# PSC4375: Visualizing Distributions

## Week 3: Lecture 5

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# Studying political efficacy

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- Goal: determine feelings of political efficacy
- Question: "How much say do you have in getting the government to address issues that interest you?"
  1. No say at all
  2. little say
  3. some say
  4. a lot of say
  5. unlimited say

## Data

- Load the data:

```r
library(tidyverse)
data(vignettes, package = "qss")
head(vignettes)
```

```
##   self alison jane moses china age
## 1    1      5    5     2     0  31
## 2    1      1    5     5     0  54
## 3    2      3    1     1     0  50
## 4    2      4    2     1     0  22
## 5    2      3    3     3     0  52
## 6    1      3    1     5     0  50
```

```r
## Also works if you downloaded the data:
# vignettes <- read.csv("data/vignettes.csv")
```

## Contingency table

- count() shows how many units are in each category of a variable:

```
vignettes %>%
  count(self)
```

```
##   self   n
## 1    1 327
## 2    2 210
## 3    3 130
## 4    4  56
## 5    5  58
```
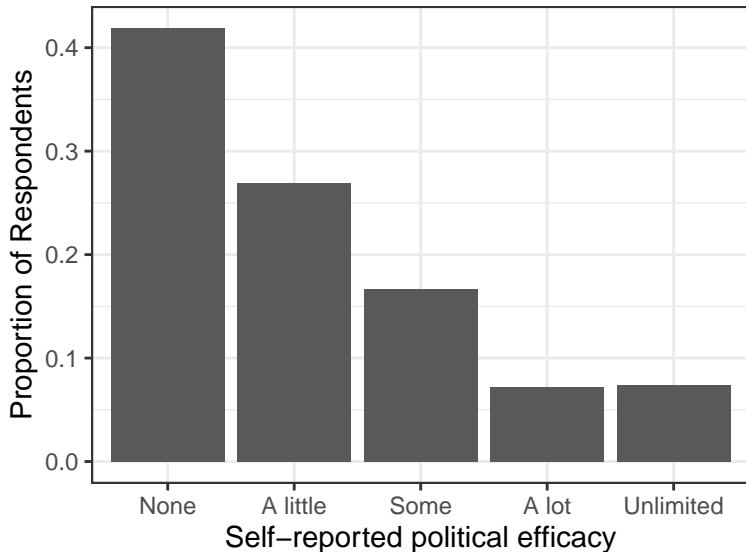
## Contingency table (continued)

- using group_by we can convert these counts into proportions of units:

```
vignettes %>%
  group_by(self) %>%
  count() %>%
  ungroup() %>%
  mutate(prop = n / sum(n))
```

```
## # A tibble: 5 x 3
##    self     n   prop
##   <int> <int>  <dbl>
## 1     1   327  0.419
## 2     2   210  0.269
## 3     3   130  0.166
## 4     4    56 0.0717
## 5     5    58 0.0743
```

## Useful way to visualize this information: barplot

## Barplots in R

- The barplot() function can help us visualize a categorical variable:

```
vignettes %>%
  ggplot(aes(x = as.factor(self),y=..prop..,group = 1)) +
  geom_bar() +
  scale_x_discrete(labels = c("None", "A little",
                    "Some", "A lot", "Unlimited")) +
  xlab("Self-reported political efficacy") +
  ylab("Proportion of Respondents") +
  theme_bw()
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- Arguments:
  - aes(): the aestetic mapping of the plot (what you see)

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- Arguments:
  - aes(): the aestetic mapping of the plot (what you see)
  - scale_x_discrete(): changes the scale of the axis
  - xlab(), ylab() are axis labels
  - theme_bw() removes grey background

## Histogram

- **Histograms** visualize density of a continuous/numeric variable



Distribution of Respondent's Age
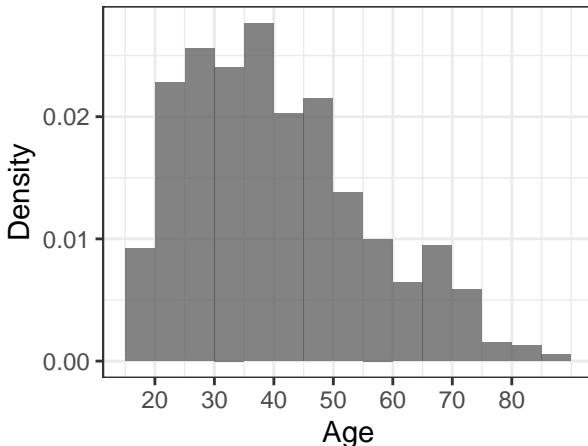
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- The areas of the bins = proportion of observations in those bins.
  - ⇝ area of the blocks sum to 1 (100%)
  - With equal-width bins, height is proportional to proportion in bin.

# Histograms in R (`geom_histogram()`)

```r
vignettes %>%
  ggplot(aes(x = age,
             y = ..density..)) +
  geom_histogram(binwidth = 5, # how wide for each bin
                 boundary = 0, # bin position
                 alpha=0.75) + # reduces opaqueness
  scale_x_continuous(breaks = seq(20, 80,by = 10)) +
  labs(title = "Distribution of Respondent's Age",
       y = "Density",
       x = "Age") +
  theme_bw()
```

-labs sets the titles for the plot (used xlab and ylab in previous plot)
-scale_x_continuous sets the scale for the x-axis

# Histograms in R: adding a vertical `median` line
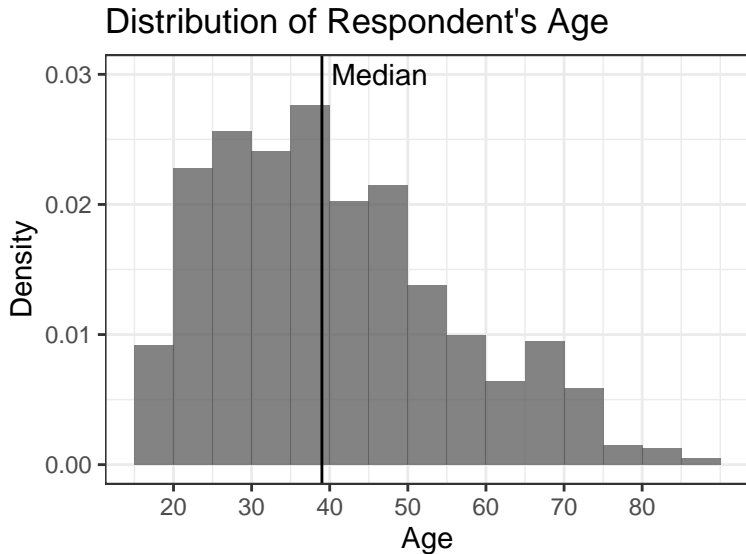


Distribution of Respondent's Age

# Histograms in R: adding a vertical `median` line

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  ggplot(aes(x = age,
             y = ..density..)) +
  geom_histogram(binwidth = 5, # how wide for each bin
                 boundary = 0, # bin position
                 alpha=0.75) + # reduces opaqueness
  geom_vline(xintercept = median(vignettes$age)) +
  annotate(geom = "text", x = median(vignettes$age),
           y=.03, label = "Median", hjust = -0.1) +
  scale_x_continuous(breaks = seq(20, 80,by = 10)) +
  labs(title = "Distribution of Respondent's Age",
       y = "Density",
       x = "Age") +
  theme_bw()
```

## Boxplot

- A **boxplot** can characterize the distribution of continuous variables



Distribution of Age
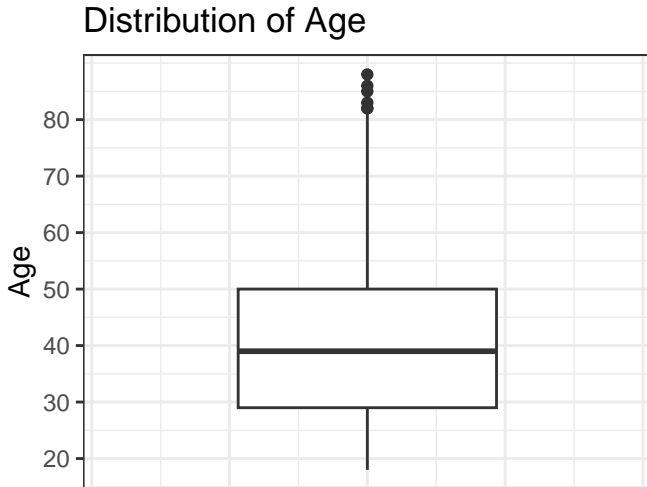
# Boxplots in R

- "Box" represents range between lower and upper quartile
- "Whiskers" represents either:
  - 1.5 x IQR or max/min of the data, whichever is smaller
  - Points beyond whiskers are outliers
- Use geom_boxplot() in ggplot

## Boxplots in R

```
vignettes %>%
  ggplot(aes(y = age)) +
  geom_boxplot() +
  scale_y_continuous(breaks = seq(20, 80,by = 10)) +
  xlim(-.75,.75) +
  labs(title = "Distribution of Age", y = "Age") +
  theme_bw() +
  theme(axis.text.x=element_blank(),
        axis.ticks.x=element_blank())
```

- Added options:
    - scale_y_continuous: scale the y axis
    - xlim: alter range of x-axis so box is less wide
    - theme_bw: removes grey background
    - theme: allows you to adjust other parts of figure

# Review

- Visualizing single discrete/categorical variables: **barplots**

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- Visualizing single discrete/categorical variables: **barplots**
- Visualizing continuous variables: **histograms, boxplots**