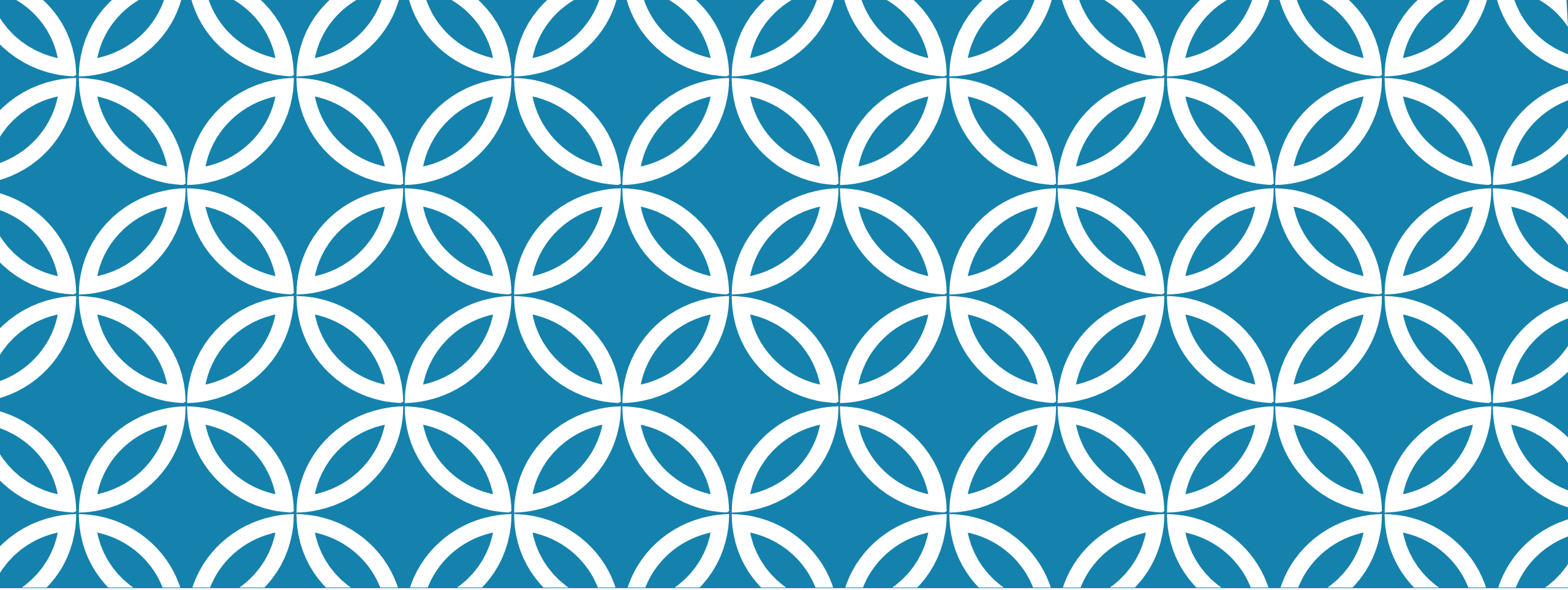


Data Transformation

Patrick Mathias

Lesson 5

DLMP Fall 2021

Goal

1. Learn how to use dplyr to transform data frames
2. Appreciate the role of piping in facilitating data transformation

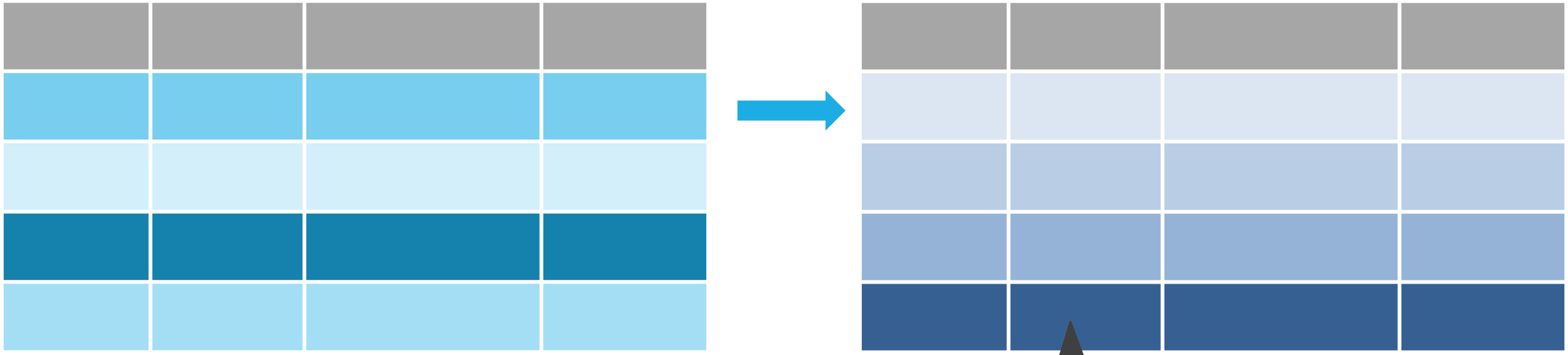
Objectives

1. List the major forms of data transformation implemented in dplyr
2. Use the pipe operator to pass the output of one function as an input to the next function
3. Create new calculated columns not found in the original data frame

Reordering Rows

arrange()

Order rows by values in a column



= Number of rows

= Number of Columns

arrange()

Order rows by values in a column

```
arrange(data, ... )
```

data frame to transform

name(s) of columns to arrange by

arrange()

Order rows by values in a column

```
arrange(covid_testing, first_name)
```

mrn	first_name	last_name
5000876	sarella	stark
5006017	alester	stark
5001412	jhezane	targaryen
5000533	penny	targaryen

mrn	first_name	last_name
5006017	alester	stark
5001412	jhezane	targaryen
5000533	penny	targaryen
5000876	sarella	stark

arrange()

Order rows by values in a column

```
arrange(covid_testing, desc(mrn))
```

mrn	first_name	last_name
5000876	sarella	stark
5006017	alester	stark
5001412	jhezane	targaryen
5000533	penny	targaryen

mrn	first_name	last_name
5006017	alester	stark
5001412	jhezane	targaryen
5000876	sarella	stark
5000533	penny	targaryen

Your Turn 1

Open “05 – Transform.Rmd”

The column ct_value contains the cycle threshold (Ct) for the real-time PCR that generated the final result.

How might you use arrange() to determine the highest and lowest Ct result in the dataset?

Pop Quiz

The default behavior of arrange() is to order from lower to higher values.

When might arrange() place "1000" before "50"?

The Pipe Operator: |>

Data Analysis Steps

```
day_10 <- filter(covid_testing, pan_day <= 10)

day_10 <- select(day_10, clinic_name)

day_10 <- arrange(day_10 , clinic_name)
```

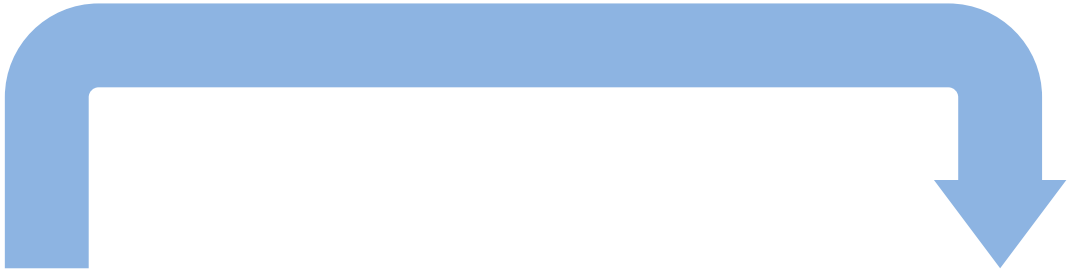
1. Filter tests to those on pandemic day less than 10
2. Select the column that contains ordering location
3. Arrange those columns by location

Data Analysis Steps

```
day_10 <- arrange(
            select(
              filter(
                covid_testing,
                pan_day <= 10
              ),
              clinic_name
            ),
            clinic_name
          )
```

The Pipe Operator |>

Passes result on left into first argument of function on right.



```
covid_testing |> filter(____, pan_day <= 10)
```

```
filter(covid_tesing, pan_day <= 10)
covid_tesing |> filter(pan_day <= 10)
```

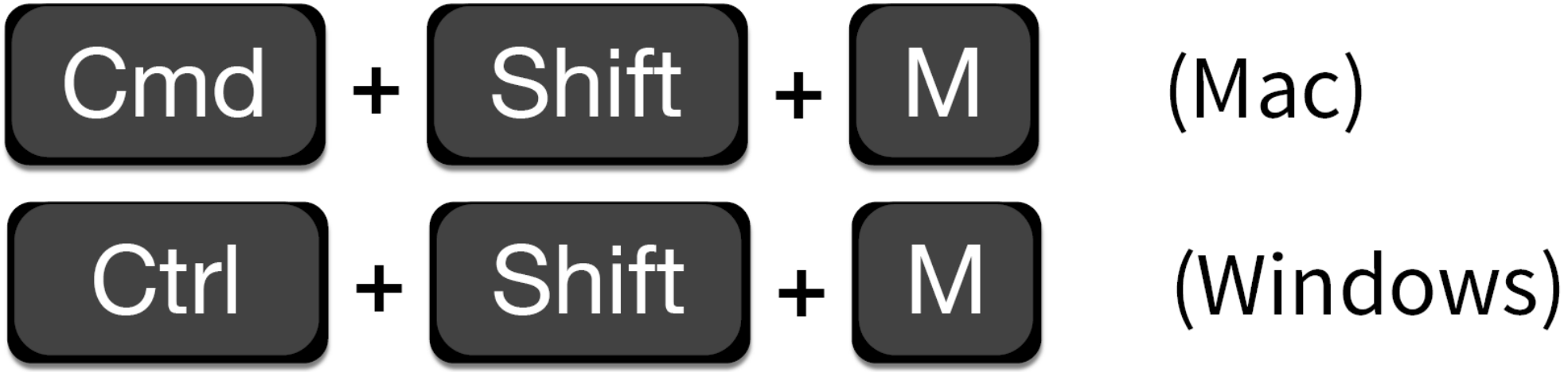
Data Analysis Steps

```
day_10 <- arrange(
            select(
              filter(
                covid_testing,
                pan_day <= 10
              ),
              clinic_name
            ),
            clinic_name
          )
```

Data Analysis Steps

```
covid_testing |>
    filter(pan_day <= 10) |>
    select(clinic_name) |>
    arrange(clinic_name)
```

Shortcut to type |>



RStudio needs to be configured to use native pipe |>

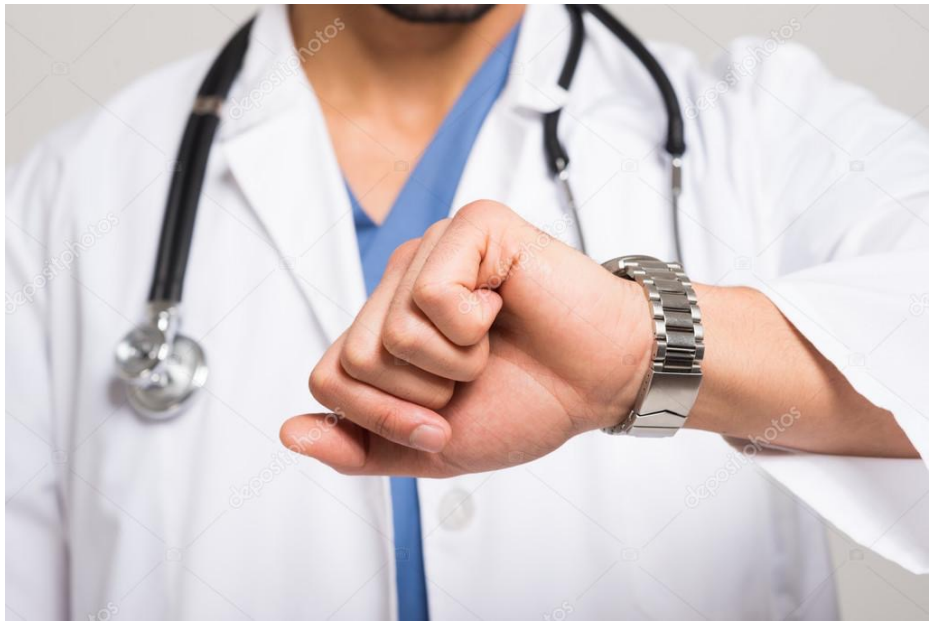
Previous version of pipe: %>%

Scene

The PICU would like a word with you because of a recent incident involving a delay in results for a patient who required a AGP

They had to wait over 10 hours before the procedure could begin

You decide to investigate… WITH DATA



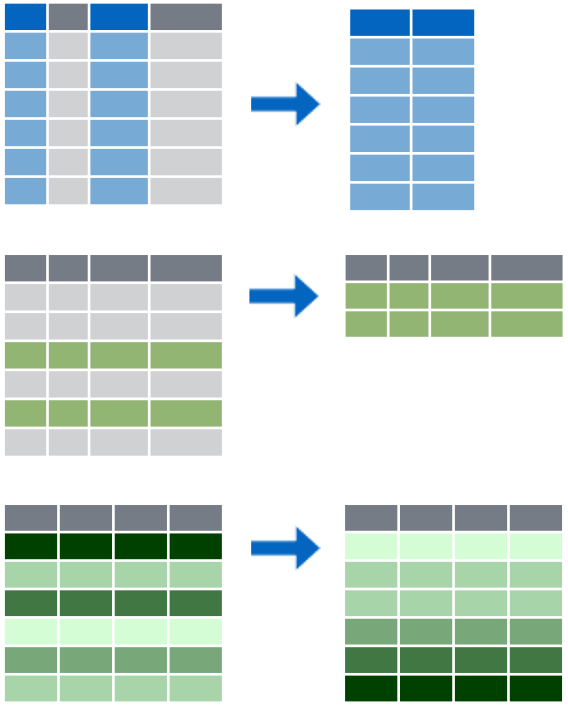
Your Turn 2

Use |> to write a sequence of three functions that:

1. Filters to tests from the clinic (**`clinic_name`**) of "picu"
2. Selects the column with the receive to verify turnaround time (**`rec_ver_tat`**) as well as the day from start of the pandemic (**`pan_day`**)
3. Arrange the `` `pan_day` `` from highest to lowest

Using <-, assign the result to a new variable, call it whatever you want.

Isolating data



Extract variables with **select()**

Extract rows with **filter()**

Arrange rows, with **arrange()**.

Creating New Columns

What is the mean and median collect to verify turnaround time by clinic?

Breaking down the analytical question

1. Total TAT for each test
2. Group tests by clinic
3. Calculate mean and median for each clinic

Deriving data

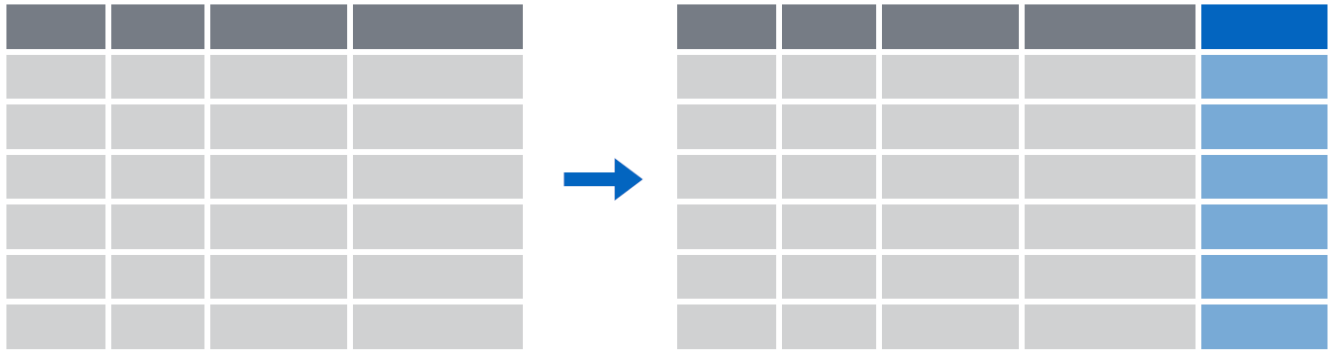
Make new variables with **mutate()**

Make summaries of data with **summarize()**

mutate()

mutate()

Creating new calculated columns



= Number of rows

↑ Number of Columns

mutate()

Creating new calculated columns

```
Covid_testing |>
    mutate(new_column = calculation)
```

name for new column

equals

function whose results will populate columns

mutate()

Creating new calculated columns

```
covid_testing |>
    mutate(c_r_tat_mins = col_rec_tat * 60)
```

mrn	col_rec_tat	rec_ver_tat
5000876	29.5	11.5
5006017	3.6	5
5001412	1.4	5.2
5000533	2.3	5.8

mrn	col_rec_tat	rec_ver_tat	c_r_tat_mins
5000876	29.5	11.5	1770
5006017	3.6	5	216
5001412	1.4	5.2	84
5000533	2.3	5.8	138

Your Turn 3

Create a new column using the mutate() function that contains the total TAT (sum of **`col_rec_tat`** and **`rec_ver_tat`**)

Functions to use in mutate()

Vector Functions

TO USE WITH MUTATE ()

mutate() and **transmute()** apply vectorized functions to columns to create new columns. Vectorized functions take vectors as input and return vectors of the same length as output.

vectorized function

OFFSETS

dplyr::**lag()** - Offset elements by 1
dplyr::**lead()** - Offset elements by -1

CUMULATIVE AGGREGATES

dplyr::**cumall()** - Cumulative all()
dplyr::**cumany()** - Cumulative any()
cummax() - Cumulative max()
dplyr::**cummean()** - Cumulative mean()
cummin() - Cumulative min()
cumprod() - Cumulative prod()
cumsum() - Cumulative sum()

RANKINGS

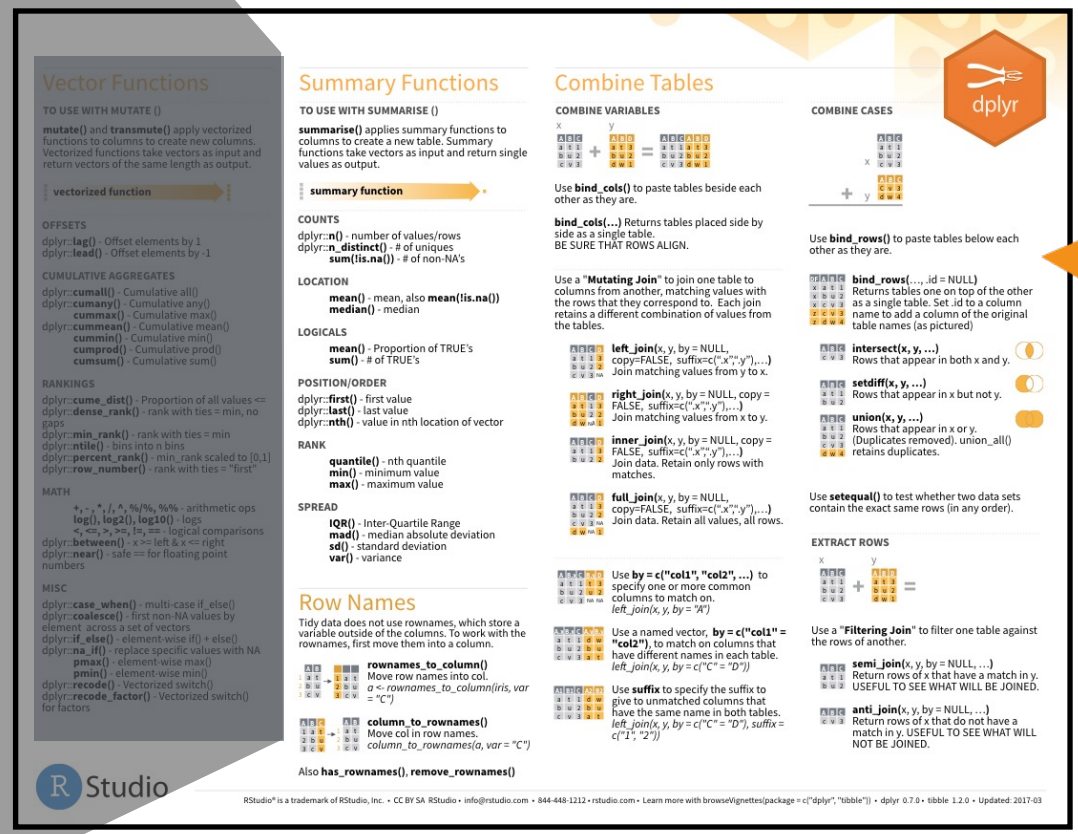
dplyr::**cume_dist()** - Proportion of all values <=
dplyr::**dense_rank()** - rank with ties = min, no gaps
dplyr::**min_rank()** - rank with ties = min
dplyr::**ntile()** - bins into n bins
dplyr::**percent_rank()** - min_rank scaled to [0,1]
dplyr::**row_number()** - rank with ties = "first"

MATH

+, - , *, /, ^, %/%, %% - arithmetic ops
log(), log2(), log10() - logs
<, <=, >, >=, !=, == - logical comparisons
dplyr::**between()** - x >= left & x <= right
dplyr::**near()** - safe == for floating point numbers

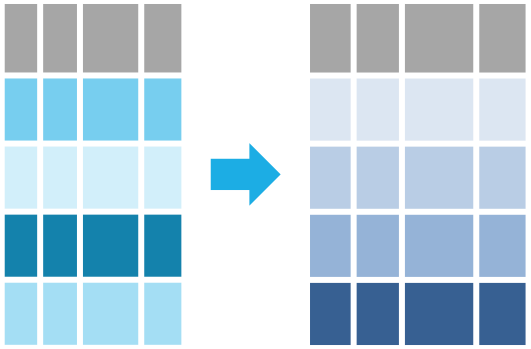
MISC

dplyr::**case_when()** - multi-case if_else()
dplyr::**coalesce()** - first non-NA values by element across a set of vectors
dplyr::**if_else()** - element-wise if() + else()
dplyr::**na_if()** - replace specific values with NA
pmax() - element-wise max()
pmin() - element-wise min()
dplyr::**recode()** - Vectorized switch()
dplyr::**recode_factor()** - Vectorized switch() for factors



on back

Recap



arrange() sorts data based on the data type of the column(s) used to sort

Pipes (|>) allow you to sequentially apply functions to a data frame efficiently

mutate() adds a column to the data frame that may be based on calculations on one or more other columns

What else?

mutate()

Replacing columns

Function to "coerce" one type of data into another type of data

```
covid_testing |>
    mutate(mrn = as.character(mrn))
```

mrn <dbl>	first_name <chr>	last_name <chr>
5000876	sarella	stark
5006017	alester	stark
5001412	jhezane	westerling
5000533	penny	targaryen

mrn <chr>	first_name <chr>	last_name <chr>
5000876	sarella	stark
5006017	alester	stark
5001412	jhezane	westerling
5000533	penny	targaryen

mutate()

Conditionally replacing values

```
covid_testing |>
     mutate(last_name = if_else(last_name=="targaryen",
                                "TARGARYEN",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

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