Evolution of Influenza Over Time

New Mexico
Supercomputing Challenge
Final Report
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Team 21
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Executive Summary:

Our project, Evolution of Influenza over Time, deals with the evolution of the influenza virus over time. We researched its previous impact in society during the influenza pandemic of 1918, or Spanish Influenza. We studied its symptoms, its spread, and its consequences and incorporated them into our model. We made our model under the NetLogo program. We then decided to model the effects of the influenza in our society today. We moved around on the numbers on the sliders changing the variables value to see what would happen under different circumstances. Variables we included were population rates, chance of recovery, the infection rate, and the virus's duration. We recorded the information from our simulation in tables and graphs.

Currently, our program runs well incorporating some of the variables, but does not include every variable that would come into effect in a real life situation. Since our knowledge of the NetLogo program has some limitations, we do not know how to incorporate every variable that affects the influenza, but we have researched each solution we could incorporate and incorporated it to the best of our abilities.

Introduction:

The Spanish Influenza spread to a vast majority of the countries in the world. It is estimated to have killed fifty million to one hundred million people in a period of about two years from 1918 to 1920. There was a lot of chaos because people feared getting the disease from another person. The symptoms of the Spanish influenza are as follows: extreme coughing fits (bloody), sweating, fever, delirium, blood coming out from nose and possibly their ears, collapse, meningitis of the brain, pneumonia of the lungs, headache, vomit, and diarrhea, The Spanish flu was a virus that was a form of an early version of H1N1. The surviving rate of the people who obtained the virus was approximately ninety-five percent. This means that although many people died and suffered from the outbreak, the number of deaths was not great compared to the survivors in the world.

Materials and Procedure:

During our project, we used the NetLogo program to model our simulation of the Spanish Influenza over time. We used our resources by navigating the internet, reading books relating to the Influenza Pandemic of 1918, and speaking to our mentors about viruses and their impacts.

First, we decided what topic we would research, then we came up with two ideas that we would like to research. We searched information on both topics and we decided to do the one that interested us most which was the Spanish Flu. We continued to research and assigned certain tasks to each of the team members. Then we decided on what our model would consist of and began to write it. We then went on to write our final report and our conclusions to our project and model.

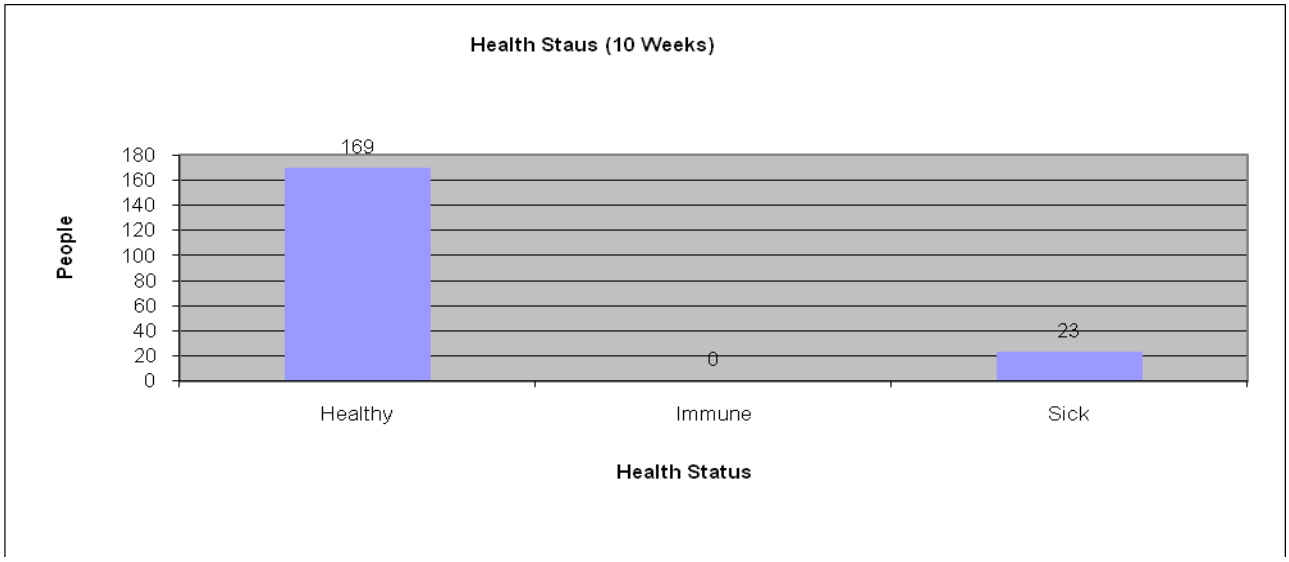
Model Description:

To simulate the Spanish Influenza, we used the program NetLogo. During the process of making this simulation, we incorporated many different things into our model, referred to as globals on the program. In our model we had five main globals including percent infected, percent immune, lifespan, average offspring, and carrying capacity. Each one of our globals represented an important aspect of life during the Spanish Influenza of 1918. Also in our model, we had to define variables. Like globals, our variables were very important. Our variables consisted of making our people move, get infected, become immune, get older, and reproduce. After our programming was accomplished, we were able to see the visual part of it. When you look at our model, you will see, on the left, two buttons, three boxes consisting of data, four sliding bars in which you can adjust the chances of getting and recovering from the virus, and a graph. You will also see a box with a black background and different colored people running around. This represents the world of people and the colors represent the state of the people from the virus such as healthy, infected, and immune. To first start the program, you must press setup. This setups all the variables and globals we created during our programming. After

pressing the setup button, you press the go button. This makes the people move and start infecting other people. In our simulation model, the green people are healthy, the red people are infected, and the blue people have developed their immunity to the virus. You can change the chance recovery and infectiousness. Because of the data and statistics we pulled off the internet, we have our chance recovery at ninety-five percent and our infectiousness at thirty-three percent. While our simulation model is operating, so is the graph. As time passes, the program is graphing the data for us. At any given point, you can change the speed at which time passes and how much time you want to pass every second. This is the model description for our simulation model of the Spanish Influenza of 1918.

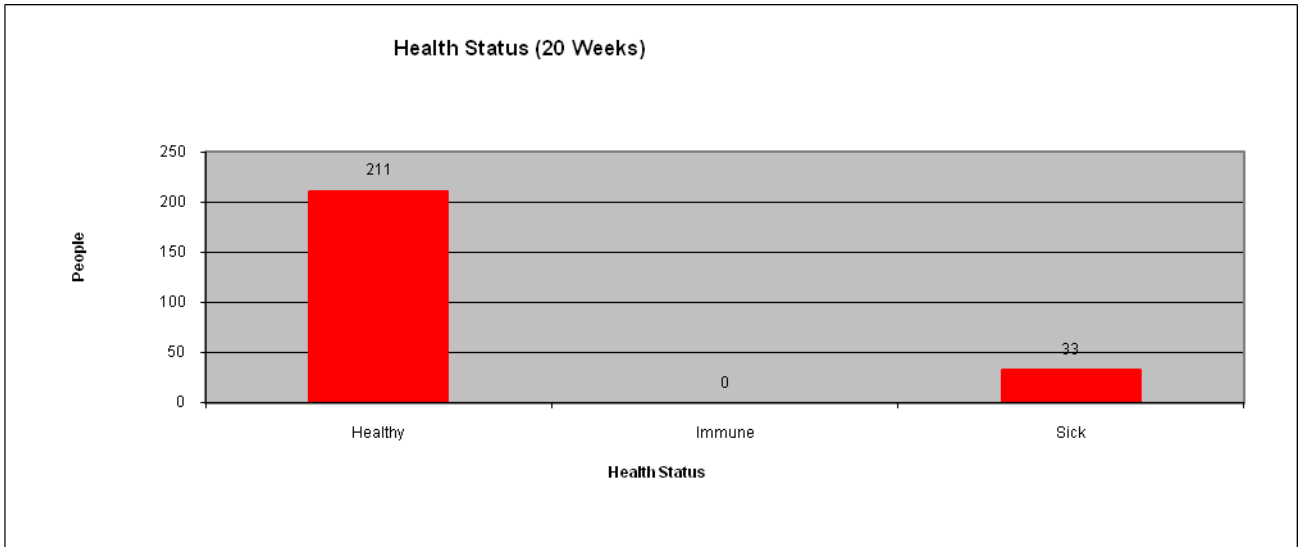
Ten Weeks

Healthy	Immune	Sick	Total
169	0	23	192



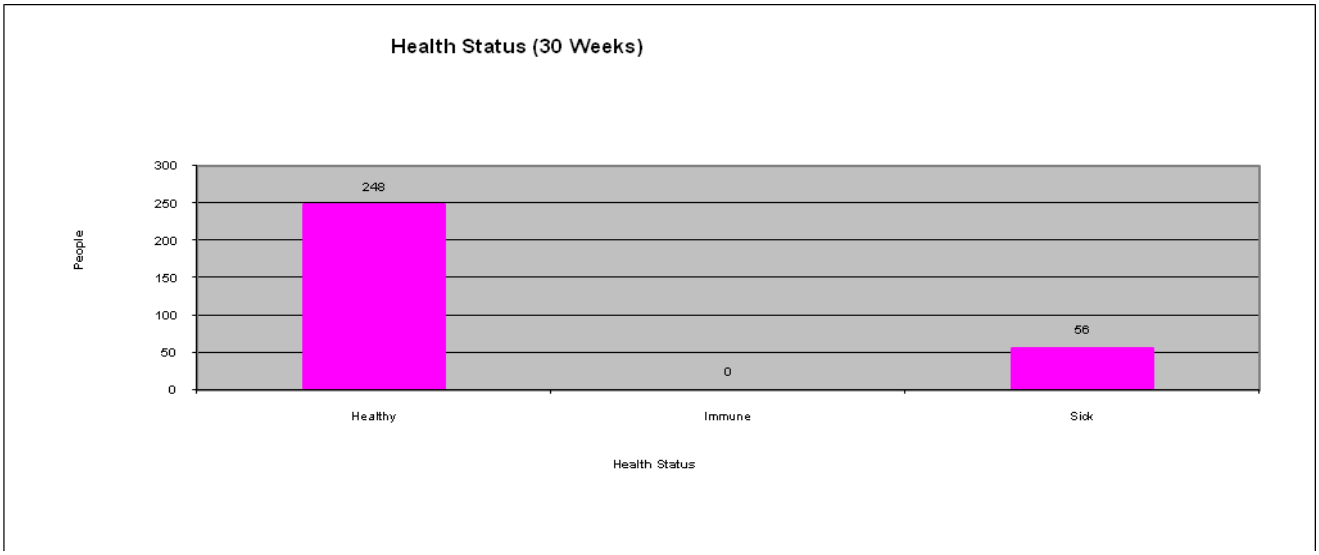
Twenty Weeks

Healthy	Immune	Sick	Total
211	0	33	244



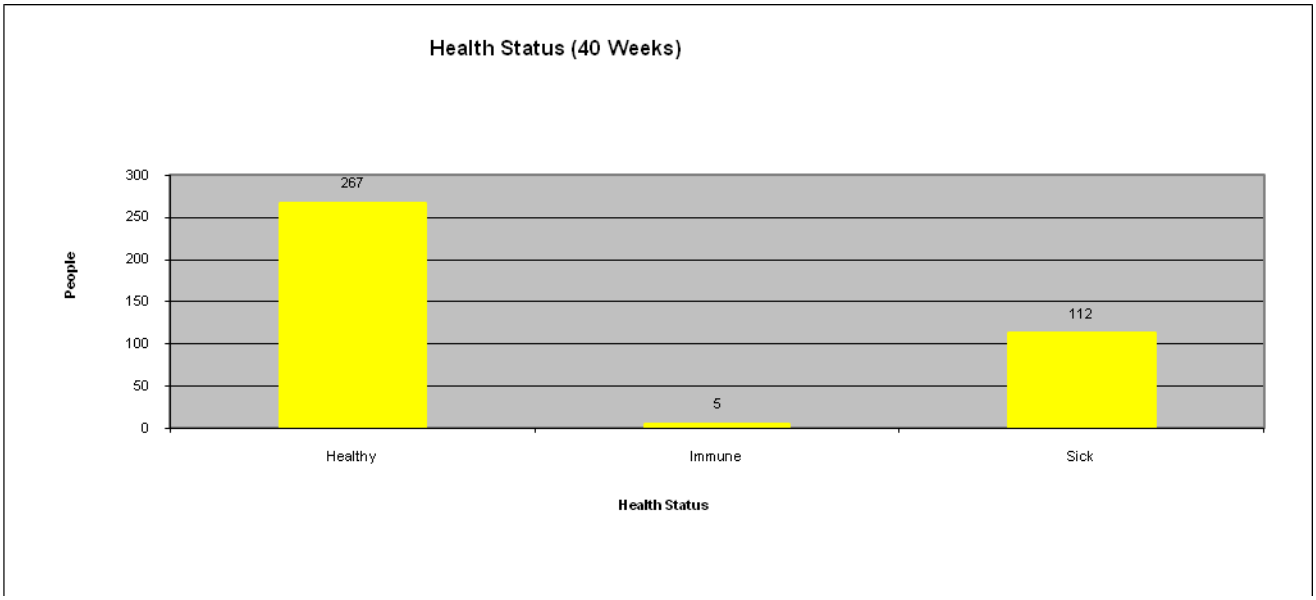
Thirty Weeks

Healthy	Immune	Sick	Total
248	0	56	304



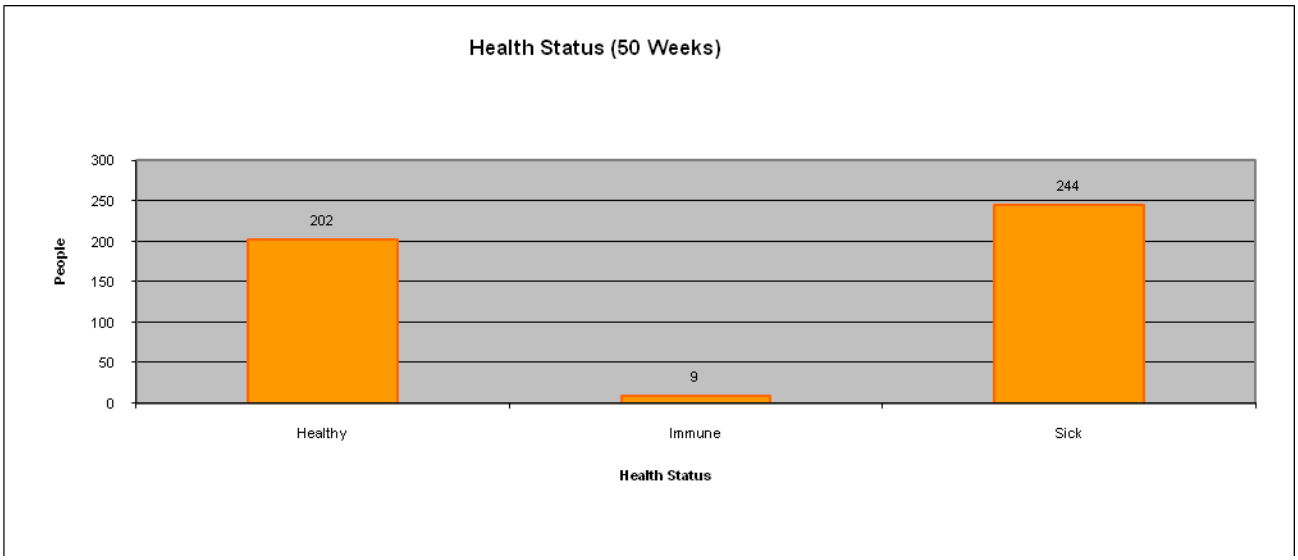
Forty Weeks

Healthy	Immune	Sick	Total
267	5	112	384



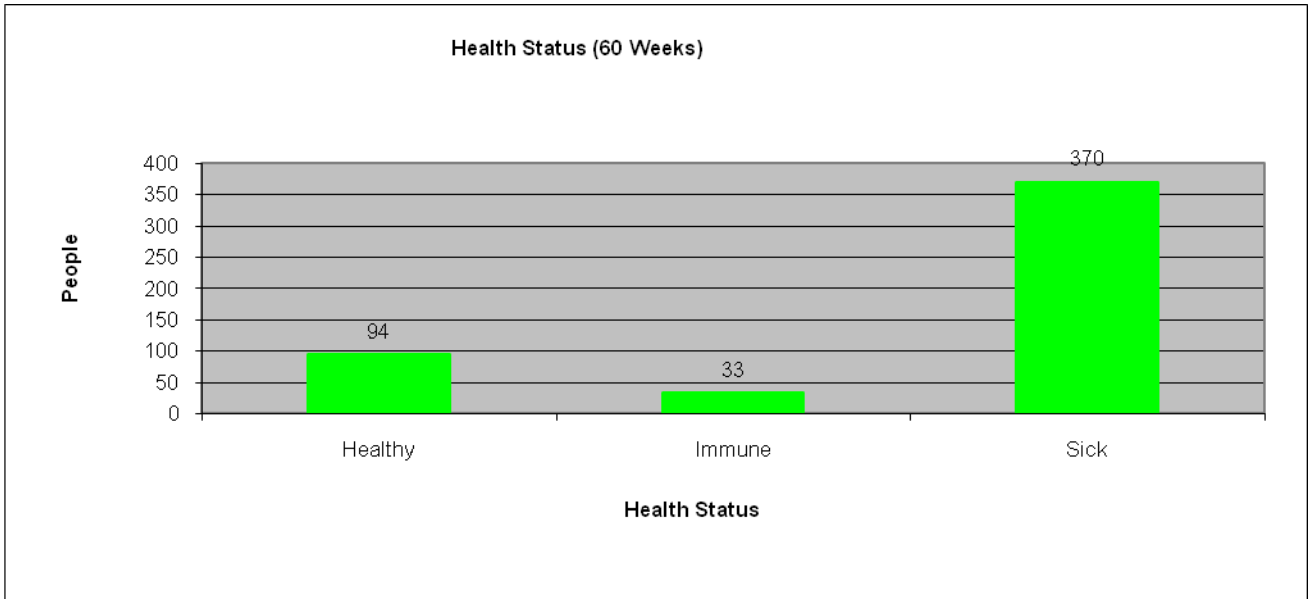
Fifty Weeks

Healthy	Immune	Sick	Total
202	9	244	455



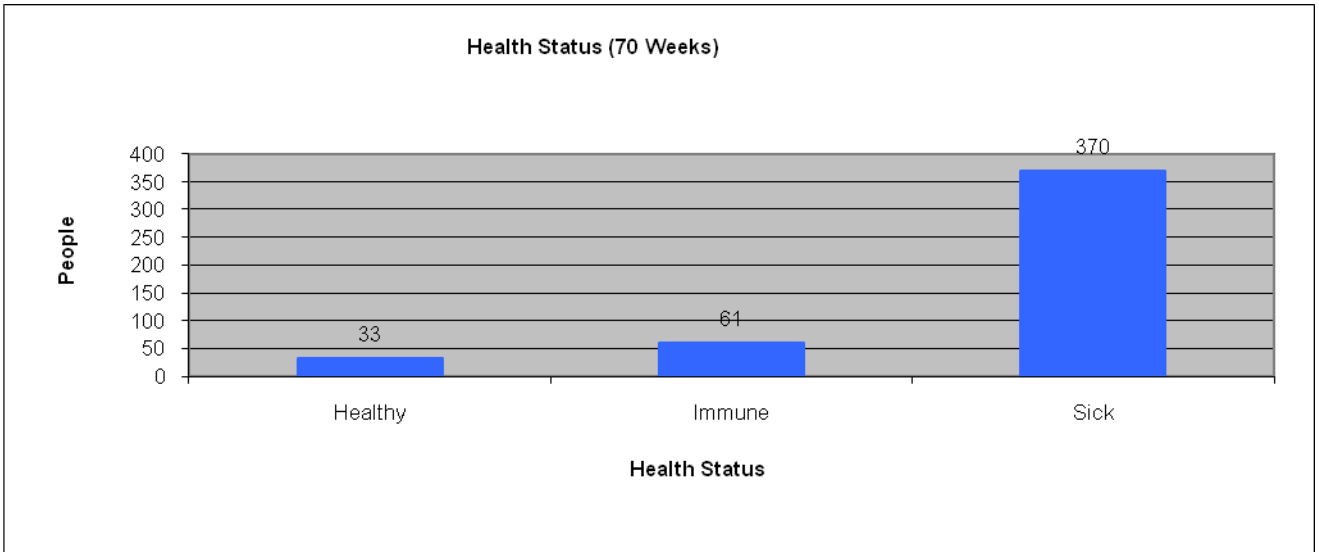
Sixty Weeks

Healthy	Immune	Sick	Total
94	33	370	497



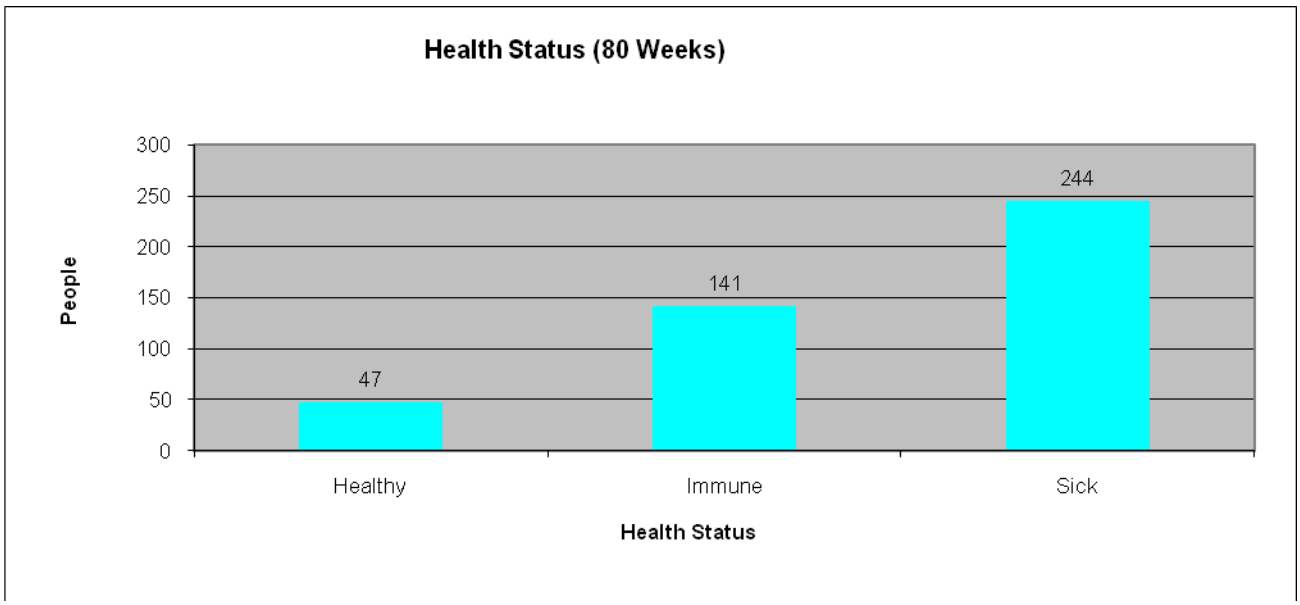
Seventy Weeks

Healthy	Immune	Sick	Total
33	61	370	464



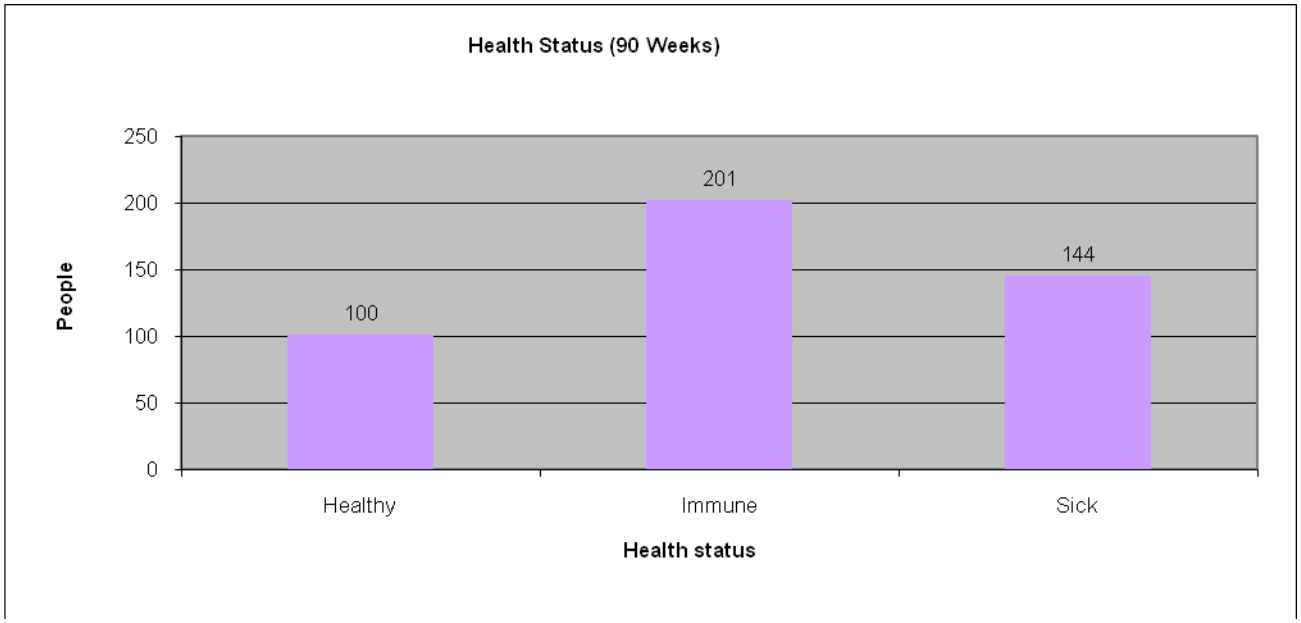
Eighty Weeks

Healthy	Immune	Sick	Total
47	141	244	432



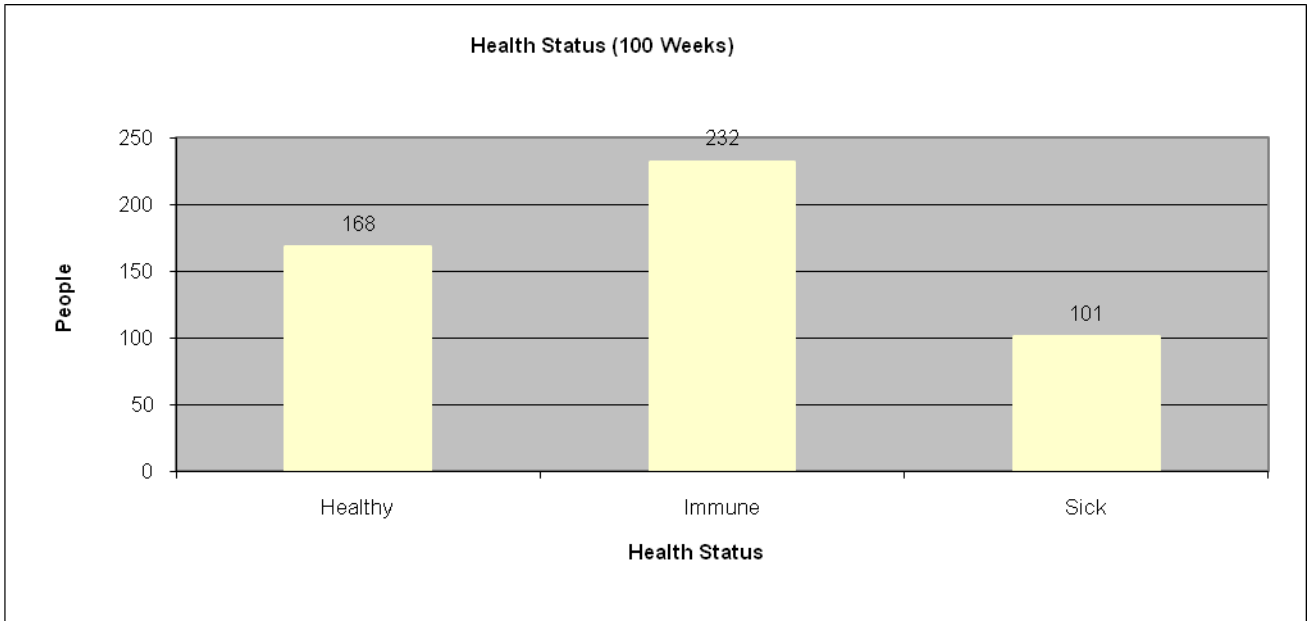
Ninety Weeks

Healthy	Immune	Sick	Total
100	201	144	445



One Hundred Weeks

Healthy	Immune	Sick	Total
168	232	101	501



Conclusion:

As a group, we have successfully completed our goal to increase our understanding of the Spanish Influenza. In the beginning, we wanted to understand this influenza because we know that many diseases and influenzas are not understood and that this specific flu was an epidemic that not many people understand. Now that we have gained knowledge about where this pandemic came from and how it came to be one of the most deadly influenzas spread, we have also gained an understanding of the H1N1 virus. The H1N1 virus has not gotten as far as the Spanish Influenza virus because we have better medical supplies such as vaccines and more advanced technology. As a group, we believe that if it were not for our current-day technology, the H1N1 could have been as deadly as or even much worse than the Spanish Flu. We based our conclusion according to information we have studied and gathered on the Spanish Influenza and its many factors.

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