

Modelling Response to Bioterrorist Plague

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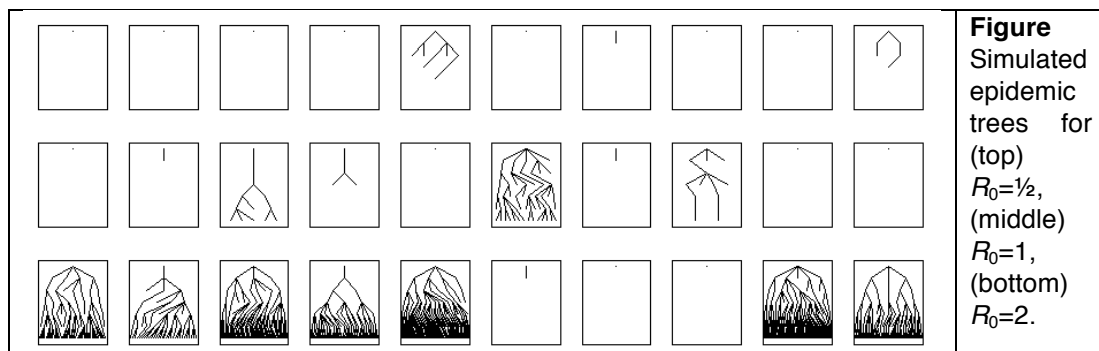
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Plague is an endemic disease in many areas of the world and the causative agent *Yersinia pestis* is considered a category 1 bioterrorist agent. One manifestation, termed Primary pneumonic plague (PP), occurs when *Y. pestis* is inhaled; either directly from person to person through the passage of respiratory droplets or potentially from deliberate aerosol release. In the absence of appropriate treatment the case fatality rate for PP approaches 100%.

Previous modelling has considered individual based simulation (Williams et al., 2011) and compartmental-type models (Gani and Leach, 2004). Epidemiological reviews suggests that most infections occur in the household and that the mean number of secondary infections per primary infection (the basic reproductive ratio, R_0) is close to 1 (Gani and Leach, 2004; Egan, 2010), suggesting the need for both stochasticity and network structure in future models.

Mathematically, $R_0 \approx 1$ corresponds to a near-critical random graph model for any epidemics that occur, and as shown in the Figure below such structures are highly distinctive and the aim of this project is to extend network (House et al., 2010) and spatial (Hancock et al., 2014) mathematical tools for working with such outbreak data. Working with outbreak data effectively can then feed into policy-driven modelling to consider optimal response in the event of a plague outbreak.



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