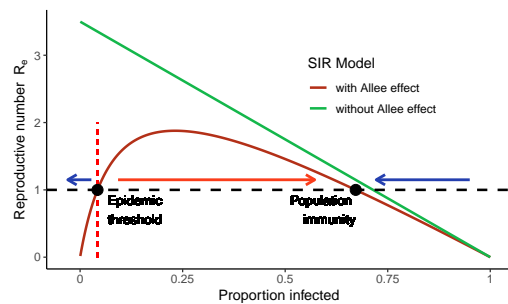


a

Non-pharmaceutical interventions (NPIs) induce an Allee effect on disease dynamics

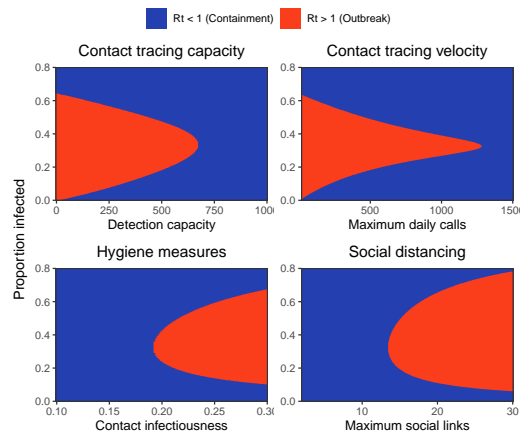
$$R_e = P_{susceptible} \cdot b_{link}(L \cdot f_q + L_{max} \cdot f_{nq})$$

Personal behavior Contact tracing Social distancing



b

Transition between dynamic states is determined by the strength of NPIs and the proportion of infected individuals



c

Simulated dynamics with an NPI-induced Allee effect often show sharp accelerations after slow initial spread

Simulated SIR Dynamics

$$\begin{aligned} S(t+1) &= S(t) - I_{new}(t) \\ I(t+1) &= I(t) + I_{new}(t) - \frac{I(t)}{\gamma(I(t))} + I_{imp}(t) \\ R(t+1) &= R(t) + \frac{I(t)}{\gamma(I(t))} \end{aligned}$$

$$\begin{aligned} I_{new}(t) &\sim \text{Poisson}(\lambda) \\ \lambda &= \frac{\beta(I(t))I(t)S(t)}{N} \\ I_{imp}(t) &\sim \text{NB}(\mu, \sigma) \end{aligned}$$

