

EDS 223 HW#1

Assessing proximity of hazardous waste disposal sites to low income communities

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Purpose:

The purpose of this document is to practice geospatial data analysis by creating visually appealing maps that display an environmental injustice in Michigan's Murray County.

Workflow:

1) Load in the relevant libraries

```
library(tidyverse)
library(sf)
library(here)
library(tmap)
library(stars)
library(terra)
```

2) 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"))
```

```
Reading layer 'EJSCREEN_StatePctiles_with_AS_CNMI_GU_VI' from data source
'/Users/henryoliver/Documents/MEDS/EDS-223/hw/hw1/eds223-hw1/data/ejscreen/EJSCREEN_2023_BG_StatePct_with_AS'
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
```

3) Read in other data to be used in map display

```
# Shapefile for cities in detroit, filtered for most populous
mi_cities <- sf::st_read(here::here("data", "tl_2017_26_place", "tl_2017_26_place.shp"))
filter((NAME == "Detroit" ) | (NAME == "Dearborn"))
```

```
Reading layer 'tl_2017_26_place' from data source
'/Users/henryoliver/Documents/MEDS/EDS-223/hw/hw1/eds223-hw1/data/tl_2017_26_place/tl_26'
using driver 'ESRI Shapefile'
Simple feature collection with 692 features and 16 fields
Geometry type: MULTIPOLYGON
Dimension: XY
Bounding box: xmin: -90.19361 ymin: 41.71058 xmax: -82.39871 ymax: 47.47831
Geodetic CRS: NAD83
```

```
# Read in shapefile for the great lakes
great_lakes <- sf::st_read(here::here("data", "GL250515_lam", "GL250515_lam.shp"))
```

```
Reading layer 'GL250515_lam' from data source
'/Users/henryoliver/Documents/MEDS/EDS-223/hw/hw1/eds223-hw1/data/GL250515_lam/GL250515_lam'
using driver 'ESRI Shapefile'
Simple feature collection with 1 feature and 18 fields
Geometry type: POLYGON
Dimension: XY
Bounding box: xmin: 608936.6 ymin: 295807.5 xmax: 1924497 ymax: 1103689
Projected CRS: WGS_1984_Lambert_Conformal_Conic
```

4) Summarize geometries to get just state borders (for inset map)

```
states <- ejscreen %>%
  group_by(ST_ABBREV) %>%
  summarise() %>%
  ungroup()
```

5) Further filter data

```
# filter to Michigan
michigan <- ejscreen %>%
  dplyr::filter(ST_ABBREV == "MI")

# Create a shapefile for just the counties
mi_counties <- michigan %>%
  group_by(CNTY_NAME) %>%
  summarise() %>%
  ungroup()

# filter to Wayne County and surrounding counties in map extent
wayne <- michigan %>%
  dplyr::filter(CNTY_NAME %in% c("Wayne County",
  "Oakland County",
  "Macomb County",
  "Washtenaw County",
  "Monroe County"))
```

6) Create bounding boxes for primary map(s) and inset map(s)

```
# Set bounds for primary display maps
bounds <- st_bbox(c(xmin = -83.6, xmax = -82.63, ymin = 42.02, ymax = 42.5))

# Set bounds for inset map
state_bounds <- st_bbox(c(xmin = -89, xmax = -76, ymin = 39, ymax = 47))
```

7) Create inset map

```
# Create inset map
# Set bounds to states
inset_map <- (
```

```
tm_shape(states, bbox = state_bounds) +
  tm_polygons(fill = "#feff0d9") +
  tm_text("ST_ABBREV", # Add text to include state abbreviation
```

```
size = 0.75, # Set text size
```

```
col = "black", # Color
```

```
fontface = "bold", # Make it bold
```

```
xmod = 1.35, ymod = -0.75) + # Change the position of text relative to centroid
```

```
tm_shape(great_lakes) + # Add the great lakes shape
```

```
tm_polygons(fill = "lightblue"))
```

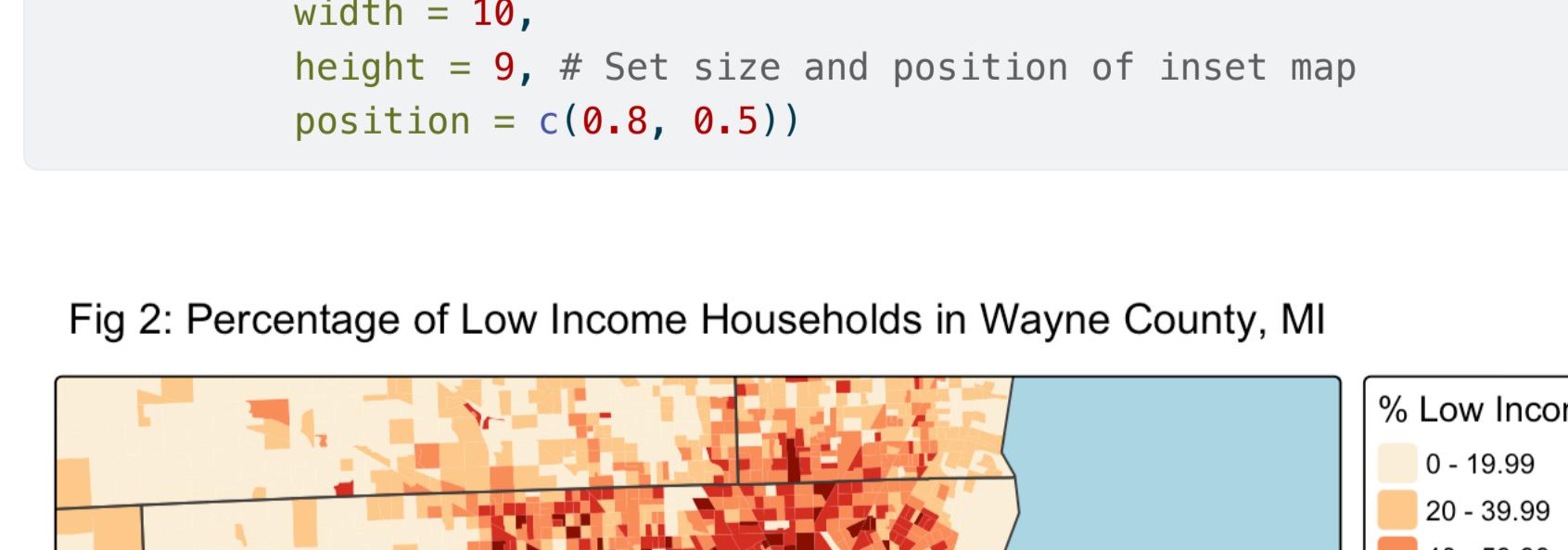
8) Create palette for display

```
# Create palette for hazardous waste sites and % income
palette = palette = (c("#feff0d9",
  "#fdcc8a",
  "#fc8d59",
  "#d7301f",
  "#8b0000"))
```

9) Create map displaying proximity to Hazardous Waste Sites

```
tm_shape(wayne, bbox = bounds) + # Plot county polygons within bounds
  tm_polygons(fill = 'PTSDF', # Determine fill parameter (proximity to haz. waste)
  breaks = c(0, 1, 3, 5, 7, Inf), # Set bin breaks
  palette = palette, # Set color palette
  lty = 'blank', # Remove census borders,
  title = "Sites within 5km", # Title legend
  labels = c("0", "1-2", "3-5", "5-7", "7+")) + # Set legend labels
  tm_shape(mi_counties, bbox = bounds) + # Add county borders
  tm_borders() +
  tm_shape(great_lakes)+ # Add great lakes borders
  tm_polygons(fill = "lightblue") +
  tm_shape(mi_cities) + # Determine shape for most populous cities
  tm_dots() + # Add points for most populous cities
  tm_text(text = "NAME", ymod = 0.5, fontface = "bold", size = 0.75) +
  tm_layout(title = "Fig 1: Proximity to Hazardous Waste Sites in Wayne County, MI", # A
  size = 3,
  title.position = c(0, 1.1)) + # Specify title position
  tm_scale_bar(position = c(0.65, 0.32), size = 3) +
  tm_compass(position = c(0.65, 0.32), size = 3) +
  tm_inset(inset_map, # Add inset map
  width = 10,
  height = 9, # Set size and position of inset map
  position = c(0.8, 0.5))
```

Fig 1: Proximity to Hazardous Waste Sites in Wayne County, MI



Map showing proximity to hazardous waste sites in Wayne County, MI. The map uses a color scale to represent the number of sites within 5 km. The inset map shows the location of Wayne County within the state of Michigan.

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