lab 1

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Running Code

```
library(tidyverse)
```

```
Warning in system("timedatectl", intern = TRUE): running command 'timedatectl'
had status 1
```

```
-- Attaching packages --------------------------------------- tidyverse 1.3.2 --
v ggplot2 3.3.6     v purrr   0.3.4
v tibble  3.1.8     v dplyr   1.0.9
v tidyr   1.2.0     v stringr 1.4.1
v readr   2.1.2     v forcats 0.5.2
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
```

```
library(viridis)
```

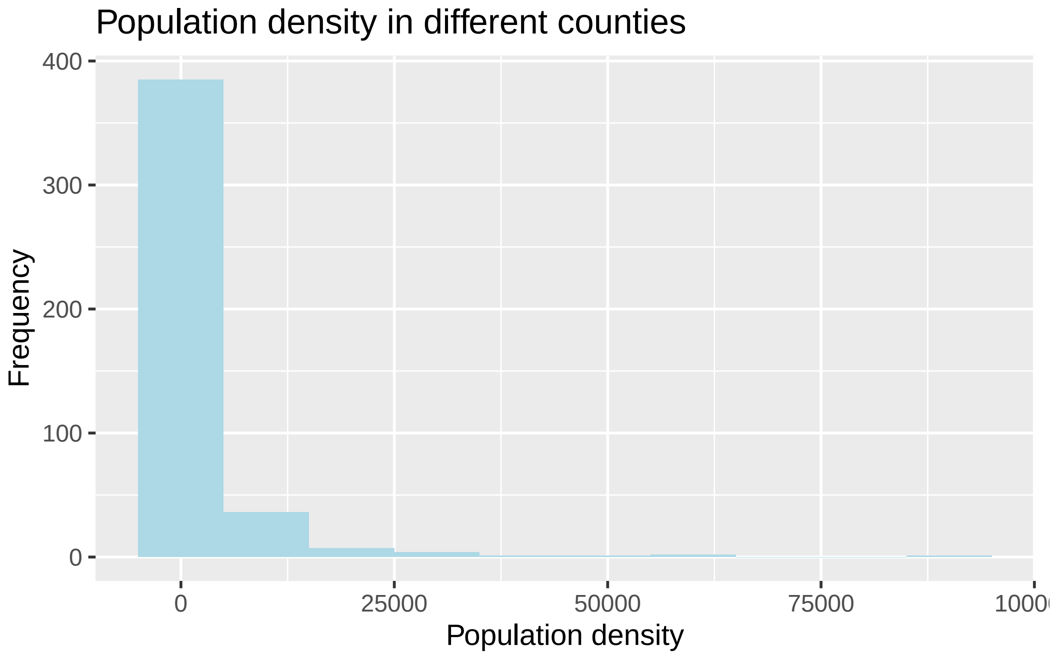
```
Loading required package: viridisLite
```

```
glimpse(midwest)
```

```
Rows: 437
Columns: 28
$ PID                  <int> 561, 562, 563, 564, 565, 566, 567, 568, 569, 570,~
$ county               <chr> "ADAMS", "ALEXANDER", "BOND", "BOONE", "BROWN", "~
$ state                <chr> "IL", "IL", "IL", "IL", "IL", "IL", "IL", "IL", "~
$ area                 <dbl> 0.052, 0.014, 0.022, 0.017, 0.018, 0.050, 0.017, ~
$ poptotal             <int> 66090, 10626, 14991, 30806, 5836, 35688, 5322, 16~
$ popdensity           <dbl> 1270.9615, 759.0000, 681.4091, 1812.1176, 324.222~
$ popwhite             <int> 63917, 7054, 14477, 29344, 5264, 35157, 5298, 165~
$ popblack             <int> 1702, 3496, 429, 127, 547, 50, 1, 111, 16, 16559,~
$ popamerindian        <int> 98, 19, 35, 46, 14, 65, 8, 30, 8, 331, 51, 26, 17~
$ popasian             <int> 249, 48, 16, 150, 5, 195, 15, 61, 23, 8033, 89, 3~
$ popother             <int> 124, 9, 34, 1139, 6, 221, 0, 84, 6, 1596, 20, 7, ~
$ percwhite            <dbl> 96.71206, 66.38434, 96.57128, 95.25417, 90.19877,~
$ percblack            <dbl> 2.57527614, 32.90043290, 2.86171703, 0.41225735, ~
$ percamerindan        <dbl> 0.14828264, 0.17880670, 0.23347342, 0.14932156, 0~
$ percasian            <dbl> 0.37675897, 0.45172219, 0.10673071, 0.48691813, 0~
$ percother            <dbl> 0.18762294, 0.08469791, 0.22680275, 3.69733169, 0~
$ popadults            <int> 43298, 6724, 9669, 19272, 3979, 23444, 3583, 1132~
$ perchsd              <dbl> 75.10740, 59.72635, 69.33499, 75.47219, 68.86152,~
$ percollege           <dbl> 19.63139, 11.24331, 17.03382, 17.27895, 14.47600,~
$ percprof             <dbl> 4.355859, 2.870315, 4.488572, 4.197800, 3.367680,~
$ poppovertyknown      <int> 63628, 10529, 14235, 30337, 4815, 35107, 5241, 16~
$ percpovertyknown     <dbl> 96.27478, 99.08714, 94.95697, 98.47757, 82.50514,~
$ percbelowpoverty     <dbl> 13.151443, 32.244278, 12.068844, 7.209019, 13.520~
$ percchildbelowpovert <dbl> 18.011717, 45.826514, 14.036061, 11.179536, 13.02~
$ percadultpoverty     <dbl> 11.009776, 27.385647, 10.852090, 5.536013, 11.143~
$ percelderlypoverty   <dbl> 12.443812, 25.228976, 12.697410, 6.217047, 19.200~
$ inmetro              <int> 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0~
$ category             <chr> "AAR", "LHR", "AAR", "ALU", "AAR", "AAR", "LAR", ~
```

1. Making a histogram to visualize the population density of counties

```
ggplot(midwest, aes(x = popdensity))+
  geom_histogram(binwidth = 10000, fill = "light blue")+
labs(title = "Population density in different counties",
     x = "Population density", y = "Frequency")
```

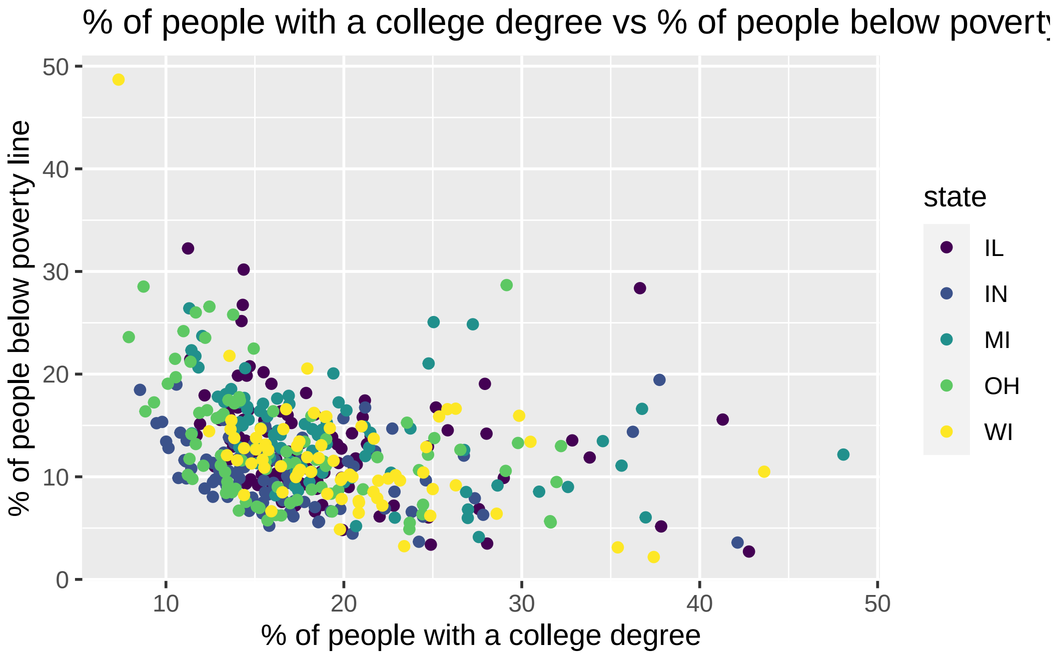


The distribution has a right skewed tail.

There seems to be a few counties with an extremely high population density at around 60000 and 90000. These are outliers, they are far away from most of the data and outside of the curve.

2. Create a scatterplot of the percentage of people with a college degree versus percentage below poverty

```
ggplot(midwest, aes(x=percollege, y=percbelowpoverty, color=state))+
  geom_point()+
  labs(title="% of people with a college degree vs % of people below poverty line",
       x= "% of people with a college degree", y= "% of people below poverty line") +
```



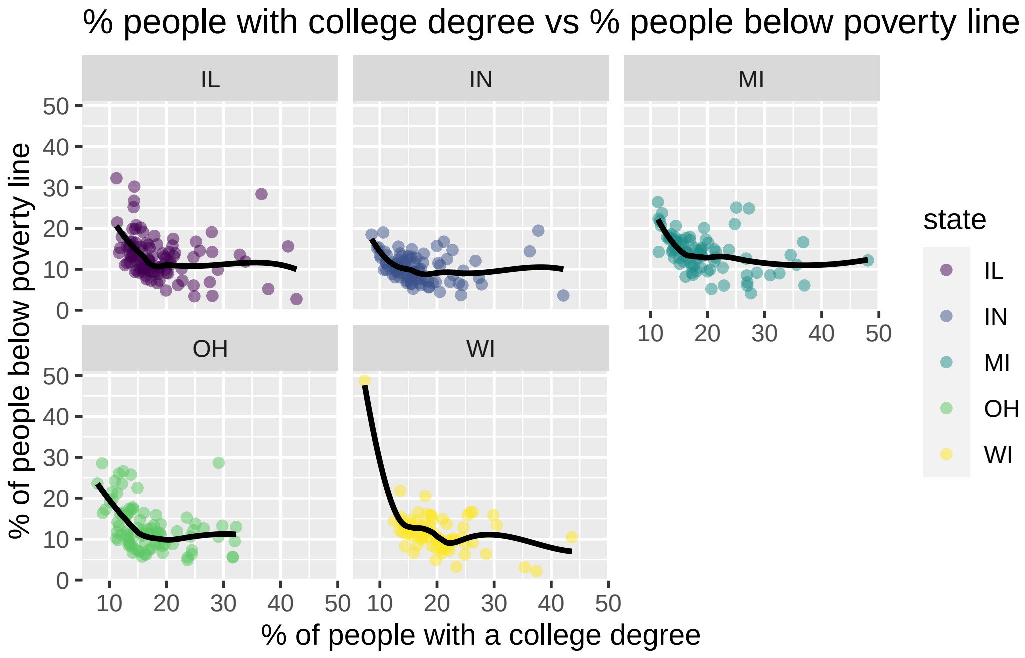
3. Describe what you observe in the plot from the previous exercise. In your description, include similarities and differences in the patterns across states.

The scatter plot does not highlight a clear relationship between the data. However,t the curve most data follow seems to be pointing downward and to the right, showing a negative relationship between the data: the higher the percentage of people with a college degree, the lower the percentage of people below the poverty line. The states of Illinois, Michigan and Ohio, seem to have the largest percentages of people below the poverty line, even with high percentages of people with a college degree

4. Looking at the relationship between the number of poeple with a college degree and the number of poeple below the poverty line by state.

```
#plotting data on a scatter plot, diving grids based on the state
ggplot(midwest, aes(x=percollege, y=percbelowpoverty, color=state))+
  geom_point(alpha = .5)+
  facet_wrap(~state) +
  geom_smooth(se = FALSE, color = "black")+
  labs(title="% people with college degree vs % people below poverty line",
       x= "% of people with a college degree",
       y= "% of people below poverty line") + scale_colour_viridis_d()
```

```
`geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



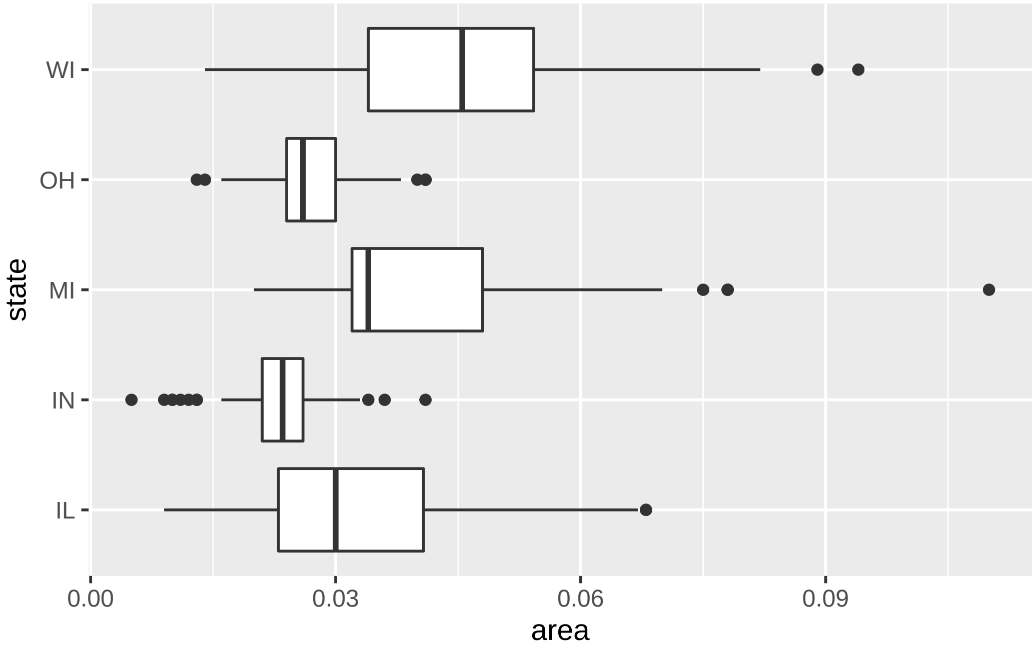
```
#color black for the lines makes the line more visible
```

Which plot do you prefer - this plot or the plot in Ex 2? Briefly explain your choice.

I prefer the plot in exercise 4 to the one in exercise 2 because the differences between the states are much clearer, and adding the trend line allows for a better reading of the plot. Also because even with different colors, in exercise 2 the plot didn't show clearly the states, because the points were on top of each other.

5. Looking at the difference in area between states.

```
#plotting the data on side by side boxplots
ggplot(midwest, aes(x=area, y=state))+
  geom_boxplot()
```



- Describe what you observe from the plot.

  This plot shows the distribution of the areas of counties in different states. Each boxplot highlights the median, interquartile range, upper and lower extremes and the outliers.

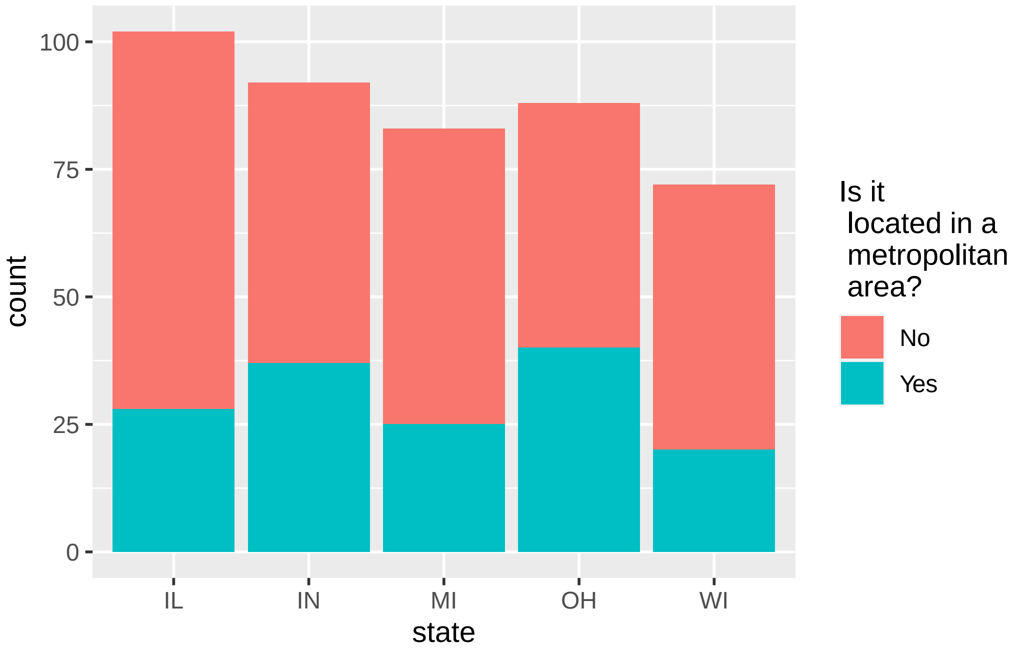
- Which state has the single largest county? How do you know based on the plot?

  Michigan seems to have the largest county, because one of its outliers shows an area much larger than all the other counties. This can be seen because the point is to the right of all the other points.

6. Exploring whether most counties in the chosen states are located in a metropolitan area or not

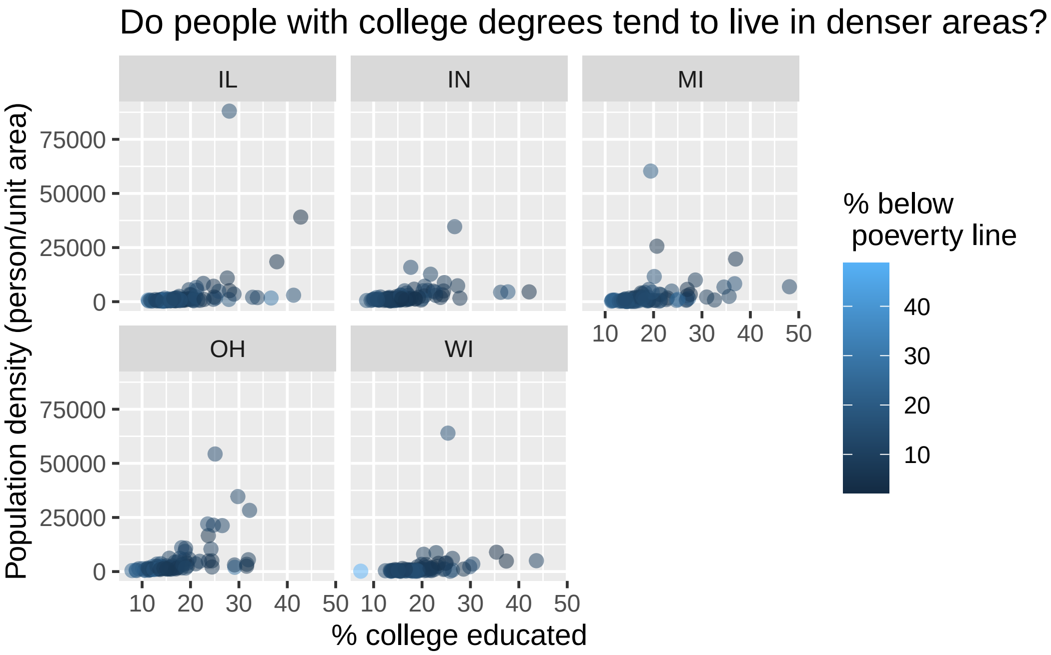
```
#data wrangling code
midwest <- midwest |>
  mutate(metro = if_else(inmetro == 1, "Yes", "No"))
```

```
#creating a segmented bar chart for the data
ggplot(midwest, aes(x=state, fill= metro))+
  geom_bar()+
  labs(fill= "Is it \n located in a \n metropolitan \n area?")
```



7. From the plot above we can see that most of the counties are located in metropolitan areas. The distinction is based on the color of the bars. The color orange identifies counties that are in metropolitan areas and all bars are predominantly orange. We can also see the number of counties per each state based on the count. The one with the largest amount is Illinois.
8. Looking at whether people with a college degree tend to live in denser areas

```
#reproducing the scatter diagram
    ggplot(midwest, aes(x=percollege, y=popdensity, color=percbelowpoverty))+
      geom_point(size=2, alpha=0.5)+
       facet_wrap(~state) +
      labs(title="Do people with college degrees tend to live in denser areas?", x= "% col
```


Do people with college degrees tend to live in denser areas?
IL
IN
MI
OH
WI
Population density (person/unit area)
0
25000
50000
75000
10
20
30
40
50
% college educated
% below
poeverty line
10
20
30
40