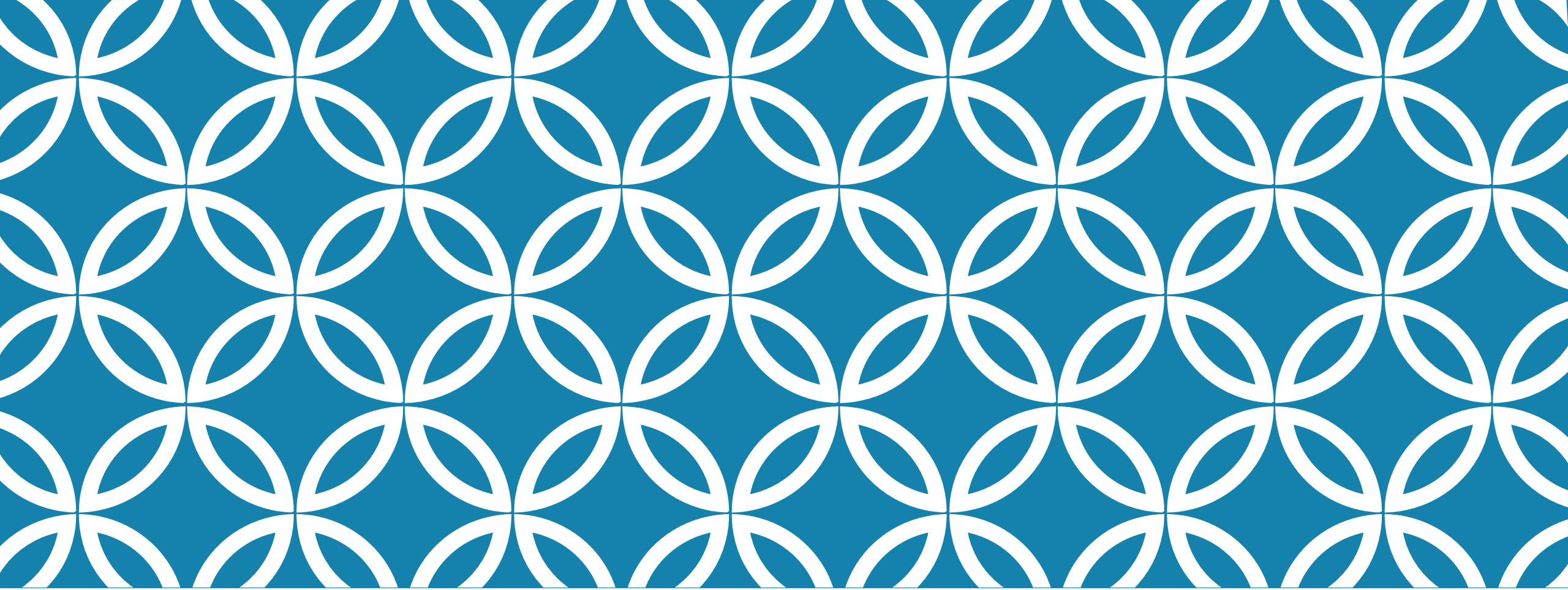


Creating a Subset

Patrick Mathias

Lesson 4

DLMP Core

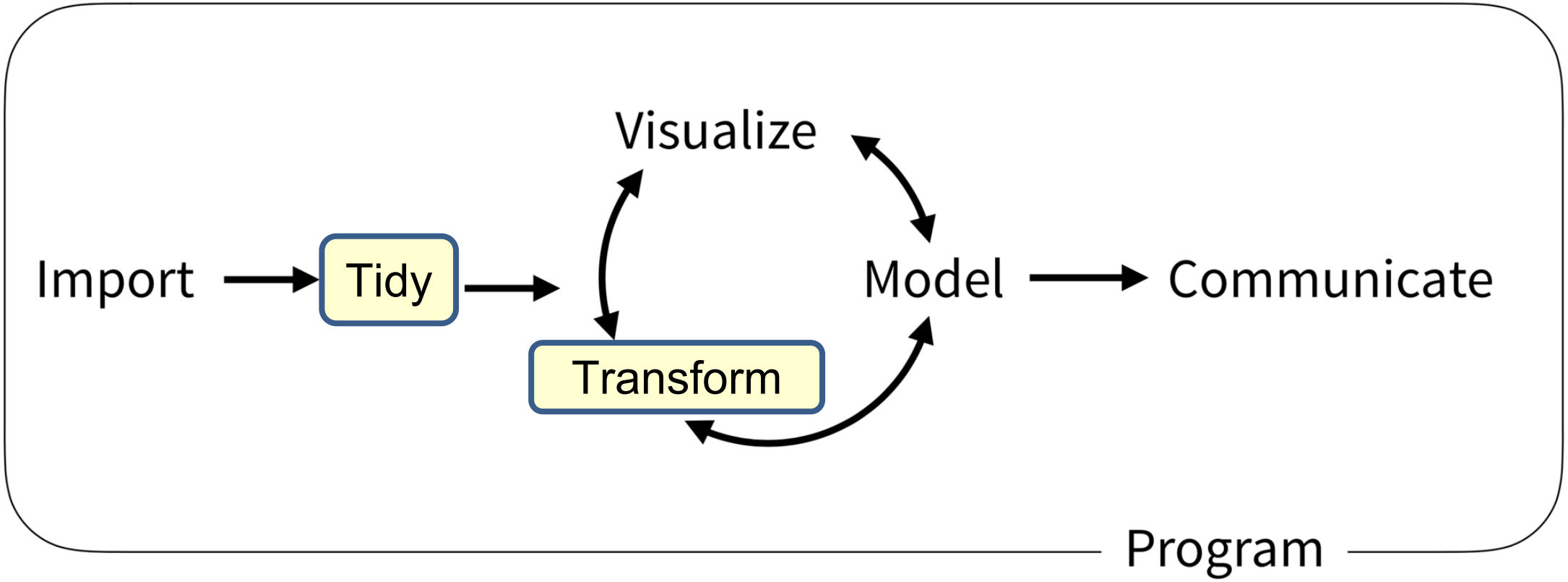
Goal

1. Learn how to use dplyr to transform data frames
2. Create a smaller subset from a data frame

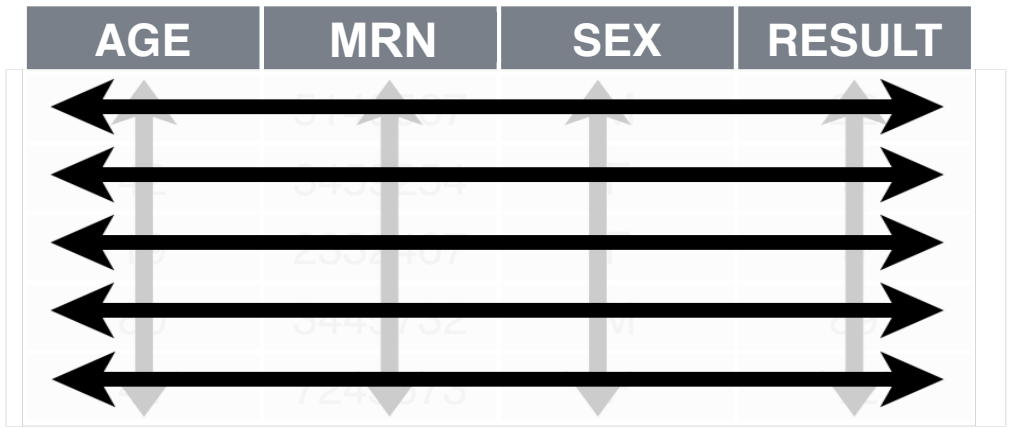
Objectives

1. List the major forms of data transformation implemented in dplyr
2. Use code templates with dplyr functions to tidy a raw data set
3. Create a subset using logical conditions to extract specific rows from a data frame

Typical Data Science Pipeline



What is a "Tidy" Data Frame



A data set is **tidy** if:

1. Each **variable** is in its own **column**
2. Each **observation** is in its own **row**
3. Each **value** is in its own **cell**

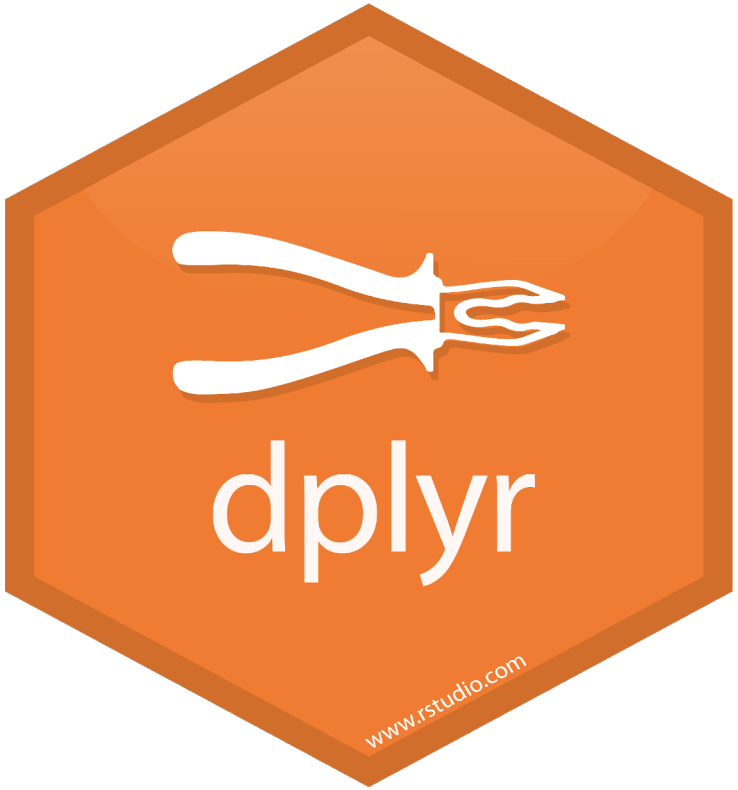
Your Turn 1

Open "**04-Subset.Rmd**"

Run the setup chunk

Transform Data with

dplyr

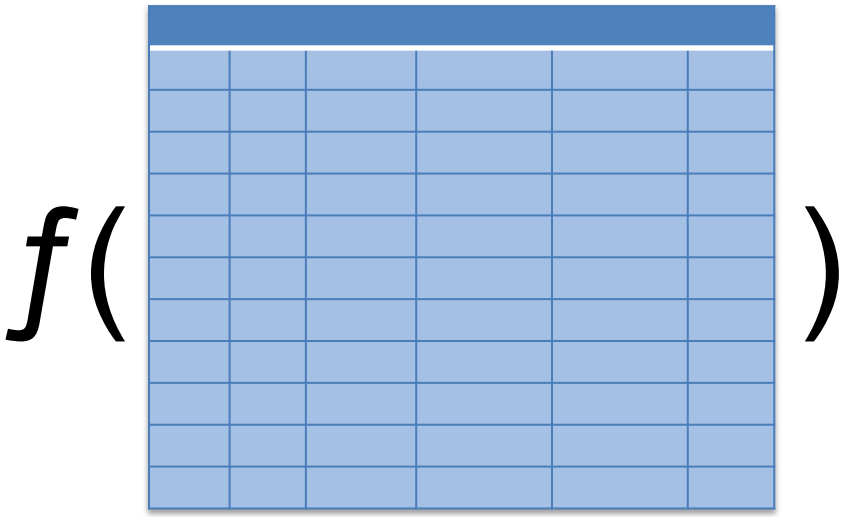


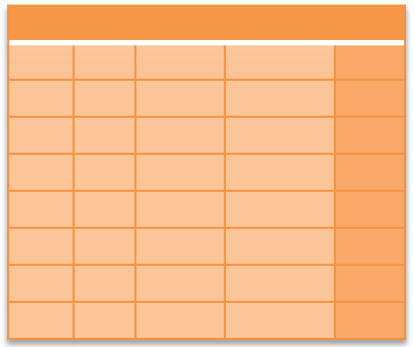
dplyr implements a *grammar* for transforming tabular data.

dplyr: a grammar for transforming data

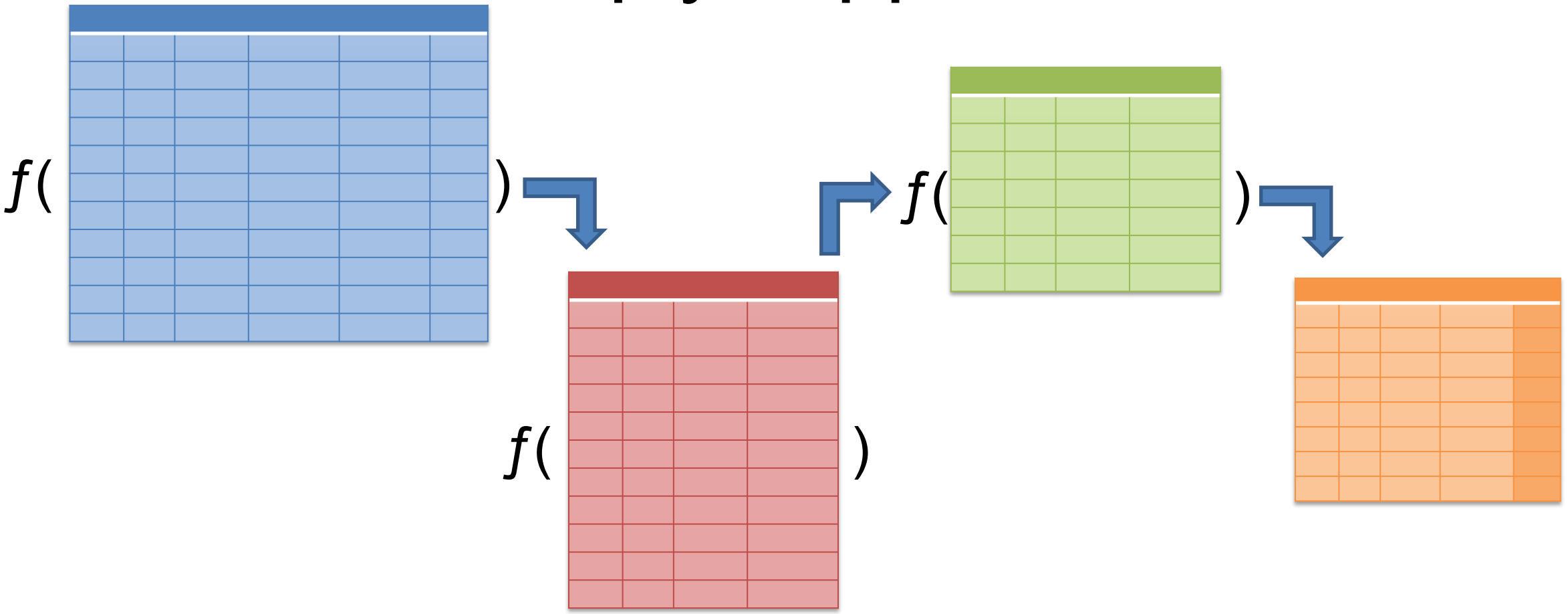
1. **Choose** columns. — **select()**
2. **Extract** rows. — **filter()**
3. **Derive** new columns. — **mutate()**
4. **Change** the unit of analysis. — **summarize()**

Dplyr Approach





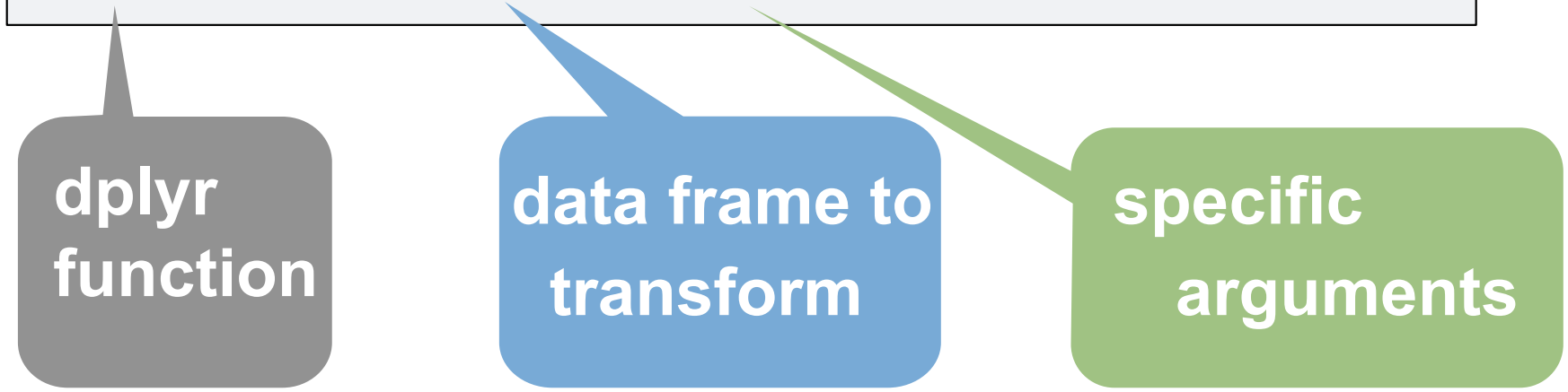
Dplyr Approach



Common syntax

Each function takes a data frame as its first argument and returns a data frame as its output.

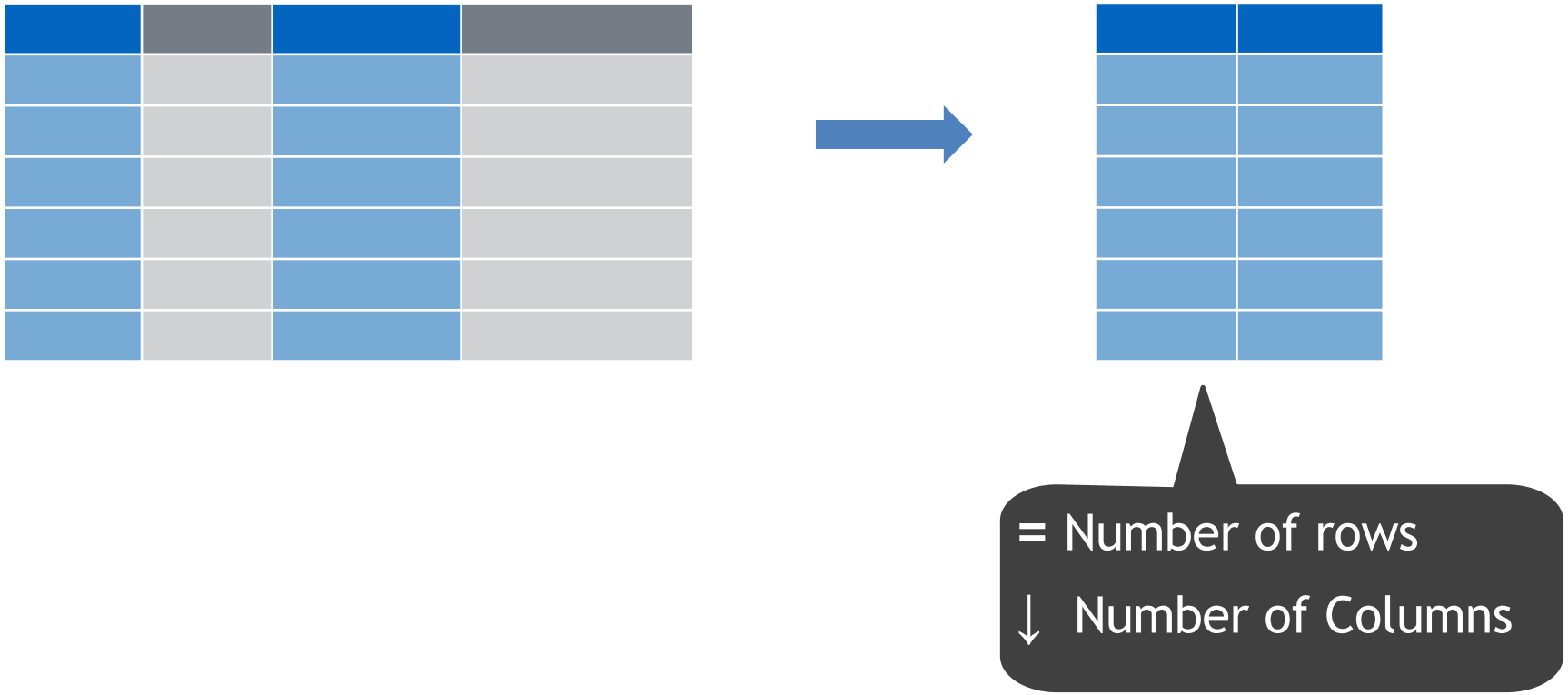
```
function(data, ...)
```



Subset Specific Columns

select()

Extract columns from a data frame



select()

Extract columns from a data frame

```
select(covid_testing, mrn, last_name)
```

dplyr function

data frame to transform

name(s) of columns to extract
(or a select helper)

select()

Extract columns from a data frame **by name**

```
select(covid_testing, mrn, last_name)
```

covid_testing

mrn	first_name	last_name	gender
5000876	sarella	stark	female
5006017	alester	stark	male
5001412	jhezane	westerling	female
5000533	penny	targaryen	female
...			

mrn	last_name
5000876	stark
5006017	stark
5001412	westerling
5000533	targaryen

select()

Extract columns from a data frame **by name**

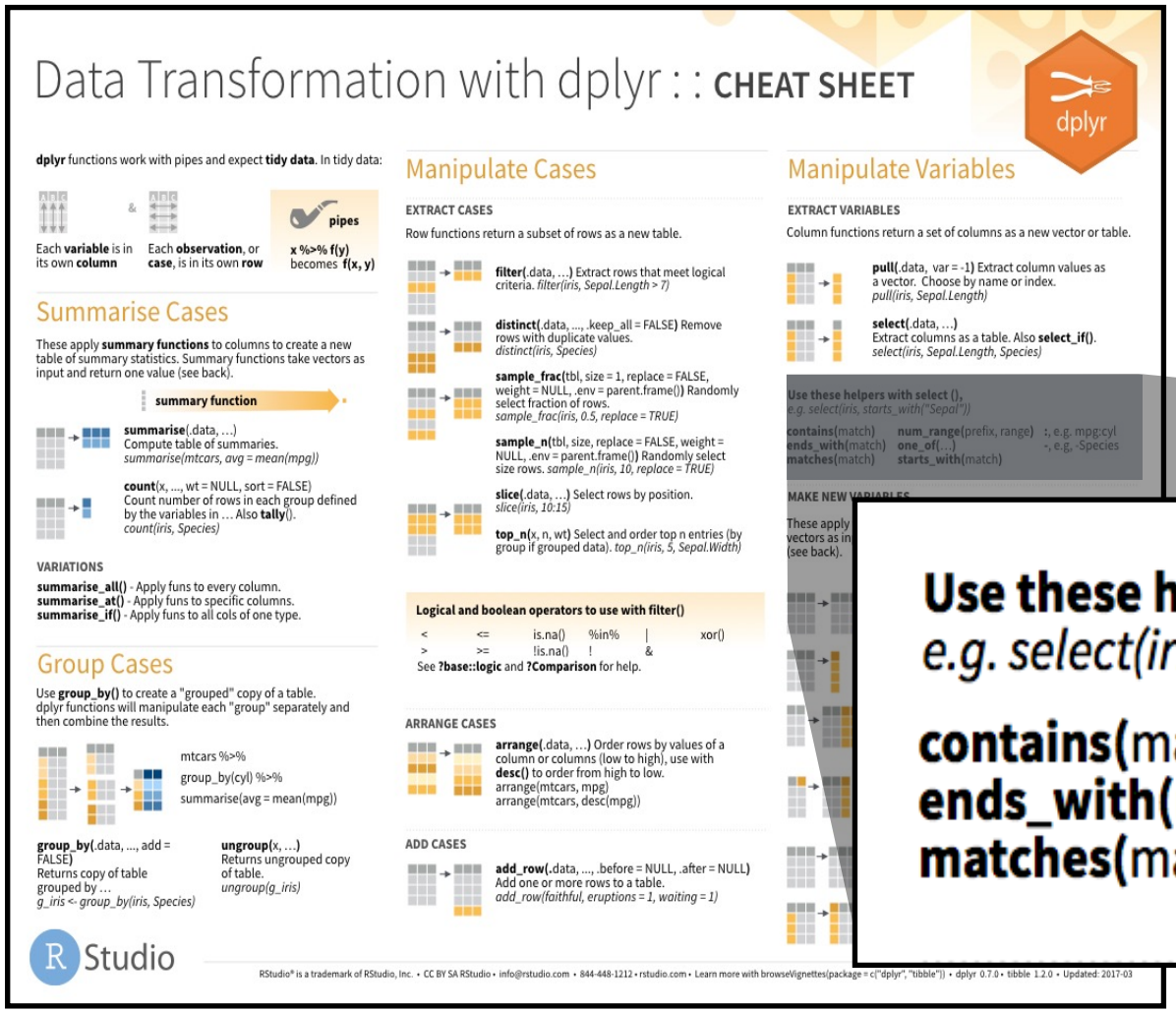
```
select(covid_testing, -mrn, -last_name)
```

covid_testing

mrn	first_name	last_name	gender
5000876	sarella	stark	female
5006017	alester	stark	male
5001412	jhezane	westerling	female
5000533	penny	targaryen	female
...			

first_name	gender
sarella	female
alester	male
jhezane	female
penny	female

select() helpers



Data Transformation with dplyr : : CHEAT SHEET

dplyr

dplyr functions work with pipes and expect **tidy data**. In tidy data:

Each **variable** is in its own **column** & Each **observation**, or **case**, is in its own **row**

pipes
x %>% f(y) becomes **f(x, y)**

Summarise Cases

These apply **summary functions** to columns to create a new table of summary statistics. Summary functions take vectors as input and return one value (see back).

summary function

summarise(.data, …)
Compute table of summaries.
summarise(mtcars, avg = mean(mpg))

count(x, ..., wt = NULL, sort = FALSE)
Count number of rows in each group defined by the variables in … Also **tally**().
count(iris, Species)

VARIATIONS

summarise_all() - Apply funs to every column.
summarise_at() - Apply funs to specific columns.
summarise_if() - Apply funs to all cols of one type.

Group Cases

Use **group_by()** to create a "grouped" copy of a table. dplyr functions will manipulate each "group" separately and then combine the results.

mtcars %>%
group_by(cyl) %>%
summarise(avg = mean(mpg))

group_by(.data, ..., add = FALSE)
Returns copy of table grouped by …
g_iris <- group_by(iris, Species)

ungroup(x, …)
Returns ungrouped copy of table.
ungroup(g_iris)

Manipulate Cases

EXTRACT CASES

Row functions return a subset of rows as a new table.

filter(.data, …) Extract rows that meet logical criteria. *filter(iris, Sepal.Length > 7)*

distinct(.data, ..., .keep_all = FALSE) Remove rows with duplicate values.
distinct(iris, Species)

sample_frac(tbl, size = 1, replace = FALSE, weight = NULL, .env = parent.frame()) Randomly select fraction of rows.
sample_frac(iris, 0.5, replace = TRUE)

sample_n(tbl, size, replace = FALSE, weight = NULL, .env = parent.frame()) Randomly select size rows. *sample_n(iris, 10, replace = TRUE)*

slice(.data, …) Select rows by position.
slice(iris, 10:15)

top_n(x, n, wt) Select and order top n entries (by group if grouped data). *top_n(iris, 5, Sepal.Width)*

Logical and boolean operators to use with filter()

<	<=	is.na()	%in%	|	xor()
>	>=	!is.na()	!	&	

See **?base::logic** and **?Comparison** for help.

ARRANGE CASES

arrange(.data, …) Order rows by values of a column or columns (low to high), use with **desc()** to order from high to low.
arrange(mtcars, mpg)
arrange(mtcars, desc(mpg))

ADD CASES

add_row(.data, ..., .before = NULL, .after = NULL) Add one or more rows to a table.
add_row(faithful, eruptions = 1, waiting = 1)

Manipulate Variables

EXTRACT VARIABLES

Column functions return a set of columns as a new vector or table.

pull(.data, var = -1) Extract column values as a vector. Choose by name or index.
pull(iris, Sepal.Length)

select(.data, …)
Extract columns as a table. Also **select_if()**.
select(iris, Sepal.Length, Species)

Use these helpers with select (),
e.g. select(iris, starts_with("Sepal"))

contains(match)	**num_range**(prefix, range)	:, e.g. mpg:cyl
ends_with(match)	**one_of**(…)	-, e.g, -Species
matches(match)	**starts_with**(match)	

MAKE NEW VARIABLES

These apply vectors as in (see back).

RStudio

RStudio® is a trademark of RStudio, Inc. • CC BY SA RStudio • info@rstudio.com • 844-448-1212 • rstudio.com • Learn more with browseVignettes(package = c("dplyr", "tibble")) • dplyr 0.7.0 • tibble 1.2.0 • Updated: 2017-03

Use these helpers with select (),
e.g. select(iris, starts_with("Sepal"))

contains(match)	**num_range**(prefix, range)	:, e.g. mpg:cyl
ends_with(match)	**one_of**(…)	-, e.g, -Species
matches(match)	**starts_with**(match)	

dplyr

Your Turn 2

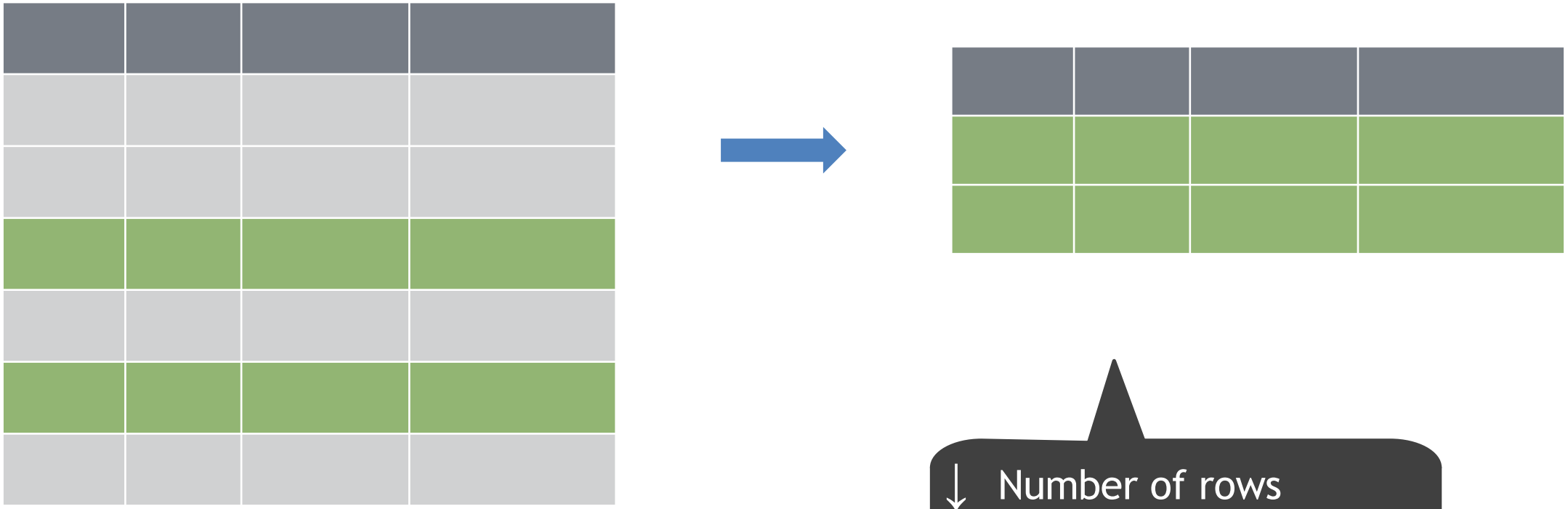
- Alter the code to select just the `first_name` column from `covid_testing`
- Use the second code chunk to see if you can remove the `first_name` column

```
covid_testing_2 <- select(covid_testing, _____)
```

Subset Specific Rows Based on Logical Conditions

filter()

Extract rows that meet logical criteria



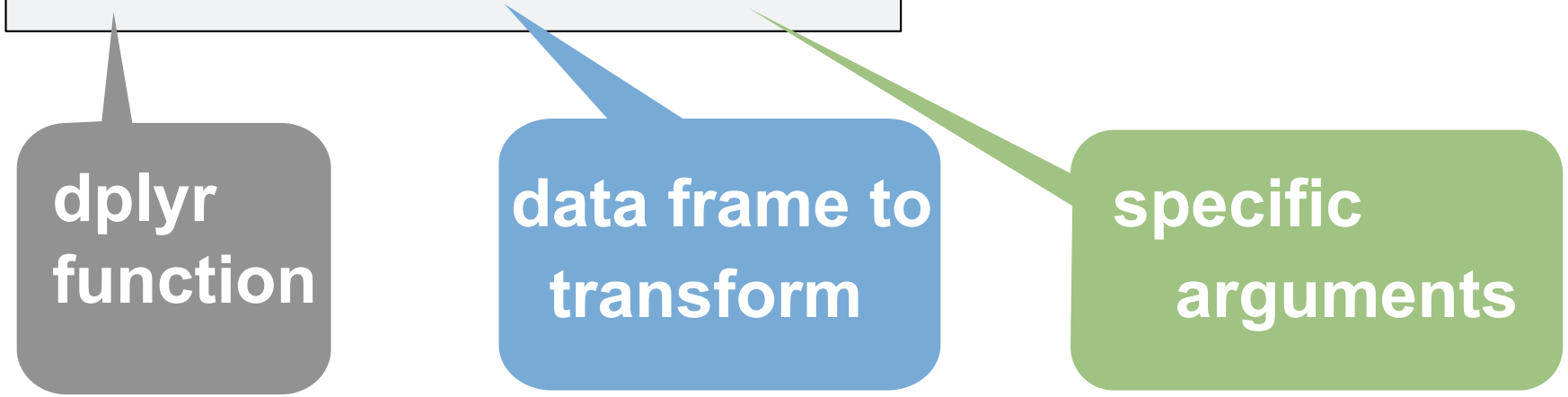
↓ Number of rows

= Number of Columns

Common syntax

Each function takes a data frame as its first argument and returns a data frame as its output.

```
function(data, ...)
```



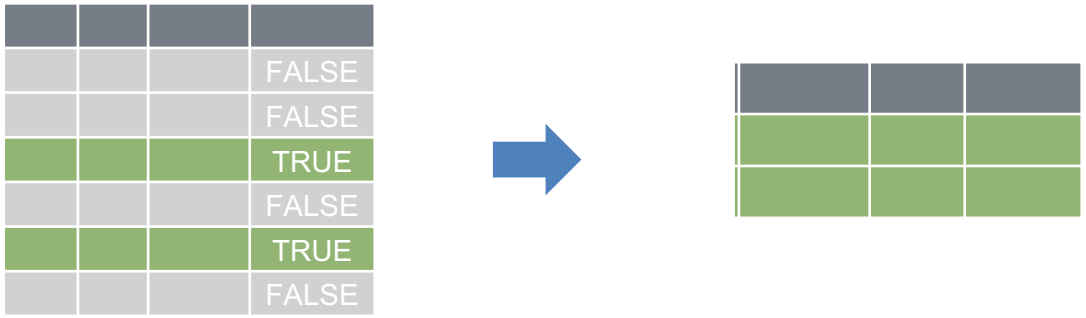
filter()

Extract rows that meet logical criteria

```
filter(data, ... )
```

data frame to transform

one or more logical tests (filter returns each row for which the test is TRUE)

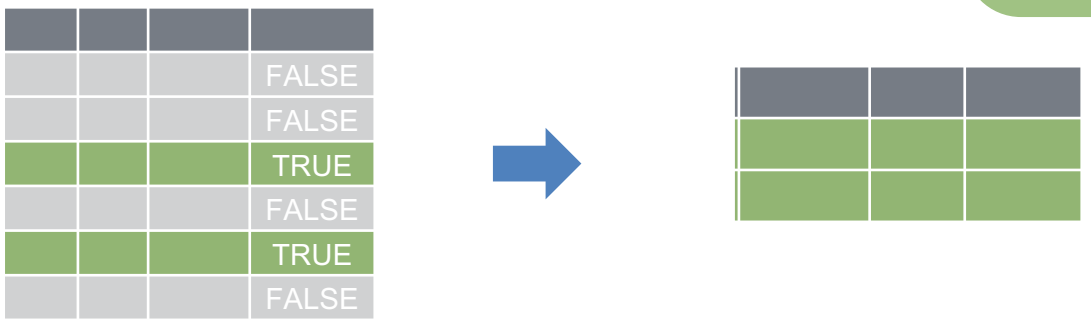


filter()

Extract rows that meet logical criteria

```
filter(data, column_name == criteria )
```

one or more logical tests
(filter returns each row for which the test is TRUE)



filter()

Extract rows that meet logical criteria

```
filter(covid_testing, mrn==5000083)
```

	mrn	first_name	last_name
FALSE	5000876	sarella	stark
FALSE	5006017	alester	stark
FALSE	5001412	jhezane	westerling
TRUE	5000083	lollys	clegane

mrn	first_name	last_name
5000083	lollys	clegane

filter()

Extract rows that meet logical criteria

```
filter(covid_testing, mrn==5000083)
```

mrn	first_name	last_name
5000876	sarella	stark
5006017	alester	stark
5001412	jhezane	westerling
5000083	lollys	clegane

= sets

(returns nothing)

== tests if equal

(returns TRUE or FALSE)

filter()

Values coded as character strings must be surrounded by quotes

Extract rows that meet logical criteria.

```
filter(covid_testing, last_name=="stark")
```

mrn	first_name	last_name	
5000876	sarella	stark	TRUE
5006017	alester	stark	TRUE
5001412	jhezane	westerling	FALSE
5000083	lollys	clegane	FALSE

→

mrn	first_name	last_name
5000876	sarella	stark
5006017	alester	stark

filter()

Extract rows that meet logical criteria

```
filter(data, ...)
```

data frame to transform

one or more logical tests (filter returns each row for which the test is TRUE)

Logical tests

`x < y`	Less than
`x > y`	Greater than
`x == y`	Equal to
`x <= y`	Less than or equal to
`x >= y`	Greater than or equal to
`x != y`	Not equal to
`x %in% y`	Group membership
`is.na(x)`	Is NA
`!is.na(x)`	Is not NA

Pop Quiz

What is the result?

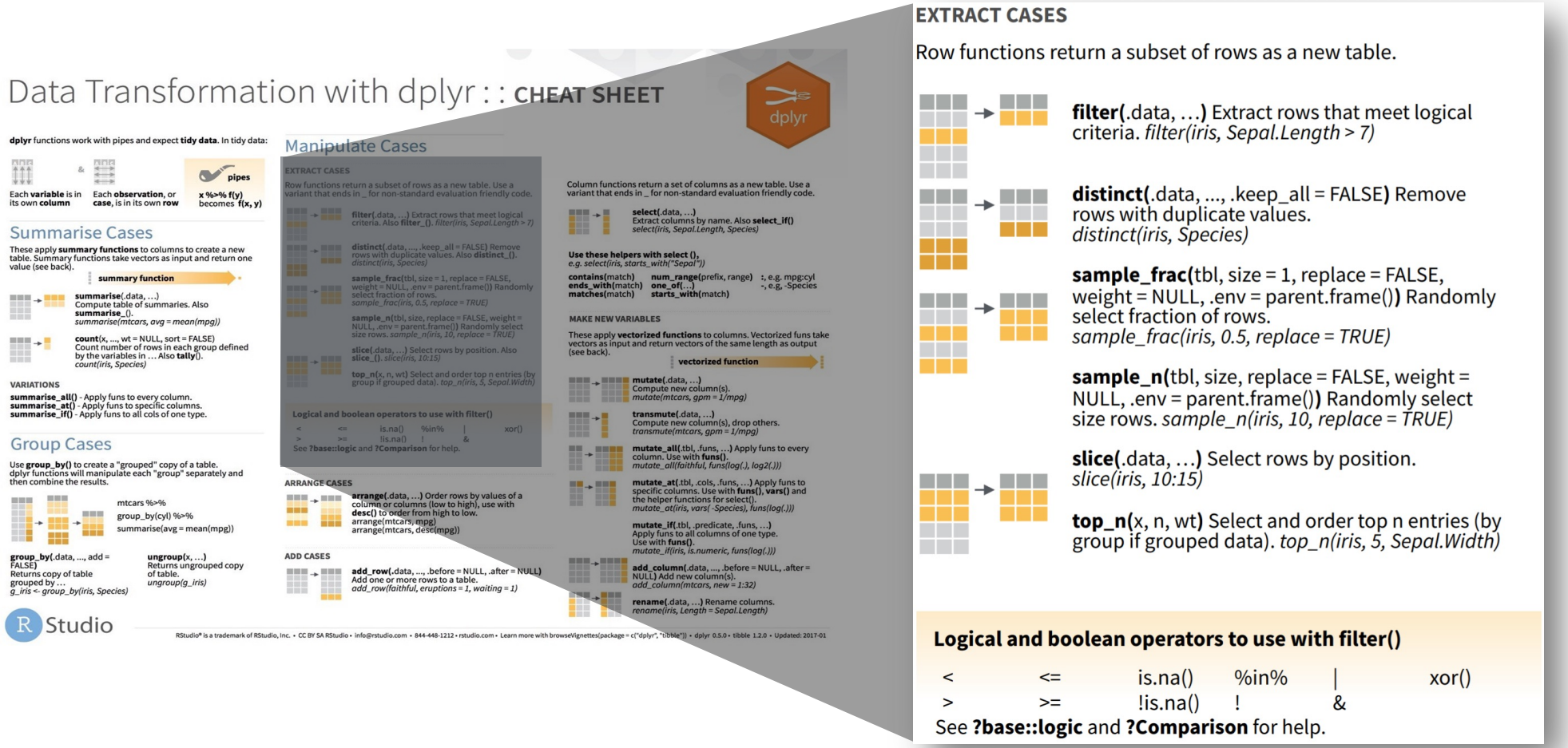
```
1 == 1
```

Pop Quiz

What is the result?

```
3 != 1
```

filter() variants



Your Turn 3

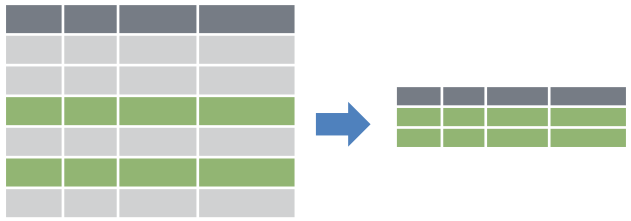
Use filter() with the logical operators to find:

- Every test for patients **over age 80**
- All of the covid testing where the demographic group (demo_group) is **equal to "client"**

Recap

dplyr is a package that contains a variety of data transformation packages intended to be used sequentially

select() will extract specific columns from a data frame



filter() extracts specific rows from a data frame based on logical conditions, and evaluates each row to determine if it is retained or removed

What else?

select()

Renaming columns

```
covid_testing %>%
    select(MRN = mrn, first_name, last_name)
```

mrn <dbl>	first_name <chr>	last_name <chr>
5001412	jhezane	westerling
5000533	penny	targaryen
5009134	grunt	rivers
5008518	melisandre	swyft

MRN <dbl>	first_name <chr>	last_name <chr>
5001412	jhezane	westerling
5000533	penny	targaryen
5009134	grunt	rivers
5008518	melisandre	swyft

filter()

Filter to multiple matches

```
covid_testing %>%
    filter(first_name %in% c("jon","daenerys"))
```

mrn <dbl>	first_name <chr>
5001412	jhezane
5000533	penny
5009134	grunt
5008518	melisandre
5008967	rolley

mrn <dbl>	first_name <chr>
5002427	daenerys
5011120	jon
5001092	jon
5004082	jon
5005197	daenerys

Goal

1. Learn how to use dplyr to transform data frames
2. Create a smaller subset from a data frame

Objectives

1. List the major forms of data transformation implemented in dplyr
2. Use code templates with dplyr functions to tidy a raw data set
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