

# Lab 1 - Data visualization

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## Questions

### Part 1

```
library(tidyverse)

-- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
v dplyr     1.1.4      v readr     2.1.6
v forcats   1.0.1      v stringr   1.6.0
v ggplot2   4.0.1      v tibble    3.3.0
v lubridate 1.9.4      v tidyr    1.3.2
v purrr    1.2.0

-- Conflicts -----
x dplyr::filter() masks stats::filter()
x dplyr::lag()   masks stats::lag()

i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become non-conflicting.
```

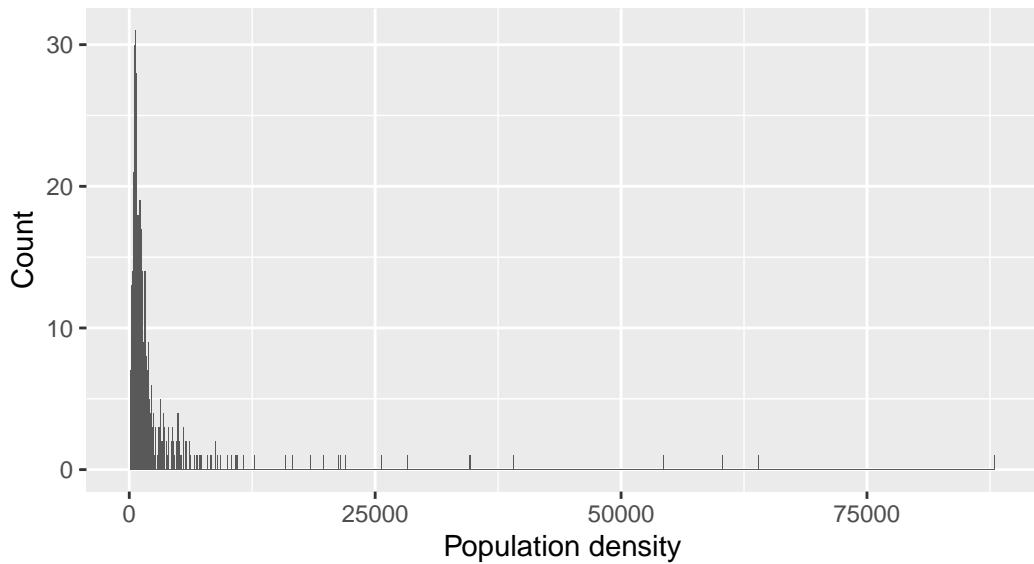
### Question 1

Binwidth = 100

```
ggplot(midwest, aes(x = popdensity)) +
  geom_histogram(binwidth = 100) +
  labs(
    x = "Population density",
    y = "Count",
    title = "Population density of midwestern counties",
    subtitle = "Binwidth = 100"
  )
```

## Population density of midwestern counties

Binwidth = 100

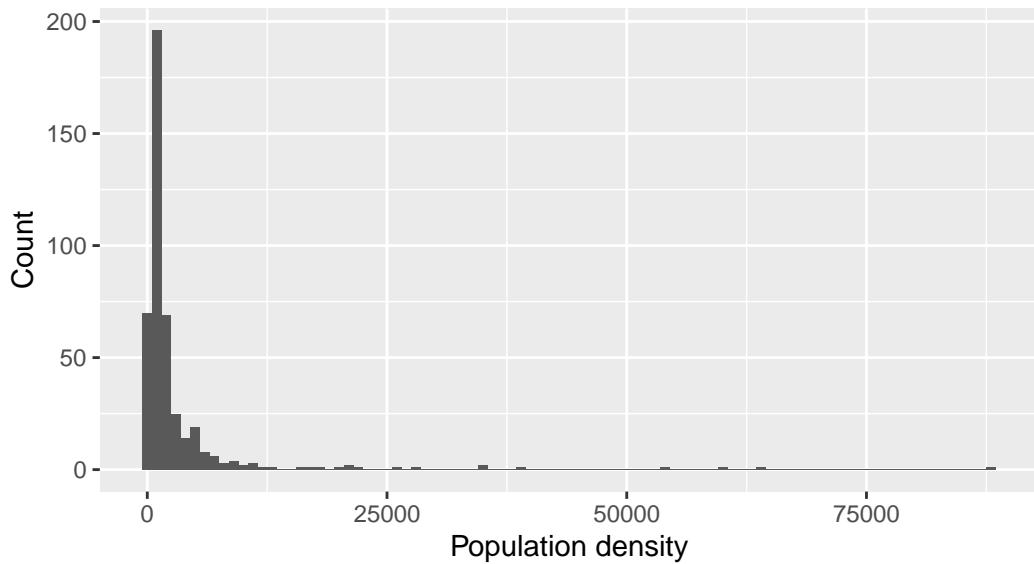


Binwidth = 1000

```
ggplot(midwest, aes(x = popdensity)) +  
  geom_histogram(binwidth = 1000) +  
  labs(  
    x = "Population density",  
    y = "Count",  
    title = "Population density of midwestern counties",  
    subtitle = "Binwidth = 1000"  
)
```

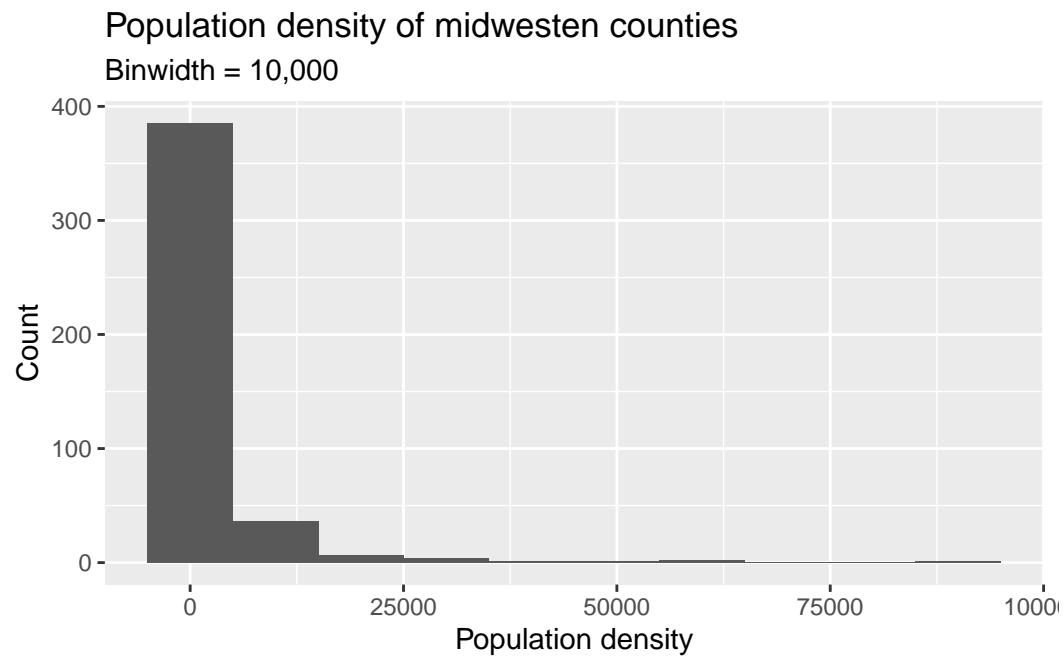
## Population density of midwestern counties

Binwidth = 1000



Binwidth = 10,000

```
ggplot(midwest, aes(x = popdensity)) +  
  geom_histogram(binwidth = 10000) +  
  labs(  
    x = "Population density",  
    y = "Count",  
    title = "Population density of midwestern counties",  
    subtitle = "Binwidth = 10,000"  
)
```

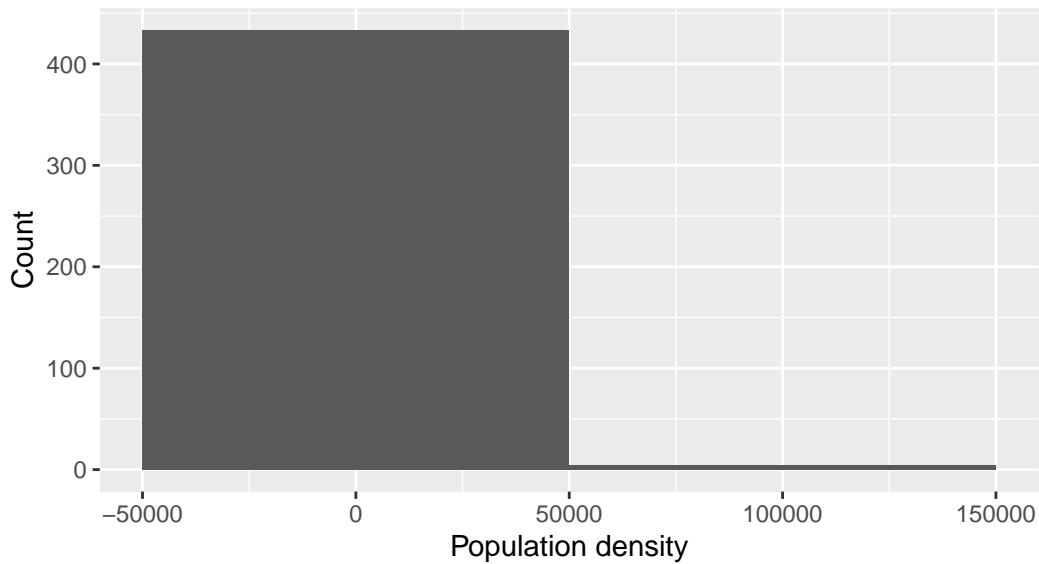


Binwdith = 100,000

```
ggplot(midwest, aes(x = popdensity)) +  
  geom_histogram(binwidth = 100000) +  
  labs(  
    x = "Population density",  
    y = "Count",  
    title = "Population density of midwestern counties",  
    subtitle = "Binwidth = 100,000"  
)
```

## Population density of midwestern counties

Binwidth = 100,000



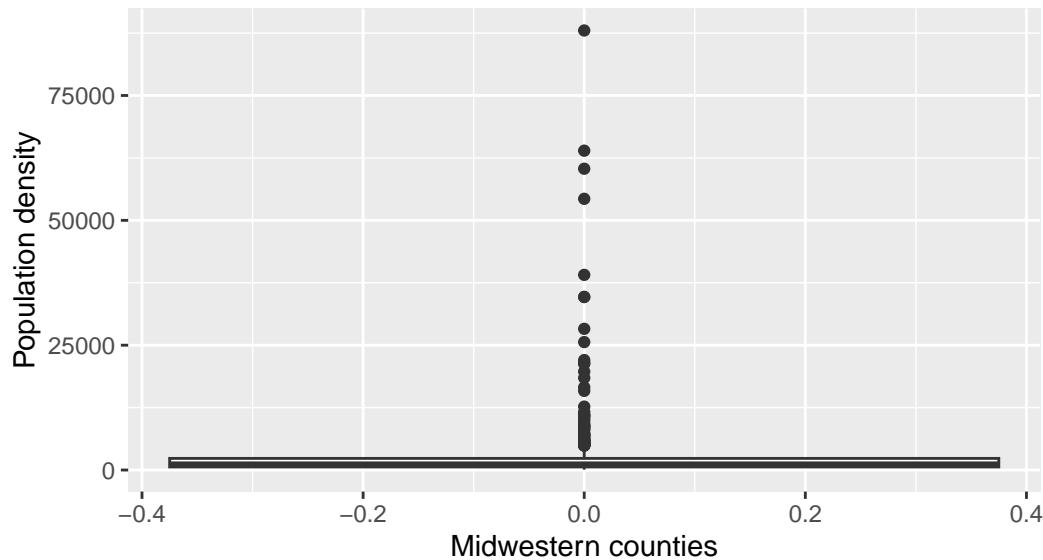
Comment: A graph with bandwidth 1,000 is the most appropriate because it shows the overall distribution clearly without losing important detail, not too noisy nor oversmooth.

### Question 2

```
ggplot(midwest, aes(y = popdensity)) +  
  geom_boxplot() +  
  labs(  
    x = "Midwestern counties",  
    y = "Population density",  
    title = "Population density of midwestern counties",  
    subtitle = "Boxplot of population density"  
)
```

## Population density of midwestern counties

Boxplot of population density



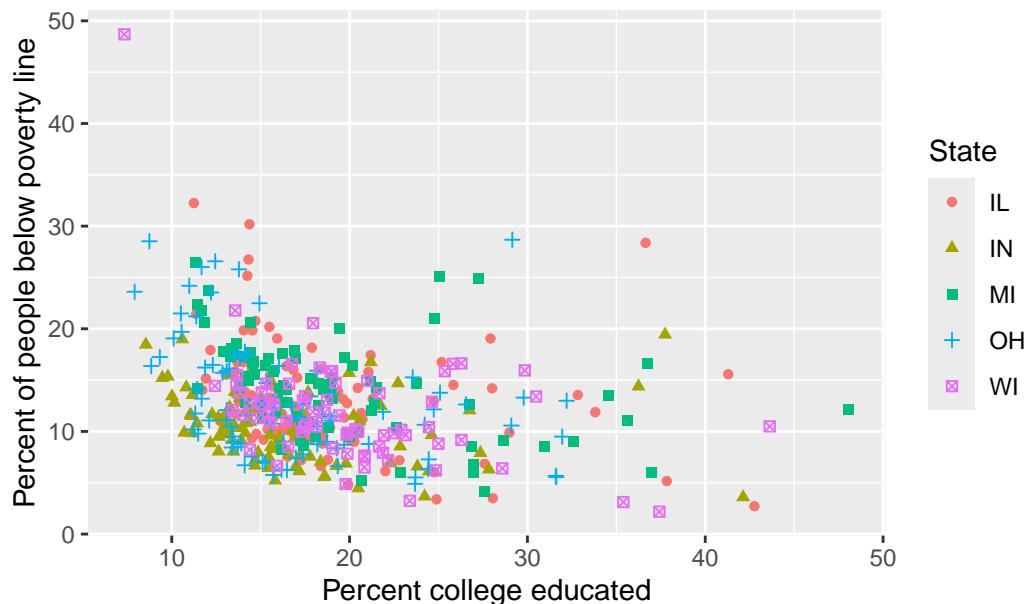
```
view(midwest)
```

Comment: The distribution of population density among Midwestern counties is highly right-skewed, which means most counties having relatively low population density. One clear outlier is Cook County, IL, which has much higher population density than most other counties.

### Question 3

```
ggplot(midwest, aes(x = percollege , y = percbelowpoverty,
                     color = state, shape = state)) +
  geom_point() +
  labs(
    x = "Percent college educated",
    y = "Percent of people below poverty line",
    color = "State",
    shape = "State",
    title = "College education and poverty in Midwestern counties",
  )
```

## College education and poverty in Midwestern counties



Comment: Overall, there is a negative relationship between percentage of people with a college degree and the percentage of people living below the poverty line. Counties with higher levels of college education tend to have lower poverty rates, while counties with lower levels of college education tend to have higher poverty rates.

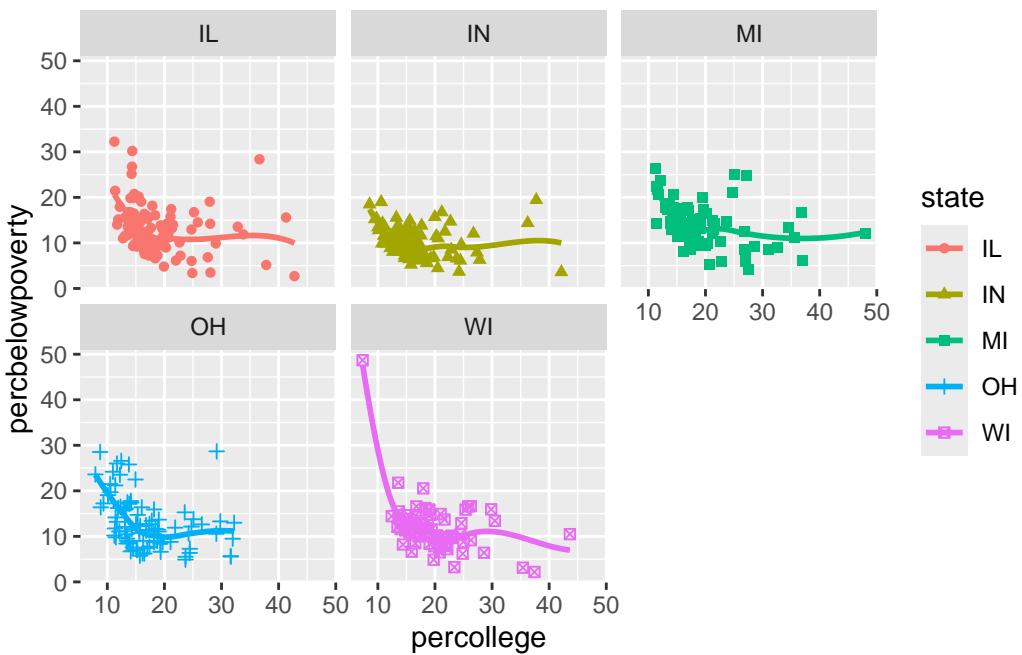
```
view(midwest)
```

Comment: From the scatter plot above, WI with square and purple point is the outlier. Based on the data, it can be seen that Minominee, WI has 48% of people below poverty with 7% of people college educated.

### Question 4

```
ggplot(midwest, aes(x = percollege , y = percbelowpoverty,
                     color = state, shape = state)) +
  geom_point() +
  geom_smooth(se = FALSE) +
  facet_wrap(~ state)
```

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



```
labs(
  x = "Percent college educated",
  y = "Percent of people below poverty line",
  shape = "State",
  color = "State",
  title = "College education and poverty in Midwestern counties"
)
```

```
<ggplot2::labels> List of 5
$ x      : chr "Percent college educated"
$ y      : chr "Percent of people below poverty line"
$ shape  : chr "State"
$ colour: chr "State"
$ title  : chr "College education and poverty in Midwestern counties"
```

**Question 5**

**Question 6**

**Question 7**

**Part 2**

**Enough about the Midwest!**

**Question 8**

**Question 9**