Spread of Epidemics SIR Model

 In our current conditions today, we are in a time of a pandemic. With each body passing on the virus/disease to the next, infecting people at increasing rates, usually exponentially because as more people get infected, more people are vulnerable to being infected because there is a lot more people that are already infected. The weather and location affect how the virus/disease spreads. Take for example a population of 500 people, one person can infect another person, and then those two can infect two more people, and so on and so forth. Though it will not always be like this as one person can infect more than one person which speeds up the progress.

 The equation that we use to figure out how many people can and are going to be infected is as followed:



S(0) is the initial number of susceptible subjects

R(0) is the initial number of removed subjects

N is the constancy of population

R0 is basic reproduction number

S(t) is the number of susceptible individuals as a function of time

R(t) is the number of removed individuals as a function of time

 On the site, [https://en.wikipedia.org/wiki/File:SIR\_model\_simulated\_using\_python.gif](https://en.wikipedia.org/wiki/File%3ASIR_model_simulated_using_python.gif), there is a model of how an epidemic can spread. You can see that as less people are infected, the rate of infection increases, and as most of the population is infected, the rate of infection decreases.

The equation represents the total number of people that can be infected at a certain time. The exponent of e, the mathematical constant, as it increases, the number of people being infected also increases. It also increases and decreases at a proportional rate, as it increases, the number of people that can be infected decreases, lowering the rate of infection as there is not as many people that can be infected. With this, we can even use this information to help us get a grasp on how many people we are expecting to be infected and have the ability to try to make that number stable and contain the spread. With Coronavirus for example, we can use the differential equation to see how many vaccines we need to slow down and end the spread of the virus as it tells us how many people are going to be infected at a certain time. As of right now, we are in the middle of a pandemic, but more towards the end of it. Vaccines are being produced bit by bit, and hopefully everyone can get one to help slow and maybe end the pandemic. If you want to try to simulate this, you can play Plague Inc. on your phones as it simulates how a epidemic spreads and turn into a pandemic. There are many variables in a spread of a virus/disease, but this is the basic equation.

Citations

“Compartmental Models in Epidemiology.” *Wikipedia*, Wikimedia Foundation, 13 Dec. 2020, en.wikipedia.org/wiki/Compartmental\_models\_in\_epidemiology.