Predicting the Next Pandemic:

A new study pinpoints where and how future infectious viruses may spread

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Where will the next pandemic come from? Likely from bats.

Fighting emerging infectious diseases costs billions of dollars, as the AIDS pandemic and the recent Ebola epidemic in West Africa attest. So researchers from New York City-based nonprofit EcoHealth Alliance set out several years ago to try to pinpoint where and how future pandemics might erupt. Analyzing a database of wildlife species and viruses known to infect mammals and people, they calculated how many unknown viruses may be out there, who carries them and where they are likely to be.

Most new infectious diseases, such as HIV, Ebola and SARS, originate in animals and spill over into humans. If the viruses that cause them then start spreading from one person to another, they can cause outbreaks.

Predicting the next pandemic is more critical now than ever, said Peter Daszak, disease ecologist and president of EcoHealth Alliance. The rate at which new viruses are infecting people is increasing, a consequence in part of global travel and economic development. “We travel the world in one day, and we take the viruses we pick up with us,” Dr. Daszak said. “That’s how viruses become pandemics.”

Using a database of 2,805 mammal-virus connections, the researchers found that bats harbor nearly twice as many viruses that either threaten humans today or could threaten them in the future than the next mammal on the list—primates. Rodents came in third. Bats can infect people directly and by infecting other animals such as primates.

“If you think back over the last 20 years, we’ve had Ebola virus, SARS, MERS, Nipah virus, Hendra virus in Australia—these viruses are all carried by bats,” said Dr. Daszak, who was senior author of the study and led the group doing the research.

Each of more than 1,200 bat species has on average 17.22 viruses likely to cause disease in people, he said. He said that 53 bat viruses have infected people, so most of the viruses are still unknown and have yet to strike, he said. “There are literally thousands of potentially infectious viruses waiting to be discovered in bats,” he said.

The researchers analyzed which types of viruses pose the most danger to humans, showing that those that infect lots of species are significantly more likely to infect people.

They then identified hot spots where bats, primates and other mammals carry the unknown viruses and are coming into increasing contact with humans—places like the Amazon in Brazil, where logging businesses and roads such as the Trans-Amazonian Highway have penetrated forests rich with wildlife, or West Africa, where agricultural development is unearthing rats, mice and other rodents. Rodents are also a threat in parts of the mountain states and southwestern U.S., as suburbs develop and more people engage in outdoor activities, Dr. Daszak said. Primates are a risk in Central Africa, where they are hunted, and in Southeast Asia, where people live in close quarters with macaques, the nonprofit said.

"The idea is to get out there and stop" pandemics, Dr. Daszak said. "And the first step to stopping it is understanding where these viruses are."

Given all the travel and economic development in the world now, "it's the best it's ever been from a virus's point of view, and that's the challenge—how do we get ahead of that curve," he said. "If we just sit here and wait we will discover all of these unknown viruses, but we'll do it the hard way, by having pandemics."