The role of uncertainty in infectious disease modelling

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Research by scientists at the University of Liverpool has found that greater consideration of the limitations and uncertainties in infectious disease modelling would improve its usefulness and value.

Infectious disease dynamical modelling plays a central role in planning for outbreaks of human and livestock diseases. They forecast how they

might progress and inform policy responses.

Informing policy decisions

Modelling is commissioned by governments or may be developed independently by researchers. It has been used to inform policy decisions for human and animal diseases such as SARS, H1N1 swine influenza, foot-and-mouth disease and is being used to inform action in the campaign to control bovine TB.

In a study published in *PLOS One*, researchers analysed scientific papers, interviews, policies, reports and outcomes of previous infectious disease outbreaks in the UK to ascertain the role uncertainties played in previous models, and how these were understood by both the designers of the model and the users of the model.

They found that many models provided only cursory reference to the uncertainties of the information and data or the parameters used. Whilst the models were uncertain many still informed action.
Dr Rob Christley, from the University's Institute of Infection and Global Health, said: "It is accepted that models will never be able to predict 100% the size, shape or form of an outbreak and it is recognised that a level of uncertainty always exists in modelling. However, modellers often fear detailed discussion of this uncertainty will undermine the model in the eyes of policy makers.

"This study found that the uncertainties and limitations of a model are sometimes hidden and sometimes revealed, and that which occurs is context dependent.

"Whilst it isn't possible to calculate the level of uncertainty, a better understanding and communication of the model's limitations is needed and could lead to better policy."

Uncertainty

Uncertainty can occur at all stages of the modelling process from weaknesses in the quality and type of data used, assumptions made about the infectious agent itself, and about the world in which the disease is circulating, all the way through to the technical aspects of the model.

The research team comprised veterinary scientists and epidemiologists, sociologists, microbiologists and environmental scientists.

More information: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0076277

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