

# 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)
```

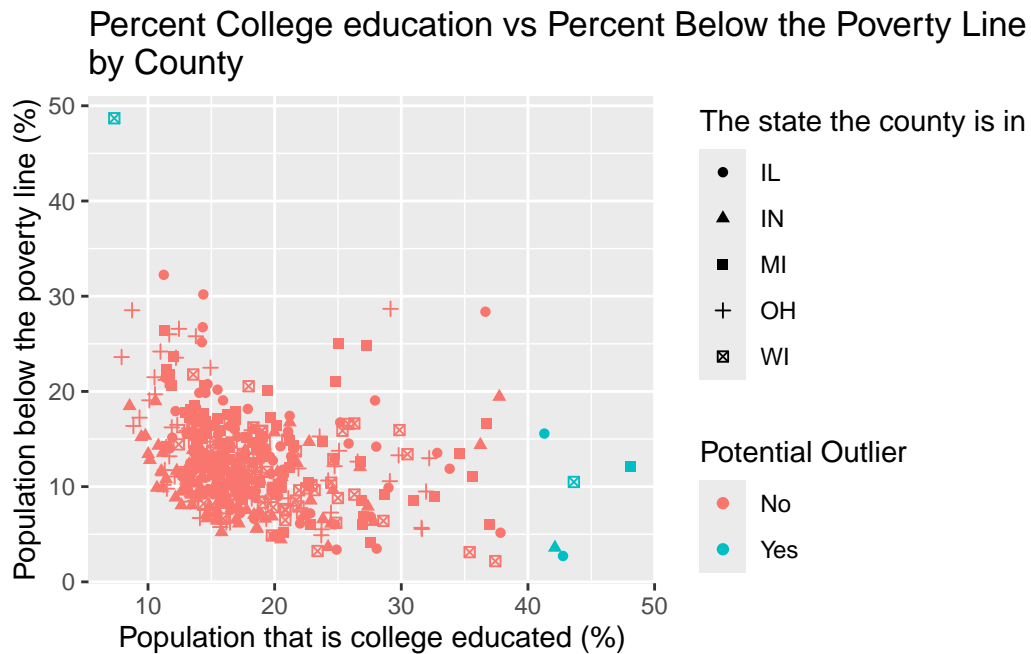
```
# A tibble: 437 x 5
  county state percbelowpoverty percollege potential_outlier
  <chr>   <chr>          <dbl>      <dbl> <chr>
1 ADAMS  IL             13.2        19.6 No
2 ALEXANDER IL          32.2        11.2 No
3 BOND   IL             12.1        17.0 No
4 BOONE  IL              7.21        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