⁵, Giuseppe Feltrin ⁶, Valerio Valeriano ⁷, Laura Favero ⁸, Francesca Russo ⁸, Matteo Mazzucato ³, Alessio Bortolami ³, Paolo Mulatti ³, Calogero Terregino ³, Gioia Capelli ³

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PMID: 36331269 DOI: 10.1093/jtm/taac125

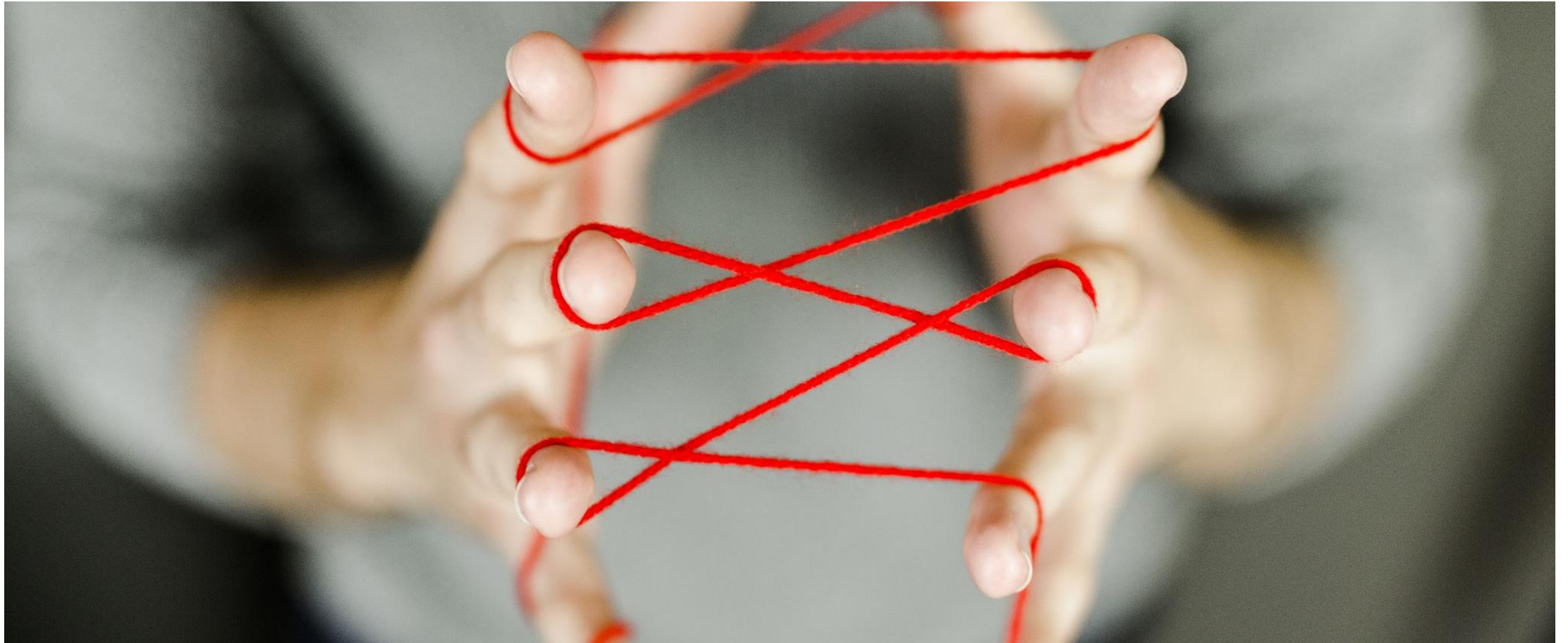
June 15 to August 21 2022

How does the 2022 transmission season compare with previous years?

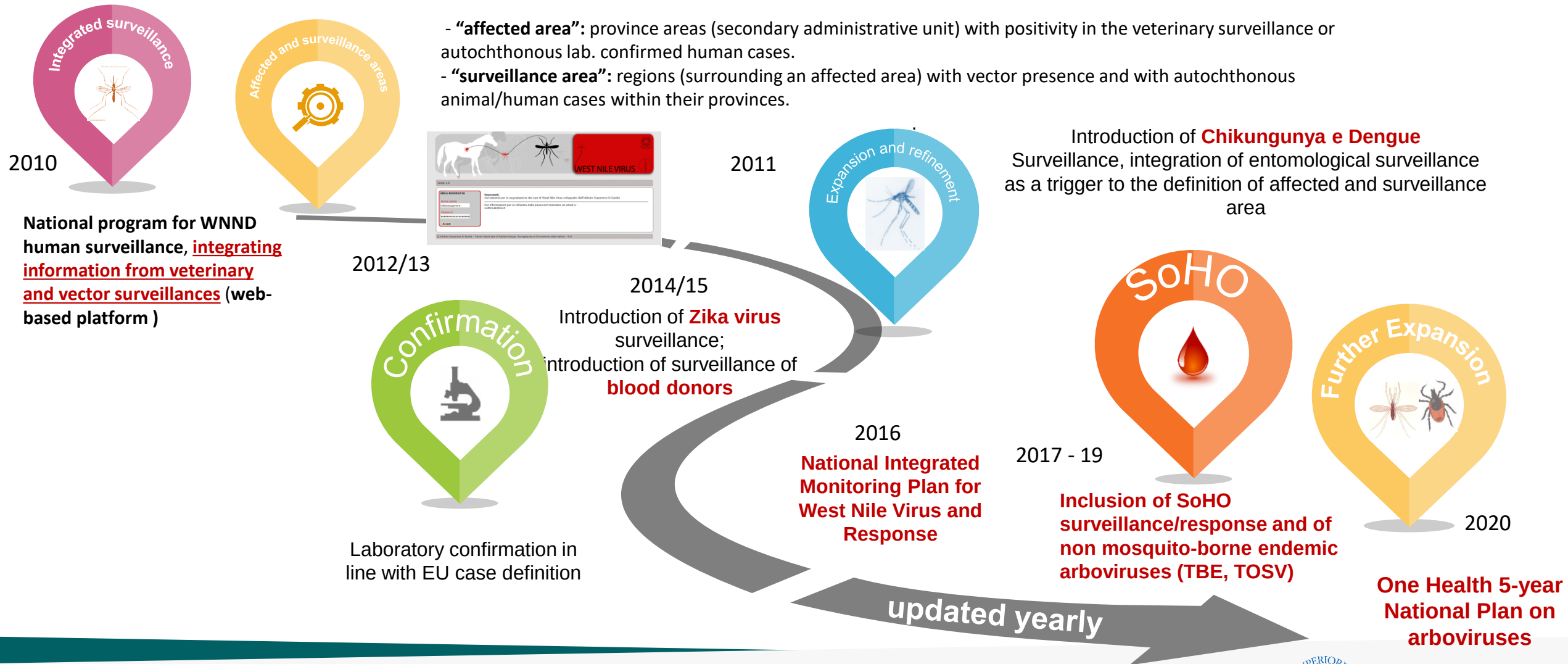


In 2022, until 9 November, most cases (61%) and deaths (51%) associated with WNV infections in the EU and European Economic Area (EEA) were reported by Italy

Early Warning and Response in Italy – a multisectoral network



Context: evolution of One Health surveillance in Italy



Triggers for safety of Substances of Human Origin from a One Health perspective

Total = 301 locally acquired confirmed human cases

Total = 343 confirmed animal cases/mosquito pools

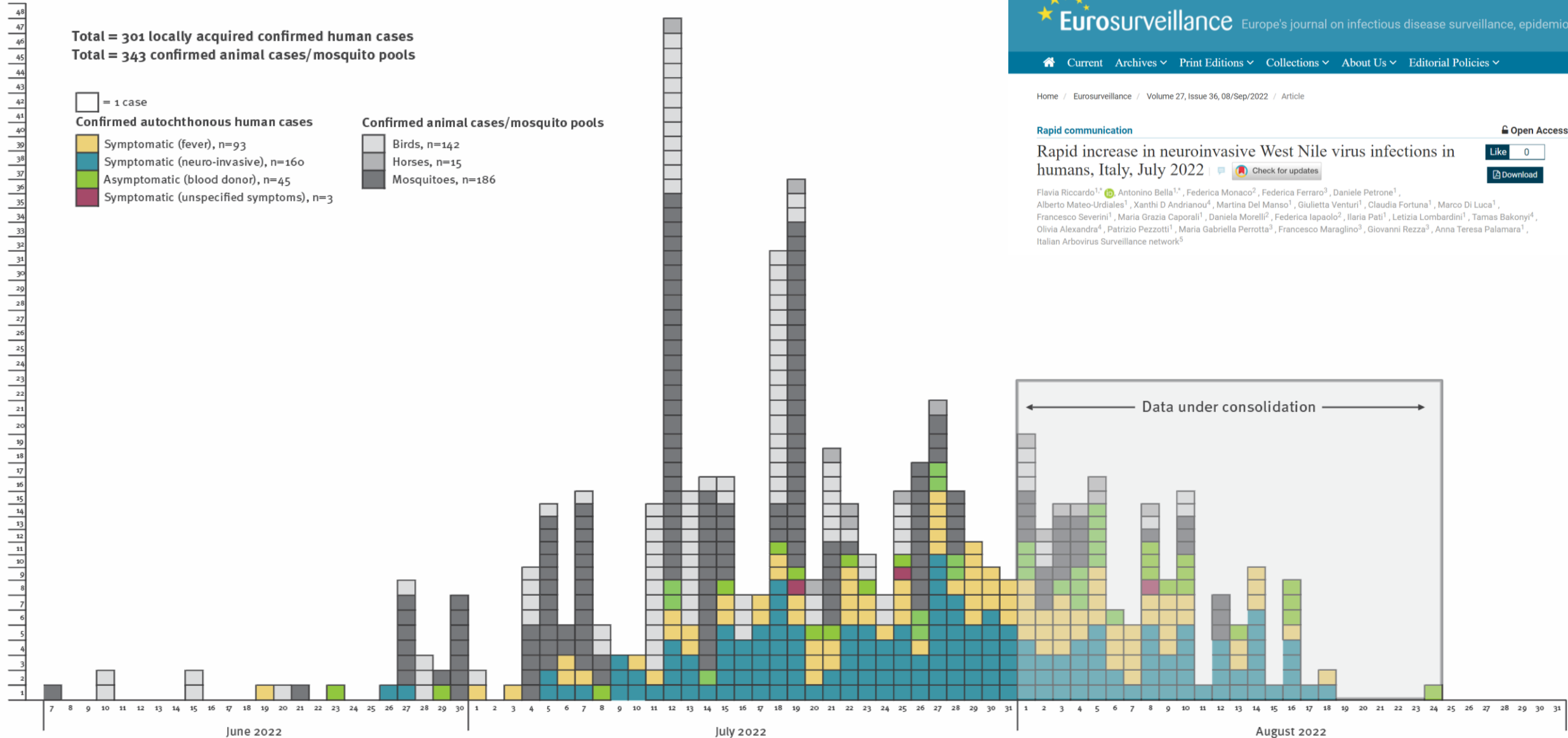
□ = 1 case

Confirmed autochthonous human cases

- Symptomatic (fever), n=93
- Symptomatic (neuro-invasive), n=160
- Asymptomatic (blood donor), n=45
- Symptomatic (unspecified symptoms), n=3

Confirmed animal cases/mosquito pools

- Birds, n=142
- Horses, n=15
- Mosquitoes, n=186



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Rapid communication

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Rapid increase in neuroinvasive West Nile virus infections in humans, Italy, July 2022

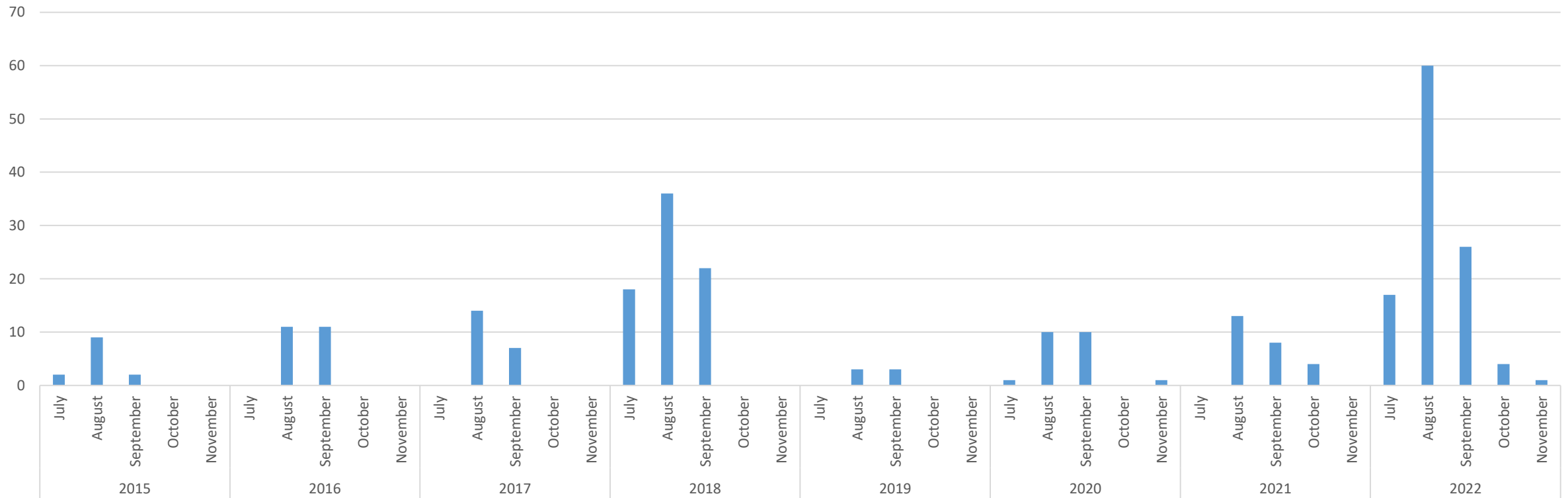
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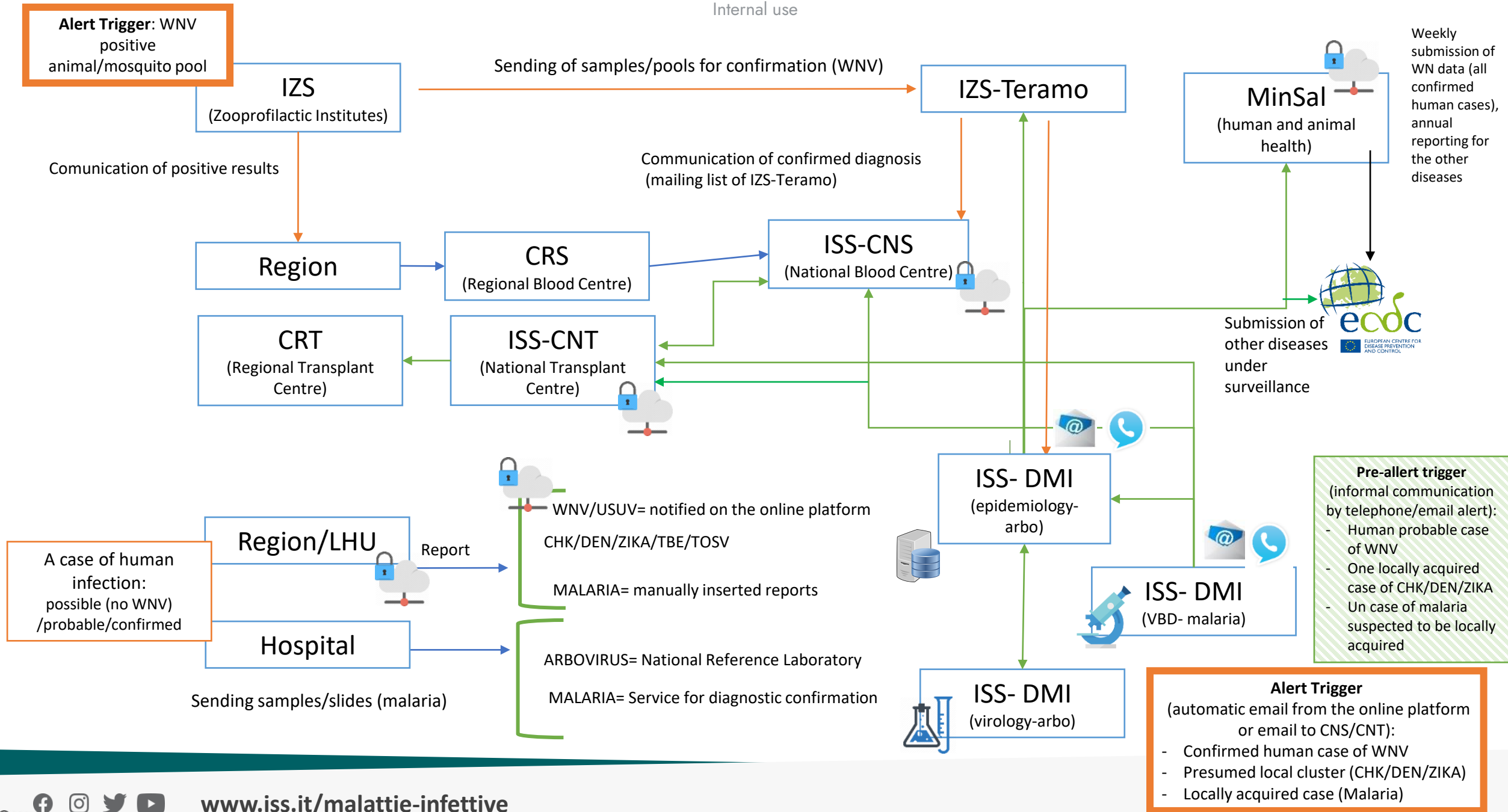
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Flavia Riccardo^{1,2}, Antonino Bella^{1,2}, Federica Monaco², Federica Ferraro³, Daniele Petrone¹, Alberto Mateo-Urdiales¹, Xanthi D Andrianou⁴, Martina Del Manso¹, Giulietta Venturi¹, Claudia Fortuna¹, Marco Di Luca¹, Francesco Severini¹, Maria Grazia Caporali¹, Daniela Morelli², Federica Iapalo², Ilaria Pati¹, Letizia Lombardini¹, Tamas Bakonyi⁴, Olivia Alexandra⁴, Patrizio Pezzotti¹, Maria Gabriella Perrotta³, Francesco Maraglino³, Giovanni Rezza³, Anna Teresa Palamara¹, Italian Arbovirus Surveillance network⁵

WNV screening of blood donors in Italy

Blood donors screened with confirmed WNV infection, Italy, 2015-2022





2022 transmission season: extension of blood safety measures

- Nucleic acid testing (NAT) to detect and so prevent transmission of WNV infection through donated substances of human origin (SoHO).
- IgG/IgM testing to screen donors of tissues, cells and organs.
- Province-level (NUTS3) triggers for SoHO safety measures are confirmed viral detection in mosquito pools, or confirmed infection in animals or humans.



Misure preventive per il contrasto del West Nile Virus (WNV): test NAT o in alternativa sospensione temporanea per 28 giorni dei donatori di sangue e di emocomponenti che abbiano soggiornato anche solo per una notte nei luoghi indicati nella stagione estivo-autunnale 2022

Aggiornamento
03/11/2022



ITALIA (province interessate dall'attivazione delle misure)

Alessandria, Asti, Bergamo, Biella, Bologna, Brescia, Cagliari, Caserta, Catania, Como, Cremona, Crotone, Cuneo, Ferrara, Firenze, Forlì-Cesena, Gorizia, Lecco, Lodi, Lucca, Mantova, Milano, Modena, Monza e Brianza, Novara, Nuoro, Oristano, Padova, Palermo, Parma, Pavia, Piacenza, Pistoia, Pordenone, Ravenna, Reggio Emilia, Rimini, Rovigo, Sassari, Torino, Trapani, Treviso, Udine, Varese, Venezia, Verbano-Cusio-Ossola, Vercelli, Verona, Vicenza.

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Austria: Stati federati della Bassa Austria, di Vienna e del Burgenland. **Croazia:** Regioni di Baranja, Karlovac, Moslavina, Osijek, Sirmia, Sisak, Vukovar, Zagabria. **Francia:** dipartimenti delle Bocche del Rodano e del Var. **Germania:** Circondari di Harz, Saale, Salzland, Vogtland e città di Berlino e Lipsia. **Grecia:** Unità periferiche della Calcidia, Drama, Eubea, Ftiotide, Imazia, Karditsa, Kavala, Kilkis, Larissa, Leucade, Pella, Pieria, Salonicco, Serres, Tasos, Trikala. **Romania:** Distretti di Brăila, Brasov, Botosani, Bucarest, Costanza, Dâmbovița, Galati, Giurgiu, Iasi, Ilfov, Olt, Sibiu. **Serbia:** Distretti di Bačka Occidentale, Bačka Settentrionale, Banato Settentrionale, Braničevo, Grad Beograd (Belgrado), Juzno-Backi, Juzno-Banatski, Kolubara, Mačva, Moravica, Podunavlje, Pomoravlje, Rasinski, Srednje-Banatski, Sremski, Šumadija. **Slovacchia:** Regione di Bratislava. **Spagna:** province di Cadice, Cordova e Terragona. **Ungheria:** Province di Csongrád, Győr-Moson-Sopron, Hajdú-Bihar, Heves, Pest, Somogy, Szabolcs-Szatmár-Bereg.

SOSPENSIONE TUTTO L'ANNO

Stati Uniti e Canada

In conclusion

- Arboviruses are diseases with relevant public health impact
- Complexity in transmission cycles across species and diverse epidemiology
- Complexity in surveillance and response
- Connection between environmental parameters and vector activity



Opportunity for earlier triggers for action

Thank you!

flavia.riccardo@iss.it



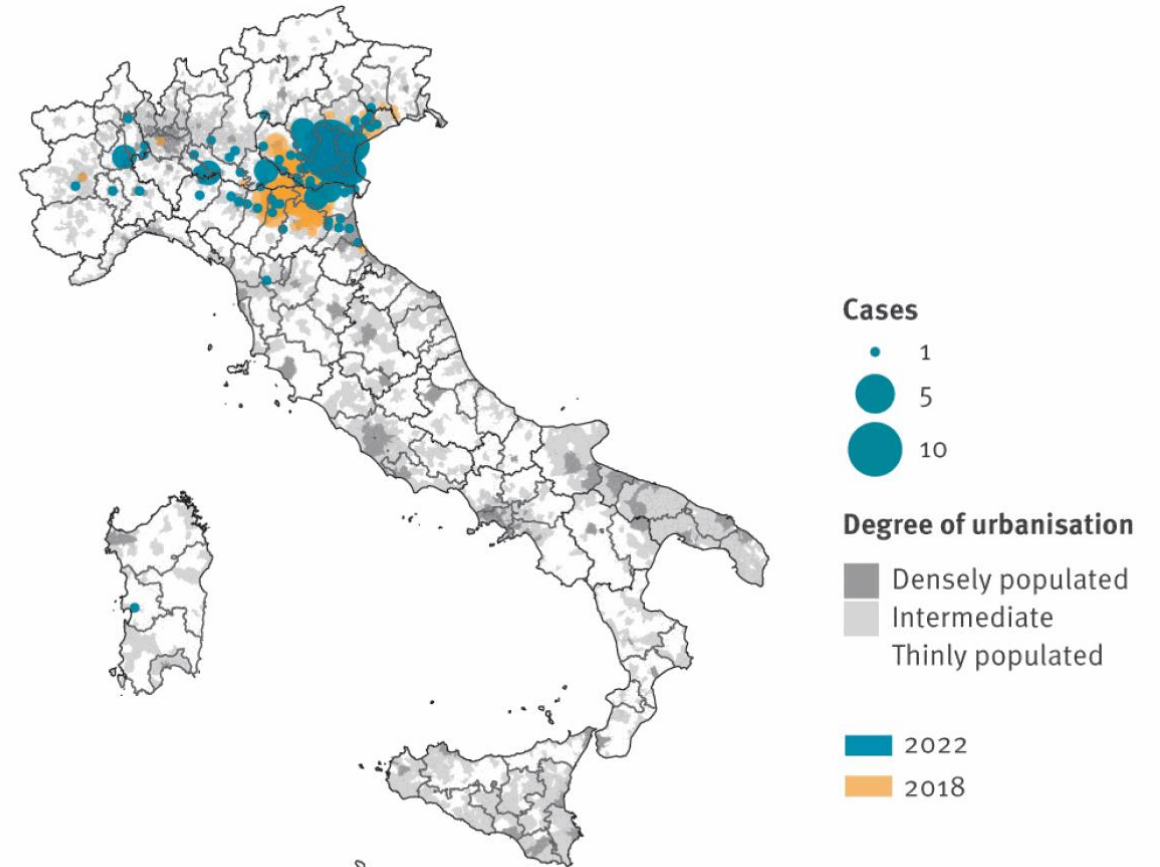
Extra Slides

Geographical distribution of cases in 2022

The highest human case counts were in Veneto, mainly in the Padua province

Higher proportion of WNV-1 cases than WNV-2 cases in Padua, Rovigo and Venice (Barzon, 2022)

Geographical distribution of West Nile virus human infections in regions with at least one human case with onset or diagnosis up to 31 July, by affected municipality and degree of urbanisation, Italy, 2018 vs 2022 (as of 24 August 2022)



Viral lineage distribution changes over time

- WNV-1 was first detected in 1998, WNV-1 strains of the Western Mediterranean clade caused outbreaks until 2013
- WNV-2 of the Central and Southern European clade was first detected in Italy in 2011 and replaced WNV-1 in northern Italy since 2013
- The 2018 outbreak was sustained by WNV-2 of the central-southern European clade
- A newly introduced WNV-1a strain, was identified for the first time in 2021 in Veneto and spread more widely in 2022
- In 2022 co-circulation of WNV lineages 1 and 2 was detected

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Early start of seasonal transmission and co-circulation of West Nile virus lineage 2 and a newly introduced lineage 1 strain, northern Italy, June 2022 | [Check for updates](#)

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Luisa Barzon^{1,2} [ORCID](#), Fabrizio Montarsi³ [ORCID](#), Erika Quaranta³ [ORCID](#), Isabella Monne³ [ORCID](#), Monia Pacenti² [ORCID](#), Alice Michelutti³, Federica Toniolo³, Patrizia Danesi³ [ORCID](#), Giulio Marchetti³, Federica Gobbo³ [ORCID](#), Alessandro Sinigaglia¹ [ORCID](#), Silvia Riccetti¹ [ORCID](#), Emanuela Dal Molin¹, Laura Favero⁴, Francesca Russo⁴, Gioia Capelli³ [ORCID](#)

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PMID: 36331269 DOI: [10.1093/jtm/taac125](#)

2022 Increased circulation

Hypothesis

The drought might have limited the number of favourable habitats for mosquito breeding and bird nesting, favouring an initial geographical concentration of vectors and hosts, viral amplification and, subsequently, the spread of WNV circulation once water became more abundant.

Increased susceptibility in birds/vectors for new WNV-1a strain?

Increased proportion of WNND

Concurrent increased transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may have made WNF ascertainment less likely, especially in the case of mild and self-limiting disease

Increased disease severity associated with new WNV-1a strain?

Hypothesis