Measles Spread in a Vaccinated vs Unvaccinated Environment

New Mexico
Supercomputing Challenge
Final Report
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Gadsden Middle School

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Executive Summary

Measles is a virus that is spread through talking, coughing, and breathing. Even being near an infected person can make you sick with the measles. Measles virus is airborne, and the symptoms normally take 10-12 days to develop, but may take as many as 7 to 21 days. The symptoms of measles normally are a high fever, rashes, runny nose, pink watery eyes, coughing, diarrhea, and earache. To prevent measles, there is a vaccine called the MMR which prevents the Mumps, Measles, and Rubella. Some people do not believe in vaccination, so the measles is spreading more and more in the U.S.A. We usedStarlogonova to simulate what is happening in schools where people are spreading measles. Research shows that schools with not vaccinated kids at 5% not vaccinating will increase the chance of an outbreak by 4% in a community. According to David Sinclair, Ph. D., “At current vaccination rates, there’s a significant chance of an outbreak involving more than 400 people right now in some Texas cities.” Measles is so contagious, that 90% of the people who are not immune or vaccinated will get it. We will use our school population. Our question will be, if 5% of our school is not vaccinated, how will measles affect the school population?

The Starlogo model we used had different percentages of students that were not vaccinated to track the amount of students that could get infected if someone came into the school with the Measles.Problem Solution not vaccinated people can cause an outbreak of measles at a school and in the community. We will research at the elementary, middle, and high school level, what the student population is to see what would be the outbreak number of measles if 5% of parents and students refused to become vaccinated.

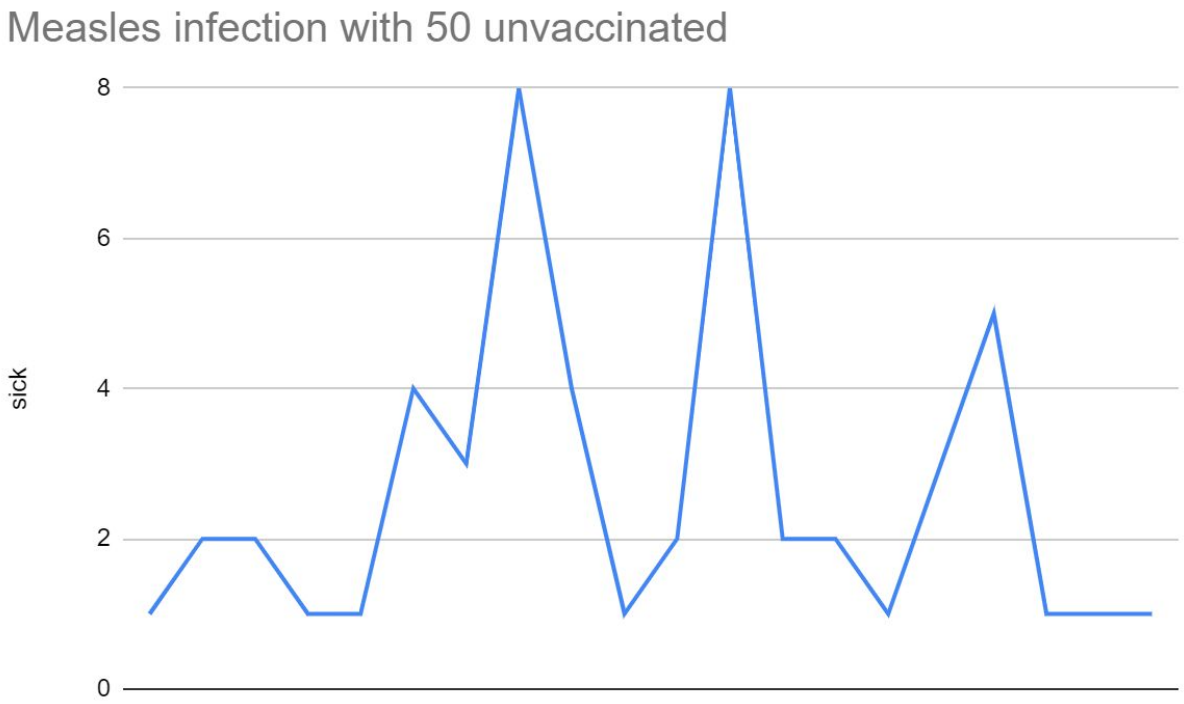
Problem

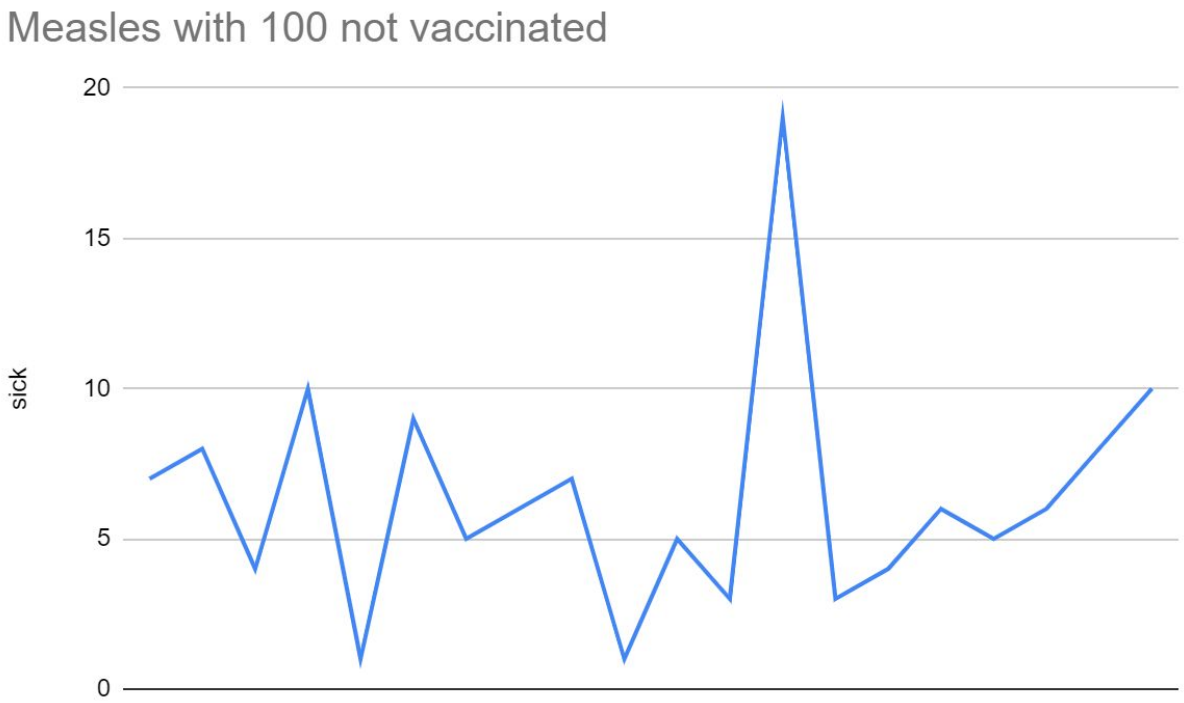
In our StarLogoNova model, the white agents are the vaccinated healthy population, the blue population are the not vaccinated population, and the red ones are the measles infected population. We started with 1 infected person not vaccinated. The vaccinated population were unable to be infected.

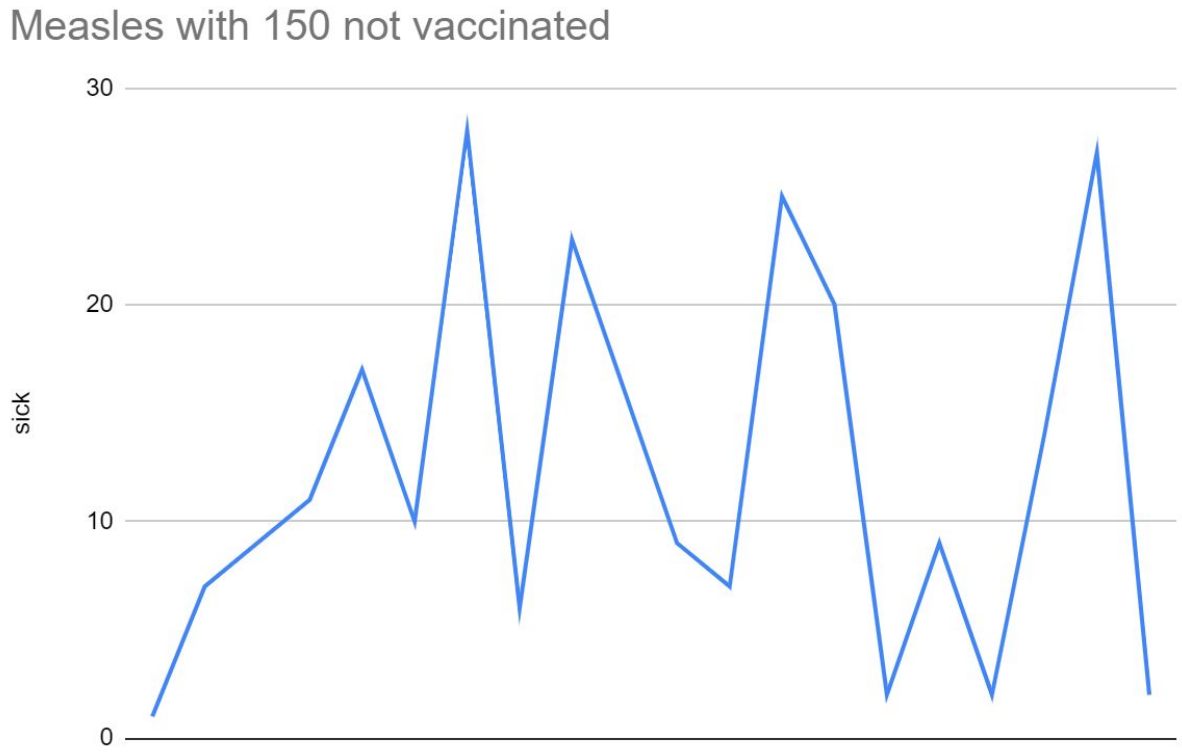
Description of Method

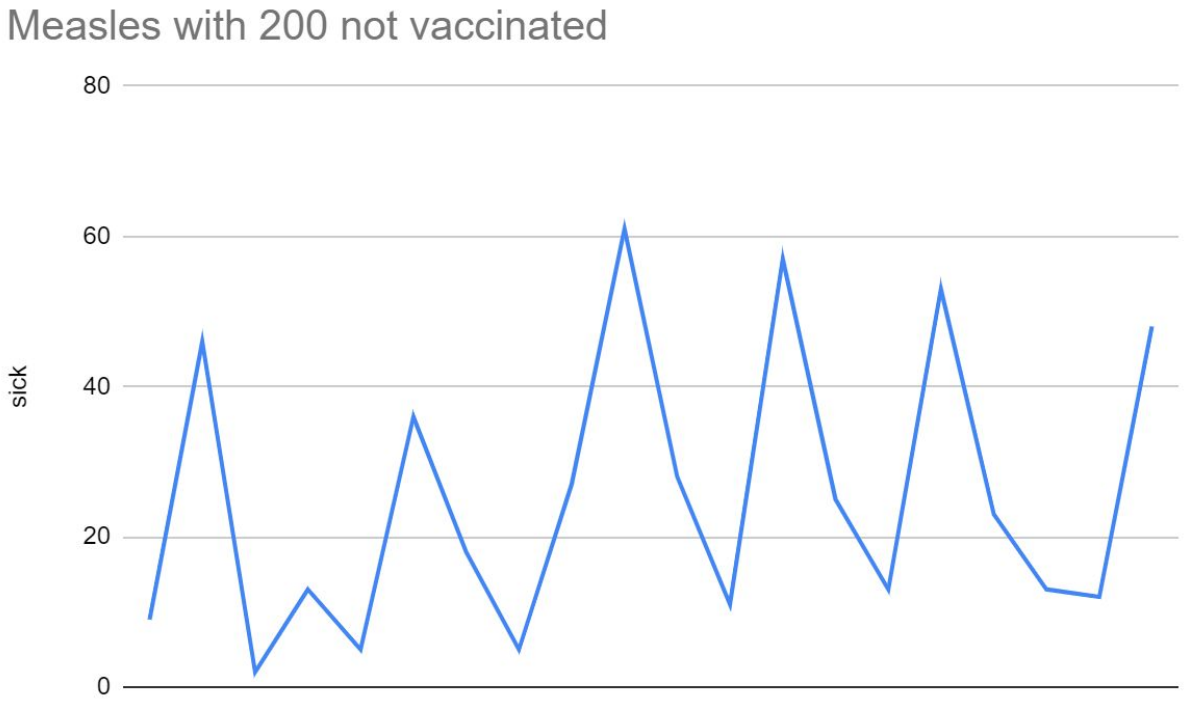
We used the healthy population of Gadsden Middle School. The only people who can get measles are the people who are not vaccinated. We made it so that 6% of the population is not vaccinated and there is 1 person infected with measles who brings the infection to the school. We will run and track the number of people that become infected based on the middle school. We will change the amount of people not vaccinated to 13% and track the same results. We will change the amount of people not vaccinated to 20% and track the same results. Lastly, we changed the percent to 26% and tracked the data. The problem the program checked is how an unvaccinated population can be affected by one person coming into the school with the measles virus.

The Starlogonova program was used to track the infection with one person bringing Measles to the Gadsden Middle School population. The first data was fifty people not vaccinated. The data was run twenty times and stopped at sixty tics. The second data was a hundred people not vaccinated. The data was run twenty times and stopped at sixty tics. The third data was a hundred fifty people not vaccinated. The data was run twenty times and stopped at sixty tics. The fourth data was two hundred people not vaccinated. The data was run twenty times and stopped at sixty tics.


Measles infection with 50 unvaccinated
sick
8
6
4
2
0


Measles with 100 not vaccinated
sick
20
15
10
5
0


Measles with 150 not vaccinated
30
20
10
0
sick


Measles with 200 not vaccinated
80
60
40
20
0
sick

Verified and Validated

The unvaccinated population that came in contact with the Measles infected person would become infected. Our research showed that one percent of the vaccinated population could still get the Measles if they came into contact with someone infected with it.

We found that “Research shows that schools with not vaccinated kids at 5% not vaccinating will increase the chance of an outbreak by 4% in a community. According to David Sinclair, Ph. D.,Measles is so contagious, that 90% of the people who are not immune or vaccinated will get it.” So we used a 90% chance of unvaccinated people getting infected with a collision with the infected person.

Results

With fifty people not vaccinated, up to eight people from the 750 total school population became infected from one person bringing the infection to the school. With a hundred people not vaccinated, up to about twenty people of the school population became infected. With one hundred fifty people not vaccinated, up to about 30 people of the school population become infected. With two hundred people not vaccinated, up to about sixty people of the school become infected.

Conclusion

This proves that unvaccinated people can spread a disease like the Measles. Of course, the more people not vaccinated the worse the spread the infection will be to a community. That some of the people who are vaccinated could still become infected because it's not a hundred percent effective. This model simulation can be use to show parents the importance of vaccination.

BIBLIOGRAPHY

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Achievements

Our project’s most significant achievements is that our model incorporates realistic data. We were able to show the chance of getting infected with the measles if someone isn't vaccinated with the data we got from our research. The project was able to get close to the accurate percent people would get infected over time with the measles.

Acknowledgments

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