Adam Razaq, Julia Lewis
Agent Based Modeling
24 April 2022

Project Experiment and Results

Experiment(s):

In this experiment, we attempt to test the impact of two different Covid-19 prevention measures. As there are four separate outcomes, we will toggle each switch after each simulation to infer results about our model behavior. We make the change to the model prior to simulating its behavior; the switches will be toggled prior to starting the model.

The test will be conducted across a period of 300 ticks and the values for healthy, asymptomatic, symptomatic, and dead persons will be recorded through monitor output, as well as a plot documenting the spread of the virus, for a total of three simulations per experiment. We choose to initialize our model with 500 people with an initial-infected rate of 5% for all simulations.

In the **first** experiment I will leave both toggles that represent social distancing and masking off. It is anticipated that the model will show an exponential increase in cases and deaths, and the healthy population will decrease at an equally decreasing rate.

In the **second** experiment I will toggle-on masking and leave social distancing off. It is anticipated that the model will show a delayed response to the masking measures as compared to the first experiment, but the amount of deaths will similarly follow the infection rate, though delayed.

In the **third** experiment I will toggle-on social distancing and leave masking off. It is anticipated that the model will show similar results to the second experiment, where the model will show a delayed response to the social distancing measures as compared to the first experiment, but the amount of deaths will similarly follow the infection rate, though delayed.

In the **fourth** experiment I will toggle-on both social distancing and masking. It is anticipated that the model will show a virtually healthy population throughout the simulation. As a result, it might be inferred that these prevention measures are effective against COVID transmission.
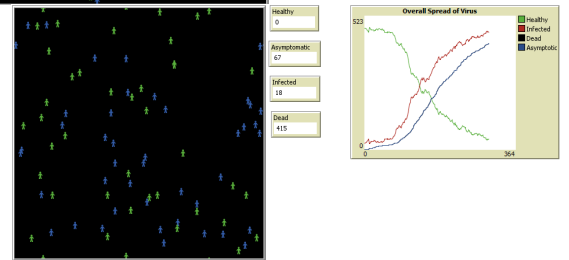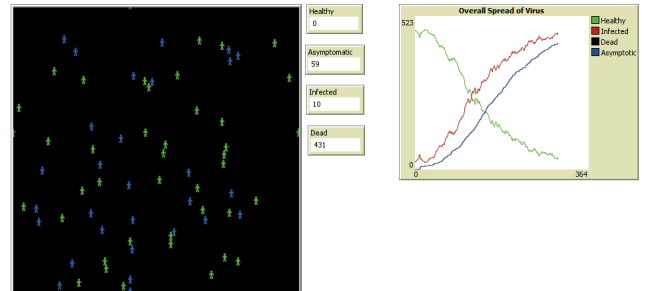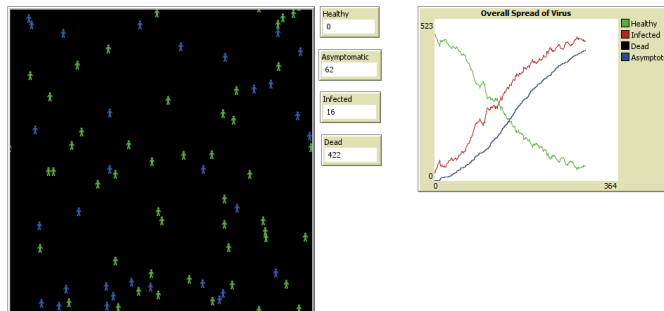
Analysis and Results

Experiment 1 Results:

The first experiment sought to create a baseline scenario over a test period of 300 ticks. The results of the model experiment across three model runs are shown in the plots below. As expected, both the plot and the simulation indicate a high transmission rate and a high death rate.
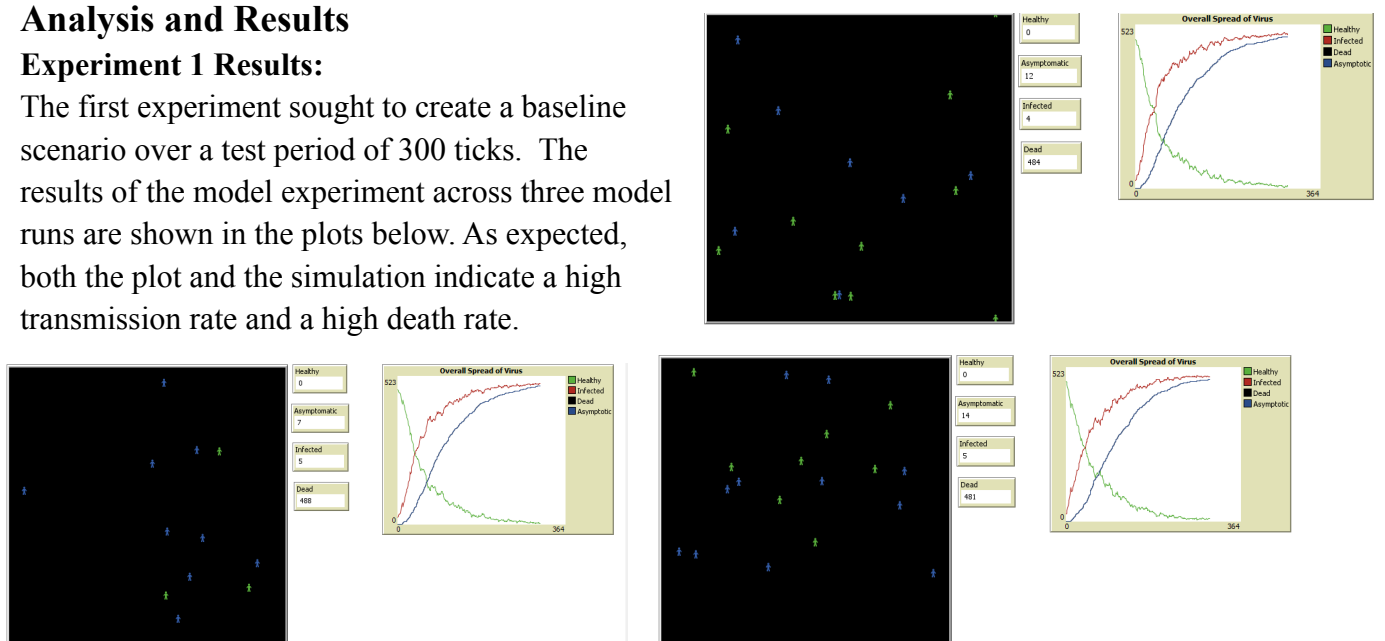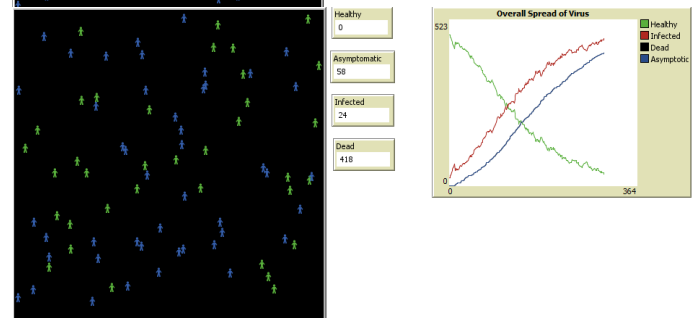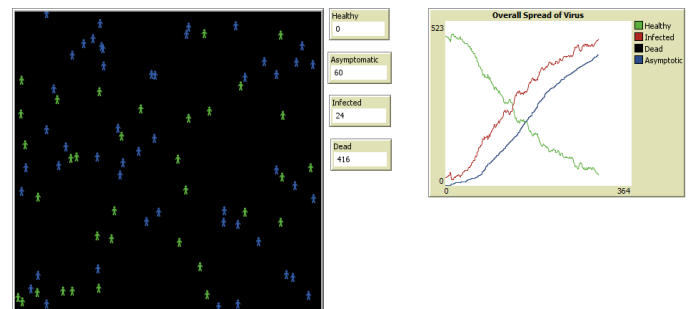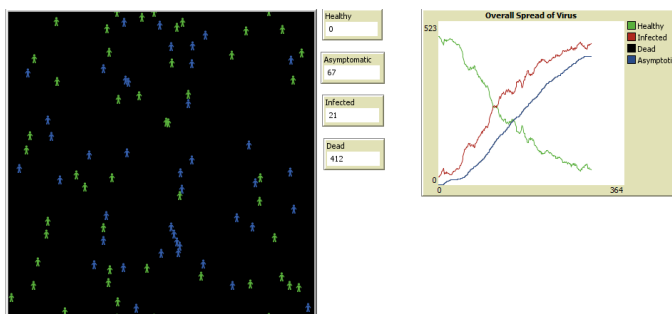
Experiment 2 Results:

The second experiment sought to test the impact of masking measures relative to the baseline scenario over a test period of 300 ticks. The results of the model experiment across 100 model runs are shown in the plots below. The model shows a delayed response to the masking measures as compared to the first experiment.


Experiment 3 Results:

The third experiment sought to test the impact of social distancing relative to the baseline scenario over a test period of 300 ticks. The results of the model experiment across three model runs are shown in the plots below. The model shows a delayed response to the social distancing measures as compared to the first experiment.

Experiment 4 Results:

The fourth experiment sought to test the impact of both masking measures and social distancing measures relative to the baseline scenario over a test period of 300 ticks. The results of the model experiment across three model runs are shown in the plots below. The model shows a virtually healthy population throughout the simulation.
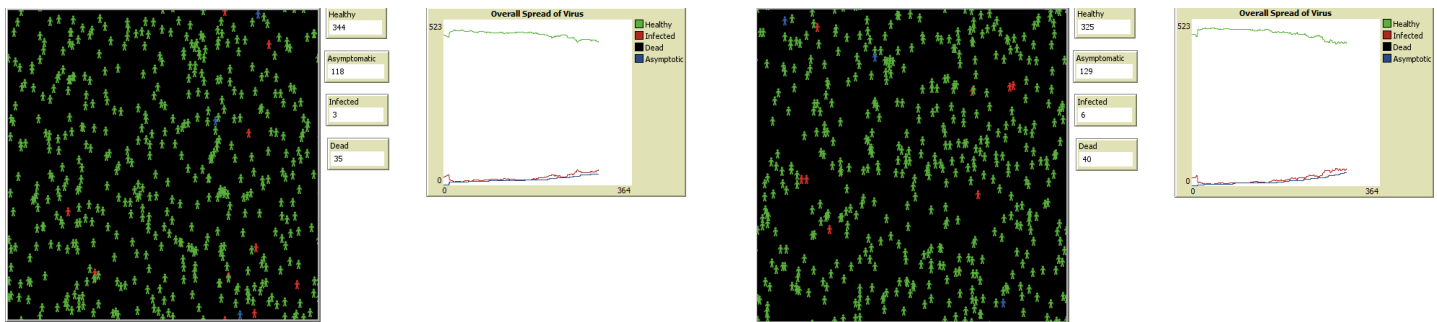
Discussion

Before conducting any form of simulation, we hypothesized the effect that COVID-19 prevention measures had on the transmission of the virus. Based on prior trends indicated through the CDC and local communities, our research shows that a complete lack of prevention measures would result in the most dramatic results; the transmission rate and death rate would be the highest out of all the tested simulations. Our Experiment 1 corroborates this claim, and suggests that the lack of masking and social distancing is completely ineffective in reducing transmission spread. Experiments 2 and 3 yielded similar results to our initial hypothesis, though we had a belief that either prevention measure would be permanently effective, but the simulation indicates that using only one simply delays the inevitable, where the population is eventually affected. Experiment 4 affirmed our prior hypothesis- prevention measures, through the form of masking and social distancing, work incredibly well when used simultaneously, as the population remained healthy throughout the simulation.