Chapter 2: Causality

Data Transformation with Tidyverse

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1. Data Transformation

2. Functions

3. Summary

Section 1

Data Transformation

Let's get started with Data

Does racial discrimination exist in the labor market?

```
## load packages
library(tidyverse)
## load data
resume <- read_csv("data/resume.csv")
# check data
resume
```

```
## # A tibble: 4,870 x 4
##    firstname sex    race   call
##    <chr>     <chr>  <chr> <dbl>
##  1 Allison   female white     0
##  2 Kristen   female white     0
##  3 Lakisha   female black     0
##  4 Latonya   female black     0
##  5 Carrie    female white     0
##  6 Jay       male   white     0
##  7 Jill      female white     0
##  8 Kenya     female black     0
```

Today's Goal

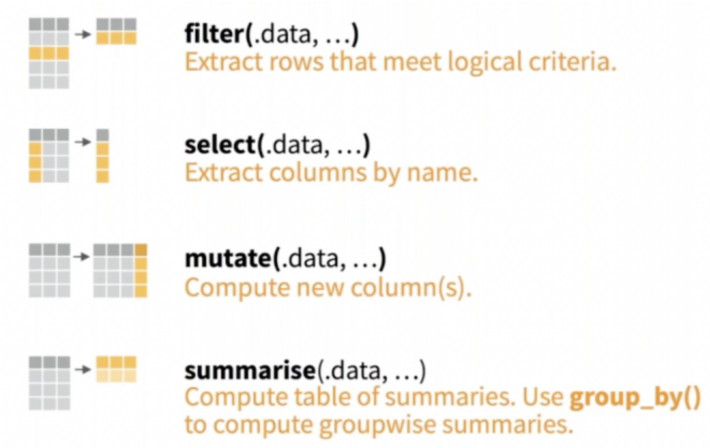
Combine functions to get informative output

```
racial_gaps_by_sex <- resume %>%
  group_by(race, sex) %>%
    # using two variables to group the data
  summarize(callback = mean(call)) %>%
    # the callback rate for each group
  pivot_wider(names_from = race,
                # reshaping the data
              values_from = callback) %>%
  mutate(race_gap = white - black)
```

sex	black	white	race_gap
female	0.0662778	0.0989247	0.0326469
male	0.0582878	0.0886957	0.0304079

Tools

dplyr from Tidyverse



filter(.data, …)
Extract rows that meet logical criteria.

select(.data, …)
Extract columns by name.

mutate(.data, …)
Compute new column(s).

summarise(.data, …)
Compute table of summaries. Use **group_by()** to compute groupwise summaries.

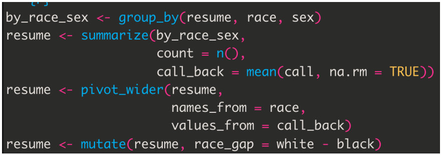
Source: RStudio

Section 2

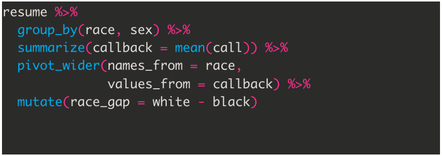
Functions

What is “pipe %>%” ?

- “a good way to pronounce %>% when reading code is “**then**”.”



```
by_race_sex <- group_by(resume, race, sex)
resume <- summarize(by_race_sex,
                    count = n(),
                    call_back = mean(call, na.rm = TRUE))
resume <- pivot_wider(resume,
                      names_from = race,
                      values_from = call_back)
resume <- mutate(resume, race_gap = white - black)
```



```
resume %>%
  group_by(race, sex) %>%
  summarize(callback = mean(call)) %>%
  pivot_wider(names_from = race,
              values_from = callback) %>%
  mutate(race_gap = white - black)
```

Source: R for Data Science

Extract Rows (filter)

- filter: Return rows by name/number/etc.

```
## subset data with black names
resume %>%
  filter(race == "black")
```

```
## # A tibble: 2,435 x 4
##    firstname sex    race   call
##    <chr>     <chr>  <chr> <dbl>
##  1 Lakisha   female black     0
##  2 Latonya   female black     0
##  3 Kenya     female black     0
##  4 Latonya   female black     0
##  5 Tyrone    male   black     0
##  6 Aisha     female black     0
##  7 Aisha     female black     0
##  8 Aisha     female black     0
##  9 Tamika    female black     0
```

Extract Columns (select)

- select: Return columns by name/number/etc.

```
## Subset with sex and race columns
resume %>%
  select(sex, race)
```

```
## # A tibble: 4,870 x 2
##    sex    race
##    <chr>  <chr>
##  1 female white
##  2 female white
##  3 female black
##  4 female black
##  5 female white
##  6 male   white
##  7 female white
##  8 female black
##  9 female black
```

Compute New Columns (mutate)

- mutate

```
## create a factor variable that takes one of the four values
resume %>%
  mutate(type = case_when(race == "black" & sex == "female" ~ "BlackFemale",
                          race == "black" & sex == "male" ~ "BlackMale",
                          race == "white" & sex == "female" ~ "WhiteFemale",
                          race == "white" & sex == "male" ~ "WhiteMale",
                          TRUE ~ "Other"))
```

```
## # A tibble: 4,870 x 5
##    firstname sex    race   call type
##    <chr>     <chr>  <chr> <dbl> <chr>
##  1 Allison   female white     0 WhiteFemale
##  2 Kristen   female white     0 WhiteFemale
##  3 Lakisha   female black     0 BlackFemale
##  4 Latonya   female black     0 BlackFemale
##  5 Carrie    female white     0 WhiteFemale
##  6 Jay       male   white     0 WhiteMale
##  7 Jill      female white     0 WhiteFemale
##  8 Kenya     female black     0 BlackFemale
##  9 Latonya   female black     0 BlackFemale
## 10 Tyrone    male   black     0 BlackMale
## # ... with 4,860 more rows
```

Compute Table Summaries (summarise)

```r
## callback rate for black female names
resume %>%
  filter(race == "black" & sex =="female") %>%
  summarize(callback_rate = mean(call, na.rm = TRUE))
```

```
## # A tibble: 1 x 1
##   callback_rate
##           <dbl>
## 1        0.0663
```

Section 3

Summary

Overwhelmed?

Don't worry!

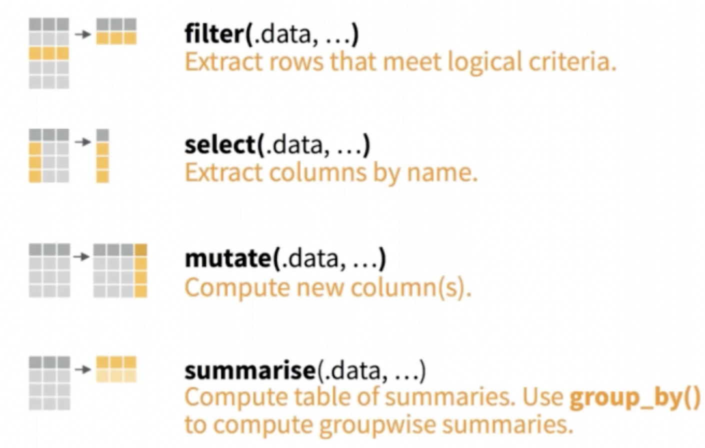
There are many resources you can use, and you don't have to memorize all the functions.

- QSS Textbook
  - Tidyverse Version is on `Perusall`
- Cheetsheets
  - Search "`tidyverse cheetsheets`"
  - https://www.rstudio.com/resources/cheatsheets/
- Online Resources
  - Google "`tidyverse add column error`"
  - official reference page, stackoverflow, RPubs, etc.

Teaching Team

We are here for you!

Let's practice!



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Source: RStudio

Reference

- QSS (Textbook)
- [RStudio](https://www.rstudio.com/resources/webinars/tidyverse-visualization-manipulation-basics/
- R for Data Science