

Math and Medicine: Homework Assignment 3
Due on Sept 15

1. Suppose everybody infects k other people with the probability

$$p_k = \frac{\Lambda^k e^{-\Lambda}}{k!}$$

according to the Poisson distribution with parameter Λ .

- a. Write the equation for Q_1 , the probability an epidemic dies out starting from a single individual.
 - b. Suppose that $\Lambda = 1.1$. Show that R_0 (the mean number of people infected per person) is also equal to 1.1.
 - c. By hook or crook, find Q_1 in this case.
 - d. **Extra credit:** Try this for a whole range of values of Λ .
2. Find the programs `ebol asim.R` and `ebol aloop.R` on the course web site. The first simulates the process of disease spread just once, and the second loops over it many times.
- a. Change the values of R_0 , R_c and k to interesting values, run `ebol asim.R` a few times, and look at the output `edat`. Make an interesting observation.
 - b. Run `ebol aloop.R` for at least two values of the parameters. How do your results compare with those in the paper?
 - c. **Extra credit:** Change the program to model the immediate control scenario and see if the results line up with those in the paper.