Mathematical modelling throughout infectious disease outbreaks

Speaker: Robin Thompson

Abstract: Mathematical models are useful tools for guiding infectious disease outbreak control measures. Before a pathogen has even entered a host population, models can be used to determine the locations that are most at risk of outbreaks, allowing limited surveillance resources to be deployed effectively. Early in an outbreak, key questions for policy advisors include whether initial cases will lead on to a major epidemic or fade out as a minor outbreak. When a major epidemic is ongoing, models can be applied to track pathogen transmissibility and inform interventions. And towards the end of (or after) an outbreak, models can be used to estimate the probability that the outbreak is over and that no cases will be detected in future, with implications for when interventions can be lifted safely. In this talk, I will summarise the work done by my research group on modelling different stages of infectious disease outbreaks. This includes: i) Before an outbreak: Projections of the locations at-risk from vector-borne pathogens towards the end of the 21st century under a changing climate; ii) Early in an outbreak: Methods for estimating the risk that introduced cases will lead to a major epidemic; and iii) During a major epidemic: A novel approach for inferring the time-dependent reproduction number during outbreaks when disease incidence time series are aggregated temporally (e.g. weekly case numbers are reported rather than daily case numbers). In addition to discussing this work, I will suggest areas for further research that will allow effective interventions to be planned during future infectious disease outbreaks.