Samuel Odoom

LA 558

Final Project (Detailed Procedure)

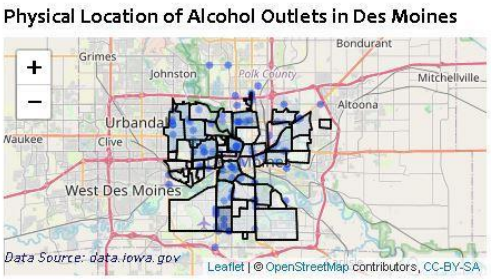
Alcohol Outlet Density and Crime in Des Moines

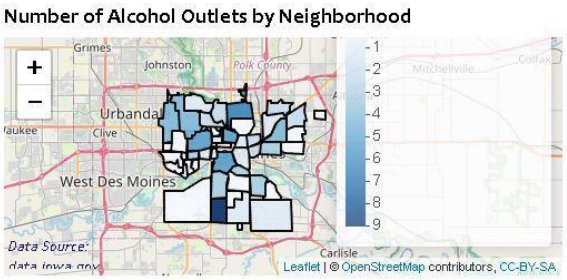
In this final project, I made use of the following main datasets:

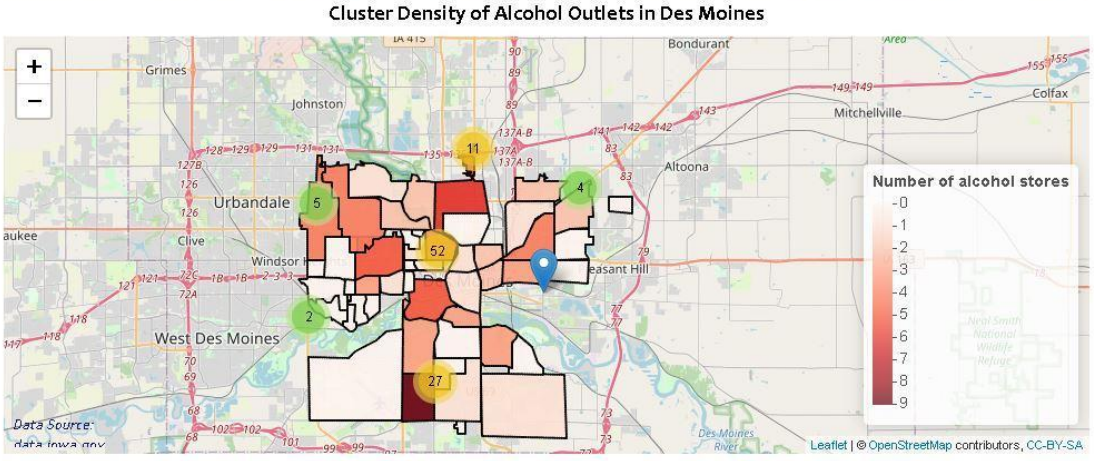
- Shapefile for the city of Des Moines (from the city's website)
- Data on crime index for each neighborhood in Des Moines (from a website called Weichert.com)
- Data on the location of alcohol outlets in Des Moines (from a public open data website called data.iowa.gov).

Note: My final output was a tableau story with different dashboards. This document therefore provides details on how I arrived at each of the dashboards that fed into the final story. The different dashboards are numbered for easier understanding.

In producing my graphics (maps and charts), I used R studio and Tableau. With R studio I generated three maps **(Dashboard 1)** which are shown below

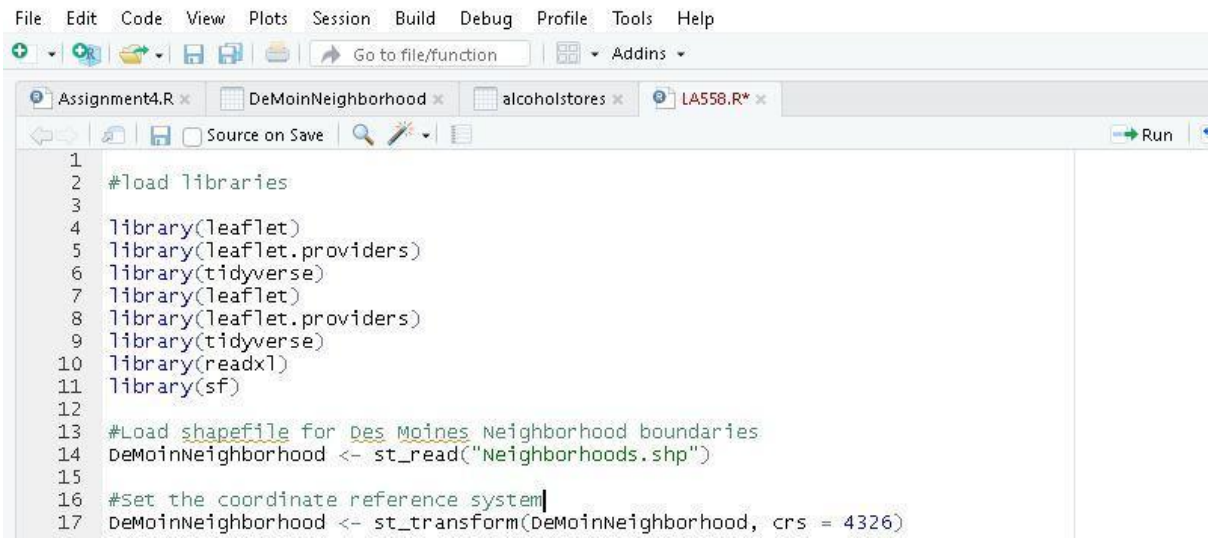




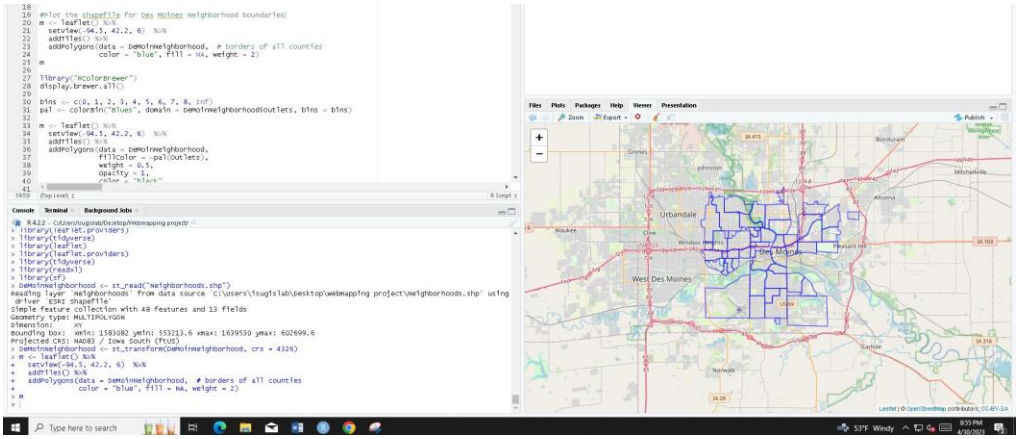


The following steps were followed to generate the above maps

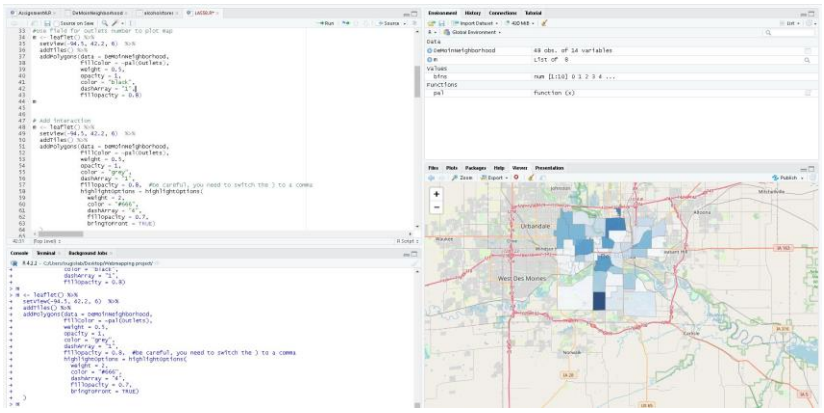
- First, I loaded the libraries for the required packages and the shapefile for the boundary of Des Moines and set the coordinate reference system as shown below.



- I then plotted the boundaries for the city of Des Moines and loaded the package 'colorbrewer' as shown below



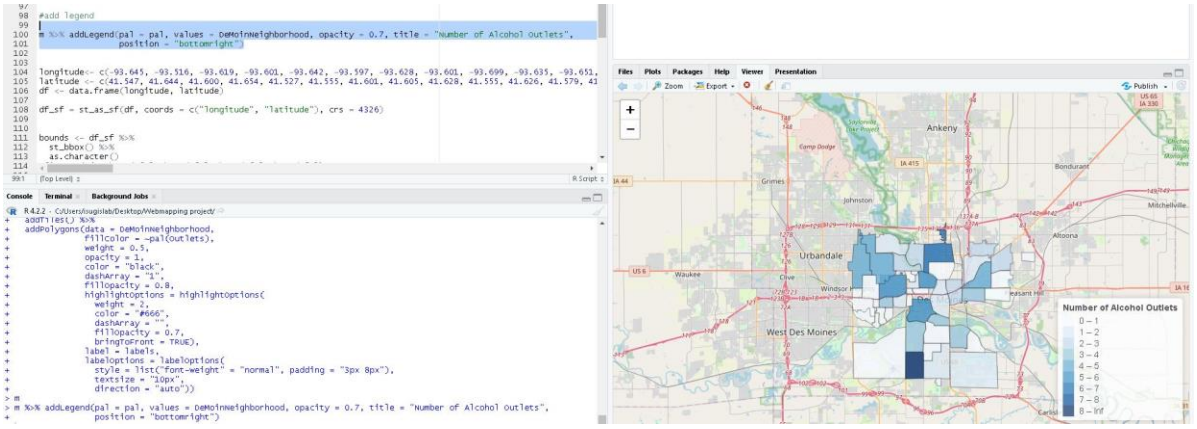
At this point, I had the outline plotted. Using the code shown in the image below I plotted a choropleth map using the 'Outlets number' filed and added an interactive function



- I then added labels and plotted the labeled map as shown below

```
#add labels
labels <- sprintf(
  "<strong>%s</strong><br/>%g alcohol outlets",
  DeMoinNeighborhood$NHNAME, DeMoinNeighborhood$Outlets
) %>% lapply(htmltools::HTML)


#Plot labeled map
m <- leaflet() %>%
  setView(-93.65, 41.62, 11)  %>%
  addTiles() %>%
  addPolygons(data = DeMoinNeighborhood,
              fillColor = ~pal(Outlets),
              weight = 0.5,
              opacity = 1,
              color = "black",
              dashArray = "1",
              fillOpacity = 0.8,
              highlightOptions = highlightOptions(
                weight = 2,
                color = "#666",
                dashArray = "",
                fillOpacity = 0.7,
                bringToFront = TRUE),
              label = labels,
              labelOptions = labelOptions(
                style = list("font-weight" = "normal", padding = "3px 8px"),
                textsize = "10px",
                direction = "auto"))
m
```

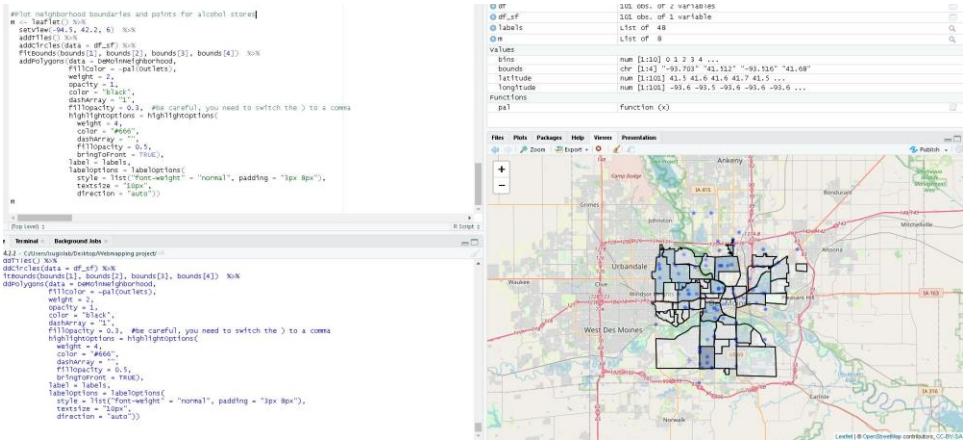
- I added a legend to the map using the coded shown below **(map 1 of Dashboard 1)**



- In order to add the points (location of alcohol outlets), I pulled in the coordinates for all the alcohol stores and set its coordinate reference system as shown below

```r
#Added individual points
longitude<- c(-93.645, -93.516, -93.619, -93.601, -93.642, -93.597, -93.628, -93.601, -93.699, -93.635, -93.651,
latitude <- c(41.547, 41.644, 41.600, 41.654, 41.527, 41.555, 41.601, 41.605, 41.628, 41.555, 41.626, 41.579, 41
df <- data.frame(longitude, latitude)

df_sf = st_as_sf(df, coords = c("longitude", "latitude"), crs = 4326)

bounds <- df_sf %>%
  st_bbox() %>%
  as.character()
#fitBounds(m, bounds[1], bounds[2], bounds[3], bounds[4])
```

- I then plotted a map showing the city boundaries with the location of alcohol outlets as points **(map 2 of Dashboard 1)**



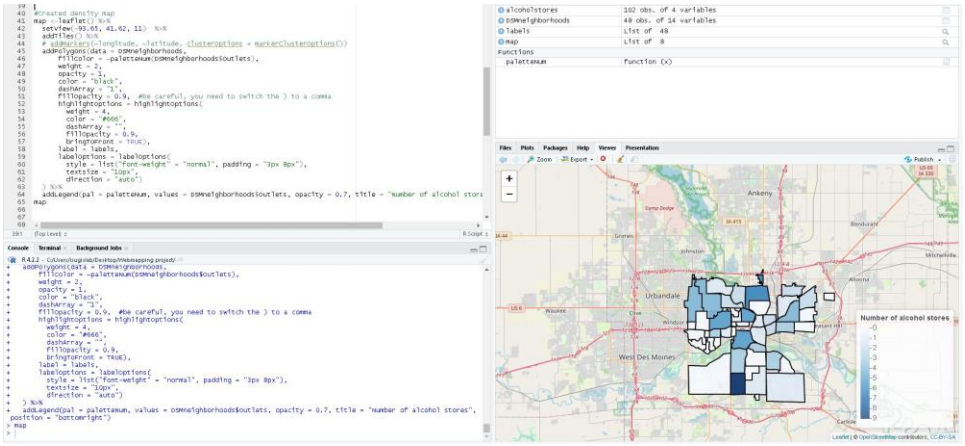
At this point I had already generated two maps and decided to also generate a cluster density map to show the parts of the city that had high concentrations of alcohol outlets. I initially tried building upon the previous code, but I ran into problems and decided to create a new R file for that purpose.

- Starting with that, I had to load a set of packages and the polygon for the city's boundaries again as shown below

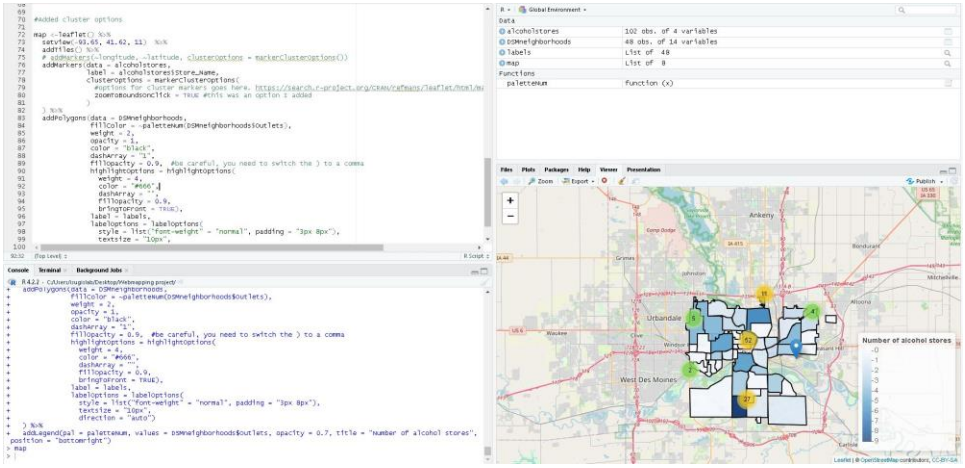
- I then loaded the point files and defined the choropleth map's labels as shown below

```
#load the pointfile
alcoholstores <- st_read("outlets.shp")
alcoholstores <- st_transform(alcoholstores, crs = 4326)

#this is actually not used as I used paletteNum instead

#bins <- c(0, 1, 2, 3, 4, 5, 6, 7, 8, Inf)
#pal <- colorBin("Blues", domain = DeMoinNeighborhood$outlets, bins = bins)

#for the Chloropleth county outlines
paletteNum <- colorNumeric('Blues', domain = DSMneighborhoods$outlets)

#define the Chloropleth layer labels. The $s is replaced with the first field
#IowaCounties$COUNTY while the value IowaCounties$TOT_POP is represented with %g
labels <- sprintf(
  "<strong>%s</strong><br/>%g",
  DSMneighborhoods$NHNAME, DSMneighborhoods$outlets
) %>% lapply(htmltools::HTML)
```

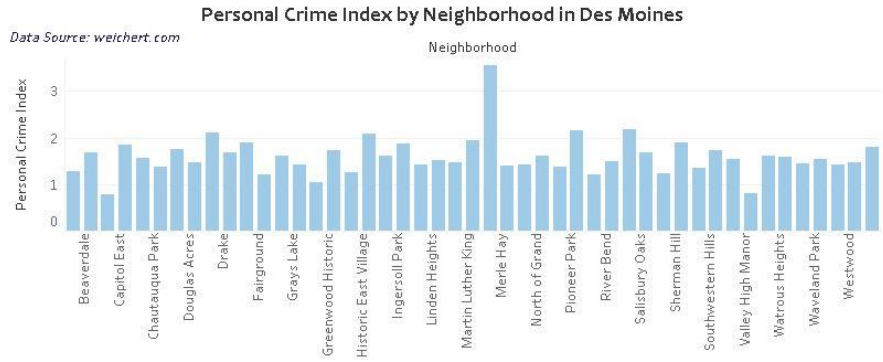
- I then created the alcohol outlet density map again and added its legend as shown below

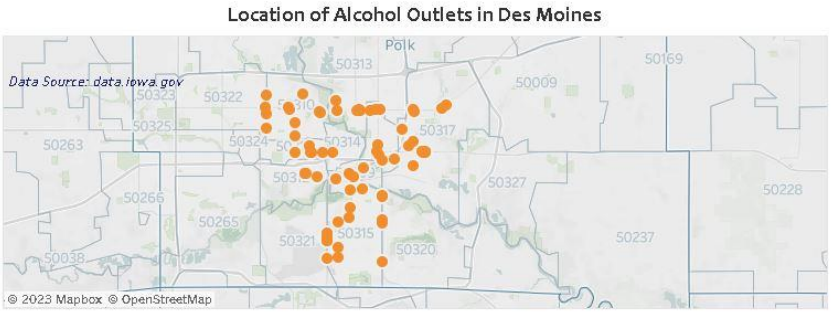


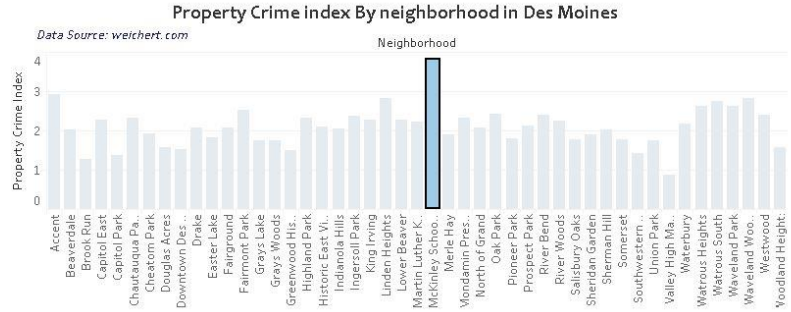
- I finally added the cluster options to make it possible for the points to cluster when zoomed out as shown below **(map 3 of Dashboard 1)**



- The next thing I did was to show the relationship between crime and alcohol outlet density in Des Moines. **One way** I chose to do this was to link a bar graph showing the different crime indices (personal and property) of each neighborhood to a map showing the number of alcohol outlets in each neighborhood. The resulting output was such that clicking on any bar corresponding to any neighborhood would automatically show you the location and number of alcohol outlets for that neighborhood – **Dashboards 2 and 3**(see the 2 images below). ***Note: This was done using Tableau***

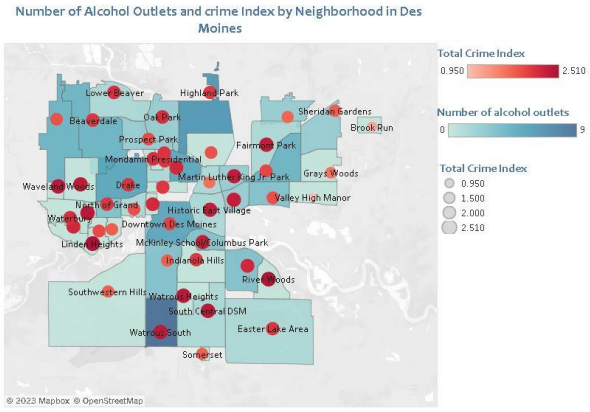






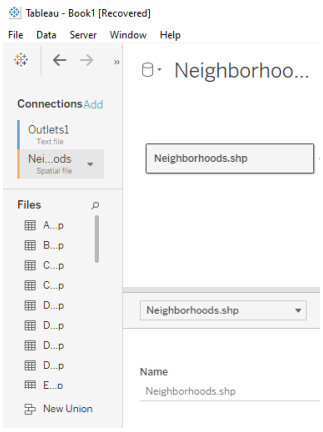
To do this, the following steps were followed

- I connected to a csv file that had all the coordinates for the alcohol outlets as well as the crime indices for the different neighborhoods in Des Moines.
- I then plotted the coordinates and added a filter by neighborhoods such that turning on each neighborhood would show the alcohol outlets in that neighborhood
- The next step was to create a bar graph showing the different crime indices (personal and property) of each neighborhood and using it as a filter such that clicking on any bar corresponding to any neighborhood would automatically show you the location and number of alcohol outlets for that neighborhood
- After this, I decided to display the relationship between crime and alcohol outlet density in another way. This resulted in a map showing both alcohol outlet density (in blue) and total crime index (in red circles) as shown below **(Dashboard 4)**. ***Note: This was done using Tableau***

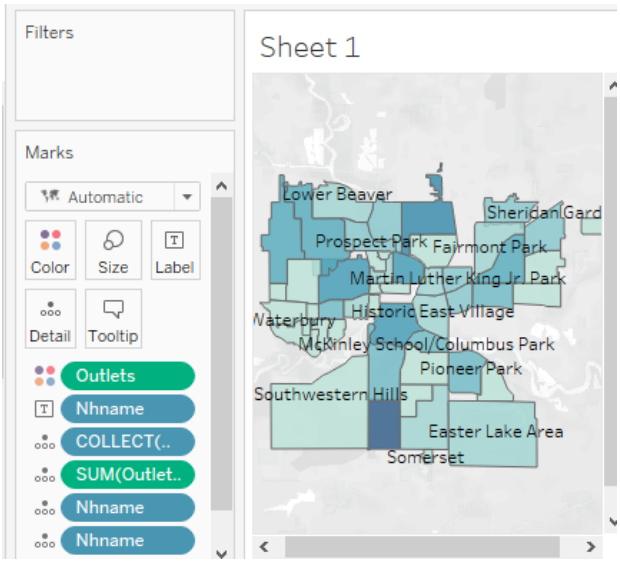


In order to arrive at the above map, I followed the following steps

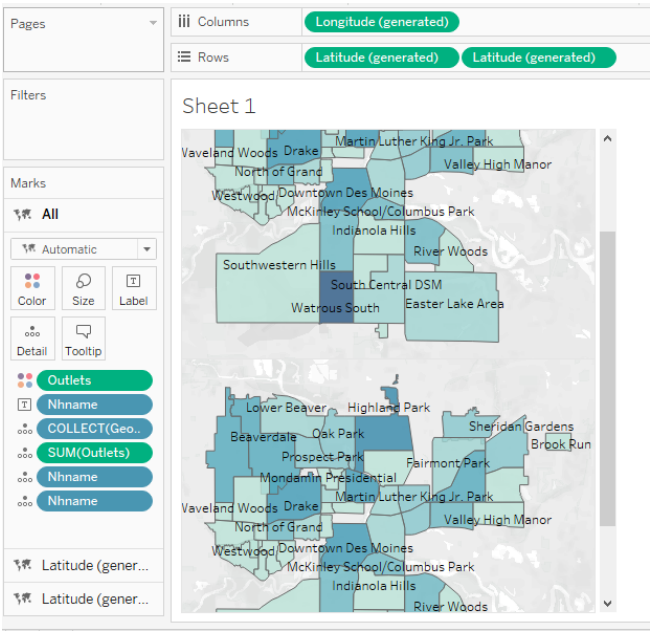
- First, I connected to the shapefile for the city of Des Moines as shown below



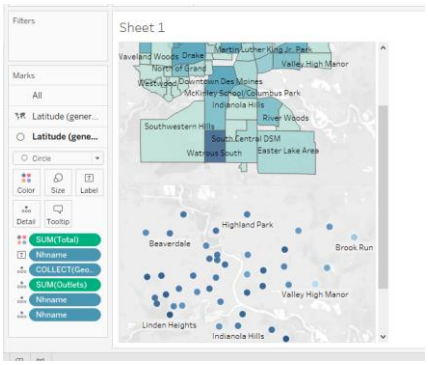
- At this point, I had the fields for the shapefile show as dimensions and measures. This made it possible for me to create an alcohol outlet density map as shown below.



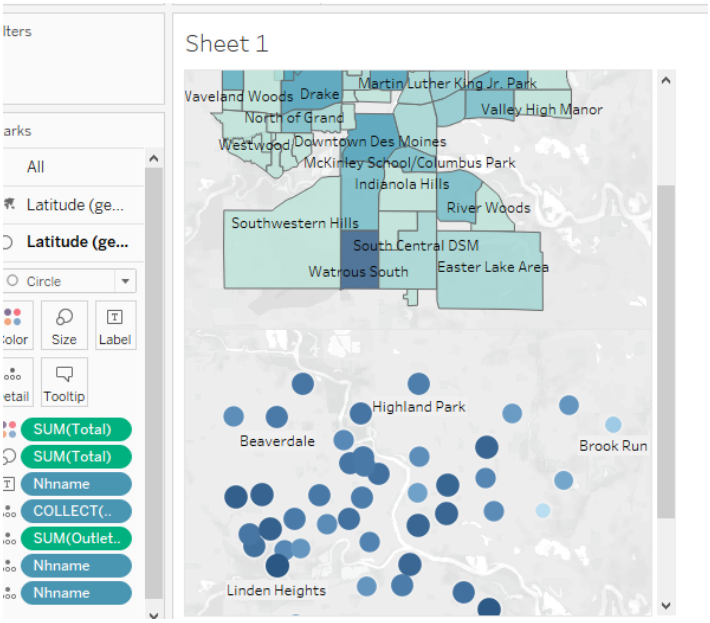
- I then duplicated the map as shown below



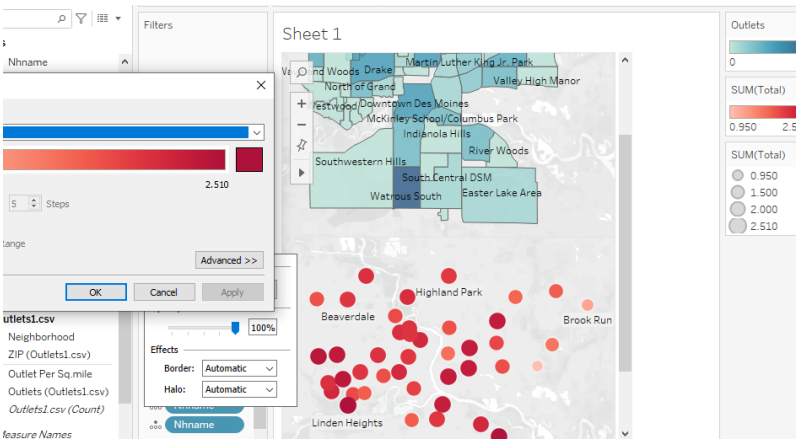
- The next step was to change the second map's output type from map to circle as shown below



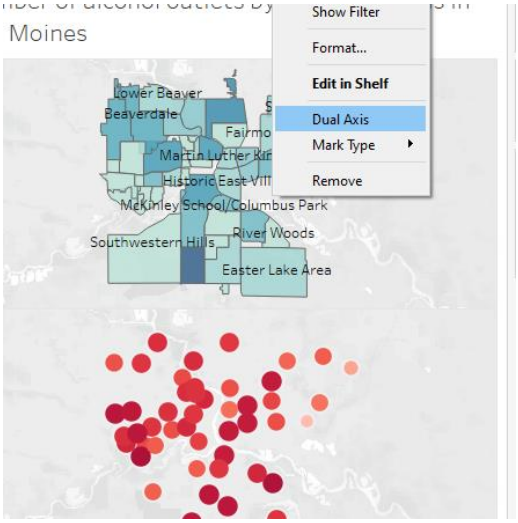
- At this point, it was just the same alcohol outlet density map being displayed in a different format (as circles). This meant that the circles were still representing the alcohol outlet density of each neighborhood. However, since I wanted the circles to show the total crime index rather than the alcohol outlet density, I dragged the field or measure for the total crime index onto the ‘color’ and ‘size’ options such that the color and size of each circle now represented the total crime index



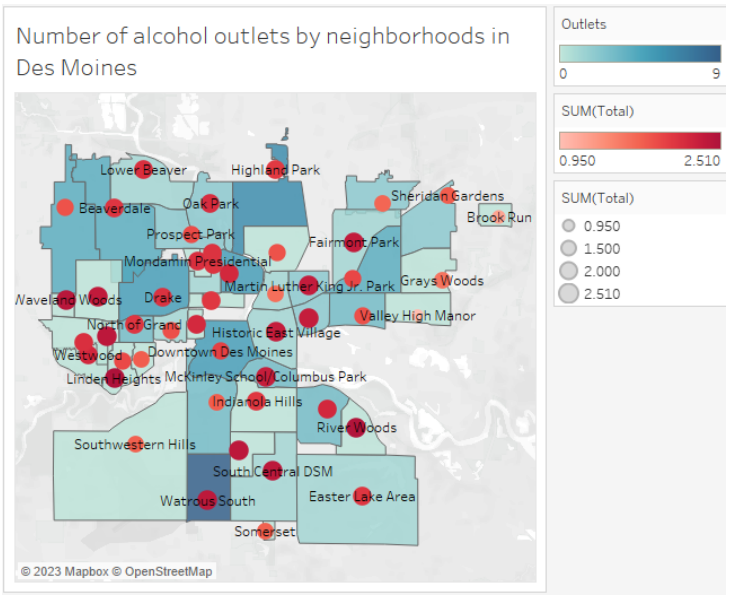
- I then changed the color of the circles to red such that it would be distinct (see image below)



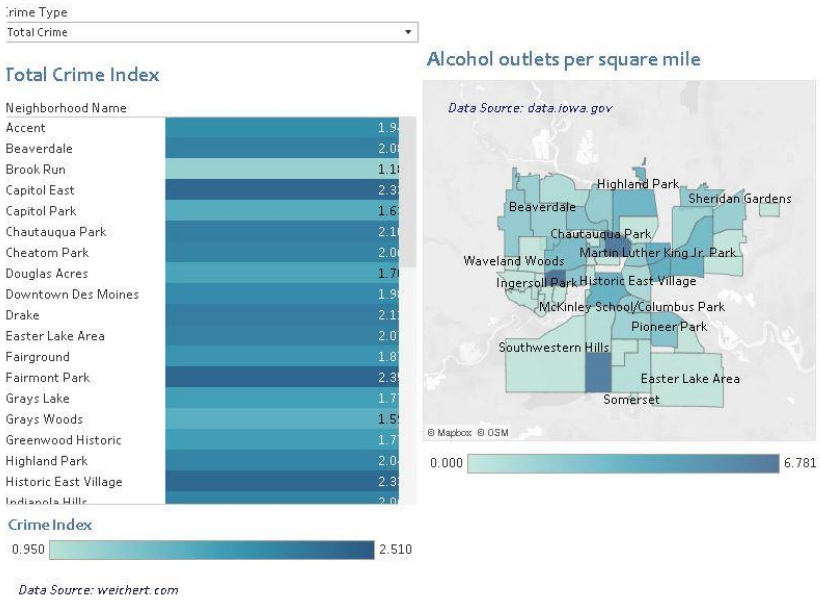
- To combine both maps, I right clicked on the label for the second latitude on the 'rows' and selected the dual axis option as shown below



- This gave me the output shown below



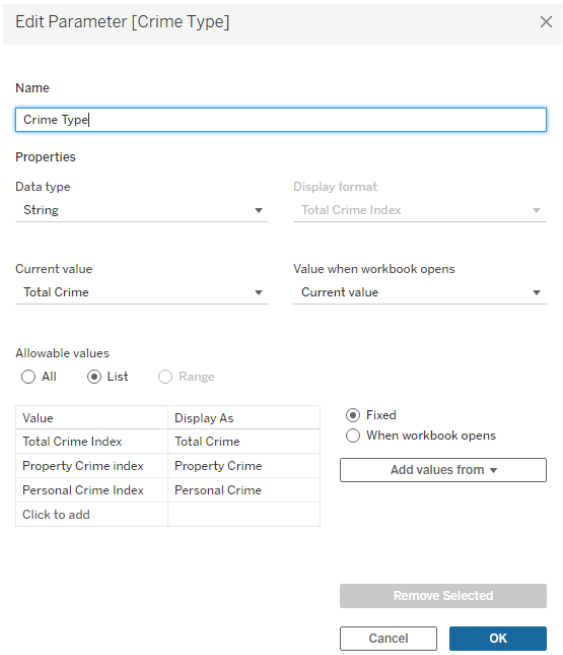
- After creating the combined map, I decided to also make use of parameters in my final project. My idea was to use the different crime indices (personal and property) as parameters such that switching between them would change the table displaying each crime index for each neighborhood and the corresponding map for the alcohol outlet density for each neighborhood as shown below **(Dashboard 5).**



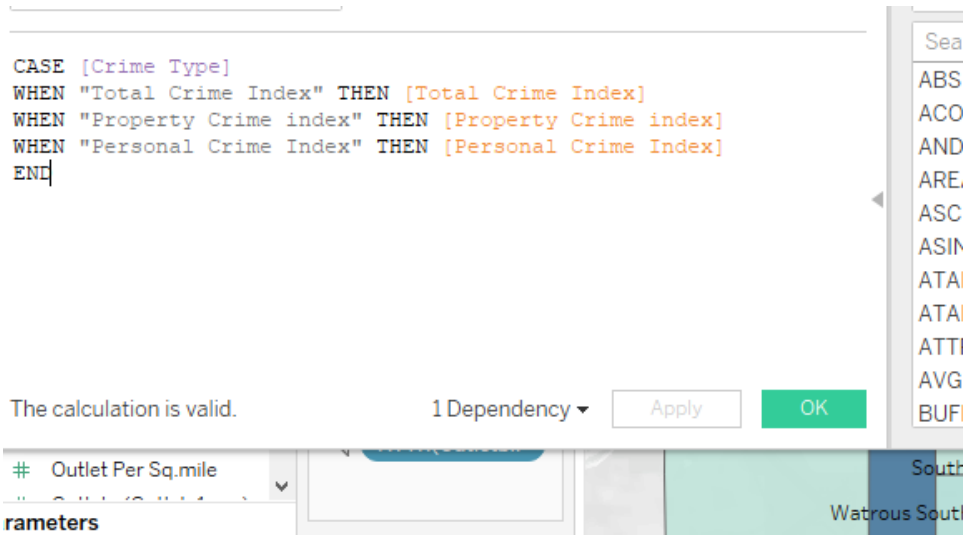
To do this I followed the following steps

- First, I connected to a csv file that had all the coordinates for the alcohol outlets as well as the crime indices for the different neighborhoods in Des Moines.

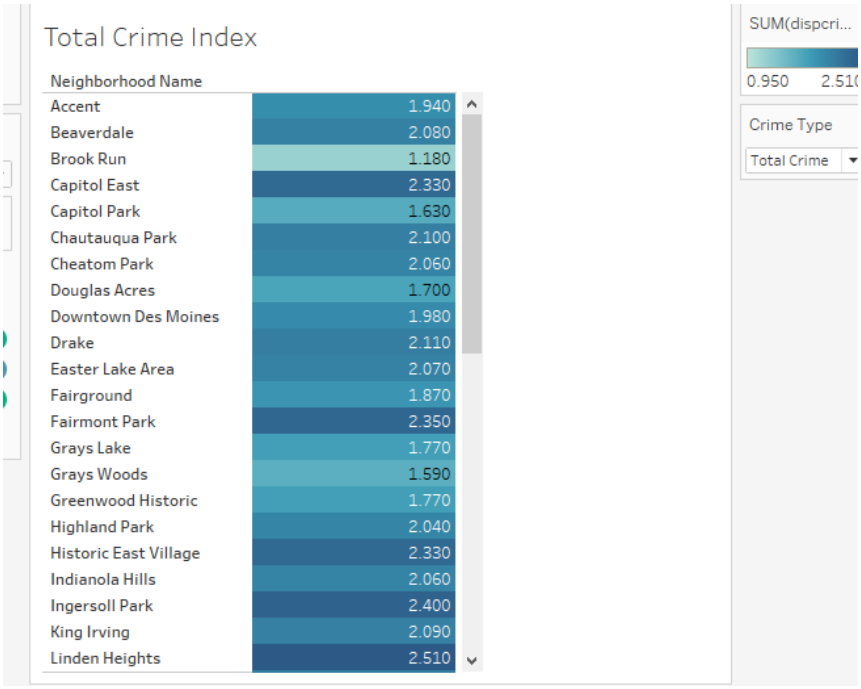
- I then created a parameter called '**Crime Type** as shown below



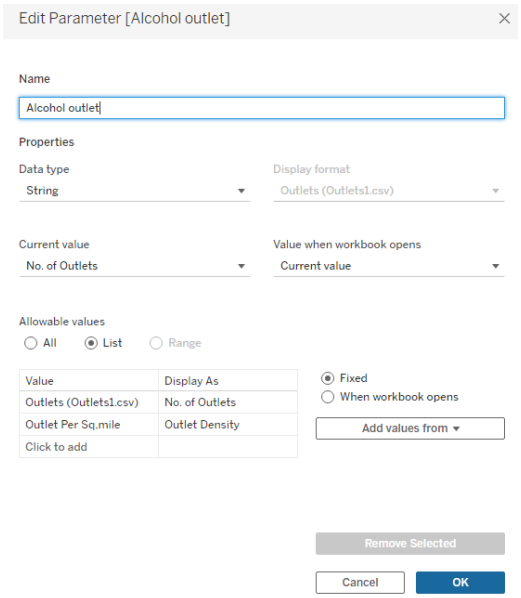
- I then created a new calculated field such that the individual elements in the **Total crime** parameter would correspond to different fields as shown below



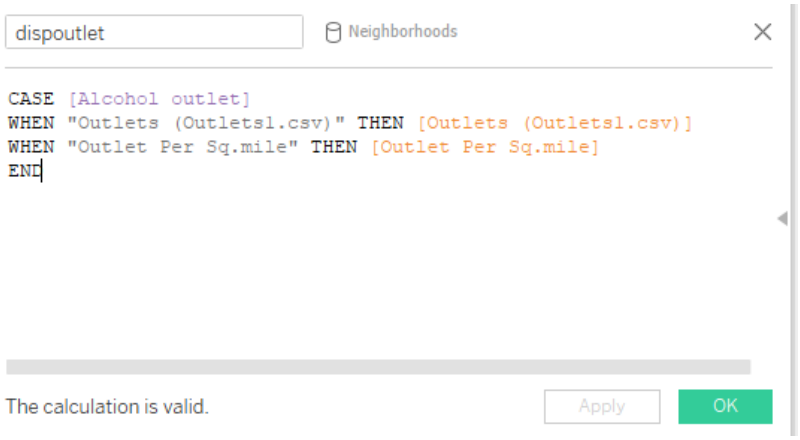
- I then created a table showing the different crime indices for each neighborhood as shown below



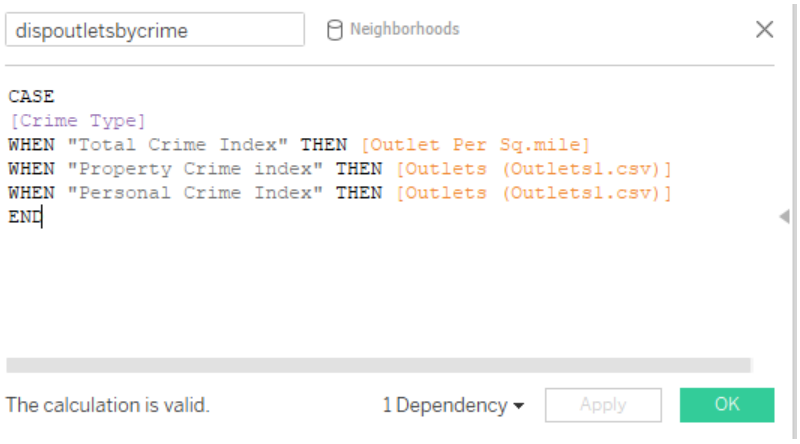
- The next step was to create another parameter labeled as **Alcohol outlet** as shown below



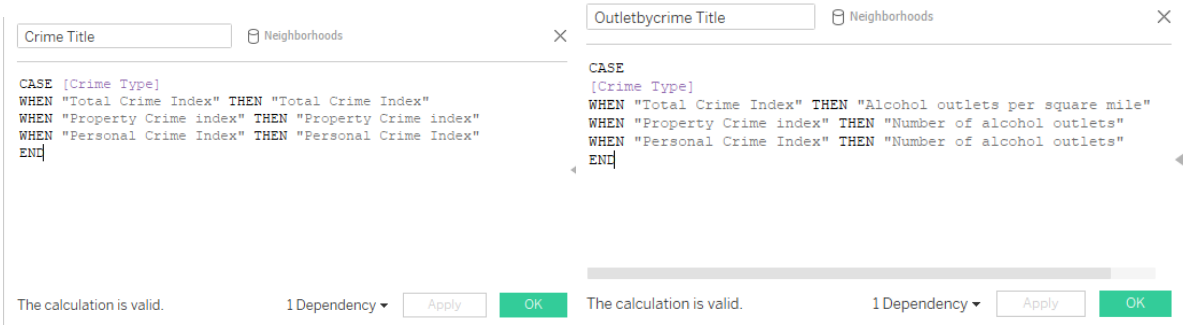
- Just like previously, I created another calculated field such that the individual elements in the **Alcohol outlet** parameter would correspond to different fields as shown below

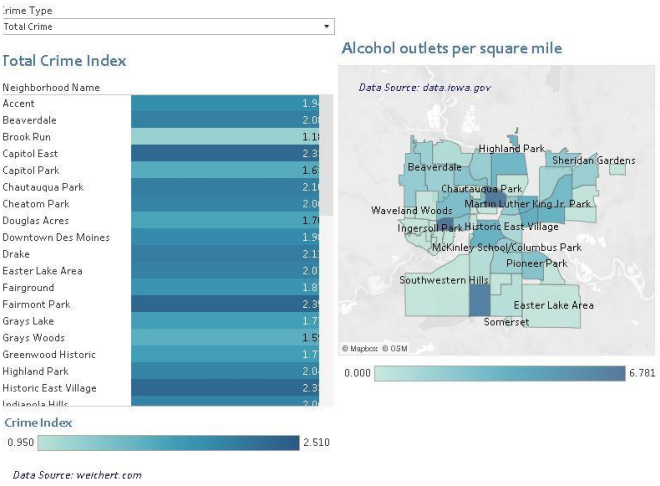


- I then created another calculated field that instructed the software on what to display anytime the parameters were switched (see image below)



- I finally created 2 additional calculated fields that instructed the software to change the titles of the map and table upon a change in parameter (see images below).





At this point I already had my five dashboards for the story

- I finally created 2 additional dashboards for the introduction and conclusion and created my final story as shown below

Alcohol Outlet Density and Crime in Des Moines, Iowa

Samuel Odoom
LA 558
May 2023

To better understand the causes of urban crime and how to manage it, scholars have begun looking into how the physical fabric of cities can create a conducive environment for crime and how these physical environments can be altered to reduce crime. To achieve this, using geospatial tools has become critical and helped bring new perspectives to scholarly ideas regarding the use of geographic data in explaining social phenomena. This project aims to document the relationship between alcohol outlet density and the incidence of crimes in Des Moines using a Geospatial approach.