



AE 17: Visualizing household income in New York

Suggested answers

APPLICATION EXERCISE

ANSWERS

MODIFIED

March 26, 2025

Packages

```
library(tidyverse)
library(sf)
library(colorspace)
library(scales)

# set default theme
theme_set(theme_minimal())

# create reusable labels for each plot
map_labels <- labs(
  title = "Median household income in New York in 2023",
  subtitle = "By census tract",
  color = NULL,
  fill = NULL,
  caption = "Source: American Community Survey"
)
```

Load New York 2023 median household income

We will use two data files for this analysis. The first contains median household incomes for each census tract in New York from 2023. The second contains the boundaries of each county in New York.

```
# load data
ny_inc <- st_read(dsn = "data/ny-inc.geojson")
```

Reading layer `ny-inc.geojson' from data source

`/Users/soltoffbc/Projects/info-3312/course-site/ae/data/ny-inc.geojson'

using driver `GeoJSON'

Simple feature collection with 5396 features and 4 fields (with 16 geometries empty)

Geometry type: MULTIPOLYGON

Dimension: XY

Bounding box: xmin: -79.76215 ymin: 40.4961 xmax: -71.85648 ymax: 45.01585

Geodetic CRS: NAD83

```
ny_counties <- st_read(dsn = "data/ny-counties.geojson")
```

Reading layer 'ny-counties.geojson' from data source

'/Users/soltoffbc/Projects/info-3312/course-site/ae/data/ny-counties.geojson'

using driver 'GeoJSON'

Simple feature collection with 62 features and 4 fields

Geometry type: MULTIPOLYGON

Dimension: XY

Bounding box: xmin: -79.76215 ymin: 40.4961 xmax: -71.85648 ymax: 45.01585

Geodetic CRS: NAD83

```
ny_inc
```

Simple feature collection with 5396 features and 4 fields (with 16 geometries empty)

Geometry type: MULTIPOLYGON

Dimension: XY

Bounding box: xmin: -79.76215 ymin: 40.4961 xmax: -71.85648 ymax: 45.01585

Geodetic CRS: NAD83

First 10 features:

	GEOID	NAME	medincomeE
1	36015010800	Census Tract 108; Chemung County; New York	54354
2	36055010200	Census Tract 102; Monroe County; New York	135260
3	36055011705	Census Tract 117.05; Monroe County; New York	115568
4	36055013902	Census Tract 139.02; Monroe County; New York	57588
5	36055004702	Census Tract 47.02; Monroe County; New York	46250
6	36055013604	Census Tract 136.04; Monroe County; New York	52766
7	36055006300	Census Tract 63; Monroe County; New York	65167
8	36055006000	Census Tract 60; Monroe County; New York	56951
9	36055008100	Census Tract 81; Monroe County; New York	47273
10	36055012700	Census Tract 127; Monroe County; New York	120753

	medincomeM	geometry
1	7404	MULTIPOLYGON (((-76.83044 4...
2	10008	MULTIPOLYGON (((-77.61592 4...
3	31498	MULTIPOLYGON (((-77.48616 4...
4	13986	MULTIPOLYGON (((-77.65909 4...
5	8729	MULTIPOLYGON (((-77.61634 4...
6	12776	MULTIPOLYGON (((-77.69645 4...
7	32012	MULTIPOLYGON (((-77.64697 4...
8	10918	MULTIPOLYGON (((-77.56453 4...

```

9      22281 MULTIPOLYGON (((-77.6001 43...
10     7602 MULTIPOLYGON (((-77.57503 4...

```

ny_counties

Simple feature collection with 62 features and 4 fields

Geometry type: MULTIPOLYGON

Dimension: XY

Bounding box: xmin: -79.76215 ymin: 40.4961 xmax: -71.85648 ymax: 45.01585

Geodetic CRS: NAD83

First 10 features:

	GEOID	NAME	medincomeE	medincomeM
1	36013	Chautauqua County, New York	56507	1981
2	36045	Jefferson County, New York	64978	2730
3	36059	Nassau County, New York	143408	1643
4	36111	Ulster County, New York	81804	2953
5	36051	Livingston County, New York	72464	2969
6	36123	Yates County, New York	67521	4456
7	36025	Delaware County, New York	60226	2922
8	36103	Suffolk County, New York	128329	1374
9	36047	Kings County, New York	78548	1052
10	36105	Sullivan County, New York	69826	2633

	geometry
1	MULTIPOLYGON (((-79.76215 4...
2	MULTIPOLYGON (((-76.14744 4...
3	MULTIPOLYGON (((-73.76871 4...
4	MULTIPOLYGON (((-74.78069 4...
5	MULTIPOLYGON (((-78.06078 4...
6	MULTIPOLYGON (((-77.36711 4...
7	MULTIPOLYGON (((-75.42264 4...
8	MULTIPOLYGON (((-72.0377 41...
9	MULTIPOLYGON (((-74.04171 4...
10	MULTIPOLYGON (((-75.14474 4...

Part 1

Draw a continuous choropleth of median household income

Your turn: Create a choropleth map of median household income in New York. Use a continuous color gradient to identify each tract's median household income.

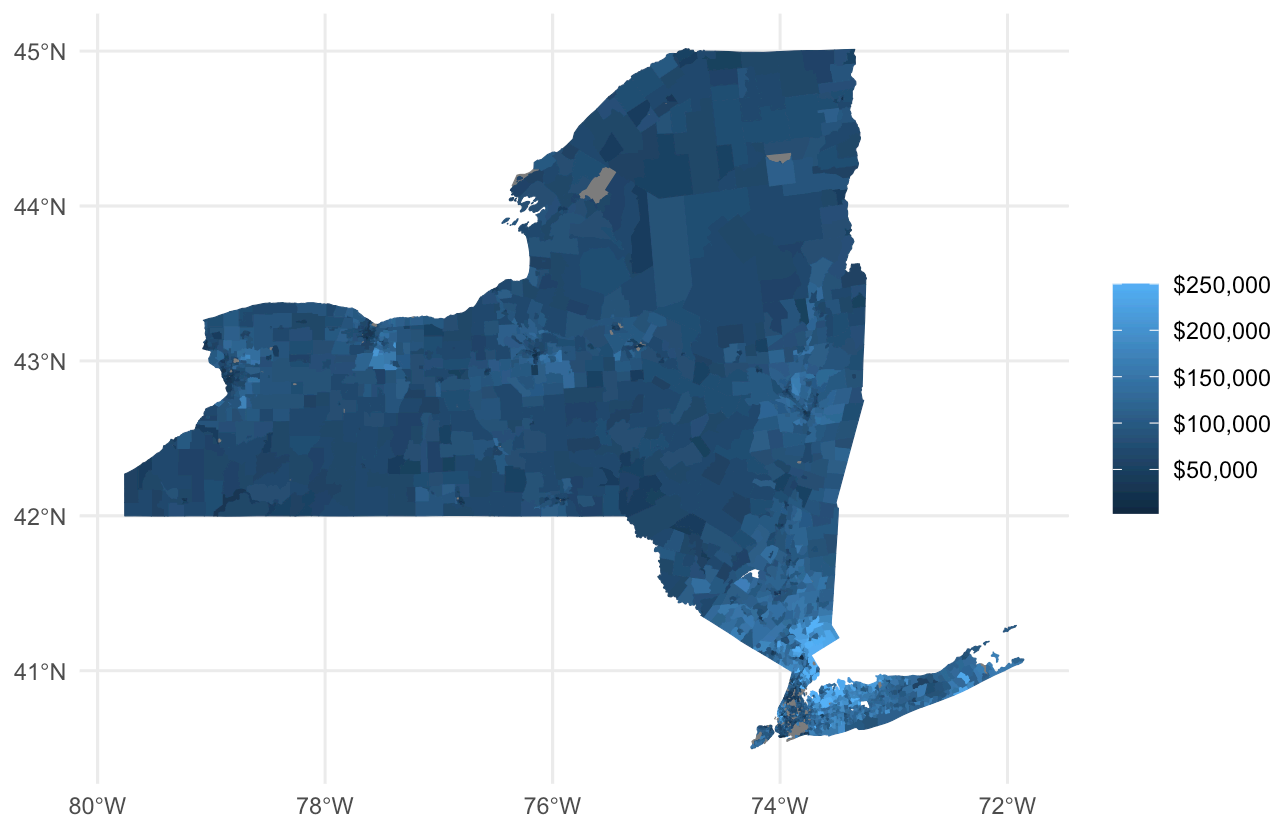
Tip

Use the stored `map_labels` to set the title, subtitle, and caption for this and the remaining plots.

```
ggplot(data = ny_inc) +
  # use fill and color to avoid gray boundary lines
  geom_sf(aes(fill = medincomeE, color = medincomeE)) +
  # increase interpretability of graph
  scale_color_continuous(labels = label_dollar()) +
  scale_fill_continuous(labels = label_dollar()) +
  map_labels
```

Median household income in New York in 2023

By census tract



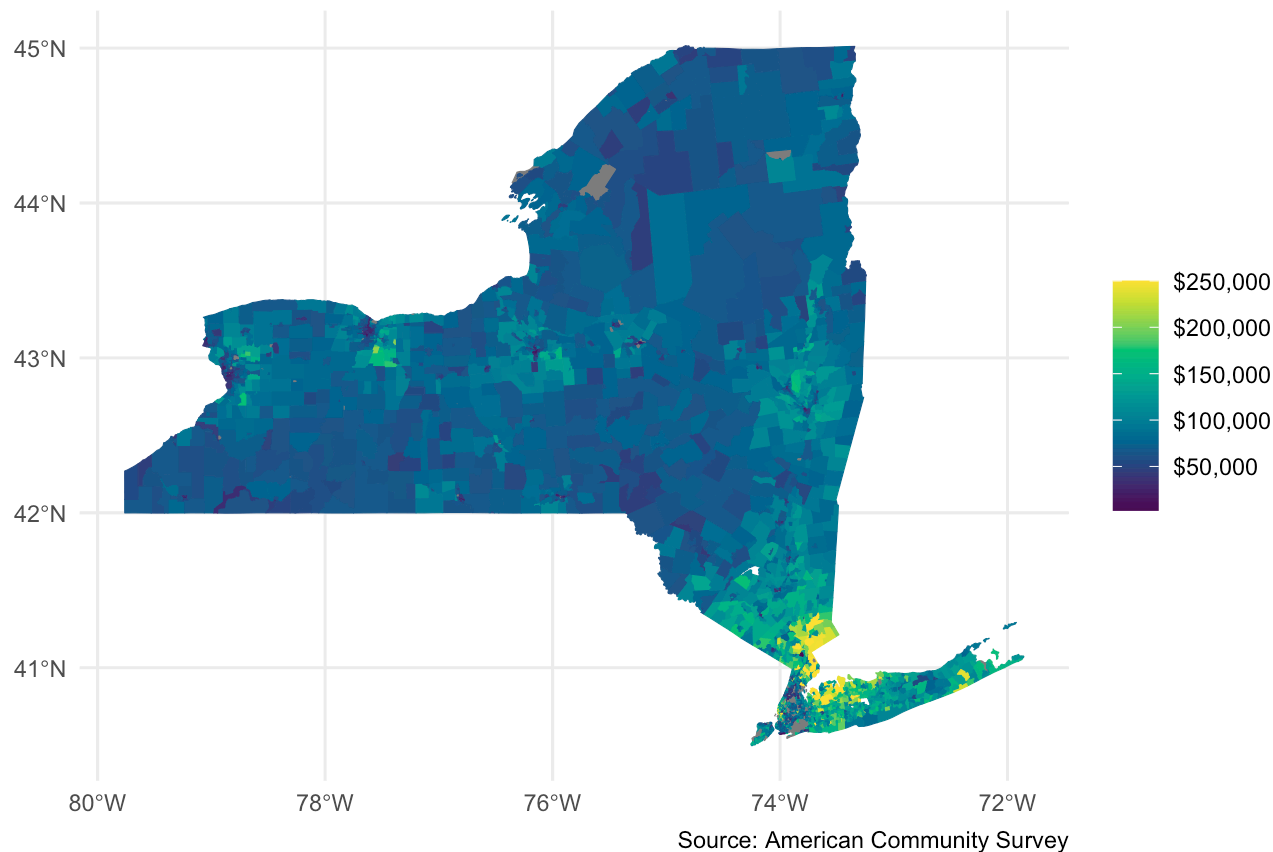
Source: American Community Survey

Your turn: Now revise the map to use an optimized color gradient for improved readability.

```
ggplot(data = ny_inc) +
  # use fill and color to avoid gray boundary lines
  geom_sf(mapping = aes(fill = medincomeE, color = medincomeE)) +
  # increase interpretability of graph
  scale_fill_continuous_sequential(
    palette = "viridis",
    rev = FALSE,
    aesthetics = c("fill", "color"),
    labels = label_dollar(),
    name = NULL
```

```
) +  
map_labels
```

Median household income in New York in 2023 By census tract



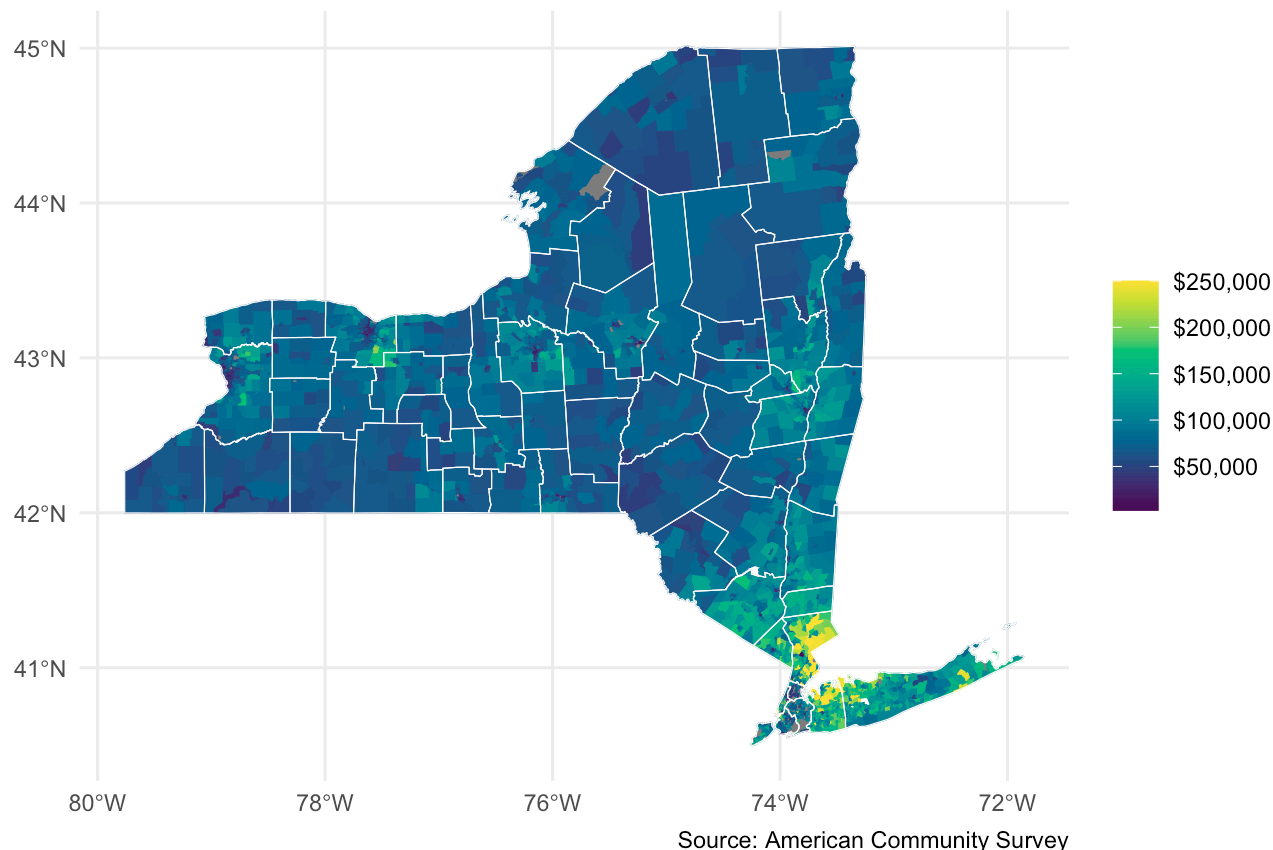
Overlay county borders

Your turn: To provide better context, overlay the NY county borders on the choropleth map.

```
ggplot(data = ny_inc) +  
  # use fill and color to avoid gray boundary lines  
  geom_sf(mapping = aes(fill = medincomeE, color = medincomeE)) +  
  # add county borders  
  geom_sf(data = ny_counties, color = "white", fill = NA) +  
  # increase interpretability of graph  
  scale_fill_continuous_sequential(  
    palette = "viridis",  
    rev = FALSE,  
    aesthetics = c("fill", "color"),  
    labels = label_dollar(),  
    name = NULL
```

```
) +  
map_labels
```

Median household income in New York in 2023 By census tract



Part 2

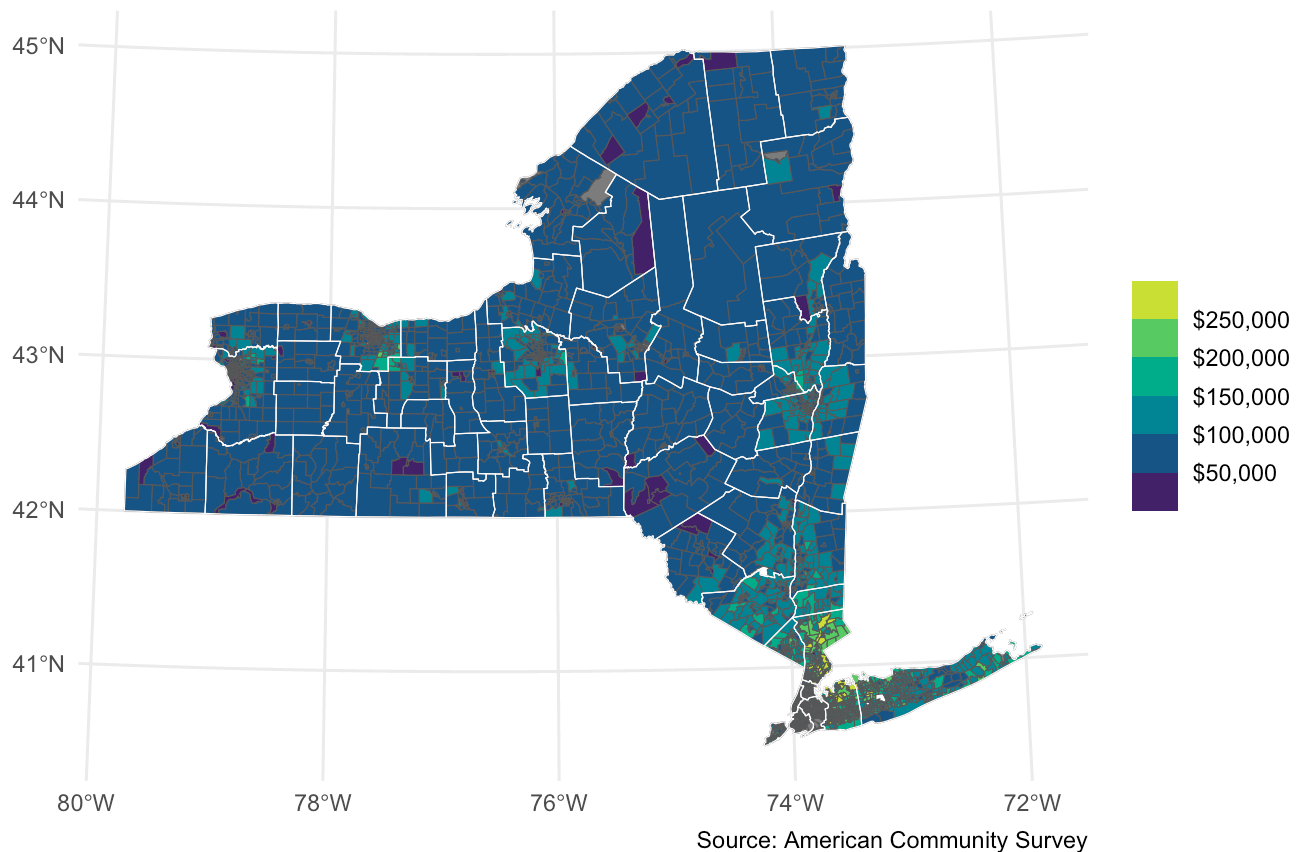
Your turn: Continuous color palettes can be hard to distinguish visibly. To improve readability, convert the continuous color palette into a discrete one with 6 levels. Additionally, modify the projection method to use this [projection optimized for New York](#).

```
# binned_scale() - default breaks  
ggplot(data = ny_inc) +  
  geom_sf(mapping = aes(fill = medincomeE)) +  
  geom_sf(data = ny_counties, color = "white", fill = NA) +  
  scale_fill_binned_sequential(  
    palette = "viridis",  
    rev = FALSE,  
    labels = label_dollar()  
  ) +  
  # increase interpretability of graph
```

```
map_labels +  
coord_sf(crs = 2261)
```

Median household income in New York in 2023

By census tract



Session information

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