SVI Toolkit - Exercise 1
Create SVI Maps for Your State and County

Learning Objectives:

1. Quick orientation to RStudio
2. Learn how to access the Social Vulnerability Index (SVI) data
3. Create SVI map for region of interest

Part 1: Getting Started in R

Create a designated folder for your data files.

Download your files. Download exercises 1-3 and the "**`SVI_2024_analytic.RDS`**" file. Save these 4 files in a folder on your computer's desktop named "**SVI Project**". Be sure that this folder is located on your local computer's drive and not on any type of cloud service to avoid issues with loading your data and saving your files. This is the folder you will set as your working directory for each of these exercises.

Set up your working directory.

Your working directory is the default location where R will look for files (e.g., your analytic data file) that you may want to use and where it will put all the files you save.

You can copy and paste the file path from your finder or explorer windows where you can access your files.

TIPS:

1. Make sure that all slash symbols are converted to the "/" direction if you copy and paste your file path from your computer. This is especially salient for PC users.
2. Keep your file path simple. Start with using your "desktop" folder or another that is easy to find instead of a folder buried very deep in many other folders
3. Make sure you include your path in quotes!
4. Use the hashtag **"#"** symbol to make comments and notes in your code. Similar to taking notes, use this syntax to make your code clear and easy to follow (e.g., describing the code being run)

```
Here is an example of how your code may look. NOTE: you must make sure all of
the "\" symbols are converted to "/" if you copy and paste your file path fro
m your computer. This is especially important for PC users.

Problem: Uh oh! This one won't run! Check direction of slashes
  setwd("C:\Users\janedoe\Desktop\SVI Project")

Solution:
  setwd("C:/Users/janedoe/Desktop/SVI Project")

Now you try!
 setwd("Your file path here")
```

Install R Packages for Today's Exercise

R Packages are containers for collections of R code that have a specific purpose or use. There are lots of R packages out there and the ones you use will depend on what you are working on in R.

TIPS:

1. You only need to install packages once after downloading R and RStudio, but you do need to load them each time you use RStudio with the **"library()"** function. Remove the #s if you need to install, otherwise run the code below.
2. When you update R and RStudio on your computer, you *will* need to install your packages again.
3. Type **>?nameofthepackage** in the console to see a description and key info about the functions of the packages.

Today, we will need the following packages:

```
Use the code below to install each of the packages you need for this exercise
You only need to perform this task once after installing or updating R and
RStudio.

#install.packages("tidyverse")
#install.packages("tidycensus")
#install.packages("tigris")
#install.packages("sf")
#install.packages("tmap")
#install.packages("tmaptools")
#install.packages("RColorBrewer")
#install.packages("spdep")
#install.packages("rgeos")
#install.packages("spgwr")
#install.packages("gridExtra")
#install.packages("rio")
#install.packages("knitr")
#install.packages("webshot")
#install.packages("webshot2")
```

```
Use the code below to load each of the packages you need for this exercise. Y
ou need to perform this task each time you use R and RStudio.


library(tidyverse)
library(tidycensus)
library(sf)
library(tigris)
library(tmap)
library(tmaptools)
library(RColorBrewer)
library(spdep)
library(spgwr)
library(gridExtra)
library(rio)
library(webshot)
library(webshot2)
library(rmarkdown)
```

Part 2: Examining the SVI Data

Before getting started with an analysis, you will need to bring your file named "SVI_2024_analytic_file.RDS" from your computer where your R working directory is routed, into the RStudio environment with the **readRDS** function. This function also renames the file "data" and reconfigures it into an R dataframe that will be stored in your R environment. Make sure that you have your working directory set as described above and that your analytic file is within that folder on your computer. Once you have loaded your data into your R environment, use the **head** function to familiarize yourself with the data.

```
data <- readRDS(file = "SVI_2024_analytic_file.RDS")

#Check the columns included in your dataset with the head function.

#Here is another way to load in your data with the "here" function in the
"rio" package. This code can be helpful if you are having trouble changing
the location of your working directory. NOTE: If you use the readRDS function
successfully, you do NOT need to also run the rio::import function below and
vice versa.

#data <- rio::import(here::here("SVI_2024_analytic_file.RDS"))

Check the columns included in your dataset with the head function. Checking
your column headers with the head function allows you to see the variables
in your dataset. Notice this dataset include FIPS codes, state, state
abbreviation, county, crude depression prevalence from CDC PLACES 2021,
overall SVI percentile rankings, and SVI theme percentile rankings.
The "data" object that you created includes information for all census tracts
within the United States.

head(data)
```

Part 3: Create your first SVI maps with the `tmap` package

The following exercises will show you how to work with spatial data from the SVI.

You can complete this exercise using the dataset for the entire United States (U.S.), OR you can create a data subset with just the state and/or county you are interested in. Use the code below to learn how subset by a variable of choice. For this exercise, we will be using the STATE variable.

Subset your data to your state and county of choice.

```
#You can type in your state of interest in the quotation marks of the code.
Make sure that you write the full name of the state and spell it correctly.
Use the head function to check that the function was run correctly.

my_state <- data[data$STATE=="Georgia",]
head(my_state)

Here is a snippet of what you will see once you've run the head function.
Check to confirm that your state of choice is shown in the "my_state" dataset
that you have created with the code above.

## Simple feature collection with 6 features and 11 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: -82.45868 ymin: 31.46925 xmax: -82.04858 ymax: 31.966
18
## Geodetic CRS:  NAD83
##               FIPS   STATE ST_ABBR  COUNTY
## 21224 13001950100 Georgia      GA Appling

# Now, subset your specific county of interest from the my_state dataset that
we have created.
my_county <- my_state[my_state$COUNTY=="Fulton",]
head(my_county)

Here is what you will see once you've run the head function. Confirm that.
your county of choice is listed.

## Simple feature collection with 6 features and 11 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: -84.40086 ymin: 33.77975 xmax: -84.34806 ymax: 33.813
13
## Geodetic CRS:  NAD83
##               FIPS   STATE ST_ABBR COUNTY
## 22474 13121000100 Georgia      GA Fulton
```

Create your maps.

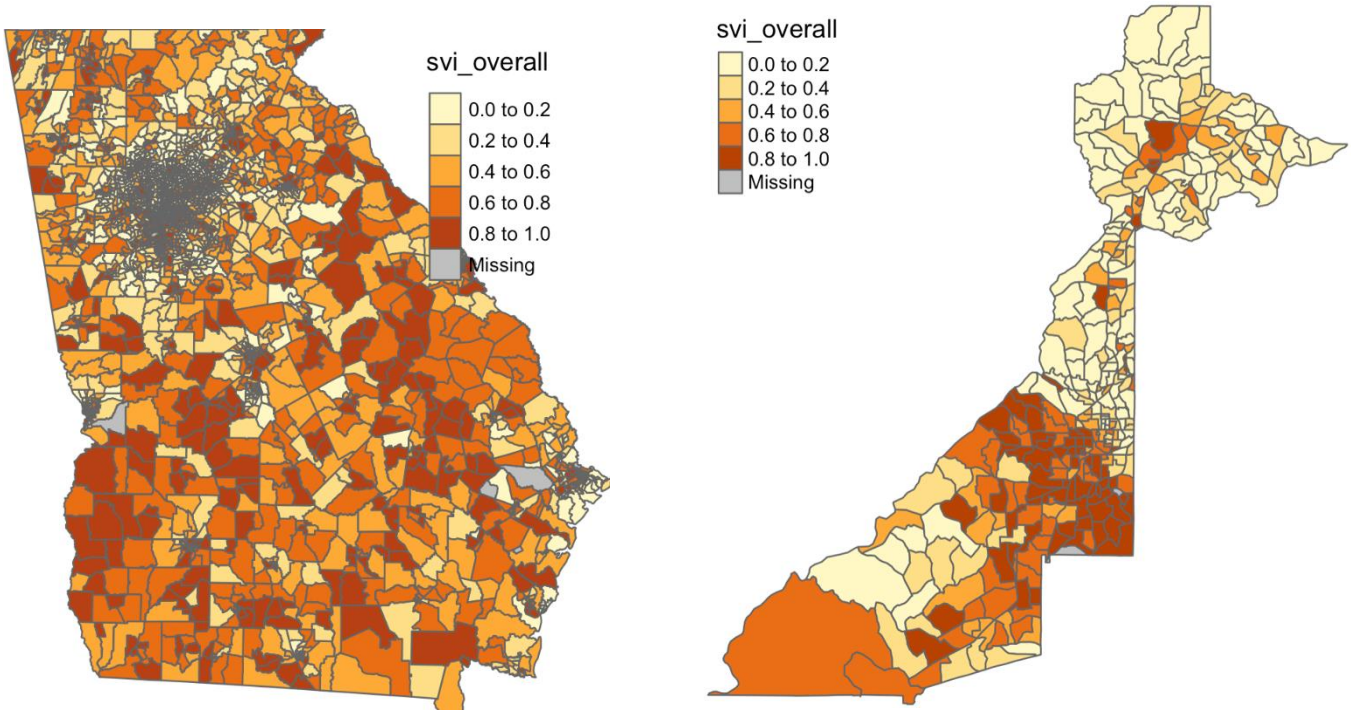
Now that you have created a single state and a single county dataset, we will use the code below to visualize the data on a map. We will start by creating a thematic map of the overall SVI scores for census tracts in your state and county of choice. In the code, you can also replace the "**svi_overall**" variable with one of the SVI theme variables by simply typing in the name of the theme variable (e.g., "**svi_theme1**" or "**svi_theme2**").

```
#SVI Overall Map
state_svi_overall_map <- qtm(my_state, fill = "svi_overall")
county_svi_overall_map <- qtm(my_county, fill = "svi_overall")

#SVI Theme 1 - Socioeconomic Status Map
#Characteristics: Below 150% poverty, unemployed, housing cost burden,
no high school diploma, no health insurance)
state_svi_theme1_map <- qtm(my_state, fill = "svi_theme1")
county_svi_theme1_map <- qtm(my_county, fill = "svi_theme1")

#SVI Theme 2 - Household Characteristics Map
#Characteristics: aged 65 or older, aged 17 or younger, civilian with a
disability, single-parent households, English language proficiency)
state_svi_theme2_map <- qtm(my_state, fill = "svi_theme2")
county_svi_theme2_map <- qtm(my_county, fill = "svi_theme2")

#SVI Theme 3 - Racial & Minority Status Map
#Characteristics:(Hispanic or Latino (of any race); Black and African
American, Not Hispanic or Latino; American Indian and Alaska Native, Not
Hispanic or Latino; Asian, Not Hispanic or Latino; Native Hawaiian and Other
Pacific Islander, Not Hispanic or Latino; Two or More Races, Not Hispanic or
Latino; Other Races, Not Hispanic or Latino)
state_svi_theme3_map <- qtm(my_state, fill = "svi_theme3")
county_svi_theme3_map <- qtm(my_county, fill = "svi_theme3")

#SVI Theme 4 - Housing Type & Transportation
#Characteristics:(multi-unit structures, mobile homes, crowding, no vehicle,
group quarters)
state_svi_theme4_map <- qtm(my_state, fill = "svi_theme4")
county_svi_theme4_map <- qtm(my_county, fill = "svi_theme4")

#Print Your Maps (Note: you can add a # sign in front of a line of code if yo
u do not want to print certain map)
tmap_options(check.and.fix = TRUE)

#Code for Printing State Maps
state_svi_overall_map
state_svi_theme1_map
state_svi_theme2_map
state_svi_theme3_map
state_svi_theme4_map
```

```
#Code for Printing County Maps

county_svi_overall_map
county_svi_theme1_map
county_svi_theme2_map
county_svi_theme3_map
county_svi_theme4_map
```

(note: your maps may render slightly differently depending on system settings)

Example of State and County Maps for the Overall SVI:

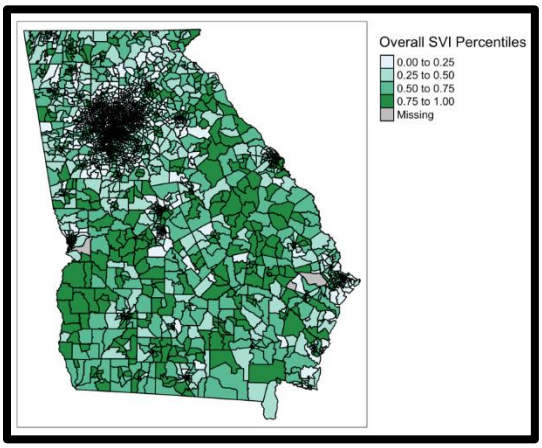


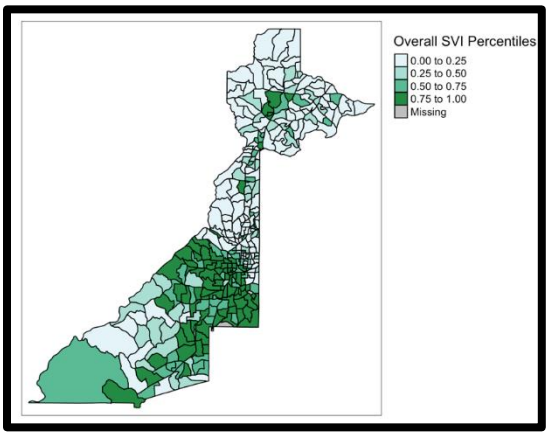
Stylize and format your maps to distinguish each SVI theme.

You may notice that it is difficult to tell your maps apart before adding titles, bolder borders around census tracts, and colors that correspond to themes. The next portion of this exercise will help us to format the size and shape of the maps and keys, to stylize the maps with colors that correspond to the official SVI themes (e.g., **"BuGn"**) for the Overall SVI), and to add titles for the maps and keys, respectively.

```
#Install and load the "RColorBrewer" package for coloring your map.
#install.packages("RColorBrewer")

library(RColorBrewer)

############################## Overall SVI Map ###################################
#County
    county_svi_overall_map <- tm_shape(my_county, bbox = bbox_new) +
      tm_polygons(col = "svi_overall", title = "Overall SVI Percentile",
breaks =  c(0,0.25,0.50,0.75,1.0), pal = "BuGn", border.col = "black") +
      tm_layout(legend.outside = T,
                title = "[County Name] Overall SVI Percentile Rankings by
Census Tract 2020",
                title.position = c('center', 'bottom')
#State
      state_svi_overall_map <- tm_shape(my_state, bbox = bbox_new_state) +
      tm_polygons(col = "svi_overall", title = "Overall SVI Score",breaks =
c(0,0.25,0.50,0.75,1.0), pal = "BuGn", border.col = "black") +
        tm_layout(legend.outside = T,
                title = "[State Name] Overall SVI Percentile Rankings by
Census Tract 2020",
                title.position = c('center', 'bottom'),
                main.title.position = "center")
#Print
county_svi_overall_map
state_svi_overall_map
```

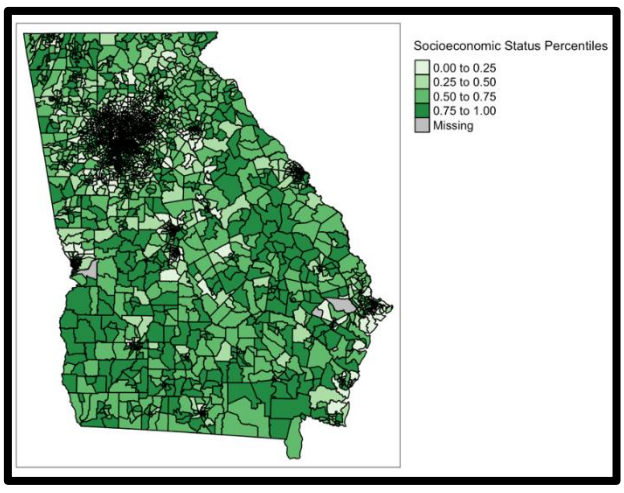
Example of Stylized State and County Maps for the Overall SVI:

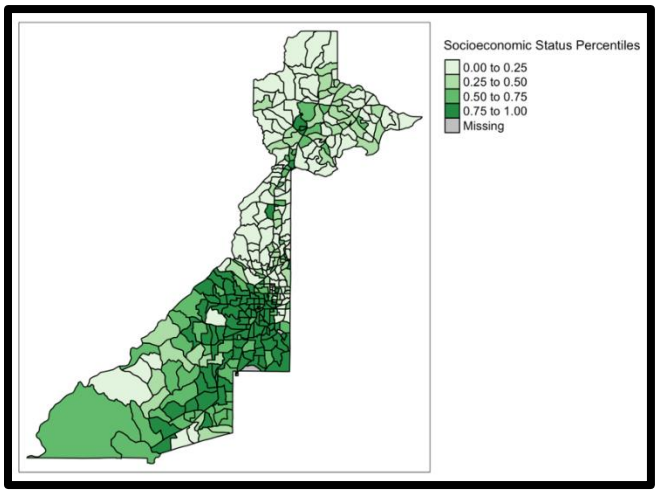




```
################################## SVI Theme 1 ##################################
#County
    county_svi_theme1_map <- tm_shape(my_county, bbox = bbox_new) +
      tm_polygons(col = "svi_theme1", title = "Socioeconomic Status
Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Greens", border.col =
"black") +
      tm_layout(legend.outside = T,
                title = "[County Name] Socioeconomic Status SVI Rankings by
Census Tract 2020",
                title.position = c('center', 'bottom')

#State
    state_svi_theme1_map <- tm_shape(my_state, bbox = bbox_new_state) +
      tm_polygons(col = "svi_theme1", title = "Socioeconomic Status
Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Greens", border.col =
"black") +
      tm_layout(legend.outside = T,
                title = "[State Name] Socioeconomic Status SVI Rankings by
Census Tract 2020",
                title.position = c('center', 'bottom'),
                main.title.position = "center")
#Print
county_svi_theme1_map
state_svi_theme1_map
```

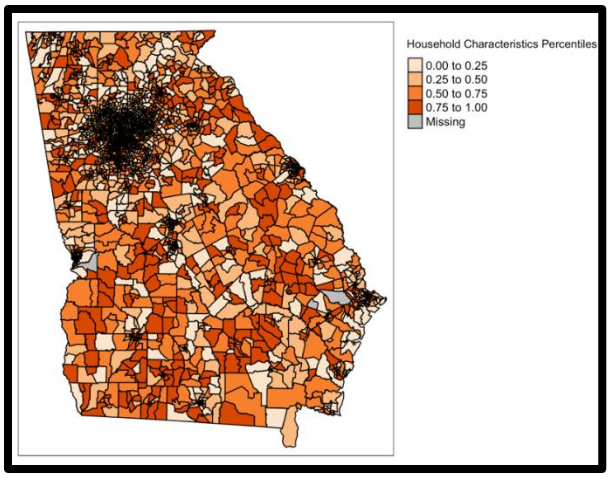
Example of Stylized State and County Maps for SVI Theme 1:

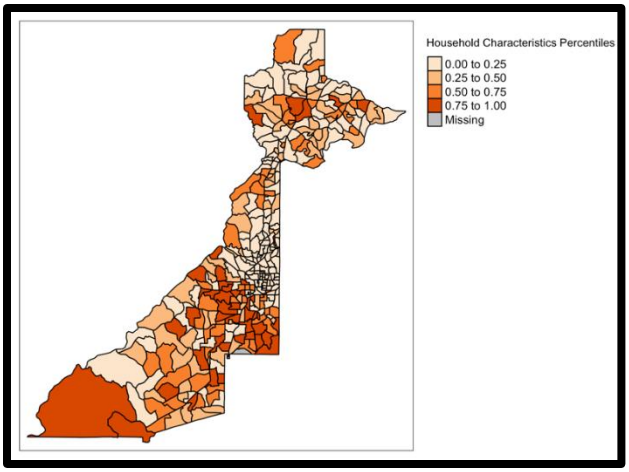




```
################################## SVI Theme 2 ##################################
#County
    county_svi_theme2_map <- tm_shape(my_county, bbox = bbox_new) +
      tm_polygons(col = "svi_theme2", title = "Household Characteristics
Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Oranges", border.col
=  "black") +
      tm_layout(legend.outside = T,
                title = "[County Name] Household Characteristics Percentiles
Rankings by Census Tract 2020",
                title.position = c('center', 'bottom')

#State
    state_svi_theme2_map <- tm_shape(my_state, bbox = bbox_new_state) +
      tm_polygons(col = "svi_theme2", title = "Household Characteristics
Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Oranges", border.col
=  "black") +
      tm_layout(legend.outside = T,
                title = "[State Name] Household Characteristics Percentile
Rankings by Census Tract 2020",
                title.position = c('center', 'bottom'),
                main.title.position = "center")
#Print
county_svi_theme2_map
state_svi_theme2_map
```

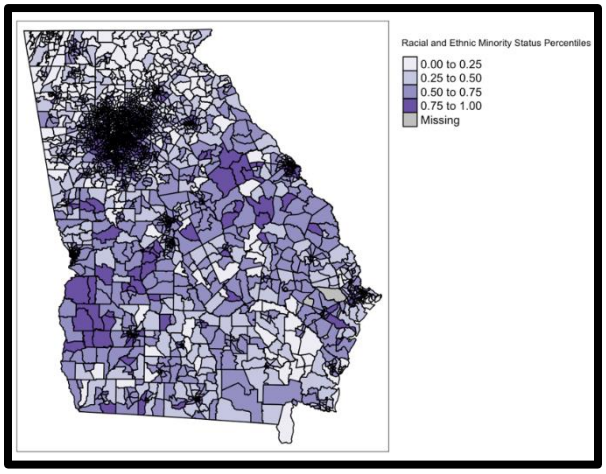
Example of Stylized State and County Maps for SVI Theme 2:

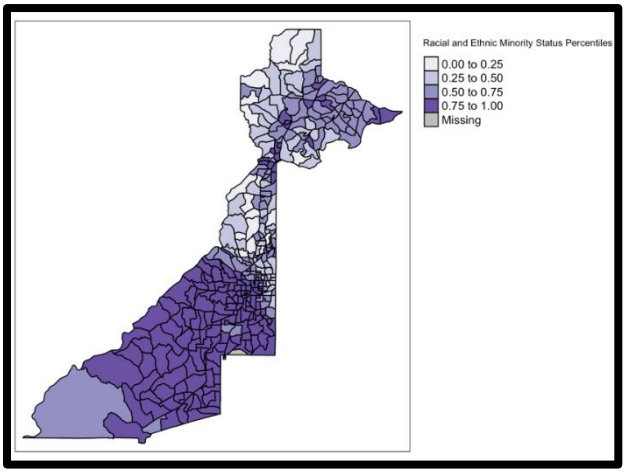




```
################################## SVI Theme 3 ##################################
#County
    county_svi_theme3_map <- tm_shape(my_county, bbox = bbox_new) +
      tm_polygons(col = "svi_theme3", title = "Racial and Ethnic Minority
Status Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Purples",
border.col =  "black") +
      tm_layout(legend.outside = T,
                title = "[County Name] Racial and Ethnic Minority Status
Percentiles Rankings by Census Tract 2020",
                title.position = c('center', 'bottom')

#State
    state_svi_theme3_map <- tm_shape(my_state, bbox = bbox_new_state) +
      tm_polygons(col = "svi_theme3", title = "Racial and Ethnic Minority
Status Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Purples",
border.col =  "black") +
      tm_layout(legend.outside = T,
                title = "[State Name] Racial and Ethnic Minority Status
Percentile Rankings by Census Tract 2020",
                title.position = c('center', 'bottom'),
                main.title.position = "center")
#Print
county_svi_theme3_map
state_svi_theme3_map
```

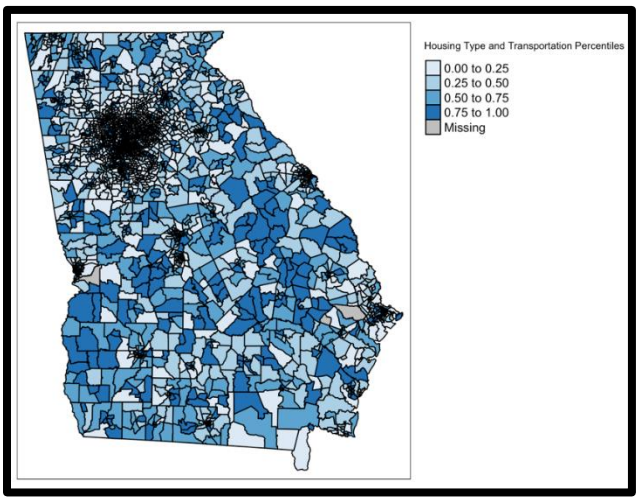
Example of Stylized State and County Maps for SVI Theme 3:

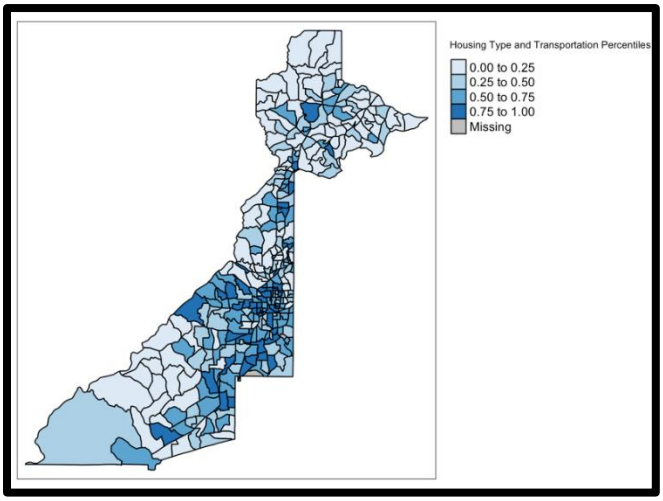




```
################################## SVI Theme 4 ##################################
#County
    county_svi_theme4_map <- tm_shape(my_county, bbox = bbox_new) +
      tm_polygons(col = "svi_theme4", title = "Housing Type and
Transportation Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Blues"
,         border.col =  "black") +
      tm_layout(legend.outside = T,
                title = "[County Name] Housing Type and Transportation
Percentiles Rankings by Census Tract 2020",
                title.position = c('center', 'bottom')

#State
    state_svi_theme4_map <- tm_shape(my_state, bbox = bbox_new_state) +
      tm_polygons(col = "svi_theme4", title = "Housing Type and
Transportation Percentiles", breaks =  c(0,0.25,0.50,0.75,1.0), pal = "Blues"
,        border.col =  "black") +
      tm_layout(legend.outside = T,
                title = "[State Name] Housing Type and Transportation
Percentiles Rankings by Census Tract 2020",
                title.position = c('center', 'bottom'),
                main.title.position = "center")
#Print
county_svi_theme4_map
state_svi_theme4_map
```

Example of Stylized State and County Maps for SVI Theme 4:





Change your SVI variables from continuous to categorical.

So far, we have considered the SVI as a continuous variable only. It has also been treated as a categorical variable in the literature, which is often easier to interpret. The following code creates a variable called "**SVI_overallcat**", which categorizes the SVI percentile rankings into quartiles in new datasets called "**my_county_qrt**" and "**my_state_qrt**".

```
#The mutate command will categorize the continuous SVI percentile rankings
into quartiles in a new variable (e.g., "svi_overall_cat". The following code
will update the county and state datasets to include this new variable.

my_county_qrt <- my_county %>%
  mutate(svi_overallcat = cut(svi_overall,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme1cat = cut(svi_theme1,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme2cat = cut(svi_theme2,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme3cat = cut(svi_theme3,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme4cat = cut(svi_theme4,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4))
         )
my_state_qrt <- my_state %>%
  mutate(svi_overallcat = cut(svi_overall,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme1cat = cut(svi_theme1,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme2cat = cut(svi_theme2,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme3cat = cut(svi_theme3,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4)),
         svi_theme4cat = cut(svi_theme4,
                              breaks = c(0, 0.25,0.5,0.75, Inf),
                              labels = c(1,2,3,4))
         )
#Verify that you've added the categorical variables to your datasets.
head(my_county_qrt)
head(my_state_qrt)
```

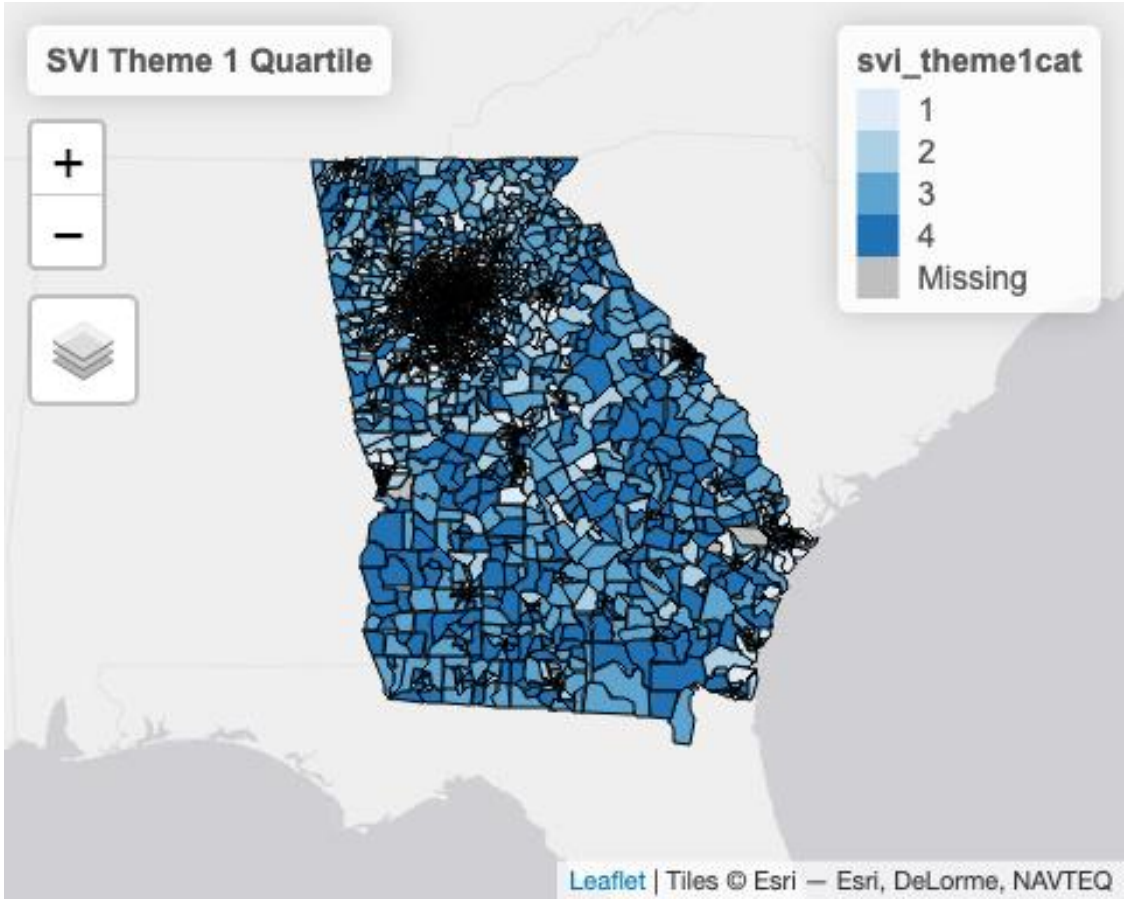
Create interactive maps.

Now that we have a categorical SVI variable, let's create a new map with interactive features! You may have notice that it is difficult to see some polygons in your state map because they are so small. Creating this map will allow you to view the entire state and zoom in on areas of interest within RStudio. (NOTE: This function is for within R or an HTML format and cannot be tested in this PDF file.) FIPS codes for the census tract will be visible when you scroll over a tract with your cursor. Use the code below.

```
#Overall SVI
overall_state_cat_map<-tm_shape(my_state_qrt) + tm_fill("svi_overallcat", sty
le = "cat", palette = "BuGn") +
  tm_layout("Overall SVI Quartile",
            legend.outside = T) + tm_polygons(border.col = "black")

#SVI Theme 1
theme1_state_cat_map<-tm_shape(my_state_qrt) + tm_fill("svi_theme1cat", style
= "cat", palette = "Greens") +
  tm_layout("SVI Theme 1 Quartile",
            legend.outside = T) + tm_polygons(border.col = "black")

#SVI Theme 2
theme2_state_cat_map<-tm_shape(my_state_qrt) + tm_fill("svi_theme1cat", style
= "cat", palette = "Oranges") +
  tm_layout("SVI Theme 1 Quartile",
            legend.outside = T) + tm_polygons(border.col = "black")

#SVI Theme 3
theme3_state_cat_map<-tm_shape(my_state_qrt) + tm_fill("svi_theme1cat", style
= "cat", palette = "Purples") +
  tm_layout("SVI Theme 1 Quartile",
            legend.outside = T) + tm_polygons(border.col = "black")

#SVI Theme 4
theme4_state_cat_map<-tm_shape(my_state_qrt) + tm_fill("svi_theme1cat", style
= "cat", palette = "Blues") +
  tm_layout("SVI Theme 1 Quartile",
            legend.outside = T) + tm_polygons(border.col = "black")
```

```
#As a nice feature, the package tmap_tools helps to make maps interactive
The tmap_mode("view") code sets the plot to interactive viewing. Then, the
following lines of code allow you to print each of your interactive maps for
viewing in RStudio.

tmap_mode("view")

overall_state_cat_map
theme1_state_cat_map
theme2_state_cat_map
theme3_state_cat_map
theme4_state_cat_map


NOTE: If you receive an error message when printing your maps, try running
the code below:

tmap_options(check.and.fix = TRUE)
```

Stylized Interactive State Map Preview:



Reset your code back to normal (non-interactive) plots prior to continuing.

For the remainder of this exercise, set the mode back to simple plots using the code below (as needed).

```
#For the remainder of the exercise, set the mode back to plot.

NOTE: Run this before using other functions in R! If you forget to, you may
encounter some error messages that prevent you from continuing in RStudio.
tmap_mode("plot")

## tmap mode set to plotting
```

Learn about your state and county with descriptive statistics.

The next set of examples show how to run descriptive statistics on your SVI dataset. For example, which county in your state has the highest (continuous) overall SVI value?

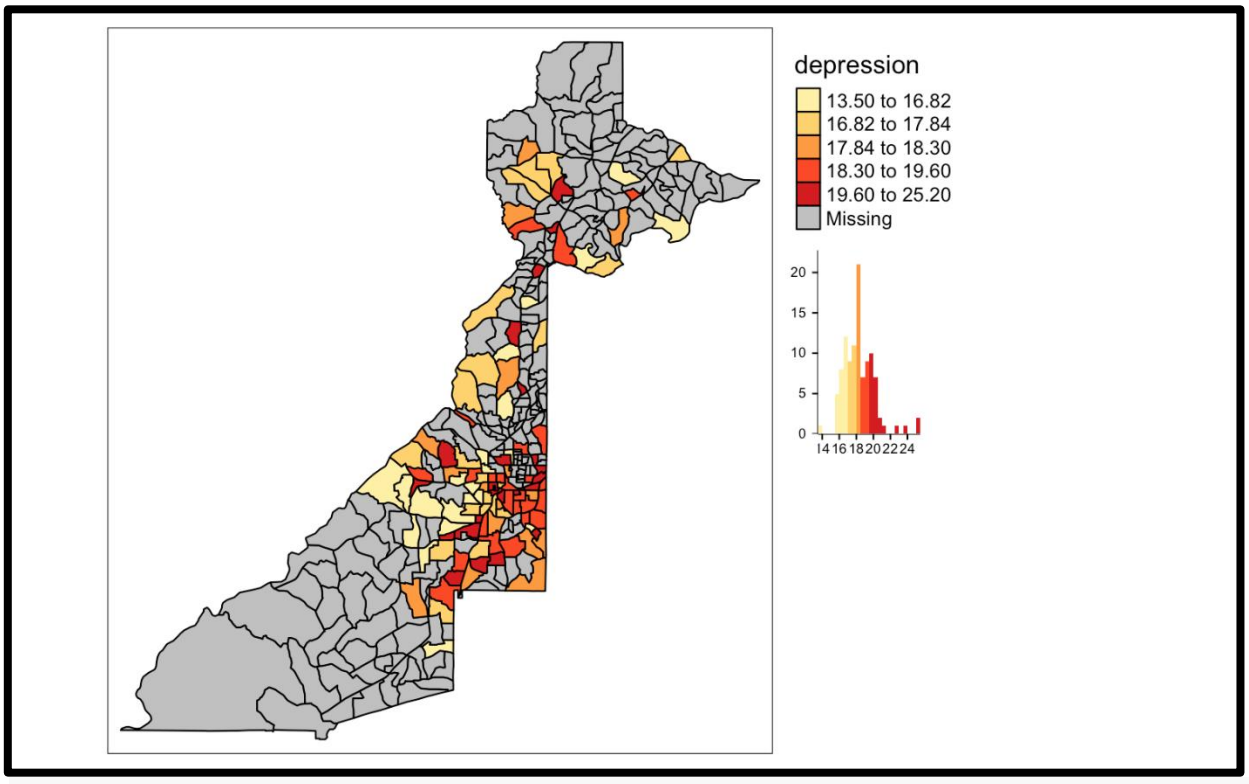
```
# The summary function provides descriptive statistics for the continuous and
categorical variables in your dataset. For continuous variables, minimum,
maximum, median, mean, first and third quartiles, and the number of missing
values are printed. For categorical variables, the number of records at
each level of the variable are printed, in addition to the number of missing
values.
summary(my_state_qrt)

##      FIPS               STATE              ST_ABBR             COUNTY
##  Length:2791        Length:2791        Length:2791        Length:2791
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##    LOCATION           depression      svi_theme1       svi_theme2
##  Length:2791        Min.   :13.50   Min.   :0.0004   Min.   :0.0006
##  Class :character   1st Qu.:18.80   1st Qu.:0.3514   1st Qu.:0.2283
##  Mode  :character   Median :20.90   Median :0.6247   Median :0.4865
##                     Mean   :20.82   Mean   :0.5753   Mean   :0.4817
##                     3rd Qu.:22.70   3rd Qu.:0.8129   3rd Qu.:0.7269
##                     Max.   :35.10   Max.   :0.9998   Max.   :0.9992
##                     NA's   :1544    NA's   :11       NA's   :8
##    svi_theme3       svi_theme4      svi_overall              geometry
##  Min.   :0.0000   Min.   :0.0000   Min.   :0.0003   MULTIPOLYGON :2791
##  1st Qu.:0.4095   1st Qu.:0.1584   1st Qu.:0.2633   epsg:4269    :   0
##  Median :0.6306   Median :0.4060   Median :0.5407   +proj=long...:   0
##  Mean   :0.5970   Mean   :0.4325   Mean   :0.5164
##  3rd Qu.:0.7998   3rd Qu.:0.6840   3rd Qu.:0.7701
##  Max.   :0.9959   Max.   :0.9998   Max.   :0.9999
##  NA's   :7        NA's   :10       NA's   :11
##  svi_overallcat svi_theme1cat svi_theme2cat svi_theme3cat svi_theme4cat
```

```
##  1   :660       1   :493      1   :750      1   :310      1   :869
##  2   :632       2   :538      2   :685      2   :638      2   :677
##  3   :719       3   :803      3   :731      3   :932      3   :617
##  4   :769       4   :946      4   :617      4   :900      4   :530
##  NA's: 11       NA's: 11      NA's:  8      NA's: 11      NA's: 98
##
##

#Which county has the highest overall SVI?
my_state %>% slice_max(svi_overall)

## Simple feature collection with 1 feature and 11 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: -84.41833 ymin: 33.67293 xmax: -84.39752 ymax: 33.686
46
## Geodetic CRS:  NAD83
##          FIPS   STATE ST_ABBR COUNTY                                  LOCATI
ON
## 1 13121007400 Georgia      GA Fulton Census Tract 74, Fulton County, Georg
ia
##   depression svi_theme1 svi_theme2 svi_theme3 svi_theme4 svi_overall
## 1       19.6     0.9791     0.9923     0.9394     0.9993      0.9999
##                          geometry
## 1 MULTIPOLYGON (((-84.41823 3...

#Which county has the lowest overall SVI?
my_state %>% slice_min(svi_overall)

## Simple feature collection with 1 feature and 11 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: -84.42951 ymin: 33.82031 xmax: -84.40742 ymax: 33.840
19
## Geodetic CRS:  NAD83
##          FIPS   STATE ST_ABBR COUNTY                                    LOC
ATION
## 1 13121009804 Georgia      GA Fulton Census Tract 98.04, Fulton County, Ge
orgia
##   depression svi_theme1 svi_theme2 svi_theme3 svi_theme4 svi_overall
## 1         NA      4e-04     0.0376     0.2857          0       3e-04
##                          geometry
## 1 MULTIPOLYGON (((-84.42951 3...

#Try using these functions with other variables and see what you find!
```

Create map of the prevalence of crude depression in your state and county.

Finally, create a map demonstrating the prevalence of crude depression in the United States, or your state and county of interest using the code below. Do you observe any similarities between your depression map and your overall SVI map (e.g., do areas where there is high SVI also have high depression)? Any differences?

```
tm_shape(my_county_qrt) +
  tm_fill("depression",
          style = "quantile",
          palette = "YlOrRd",
          legend.hist = T) +
  tm_layout(legend.outside = T) +

  tm_polygons(border.col = "black")
```




```
#Note in tm_fill, the argument legend.hist = T which displays a histogram of
the trait being mapped.
```

```
#You can also try looking at these data with your state map.
tm_shape(my_state_qrt) +
  tm_fill("depression",
          style = "quantile",
          palette = "YlOrRd",
          legend.hist = T) +
  tm_layout(legend.outside = T) +

  tm_polygons(border.col = "black")
```