

Children in the Dynamic of the HIV/AIDS Spread

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We propose the research that will be part of the degree work that will be presented as a conclusion work to obtain the degree in bachelor in mathematics of Juan Pacazuca, with the objective of obtaining suggestions, comments and constructive criticism that will lead to a better realization of this work. This research focuses on modeling the dynamics of infection by the Human Immunodeficiency Virus and subsequent Acquired Immunodeficiency Syndrome considering children who become adults and participate in sexual infection and needle sharing in injecting drug users under treatment with antiretroviral drugs. Principal references in the construction of this mathematical model were [1, 2].

Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) have been one of the most significant public health challenges in recent decades, affecting millions of people worldwide and causing a large number of deaths. Since its identification in the 1980s, HIV has infected more than 70 million people worldwide, and more than 35 million have died from AIDS-related illnesses. The article [3] shows that elements such as vertical (mother-to-child) transmission and needle-sharing transmission are particularly important in the context of HIV.

After a review in Google Scholar of models that consider vertical transmission or transmission by sharing needles in the period 1980-1990, it can be found that one of the first is the one proposed in [4], in this work several models are developed, and in a section it is discussed about the non-sexual routes of transmission, it was found that vertical transmission and by injecting drugs can be an important factor (depending on the population) in the spread of the HIV epidemic. According to a review [2], in a representative sample of 101 mathematical models, only 13 consider vertical transmission and 3 injecting drug transmission. All of the above reveals the importance of proposing a mathematical model that considers vertical transmission and needle sharing, where the dynamics of contagion can be explored, and conclusions can be obtained that are useful for larger studies or for making decisions on health policies.

In this mathematical epidemiological model, two age groups; adults and children are studied. Adults are individuals older than 13 years of age, who have sexual relation and could be use injectable drug users (IDU) that share needles. Children are considered under 13 years old and can be infected only by vertical transmission (MTCT); when they become adults, they could participate in the dynamic of infection. Therefore we propose an equation differential system to model the dynamic of the HIV/AIDS Spread in human population, also considering sexual transmission in adults under antirretroviral therapy. Mathematical analysis such as positiveness, boundedness, stationary points, local stability and the basic reproduction number are studied.

The following numeric simulation was obtained by Runge Kutta fourth order method. In this model ten populations were considered, they are: Susceptible children, Untreated Infected children, Treated children, Children living with AIDS, Susceptible Women, Untreated Infected adult women, Susceptible adult men, Untreated Infected adult men, Treated adult people and Adult people living with AIDS. More details about the model such as parameters, variables, equations and another simulations will be presented on the possible accepted talk at the event.

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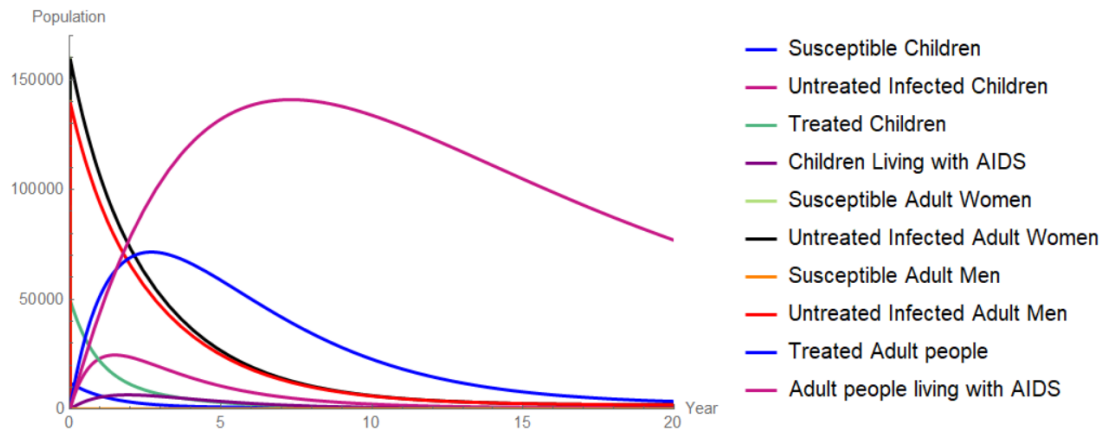


Figure 1: A simulation of the model. Source: Own elaboration.

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References

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