A simple model for behaviour change in epidemics

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Background: People change their behaviour during an epidemic. Infectious members of a population may reduce the number of contacts they make with other people because of the physical effects of their illness and possibly because of public health announcements asking them to do so in order to decrease the number of new infections, while susceptible members of the population may reduce the number of contacts they make in order to try to avoid becoming infected.

Methods: We consider a simple epidemic model in which susceptible and infectious members respond to a disease outbreak by reducing contacts by different fractions and analyze the effect of such contact reductions on the size of the epidemic. We assume constant fractional reductions, without attempting to consider the way in which susceptible members might respond to information about the epidemic.

Results: We are able to derive upper and lower bounds for the final size of an epidemic, both for simple and staged progression models.

Conclusions: The responses of uninfected and infected individuals in a disease outbreak are different, and this difference affects estimates of epidemic size.

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$$I' = b\ I - aI \tag{1}$$

$$R' = aI,$$

[illegible] βN [illegible] $1/\alpha$, [illegible] N [illegible] 5] . [illegible] S_0 [illegible] I_0 [illegible] $S_0 + I_0 = N$. F [illegible] (1) [illegible]

$$R_0 = \frac{bN}{a},$$

[illegible] S_∞

F (*p*, *q*)*N* ≤ *T* ≤ *N*

$$\frac{}{N} \leq \frac{}{\min(,)N},$$

, (4), (5),

$$\frac{bN}{a} \left(1 - \frac{\infty}{N}\right) \leq \ln \frac{0}{\infty} \leq \frac{bN}{a} \frac{}{\min(,)} \left(1 - \frac{\infty}{N}\right). \quad (6)$$

$$\frac{}{\min(,)} = \max(,),$$

, (6),

$$\frac{bN}{a} \left(1 - \frac{\infty}{N}\right) \leq \ln \frac{0}{\infty} \leq \frac{bN}{a} \max(,) \left(1 - \frac{\infty}{N}\right). \quad (7)$$

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$$R_0 = \frac{bN}{}$$