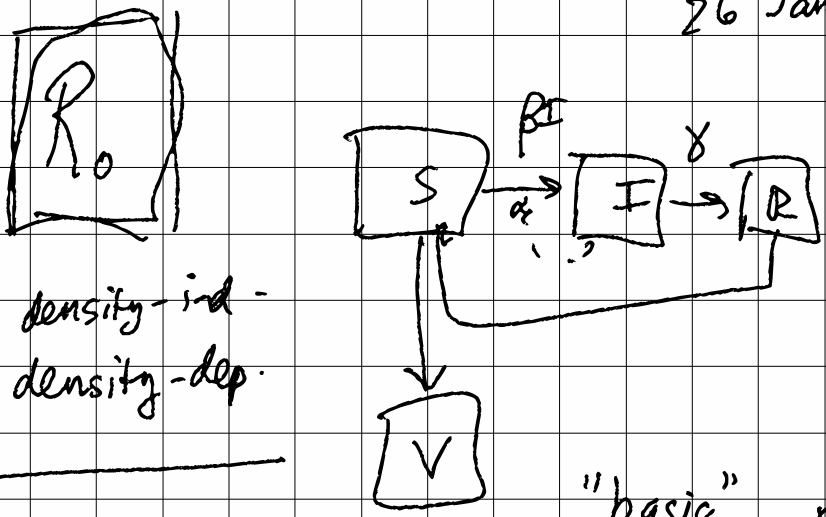
26 Jan 2022



density-ind -
density-dep.

"basic" reproductive number
"intrinsic"

R_0 = (average) expected number of secondary cases caused by an infected person over their infectious period, IN A COMPLETELY SUSCEPTIBLE POPULATION

R_t ~ current effective reproductive number

~ { host biology, parasite biology, ecology, behaviour } = { strains (omicron, delta), societies, behaviour, host genetics }

per-generation

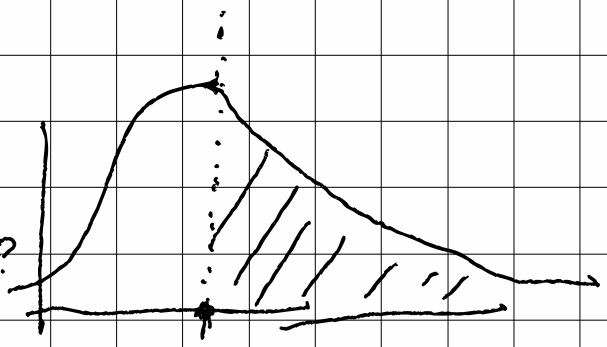
R_0 = FITNESS

l_x, m_x

$R_0 < 1$ epidemic die out

parasite fails to establish

$R_0 \approx 0.9$

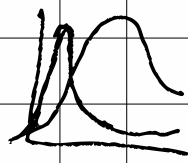


which strain is evolutionarily superior?

$\approx$ highest R_0 win.

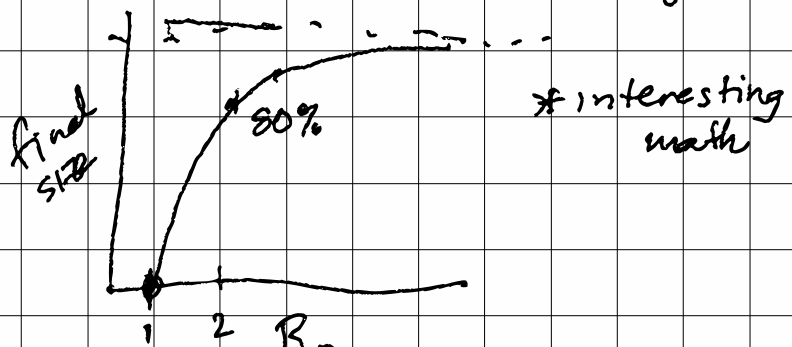
will epidemic spread? "how fast" (per generation)?

R_0 DOESN'T distinguish between fast and slow parasites

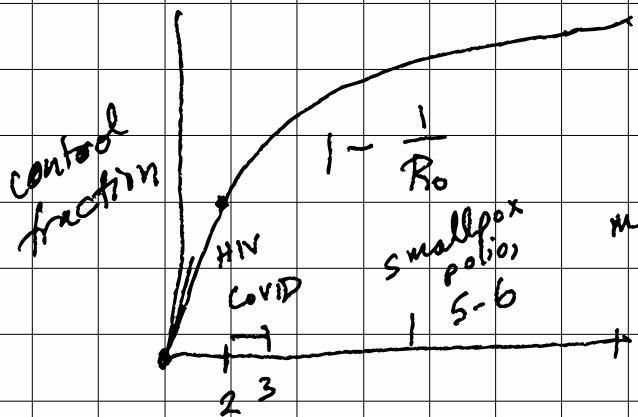


if I two strains with the same R_0 but one has a GENERATION TIME of 2 days and the other of 10 ...

determines final size. epidemic will die before everyone in the population gets infected



* interesting math



CRITICAL CONTROL VARIATION

$R_0 = 5 \rightarrow R_t = 1$ if control 80% of possible infections

$R_0 = 20 \rightarrow 95\%$

~ ENDEMIC diseases.

N = total pop

$$R_t = \left(R_0 \cdot \left(\frac{S^*}{N}\right)\right)$$

R_0 =

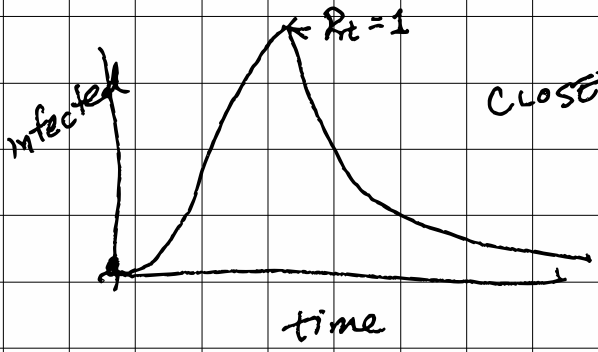
$$1 = R_0 \times \frac{S^*}{N} \rightsquigarrow \left(\frac{S^*}{N} = \frac{1}{R_0}\right)$$

equilibrium

S = number susc.

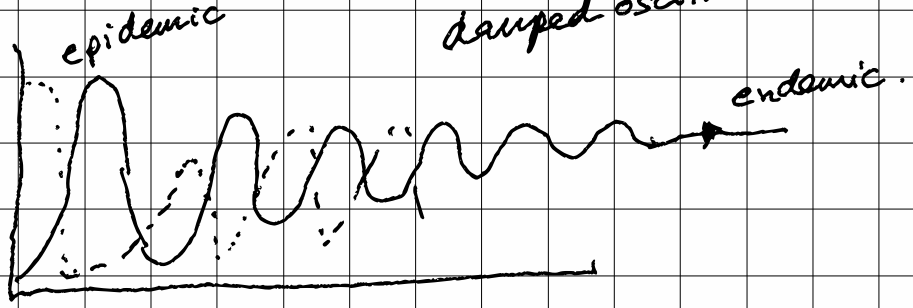
S/N frac susc

OSCILLATIONS : (damped)



closed population

birth, immigration



HOST POPULATION