SARS: a model disease

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A new model to predict the spread of emerging diseases has been developed by researchers in the US, Italy, and France. The model, described in the online open access journal *BMC Medicine*, could give healthcare professionals advance warning of the path an emerging disease might take and so might improve emergency responses and control.

Severe acute respiratory syndrome (SARS) spread rapidly in 2002-2003, revealing just how vulnerable we might be to emerging diseases and how global transportation is critical to the spread of an epidemic.

Now, Vittoria Colizza and Alessandro Vespignani of Indiana University, Bloomington, USA and the Institute for Scientific Interchange Foundation, in Turin, Italy, and colleagues in France have developed a predictive model of the spread of emerging diseases based on actual travel and census data for more than three thousand urban areas in 220 countries. The model provides predictions of how likely an outbreak will be in each region and how widespread it might become. The research highlights just how the accuracy in predicting the spreading pattern of an epidemic can be related to clearly identifiable routes by which the disease could spread.

In order to assess the predictive power of their model, the researchers turned to the historical records of the global spread of the SARS virus. They evaluated the initial conditions before the disease had spread widely, based on the data for the arrival of the first patient who left mainland China for Hong Kong, and for the resulting outbreak there.

They then simulated the likelihood that SARS would emerge in specific countries thereafter, as brought by infectious travelers.

The simulated results fit very accurately with the actual pattern of the spread of SARS in 2002. Analysis of the results also identified possible paths of the virus' spread along the routes of commercial air travel, highlighting some preferred channels which may serve as epidemic pathways for the global spread of the disease.

"The presented computational approach shows that the integration of long-range mobility and demographic data provides epidemic models with a predictive power that can be consistently tested," the researchers explain. "This computational strategy can be therefore considered as a general tool in the analysis and forecast of the global spreading of emerging diseases."

Article: Predictability and epidemic pathways in global outbreaks of infectious diseases: the SARS case study Vittoria Colizza, Alain Barrat, Marc Barthelemy and Alessandro Vespignani
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