

Samuel Odoom

LA 558

Final Project (Detailed Procedure)

Alcohol Outlet Density and Crime in Des Moines

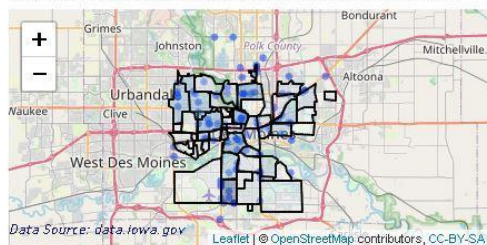
In this final project, I made use of the following main datasets:

- 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).

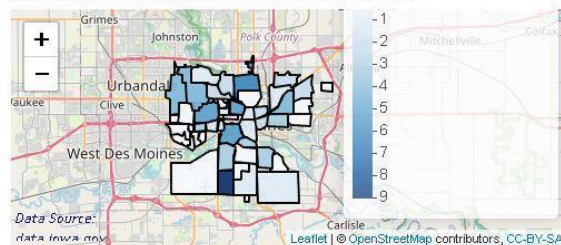
Note: My final output was a tableau story with different dashboards. This document therefore provides details on how I arrived at each of the dashboards that fed into the final story. The different dashboards are numbered for easier understanding.

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

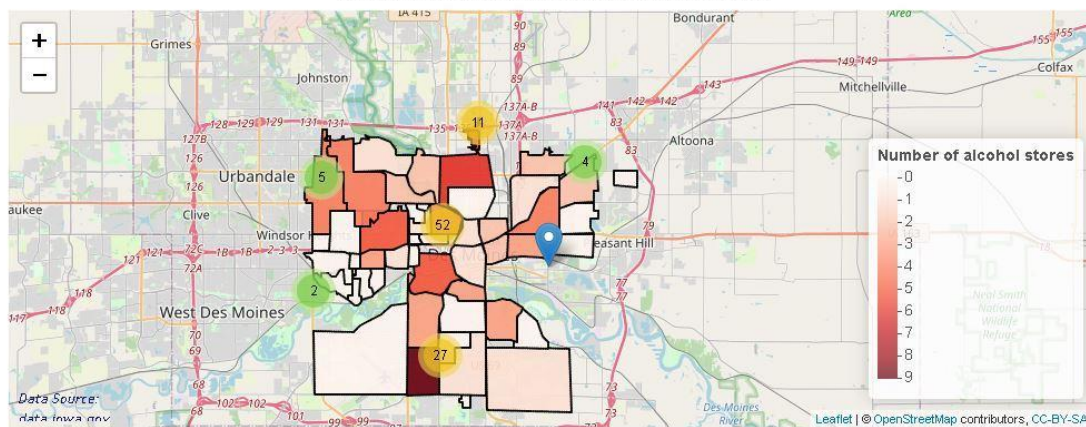
Physical Location of Alcohol Outlets in Des Moines



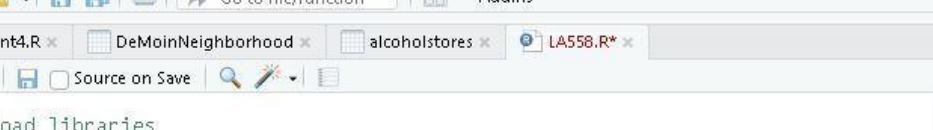
Number of Alcohol Outlets by Neighborhood



Cluster Density of Alcohol Outlets in Des Moines



The following steps were followed to generate the above maps

- 
- The screenshot shows the RStudio IDE interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for file operations and a search bar. The tab bar shows four open files: Assignment4.R, DeMoinNeighborhood, alcoholstores, and LA558.R*. The main editor window displays R code for loading libraries and reading a shapefile. The code is as follows:
- ```
1 #load libraries
2
3
4 library(leaflet)
5 library(leaflet.providers)
6 library(tidyverse)
7 library(leaflet)
8 library(leaflet.providers)
9 library(tidyverse)
10 library(readxl)
11 library(sf)
12
13 #Load shapefile for Des Moines Neighborhood boundaries
14 DeMoinNeighborhood <- st_read("Neighborhoods.shp")
15
16 #Set the coordinate reference system
17 DeMoinNeighborhood <- st_transform(DeMoinNeighborhood, crs = 4326)
```

- The screenshot displays the QGIS desktop environment. The main map window shows a city area with a blue-shaded neighborhood boundary. The left panel shows the QGIS console with the following R script output:

```
R console:
> # R422 - CAUsers\qgis\desktop\workspace\project\
> library(sf)
> library(tidyverse)
> library(leaflet)
> library(leaflet.providers)
> library(tidyverse)
> library(readr)
> neighborhood <- st_read("neighborhoods.shp")
> # Load layer 'neighborhood' from data source 'C:\Users\jsug1\Desktop\workspace\project\neighborhoods.shp' using
> 'Open ESRI Shapefile'
> Simple feature collection with 48 features and 13 fields
> Geometry type: MULTIPOLYGON
> Bounding box: wkt: 1585202 yfmi: 53223.6 xmax: 1639530 ymax: 802699.6
> Projected CRS: NAD83 / Zone 18N EPSG:
> geom_neighborhood <- st_transform(geom_neighborhood, crs = 4326)
> m <- leaflet() %>%
> addTiles() %>%
> addPolygons(data = geom_neighborhood, # borders of all counties
> color = "blue", fill = NA, weight = 2)
> display.brewer.all()
```

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





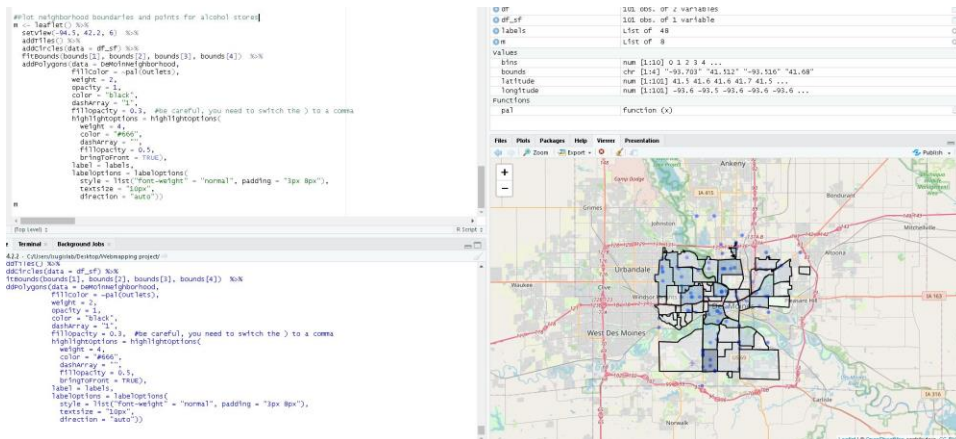
```
#Added individual points
longitude<- c(-93.645, -93.516, -93.619, -93.601, -93.642, -93.597, -93.628, -93.601, -93.699, -93.635, -93.651,
latitude <- c(41.547, 41.644, 41.600, 41.654, 41.527, 41.555, 41.601, 41.605, 41.628, 41.555, 41.626, 41.579, 41
df <- data.frame(longitude, latitude)

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

```
Assignment4.R | DeMoinNeighborhood | alcoholstores | AlcoholDensityCluster.R*
For this I decided to create this new file as I was running into errors trying to continue with the previ
2
3 install.packages(c("tidyverse", "readxl", "sf", "leaflet", "leaflet.providers", "RColorBrewer"))
4
5 #Load libraries
6 library(leaflet)
7 library(leaflet.providers)
8 library(tidyverse)
9 library(readxl)
10 library(sf)
11 library(htmltools)
12
13 library("RColorBrewer")
14 # display.brewer.all()
15
16 #load the polygons
17 DSMneighborhoods <- st_read("Neighborhoods.shp")
18 DSMneighborhoods <- st_transform(DSMneighborhoods, crs = 4326)
```

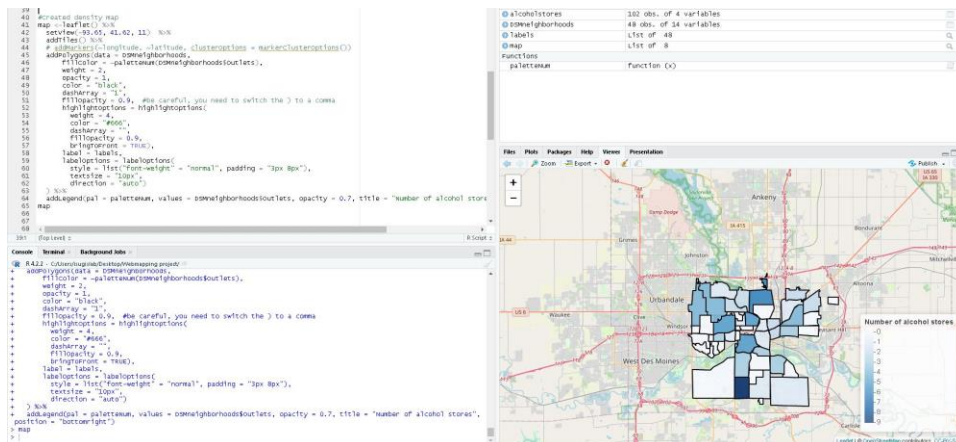
- I then loaded the point files and defined the choropleth map's labels as shown below

```

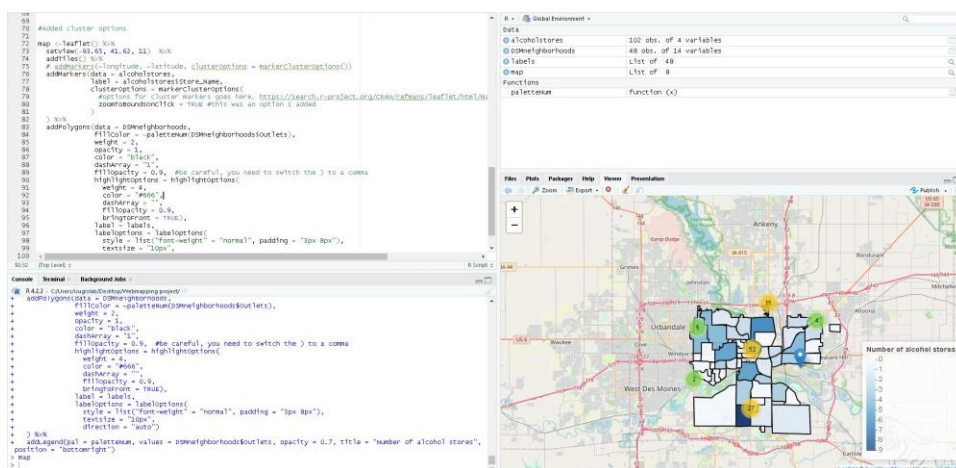
19
20 #load the pointfile
21 alcoholstores <- st_read("outlets.shp")
22 alcoholstores <- st_transform(alcoholstores, crs = 4326)
23
24 #this is actually not used as I used paletteNum instead
25
26 #bins <- c(0, 1, 2, 3, 4, 5, 6, 7, 8, Inf)
27 #pal <- colorBin("Blues", domain = DeMoinNeighborhood$outlets, bins = bins)
28
29 #for the Chlorgropleth county outlines
30 paletteNum <- colorNumeric('Blues', domain = DSMneighborhoods$outlets)
31
32 #define the Chlorgropleth layer labels. The $s is replaced with the first field
33 #IowaCounties$COUNTY while the value IowaCounties$TOT_POP is represented with %g
34 labels <- sprintf(
35 "%s
%g",
36 DSMneighborhoods$NHNAME, DSMneighborhoods$outlets
37) %>% lapply(htmltools::HTML)
38

```

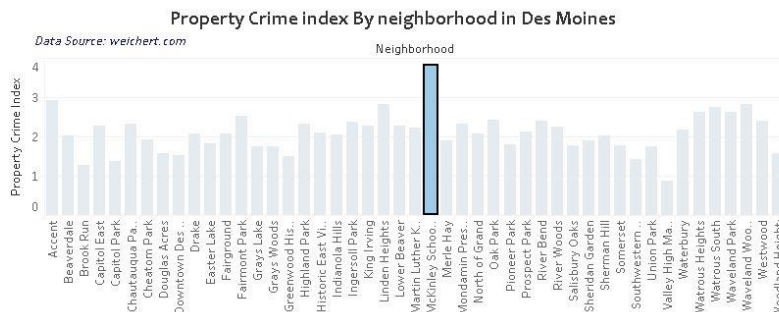
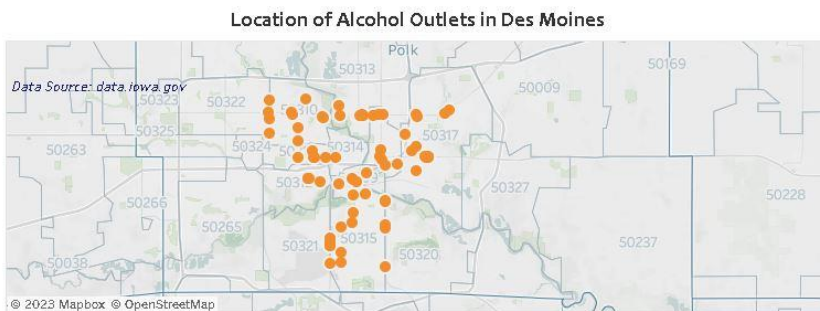
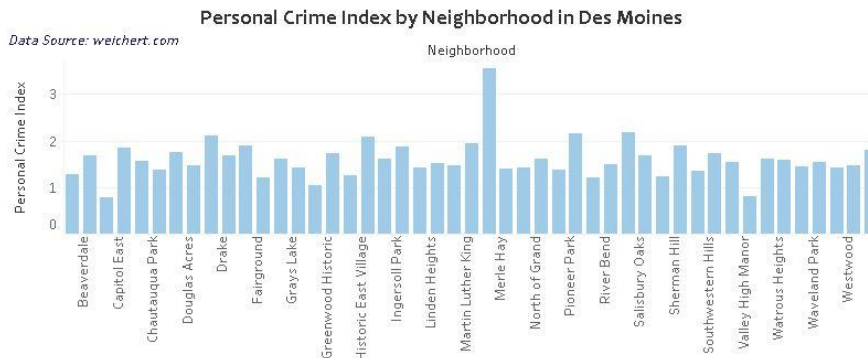
- I then created the alcohol outlet density map again and added its legend as shown below



- 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)

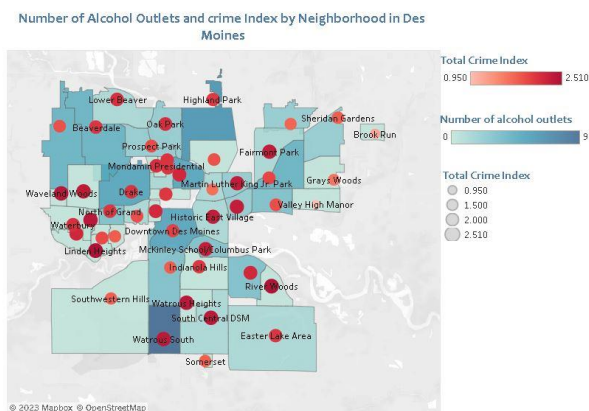


- The next thing I did was to show the relationship between crime and alcohol outlet density in Des Moines. **One way** I chose to do this was to link a bar graph showing the different crime indices (personal and property) of each neighborhood to a map showing the number of alcohol outlets in each neighborhood. 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*



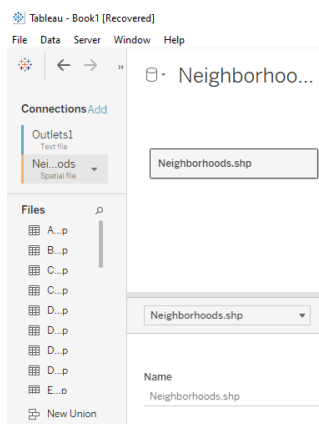
To do this, the following steps were followed

- 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*

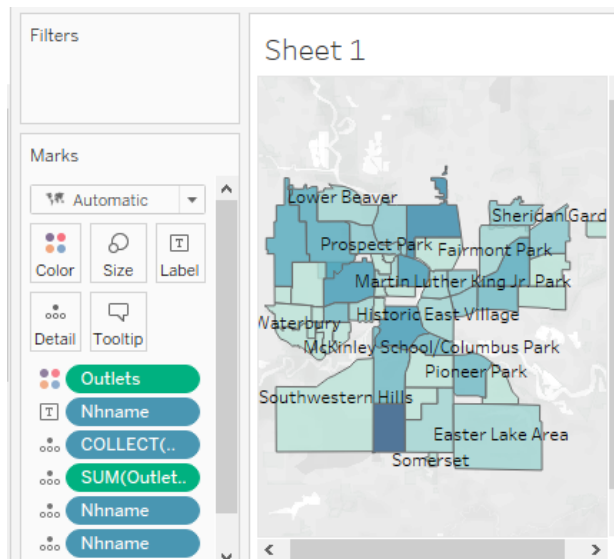


In order to arrive at the above map, I followed the following steps

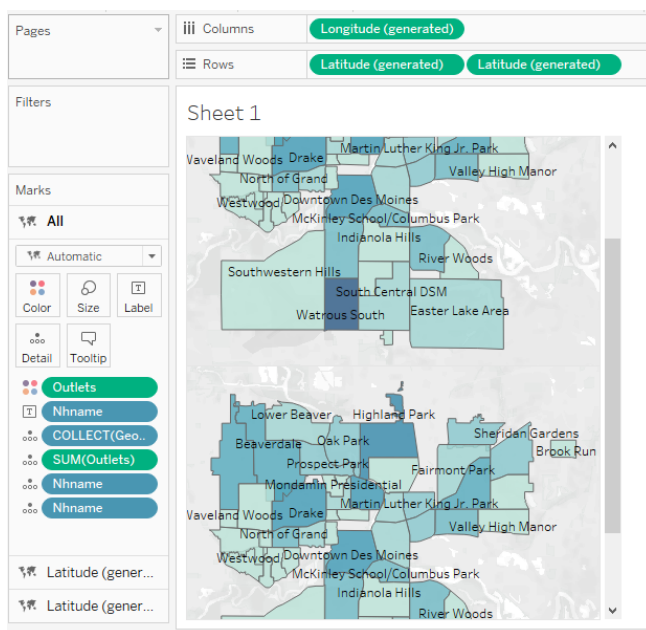
- First, I connected to the shapefile for the city of Des Moines as shown below



- 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.

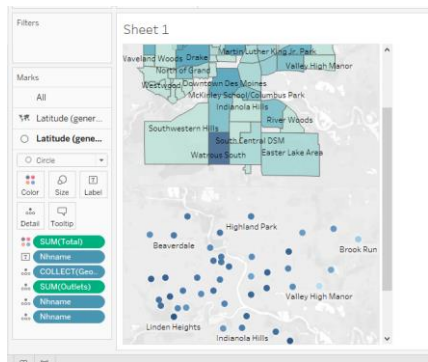


- I then duplicated the map as shown below

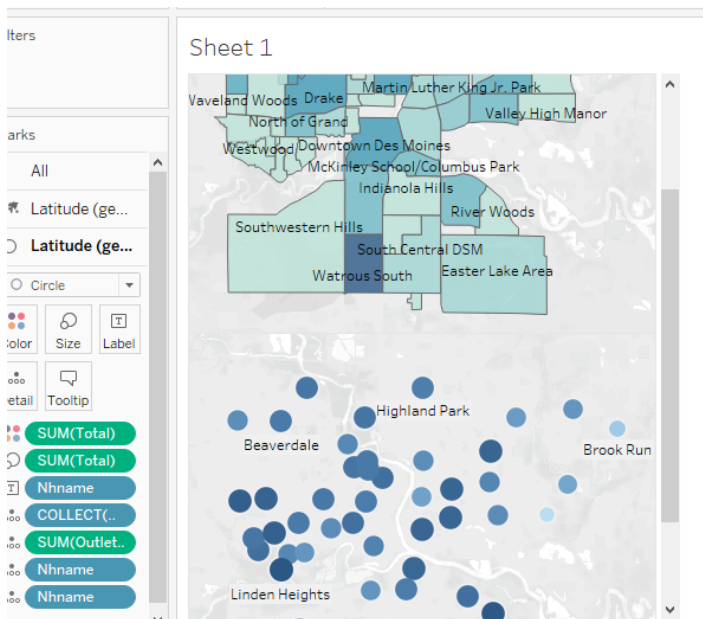


- The next step was to change the second map's output type from map to circle as shown below

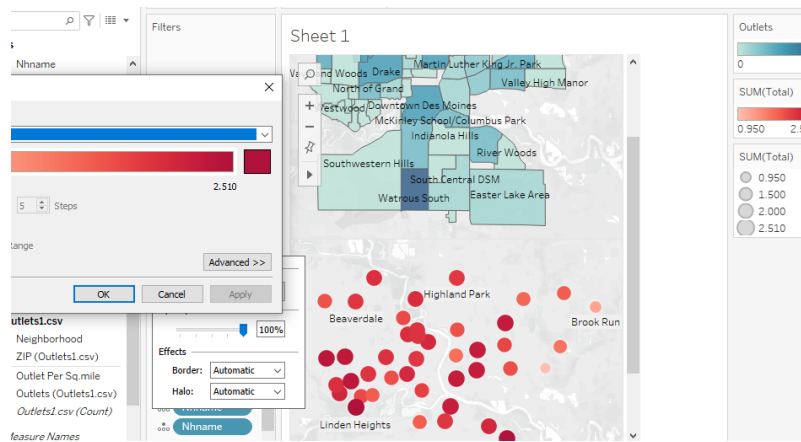




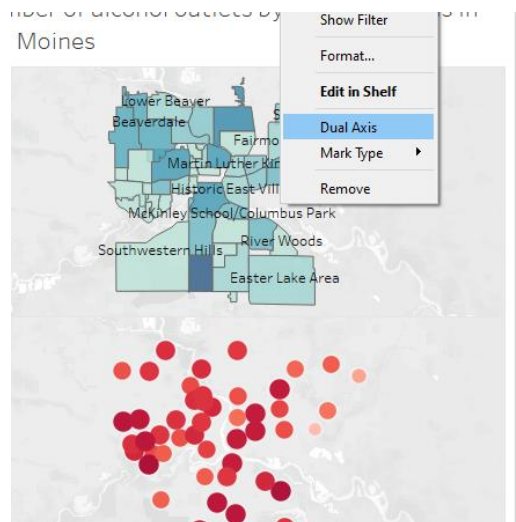
- At this point, it was just the same alcohol outlet density map being displayed in a different format (as circles). This meant that the circles were still representing the alcohol outlet density of each neighborhood. However, since I wanted the circles to show the total crime index rather than the alcohol 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



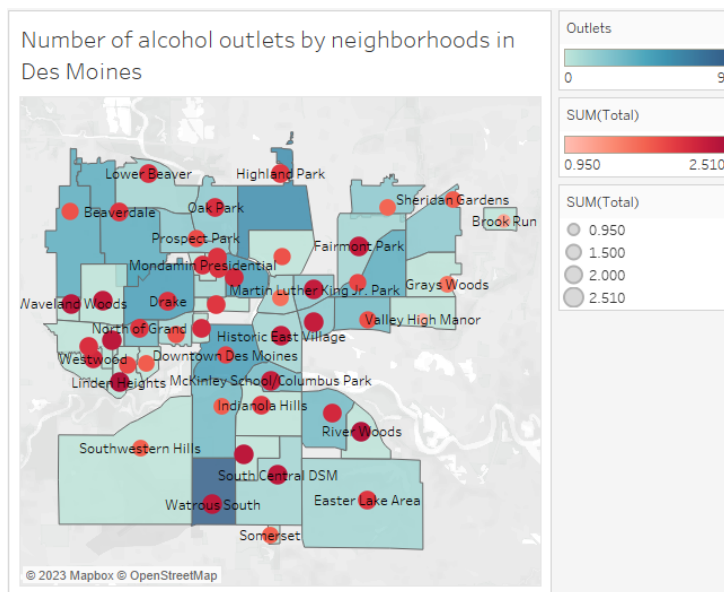
- I then changed the color of the circles to red such that it would be distinct (see image below)



- 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

Edit Parameter [Crime Type]

Name

Properties

Data type  
String

Display format  
Total Crime Index

Current value  
Total Crime

Value when workbook opens  
Current value

Allowable values

☐ All
☒ List
☐ Range

| Value                | Display As     |
|----------------------|----------------|
| Total Crime Index    | Total Crime    |
| Property Crime index | Property Crime |
| Personal Crime Index | Personal Crime |
| Click to add         |                |

☒ Fixed
☐ When workbook opens

Add values from

Remove Selected

Cancel
OK

- 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

CASE [Crime Type]
WHEN "Total Crime Index" THEN [Total Crime Index]
WHEN "Property Crime index" THEN [Property Crime index]
WHEN "Personal Crime Index" THEN [Personal Crime Index]
END

The calculation is valid.
1 Dependency
Apply
OK

# Outlet Per Sq.mile
Parameters

Sea
ABS
ACO
AND
ARE.
ASC
ASIN
ATAI
ATAI
ATTI
AVG
BUF

South
Watrous South

- 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

Edit Parameter [Alcohol outlet] X

Name  
Alcohol outlet

Properties

Data type: String  
Display format: Outlets (Outlets1.csv)

Current value: No. of Outlets  
Value when workbook opens: Current value

Allowable values

☐ All ☒ List ☐ Range

| Value                  | Display As     |
|------------------------|----------------|
| Outlets (Outlets1.csv) | No. of Outlets |
| Outlet Per Sq.mile     | Outlet Density |
| Click to add           |                |

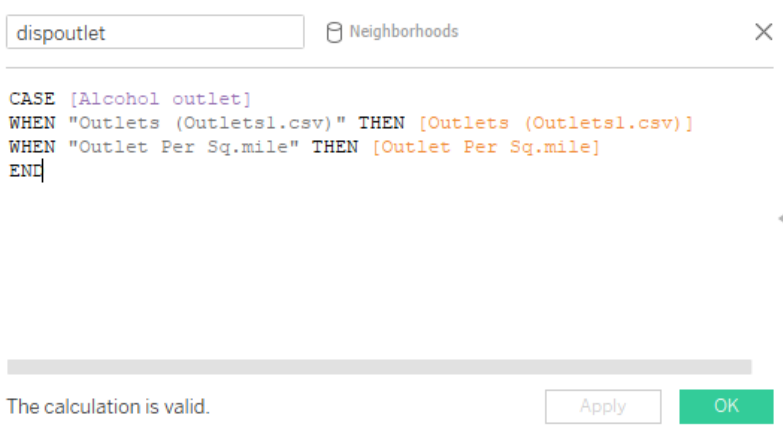
☒ Fixed ☐ When workbook opens

Add values from

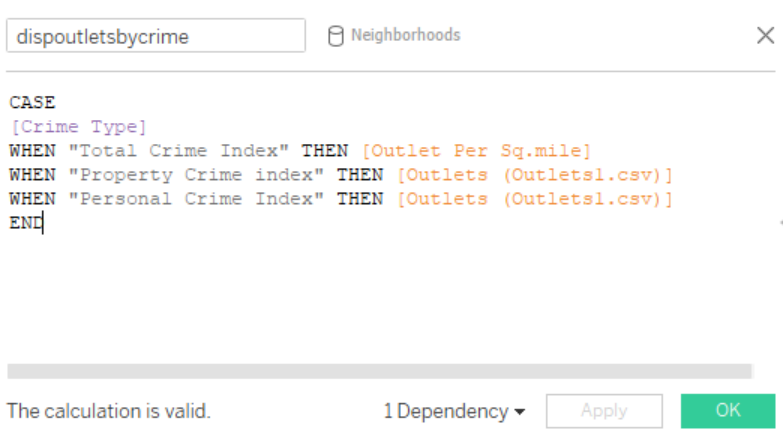
Remove Selected

Cancel OK

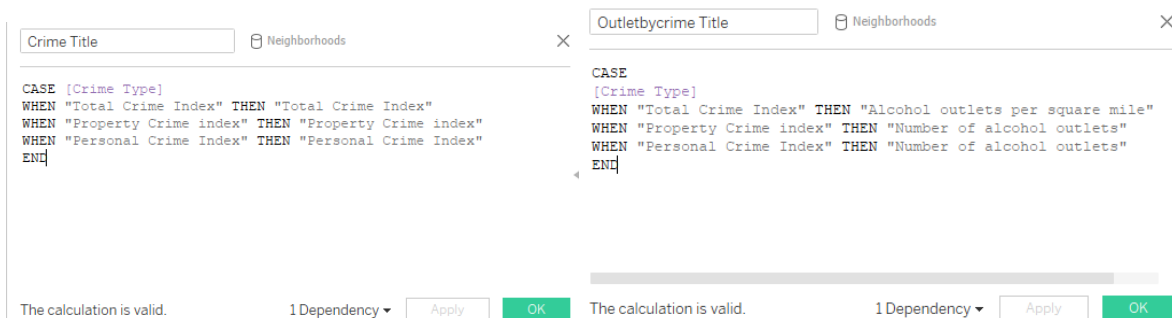
- Just like previously, I created another calculated field such that the individual elements in the **Alcohol outlet** parameter would correspond to different fields as shown below



- 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

|   |              |                      |                                   |                                   |                                            |                                      |     |   |
|---|--------------|----------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------|-----|---|
| < | Introduction | Outlets Distribution | Personal Crime & Outlets Location | Property Crime & Outlets Location | Alcohol Outlet Density & Total Crime index | Crime Type Vs Alcohol Outlet Density | Con | > |
|---|--------------|----------------------|-----------------------------------|-----------------------------------|--------------------------------------------|--------------------------------------|-----|---|

### Alcohol Outlet Density and Crime in Des Moines, Iowa

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LA 558

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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.

