Epidemiology Project Proposal
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Background: With the current global scare of 2019-nCov, we decided to create a simulation of our own using transportation data from the DC Metro area. Many people are taking precautions around the world in order to avoid contracting the virus. China's government has even proposed travel bans in certain areas of the country in order to try and confine the virus as much as possible. However, the virus was able to escape Wuhan and travel elsewhere. Although 2019-nCoV is found primarily in China, the virus has spread to many countries including the United States. Scientists are working hard to find a vaccine to treat the coronavirus, but have yet to succeed. Through our project, we are hoping to find out if restricting travel is a viable option to eradicate the virus, or if putting forward money now to find a viable vaccine would better solve the issue at hand.

Problem Statement: In a densely populated area, like the District of Columbia, would restricting transportation around the city be as effective as vaccinating a part of the population to reduce the rate of infection? To restrict the population from moving around the city, Metro stations can reduce the amount of people per day, restrict travel in the evening hours, close down highly populated stations around malls, museums, etc. City officials can also close physical places like schools, churches, etc. to reduce travel demand, or close off blocks in which infection is at a high rate. Would these be effective solutions for eradicating, or at least slowing down the spread of the virus?

Methods: In order to answer our problem statement, our goal is to create a simulation to better understand how both vaccination and transportation restriction methods would affect our model. The mode of transition of the virus will be simulated using travel data from *2015 DC Metro Train System.* The DC area can be subdivided by blocks (see figure right), where we will consider only blocks which contain a metro station (Metro Train Stations and Routes). At the start of any timestep *t*, persons may travel to another area by train, make contact with individuals in the destination block, and then will return to the block in which they reside at the end of *t*. Also, individuals can leave their block either by train or through walking or driving to adjacent blocks; otherwise, they are contained within their block for the entire period t. Because of this, the population within a block will never change throughout the course of the simulation. Death is not a factor in this model. We will be testing different scenarios in which we use reduced transportation and vaccination strategies to answer our problem statement. We are planning on using information from *The Lancet Paper* to get numbers for R_0, β, and γ. We understand that the numbers they calculated were location-based, but they should translate fine to our model. Note that, as long as our numbers for R_0, β, and γ are relatively close to their actual values, we still should be able to answer our proposed problem statement.