The Growing Threat of Enterovirus D68

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Area of Science: Epidemiology

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Executive Summary

Asthmatics across the United States are endangered by Enterovirus D68. What can be done to help asthmatic children from Enterovirus D68? The project is helping asthmatic children, because even though it's not helping everyone, it is helping the most endangered people. The goal is to help save asthmatic children from Enterovirus D68. The Null hypothesis is: no people with asthma will get saved from the virus.The Alternative hypothesis is: all asthmatics will survive and not become infected. The code was made on Starlogo tng. It is focused on asthmatic children because they already have respiratory problems so the virus is more dangerous for them. The data shows that Enterovirus is not only more dangerous for asthmatics, but it also can cause asthma in some children previously non-asthmatic. In the end, our code showed that asthmatics outnumbered the non-asthmatics. If not contained in hospitals, this virus would be a very dangerous.

Problem

The Enterovirus-d68 (also known as EV-d68) is a fast spreading and deadly virus. Ten to fifteen million people a year get Enterovirus. To date, Enterovirus D68 is less common. This is lucky because Enterovirus D68 is a worse virus compared to most of the other Enteroviruses. Many people are endangered by this virus. EV-d68 is a polio-like virus. Enterovirus-d68 is a terribly destructive virus for children's lungs. Enterovirus D68 has been spreading rapidly and has caused cases in the 48 contiguous United States. Enterovirus D68 has affected asthmatics and children more than any other groups.

How can Enterovirus D68 spread and what can it do when it does spread? Enterovirus can spread by coughing, sneezing, and through transfer of saliva between people. The average age of the people that get infected is twelve years old. EV-d68 is more dangerous in children,

especially if they have asthma. The reason for this is because the children have been exposed to less other types of enteroviruses, and in asthmatics they already have respiratory problems. If asthmatics become infected with enterovirus, the disease will be a lot worse than in an average person. Almost 25 million people in the United States are known to have asthma ("Asthma facts and figures,"). About ¼ of the Enterovirus emergency room visits are from asthmatics, or about 1.75 million ("Asthma facts and figures,"). Nearly all the people (eight out of nine) who died from Enterovirus d68 had asthma ("Enterovirus D68," 2014). The only other death was in a child under the age of five. Enterovirus D68 targets the respiratory system and if someone already has asthma the effect could be twice as bad as the effect could on non-asthmatic people.

The problem was to inspect what would be the impact of EV-D68 in a third world country.

Methods:

We wrote a code in Starlogo tng. We created five agent groups: doctors, infected, asthmatic infected, children, and asthmatics. The groups were chosen because they are the groups that have been impacted by EV D68. We created a higher likelihood of infection of for the asthmatics because they have a higher risk of getting the disease. We created a higher likelihood of the disease spreading through the asthmatic infected because asthmatics tend to cough more than non-asthmatics. Coughing is the primary way the disease is spread. In our code, the doctors could get infected. We chose to include this because doctors get infected in third world countries.

The code we made was a trial and error program. We made a lot of mistakes and had to fix them. At first we did not have doctors. We later realized we needed to add doctors into our code. We worked with the collisions until we got a likelihood of contact that is different and

variable for each set of collisions. We think there are still some mistakes in our code. If we did this project again we would do more fine tuning on the code.

At one point, we adjusted the code to increase the number of doctors until the virus would disappear. This showed that one doctor per every ten people was needed.

One of the things that we noticed and initially thought was a bad glitch was that there were more asthmatics at the end than at the beginning. At first, we put in less people with asthma than non-asthmatic children, but in the end the amount of asthmatic infected increased. One of the other mistakes was that we had the doctors get infected by accident. This strategy actually worked; the doctors healed a few people and then got infected. A glitch in the code with the doctors that did not work out is that after a few times of hitting the infected, the doctors turned into children and became infected in the model.

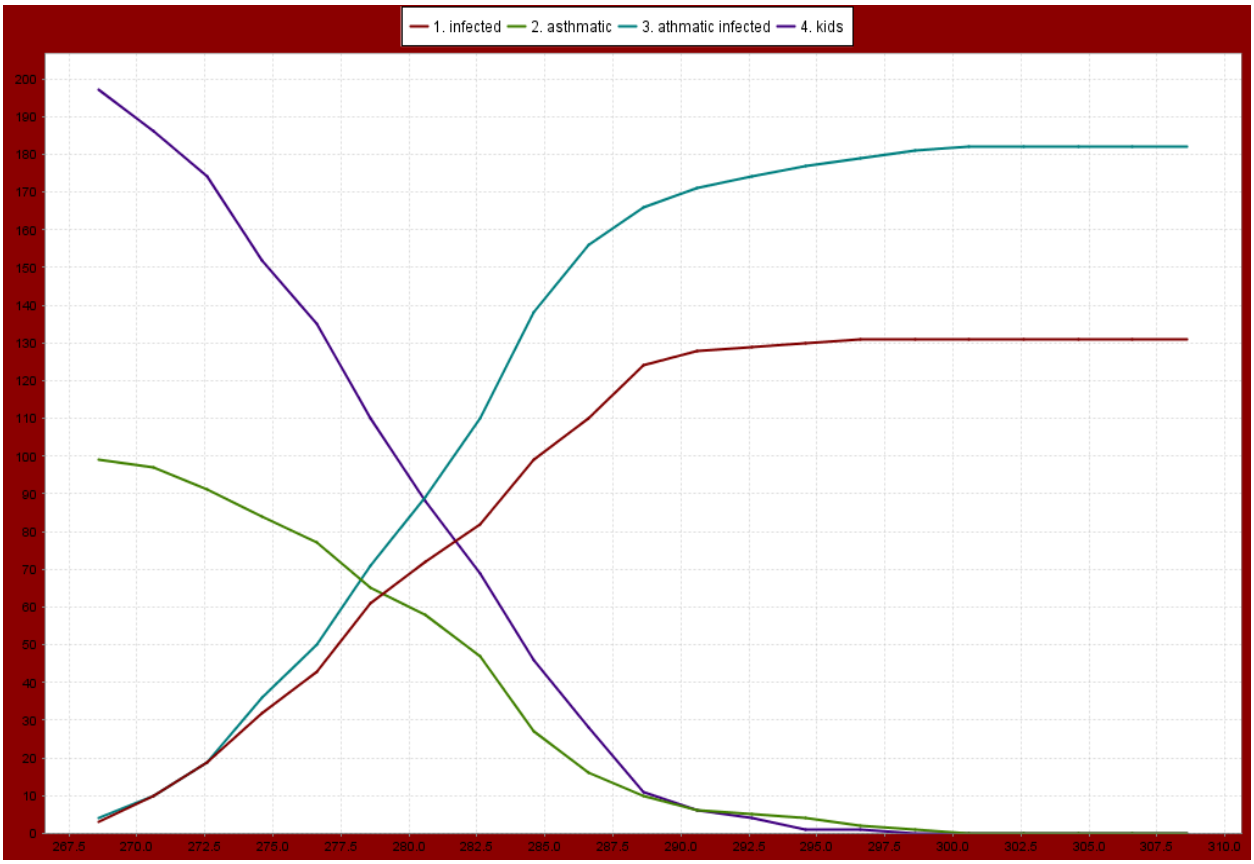
Verification and Validation

The doctors save people, but then after awhile the doctors get infected. The code takes place in a third world country where there are no hospitals and doctors can get sick more easily. Also there is a 25 percent larger chance that the asmatics get infected and this shows up it the code to. There is also the same percentage of asthmatics as there are in really life.

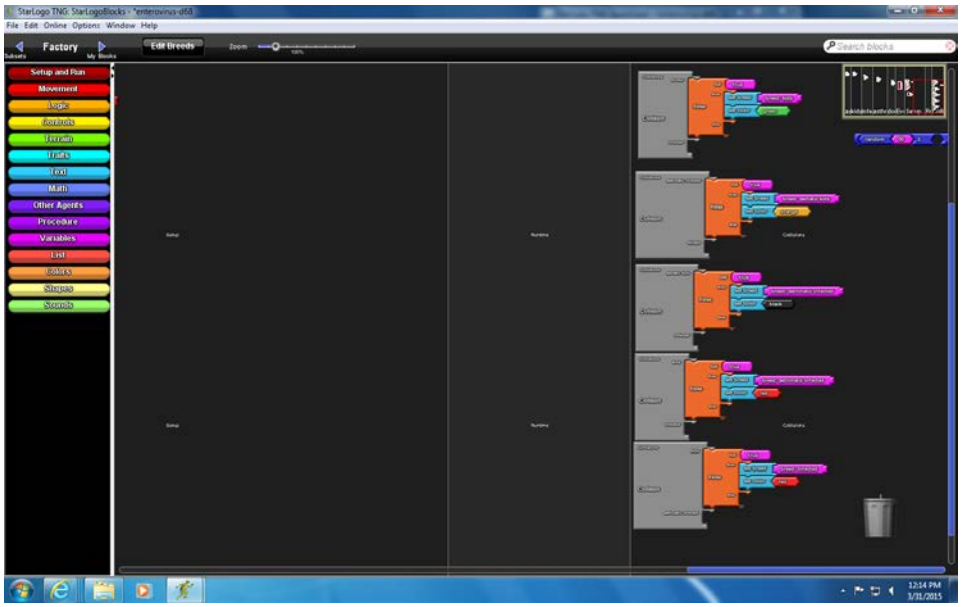
Results

Our initial results showed that if there were two sick people in the world in the beginning, that 575 days later the world was consistently and completely infected with EV D68. In these early tests we had no doctors. Later we added doctors to the code. Although there were doctors in the later tests, the world was taken over at about the same time. The difference in the later tests showed that the doctors would save people that would only be reinfected later. The graph of the population showed this pattern where population of infected people grew slowly, and steadily

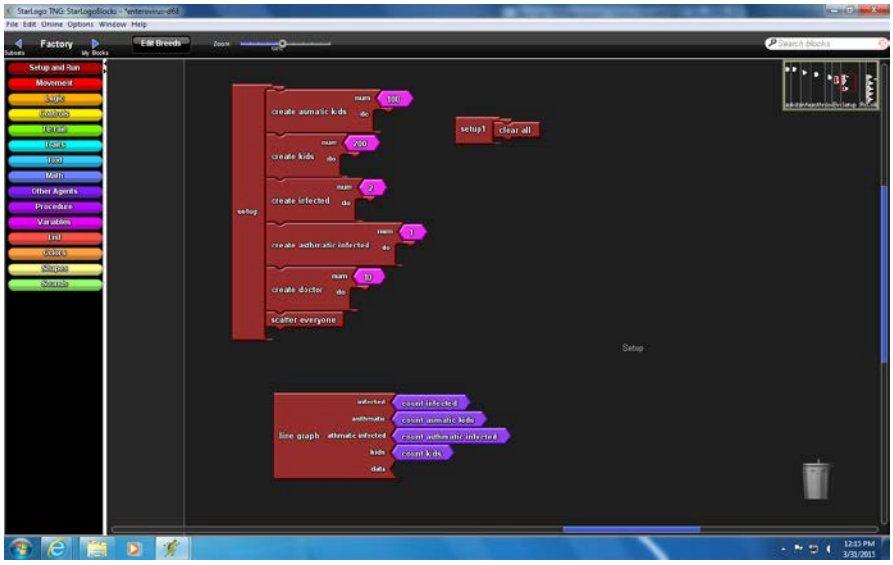
sped up as more people became infected. This made sense because the more infected and contagious people there are, more people will get sick and this pattern will continue until the graph flatlines.



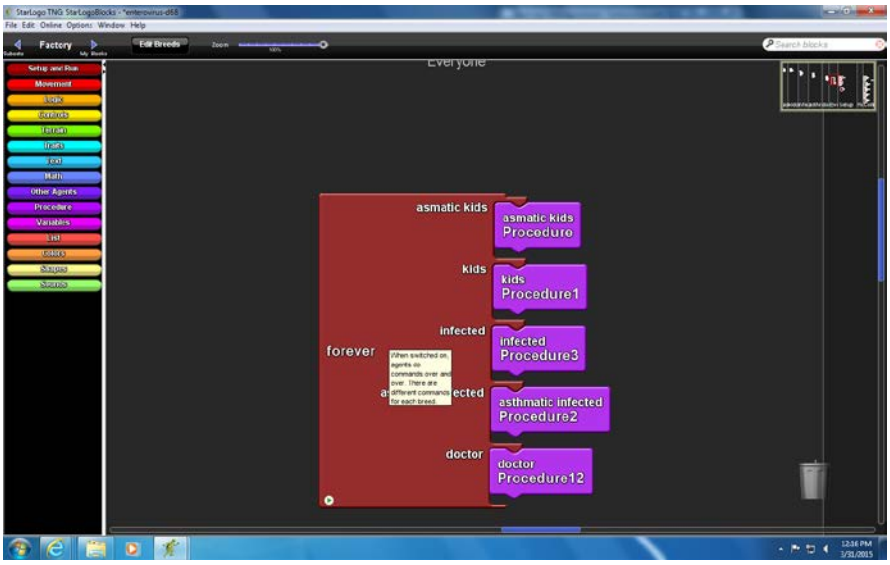
Graph of Population



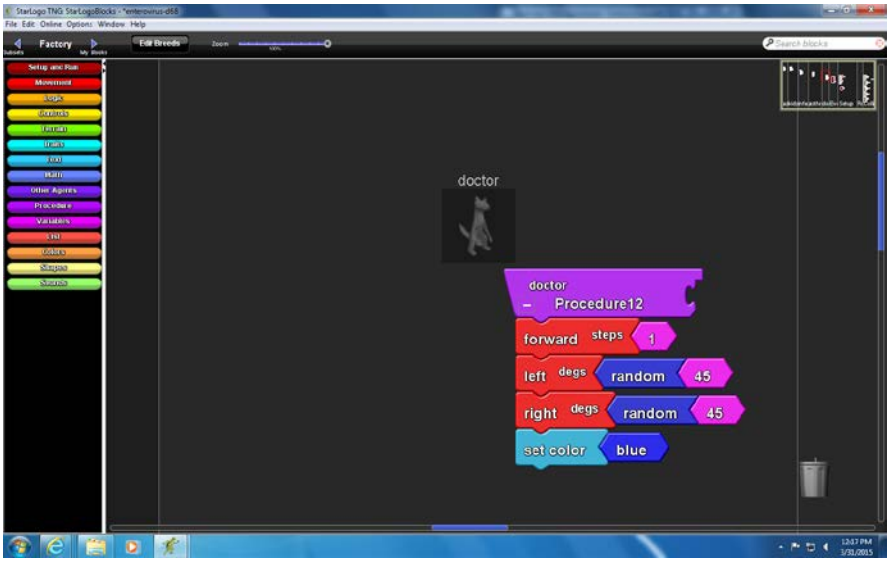
Collisions



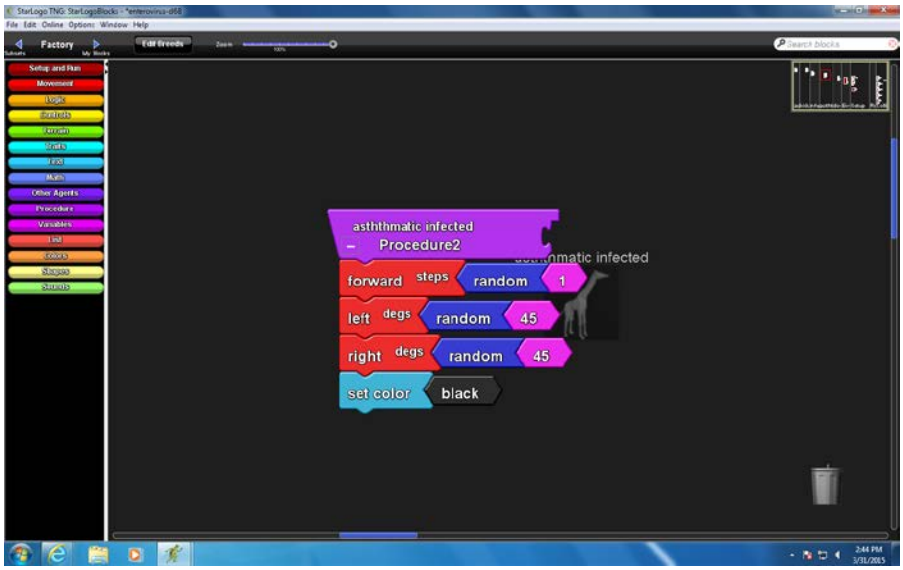
Setup



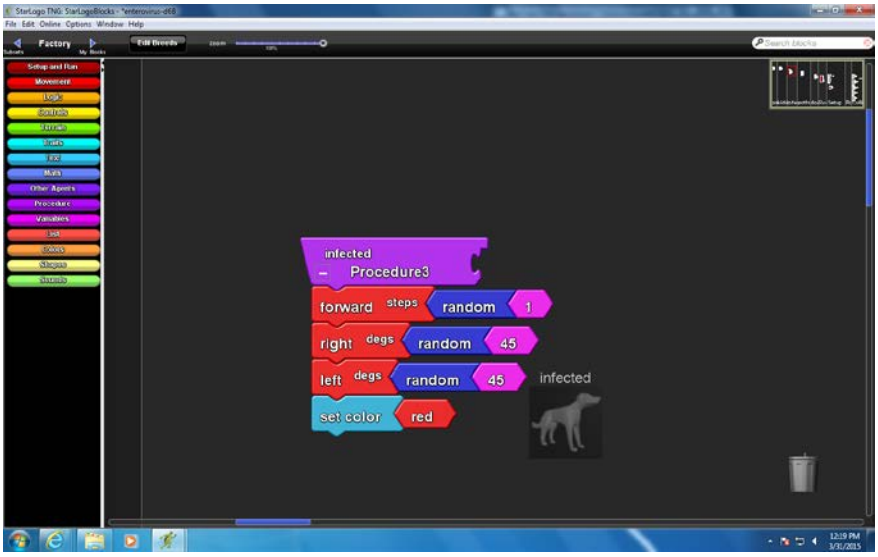
Forever



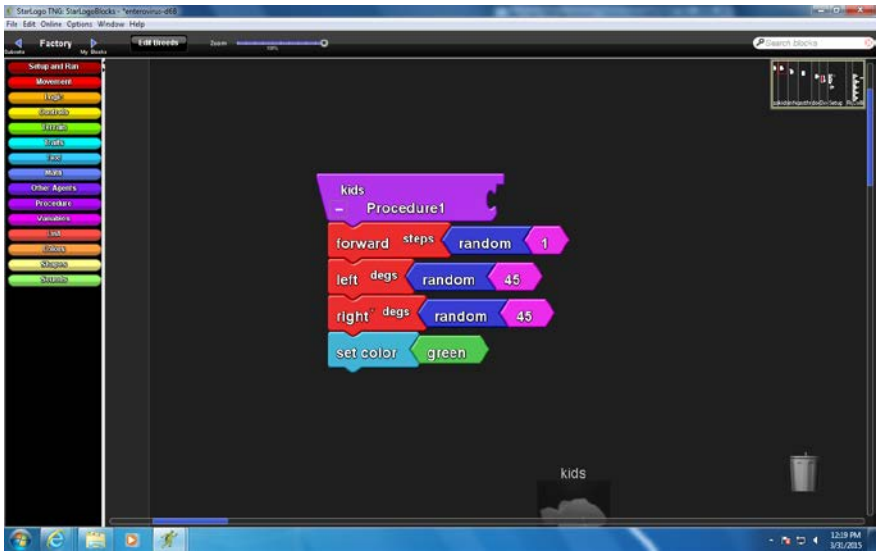
Doctors



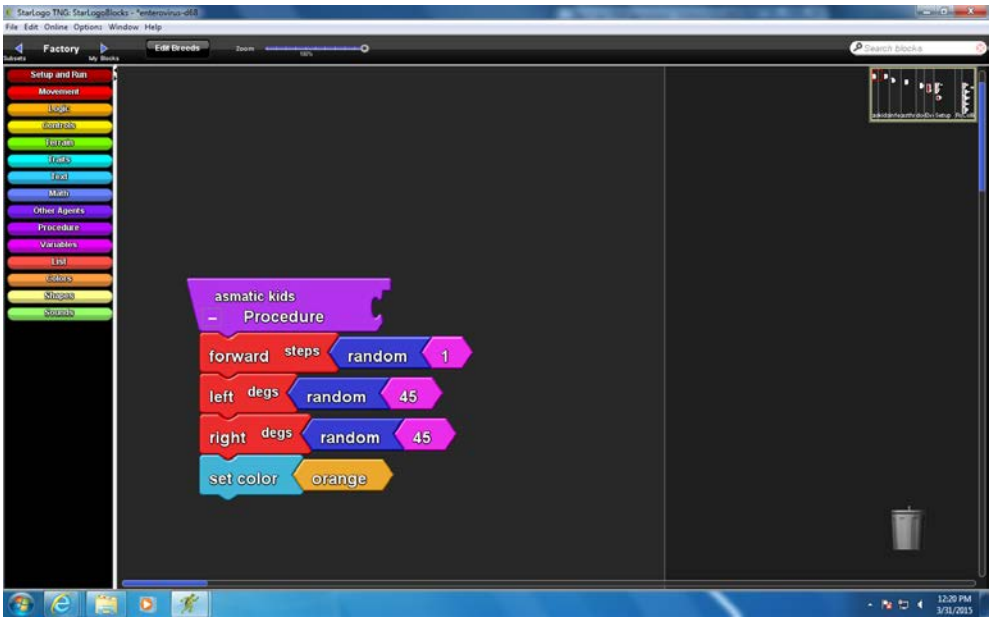
Asthmatic Infected



Asthmatic



Children



Infected.

Conclusions

The code showed that a person who is exposed to Enterovirus d68 is more likely to get infected than get saved by the doctors. To prevent the spread of disease in a third

world country, one doctor for every ten people would be needed. If an outbreak occurred, the number of asthmatics would increase by 15%.

The coding was pretty good and the experiment worked quite well. The code had a few mistakes and still worked out nicely despite the mistakes. If we did this project again we would do more fine tuning on the code. We think that we did well though, and we know that we worked hard.

Significant Achievement

We improved our code a lot from last year, this is because we spent much more time coding, and we had more experience. I started computer programing where I learned to code proficiently this year and worked to make the code more realistic.

Acknowledgment

We would like to thank our parents and teachers (Ms. Galligan, Mr. Evans, and Mr. Tennant) for the support which they have provided us over the weeks which we have spent working on this project. Many sandwiches were made and great friendships were formed over that time.

References

Bever, L. (2014, september 15). *Respiratory virus enterovirus d68 hits the northeast*. Retrieved from http://www.washingtonpost.com/

Goodman, B. (2014, october 24). *Enterovirus d68: what parents need to know*. Retrieved from http://www.webmd.com/

Enterovirus (non-polio enterovirus infection). (2014, november 5). Retrieved from http://www.medicinenet.com

Flores, A., & Brown, E. (2014, October 10). *California now has 32 reported cases of enterovirus d-68*. Retrieved from http://www.latimes.com

Enterovirus d68. (2014, November 6). Retrieved from http://www.cdc.gov