

Herd immunity in a network

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Herd immunity

Disease types

Networks

Herd immunity

Protect the flock by immunizing

Disease types

Networks

Herd immunity

- R_0 : 'basic reproduction number'

Avg. no. of people infected pr. person

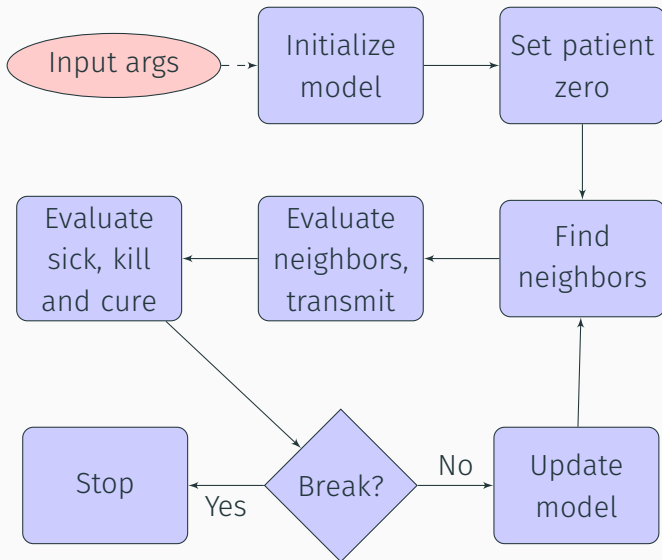
- p_c : herd immunity threshold

$$p_c = 1 - 1/R_0$$

- Herd immunity passively protects whole population

| | R_0 | Mortality rate | HIT |
|---------|---------|----------------|-----------|
| Ebola | 1.5-2.5 | 0.25-0.90 | 0.33-0.60 |
| Measles | 12-18 | 0.15 | 0.92-0.94 |
| Polio | 5-7 | 0.15-0.30 | 0.80-0.86 |

Table 1: Data from https://en.wikipedia.org/wiki/Herd_immunity



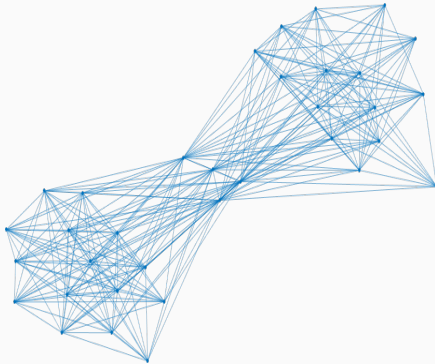
- Small world
- Scale free
- Random
- Custom network (two cities with commuters)

Movie time: two cities, death

Movie time: two cities, immunity

Custom network

Custom network, simulating two cities with commuters



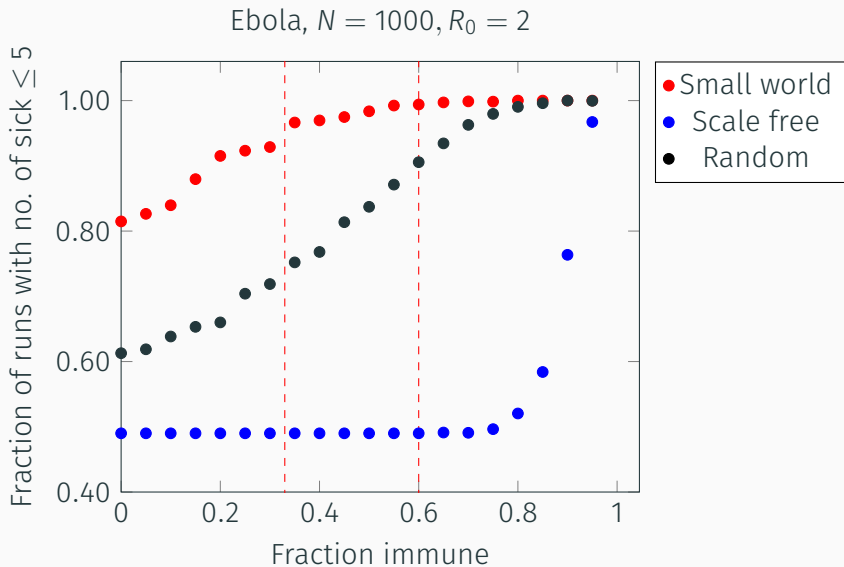
Success criteria

- Real world
 - No percolation
 - Disease no longer endemic
- Our model
 - Unable to define percolation
 - Discussion of alternate criteria
 - **Total sick < arbitrary threshold**
 - Effective reproductive number ≤ 1
 - $n_{\text{sick}} = 0$ and $n_{\text{healthy}} \neq 0$
 - $n_{\text{healthy}} = 0$

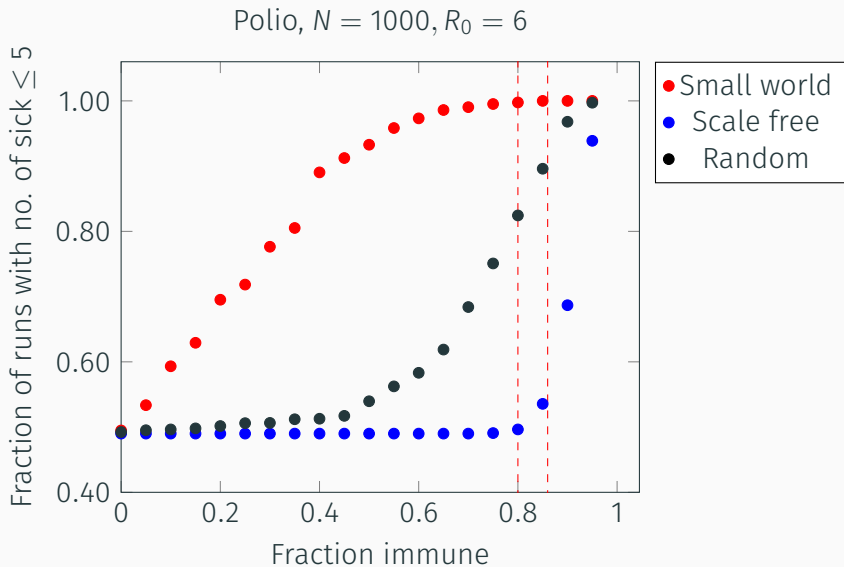
The simulations

- Run each disease 50 times on each network
- With 20 p_I values
- Save relevant output

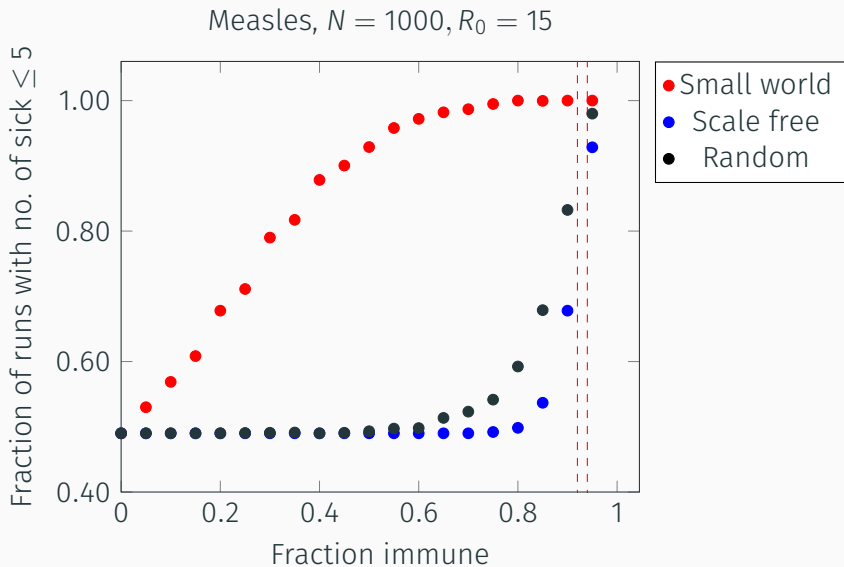
Results



Results



Results



Conclusion

noget med krav

opdel kode?

noget mere?