

H.I.V. on Campus

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NEW MEXICO

SUPERCOMPUTING CHALLENGE

FINAL REPORT

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TEAM #57

LOVINGTON HIGH SCHOOL

TEAM MEMBERS

ASHLEY SPIVEY

KIMBERLY MADRID

TEACHER

MR. CRAWFORD

PROJECT MENTORS

MR. CHRISTOPHER HOPE

MR. NICK BENNET

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Executive Summary

Our project is about the spread of HIV on a high school campus throughout one school year. HIV stands for human immunodeficiency virus. What it does is kills your body's CD4 cells, which are also known as the t-helper cells, by doing this it keeps the body from fighting off infection and disease. We have decided to use Star Logo to help us get the results that we are looking for. Most of the data that we have put into Star Logo was from the Center of Disease Control. The information that we have received from them has been really helpful in figuring out our problem. In real life we cannot find a cure for HIV for it is incurable but by figuring out how fast it can spread we can use that to try and prevent it from spreading.

Problem

The Problem Our project is about the spread of HIV on a high school campus throughout one school year. We have decided to use Star Logo to help us get the results that we are looking for. Most of the data that we have put into Star Logo was from the Center of Disease Control. HIV (human immunodeficiency virus) is a growing disease and the virus that causes AIDS. This virus may be passed from one person to another when infected blood, semen, or vaginal secretions come in contact with an uninfected person's broken skin or mucous membranes. In addition, infected pregnant women can pass HIV to their baby during pregnancy or delivery, as well as through breast-feeding. People with HIV have what is called HIV infection. Some of these people will develop AIDS as a result of their HIV infection. (Center of Disease Control) This disease is not curable but there are three methods that can try to control it. The three methods are Immune system support, preventing and controlling opportunistic infections, and slowing down the growth of HIV in the body.

The immune system is a system within all vertebrates (animals with a backbone) which in general terms, is comprised of two important cell types: the B-cell and the T-cell. The B-cell is responsible for the production of antibodies (proteins which can bind to specific molecular shapes), and the T-cell (two types) is responsible either for helping the B-cell to make antibodies, or for the killing of damaged or "different" cells (all foreign cells except bacteria) within the body. The two main types of T-cells are the "helper" T-cell and the cytotoxic T-cell. HIV *specifically* infects the very cells necessary to activate both B-cell *and* cytotoxic T-cell immune responses. Without helper T-cells, the body cannot make antibodies properly, nor can infected cells containing HIV (an intracellular pathogen) be properly eliminated. . Immunizations are

usually recommended to prevent influenza, certain types of pneumonia, and some types of hepatitis. Anti-HIV medicines, which slow down viral growth in the body, also help preserve immune system function. (<http://people.ku.edu/~jbrown/hiv.html>) Preventing and controlling opportunistic infections may be accomplished by trying to avoid exposure to infection; for example, through eating safely and avoiding close contact to people with fevers or other signs of infection. Slowing down the growth of HIV in the body is done by using anti-HIV medicines. This treatment is usually started after the infection has affected the immune system to the point that that the person is beginning to risk serious illness. Many studies have shown that effective anti-HIV drugs reduce HIV-related illness and prolong life.

There is nothing that can cure this disease but there is three methods that can control the disease which are support the immune system, preventing and controlling opportunistic infections, and slowing down the growth of HIV in the body. As we plug in numbers to try to get a rate of how the disease is growing.

Method

In our project we are not able to actually solve the problem but we can try to prevent it. Our method to try and figure out how we can prevent it is to gather data and information from the CDC. After doing this we put a code into Star Logo. Then we put the numbers from the information we found from the CDC into Star Logo. As we watched Star Logo run we wrote down the numbers that showed up on the program. To know which turtles were infected and which turtles were ok we assigned a color to each one. The non-infected turtles are brown, the exposed turtles are green, and the infected are red. After doing so we could figure a steady rate of exposure and infection.

Results

Infection Rate	Exposed Rate	Time	Green turtles	Red Turtles
3	60	369	16	10
9	60	368	108	97
4	45	369	1	1
3	70	398	2	1
6	70	374	97	55
4	20	366	0	2

As we changed the Infection Rate and the Exposed Rate the amount of turtles that were infected and those that we exposed changed along with it. The first set of infection rate and the exposed rate numbers are the numbers from the CDC. The other statistics are from other reliable website that we have located in our research. By maintaining a steady time period we were able to get accurate data. As we altered the rates we realized that the lower the infection rate the less turtles we had that were exposed or infected. When the exposed rate was lowered it didn't change the results as much as the infection rate did.

Conclusion

By the end of this project we can conclude that HIV is an incurable disease but there is a way of preventing the spread of it. After doing all the calculations we can conclude that if we did more test through out the schools to look for students that have this disease. We can take them out of the schools and put them in the hospitals for treatment. If we cannot find a way to decrease the rates this problem will just get worse as the years go by. If we can decrease the amount of students getting exposed to it then we can decrease the amount of students that are getting infected and can pass it on to other students. Once again there is no cure for HIV but we can try and prevent the numbers from increasing.

Software

As we use Star logo to find out how HIV can spread within a school year. We use different rates of infection and exposure. We used Star logo to infected one of the turtles and for other turtles to be exposed. We used information from different websites and plugged different numbers in. We program the software to have three colors which showed what the turtles were either infected exposed. The infected turtles are red and the exposed green.

Our Achievements

Throughout this project we have achieved many things. By doing all the research we have learnt much about HIV and what it does to the body. Now that we have finished the project we know that with the spread of the disease being so low we can try and prevent it now instead of it increasing and getting worse. Now that we know that this happens in our school daily we can say that it's a tragic ordeal that needs to be fixed.

Acknowledgments

We would like to thank all the people that have made this possible for us. First we want to thank Mr. Crawford for giving us this opportunity. Second our principle Mr. Brown for allowing us to go on the trips and to the meetings. Somebody else we would like to thank is our mentors Mr. Christopher Hope and Mr. Nick Bennet. Last but not least we would like to thank our school board for giving us the money to make the trips.

Resources

- <http://www.cdc.gov/HealthyYouth/sexualbehaviors/guidelines/guidelines/htm>
- <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5531a4.htm>
- <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/2004report/map2.htm>
- <http://www.thebody.com>
- <http://www.aidsinfo.nih.gov>