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Household epidemic models with variable infection severity

We explore SIR (Susceptible \rightarrow Infective \rightarrow Removed) epidemic models with household structure and the feature that infectives can be either mildly or severely infective. We analyse two different models which describe such behaviour, one where individual's severities are pre-determined (perhaps due to prior partial immunity) and one where the an individual's severity is influenced by the severity of the individual that infects it and whether this infection resulted from a within- or between-household contact. The aim is to determine whether it is possible to find which of the two models best explains the varying response when given final size household outbreak data containing mild and severe cases. We conduct numerical studies from which we conclude that this discrimination usually is possible.

This is joint work with Frank Ball (University of Nottingham) and Tom Britton (Stockholm University).