School: Academy for Technology and the Classics

Team Number: ATC-3

Area of Science: Epidemiology

Title: Epidemiology Simulation

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Project Definition

Our project is a model of the spread of the Influenza Thread A between two hypothetical neighborhoods. The problem that we are trying to solve is how individual conditions can affect the spread of a disease through two different neighborhoods. We can utilize this data in order to show if individual demographics produce a quicker spread through the community, therefore needing more assistance to aid an outbreak. This data can also help us understand on a local level, how the disease spreads in different conditions. Our model considers transportation, demographics (age and economic status; the economic status would reflect how the agents would use their money), local gatherings, countermeasures against disease (vaccines), and symptomatic and contagion time periods.

Project Solution

We plan to solve this problem by creating a model that will incorporate the given variables, along with a fairly basic agent-based python model in order to show the spread of the disease between the two different neighborhoods. We will compare how the different demographics will affect the severity of the illness in the two neighborhoods as well as particular methods on how to prevent the spread of the illness.

Progress to Date

We are researching the demographics and infectivity rates. We have found a statistic on the percentages of age groups that receive vaccines: 49% of people who are 6 months to 17 years old have gotten vaccines compared to 31.7% of people 18-49[1]. We have also found that the Influenza virus doesn't create symptoms immediately, and someone can have the flu and spread it before they become noticeably sick[2]. The flu is commonly spread from little infected droplets that are expelled from the mouth and nose. It is also shown that on average 5-20% of United States citizens will get the flu per year, therefore we can drawn a conclusion that you have between a 1 in 20 and 1 in 5 chance of receiving the flu[3] in the U.S.. It has also been shown that influenza isn't deadly unless you have pre-existing medical conditions[4]. We are also beginning to learn about both Python[5] and StarLogo, as well as discussing the parameters that will be implemented into the model. Several other research areas are examples are; how strong the immune system of an individual is, along with the age of the agent, and the time they are showing symptoms or spreading the sickness.

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[1] "Influenza." Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, 06 Oct. 2016. Web. 22 Dec. 2016.

[2] "Key Facts About Influenza (Flu)." Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, 25 Aug. 2016. Web. 22 Dec. 2016.

[3] "Flu Statistics: What Are Your Odds of Getting the Flu?" WebMD. WebMD, n.d. Web. 22 Dec. 2016.

[4] "Estimating Seasonal Influenza-Associated Deaths in the United States." Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, 09 Dec. 2016. Web. 22 Dec. 2016.

[5] "The Python Tutorial¶." The Python Tutorial — Python 3.6.0 Documentation. N.p., n.d. Web. 27 Dec. 2016.

Expected Results

In the program we expect to see the neighborhood demographics with lower wealth to be more susceptible to lower health. With this, we expect the Influenza to spread faster in the lower income neighborhood as compared to its spread in the wealthier neighborhood. We expect to see a larger congregation of the illness at the school rather than at the office building. We expect to gain an understanding of influenza spread patterns around different age and wealth groups. We also expect to discover demographic is the most beneficial for preventing the spread of the Influenza.