Modeling Disease Transmission

In class, we have discussed the SIR model for disease transmission. The goal of this activity is to simulate the spread of a disease and see these models in action.

Model 1

To begin, we model a disease for which there is no recovery.

Rules:

1. Keep track of your current state, which is either 0 or 1. Your initial state is in column 0 of the chart below.

2. In each round, partner up with a different person in the class.

3. Write the product of your and your partner's states of the previous round in the box for this round.

Round	0	1	2	3	4	5	6	7
State	0							

Record the totals for the class in the chart below.

Round	0	1	2	3	4	5	6	7
0								
1								

1. Which of the numbers represents a susceptible individual? Which represents an infected individual? How do you know?

2. Describe the infection rate of the disease.

Model 2

Next, we model a disease for which there is recovery.

Additional Rules:

1. There is a new state R that represents a recovered individual.

2. When you partner up with someone else in state R, repeat the symbol you wrote in the previous round.

3. After 2 consecutive rounds of writing 0, switch to writing R, and do this for all of the remaining rounds.

Round	0	1	2	3	4	5	6	7
State	1							

Record the totals for the class in the chart below.

Round	0	1	2	3	4	5	6	7
0								
1								
R								

3. According to this model, are people who recover immune to the disease? How do you know this? Give an example of a disease for which this is true.

4. Did the total number of individuals who got the disease change from the previous round?

Model 3

In the final model, we consider the scenario where some individuals are initially "recovered". The same rules apply as in the previous round.

Round	0	1	2	3	4	5	6	7
State	1							

Record the totals for the class in the chart below.

Round	0	1	2	3	4	5	6	7
0								
1								
R								

5. How could it be possible for some individuals to be "recovered" from the disease without having had it?

6. Were any of the individuals who were initially susceptible able to last the entire activity without contracting the disease?

7. Assuming you were able to answer the above question in the affirmative, what is the significance of this result from a medical perspective.