

## Invited Talk 2.1

### **HOUSEHOLDS TO GLOBAL AIR TRAVEL: HOW NETWORKS SHAPE EPIDEMICS**

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#### **Abstract**

Epidemic modelling has grown in prominence as a tool to assist public health professionals and policy-makers to plan for and respond to outbreaks of human and animal diseases. Recent examples include Foot and Mouth Disease in livestock, SARS in humans, and planning for a possible human pandemic caused by H5N1 avian flu. In all these cases, understanding how transmission processes span multiple scales of host interaction and social structure has been key. I will discuss how the network perspective has given valuable insight into the dynamics of outbreaks at these different scales. I will then review recent progress in developing large scale epidemic simulations which seamlessly capture all scales from the individual to the continental – and the challenges remaining. Throughout I will emphasise the need for a healthy scepticism about the degree to which epidemiological contact processes can really be mapped onto simple static or even dynamical network processes. The network paradigm is often more useful as a guide to understanding and analytical insight than a framework to allow realistic (or even predictive) epidemiological modelling. I will conclude with a discussion of recent advances in our ability to map epidemiologically relevant social networks, and in our ability to analyse simple network models of epidemic spread.

#### **Biography**

Neil Ferguson, FmedSci, is Director of the newly founded MRC Centre for *Outbreak Analysis and Modelling* and holds a Chair in *Mathematical Biology* at the Dept. of Infectious Disease Epidemiology, Imperial College. He uses mathematical and statistical models to investigate the processes shaping infectious disease pathogenesis, evolution and transmission. A key practical focus is advising on disease control policies in public health, clinical and veterinary contexts. As well as basic theoretical work on evolutionary and epidemiological dynamics, Professor Ferguson also applies his work to a range of pathogens, including influenza, SARS, BSE/vCJD, HIV, foot-and-mouth disease and smallpox.

He was educated at Oxford University, held a Royal Society University Research Fellowship at Oxford, then a readership at the University of Nottingham before moving to Imperial College. He was awarded an OBE in 2001 by the UK Government for his contribution to advising on the control of the foot-and-mouth epidemic in the UK that year, and was awarded Fellowship of the Academy of Medical Sciences in 2005. His current research focus is on the use of models as contingency planning tools for emerging infections (pandemic influenza in particular) and bioterrorism. He is a member of the World Health Organisation Pandemic Influenza Task Force, the UK Dept. of Health Pandemic Influenza Science Advisory Group, the DEFRA Science Advisory Council, and DEFRA's National Expert Group on Epidemic Diseases (covering Avian Influenza and Foot and Mouth Disease). He also advises the US Homeland Security Council and DHHS on pandemic planning.