## **Discovery**

# Ebola, Dengue fever, Lyme disease: The growing economic cost of infectious diseases

Five new such diseases expected each year; strategies to reduce climate change adaptable to infectious diseases



Stopping Ebola in its tracks calls for rapid control measures; long-term, is there a better way?

#### **December 16, 2014**

Emerging pandemic disease outbreaks such as Ebola increasingly threaten global public health and world economies, scientists say. We can expect five new such diseases each year, into the future.

And expect them to spread. The tropical disease dengue fever, for example, has made its way to Florida and Texas, seemingly to stay.

But the global response to infectious diseases is often too late to prevent major effects on health and economic growth, researchers believe.

According to the World Health Organization (WHO), the number of people infected with Ebola has surpassed 17,000, with more than 6,000 deaths. The World Bank now estimates that the two-year financial cost of Ebola may reach \$32.6 billion and force some already suffering West African economies into a deep recession.

#### Growing economic cost of global disease outbreaks

Scientists at EcoHealth Alliance in New York and other organizations studied the economic cost of such global disease outbreaks.

Economists, disease ecologists and others collaborated on an in-depth economic analysis of strategies to address pandemic threats in a proactive way--rather than a reactive response to a crisis. The results are published in this week's issue of the journal *Proceedings of the National Academy of Sciences (PNAS)*.

"Our research shows that new approaches to reducing emerging pandemic threats at the source would be more cost-effective than trying to mobilize a global response after a disease has emerged," says Peter Daszak, senior author of the paper and president of EcoHealth Alliance.

The researchers used economic modeling to analyze two strategies for a pandemic response: Current business-as-usual approaches that rely on global surveillance to identify new diseases in people, and new "mitigation" strategies to reduce the underlying drivers of emerging diseases and lower the risk of their emergence.

"Our economic modeling demonstrates that the new approach to dealing with disease emergence is the right strategy in the long-term," says Jamie Pike, an economist at EcoHealth Alliance and first author of the paper.

The results indicate that the strategy for pandemics needs to be coordinated on a global scale to be effective in reducing risk. And that mitigation strategies will be far more costeffective in the long-term.

The results follow those reported in a September, 2014, paper in the journal *EcoHealth*, in which Daszak, Charles Perrings of Arizona State University, A. Marm Kilpatrick of the University of California at Santa Cruz, and colleagues show that economic epidemiology has the potential to improve predictions of the course of infectious diseases, and to support new approaches to management of such diseases.

#### **Environmental change causing increase in number of new diseases**

Ebola. West Nile virus. Lyme disease. All are infectious diseases spreading in animals, and in humans. Is our interaction with the environment somehow responsible for the increase in incidence of these diseases?

With 60 percent of all human diseases and 75 percent of all emerging infectious diseases involving animal-to-human transmission, the underlying factors that contribute to disease outbreaks are mostly related to environmental changes to global ecosystems, the scientists found. Deforestation and illegal wildlife trade are two culprits.

Large-scale environmental events alter the risks of emergence of viral, parasitic and bacterial diseases in humans and animals.

"Virtually all the world's terrestrial and aquatic communities have undergone dramatic changes in biodiversity due primarily to habitat transformations such as deforestation and agricultural intensification, invasions of exotic species, chemical contamination, and

climate change events," says Sam Scheiner, National Science Foundation (NSF) program director for the joint NSF-NIH-USDA Ecology and Evolution of Infectious Diseases (EEID) Program, which funded the research.

# Ebola epidemic highlights need to address infectious disease threats

"The current Ebola epidemic highlights the need to anticipate possible health threats from these changes," says Scheiner. "This study shows that the long-term economic benefits outweigh the short-term costs, not to mention the human benefits of preventing the next pandemic."

Rapid changes to the environment are resulting in a continuous year-by-year increase in the number of new diseases emerging, the researchers found.

"With continued pressure causing diseases to rise, we need to analyze the ecological and economic foundations of the risk, and identify economically effective strategies to reduce it," says David Finnoff, an economist at the University of Wyoming and co-author of the *PNAS* paper.

The paper highlights WHO International Health Regulations goals, and points out that the global capacity to achieve such targets needs to be addressed to deal with the continuous rise in the rate of new diseases.

### Five new diseases each year into the future

"We show that we can expect more than five new emerging diseases each year into the future," says Daszak.

"With this continuous rise in the pandemic threat, and our increasing global connectivity, we are at a critical moment in history to act."

-- Cheryl Dybas, NSF