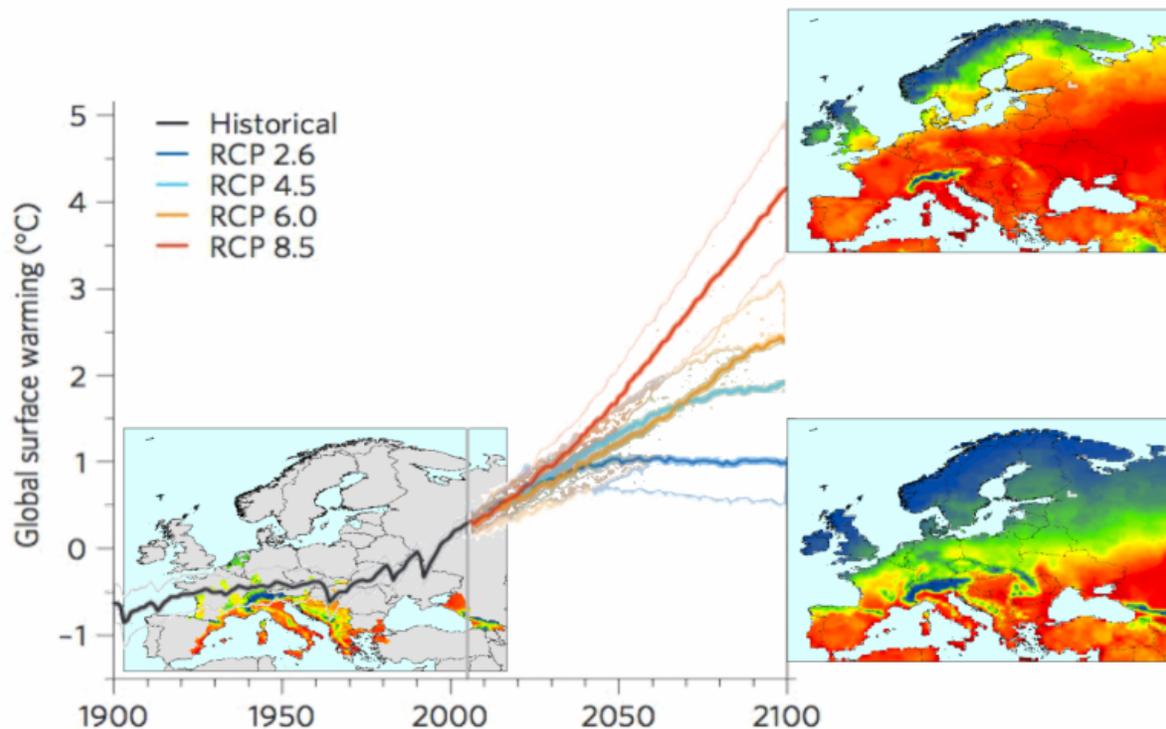


# A warming climate puts Europe at risk for seasonal outbreaks of dengue fever

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Map on the the left shows areas with current dengue epidemic potential (from *Aedes* mosquitos). Map on top right shows future dengue epidemic potential during 2090s, under high emission scenario. Map on lower right show future dengue epidemic potential during 2090s, under low emission scenario. Line plots global surface temperature change over time from historical data to future scenarios. Credit: Jing Liu-Helmersson

Increasing temperatures will enlarge Europe's seasonal window for the potential spread of mosquito-borne viral disease, expanding the geographic areas at risk for a dengue epidemic to include much of Europe. The findings by researchers at Umeå University in Sweden are published in the journal *EBioMedicine*.

Researchers at Umeå University's Unit for Global Health have calculated the risk for [dengue](#) outbreaks in Europe based on a set of different [climate change](#) predictions. Climate change-related temperature variations and overall warmer mean temperatures both have profound growth impacts on the ability of vectors - *Aedes aegypti* and *Aedes albopictus* - to transmit dengue. The *Aedes* mosquitos, especially *Aedes aegypti*, are associated with most major dengue epidemics.

"The geographic expansion of dengue viruses and *Aedes* mosquitos as the carrying vectors is a major [global health](#) concern," says Jing Liu-Helmersson, researcher at the Department of Public Health and Clinical Medicine and main author of the article. "In the midst of warming temperatures on the European continent and a number of complex factors such as increased travel and trade, Europe now finds itself at an elevated risk of mosquito-borne epidemics such as dengue fever.

Earlier studies have shown that warming temperatures may increase the geographic spread of tropical and subtropical mosquito-borne viral diseases into temperate areas, such as Europe. The study published in *EBioMedicine* is the first to look at how increasing mean temperatures and its daily variation correspond with increases in vectorial capacity, i.e. the ability for a mosquito to transmit the disease between humans. Vectorial capacity depends on a number of parameters. In general, warmer temperatures increase virus reproduction and transmission, and the rate in which the female mosquitos bite. As a result, a warmer overall climate extends the seasonal window of opportunity for mosquitos to transmit [dengue fever](#).

In determining the dengue epidemic risk for Europe, the Umeå University researchers studied the effects of temperature on vectorial capacity of *Aedes* mosquitos. Using historic and present climate data and vector surveillance data as well as various climate change scenarios as basis, the researchers determined dengue epidemic risks in Europe based on modest to severe warming projections.

### **The study shows that:**

- Current vectorial capacity indicates that dengue epidemics are possible in summer in areas of Southern Europe where *Aedes* mosquitos are present.
- Future climate change will intensify vectorial capacity and shift the risk areas northward while prolonging the seasonal window.
- By the end of the century, seasonal dengue outbreaks could emerge in much of Europe where *Aedes* mosquitos are present.

The Umeå University researchers argue that *Aedes* mosquitos are likely to become a fixture in Europe, based on several factors. Historically, *Aedes* mosquitos were present in many European countries during the first half of the 1900s. The main dengue vector - *Aedes aegypti* - has recently been documented in Russia and Georgia. And current surveillance indicate that the secondary dengue vector, *Aedes albopictus*, are present in much of Southern Europe and as far north as the Netherlands.

"The 2012-2013 dengue outbreak in Madeira was a wakeup call for Europe to act," says Jing Liu-Helmersson. "More effective vector control will certainly be crucial to reduce the risk of dengue in Europe. But this is not as easy as it sounds. In Singapore, for example, is proving difficult to control *Aedes* mosquitos even with readily available resources. More importantly, however, our findings illustrate that mitigating greenhouse gas emissions to curb global warming will be just as crucial."

## About dengue: a growing global health concern

- According to the WHO, dengue is the world's most rapidly spreading viral infection in the last 20 years.
- Around 100 countries are considered endemic, though countries in Southeast Asia and South America are hit disproportionately.
- There are many as 390 million new viral infections per year and about 2.5 billion people are at risk of being infected, mainly in the tropics and sub-tropics.
- Dengue fever is a big burden on health care in affected countries.
- Since the *Aedes* mosquitos carrying the virus are active during the day, and children generally do not have immunity, school children are the most exposed group.

**More information:** Jing Liu-Helmersson et al. Climate Change and *Aedes* Vectors: 21st Century Projections for Dengue Transmission in Europe, *EBioMedicine* (2016). [DOI: 10.1016/j.ebiom.2016.03.046](https://doi.org/10.1016/j.ebiom.2016.03.046)

Provided by Umea University

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