

## **Tag, Your Sick! - The Spread of Diseases**

**Adapted from:** Original Lesson

**Teachers:** Jon Hayes and Caitlin Ament

**Grade Level:** 7th

**Unit Topic/Theme:** Research

**Time allotted:** 1 period of 42 minutes

### **Learning goals:**

- Students will understand how infectious diseases spread.
- Students will see math models matching real world data.
- Students will understand how math and the sciences work together to solve problems.

### **Learning objectives:**

- Students will be able collect and plot data.
- Students will be able to define epidemiology.
- Students will be able to give examples of infectious diseases.

### **NJ Core Curriculum Content Standards:**

- 4.3.7.B.1 Graphing functions
- 4.3.7.C.2 Models
- 4.4.7.A.1 Selecting appropriate display of data
- 4.4.7.A.2 Making inferences based on displays
- 4.5.7.B.2 Communicating mathematical ideas to peers and teachers.
- 4.5.7.E.1 Graphical representations
- 5.1.8.A.1 Model Building
- 5.1.8.A.2 Computer based mathematical models
- 5.1.8.B.2 Using mathematics
- 5.3.8.C.1 Population sizes of organisms

**Key vocabulary/concepts:** Epidemiology, Macroscopic Epidemiology, Microscopic Epidemiology, Epidemic

**Materials:** Computer with Matlab, PowerPoint.

### **Procedures:**

1. Discuss Epidemiology
  1. What diseases/illnesses have you heard of?
    1. TB, Malaria, Smallpox, Measles, H1N1, Flu, Meningitis
  2. How are these diseases transmitted?
    1. Coughing, sneezing, touch, bodily fluids, carriers (fleas or mosquitoes)
  3. Epidemiology
    1. Epidemic - an outbreak of an infectious disease.
  4. Microscopic Epidemiology
    1. A small scale look at epidemiology
    2. Ex: How does a virus mutate over time?

5. Macroscopic Epidemiology
  1. A large scale look at epidemiology
  2. Ex: How does a disease move through a population?
  3. Show England Measles Data video.
2. Simulation (game) - Susceptible and Infected
  1. There are two groups of people in this game, susceptible and infected. The game starts out with one infected person, and everyone else is susceptible. The infected person is on one side of the field and everyone else is on the other side of the field. The infected person shouts, "one, two, three GO!" and all of the susceptible people try to run across the field without getting tagged. If a susceptible person is tagged, then he/she will be an infected person in the next round. The game is played until everyone is infected. The last person without the disease wins.
  2. Discuss how we can record the data.
  3. Note: It is ok if students do not want to run. We will discuss what this means in our model at the end of the class.
  4. Make sure that the teacher records the number of infected for each round.
3. Have the students graph the infected and susceptible populations.
4. Discuss the results
  1. How did the data match the simulation?
  2. How could we improve our results?
  3. Beta is the 'contact rate' between infected people and susceptible people. What would happen if we increased/decreased beta?
  4. If the first infected person was the fastest person in the class, do you think that beta would be higher or lower? Why?
  5. In our simulation, what would happen if everyone walked? (This would mean a higher contact rate)
  6. What is the sum of I and S at any time?

**Accommodations:**

- Show PowerPoint with videos (ELL).
- Playing the game will help kinesthetic learners understand the concepts.

**Assessment Plan:**

- Discussion and completion of the worksheet

**Attachments:** Susceptible and Infected worksheet