

VetPath 571 – Spring 2021
Problem Set 5

Q1. The R_0 for Measles is approximately 18. What percentage of the population needs to be vaccinated to achieve herd immunity? Show your work. What sort of public health policy implications might your answer have?

Q2. Suggest an extension to the SIR model discussed in class (for example, asymptomatic infected individuals). Create a diagram of your new model and write the appropriate equations.

Q3. Your supervisor has been working on a viral disease known as Cougar Pox, which is believed to have an R_0 of 6.3. You have run a cohort study that suggests that the average duration of infection is 9 days. What is the value of beta?

Q4. Your supervisor believes they have developed a new compound that will shorten the duration of infection to 4.5 days. What impact will this have on a hypothetical outbreak of Cougar Pox? Show your results graphically.

Q5. Implement a stochastic SEIR model in R with an initial population of 500 people. What are your parameters? Paste your code for that model below.

Q6. Run that model 10 times. What was the minimum size of the epidemic? What was the maximum? Plot your results.

Q7. Change the initial population to 50 people, and run that model 10 times. What was the minimum size of the epidemic? What was the maximum? Plot your results. Discuss how this differs from your results for Q6, and why.