# Environmental Justice Data Exploration

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## Introduction

This quarto document explores environmental justice issues in NorthEast Los Angeles (NELA), specifically Eagle Rock, Highland Park, Glassell Park, Cypress Park, Atwater Village, Montecito Heights, Lincoln Heights, El Sereno, and Mount Washington. There is some dispute about the official Los Angeles neighborhoods that make up NELA, so Matsuoka & Urquiza's NELA definition was utilized for this analysis (2021). NELA is an interesting case study to analyze as it is ethnically diverse and can act as a representation for what may be occuring across the United States.

*Adding the necessary libraries:*

```
library(tidyverse)
```

```
── Attaching core tidyverse packages ──────────────────── tidyverse 2.0.0.9000
──
✔ dplyr     1.1.4     ✔ readr     2.1.5
✔ forcats   1.0.0     ✔ stringr   1.5.1
✔ ggplot2   3.5.2     ✔ tibble    3.3.0
✔ lubridate 1.9.4     ✔ tidyr     1.3.1
✔ purrr     1.1.0
── Conflicts ────────────────────────────────────────── tidyverse_conflicts()
──
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all
conflicts to become errors
```

```
library(sf)
```

```
Linking to GEOS 3.13.0, GDAL 3.8.5, PROJ 9.5.1; sf_use_s2() is TRUE
```

```
library(here)
```

```
here() starts at /Users/sofiarodas/Documents/MEDS/EDS-223/eds223-hw1
```

```
library(tmap)
```

## Import 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_CNMI_GU_VI.gdb"))

Reading layer `EJSCREEN_StatePctiles_with_AS_CNMI_GU_VI' from data source
  `/Users/sofiarodas/Documents/MEDS/EDS-223/eds223-
hw1/data/ejscreen/EJSCREEN_2023_BG_StatePct_with_AS_CNMI_GU_VI.gdb'
  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

# Read in Los Angeles neighnorhood shape file
la_neighborhood <- sf::st_read(here::here("LA_Times_Neighborhood_Boundaries-
shp",
                                          "8494cd42-db48-4af1-a215-
a2c8f61e96a22020328-1-621do0.x5yiu.shp"))

Reading layer `8494cd42-db48-4af1-a215-a2c8f61e96a22020328-1-621do0.x5yiu'
from data source `/Users/sofiarodas/Documents/MEDS/EDS-223/eds223-
hw1/LA_Times_Neighborhood_Boundaries-shp/8494cd42-db48-4af1-a215-
a2c8f61e96a22020328-1-621do0.x5yiu.shp'
  using driver `ESRI Shapefile'
Simple feature collection with 114 features and 2 fields
Geometry type: MULTIPOLYGON
Dimension:     XY
Bounding box:  xmin: 6359592 ymin: 1715035 xmax: 6514633 ymax: 1945515
Projected CRS: NAD83 / California zone 5 (ftUS)
```

## Subset Data

*Changing column names to lower_snake*

```
ejscreen <- janitor::clean_names(ejscreen)
```

*Filter for Los Angeles County*

```
los_angeles <- ejscreen |>
  filter(cnty_name == "Los Angeles County")
```

*Filter for NELA neighborhoods*

```
la_neighborhood <- la_neighborhood |>
  filter(name == "Eagle Rock" |
           name == "Highland Park" |
           name == "Mount Washington" |
           name == "Glassell Park" |
           name == "Cypress Park"|
           name == "Montecito Heights"|
           name == "Atwater Village"|
           name == "Lincoln Heights"|
           name == "El Sereno"  )
```

## Data Manipulation

*Changing the measure from 0-1 to 0-100*

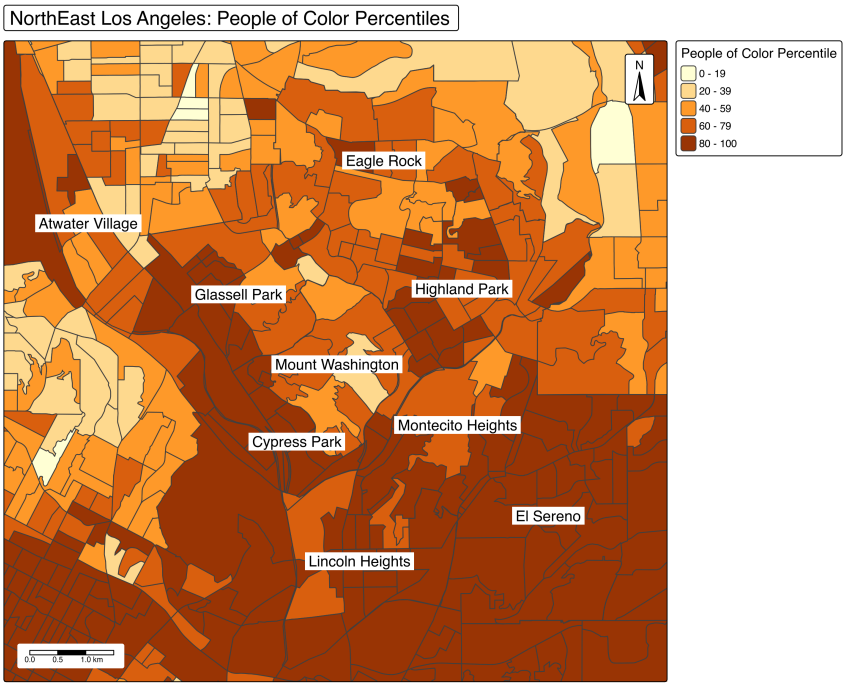
```
los_angeles <- los_angeles |>
  mutate(poc_ile = (peopcolorpct * 100))
```

# Visualize Data

## Map: People of Color Percentile in NorthEast Los Angeles

```
 poc_percentiles <- tm_shape(los_angeles)+
  tm_polygons(fill = "poc_ile",
              fill.scale = tm_scale(values = "brewer.YlOrBr"),
              fill.legend = tm_legend(title = "People of Color Percentile"))
+
tm_shape(la_neighborhood, is.main = TRUE) + # is.main to set the size of map
  tm_borders() + # Use tm_borders so the layer under is visible
  tm_text("name", # Name helps distinguish what part of LA is being mapped
          shadow = TRUE,
          bgcol = "white") +
  tm_title(text = "NorthEast Los Angeles: People of Color Percentiles",
           frame = TRUE)+
  tm_compass(position = c("right", "top"),
             bg = TRUE,
             bg.color = "white",
             frame = TRUE)+
  tm_scale_bar(position = c("left", "bottom"),
               bg = TRUE,
               bg.col = "white")



── tmap v3 code detected
──────────────────────────────────────────────────────────────

[v3->v4] `tm_text()`: migrate the layer options 'shadow' to 'options =
opt_tm_text(<HERE>)'
! `tm_scale_bar()` is deprecated. Please use `tm_scalebar()` instead.

# Save map and define the size
tmap_save(poc_percentiles,
          here::here("maps", "poc_percentiles.png"),
          height = 8,
          width = 14)

[cols4all] color palettes: use palettes from the R package cols4all. Run
`cols4all::c4a_gui()` to explore them. The old palette name "brewer.YlOrBr"
is
named "yl_or_br" (in long format "brewer.yl_or_br")
Map saved to /Users/sofiarodas/Documents/MEDS/EDS-223/eds223-
```

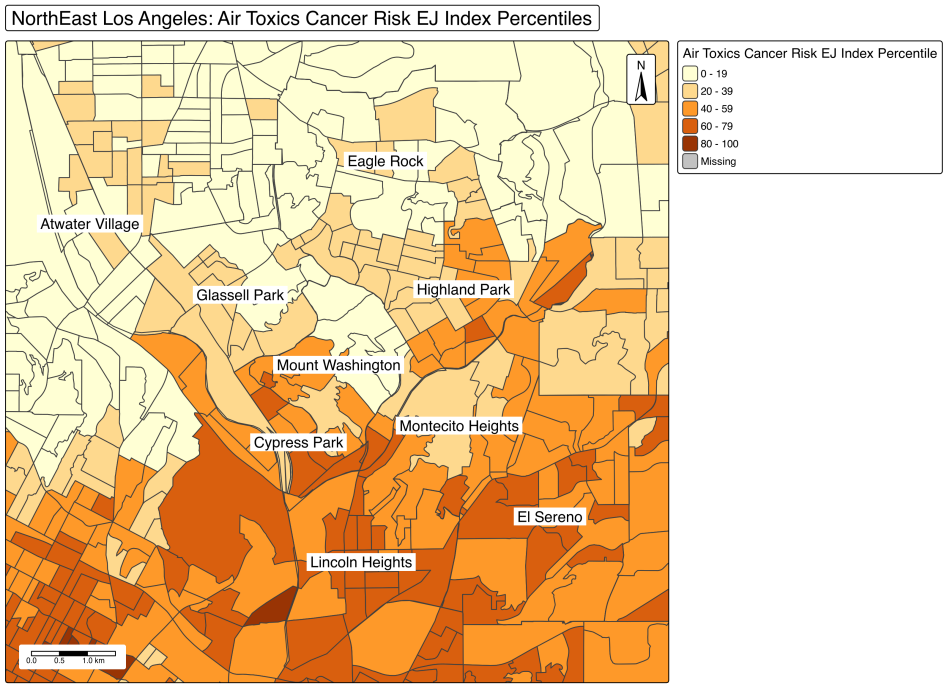
```
hw1/maps/poc_percentiles.png

Resolution: 4200 by 2400 pixels

Size: 14 by 8 inches (300 dpi)

# Show map in the quarto doc
print(poc_percentiles)

[cols4all] color palettes: use palettes from the R package cols4all. Run
`cols4all::c4a_gui()` to explore them. The old palette name "brewer.YlOrBr"
is
named "yl_or_br" (in long format "brewer.yl_or_br")
[plot mode] fit legend/component: Some legend items or map compoments do not
fit well, and are therefore rescaled.
ℹ Set the tmap option `component.autoscale = FALSE` to disable rescaling.
```




## Map: Air Toxics Cancer Risk Percentile, an Environmental Justice (EJ) Index in NorthEast Los Angeles

```
air_cancer_risk <- tm_shape(los_angeles)+
  tm_polygons(fill = "d2_cancer",
              fill.scale = tm_scale(values = "brewer.YlOrBr"),
              fill.legend = tm_legend(title = "Air Toxics Cancer Risk EJ
Index Percentile")) +
tm_shape(la_neighborhood, is.main = TRUE) + #is.main to set the size of the
map
  tm_borders() + # Use tm_borders so the layer under is visible
  tm_text("name", # Name helps distinguish what part of LA is being mapped
```

```
          shadow = TRUE,
          bgcol = "white") +
  tm_title(text = "NorthEast Los Angeles: Air Toxics Cancer Risk EJ Index
Percentiles",
           frame = TRUE)+
  tm_compass(position = c("right", "top"),
             bg = TRUE,
             bg.color = "white",
             frame = TRUE) +
  tm_scale_bar(position = c("left", "bottom"),
               bg = TRUE,
               bg.col = "white")



── tmap v3 code detected
──────────────────────────────────────────────────────────────

[v3->v4] `tm_text()`: migrate the layer options 'shadow' to 'options =
opt_tm_text(<HERE>)'
! `tm_scale_bar()` is deprecated. Please use `tm_scalebar()` instead.

# Save map and define the size
tmap_save(air_cancer_risk,
          here::here("maps", "air_cancer_risk.png"),
          height = 8,
          width = 14)

[cols4all] color palettes: use palettes from the R package cols4all. Run
`cols4all::c4a_gui()` to explore them. The old palette name "brewer.YlOrBr"
is
named "yl_or_br" (in long format "brewer.yl_or_br")
Map saved to /Users/sofiarodas/Documents/MEDS/EDS-223/eds223-
hw1/maps/air_cancer_risk.png

Resolution: 4200 by 2400 pixels

Size: 14 by 8 inches (300 dpi)

# Show map in the quarto doc
print(air_cancer_risk)

[cols4all] color palettes: use palettes from the R package cols4all. Run
`cols4all::c4a_gui()` to explore them. The old palette name "brewer.YlOrBr"
is
named "yl_or_br" (in long format "brewer.yl_or_br")
[plot mode] fit legend/component: Some legend items or map compoments do not
fit well, and are therefore rescaled.
ℹ Set the tmap option `component.autoscale = FALSE` to disable rescaling.
```




## Map Interpretation

The first graph above shows the percentile of people of color for each Census block. The second graph shows the percentile of air toxics cancer risk environmental justice index. The opacity of the orange darkens as the percentiles increase. The air toxics cancer risk environmental justice index is based on the estimated risk of inhaling carcinogens in the ambient air. There is an apparent correlation showing that the higher the percentile of people of color that live in an area, the more likely a community is to have a higher percentile for air toxics cancer risk environmental justice index. In other words, people of color are exposed to cancer risks from their ambient environment at a higher rate.

Though disheartening, the finding that people of color live where environmental pollution health risks are greater raises awareness of the issue and is the first step to making policy change that can help offset injust risks. Air toxics is just one of the many environmental justice indices. Further analysis of the distribution of risks ranging from toxic wastewater discharge to lead paint in homes can help show accumulated environmental risks for people of color and shows the immediate need for intervention to reduce negative outcomes for marginalized communities.

# References


- LA Times. (2016). LA Times Neighborhood Boundaries. Retrieved from URL
- Matsuoka, Martha & Urquiza, John. (2021). Building community knowledge, resilience and resistance through research. GeoJournal. 87. 10.1007/s10708-021-10422-5.
- U.S. Environmental Protection Agency (EPA), 2023. EJScreen Technical Documentation.