

TOD Assignment Review

& Tips for the midterm



Anna Duan, March 15, 2024 | Public Policy Analytics

(R)Markdown

Markdown theme

- Preset formatting & fonts
- flatly, cosmo, cerulean, united are all good options

```
1 ---
2 title: "HIP Code Sharing Template"
3 author: "Anna Duan"
4 date: "`r Sys.Date()`"
5 output:
6   html_document:
7     keep_md: yes
8     toc: yes
9     theme: flatly
10    toc_float: yes
11    code_folding: hide
12    number_sections: no
13    fontsize: 12pt
14  pdf_document:
15    toc: yes
16 editor_options:
17   markdown:
18     wrap: 72
19 ---
20
```

Policy Brief: Transit-Oriented Development in Washington, DC

[Code](#)

Tao Chen

2024-02-16

Introduction

With DC's population growing consistently, at 1.2% as of summer 2023, the importance of good transportation will be critical for the continuous growth of our city. At the same time, transit-oriented development, or the maximisation of residential, business, and leisure space with walking distance of public transport, ought to be encouraged to reduce the number of cars on the road. Across the Potomac in Virginia, Tysons in Fairfax county has been cited as a successful case of TOD, bringing people close to the transit hub while providing all core services needed in a dense neighbourhood.

We will look through some data to examine the state of TOD in DC proper. Specifically: 1. The proportion of the population without a car 2. Median household income 3. Median rent 4. The proportion of the population identifying as White

A comparative of these indicators of those census tracts with TOD - defined to be within half a mile of a WMATA metro station - and non-TOD will yield useful information about the importance of TOD.

It should be emphasised here that this report only examines trends in DC proper and not those in Maryland and Virginia, where WMATA also serves.

Set Up

Retrieving Census Data

Data from the America Community Survey (5-year estimate) will be used for this analysis to collect a snapshot of American demographic, social, economic, and housing data. The years 2010 and 2019 are chosen because of the availability of data for households with no car, and the impact COVID had on 2020 data, causing significant anomalies in that year's census data.

[Hide](#)

```
# Fetch ACS data for Washington D.C. tracts
tracts10 <-
  get_acs(geography = "tract",
    variables = c("B25026_001E", "B02001_002E",
                  "B19013_001E", "B25058_001E",
                  "B06012_002E", "B08014_002E"),
```

Table of contents

- Hierarchical table of contents based on markdown formatting

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19 ---
```

Atlanta City Council Policy Brief

Do households value transit-rich neighborhoods compared to others?

MARTA

Transit Oriented Development

Calculating Value

To Conclude

Appendix

Code folding

- Fold & show code using buttons

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15    toc: yes
16 editor_options:
17   markdown:
18     wrap: 72
19 ---
```

estimates, and Link Light Rail station data from Sound Transit. ACS data was gathered using the TidyCensus package in R.

Hide

```
# Load Libraries

library(tidyverse)
library(tidycensus)
library(sf)
library(scales)
library(gt)
library(gtExtras)
library(ggthemes)
library(RColorBrewer)
library(viridis)
```

```
options(scipen=999)
options(tigris_class = "sf")
```

Hide

```
seattle <- st_read("city-limits.geojson") %>%
  st_transform('ESRI:103178')

link_stat_comms <- c("Seattle", "Mercer Island", "Bellevue", "Redmond", "Tukwila", "SeaTac")
wa_muni <- st_read("WSDOT--City_Limits.geojson") %>%
  st_transform('ESRI:103178') %>%
  filter(CityName %in% link_stat_comms)
```

Hide

```
tracts19 <-
  get_acs(geography = "tract",
    variables = c("B25026_001E", "B02001_002E",
      "B15001_050E", "B15001_009E",
      "B19013_001E", "B25058_001E",
      "B06012_002E",
      "B25001_001E"),
    year=2019, state=53, county=033,
    geometry=TRUE, output="wide") %>%
  st_transform('ESRI:103178') %>%
```

Chunk options

- Hide unnecessary output, ignore code

```
69
70 ```{r setup, include=FALSE}
71 knitr::opts_chunk$set(
72   echo = TRUE,
73   message = FALSE,
74   warning = FALSE,
75   cache = TRUE
76 )
```

Retrieving WMATA Data

The DC transit data is provided by the city government's GIS service [DC](#). The layer is then reprojected to match that of the census data. The WMATA stations are then narrowed down to just those in DC boundaries.

```
## Reading layer `OGRGeoJSON' from data source
##   `https://maps2.dcgis.dc.gov/dcgis/rest/services/DCGIS_DATA/Transportation_Rail_Bus_WebMercator/MapServer/5
1/query?outFields=*&where=1%3D1&f=geojson'
##   using driver `GeoJSON'
## Simple feature collection with 98 features and 14 fields
## Geometry type: POINT
## Dimension:      XY
## Bounding box:   xmin: -77.49154 ymin: 38.76653 xmax: -76.84455 ymax: 39.11994
## Geodetic CRS:   WGS 84
```

```
## Warning: attribute variables are assumed to be spatially constant throughout
## all geometries
```

Here's a quick map of the whole WMATA rail system, highlighting stations that are in DC

=====	10%
=====	12%
=====	14%
=====	16%
=====	19%
=====	21%
=====	23%
=====	24%
=====	26%
=====	27%
=====	29%
=====	31%
=====	35%
=====	36%
=====	40%
=====	42%
=====	45%
=====	47%
=====	48%
=====	50%
=====	52%
=====	54%

Custom figure size

- Resize plots for clarity
- Recommended maximum: 10x10

```
92
93 ```{r data_processing, fig.height=6, fig.width=4}
94 # Load data
95
96 ```
97
98 ## Analysis
99
100 Use this chunk to run your analysis. You may need multiple
101 analysis
102 chunks, depending on the complexity of your code.
103 ```{r analysis}
```

Chunk Name: data_processing

Output: (Use document default)

☐ Show warnings

☐ Show messages

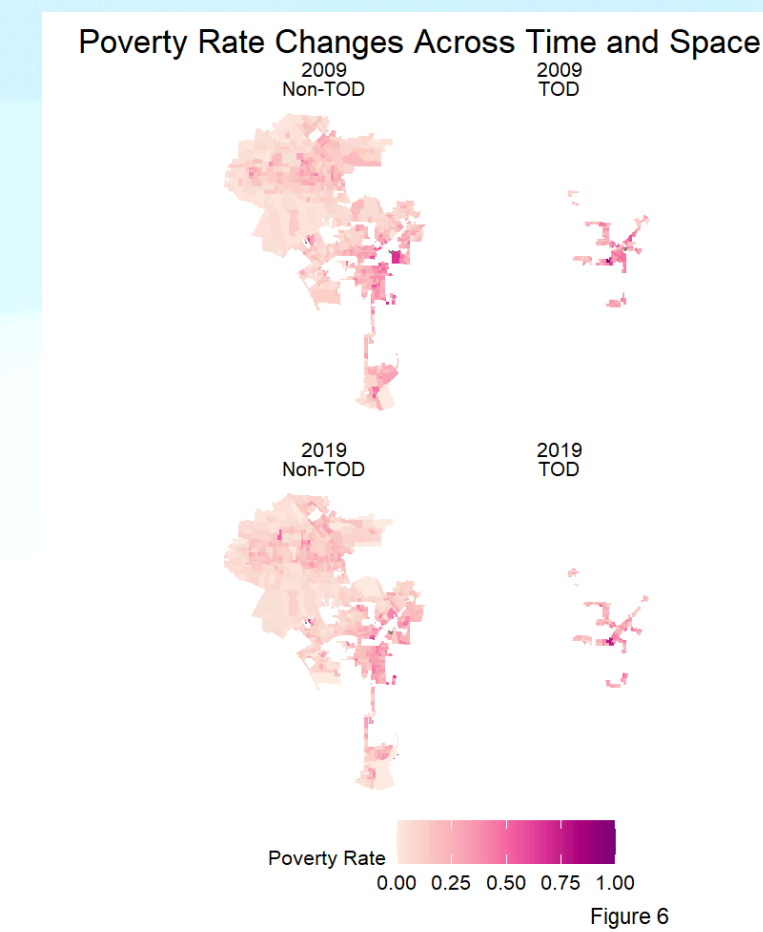
☐ Use paged tables

☐ Use custom figure size

Width (inches): 4

Height (inches): 6

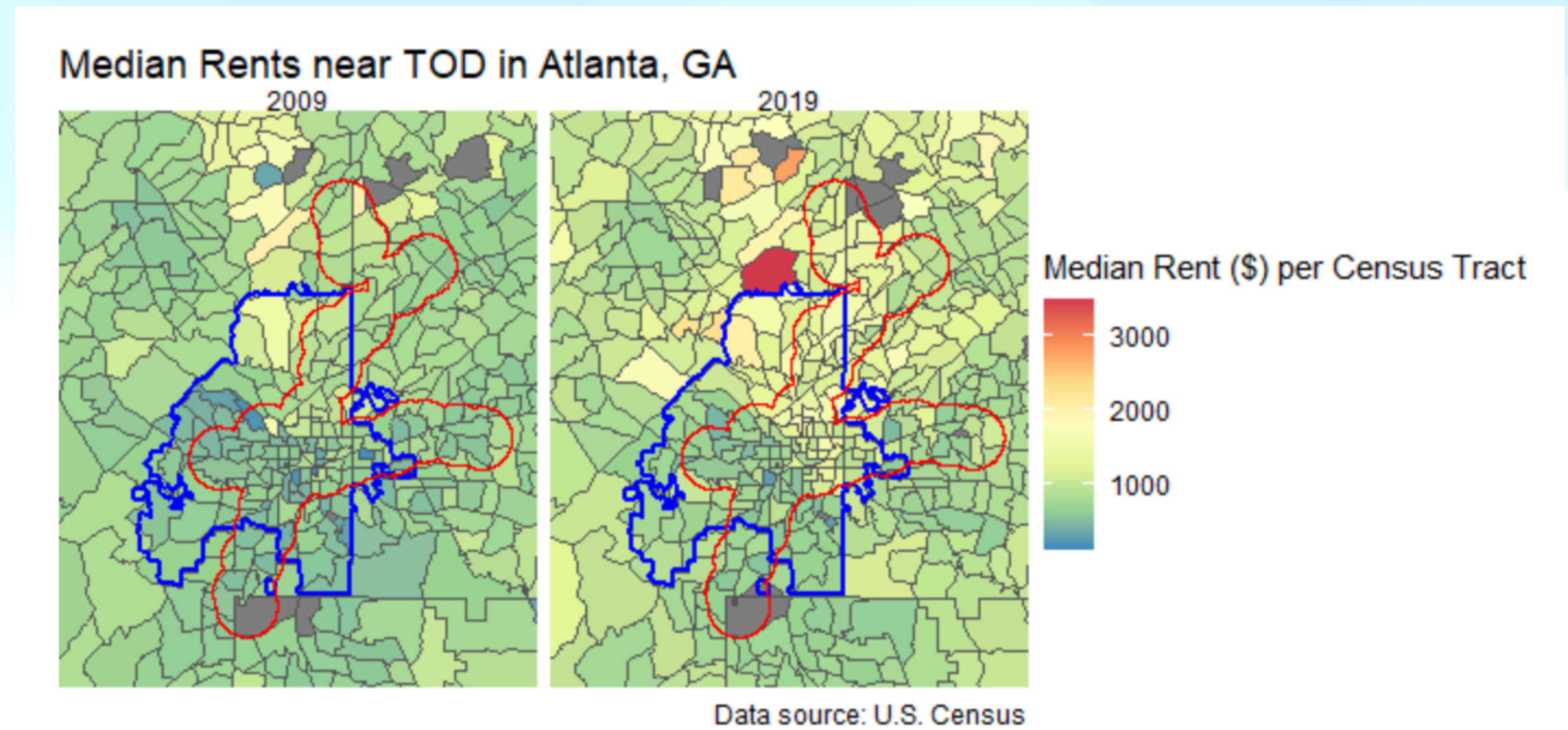
[? Chunk options](#) Revert Apply



ggplot2/dataviz

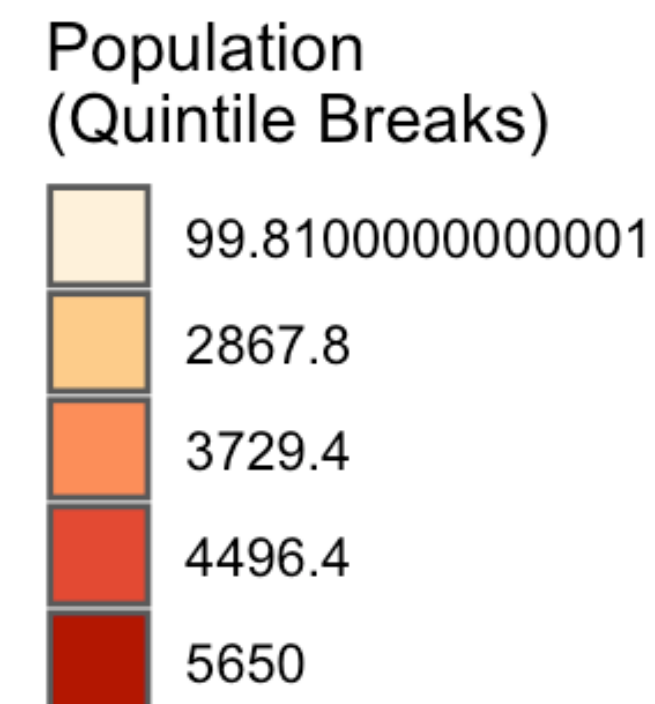
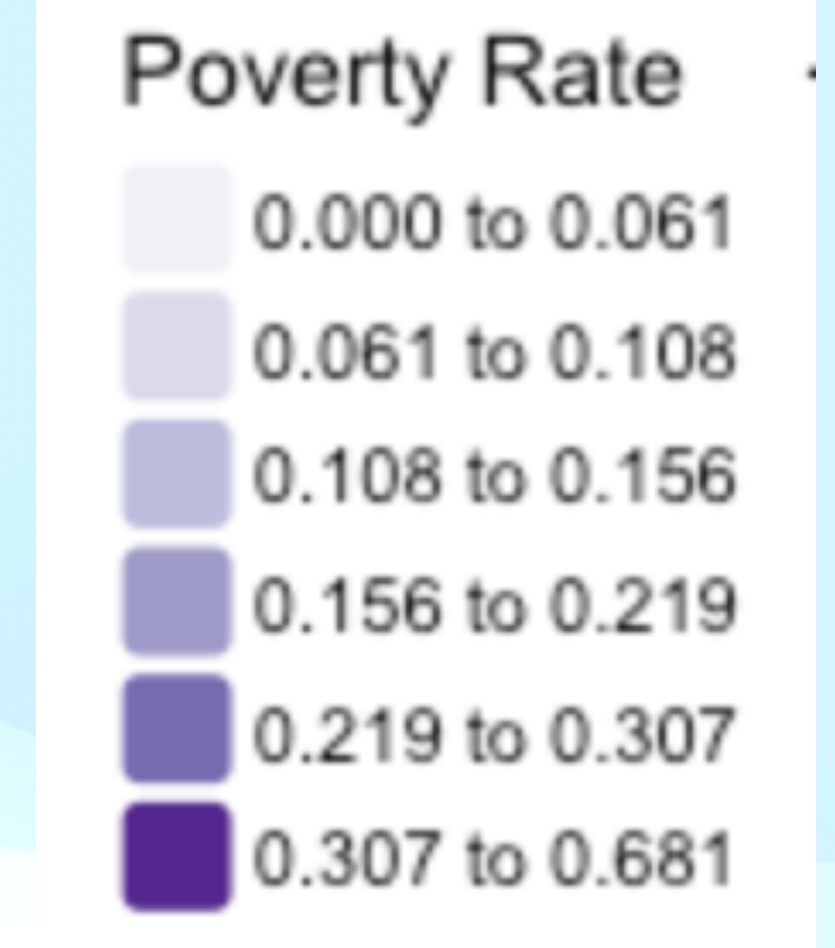
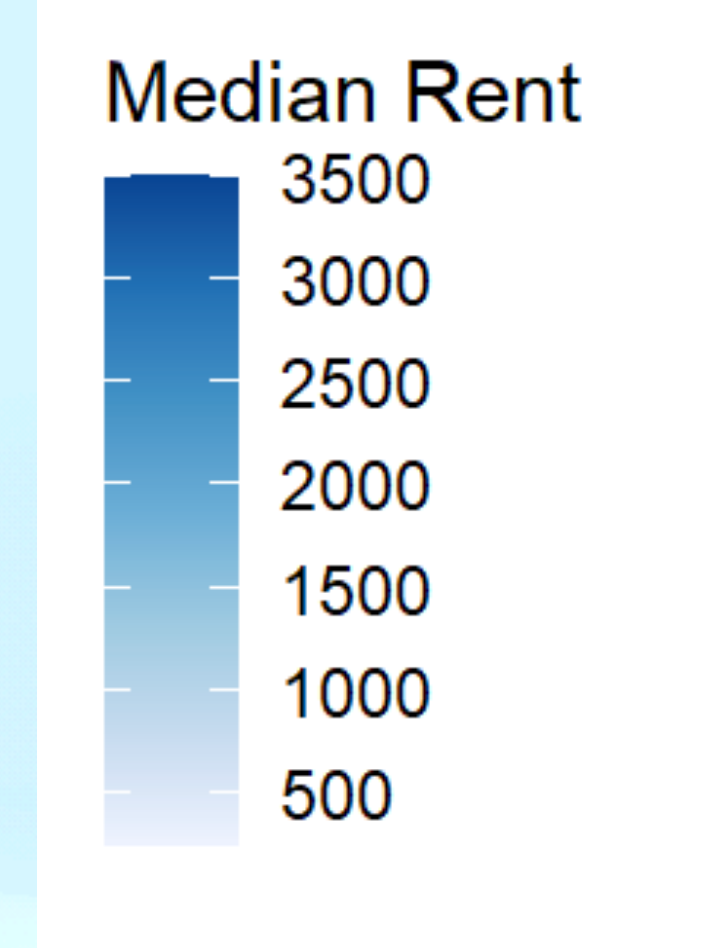
Legend position

- Use `theme(legend.position = "bottom")` to reduce white space



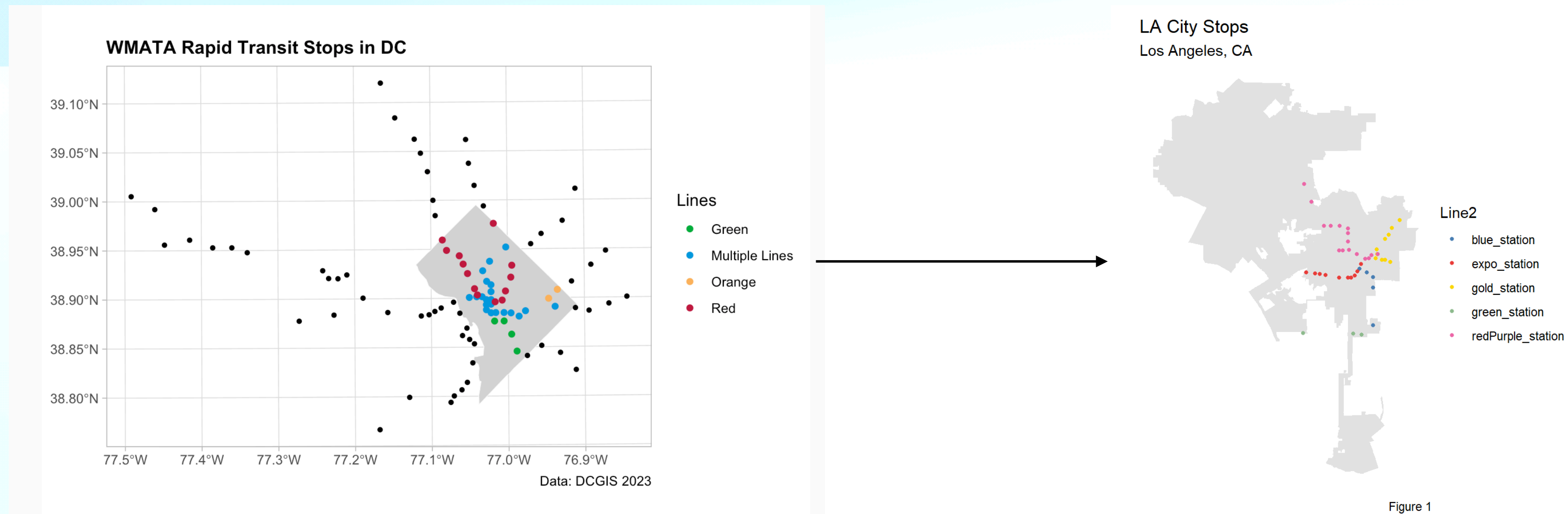
Legend units

- For easier interpretation:
 - Divide big numbers by 1000
 - Multiply percentage values to show percentage points
 - Round legend values
 - Manually adjust number of “breaks”



ggplot themes

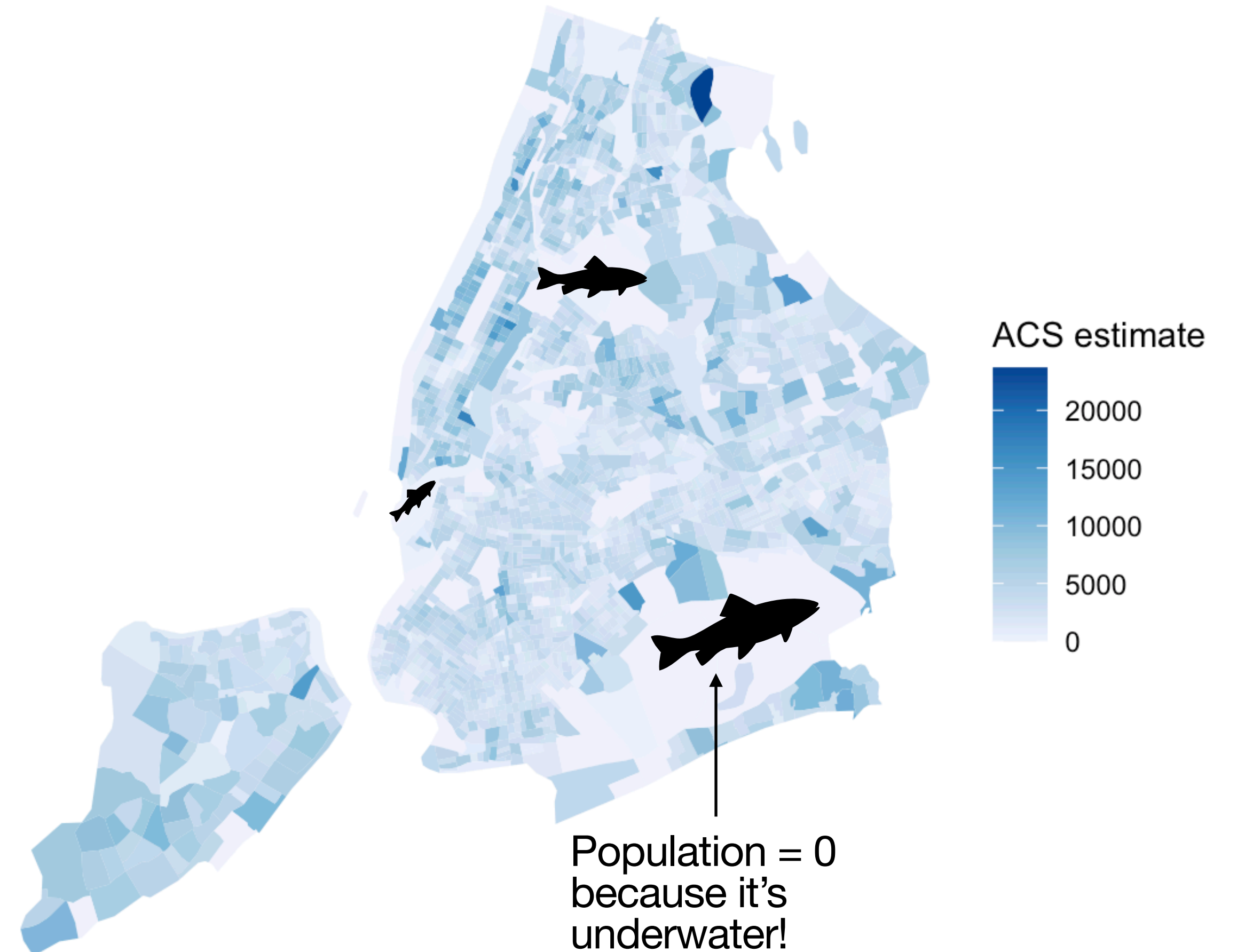
- `theme_void()` for maps
- `theme_minimal()` for plots



Remove water

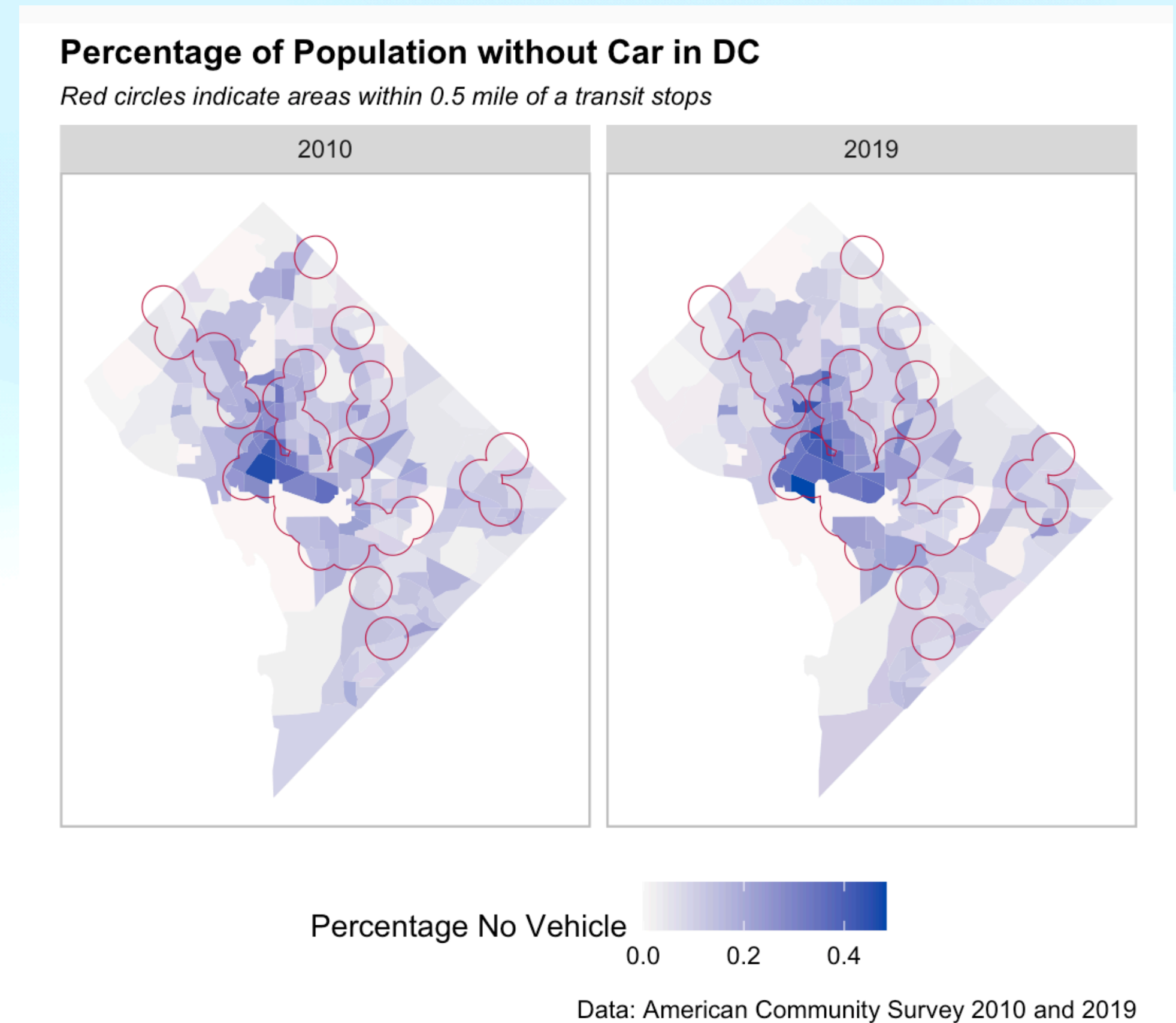
- Use `tigris::erase_water()` to remove water polygons
- **Example:** `nyc_tracts <- nyc_tracts %>% erase_water()`

A2: 2009 Population Estimates, New York



Change plots

- Map the change between year 1 and year 2 so viewers don't have to compare two maps
- `geom_sf(data = pop_18 - pop_10...`



Polygon boundaries

- `theme_void()` for maps
- `theme_minimal()` for plots
- **code:** `geom_sf(data = dat.sf, color = "transparent" ...`

Tracts within Train Station Buffer Zones

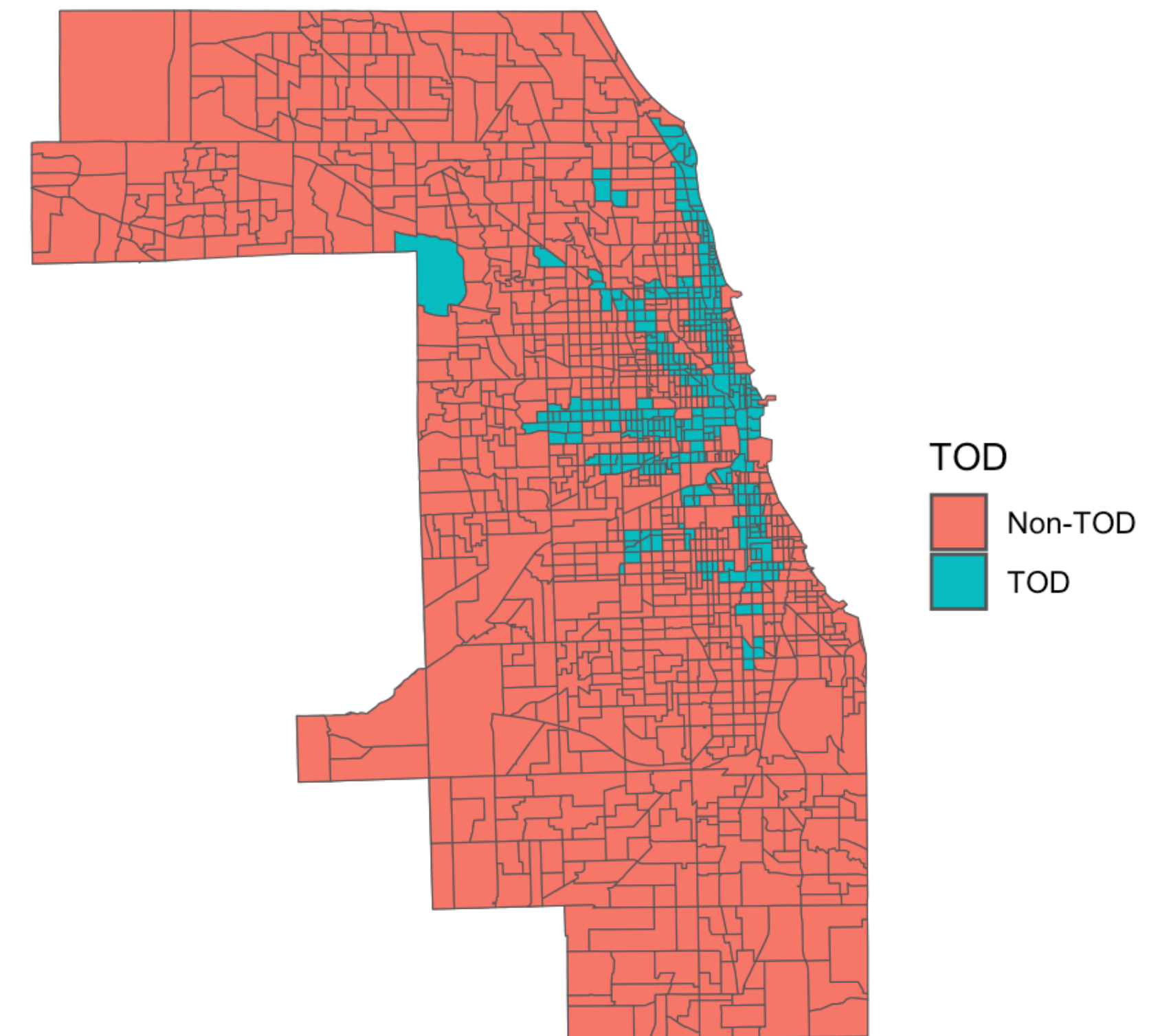


Figure 3

report structure

Report narrative

- Focus on the main story/argument over the steps you take
- Be careful with languages like “causes”, “affects”, or “impacts”
- This isn’t a tutorial - no need to visualize/thoroughly discuss data processing

Avoid section titles like this:

TOD Indicator Maps
TOD Indicators Plot
TOD Indicators Table

We don’t need to see this:

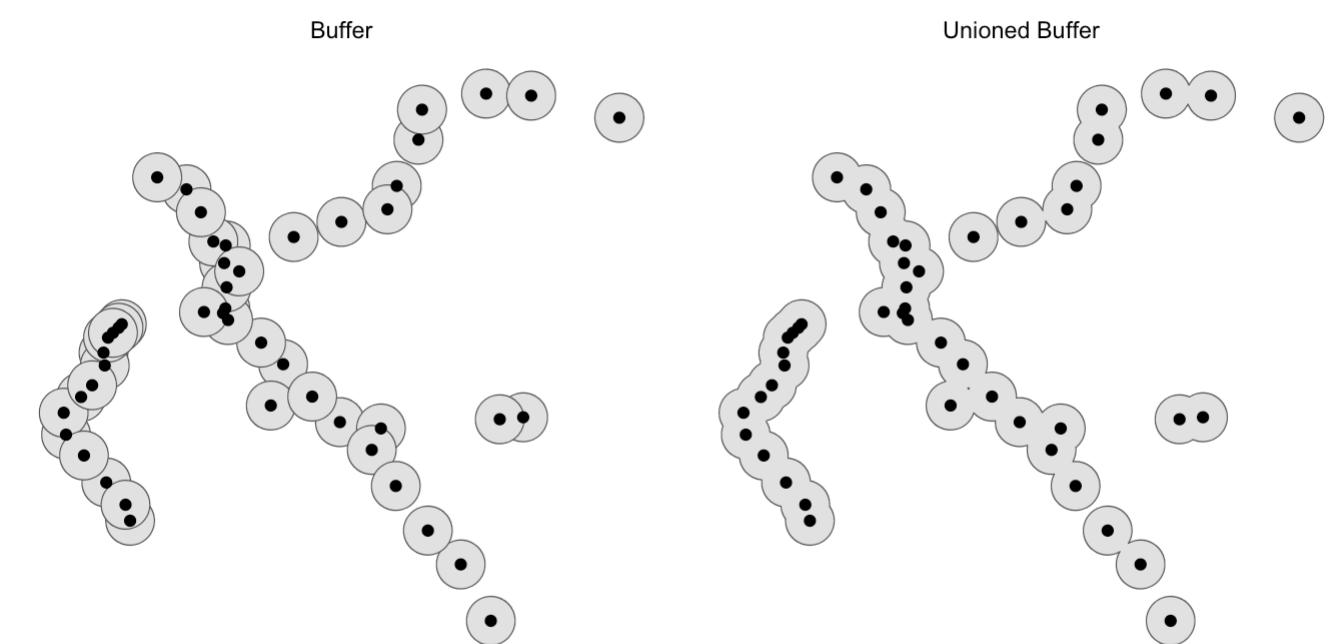
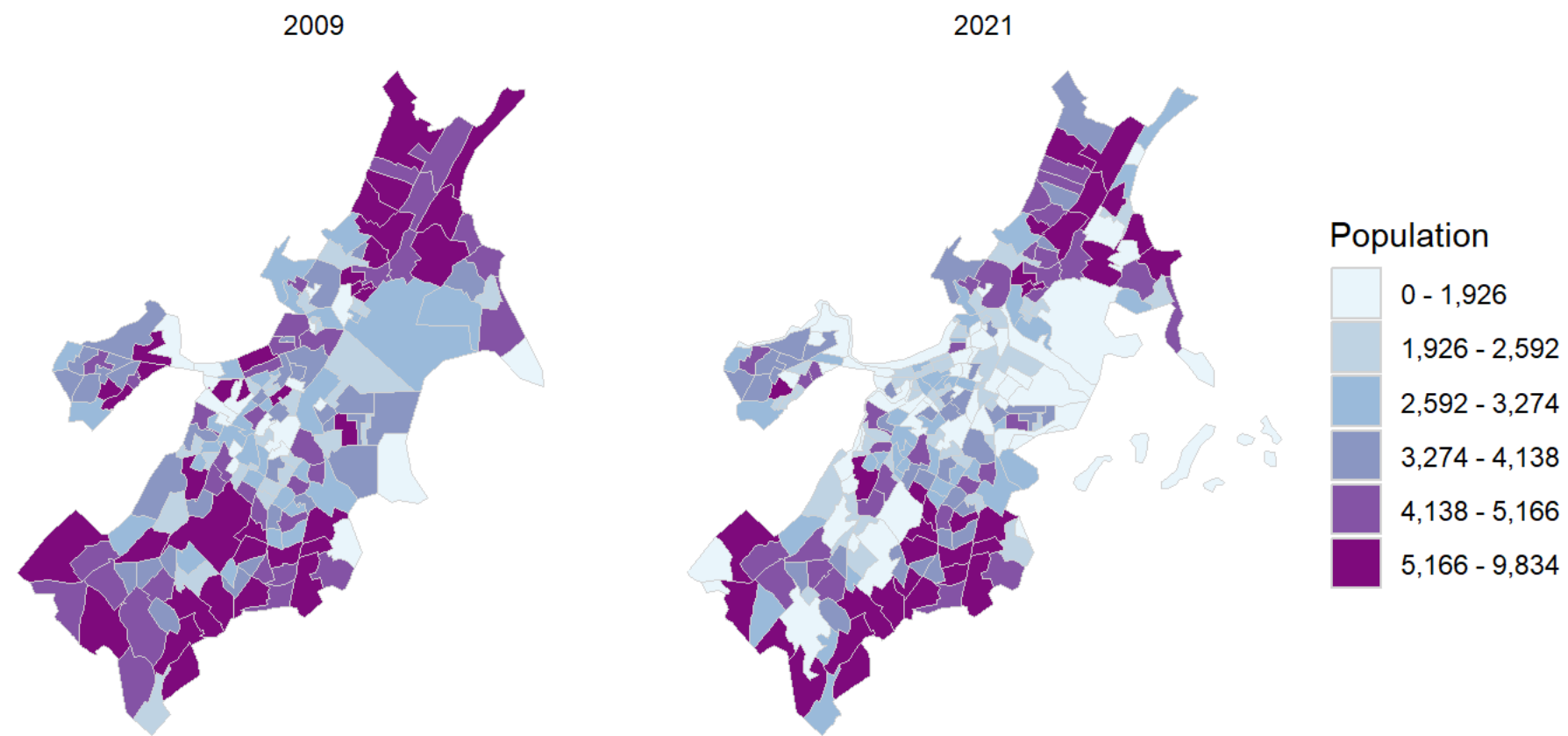


Figure 1.4

Hall of fame

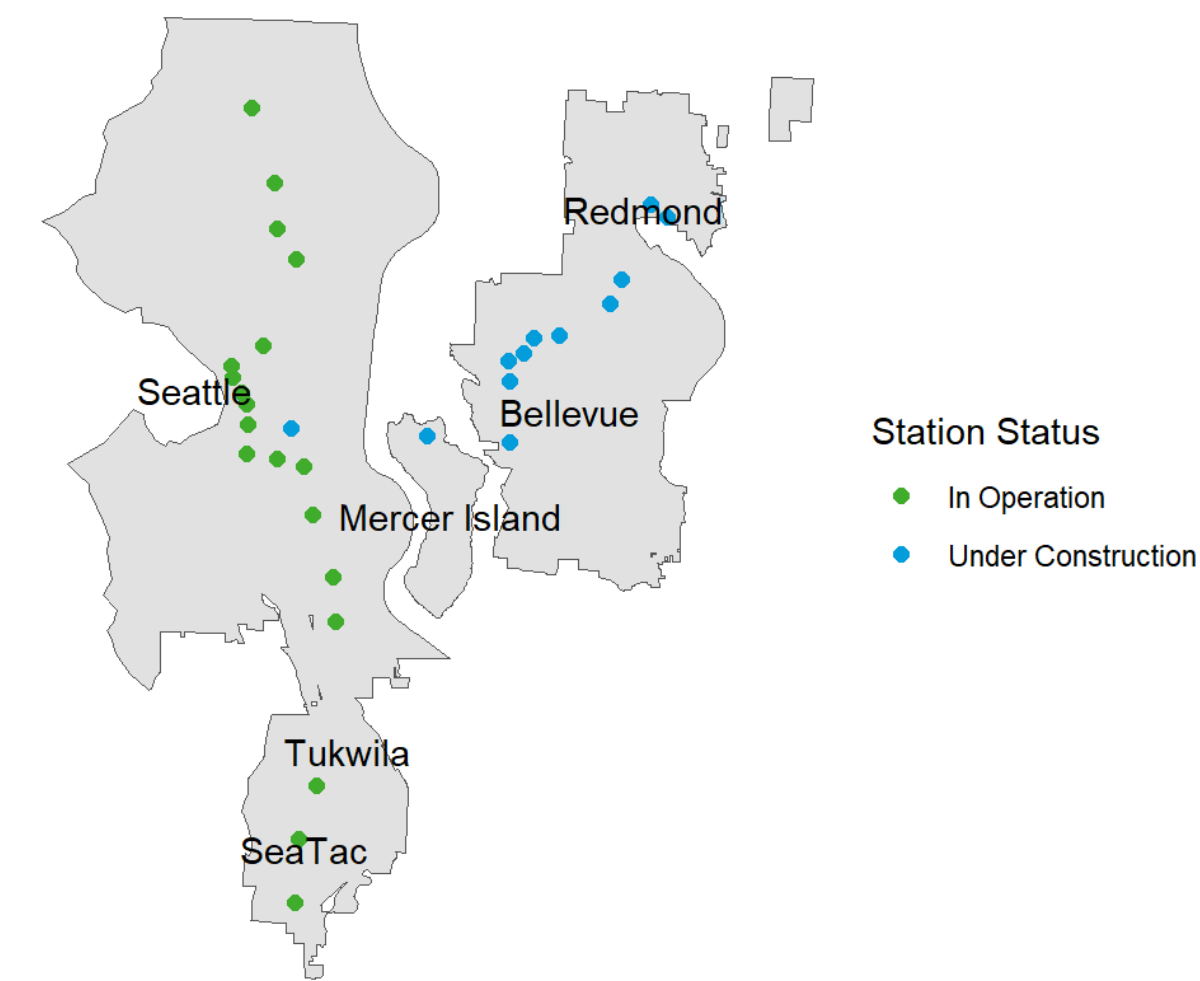


Total Population of Census Tracts in Suffolk County



Data source: 5-year ACS, US Census Bureau

Link Light Rail Stops
King County, WA



Source: WSDOT & Sound Transit