Can an Influenza Pandemic in a middle school setting be stopped?

Supercomputing Challenge
Final Report
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Capshaw Middle School
Team #25

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Team: 25

School: Capshaw Middle School

Area of Science: Life Science

Executive Summary:

Flu basics

Most people think of the Flu as a winter disease, because many people get the Flu typically from December to March. However, the Flu is actually a year-round problem. Wintertime is because people tend to stay indoors more in the winter. Influenza is a contagious disease that is caused by the influenza virus. It attacks the respiratory tract in humans. The virus is most commonly spread in liquid droplets made airborne by coughing or sneezing.

Even though anyone can get the Flu, people aged 65 years and older and very young children are more likely to get the Flu because their immune system are weaker. An adult can begin spreading the virus one day before and three to seven days after symptoms show, and children can remain contagious even longer. Some infected individuals show no symptoms, yet they can still spread the virus to others.

The annual toll

Each year, anywhere from 5 to 20 percent of the U.S. population gets the Flu. Anyone can contract it, but children, the elderly and people with chronic medical conditions are more likely to experience complications, such as pneumonia, bronchitis, and sinus and ear infections. The Flu can also worsen chronic health problems — asthmatics are more likely to have asthma attacks, and people with chronic congestive heart failure may have their condition worsen.

On average, 36,000 people in the United States die from Influenza and related complications each year. More than 200,000 are admitted to hospitals for treatment.

Since the Flu and the common cold affect the respiratory system and are both brought on by viruses, they are sometimes confused. They share many of the same symptoms, and it is nearly impossible to make the distinction based on the variety of symptoms alone.

Flu symptoms, however, are generally more intense, especially the fever and fatigue, and those symptoms can lead to dangerous complications. Symptoms — such as fever, body ache, extreme fatigue, sore throat and dry cough — begin showing in adults one to four days after being infected. The Flu can also be spread when a person touches the droplets from a sick person then touches their own or another person’s mouth or nose before washing their hands.

A virus is a small germ that causes sicknesses from the common cold to AIDS. They don’t have a complete genetic formation and depend on the host cell to multiply.

Immunizations usually known as vaccines are used to prevent the spread of a disease. Vaccines are used only by doctors and or people, which are certified or authorize to administer them to people or animals that need to be given.

STATEMENT OF PROBLEM:

Since September 11th, 2001, public health officials and organizations around the world have gone on high alert because of increasing concerns about the chances of Influenza pandemic. Lately there have been problems with the availability of vaccine for annual Flu epidemics in some countries. Cities are now constantly worried about their ability to prevent or contain a human pandemic. Our project is a small way that we are using to help and try to addresses these urgent concerns.

Our experiment and our program try to address what steps others might want to look into in order to prepare for the next outbreak of "Killer Flu." Our model though has many limitations because it is very simple. Limitations include the fact that it does not address readiness issues like those involving hospitals' inability to absorb a surge of patients and many nations' difficulties in trying to monitor and detect Flu outbreaks through out the world. The report points to the need for international agreements to share Flu vaccine and antiviral stockpiles to ensure that the 88 percent of nations that cannot manufacture or stockpile these products have access to them. Another limitation factor also include those involving the costs of preparations with the costs of illness

In this project, we attempted to show how immunization could stop or slow down the spread of the Flu virus in a middle school population in the hope of preventing a pandemic.
The hypothesis was that, immunization can stop or slow down the spread of the Flu virus in a population.

PROBLEM SOLUTION:

In order to test our hypothesis, we conducted an experiment during two class periods at our schools using the Virus game on Palm Pilots. We repeated the experiment several times and were unable to collect valid data because some of the students did not follow the rules when playing the games. However after several trials, we were able to repeat the experiment nine times with valid data.

Star Logo Model:

We also wrote the Star Logo program to test our hypothesis and investigate the way the virus spreads and how it can be stopped in a small population.

Turtle Procedures

```
to go
fd random 4
rt random 50
fd random 60
lt random 70
if color = red [grab one-of-turtles-here [setc red setc-of partner red]]
if color = green [grab one-of-turtles-here [setc green setc-of partner green]]
end

to change
if breed = healthy [setc blue]
if breed = infected [setc red]
if breed = vaccinated [setc green]
end
```

Observer Procedures

```
breeds
[infected healthy vaccinated]

to setup
ca
inf
vacc
heal

end

to make
crt number
end

to inf
create-infected 5
end

to heal
create-healthy 15
end

to vacc
create-vaccinated 10
end
```

Results:

Nine games were played with a class size of 22 students where valid data was collected. Each game was played for 2 minutes. Each round consisted of 3 games.

Round 1: 2 immune, 1 carrier. At the end of game 1, there were 7 healthy and 15 sick.

At the end of game 2, there was 16 healthy and 6 sick. At the end of game 3, there was 15 healthy and 7 sick.

Round 2: 4 immune, 1 carrier. At the end of game 1, there was 15 healthy and 7 sick. At the end of game 2, there was 13 healthy and 9 sick. At the end of game 3, there was 11 healthy and 11 sick.

Round 3: 6 immune, 1 carrier. At the end of game 1, there was 17 healthy and 5 sick. At the end of game 2, there was 19 healthy and 3 sick. At the end of game 3, there was 16 healthy and 6 sick.

Conclusion:

Based on the results we got from the "Virus Game", we found out that immunization does slow down and can stop the spread of the virus and therefore can be used to prevent a pandemic.

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