Mathematical model predicts cholera outbreaks

A mathematical model of disease cycles developed at the University of Michigan shows promise for predicting cholera outbreaks.

Speaking in a symposium titled "New Vistas in the Mathematics of Ecology and Evolution" at the annual meeting of the American Association for the Advancement of Science in San Francisco, theoretical ecologist Mercedes Pascual will discuss how models that she and coworkers have developed can aid short-term forecasting of infectious diseases, such as cholera, and inform decisions about vaccination and other disease-prevention strategies.

In research done over the past seven years, Pascual and colleagues have found evidence that a phenomenon known as the El Nino-Southern Oscillation (ENSO), a major source of climate variability from year to year, influences cycles of cholera in Bangladesh. They also showed that the coupling between climate variability and cholera cycles has become stronger in recent decades.

Now, Pascual is examining the feasibility of using a model developed during that work as an early warning system.

"The question we asked was whether, using data from 1966 to 2000, we could have predicted cholera outbreaks over the past five years," said Pascual, an associate professor of ecology and evolutionary biology. "We also wanted to know whether incorporating ENSO into the model would improve the accuracy of our predictions." The challenge for the model was particularly interesting because the past five years were atypical, with fewer cholera cases than usual and no strong climate anomalies. However, the model performed well, Pascual said.

"Our results showed that for the past five years, we would have done fairly well predicting cholera cases one year ahead, and that the model that uses ENSO makes prediction even more accurate."

Cholera, a serious health problem in many parts of the world, results from a bacterial infection. The bacterium takes up residence in the intestines, causing vomiting and diarrhea, which can lead to severe dehydration and death if patients are not promptly treated.

Source: University of Michigan