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[Interdisciplinary][epidemiology][information] Scientists Refine Disease-Simulation System to Predict Spread of Influenza in Taiwan

[Interdisciplinary][epidemiology][information] Scientists Refine Disease-Simulation System to Predict Spread of Influenza in Taiwan (Chinese Version)

Academia Sinica Newsletter (2010/11/16) Researchers from Academia Sinica, the Centers for Disease Control of Taiwan (CDC Taiwan), The University of Hong Kong and National Taiwan University recently refined a computer disease-simulation system to enable the effective simulation of the spread of influenza in Taiwan. As a result of the study, a simulation system has been used by the CDC. Taiwan is the third country in the world to officially publish the implementation of such a simulation system, after the US and the UK. The results of the research were published in the online journal PLoS ONE on November 4, 2010.

Computers have been used to simulate the spread of disease for decades and it is well-known that the spread of certain diseases, such as pandemic influenza, follows certain spatial patterns. However, data from the 2009 H1N1 pandemic suggests that past studies overestimated the within-country rate of spatial spread of this pandemic.

The scientists significantly improved the efficiency of an agent-based stochastic (probabilistic) disease simulation framework used in previous studies. The new system is about a thousand times faster than that used in previous similar studies, due to changes in fundamental computing algorithms. It also takes into account data privacy issues. In the study, the research team quantified the efficiency of the revised algorithm and introduced alternative parameters tied to basic reproductive number. They then applied the system to a population in Taiwan to demonstrate how the location of the initial seed (the first incidence of disease) can influence spatial incidence and the overall spread of the epidemic.

The system can potentially be used for applications such as the simulation of the outcomes of various airport quarantine policies that can delay the peak date of the infection, and to help decide when various intervention policies should be deployed.

The full article entitled "Efficient Simulation of the Spatial Transmission Dynamics of Influenza" is available on the PLoS ONE website at:
http://dx.plos.org/10.1371/journal.pone.0013292

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