

# BUZZ AND BITE: A REPORT ON THE RISE OF MOSQUITO-BORNE DISEASES ACROSS EUROPE IN RECENT YEARS

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## BACKGROUND

Mosquito-borne diseases, transmitted through the bites of infected mosquitoes, include chikungunya, dengue, Japanese encephalitis, malaria, Rift Valley fever, West Nile fever, yellow fever, and Zika. Native European mosquito species (*Anopheles* and *Culex*) can transmit malaria, Japanese encephalitis, and West Nile fever.

However, according to the European Centre for Disease Prevention and Control (ECDC), the risk of additional mosquito-borne diseases is raising in southern Europe due to the establishment of invasive mosquito species, particularly *Aedes albopictus* mosquito, which can transmit chikungunya, dengue, yellow fever, Zika, and Rift Valley fever.<sup>1</sup>

The threat is further strengthened by the growing international travel between dengue-endemic regions and Europe, which increased from over 5.8 million travelers entering Europe in 2010 to more than 19 million in 2022<sup>2,3</sup>. These factors have both contributed to the emergence of locally acquired cases, including local outbreak of chikungunya in Italy in 2017 and autochthonous dengue cases reported in Croatia and France starting from 2010.

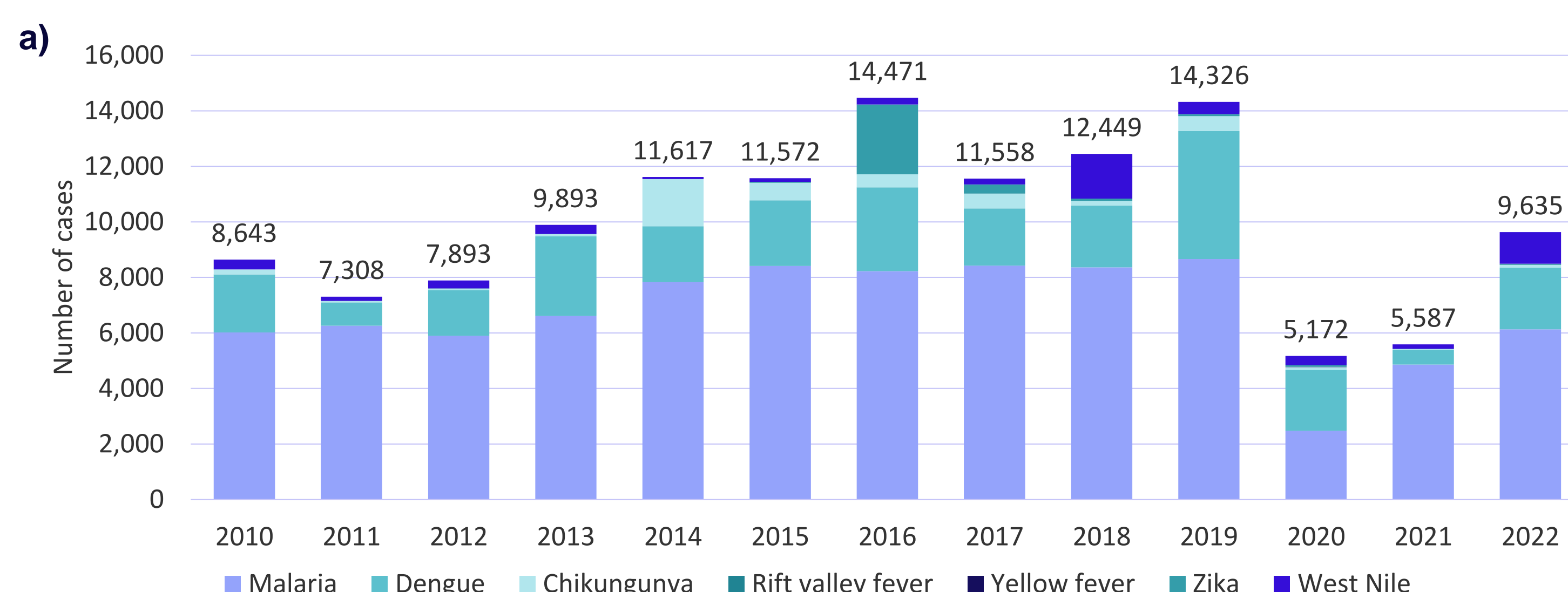
## OBJECTIVE

This study aimed to investigate the epidemiological trends of mosquito-borne diseases across Europe from 2010 to 2022. We analyzed reported cases over time, by country, and by travel destinations. With dengue being one of the fastest-growing global infectious diseases, we assessed the risk of infection among travelers between Europe and dengue-endemic regions.

## METHODS

Data on mosquito-borne diseases in Europe were sourced from the ECDC<sup>4</sup>. Detailed information on dengue, chikungunya, West Nile fever, and Zika - the most frequently reported diseases in Europe - was then obtained from the European Surveillance System (TESSy)<sup>5</sup>, chosen for its completeness and consistency. Data for the UK were supplemented using national epidemiological reports<sup>6</sup>.

Yearly figures on international travelers from 2010 to 2022, categorized by home and destination countries, were extracted from the World Tourism Organization reports (United Nations Tourism, 2024)<sup>7</sup>.



**Figure 1.** a) Reported yearly mosquito-borne disease cases in Europe (Zika cases available for 2015-2022 only); b) Total reported local cases of West Nile fever in Europe in 2010-2022; c) Total reported local cases of dengue in Europe in 2010-2022.

The travelers' infection rate (TIR) per 100,000 travelers was calculated as an indicator of the risk of infection during travel.

## RESULTS

### All cases

- Between 2010 and 2022, malaria consistently recorded the highest number of reported cases, with a stable incidence observed from 2014 to 2019 (Fig. 1a).
- In contrast, from 2010 to 2020, annual dengue cases reported across European countries steadily increased, averaging 213 additional cases per year. This trend likely resulted from enhanced surveillance efforts and a growing risk of dengue transmission. The COVID-19 pandemic significantly reduced travel activity, leading to a temporary decline in reported cases. However, by 2022, a resurgence of dengue cases was observed, and early data from 2023 (e.g., from France<sup>8</sup>) suggested a renewed risk.
- The incidence of chikungunya, Zika, and West Nile fever in Europe remained relatively stable, with isolated outbreaks occurring sporadically.

### Local cases

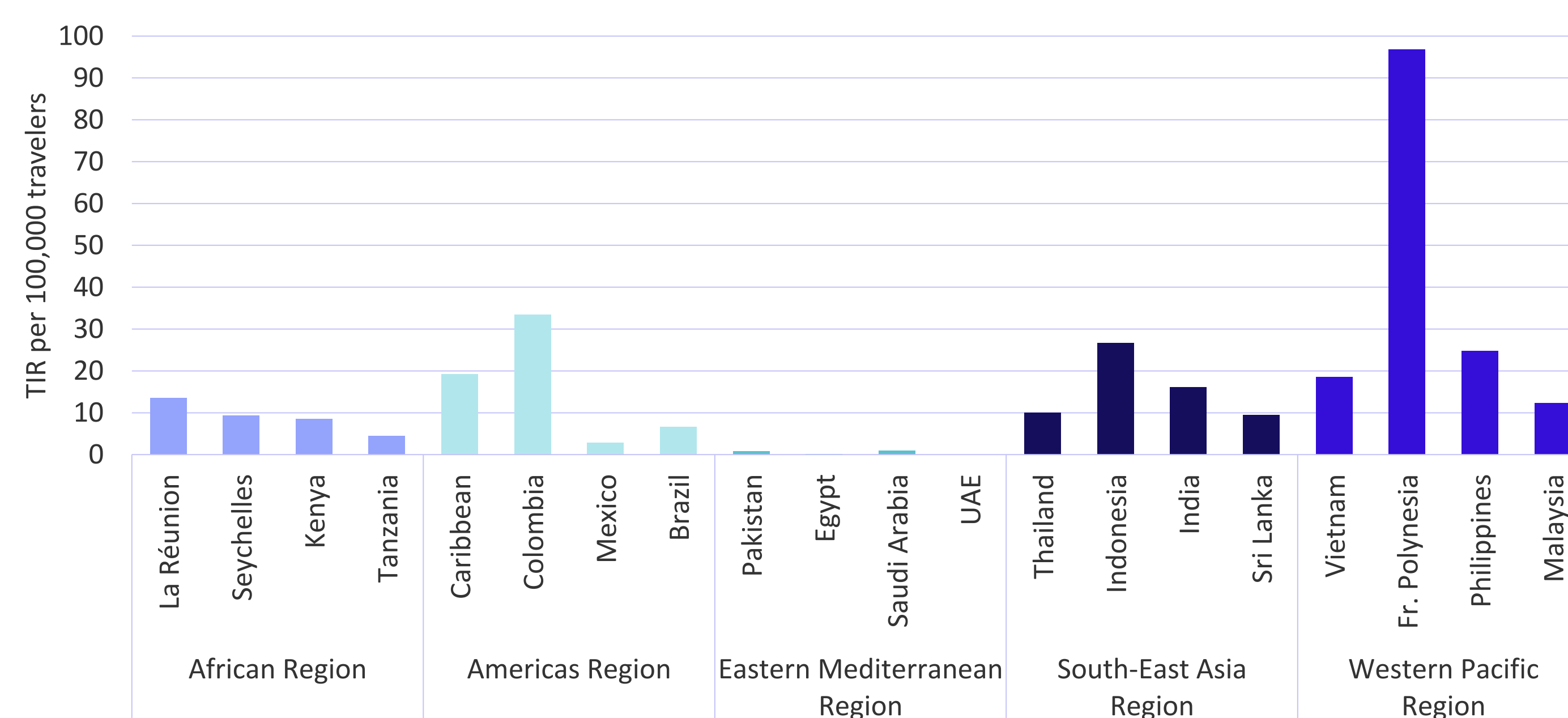
- Although malaria is transmitted by local mosquito species, over 99% of reported cases were travel-related.
- West Nile fever consistently had the highest number of locally acquired cases reported annually, primarily in Italy,

Greece, and Romania (1,973, 1,702, 731 cases, respectively; Fig. 1b).

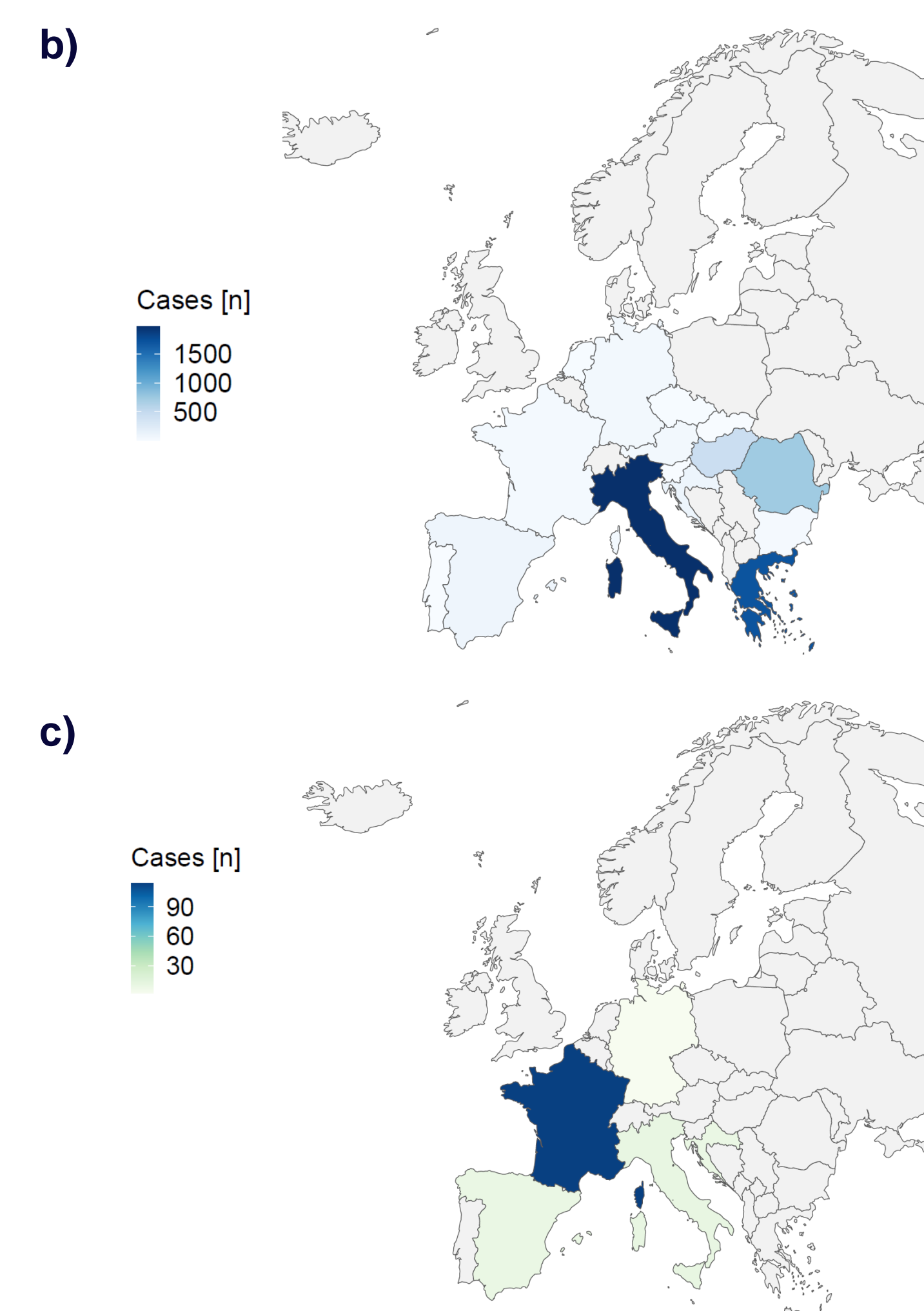
- In recent years, dengue cases have been increasingly reported, with France recording in total 114 locally acquired cases. The geographic distribution of these cases across European countries is illustrated in Fig. 1b-c.
- Isolated outbreaks of chikungunya were noted in Italy in 2017, with 282 cases, while sporadic cases of Zika were reported in 2016 (20 cases) but did not reappear in subsequent years.

### Travel-related cases of dengue

- Most dengue cases among European travelers were acquired in Thailand, Indonesia, the Caribbean and India — key destinations in dengue-endemic regions.
- While estimated TIRs varied by year, they showed relatively consistent trends across European countries and destinations (Fig. 2).
- The highest infection risk per traveler was noted in the Western Pacific, especially in French Polynesia, the Philippines, and Vietnam. This was followed by the Americas, particularly Colombia and the Caribbean, and South-East Asia, where Indonesia and India also had elevated dengue infection rates for European travelers.
- African destinations posed a consistent, moderate risk, while the Eastern Mediterranean region exhibited only sporadic risk of dengue infection.



**Figure 2.** Estimated TIRs of dengue infections among European\* travelers, by region of infection



## CONCLUSIONS

- Malaria was the most frequently reported mosquito-borne disease from 2010 to 2022, followed by dengue. Zika and chikungunya cases, though notable, were associated with isolated outbreaks, indicating episodic transmission, while Rift Valley and yellow fever cases remained rare.
- West Nile fever had the highest incidence of local transmission, underscoring the role of native mosquito species. Recent years have also seen an increase in local dengue cases transmitted by invasive mosquito species.
- Most travel-related dengue cases were imported from South-East Asia and the Caribbean; however, the number of imported cases did not always correlate with infection risk. The study suggested that travelers to less-frequented destinations may face potentially higher risks, emphasizing the importance of taking special precautions, including vaccination against dengue where available.
- Key limitations of the study included underreporting of dengue cases in Europe and inconsistencies between national surveillance systems and the data reported in the TESSy database. France, in particular, showed the largest discrepancies between TESSy data and national statistics.

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\*The analysis included dengue cases reported in France, Germany, Spain, Sweden, and the UK, which together account for over 80% of all European dengue cases. Travel destinations with insufficient data were excluded from the analysis. Note: Dengue cases reported in the UK were stratified by the UN regions only, which prevented analysis at the individual country level. Although the estimated TIRs for these regions were significantly lower than those for individual countries, they suggested similar trends..