Hep C in a Closed System

New Mexico
Supercomputing Challenge
Final Report
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Executive Summary

This project is based on a population of inmates at the Arizona State Complex in Tucson. Hepatitis C a virus is spread by contact with contaminated blood. Most people have no symptoms. Those who do develop symptoms may have fatigue, nausea, loss of appetite, and yellowing of the eyes and skin. There are more than 200,000 US cases per year. Hepatitis C is commonly spread by sharing drug needles or accidental needle stick injuries and getting a tattoo or body piercing in an unregulated setting. Hepatitis C cannot, however, be spread by sharing food, drinks, or eating utensils. It also cannot be spread by hugging, kissing, holding hands, coughing or sneezing.

We used StarLogo Nova to show how people with Hepatitis C react in a closed environment. We found out the number of inmates in the population. We ran four different scenarios of people using needles in a closed environment which would give us a probability of how many people would become infected with hepatitis C after using and sharing needles. We had the population at 840 people out of 2000 which are the ones in the closed system. We also had different transmission rates of 5 out of every 100 starting with hepatitis C and then 10, 15, and finally 20. Then the data that we collected would come out differently and show different outcomes.

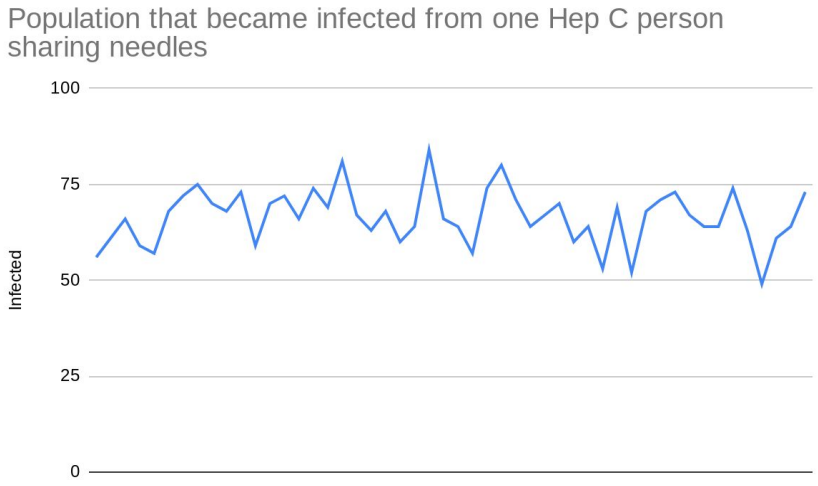
Problem Investigated

Hepatitis C spread more quickly in a drug-addicted population due to intravenous drug use when sharing needles. Fifteen percent of the prison population is Hep C infected according to Arizona Central News. Our question is how many people would be exposed if they use needles for prison tattoos or drugs in a prison, sharing needles. The outcome should be used to educate the prison and people housed thereof the chance of infection spreading of Hep C. The problem is that many people housed at a prison may not know what Hepatitis C is or that the

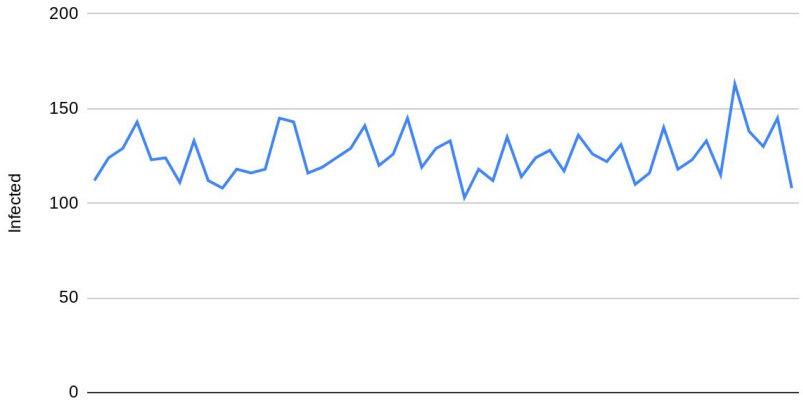
prison population has a high exposure to the disease if they share needles for drug use or tattoos.

Description of Method

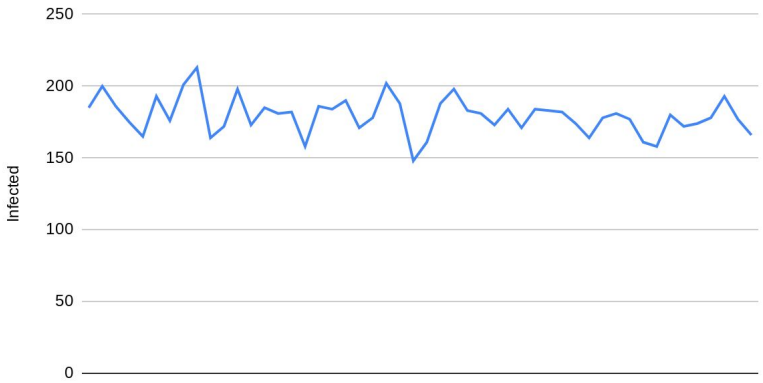
The program used was Starlogo Nova. The program simulation had four different scenarios to see how Hepatitis C would grow and affect the people inside, it tracked the numbers of people sharing needles for tattoos or drug use in a collision block. The data we collected was the number of infected and healthy after some of the population sharing needles for drug use or tattoos. We also realized that if we were to start running the data it would have no end until the Hepatitis C virus becomes a virus on all the inmates so we had stopped running the data at 20 tic's so it would be a reasonable place to see how the virus would infect the people and how many people would not have Hepatitis C.



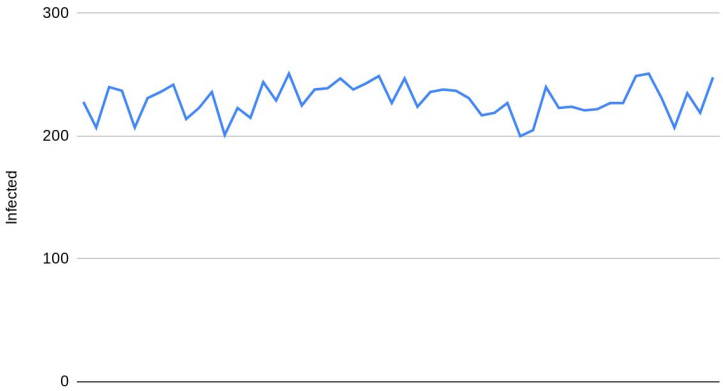
Population that became infected from two Hep C sharing needles



Population that became infected from three Hep C sharing needles



People that became infected from four Hep C sharing needles



Validated and Verified

There are more than 200,000 US cases per year. Hepatitis C is commonly spread by sharing drug needles or accidental needle stick injuries or being born to a mother who has hepatitis C. Fifteen percent of the prison population is Hep C infected according to Arizona Central News. It was researched that there were 840 people housed in the Arizona State Complex. The model was run to check that no more than 15% of the population at the facility was Hepatitis C infected. This wound up being with a 1% chance with a collision in the model simulation.

Results

With one infected person sharing needles in prison, 50 to 75 people can potentially become infected according to our data. With two infected people sharing needles in prison, 100 to 150 people can potentially become infected according to our data. With three infected people sharing needles in prison, 150 to 200 people can potentially become infected according to our data. With four infected people sharing needles in prison, 200 to 300 people can potentially become infected according to our data.

Conclusion

The area of the population that has the most Hepatitis C cases are intravenous drug users, which are most likely to be addicted to drugs. Much of this population winds up being in the prison system because they are unable to be committing crimes and using illegal drugs. While they are in prison, this simulation can predict how many of them that continue to use needles to do drugs or tattoos can become infected.

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Achievements

Our project's most significant achievement is that it showed how drug use and tattoos continue to spread Hep C. We learned how to use Excel to make spreadsheets. We hope to be able to teach inmates the risks of sharing needles.

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