

# Epidemic models with uncertainty \*

Mick Roberts

Centre for Mathematical Biology,  
IIMS & NZIAS, Massey University, Albany,  
Private Bag 102 904, North Shore Mail Centre, Auckland, New Zealand;  
Email: [m.g.roberts@massey.ac.nz](mailto:m.g.roberts@massey.ac.nz)

## Abstract

One of the first quantities to be estimated at the start of an epidemic is the basic reproduction number,  $\mathcal{R}_0$ . The progress of an epidemic is sensitive to the value of  $\mathcal{R}_0$ , hence we need methods for exploring the consequences of uncertainty in the estimate. I will analyse the Kermack-McKendrick model, and its special case the *SIR* model, by expanding the state variable in orthogonal polynomials in uncertainty space. The resulting dynamical systems need only be solved once to produce a deterministic stochastic solution. The method will be applied to data from the New Zealand epidemic of H1N1 influenza in 2009, to demonstrate the level of uncertainty when making projections based on a limited amount of data.

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