**Basic Excel Disease Spread Model**

**Objective:** To learn how to make an Excel model depicting the spread of disease in a group of people.

**Materials:** a computer with **Microsoft Excel.**

**Directions**

**Introduction to the Model**

1. 1000 students return to school, one of whom has the flu. As time passes, the sick student unwittingly infects other students, who in turn go on to infect others.
2. This can be generalized as follows: Over time, healthy people get sick and become sick people.

Begin the lesson by having the participants discuss how you would model the spreading of a disease:

* What populations will be involved in this model?
* How does someone go from being healthy to being sick?
* What can increase the infection rate? What can decrease the infection rate?

**Starting the Model**

1. Label the first three columns: **Time**, **Healthy**, and **Sick**. These columns will keep track of the population over time. Each row will represent another time step as the disease progresses.
2. In columns G, add labels for the following constants: Total, Initial Sick and Infection rate.
3. In column H, enter the following values for these numbers: Total(1000), Initial Sick(1), Infection rate(.0004).
4. Put zero in the second row in the Time column and make the time interval increase by one each row.
5. To do this quickly, put "0" in the first row and "1" in the second row. Then select the "0" and "1" and drag the bottom right corner down to row 50 or so in order to fill the other boxes.
6. In the second row of the Healthy and Sick columns (at time 0), write the initial numbers of healthy and sick people in the model. In this example the model begins with 999 healthy people and 1 sick person.

**Naming the Variables**

1. This next step will make writing the equations easier.
2. Show participants how to name their Infection rate box.

**Writing the Equations**

1. In B3 (under Healthy at time 1) type the following equation:   
   =B2-(B2\*C2\*Infection\_Rate)   
   B2 and C2 should be the Healthy and Sick columns.
2. In C3 (under Sick at time 1) type the following equation:   
   =C2+(C2\*B2\*Infection\_Rate)
3. Like you did for time, select B2 and C2, click and hold the bottom right corner, and pull down the boxes until you reach time 50.

* What do the different parts of the healthy equation represent?
* Why is the second part of the equation B2\*C2\*Infection\_Rate instead of just B2\*Infection\_Rate?
* Look at the numbers in the sick and healthy columns. These columns represent the number of healthy and sick people. What happens to the number of healthy and sick people in this population as time goes on?

**Making a Graph**

1. Start a discussion about how to graph this data:
   * What is the best way to graph this data? Why?
   * What should the x-axis represent? And the y-axis? Why?
   * How many lines will be on this graph? How many populations are we graphing?
2. Have the students make the line graph. They should highlight cells B1 through C50 for the data. Show them how to title the graph and label the axes.
   * What does the graph look like? What do each of the lines represent? What is happening to the sick and healthy populations over time?
   * Try changing the infection rate to .0007. What does this change on the graph? What about .0009? How does decreasing the infection rate change the graph?
   * Try changing the infection rate to .0003, then to .0001. How does increasing the infection rate change the graph?
   * What does this graph tell you about the spread of disease? What happens to the number of healthy and sick people in a population over time when you decrease the infection rate? What about when you increase the infection rate?