The impact of network properties and mixing on control measures and disease-induced herd immunity in epidemic models: a mean-field model perspective

https://link.springer.com/article/10.1007/s11538-021-00947-8

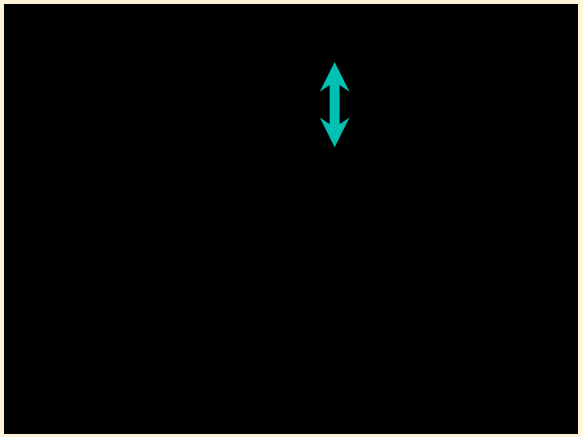
Background

- In the simplest disease transmission model, pre-emptive vaccination of a $\left(1 - \frac{5}{\ddot{E},}\right)$ fraction of the population (herd immunity threshold) prevents an epidemic.

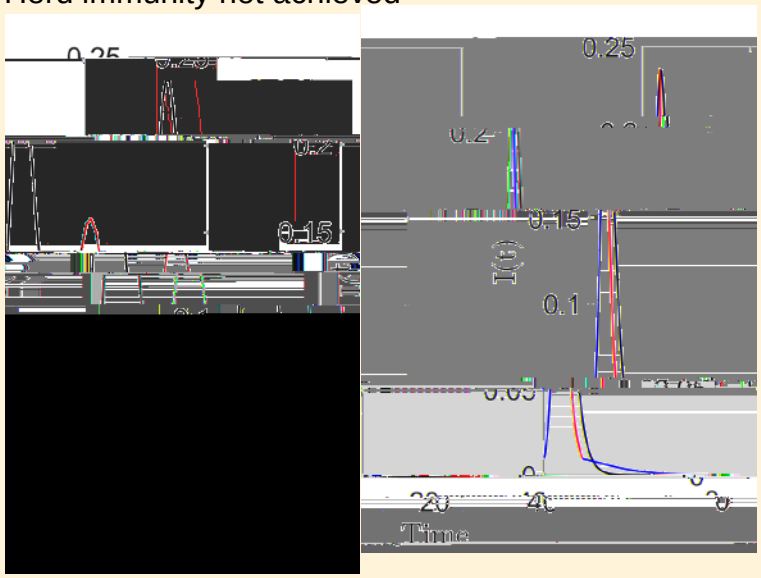
- However, if the epidemic is not controlled the final epidemic size will be much larger – the so-called ‘overshoot’.

- Implementing lockdown will result in an epidemic with a smaller 4 however, we ask, what will happen when lifting the lockdown?

- We are interested in the existence of a ‘sweet spot’ such that lifting the lockdown will not lead to a new epidemic – in other words, how many people need to become infected in the first wave in order to prevent a second wave?



Herd immunity not achieved



Herd immunity achieved