News in focus

PATRICK LANDMANN/SPL

Controlling deforestation (shown here, in a tropical rainforest in the Congo Basin) could decrease the risk of future pandemics, experts say.

WHY DEFORESTATION AND EXTINCTIONS MAKE PANDEMICS MORE LIKELY

Researchers are redoubling efforts to understand links between biodiversity and emerging diseases — and to use that information to predict and stop future outbreaks.

By Jeff Tollefson

As humans diminish biodiversity by cutting down forests and building more infrastructure, they're increasing the risk of pandemics of diseases such as COVID-19. Many ecologists have long suspected this, but a study now helps to reveal why. When some species are going extinct, those that tend to survive and thrive — rats and bats, for instance — are more likely to host potentially dangerous pathogens that can make the jump to humans.

The analysis of around 6,800 ecological communities on 6 continents adds to a growing body of evidence that connects trends in human development and biodiversity loss to disease outbreaks — but stops short of projecting where new disease outbreaks might occur.

"We've been warning about this for decades," says Kate Jones, an ecological modeller at University College London and an author of the study, published on 5 August in *Nature*[1]. "Nobody paid any attention."

Jones is one of a cadre of researchers that has long been delving into relationships between biodiversity, land use and emerging infectious diseases. Their work has mostly flown below the radar, but now, as the world reels from the COVID-19 pandemic, efforts to map risks in communities around the globe and to project where diseases are most likely to emerge are taking centre stage.

Last week, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) hosted an online workshop on the nexus between biodiversity loss and emerging diseases. The organization's goal now is to produce an expert assessment of the science underlying that connection ahead of a United Nations summit that's planned for September in New York City, where governments are expected to make new commitments to preserve biodiversity.

Others are calling for a more wide-ranging course of action. On 24 July, an interdisciplinary group of scientists, including virologists, economists and ecologists, published an essay in *Science*[2] arguing that governments can help to reduce the risk of future pandemics by controlling deforestation and curbing the wildlife trade, which involves the sale and consumption of wild – and often rare – animals that can host dangerous pathogens.

Most efforts to prevent the spread of new diseases tend to focus on vaccine development, early diagnosis and containment, but that's like treating the symptoms without addressing the underlying cause, says Peter Daszak, a zoologist at the non-governmental organization EcoHealth Alliance in New York City, who chaired the IPBES workshop. He says COVID-19 has helped to clarify the need to investigate biodiversity's role in pathogen transmission.

The latest work by Jones's team bolsters the case for action, Daszak says. "We're looking for ways to shift behaviour that would directly benefit biodiversity and reduce health risks."

Concentrating risk

Previous research has shown that outbreaks of diseases such as severe acute respiratory syndrome (SARS) and bird influenza that cross over from animals to humans have increased in the past few decades[3,4]. This phenomenon is likely to be the direct result of increased contact between humans, wildlife and livestock, as people move into undeveloped areas. These interactions happen more frequently on the frontier of human expansion because of changes to the natural landscape and increased encounters with animals.

But a key question over the past decade has been whether the decline in biodiversity that inevitably accompanies human expansion on the rural frontier increases the pool of pathogens that can make the jump from animals to humans. Work by Jones and others[5] suggests that the answer in many cases is yes, because a loss of biodiversity usually results in a few species replacing many – and these species tend to be the ones hosting pathogens that can spread to humans.

For their latest analysis, Jones and her team compiled more than 3.2 million records from several hundred ecological studies at sites around the world, ranging from native forests to cropland to cities. They found that the populations of species known to host diseases transmissible to humans – including 143 mammals such as bats, rodents and various primates – increased as the landscape changed from natural to urban, and as biodiversity generally decreased.

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Some researchers urge caution when communicating that biodiversity hotspots are where outbreaks are likely to occur. "My worry, frankly, is that people are going to cut down the forests more if this is where they think the next pandemic is going to come from," says Dan Nepstad, a tropical ecologist and founder of the Earth Innovation Institute based in San Francisco, California, a non-profit organization that campaigns for sustainable development. Efforts to preserve biodiversity will work, he says, only if they address the economic and cultural factors that drive deforestation and the dependency of rural poor people on hunting and trading wild animals.

Ibrahima Socé Fall, an epidemiologist and head of emergency operations at the World Health Organization in Geneva, Switzerland, agrees that understanding the ecology – as well as the social and economic trends – of the rural frontier will be essential to projecting the risk of future disease outbreaks. "Sustainable development is crucial," he says. "If we continue to have this level of deforestation, disorganized mining and unplanned development, we are going to have more outbreaks."

Coordinating efforts

One message that the upcoming IPBES report is likely to deliver is that scientists and policymakers need to treat the rural frontier more holistically, addressing issues of public health, the environment and sustainable development in tandem. In the wake of the COVID-19 pandemic, many scientists and conservationists have emphasized curbing the wildlife trade – an industry worth an estimated US$20 billion annually in China, where the first coronavirus infections appeared. China has temporarily suspended its trade. But Daszak says the industry is just one piece of a larger puzzle that involves hunting, livestock, land use and ecology.

"Ecologists should be working with infectious-disease researchers, public-health workers and medics to track environmental change, assess the risk of pathogens crossing over and reduce risky human activities," he says.

Daszak was an author of last month's essay in *Science*, which argued that governments could substantially reduce the risk of future pandemics such as that of COVID-19 by investing in efforts to curb deforestation and the wildlife trade, as well as in efforts to monitor, prevent and control new virus outbreaks from wildlife and livestock. The team estimated that the cost of these actions would ring in at $22 billion to $33 billion annually. The total investment would be two orders of magnitude less than the $5.6-trillion price tag estimated for the COVID-19 pandemic, the team estimates.

Fall says the key is to align efforts by government and international agencies focused on public health, animal health, the environment and sustainable development.

With the right collaboration between human-health, animal-health and environmental authorities, Fall says, "you have some mechanisms for early warnings".

Wildlife markets such as this one in Bali, Indonesia, sustain the livelihoods of many people.

AMILIA ROSO/*THE SYDNEY MORNING HERALD* VIA GETTY

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2. Dobson, A. P. *et al. Science* **369**, 379–381 (2020).
3. Jones, K. E. *et al. Nature* **451**, 990–993 (2008).
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