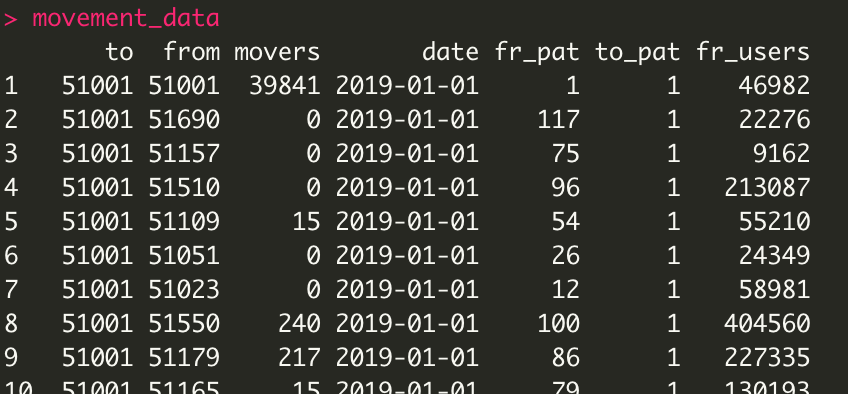
**Introduction to Spatial Models 2**

Today, we will be working with real data! The data for this assignment originate from a study in Virginia, in the USA, where we used cell phone data to quantify mobility of people between counties across the state. You will be mostly familiarizing yourself with this model, and then performing a change to see how it impacts the spread of disease.

The mobility patterns in this worksheet are from SafeGraph, from early 2020 (and so reflect some of the COVID-19 pandemic). Here, you can use the code to simulate the spread of a respiratory disease, and play around with the parameters.

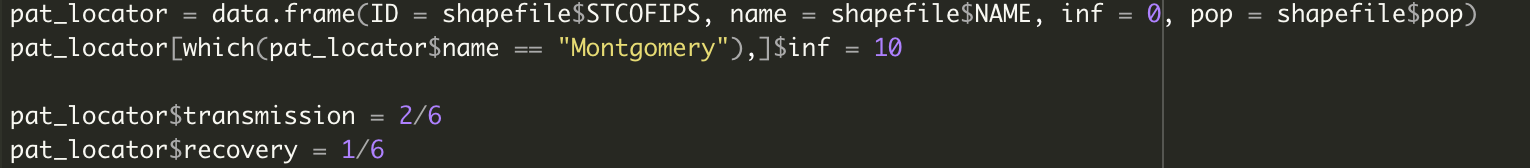
For today’s exercise, please look through the code and get a simulation to run, and look at the spread of disease after 50 days of simulation.

Roughly, this code first reads in a shapefile for Virginia that includes county boundaries and populations, and then a mobility data file similar to the one we worked with before:



Here, 39841 out of 46982 people in the county with ID 51001 stayed home (first row). Zero people moved from 51690 to 51001, out of 22276 people in county 51690.

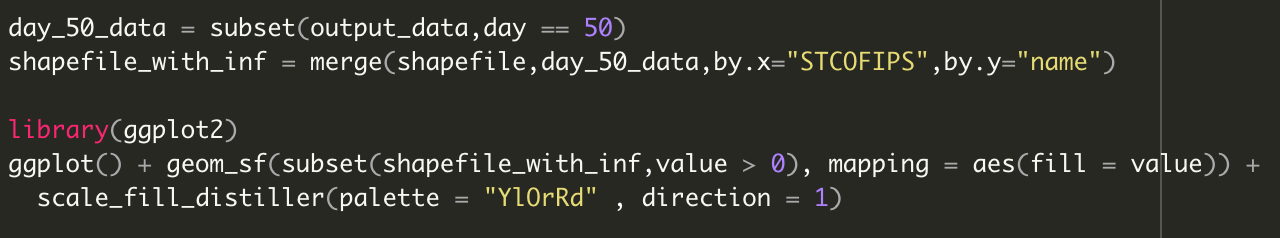
We then use this to create a data.frame that keeps track of our patches, the population size in each, IDs, the number of people initially infected, and the transmission/recovery rates. Later, you will modify this.



Here, we set the initial infected population to 0 everywhere except in Montgomery county, where we have 10 infected people.

Then, we initialize the population just as with the theoretical model, and run the model. As before, this creates two plots: An epidemic curve for each patch, then an overall epidemic curve for the entire state.

We also have some lines of code that subset the results from the 50th day of simulation, binds them to the shapefile, and then plots the shapefile:



**TASK 1:** Run the model through this line and paste the figure below:

**TASK 2:** Then, try to implement an intervention out of one of the following.

* Restricting movement
* Reducing transmission
* Increasing recovery

How would you cause this change? (ie. would you change the movement\_data file, or would you adjust transmission rates, or recovery rates?)

Implement the change in the model, then plot the outbreak again. How did it change? Paste the new figures below: