

Homework 1

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Homework 1 Assignment

Assignment here: <https://eds-223-geospatial.github.io/assignments/HW1.html>

Unofficial data explorer link: <https://pedp-ejscreen.azurewebsites.net/>

Assignment: You should select a region, community, or environmental issue that matters to you.

You must complete the following:

- create two maps that communicate an environmental justice issue
- write a brief paragraph explaining what your maps communicate

Setup

```
library(stars) # for raster data (more soon!)
library(tmap) # for static and interactive maps
library(tidyverse) # wrangling
library(sf) # vectors
library(here) # File pathing
library(viridisLite) # colors
```

Read in data

```
## read in data
# read in geodatabase of EJScreen data at the Census Block Group level
ejscreen <- sf::st_read(here::here("data", "ejscreen", "EJSCREEN_2023_BG_StatePct_with_AS_C
```

```
Reading layer `EJSCREEN_StatePctiles_with_AS_CNMI_GU_VI' from data source
`/Users/caitlinnordheim/Desktop/UCSB/Coursework/eds-223/eds-223-hw1/data/ejscreen/EJSCREEN'
using driver `OpenFileGDB'
Simple feature collection with 243021 features and 223 fields
Geometry type: MULTIPOLYGON
Dimension:      XY
Bounding box:   xmin: -19951910 ymin: -1617130 xmax: 16259830 ymax: 11554350
Projected CRS:  WGS 84 / Pseudo-Mercator
```

```
# California
# filter to state of CA
california <- ejscreen %>%
  dplyr::filter(ST_ABBREV == "CA")

# find the average values for all variables within the county
ca_counties <- aggregate(california, by = list(california$CNTY_NAME), FUN = mean)

# New Mexico
# filter to state of NM
nm <- ejscreen %>%
  dplyr::filter(ST_ABBREV == "NM")

# find the average values for all variables within the county
nm_counties <- aggregate(nm, by = list(nm$CNTY_NAME), FUN = mean)
```

Map 1

Plot Percent of people of color and the diesel particulate matter pollution relationship across counties in CA

```
# base map: california counties outlined
tm_shape(ca_counties) + # vector data, use tmshape.
  tm_graticules() + # add graticules at this layer

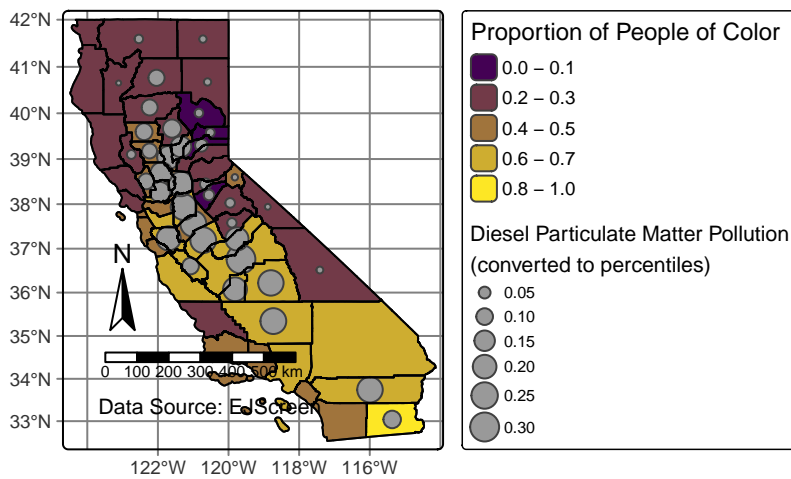
# next layer: fill by percent people of color
tm_polygons(fill = "PEOPCOLORPCT", # column name with the values
  fill.scale = tm_scale(values = viridis(2)), # specify the color scale, using viridis
  fill.legend = tm_legend(title = "Proportion of People of Color",
    position = tm_pos_out("right"))) +

# next layer: point with diesel pollution by size
tm_symbols(size = "DSLPM",
  size.legend = tm_legend(title = "Diesel Particulate Matter Pollution\n(concentration in micrograms per cubic meter)",
    orientation = "portrait",
    position = tm_pos_out("right"))) +

# next layer: label the counties
tm_borders(col = "black") + # borders of the counties

# add map elements
tm_title(text = "California Counties:\nDiesel Particulate Matter and People of Color") +
tm_compass(show.labels = 1, position = c("left", "bottom")) +
tm_scalebar(position = c("left", "bottom")) +
tm_credits("Data Source: EJScreen", position = c("left", "bottom"))
```

California Counties:
Diesel Particulate Matter and People of Color



Paragraph 1

This map depicts the state of California, and data is averaged by each county. Here, we can see that the proportion of People of Color (denoted by increasingly more yellow color) has a distinct geographical pattern, with values being higher in the Central Valley and Southern California. This map also shows the amount of Diesel Particulate Matter Pollution, where larger circles denote higher pollution levels, where the values are also higher in the Central Valley, though we are missing this data from the coastal counties of California. Interestingly, there seems to be a correlation with higher Diesel Particulate Matter in counties with more People of Color, which is a huge environmental justice issue. From this map, I would suggest to lawmakers to focus on reducing the adverse effects of pollution levels in the counties where the Diesel Pollution is highest. Moreover, they need to ensure that there is equal access to healthcare across racial groups, especially in areas with a high proportion of people of color, as more pollution exposure leads to a higher health risk. I would even recommend targeted research into how accessible and affordable healthcare is for people of color in these counties, to pinpoint barriers and improve access.

Map 2

Now let's look at the same comparison but in another state to see if the trend holds, and make some different stylistic choices to play with tmap

```

# base map: california counties outlined
tm_shape(nm_counties) + # vector data, use tmshape.
  tm_graticules() + # add graticules at this layer

# next layer: fill by percent people of color
tm_polygons(fill = "PEOPCOLORPCT", # column name with the values
            fill.scale = tm_scale(values = viridis(2)), # specify the color scale, using
            fill.legend = tm_legend(title = "Proportion of People of Color", # title of
                                     orientation = "portrait", # make this one up and down
                                     position = tm_pos_out("right")))) + # put it on the right

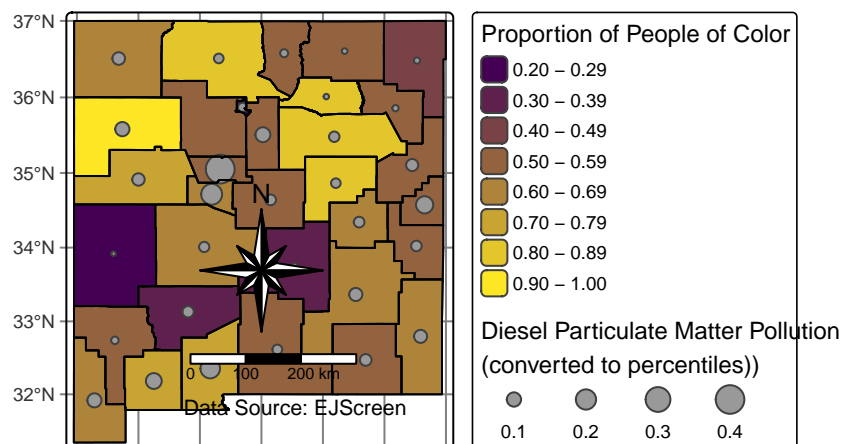
# next layer: point with diesel pollution by size
tm_symbols(size = "DSLPM", # bigger dots mean more diesel particulate matter pollution
           size.legend = tm_legend(title = "Diesel Particulate Matter Pollution\n(converted to percentiles)",
                                    orientation = "landscape", # make it landscape, why not
                                    position = tm_pos_out("right")))) + # put on the right,

# next layer: label the counties
tm_borders(col = "black") + # borders of the counties

# add map elements
tm_title(text = "New Mexico Counties:\nDiesel Particulate Matter and People of Color") +
tm_compass(show.labels = 1, type = "8star", position = c("right", "bottom")) + # add a compass
tm_scalebar(position = c("right", "bottom")) + # scale bar in bottom right
tm_credits("Data Source: EJScreen", position = c("right", "bottom")) # add data source

```

New Mexico Counties:
Diesel Particulate Matter and People of Color



Paragraph 2

Here, I am depicting the state of New Mexico to compare and contrast the trends of demographics and pollution rate to that of California, and the data is also averaged by county. There is a less clear geographic trend of areas with more or less People of Color, compared to California, that has a clear North-South and Coastal-Inland trend. Additionally, the Diesel Particulate Matter Pollution does not have a clear geographic trend either. There does seem to be a clear pattern that the areas with a very low proportion of people of color (more purple areas) have lower levels of pollution, but it is not a linear increase with more people of color like it was in California. As the pollution levels get higher (larger dots) the counties are not necessarily more yellow, in fact, the moderate values of people of color (the oranges) seem to have the highest pollution. From this map, I would still use the counties with the largest dots as areas to target to minimize the adverse effects of pollution by investing in healthcare and screening. In New Mexico, there is not a clear racial pattern in the pollution exposure disparities like in California, however it is always important to ensure all people have access to healthcare regardless of their race.

Appendix

Statistical exploration to select my demographic parameter and environmental parameter

Uncomment code and run if you like, but the plot is too large to knit so it is commented out here

```
# library (psych) # for correlation plot
#
# explore_counties_ca <- ca_counties %>%
#   st_drop_geometry() %>%
#   dplyr::select(c("PEOPCOLORPCT", "LOWINCPCT", "UNEMPPCT", "OVER64PCT", "PM25", "OZONE"))
#   drop_na()
#
# cor.plot(explore_counties_ca)
#
# # There is a positive correlation with the percent of people of color and the diesel particulate matter
#
# explore_counties_nm <- nm_counties %>%
#   st_drop_geometry() %>%
#   dplyr::select(c("PEOPCOLORPCT", "LOWINCPCT", "UNEMPPCT", "OVER64PCT", "PM25", "OZONE"))
#   drop_na()
#
# cor.plot(explore_counties_nm) # that correlation disappears in New Mexico, interesting!
```