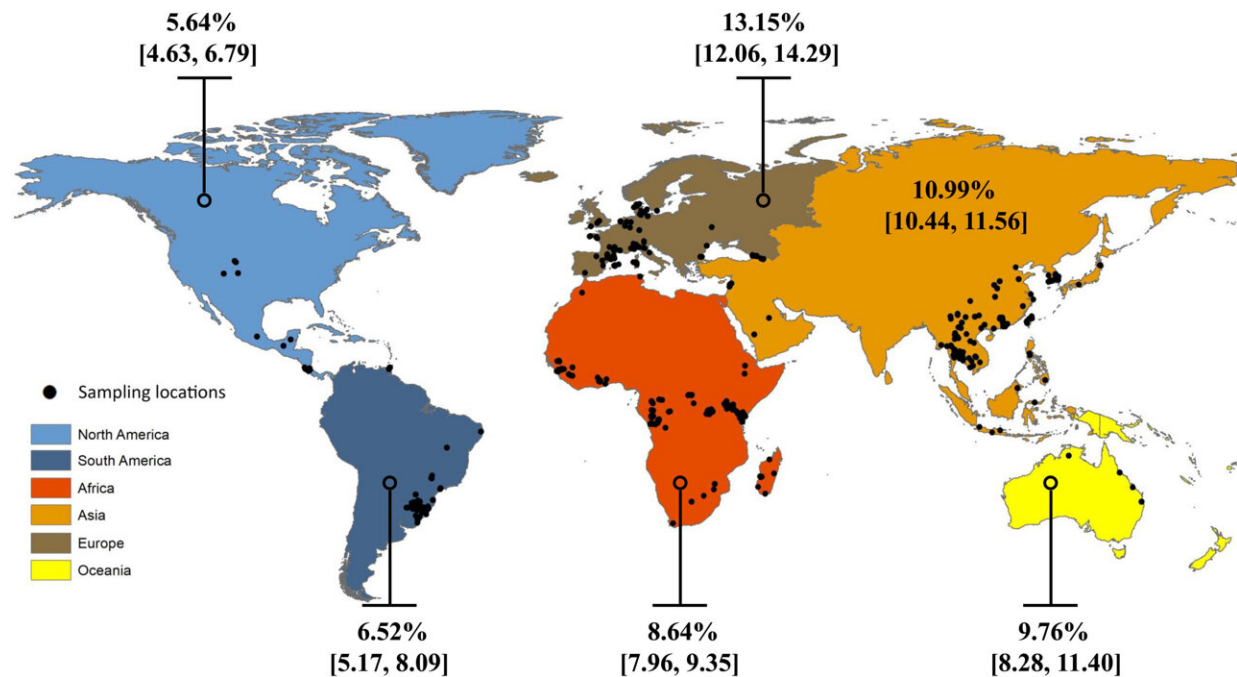


Bats in disrupted ecosystems are more infected with coronaviruses, reveals study

April 3 2023



Geographic origin of coronavirus surveillance data included in our dataset. Observed prevalence ($\pm 95\%$ CI) in wild bats averaged over continents. Credit: *Science Advances* (2023). DOI: [10.1126/sciadv.add0688](https://doi.org/10.1126/sciadv.add0688)

Over the past 20 years, coronaviruses in wild bat populations have led to three major disease outbreaks in humans: SARS in 2002, MERS in 2012 and COVID-19. The latter triggered an ongoing global pandemic. In turn, this has focused greater attention on zoonotic diseases, infectious

diseases that are transmitted from animals to humans.

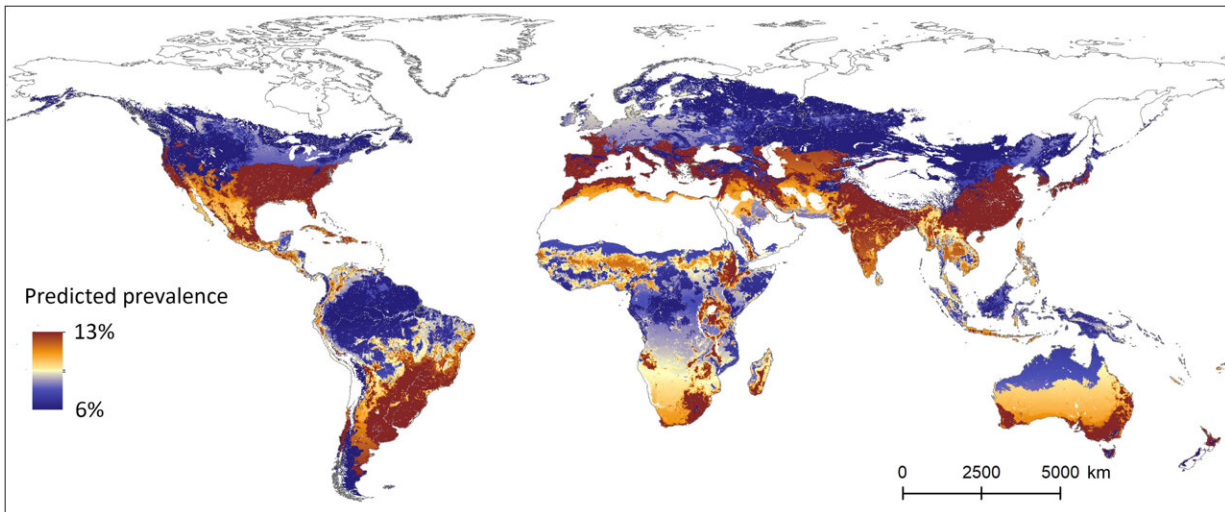
One thing has become clear: [human](#) land use change is a major driver of pathogen transmission from wildlife to humans—so called zoonotic spillover events. In part, this is a result of changes in the abundance and distribution of wild zoonotic hosts and of bringing wildlife into closer contact with humans.

Now a study led by Dr. Vera Warmuth from LMU's Department of Evolutionary Genetics reveals another important factor: their study clearly demonstrates that bats in human-dominated habitats are more frequently infected with coronaviruses than bats in less disturbed habitats. The paper is published in the journal *Science Advances*.

To arrive at this conclusion, the researchers statistically linked coronavirus infection data from more than 26,000 bats of over 300 species with [land cover](#) and land use data using a meta-analysis approach.

"Land modification often means a loss of important resources for wild animals. In the case of bats, these may be foraging grounds or suitable roost for hibernation," says Warmuth. The fact that such a loss of resources can lead to chronic stress in [wild animals](#) has already been shown on numerous occasions. If bats cannot find places to sleep or find less food in degraded or fragmented habitats, the associated chronic stress may weaken their immune system.

"The negative impact of [chronic stress](#) on the immune system of mammals is well known. Our findings clearly show that animals in disrupted ecosystems are more frequently infected. The more heavily an area is influenced by humans, the higher the probability of bats living in this area being infected with coronaviruses," Warmuth notes.



Predicted coronavirus prevalence in worldwide bats. Heatmap of predicted coronavirus prevalence conditioned on virus presence. Areas with insufficient data for extrapolation are indicated in white. Credit: *Science Advances* (2023). DOI: 10.1126/sciadv.add0688

Three broad types of land use explain most of the effect of overall land use on the prevalence of coronavirus infections in bats: agriculture, deforestation and energy production, including mining. All three have previously been identified as a major threat for bats worldwide due to their negative impact on two of the most important habitats for bats: forests and subterranean features such as caves and mines.

Bats are important reservoirs for viruses and the main animal hosts of coronaviruses. The fact that ecological stress has a significant impact on the frequency of coronavirus infections in [bats](#), suggests that successful management of spillover risk may require monitoring of not just the presence of pathogens in wildlife, but also the prevalence. "The models point to a handful of regions, especially in the eastern United States and

in India, where closer monitoring activities could be especially important," co-author Professor Dirk Metzler adds.

More information: Vera M. Warmuth et al, Human disturbance increases coronavirus prevalence in bats, *Science Advances* (2023). [DOI: 10.1126/sciadv.add0688](https://doi.org/10.1126/sciadv.add0688)

Provided by Ludwig Maximilian University of Munich

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