05 June 2023 09:49

Epidemics Modelling

Epidemiology

Reproductive Number: R_0 → reproduc^{n} no. of an infection

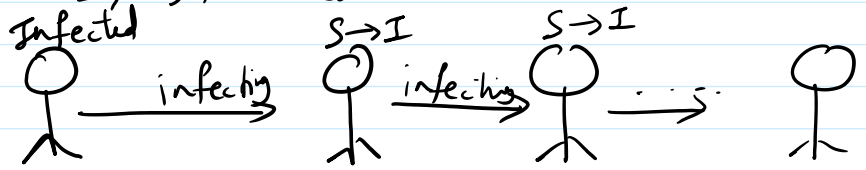
R_0 → avg. no. of new infec^{ns} generated by each infected person.

Assump^{n} : No immunity / No vaccina^{n}.
Everyone is susceptible to the disease.

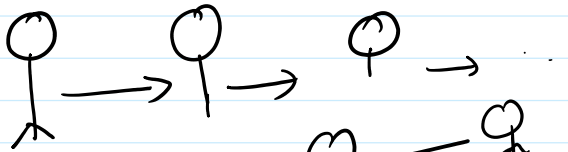
$R_0 > 1$ → high value indicates the disease is easily transmit

$R_0 < 1$ → low value → difficult to transmit disease

$R_0 = 1$ → Stable Case

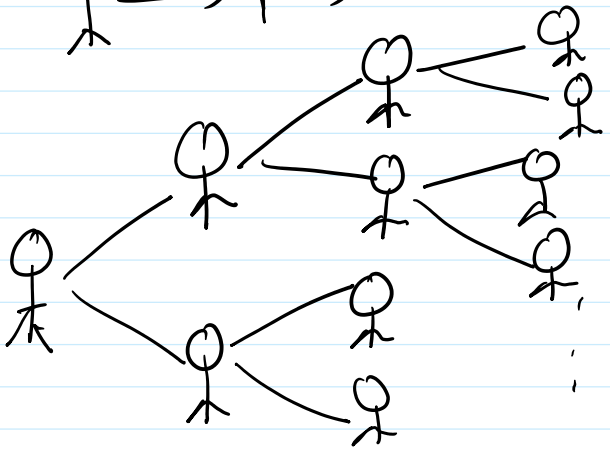


$R_0 = 0.2$

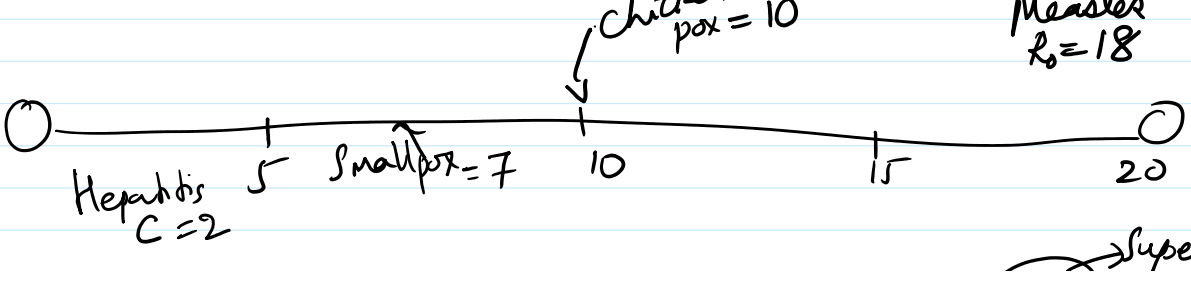


Infection decreases over time and finally that may be eradicated

$R_0 = 2$



There is exp. ↑ over time of the infections



Hepatitis
C = 2

Corona virus
$R_0 = 1.4 - 2.4$

S⁻ pple → 10 → Super Spreader
→ 2
→ 0
→ S⁻
→ 1

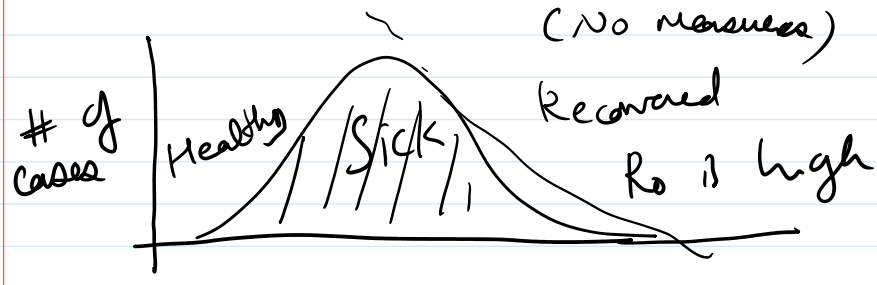
$R_0 = 3.\_\_\_$

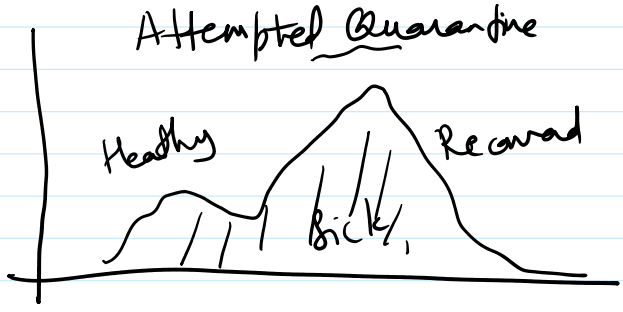
R_0 depends on various factors

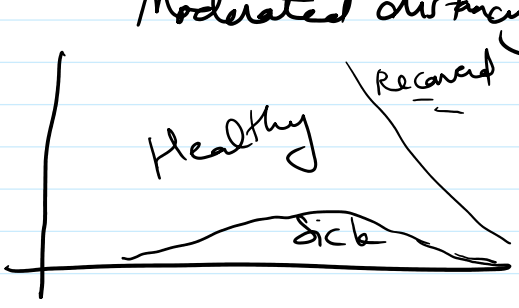
a) Avg. no. of contact bet^n Infected (I) and susceptible (S) people
↳ social behaviour

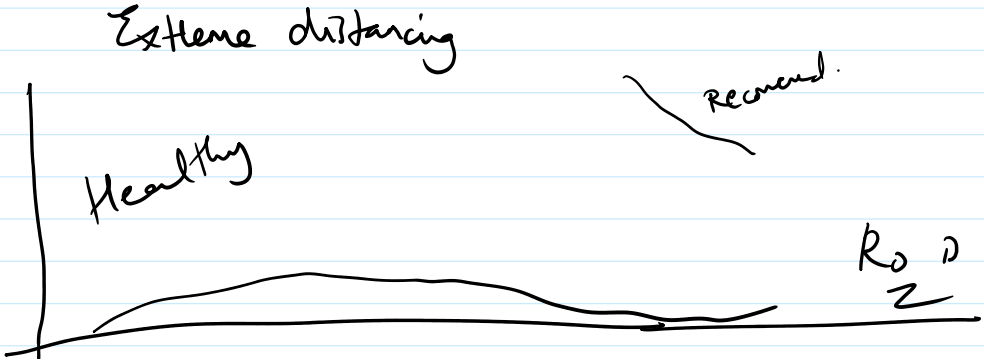
b) Duration of infection

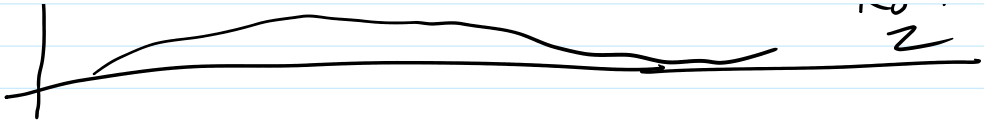
c) Prob. that infec^n is being transmitted during contact bet^n I & S pple





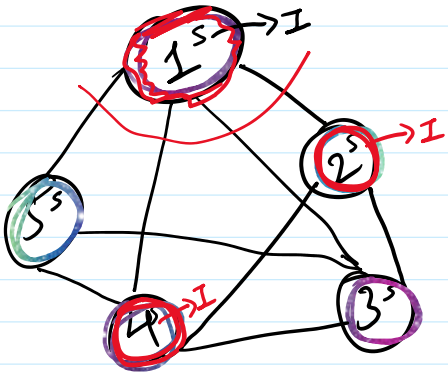






Modelling

SIS → Susceptible (S) → Infected (I) → Susceptible (S)



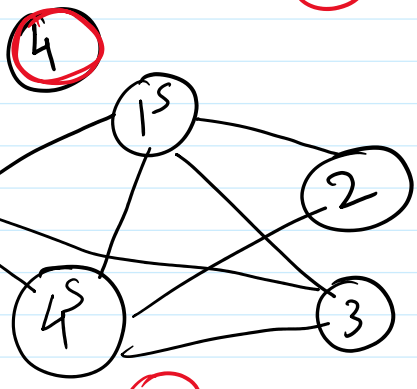
How SIS

$T_I = 1$

Randomly, any nbr node may get infected

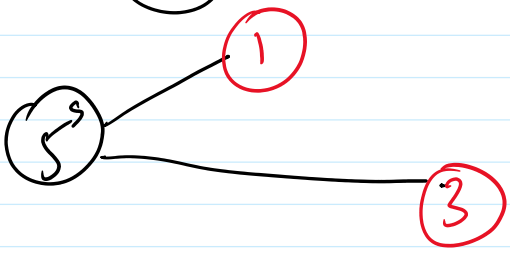
t = 0

t = 1



S – I –

t = 2

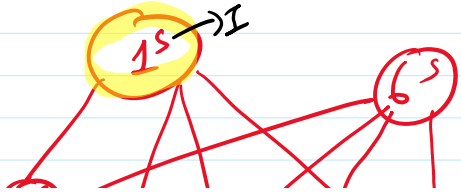


t = 3

SIR → S → I → R

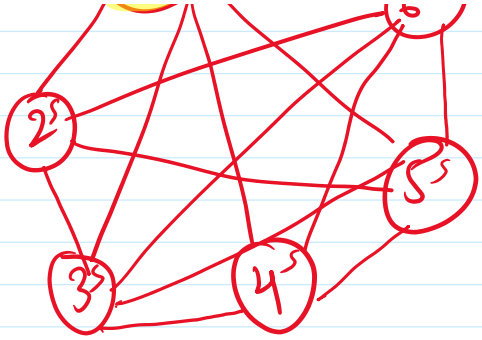
die/Recovery

t = 0



SIR

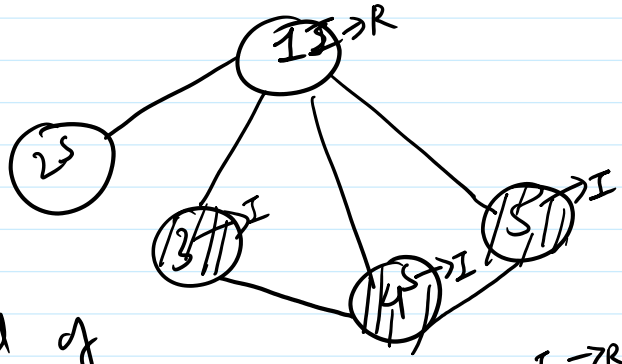
$T_I = 1$



$T_I = 1$

Infected person recovers after 1 day

$t = 1$



At the end of Day 1

$3^{I \to R}$ $5^{I \to R}$.

$t = 2$

$4^{I \to R}$

No spread. Process stops.