US Counties

1. Load the packages `tidyverse` and `usdata`.

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.4     v dplyr   1.0.7
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   2.0.1     v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(usdata)
```

2. Open the `county_complete` data set.

```
# selecting specific columns from the dataset
county_sub <- county_complete %>%
              select(pop_2019,unemployment_rate_2019,poverty_2019, state, name)

# print out the subset
glimpse(county_sub)
```

```
## Rows: 3,142
## Columns: 5
## $ pop_2019               <dbl> 55380, 212830, 25361, 22493, 57681, 10248, 1982~
## $ unemployment_rate_2019 <dbl> 3.5, 4.0, 9.4, 7.0, 3.1, 4.1, 7.0, 7.2, 4.0, 4.~
## $ poverty_2019           <dbl> 15.2, 10.4, 30.7, NA, 13.6, NA, NA, 17.9, 17.3,~
## $ state                  <chr> "Alabama", "Alabama", "Alabama", "Alabama", "Al~
## $ name                   <chr> "Autauga County", "Baldwin County", "Barbour Co~
```

There are 3,142 rows of the data set, which corresponds to the total number of counties in the USA.

3. Answer these following questions

   a. What are the top 10 US states by 2019 population?
   b. What is the distribution of unemployment rate in 2019 for counties in California, Oregon, and/or Washington?
   c. What is the relationship between unemployment rate and poverty rate?

a.

```
# grouping by state
county_sub %>% group_by(state) %>%
               # taking the sum of the population for eahc state
```

```
                summarise(sum = sum(pop_2019)) %>%
                # sorting the resulting sum in descending order
                arrange(desc(sum)) %>%
                # printing the top 10 results
                head(10)
```

```
## # A tibble: 10 x 2
##    state               sum
##    <chr>             <dbl>
##  1 California     39283497
##  2 Texas          28260856
##  3 Florida        20901636
##  4 New York       19572319
##  5 Pennsylvania   12791530
##  6 Illinois       12770631
##  7 Ohio           11655397
##  8 Georgia        10403847
##  9 North Carolina 10264876
## 10 Michigan        9965265
```

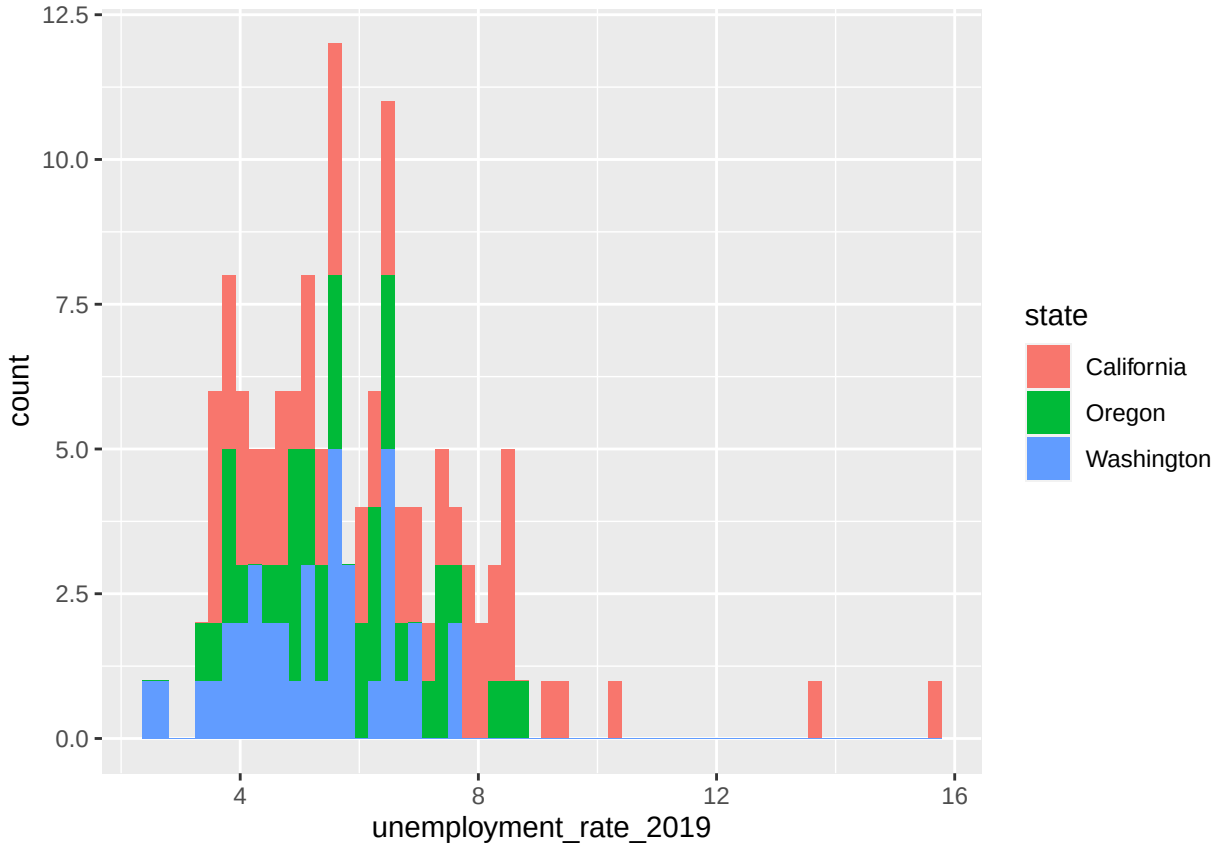
The top 10 most populous is CA, TX, FL, PA, IL, OH, GA, NC, and MI.

b.

```
county_new <- county_sub %>%
              filter(state == "California" |
                     state == "Oregon" |
                     state == "Washington")
glimpse(county_new)
```

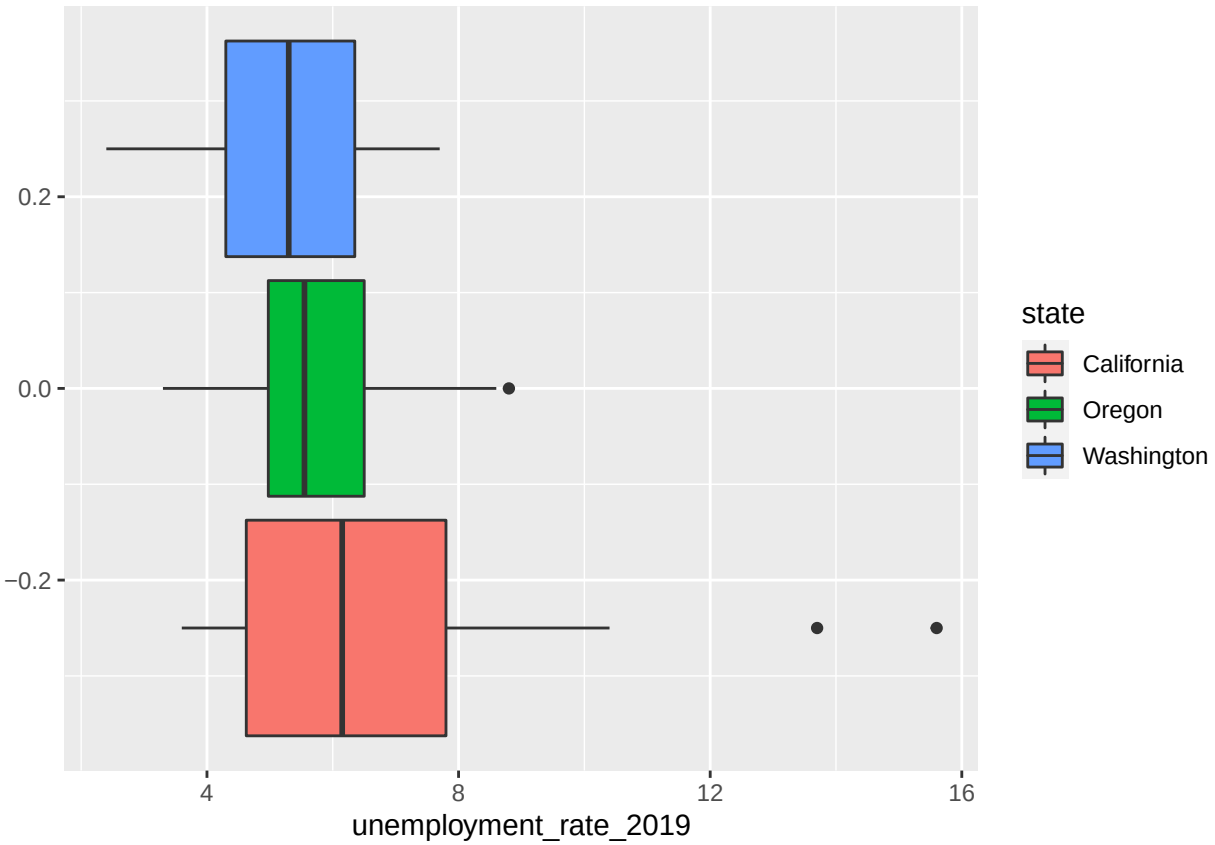
```
## Rows: 133
## Columns: 5
## $ pop_2019               <dbl> 1656754, 1039, 38429, 225817, 45514, 21454, 114~
## $ unemployment_rate_2019 <dbl> 4.4, 15.6, 6.6, 7.7, 6.6, 4.4, 5.0, 7.8, 5.4, 8~
## $ poverty_2019           <dbl> 9.9, NA, NA, 19.1, NA, NA, 8.7, NA, 8.4, 22.5, ~
## $ state                  <chr> "California", "California", "California", "Cali~
## $ name                   <chr> "Alameda County", "Alpine County", "Amador Coun~
```

```
ggplot(data = county_new, aes(x = unemployment_rate_2019, fill = state)) +
  geom_histogram(bins=60)
```




```
ggplot(data = county_new, aes(x = unemployment_rate_2019, fill = state)) +
  geom_boxplot(bins=60)
```

```
## Warning: Ignoring unknown parameters: bins
```



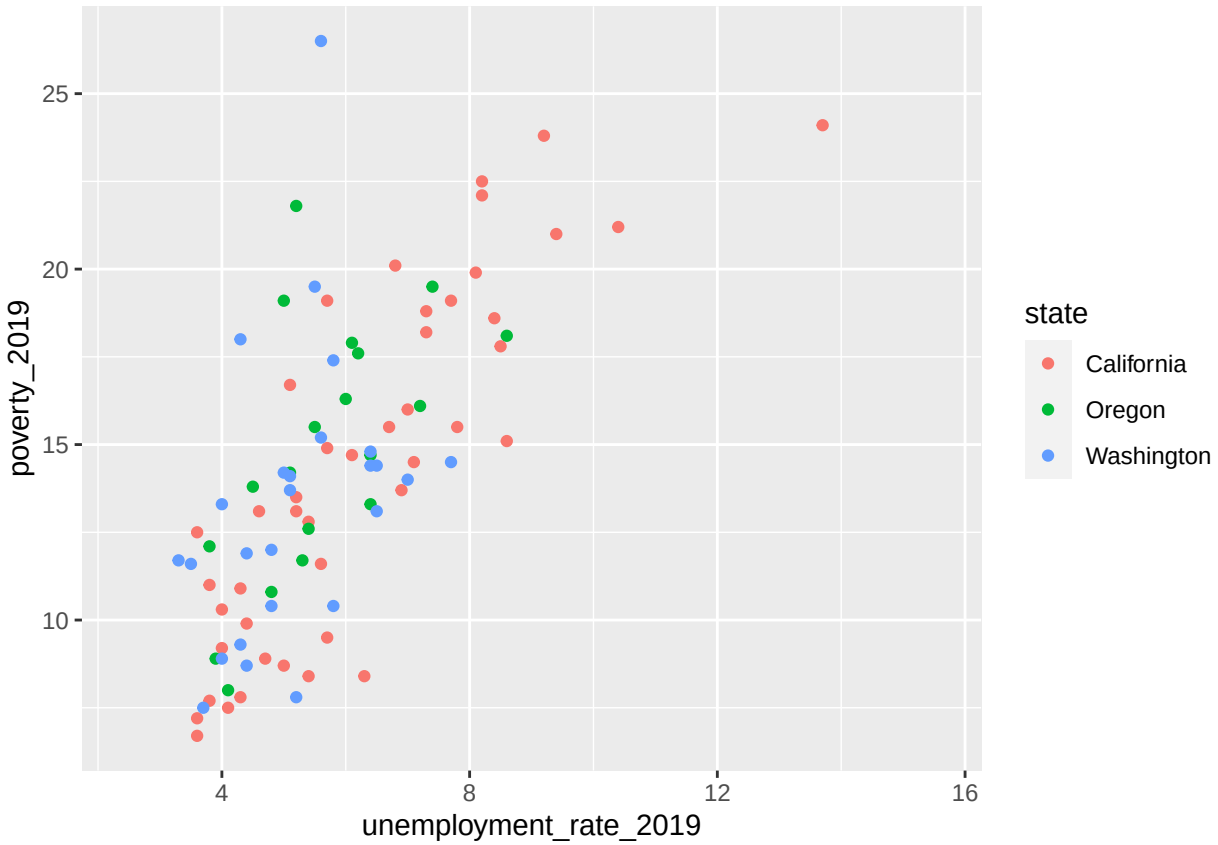
According to the histograms, all of the three states show a unimodal distribution. Also, we can observe that the California unemployment rate distribution in 2019 is right-skewed but the toher two states are not as right-skewed as California.

The boxplot shows there are outliers in CA and OR but not WA. We can also that the median unemployment rate in CA is higher than the other two states.

c.

```
ggplot(data = county_new, aes(x = unemployment_rate_2019, y = poverty_2019, color = state)) +
  geom_point()
```

```
## Warning: Removed 44 rows containing missing values (geom_point).
```



We observed in the scatter plot that all three states in our subset has a positive linear association. We can observe the heteroskedasticity of the relationship.