



Agent based modeling in R

Irish Pandemic



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Problem

Problem

- Numbers of students increasing each year
- Higher risk for epidemics due to Globalisation
- How to design universities to keep the infection rate low





Research Question

Research Questions

- What is the optimal classroom size too keep the attendance high and the costs low?
 - How does number of students per class affect the infections per week?
 - Our prediction: more students lead to more interactions causing higher infection rates
 - How does the distance between students affect the infections per week?
 - Our prediction: The smaller the distance between students the more infections per week



Model Design



Model assumptions

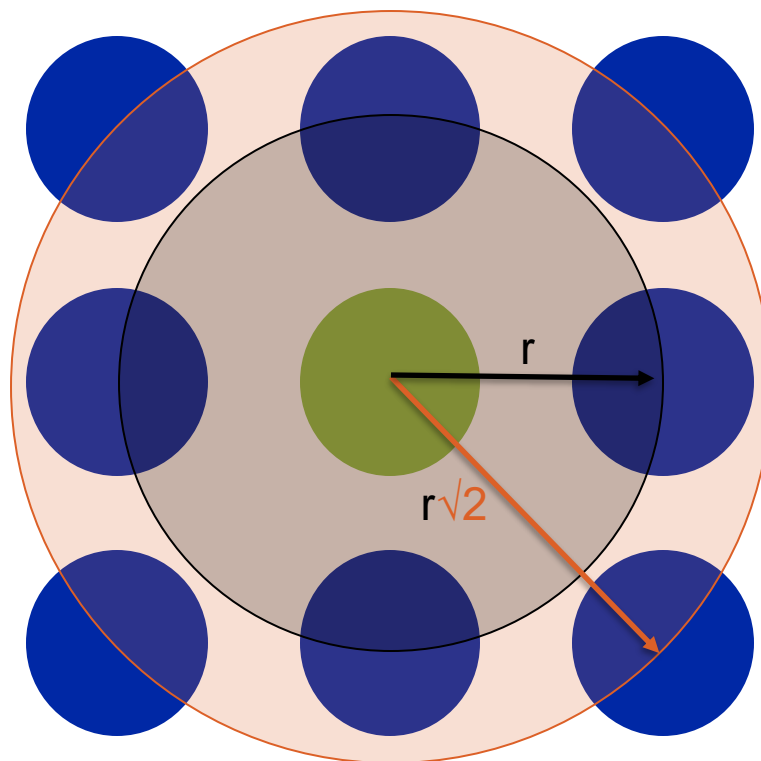
- After 7 days are all students recovered, regardless of the timepoint of infection during the 7 days
- Fixed Beta value = 0.001
- Square Classroom
- Number of students per class must be a squared number
- Students are distributed into classes randomly and the seating is random as well



Model assumptions

- Students get infected in the class, can spread the virus the second day and go home before the third day
- After 7 days are 10% of the students chosen to be sick randomly
- No immunization after an infection
- Infection only in the classroom possible

Model assumptions

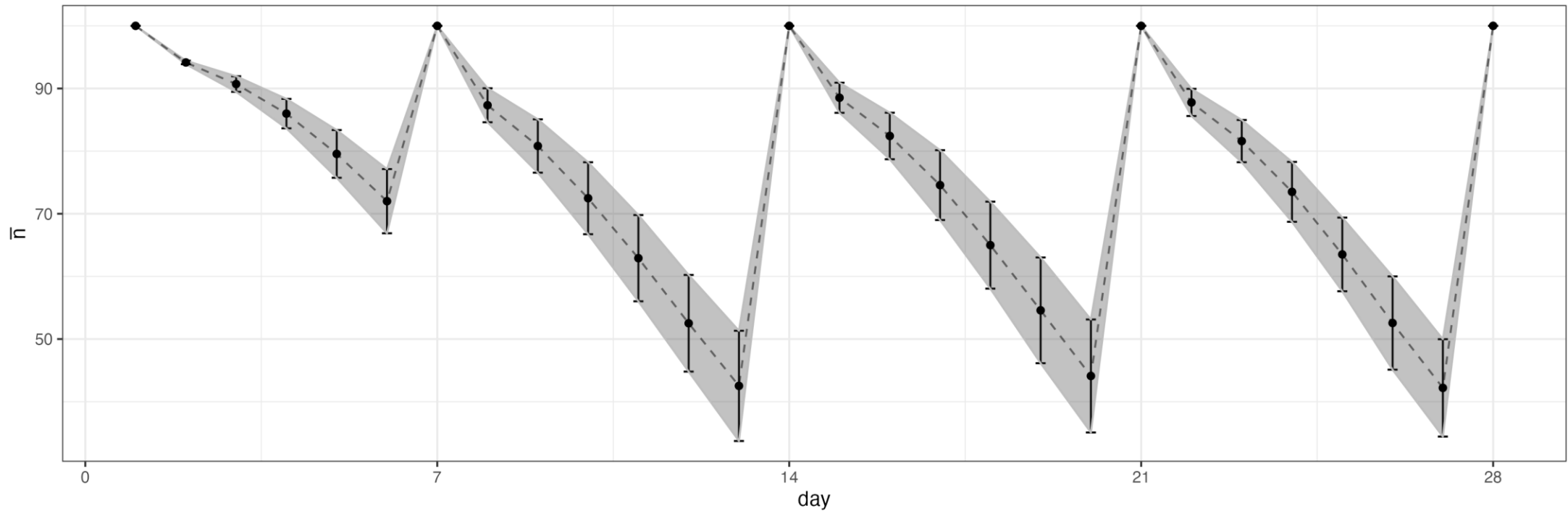




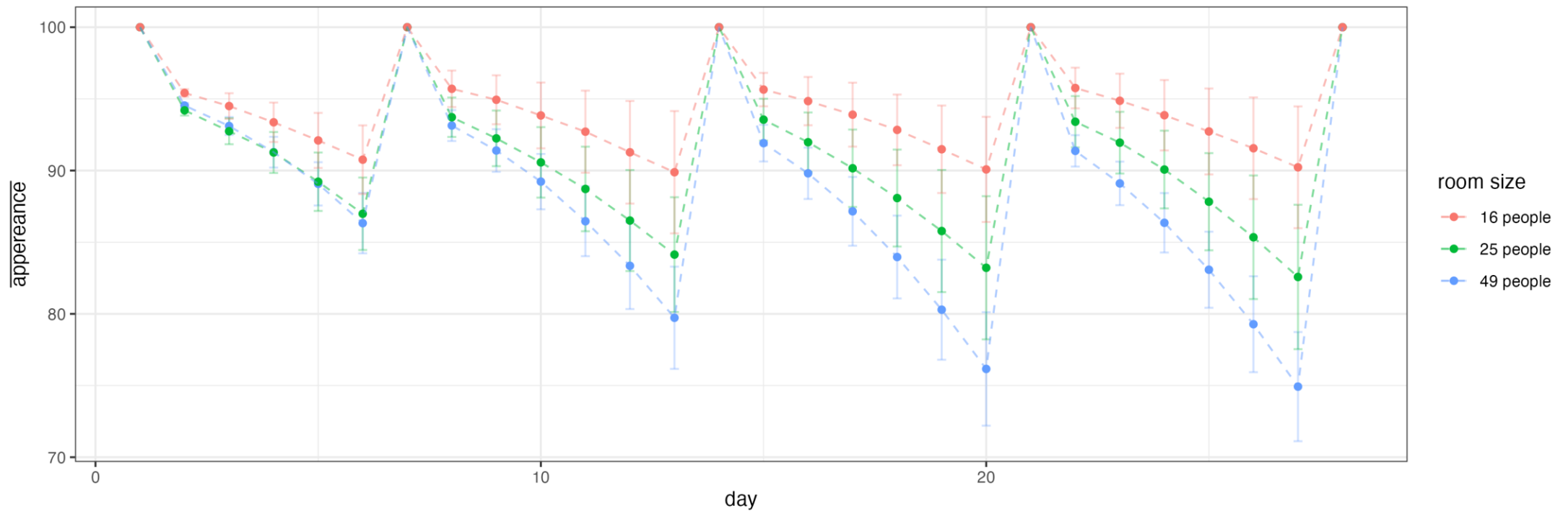
Results & discussion

Visualisation of simulation dynamics

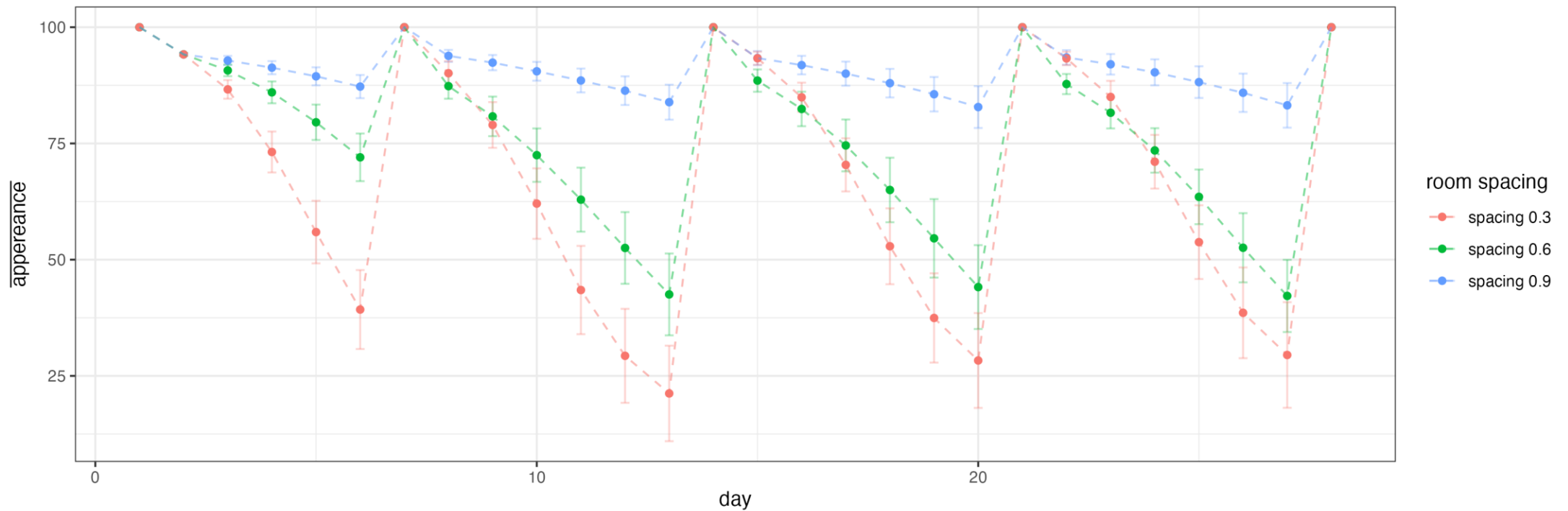
25 Students per class with 0.6 meters distance



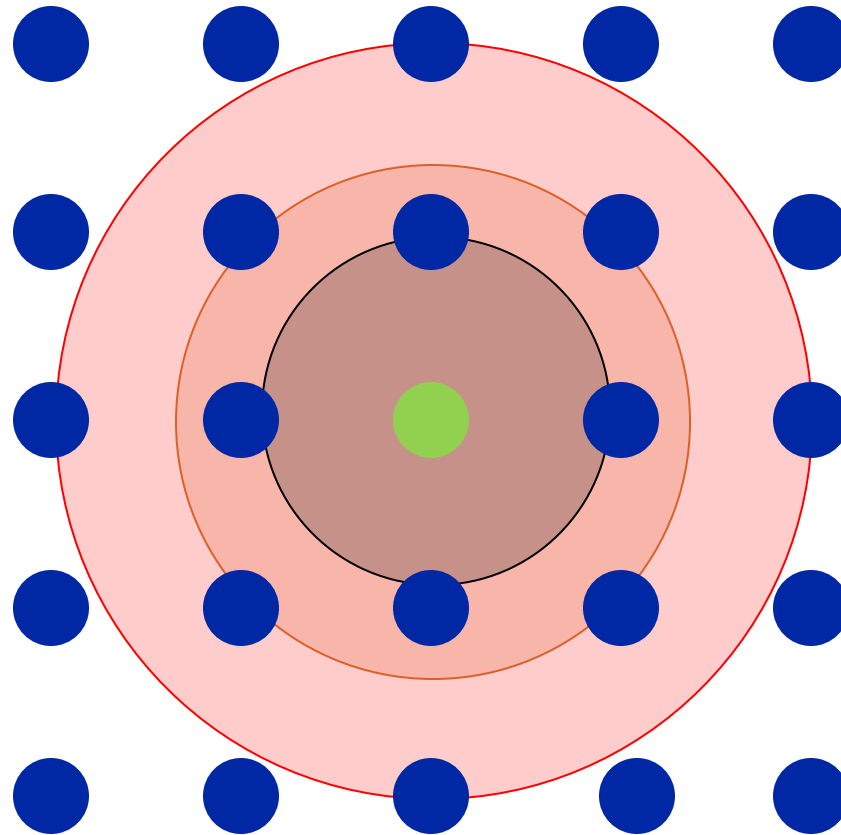
How does number of students per class affect the infections per day?



How does spacing between students affect infections per day?



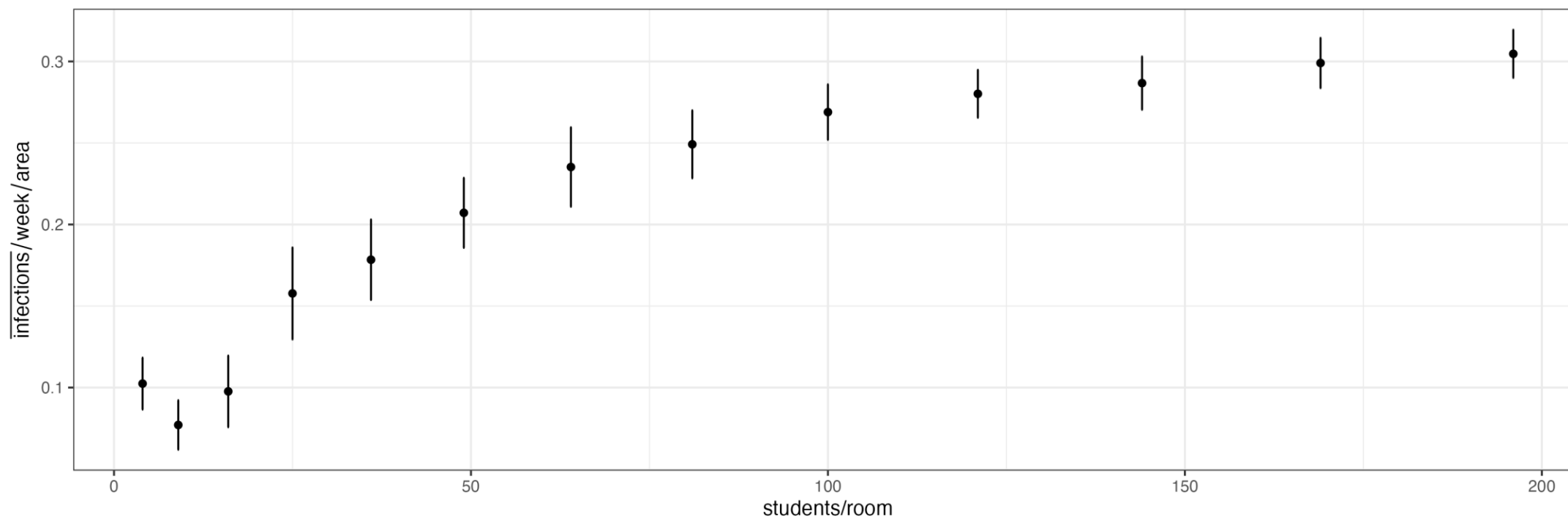
How does spacing between students affect infections per day?



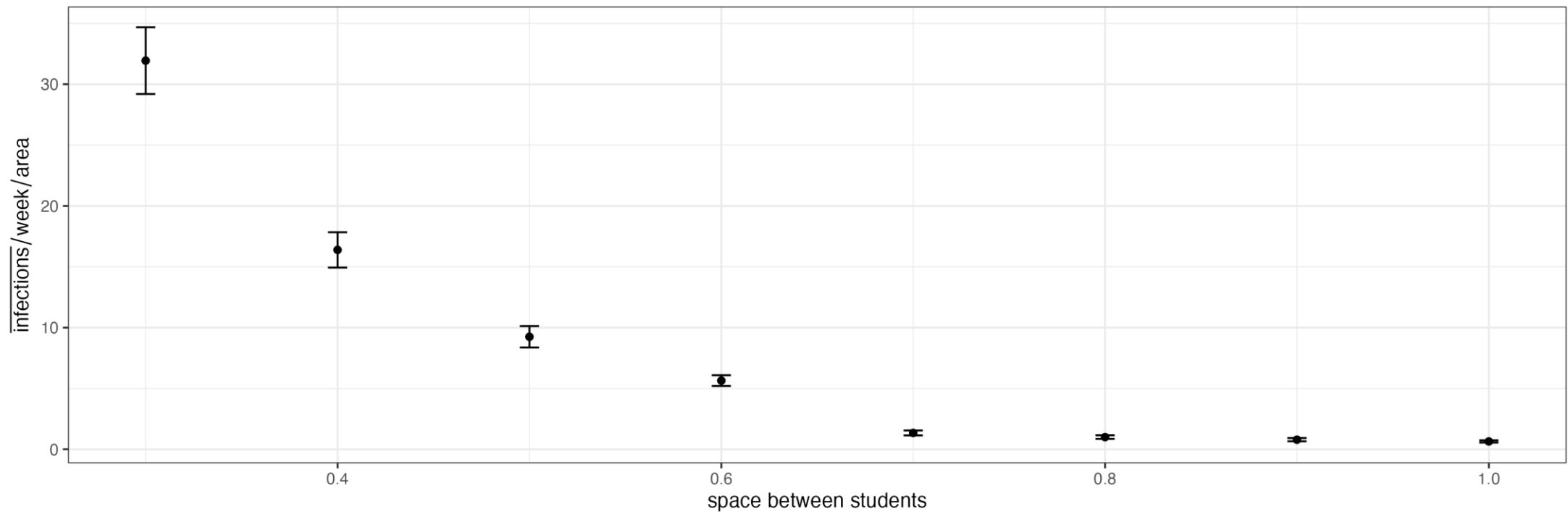


Conclusion

Optimal room size



Optimal spacing





Limitations and future directions



Limitations

- Every Student's course of disease is the same
- The contagiousness of the students is the same
- Students only get infected in the class room
- No immunity after an infection

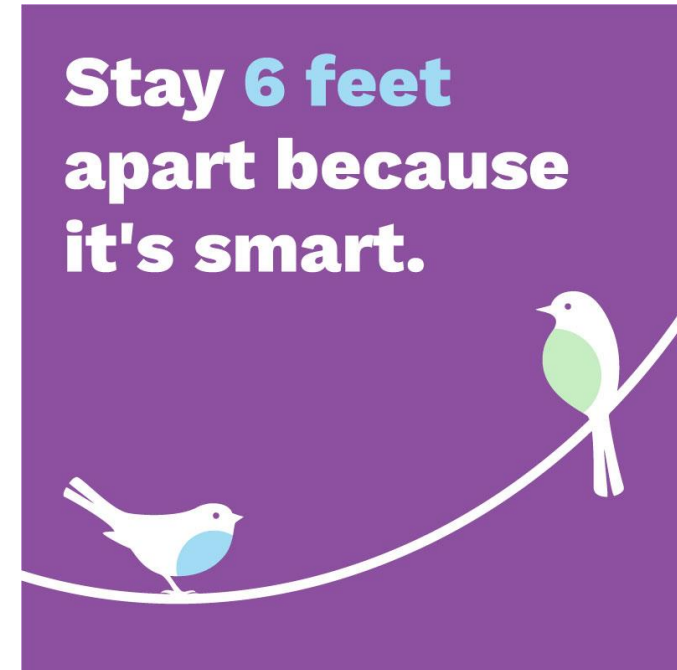
Future directions

For the Model:

- Make Students immune after an infection
- Add randomness to the course of the disease
- Every student has individual regeneration time

For Universities:

- Contagious students should wear a mask
- Online lessons for the students who feel sick





GitHub repo