

New study mapping pandemic potential could help prevent future disease outbreaks

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A new scientific study provides the first evidence-based assessment of pandemic potential in Africa prior to outbreaks and identifies ways to prevent them.

The study, published today in the international medical journal *The Lancet*, examines the potential for the widespread onset of Ebola or other lethal viral hemorrhagic fevers emanating from communities in African countries. A team of international researchers examined the relative likelihood of four deadly viruses emerging and spreading at several key stages in a possible pandemic, charting and quantifying progress from the first human case through to a widespread epidemic.

Data visualizations from the paper are available at <https://vizhub.healthdata>.

By mapping the greatest vulnerabilities for initial cases to escalate into epidemics, more precise preparedness activities can be implemented.

A data visualization

"In the absence of strong surveillance and response systems, [infectious disease outbreaks](#) can quickly overwhelm a country's health system," said Dr. Simon I. Hay, Director of Geospatial Science at the Institute for Health Metrics and Evaluation (IHME), an independent global health research organization at the University of Washington in Seattle. "As we

have seen with Ebola, it is absolutely vital to prevent or stop epidemics at the earliest possible stages. With a focus on Africa, this study's framework provides an important tool for pinpointing where local surveillance and pre-emptive countermeasures are most needed."

Researchers focused on four diseases - Ebola virus disease, Marburg virus disease, Lassa fever, and Crimean-Congo hemorrhagic fever - since the way they move from animal sources to humans is similar. The study's results showed considerable differences in the potential for these pathogens to spread both between countries as well as within and among communities in an individual country. For example, researchers identified stark contrasts in the vulnerability between Nigeria's northern and southern states.

"Understanding subnational variation in pandemic potential is a crucial part of preventing and responding to disease outbreaks," said Dr. David Pigott, lead author of the study. "These results show that national assessments can mask significant subnational differences - which could be the difference between quick case detection and treatment, or early cases going unchecked and resulting in a large-scale epidemic. National assessments are an important first step, but are insufficient on their own to strengthen local disease surveillance, response, and preparedness needs."

While the study identifies at-risk locations that have witnessed outbreaks, it also highlights large areas of the continent currently considered not at risk, much like Guinea prior to 2013, when the transmission of the Ebola virus led to more than 25,000 reported cases and 10,000 deaths in three countries, according to the World Health Organization.

Parts of Central African Republic, Chad, Somalia, and South Sudan rank as highly vulnerable to any outbreak. Areas around the Congo River in

Central Africa rank highest for local outbreak potential for Ebola and Marburg virus disease. In contrast, parts of West Africa rank highest as sources of widespread epidemics for all four viruses. For example, Guéckédou prefecture in Guinea, where the 2013-2016 Ebola outbreak originated, ranks as one of the most likely districts for an individual Ebola case to result in a widespread epidemic.

Dr. Peter Piot, Director of the London School of Hygiene & Tropical Medicine and a co-author of the study, noted, "By assessing pandemic potential at these different stages, we can begin to identify locations where different interventions or prevention measures could have the greatest impact. The various stages reflect important transitions in an outbreak and influence what interventions should be prioritized in which location."

Such efforts can range from focusing on surveillance of animals involved in transmission, rapid detection of the first case of an outbreak, or providing resources for improving health systems prior to the next outbreak. Similarly, after an outbreak has started, assessments could guide future vaccination efforts to contain any local [outbreak](#) and stop further spread. "Pairing these assessments of epidemic potential with in-country knowledge of existing local preparedness initiatives and preventive programs is a crucial next step," said Dr. Osman Sankoh, a study co-author and Executive Director of INDEPTH Network, a Ghana-based international network of representatives from health and demographic surveillance systems in low- and middle-income countries. "With estimates like these we can begin to work with local decision-makers to evaluate their existing strategies and plan for the future, a future where these diseases and their deadly consequences can be prevented."

IHME researchers and collaborators contributing to the study anticipate refining and expanding the framework in the future, according to Dr.

Pigott.

"The intention was to create an approach that allows for other diseases, or other regions of the world, to be considered," he said. "We hope to expand and improve upon this initial assessment to make sure that we consider all paths to a potential pandemic."

The study is entitled "Local, national, and regional viral haemorrhagic fever pandemic potential in Africa: a multistage analysis." Results accompanying the study are available in an interactive web tool.

More information: *The Lancet* (2017).

www.thelancet.com/journals/lan...ulltext?elsca1=tlxpr

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