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Pandemic Hot Spots Map a Path to Prevention Job one in stopping future pandemics: figure out where they start

By JR Minkel

A new study maps out areas of the world that researchers think are most likely to breed the killer diseases of the future—and the highlighted countries are not the ones getting most of the resources for disease prevention. The analysis is part of a budding effort to identify [emerging viruses](#) in particular and prevent future pandemics from reaching their full potential.

British and U.S. researchers compiled a database of 335 infectious diseases first acknowledged as a potential threat between 1940 and 2004. Examples include the Ebola virus (1976) and HIV (1981) as well as the more recent [Nipah virus](#) (1999), SARS (2002) and H5N1 bird flu (1997). They compared the frequency of novel outbreaks with possible contributing factors such as population density and growth, latitude, and the diversity of wildlife.

Emerging infections have become steadily more frequent over the decades, peaking in the 1980s, they report, possibly because of the AIDS pandemic. Bacteria were responsible for 54 percent of the total, especially drug-resistant varieties such as [methicillin-resistant staphylococcus aureus, or MRSA](#) (1961). Viruses and prions (infectious proteins) contributed 25 percent, followed by protozoa at 11 percent and fungi at six percent.

The areas showing the highest frequency of distinct outbreaks all had growing population densities. The U.S. and Europe had more reported outbreaks, but these events seemed to reflect greater disease surveillance in industrialized countries, the group wrote in *Nature*.

"We conclude that the global effort for EID [emerging infectious disease] surveillance and investigation is poorly allocated," they wrote, "with the majority of our scientific resources focused on places from where the next important emerging pathogen is least likely to originate. We advocate reallocation of resources for 'smart surveillance' of emerging disease hot spots in lower latitudes, such as tropical Africa, Latin America and Asia."

Overall, 60.3 percent of the emerging pathogens were [zoonoses](#)—animal pathogens that infect humans—and 71.2 percent of these came from wildlife. The fraction of outbreaks stemming from zoonoses in general and the wildlife variety in particular both rose over time. The team says these findings suggest that emerging infectious diseases flourish where people are coming into greater contact with wild animals.

This study and others before it increasingly show "that there are patterns which can be used for the forecasting of novel pandemics," says infectious disease specialist Nathan Wolfe of the University of California, Los Angeles, who was not part of the study. "It helps to inform the kind of monitoring that'll have to be in place to take this to the next step, to really prevent the next pandemic."

In an example of "smart surveillance," Wolfe has worked in the African nation of Cameroon monitoring the exchange of retroviruses between wild primates and human hunters exposed to their blood. He has already identified several examples of viruses jumping to people, including three new foamy viruses (which are not known to cause human sickness), and two new forms of human T-lymphotropic virus (HTLV), related to HTLV-1, which is common among IV-drug users in the U.S. and is believed to cause certain cancers.

Along with Peter Daszak of the Consortium for Conservation Medicine in New York City, a co-author of the *Nature* report, he has begun monitoring Chinese wet markets, where live animals are sold for food. Wolfe is seeking \$50 million to expand his pilot project from sites in seven African and Asian countries into what he calls a Global Viral Forecasting Initiative.

Although the hot spot map points to areas of growing density, the detailed route of a pandemic is more complex, Wolfe says. Hunters bringing valuable bushmeat or game to market take with them potential new infections. Wildlife



may also begin traveling into expanding urban areas along newly cleared roads.

"If you have close proximity, things that previously would have gone extinct now have the potential to travel from person to person and become established," Wolfe says. If a pandemic is like a wildfire, then "our hunters are kindling, [and] large, dense urban population centers are the logs."