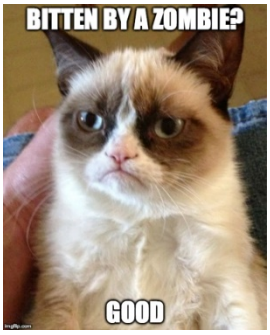
When zombies attack!
The maths of infection rates

How quickly could a zombie infection overrun the population? Could it be stopped?

Knowing how fast infections spread could mean the difference between life, death, and zombification. Although zombies may be popular in modern fiction, they have a lot in common with diseases such as Dengue fever, the Zika virus or simply the common cold. In the movies, when an unwitting person encounter a zombie they get bitten, become a zombie too, then go in search of others to bite. In the same way, someone who has been bitten by a mosquito gets the Zika virus and interacts with other people, who get sick, meet more people and so on, spreading the disease rapidly.

In this workshop, you will investigate how quickly a "healthy" population can be zombified, and what affects the rate of zombification. In the real world, mathematical models play a prominent role in predicting disease outbreaks, and other public health issues such as the effects of quarantines and vaccines. The study of the patterns, causes and effects of diseases in populations is known as **epidemiology**.



Did you know?

Stories about zombies originated in Africa as a part of the spiritual beliefs of Voodoo.

The demonstrator will give each student a piece of paper. Keep your paper secret! You will then play a series of games. The demonstrator will tell you the rules, so listen carefully.

Game 1: Zombies attack!

1. Use the Game 1 Sheet and follow the demonstrator's directions.
2. How do you think the total number of zombies progressed with time?
3. Make a quick sketch (a sketch is rough drawing with correct shape rather than accurate plotting) of a graph with number of rounds on the x-axis and total number of zombies on the y-axis. Use the pre-labelled axes on the reverse of the Game 1 Sheet.

The demonstrator will graph the total number of zombies for every round.

4. Fill out the group worksheet.
5. What does the graph tell us at Regions A-D?
6. Describe the shape of the graph? How does this relate to what was happening at the end of the game?

The demonstrator will graph the number of new zombies for each round. Answer Q7-12 in your group.

7. At what round(s) are there the least number of new zombies?
8. At what round(s) are there the most number of new zombies?
9. How does the graph of new zombies relate to the graph of total zombies?
10. The demonstrator will give you some scenarios. As a group discuss the scenarios. Which would have the same features as the zombie graph, which would be different?
11. Think about a real disease outbreak. What real life factors were not considered in this game?
12. As a class discuss what factors would lead to a different outcome where not everyone is zombified.

Game 2: Humans fight back!

1. Use the Game 2 Infection Status booklet and follow the demonstrator's instructions.
2. In this game the zombies could die on their own with time. Were there any non-immune human survivors?
3. How does the graph of zombies with time compare to the previous game?
4. Fill out the cloze activity in your booklet.
5. Think about vaccinations. From what you have learnt in this game, how does getting vaccinated protect others as well as yourself?

Want to try out a disease spread simulator, and create your own?

Check out http://www.learner.org

Challenge

There are many ways in which populations grow, whether they are populations of people, bees, zombies, or zombie bees. One common pattern found in nature is the "Fibonacci Sequence", which goes:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, …

1. Figure out the rule that the numbers follow.
2. What is the very next number in the sequence?

Puzzle

There were 100 chocolates in a box. The box was passed down along a row of people. The first person took one chocolate. Each person down the row took more chocolates than the person before, until the box was empty. What is the largest number of people that could have been in the row?

To gain **EXP** and level-up your mathematician, email your answers to the **Challenge** and **Puzzle** questions to Dr Greg at Gregory.Boyle@my.jcu.edu.au.

Q: What do vegetarian zombies crave?

A: Graaaaaaaaaiiins!