HW #2

Visualizing FEMA NRI Data

Ava Robillard

2026-01-28

Key Question: How do FEMA National Risk Index scores for counties in California compare to those in other states?

```
# Load packages
library(here)
library(tidyverse)
library(janitor)
library(gghighlight)
```

1. What are your variables of interest and what kinds of data (e.g. numeric, categorical, ordered, etc.) are they (a bullet point list is fine)?

- State name (`state_name`): categorical variable
- National Risk Index Composite (`national_risk_index_score_composite`): continuous variable

2. How did you decide which type of graphic form was best suited for answering the question? What alternative graphic forms could you have used instead? Why did you settle on this particular graphic form?

I read the background information about the National Risk Index (NRI) to determine which variables would be most important in comparing the NRI scores for counties in California against other states, and then used the flow chart on the website from Data to Viz to narrow down my choices based on my data types. I was initially interested in a stacked bar plot of the categories of NRI scores by state ("Very High", "Very Low", etc.) as these are pre-categorized in the data and might be easier to interpret than numerical values, but later decided to stick with a boxplot with the scores themselves. The second boxplot was a less visually cluttered graph and was able to show statistics like the median and quartiles of each state.

Data loading and cleaning

```
# Read in data
nri <- read_csv(here("data", "National_Risk_Index_Counties_8073841244556721111.csv")) %>%
  clean_names() %>%
  # Remove unwanted territories and districts
  filter(!state_name %in% c("American Samoa", "Guam",
          "Northern Mariana Islands", "Puerto Rico",
          "Virgin Islands", "District of Columbia"))
```

Data wrangling

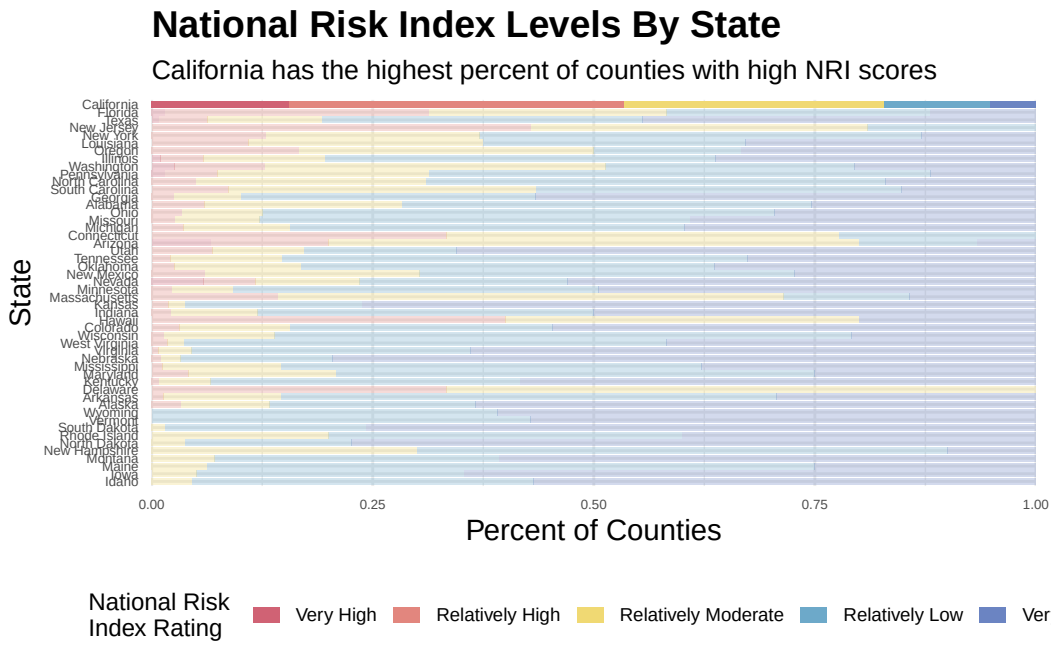
As a preliminary plot, I want a count of how many counties in each state was categorized as each risk index level ("Very High", "Relatively High", etc.) in order to make a stacked bar chart.

```
# Create data frame with count of counties per index rating
state_labels <- nri %>%
  group_by(state_name, national_risk_index_rating_composite) %>%
  summarize(county_count = n()) %>%
  # Make NRI into ordered factor
  mutate(risk_category = factor(national_risk_index_rating_composite,
                                levels = c("Very Low", "Relatively Low",
                                           "Relatively Moderate", "Relatively High", "Very Hig
  ungroup() %>%

  # Create column for ordering in plot
  group_by(state_name) %>%
  mutate(very_high_n = sum(county_count[risk_category %in% c("Very High", "Relatively High")]
  ungroup() %>%

  # Reorder state_name column by count of "Very High" and "Relatively High" counties
  mutate(state_name = fct_reorder(state_name, very_high_n, .desc = FALSE))
```

Plotting

Preliminary stacked bar plot

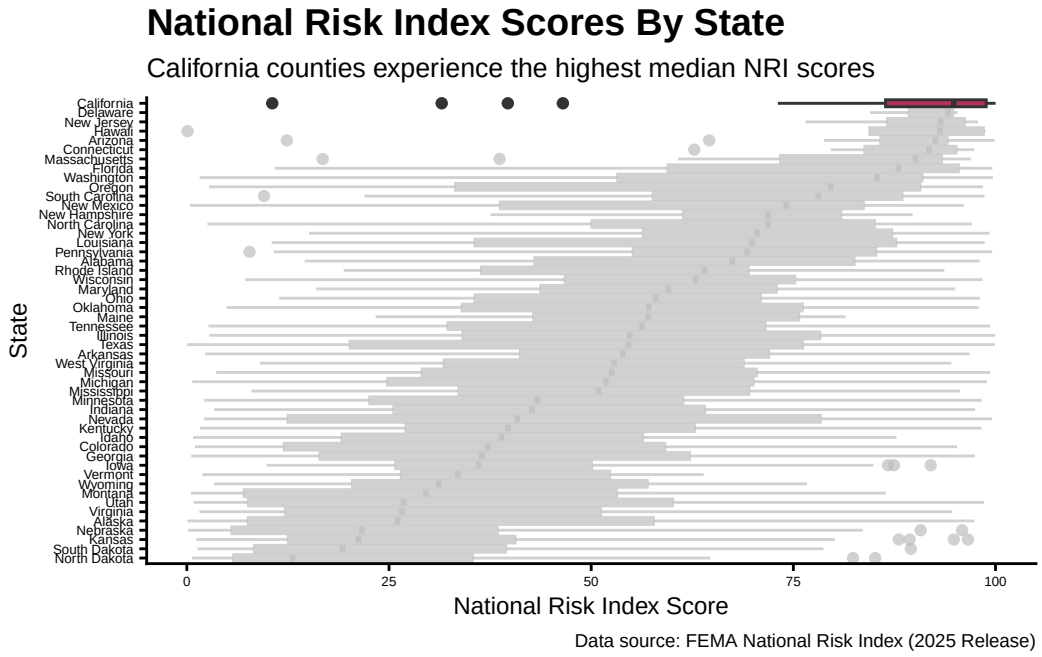
```r
# Customize colors
rating_colors <- c("Very High" = "#D06274",
                   "Relatively High" = "#E2867E",
                   "Relatively Moderate" = "#F0D973",
                   "Relatively Low" = "#6DA9C9",
                   "Very Low" = "#6B84C2")

# Create stacked bar chart
ggplot(state_labels, aes(x = state_name, y = county_count, fill = risk_category)) +
  geom_col(position = "fill") +
  scale_fill_manual(values = rating_colors) +
  # Relabel y-axis as percents
  scale_y_continuous(labels = scales::label_percent(scale = 100)) +
  coord_flip() +
  guides(fill = guide_legend(reverse = TRUE)) +
  # Emphasize California, keep other states at lower transparency
  gghighlight(state_name == "California",
              unhighlighted_params = list(fill = NULL, alpha = 0.3)) +
  labs(x = "State",
       y = "Percent of Counties",
       fill = "National Risk \nIndex Rating",
       title = "National Risk Index Levels By State",
       subtitle = "California has the highest percent of counties with high NRI scores") +
  scale_y_continuous(expand = c(0, 0)) +
  # Edit theme
  theme_minimal() +
  theme(
    axis.text = element_text(size = 5),
    plot.title = element_text(face = "bold", size = 14),
    plot.subtitle = element_text(size = 10),

    # Move legend below plot
    legend.text = element_text(size = 7),
    legend.title = element_text(size = 9),
    legend.position = "bottom",
    legend.direction = "horizontal",
    legend.key.width = unit(0.4, "cm"),
    legend.key.height = unit(0.25, "cm"),
  )
```



Final boxplot

```
# Boxplot of NRI by state
ggplot(nri, aes(x = national_risk_index_score_composite,
                y = reorder(state_name, national_risk_index_score_composite,
                            FUN = "median"),
                fill = state_name)) +
  geom_boxplot() +
  # Emphasize California
  gghighlight(state_name == "California") +
  scale_fill_manual(values = c("maroon")) +
  labs(x = "National Risk Index Score",
       y = "State",
       title = "National Risk Index Scores By State",
       subtitle = "California counties experience the highest median NRI scores",
       caption = "Data source: FEMA National Risk Index (2025 Release)") +
  # Edit theme
  theme_classic() +
  theme(
    axis.text = element_text(size = 5),
    axis.title = element_text(size = 9),
```

```
    legend.position = "none",
    plot.title = element_text(face = "bold", size = 14),
    plot.subtitle = element_text(size = 10),
    plot.caption = element_text(size = 7)
    )
```



3. Summarize your main finding in no more than two sentences.

California was the state with the highest median National Risk Index Score at about 89.

4. What modifications did you make to this visualization to make it more easily readable?

I reordered the states based on their national risk scores in order to better show California in comparison to other states. I also used gghighlight with a selected color to emphasize California's boxplot as there were 50 states shown. I also customized my theme to create a visual hierarchy of text, where the title is largest and the axes labels are the smallest.

5. Is there anything you wanted to implement, but didn't know how? If so, please describe.

I was unsure what the best approach would be for improving the readability of the y-axis state names, as these were categorical and not numeric. I searched for a way to bold the word California only on the axis but was not able to find a simple method or theme addition.