

# Lab 2 - Data wrangling

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```
library(tidyverse)
```

## Questions

### Part 1

```
?midwest
```

## Question 1

```
midwest |>
  count(state, sort = TRUE)
```

```
# A tibble: 5 x 2
  state     n
  <chr> <int>
1 IL        102
2 IN         92
3 OH         88
4 MI         83
5 WI         72
```

Comment: Illinois has the most amount of counties with 102, and Wisconsin has the least with 72.

## Question 2

```
midwest |>
  count(county,state) |>
  count(county, name = "n_states") |>
  filter(n_states == n_distinct(midwest$state))
```

```
# A tibble: 3 x 2
  county   n_states
  <chr>     <int>
1 CRAWFORD      5
2 JACKSON       5
3 MONROE        5
```

### Question 3

```
midwest |>
  filter(popdensity > 25000) |>
  select(county,state,popdensity,poptotal,area) |>
  arrange(desc(popdensity))
```

```
# A tibble: 9 x 5
  county    state popdensity poptotal   area
  <chr>     <chr>     <dbl>      <int>   <dbl>
1 COOK      IL        88018.  5105067 0.058
2 MILWAUKEE WI        63952.  959275  0.015
3 WAYNE     MI        60334.  2111687 0.035
4 CUYAHOGA OH        54313.  1412140 0.026
5 DU PAGE   IL        39083.  781666  0.02
6 MARION    IN        34659.  797159  0.023
7 HAMILTON OH        34649.  866228  0.025
8 FRANKLIN OH        28278.  961437  0.034
9 MACOMB    MI        25621.  717400  0.028
```

```
midwest |>
  filter(popdensity == max(popdensity)) |>
  select(county,state,popdensity,poptotal,area)
```

```
# A tibble: 1 x 5
  county state popdensity poptotal   area
  <chr>  <chr>     <dbl>      <int>   <dbl>
1 COOK    IL        88018.  5105067 0.058
```

#### Question 4

```
midwest |>
  summarize(
    median(popdensity),
    q1 = quantile(popdensity, 0.25),
    q3 = quantile(popdensity, 0.75)
  )
```

```
# A tibble: 1 x 3
`median(popdensity)`    q1      q3
<dbl> <dbl> <dbl>
1       1156.   622.   2330
```

Comment:

The distribution of population density of counties is unimodal and extremely right-skewed. A typical Midwestern county has population density of 1156.208 people per unit area. The middle 50% of the counties have population densities between 622.4074 to 2330 people per unit area.

## Question 5

```
midwest |>
  count(state,inmetro)|>
  group_by(state) |>
  mutate(prop=n/sum(n))
```

```
# A tibble: 10 x 4
# Groups:   state [5]
  state inmetro     n   prop
  <chr>    <int> <int> <dbl>
1 IL          0     74  0.725
2 IL          1     28  0.275
3 IN          0     55  0.598
4 IN          1     37  0.402
5 MI          0     58  0.699
6 MI          1     25  0.301
7 OH          0     48  0.545
8 OH          1     40  0.455
9 WI          0     52  0.722
10 WI         1     20  0.278
```

## Question 6

```
midwest |>
  filter(percbelowpoverty >=40,
         percollege <=10) |>
  select(county,state,
         percbelowpoverty,
         percollege)
```

```
# A tibble: 1 x 4
  county    state percbelowpoverty percollege
  <chr>     <chr>        <dbl>       <dbl>
1 MENOMINEE WI            48.7        7.34
```

```
midwest |>
  filter(percbelowpoverty <= 20,
         percollege >= 40) |>
  select(county, state,
         percbelowpoverty,
         percollege)
```

```
# A tibble: 5 x 4
  county    state percbelowpoverty percollege
  <chr>     <chr>        <dbl>       <dbl>
1 CHAMPAIGN IL            15.6        41.3
2 DU PAGE    IL            2.71        42.8
3 HAMILTON   IN            3.59        42.1
4 WASHTENAW MI            12.2        48.1
5 DANE        WI            10.5        43.6
```

```
midwest |>
  filter(
    (percbelowpoverty >= 40 & percollege <= 10) |
    (percbelowpoverty <=20 & percollege >= 40)
  ) |>
  select(county, state,
         percbelowpoverty,
         percollege)
```

```

# A tibble: 6 x 4
  county    state percbelowpoverty percollege
  <chr>     <chr>        <dbl>       <dbl>
1 CHAMPAIGN IL            15.6        41.3
2 DU PAGE   IL            2.71         42.8
3 HAMILTON  IN            3.59         42.1
4 WASHTENAW MI           12.2         48.1
5 DANE       WI           10.5         43.6
6 MENOMINEE WI           48.7         7.34

midwest |>
  mutate(
    potential_outlier = if_else(
      (percbelowpoverty >= 40 & percollege <= 10) |
      (percbelowpoverty <= 20 & percollege >= 40),
      "Yes",
      "No"
    )
  )|>
  select(county, state,
         percbelowpoverty,
         percollege,
         potential_outlier)|>
  arrange(potential_outlier)

```

```

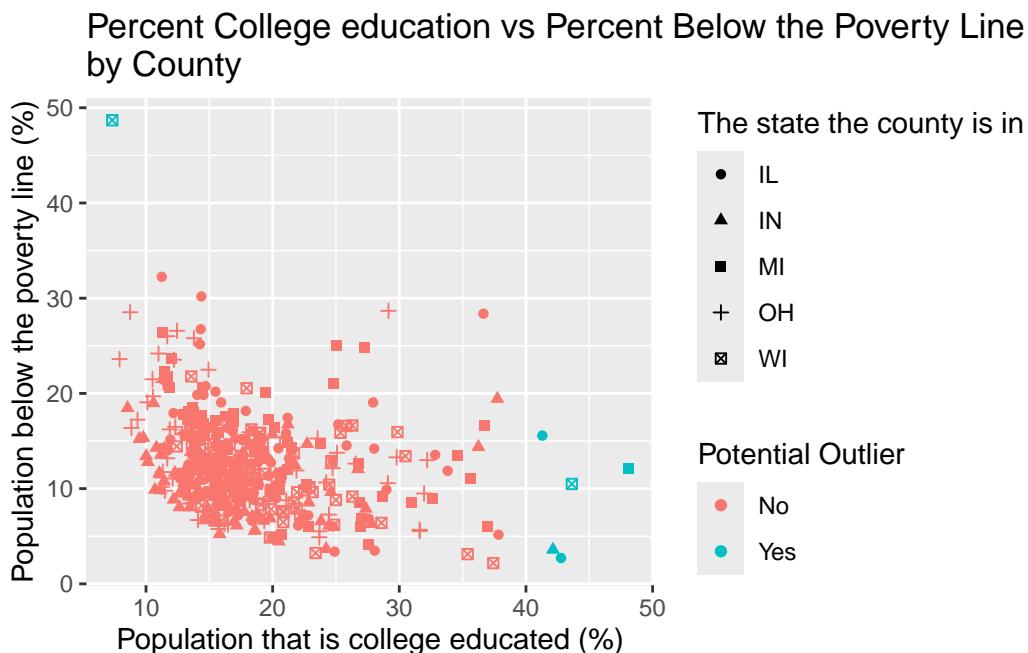
# A tibble: 437 x 5
  county    state percbelowpoverty percollege potential_outlier
  <chr>     <chr>        <dbl>       <dbl> <chr>
1 ADAMS     IL            13.2        19.6 No
2 ALEXANDER IL            32.2        11.2 No
3 BOND      IL            12.1        17.0 No
4 BOONE     IL            7.21         17.3 No
5 BROWN     IL            13.5        14.5 No
6 BUREAU    IL            10.4        18.9 No
7 CALHOUN   IL            15.1        11.9 No
8 CARROLL   IL            11.7        16.2 No
9 CASS      IL            13.9        14.1 No
10 CHRISTIAN IL           11.7        13.6 No
# i 427 more rows

```

```

midwest |>
  mutate(
    potential_outlier = if_else(
      (percbelowpoverty >= 40 & percollege <= 10) |
      (percbelowpoverty <= 20 & percollege >= 40),
      "Yes",
      "No"
    )
  )|>
  ggplot(aes(x=percollege, y=percbelowpoverty, colour = potential_outlier, shape = state)) +
  geom_point() +
  labs(x= "Population that is college educated (%)",
       y= "Population below the poverty line (%)",
       colour = "Potential Outlier",
       shape = "The state the county is in",
       title= "Percent College education vs Percent Below the Poverty Line \nby County")

```



## Question 7

```
state_population <- midwest |>
  group_by(state) |>
  summarize(total_population =sum(poptotal)) |>
  arrange(desc(total_population))
state_population
```

```
# A tibble: 5 x 2
  state total_population
  <chr>      <int>
1 IL          11430602
2 OH          10847115
3 MI          9295297
4 IN          5544159
5 WI          4891769
```

```
state_population |>
  mutate(
    population_prop = total_population / sum(total_population)
  ) |>
  arrange(desc(population_prop))
```

```
# A tibble: 5 x 3
  state total_population population_prop
  <chr>      <int>           <dbl>
1 IL          11430602        0.272
2 OH          10847115        0.258
3 MI          9295297         0.221
4 IN          5544159         0.132
5 WI          4891769         0.116
```

Comment: Illinois has the largest population, with approximately 27% of people in the Midwest living there. Wisconsin has the smallest population with approximately 12% of the population living there.

**Question 8**

## **Part 2**

### **Question 9**