Study finds climate change has contributed to the spatial expansion of West Nile virus in Europe

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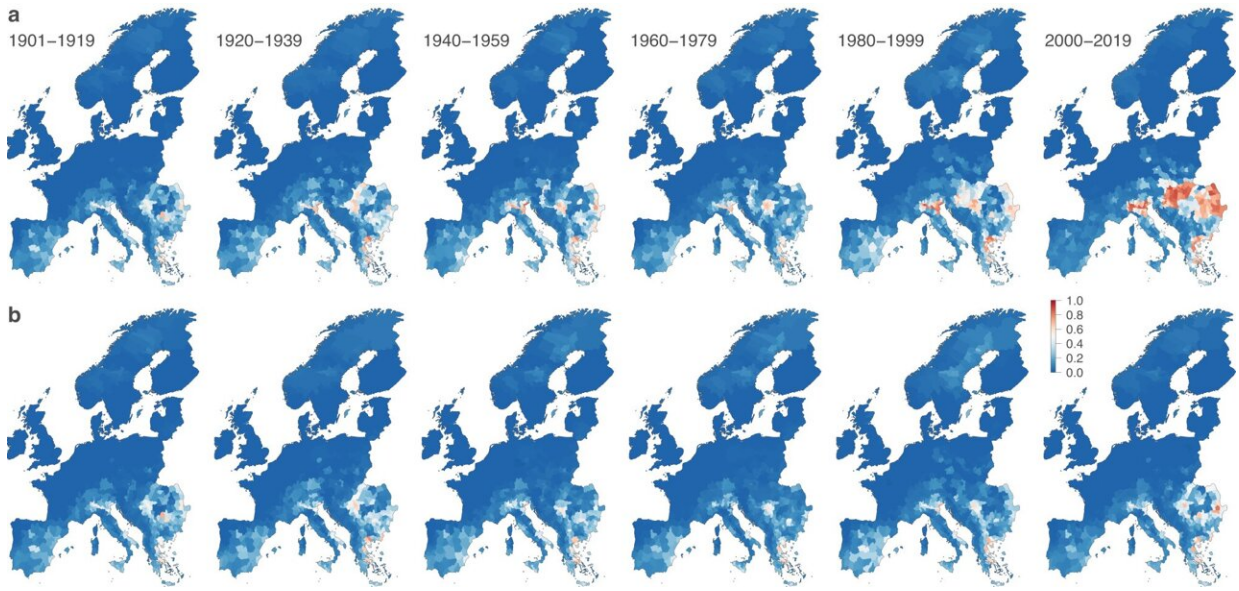

Estimated changes in the risk of local West Nile virus circulation since the beginning of last century across the European continent. The successive maps display the estimated evolution of ecological suitability based on actual environmental data (a) and a counterfactual scenario representing a world without climate change (b). Credit: *Nature Communications* (2024). DOI: 10.1038/s41467-024-45290-3

West Nile virus is an emerging pathogen in Europe and represents a public health threat in previously non-affected European countries.

Occurring in a cycle involving transmission between bird and mosquito species, this virus can be transmitted to humans by mosquitoes and induce West Nile fever.

Although most human infections are asymptomatic, about 25% of victims develop symptoms such as fever and headache, and less than 1% develop more severe neurological complications that can lead to death.

While climate change has been cited as a potential driver of the emergence of West Nile virus on the European continent, a formal evaluation of this causal relationship was lacking.

In a study published in the journal *Nature Communications*, researchers from the University of Brussels (ULB)—Diana Erazo and Simon Dellicour from the Spatial Epidemiology Laboratory—and their collaborators investigated the extent to which West Nile virus spatial expansion in Europe can be attributed to climate change while accounting for other direct human influences such as land use and human population changes.

To this end, they adopted a machine learning approach to predict the risk of local West Nile virus circulation given local environmental conditions. They subsequently unraveled the isolated effect of climate change by comparing factual simulations to a counterfactual where climate change had been removed.

"Our results point towards a significant responsibility of climate change in the establishment of West Nile virus in the south-eastern part of the continent. In particular, we identify that current West Nile virus hotspots in Europe are most likely to be attributed to climate change," explains Diana Erazo, first author of the study and post-doctoral researcher at the Spatial Epidemiology Lab.

"Our results also demonstrate a recent and drastic increase of the population at risk of exposure. While this increase is partly due to an increase in population density, we show that climate change has also been a critical factor driving the risk of West Nile virus exposure in Europe."

Made possible by the collaboration of researchers with different expertise, the study is also the result of an interdisciplinary approach. "Our work illustrates how climate data could be effectively used in an epidemiological context by estimating the past and present-day ecological suitability of the virus, filling another analytical gap between climate science and epidemiology" says Simon Dellicour, supervisor of the study and head of the Spatial Epidemiology Lab.

"With climate change emerging as a critical public health challenge, future work should explore the evolution of infectious disease distributions under different scenarios of future climate change to inform surveillance and intervention strategies."

More information: Diana Erazo et al, Contribution of climate change to the spatial expansion of West Nile virus in Europe, *Nature Communications* (2024). DOI: 10.1038/s41467-024-45290-3

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