Manipulating Data with `dplyr`

Thinking about our big goals (doing data science):

- Read in raw data and manipulate it
- Combine data sources
- Summarize data to glean insights
- Apply common analysis methods
- Communicate Effectively

We now have a good idea about reading in certain types of data. Let's take a bit of time going through common data manipulation tasks before returning to reading data in.

The two major tasks we'll consider are

- Row manipulations
  - **filtering** or subsetting our observations
  - **arranging** our observations in some order
- Column manipulations
  - **selecting** a subset of our variables
  - **rename** a column
  - **mutating** our data frame to create a new variable

We can use BaseR for this (via `[` or the `subset()` function). However, the `tidyverse` has a more coherent set of functions to allow us to do all of our tasks without having to spend as much time learning syntax. So let's go that route!

Recall the basic fundamentals about the `tidyverse`:

- (Almost) all functions take in `tibble`s (special data frames) and output `tibble`s
- (Almost) all functions have similar syntax!

  `function(tibble, arguments, ...)`

  - Allows for easy chaining!

```
      my_data |>
        select(var1:var10, var20) |>
        filter(var1 == "first") |>
        mutate(new_var = lag(var20)) |>
        ...
```

Coercing a Data Frame to a Tibble

If you happen to have a data frame that isn't already a tibble, we can easily coerce it using the `as_tibble()` function.

Consider a data set on major league baseball players (batting statistics):

```
library(dplyr)
```

```
Warning: package 'dplyr' was built under R version 4.1.3


Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

```
library(Lahman)
```

```
Warning: package 'Lahman' was built under R version 4.1.3
```

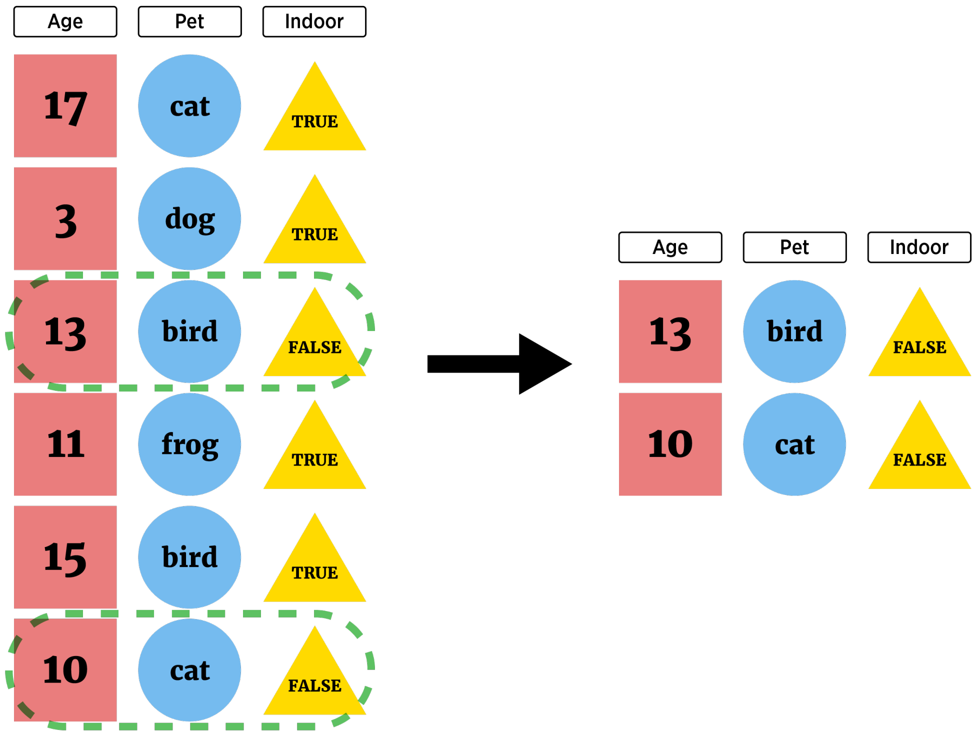
```
batting_tbl <- as_tibble(Batting)
batting_tbl
```

```
# A tibble: 108,789 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 abercda01   1871     1 TRO    NA        1     4     0     0     0     0
0
 2 addybo01    1871     1 RC1    NA       25   118    30    32     6     0
0
 3 allisar01   1871     1 CL1    NA       29   137    28    40     4     5
0
 4 allisdo01   1871     1 WS3    NA       27   133    28    44    10     2
2
 5 ansonca01   1871     1 RC1    NA       25   120    29    39    11     3
0
 6 armstbo01   1871     1 FW1    NA       12    49     9    11     2     1
0
 7 barkeal01   1871     1 RC1    NA        1     4     0     1     0     0
0
 8 barnero01   1871     1 BS1    NA       31   157    66    63    10     9
0
 9 barrebi01   1871     1 FW1    NA        1     5     1     1     1     0
0
10 barrofr01   1871     1 BS1    NA       18    86    13    13     2     1
0
# i 108,779 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

Nice, now we can work on this `tibble`!

Row Manipulations with `dplyr`

A common task is to only grab certain types of observations (**filter rows**)



or rearrange the order of the observations (rows). The two functions from `dplyr` that help us here are

- `filter()` - subset **rows**
- `arrange()` - reorder **rows**

`filter()`

`filter()` generally takes a `tibble` as its first argument and then a logical vector as the next (of the same length as the number of rows):

- Return observations where the number of games played is greater than 50 (the `G` column):

```
filter(batting_tbl, G > 50)
```

```
# A tibble: 40,168 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 bechtge01   1872     1 NY2    NA       51   247    61    74    11     3
0
 2 cummica01   1872     1 NY2    NA       55   249    37    52     9     3
```

```
0
 3 eggleda01   1872     1 NY2    NA       56   290    94    97    20     0
0
 4 hallge01    1872     1 BL1    NA       53   250    69    84    17     6
1
 5 hatfijo01   1872     1 NY2    NA       56   288    76    93    15     2
1
 6 hicksna01   1872     1 NY2    NA       56   267    54    82    12     2
0
 7 mcmuljo01   1872     1 NY2    NA       54   236    47    60     6     1
0
 8 millsev01   1872     1 BL1    NA       55   266    55    79    14     2
0
 9 pikeli01    1872     1 BL1    NA       56   285    68    85    15     5
7
10 radcljo01   1872     1 BL1    NA       56   297    70    86    13     4
1
# i 40,158 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

Notice the number of observations is far less now!

- Of course, we'll do many operations so let's use chaining even in this simple case:

```
          batting_tbl |>
            filter(G > 50)
```

```
# A tibble: 40,168 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 bechtge01   1872     1 NY2    NA       51   247    61    74    11     3
0
 2 cummica01   1872     1 NY2    NA       55   249    37    52     9     3
0
 3 eggleda01   1872     1 NY2    NA       56   290    94    97    20     0
0
 4 hallge01    1872     1 BL1    NA       53   250    69    84    17     6
1
 5 hatfijo01   1872     1 NY2    NA       56   288    76    93    15     2
1
 6 hicksna01   1872     1 NY2    NA       56   267    54    82    12     2
0
 7 mcmuljo01   1872     1 NY2    NA       54   236    47    60     6     1
0
 8 millsev01   1872     1 BL1    NA       55   266    55    79    14     2
0
 9 pikeli01    1872     1 BL1    NA       56   285    68    85    15     5
7
10 radcljo01   1872     1 BL1    NA       56   297    70    86    13     4
1
```

```
# i 40,158 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- If we want to return observations where than one condition is `TRUE` we can either pass additional arguments or use the compound logical operator `&` we discussed earlier.
    - Condition on those that played more than 50 games and played in 2018

```
batting_tbl |>
  filter(G > 50 & yearID == 2018)
```

```
# A tibble: 518 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 abreujo02   2018     1 CHA    AL      128   499    68   132    36     1
22
 2 acunaro01   2018     1 ATL    NL      111   433    78   127    26     4
26
 3 adamewi01   2018     1 TBA    AL       85   288    43    80     7     0
10
 4 adamsma01   2018     1 WAS    NL       94   249    37    64     9     0
18
 5 adducji02   2018     1 DET    AL       59   176    19    47     8     2
3
 6 adriaeh01   2018     1 MIN    AL      114   335    42    84    23     1
6
 7 aguilje01   2018     1 MIL    NL      149   492    80   135    25     0
35
 8 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 9 albieoz01   2018     1 ATL    NL      158   639   105   167    40     5
24
10 alexasc01   2018     1 LAN    NL       73     5     0     0     0     0
0
# i 508 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

```
#equivalently
batting_tbl |>
  filter(G > 50, yearID == 2018)
```

```
# A tibble: 518 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 abreujo02   2018     1 CHA    AL      128   499    68   132    36     1
22
 2 acunaro01   2018     1 ATL    NL      111   433    78   127    26     4
```

```
26
 3 adamewi01   2018     1 TBA    AL       85   288    43    80     7     0
10
 4 adamsma01   2018     1 WAS    NL       94   249    37    64     9     0
18
 5 adducji02   2018     1 DET    AL       59   176    19    47     8     2
3
 6 adriaeh01   2018     1 MIN    AL      114   335    42    84    23     1
6
 7 aguilje01   2018     1 MIL    NL      149   492    80   135    25     0
35
 8 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 9 albieoz01   2018     1 ATL    NL      158   639   105   167    40     5
24
10 alexasc01   2018     1 LAN    NL       73     5     0     0     0     0
0
# i 508 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- Often we want to check if a variable is in a specific group of values. We might think this is the way:

```
#wrong!
batting_tbl |>
  filter(G > 50, yearID == c(2018, 2019, 2020))
```

```
# A tibble: 408 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 abreujo02   2018     1 CHA    AL      128   499    68   132    36     1
22
 2 adducji02   2018     1 DET    AL       59   176    19    47     8     2
3
 3 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 4 albieoz01   2018     1 ATL    NL      158   639   105   167    40     5
24
 5 alexasc01   2018     1 LAN    NL       73     5     0     0     0     0
0
 6 almoral01   2018     1 CHN    NL      152   444    62   127    24     1
5
 7 altheaa01   2018     1 PHI    NL      105   243    28    44    11     1
8
 8 alvarjo03   2018     1 TBA    AL       70     0     0     0     0     0
0
 9 anderbr06   2018     1 MIA    NL      156   590    87   161    34     4
11
10 anderju01   2018     1 LAA    AL       57     0     0     0     0     0
0
# i 398 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- Here, R uses *recycling* on the vector and actually compares the 1st element to 2018, the 2nd to 2019, the third to 2020, the fourth to 2018, the fifth to 2019, …
- Use `%in%` to choose any observations matching an element of a vector

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020))
```

```
# A tibble: 1,172 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 abreujo02   2018     1 CHA    AL      128   499    68   132    36     1
22
 2 acunaro01   2018     1 ATL    NL      111   433    78   127    26     4
26
 3 adamewi01   2018     1 TBA    AL       85   288    43    80     7     0
10
 4 adamsma01   2018     1 WAS    NL       94   249    37    64     9     0
18
 5 adducji02   2018     1 DET    AL       59   176    19    47     8     2
3
 6 adriaeh01   2018     1 MIN    AL      114   335    42    84    23     1
6
 7 aguilje01   2018     1 MIL    NL      149   492    80   135    25     0
35
 8 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 9 albieoz01   2018     1 ATL    NL      158   639   105   167    40     5
24
10 alexasc01   2018     1 LAN    NL       73     5     0     0     0     0
0
# i 1,162 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- If we want an *or* condition, we use the compound logical operator for that
  - Here, grab those with either games greater than 50 or those that played in 2018, 2019, or 2020 (or both)

```
batting_tbl |>
  filter(G > 50 | yearID %in% c(2018, 2019, 2020))
```

```
# A tibble: 43,460 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 bechtge01   1872     1 NY2    NA       51   247    61    74    11     3
0
```

```
 2 cummica01    1872      1 NY2    NA          55   249    37    52     9     3
0
 3 eggleda01    1872      1 NY2    NA          56   290    94    97    20     0
0
 4 hallge01     1872      1 BL1    NA          53   250    69    84    17     6
1
 5 hatfijo01    1872      1 NY2    NA          56   288    76    93    15     2
1
 6 hicksna01    1872      1 NY2    NA          56   267    54    82    12     2
0
 7 mcmuljo01    1872      1 NY2    NA          54   236    47    60     6     1
0
 8 millsev01    1872      1 BL1    NA          55   266    55    79    14     2
0
 9 pikeli01     1872      1 BL1    NA          56   285    68    85    15     5
7
10 radcljo01    1872      1 BL1    NA          56   297    70    86    13     4
1
# i 43,450 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- Again, note the change in the observation count!

`arrange()`

The other major observation (row) manipulation is to reorder the observations (rows). This is done through `arrange()` from `dplyr` (or `sort()` in `BaseR`)

- Let's take our result from above and reorder by `teamID`

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(teamID)
```

```
# A tibble: 1,172 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 2 avilaal01   2018     1 ARI    NL       80   194    13    32     6     0
7
 3 boxbebr01   2018     1 ARI    NL       60     0     0     0     0     0
0
 4 bradlar01   2018     1 ARI    NL       76     0     0     0     0     0
0
 5 chafian01   2018     1 ARI    NL       77     0     0     0     0     0
0
 6 descada01   2018     1 ARI    NL      138   349    54    83    22     4
13
 7 dysonja01   2018     1 ARI    NL       67   206    29    39     4     2
2
```

```
 8 escobed01   2018     2 ARI    NL       54   198    30    53    11     0
8
 9 goldspa01   2018     1 ARI    NL      158   593    95   172    35     5
33
10 hiranyo01   2018     1 ARI    NL       75     1     0     0     0     0
0
# i 1,162 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- Remember to read the pipe (|>) as 'then'. Here we would say:
  - Take the batting tibble and then
  - filter the rows to only include those with games greater than 50 and those that played in 2018-2020 and then
  - arrange the rows by the team name
- We can obtain a secondary arrangement by giving a second column

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(teamID, playerID)
```

```
# A tibble: 1,172 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 ahmedni01   2018     1 ARI    NL      153   516    61   121    33     5
16
 2 ahmedni01   2019     1 ARI    NL      158   556    79   141    33     6
19
 3 ahmedni01   2020     1 ARI    NL       57   199    29    53    10     1
5
 4 andrima01   2019     1 ARI    NL       54     6     0     0     0     0
0
 5 avilaal01   2018     1 ARI    NL       80   194    13    32     6     0
7
 6 avilaal01   2019     1 ARI    NL       63   164    22    34     8     0
9
 7 boxbebr01   2018     1 ARI    NL       60     0     0     0     0     0
0
 8 bradlar01   2018     1 ARI    NL       76     0     0     0     0     0
0
 9 bradlar01   2019     1 ARI    NL       66     1     0     0     0     0
0
10 calhoko01   2020     1 ARI    NL       54   190    35    43     9     0
16
# i 1,162 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- We can reorder descending on a variable

```
        batting_tbl |>
          filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
          arrange(desc(teamID), playerID)
```

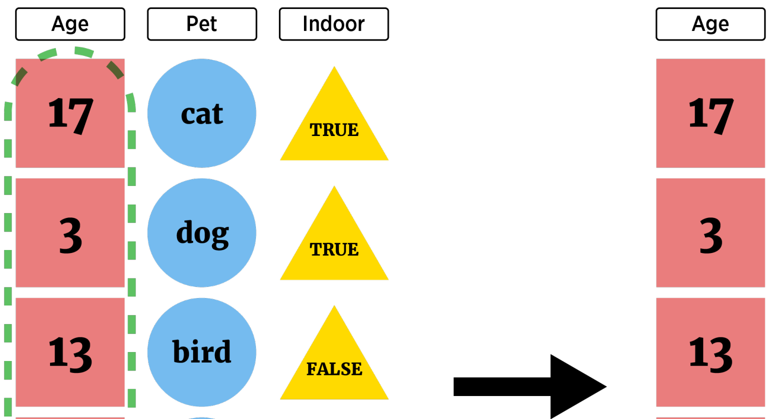
```
# A tibble: 1,172 x 22
   playerID  yearID stint teamID lgID      G    AB     R     H   X2B   X3B
HR
   <chr>      <int> <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
<int>
 1 adamsma01   2018     1 WAS    NL       94   249    37    64     9     0
18
 2 adamsma01   2019     1 WAS    NL      111   310    42    70    14     0
20
 3 cabreas01   2020     1 WAS    NL       52   190    23    46     9     3
8
 4 difowi01    2018     1 WAS    NL      148   408    55    94    14     7
7
 5 doolise01   2019     1 WAS    NL       63     3     0     0     0     0
0
 6 doziebr01   2019     1 WAS    NL      135   416    54    99    20     0
20
 7 eatonad02   2018     1 WAS    NL       95   319    55    96    18     1
5
 8 eatonad02   2019     1 WAS    NL      151   566   103   158    25     7
15
 9 gomesya01   2019     1 WAS    NL       97   314    36    70    16     0
12
10 gracema02   2018     1 WAS    NL       56     3     0     1     0     0
0
# i 1,162 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

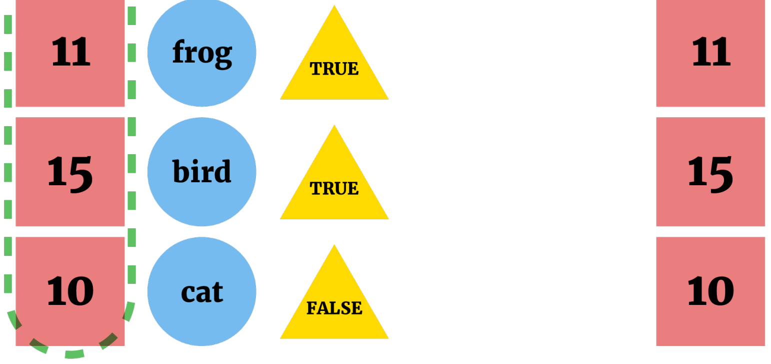
Column Manipulations with `dplyr`

We may want to subset our variables, rename them, or create new variables.

`select()` - Subset Columns

We call the subset of our variables **selecting** columns (or variables)





- To return a single (probably simplified) column we looked at the following methods (one of which is in the `tidyverse`):
  - `dplyr::pull()`
  - `$`
  - `[ , ]`

When we want to look at pulling more than one column, `select()` is much better!

- Suppose we just wanted to look at the `playerID`, `teamID`, and hits type variables: `H`, `X2B` `X3B`, and `HR` of the players in our subset
- We can add in a `select()` function to our chain (thanks again coherent ecosystem!).
  - One way is to simply list the columns you want:

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(desc(teamID), playerID) |>
  select(playerID, teamID, H, X2B, X3B, HR)
```

```
# A tibble: 1,172 x 6
   playerID  teamID     H   X2B   X3B    HR
   <chr>     <fct>  <int> <int> <int> <int>
 1 adamsma01 WAS       64     9     0    18
 2 adamsma01 WAS       70    14     0    20
 3 cabreas01 WAS       46     9     3     8
 4 difowi01  WAS       94    14     7     7
 5 doolise01 WAS        0     0     0     0
 6 doziebr01 WAS       99    20     0    20
 7 eatonad02 WAS       96    18     1     5
 8 eatonad02 WAS      158    25     7    15
 9 gomesya01 WAS       70    16     0    12
10 gracema02 WAS        1     0     0     0
# i 1,162 more rows
```

- Where we really gain here is the ability to use helper functions when selecting columns!
  - `:` to select all contiguous columns

```
        batting_tbl |>
          filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
          arrange(desc(teamID), playerID) |>
          select(playerID, teamID, H:HR)
```

```
# A tibble: 1,172 x 6
   playerID  teamID     H   X2B   X3B    HR
   <chr>     <fct>  <int> <int> <int> <int>
 1 adamsma01 WAS       64     9     0    18
 2 adamsma01 WAS       70    14     0    20
 3 cabreas01 WAS       46     9     3     8
 4 difowi01  WAS       94    14     7     7
 5 doolise01 WAS        0     0     0     0
 6 doziebr01 WAS       99    20     0    20
 7 eatonad02 WAS       96    18     1     5
 8 eatonad02 WAS      158    25     7    15
 9 gomesya01 WAS       70    16     0    12
10 gracema02 WAS        1     0     0     0
# i 1,162 more rows
```

- `starts_with()` and `ends_with()` are also really useful

```
        batting_tbl |>
          filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
          arrange(desc(teamID), playerID) |>
          select(ends_with("ID"), G, AB, H:HR)
```

```
# A tibble: 1,172 x 10
   playerID  yearID teamID lgID      G    AB     H   X2B   X3B    HR
   <chr>      <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
 1 adamsma01   2018 WAS    NL       94   249    64     9     0    18
 2 adamsma01   2019 WAS    NL      111   310    70    14     0    20
 3 cabreas01   2020 WAS    NL       52   190    46     9     3     8
 4 difowi01    2018 WAS    NL      148   408    94    14     7     7
 5 doolise01   2019 WAS    NL       63     3     0     0     0     0
 6 doziebr01   2019 WAS    NL      135   416    99    20     0    20
 7 eatonad02   2018 WAS    NL       95   319    96    18     1     5
 8 eatonad02   2019 WAS    NL      151   566   158    25     7    15
 9 gomesya01   2019 WAS    NL       97   314    70    16     0    12
10 gracema02   2018 WAS    NL       56     3     1     0     0     0
# i 1,162 more rows
```

- We can combine those two as well using `&` and `|` operators

```
        batting_tbl |>
          filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
          arrange(desc(teamID), playerID) |>
          select(ends_with("ID") | starts_with("X"), G, AB, H, HR)
```

```
# A tibble: 1,172 x 10
   playerID  yearID teamID lgID    X2B   X3B     G    AB     H    HR
   <chr>      <int> <fct>  <fct> <int> <int> <int> <int> <int> <int>
 1 adamsma01   2018 WAS    NL        9     0    94   249    64    18
 2 adamsma01   2019 WAS    NL       14     0   111   310    70    20
 3 cabreas01   2020 WAS    NL         9     3    52   190    46     8
 4 difowi01    2018 WAS    NL        14     7   148   408    94     7
 5 doolise01   2019 WAS    NL         0     0    63     3     0     0
 6 doziebr01   2019 WAS    NL        20     0   135   416    99    20
 7 eatonad02   2018 WAS    NL        18     1    95   319    96     5
 8 eatonad02   2019 WAS    NL        25     7   151   566   158    15
 9 gomesya01   2019 WAS    NL        16     0    97   314    70    12
10 gracema02   2018 WAS    NL         0     0    56     3     1     0
# i 1,162 more rows
```

- If our goal is really just to reorder the columns, we can use `everything()` after specifying the columns of interest

```
        batting_tbl |>
          filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
          arrange(desc(teamID), playerID) |>
          select(playerID, H:HR, everything())
```

```
# A tibble: 1,172 x 22
   playerID      H   X2B   X3B    HR yearID stint teamID lgID      G    AB
R
   <chr>     <int> <int> <int> <int>  <int> <int> <fct>  <fct> <int> <int>
<int>
 1 adamsma01    64     9     0    18   2018     1 WAS    NL       94   249
37
 2 adamsma01    70    14     0    20   2019     1 WAS    NL      111   310
42
 3 cabreas01    46     9     3     8   2020     1 WAS    NL       52   190
23
 4 difowi01     94    14     7     7   2018     1 WAS    NL      148   408
55
 5 doolise01     0     0     0     0   2019     1 WAS    NL       63     3
0
 6 doziebr01    99    20     0    20   2019     1 WAS    NL      135   416
54
 7 eatonad02    96    18     1     5   2018     1 WAS    NL       95   319
55
 8 eatonad02   158    25     7    15   2019     1 WAS    NL      151   566
103
 9 gomesya01    70    16     0    12   2019     1 WAS    NL       97   314
36
10 gracema02     1     0     0     0   2018     1 WAS    NL       56     3
0
# i 1,162 more rows
# i 10 more variables: RBI <int>, SB <int>, CS <int>, BB <int>, SO <int>,
#   IBB <int>, HBP <int>, SH <int>, SF <int>, GIDP <int>
```

- See the help for `select()` for more information about selection features (**these can usually be used in any `tidyverse` functions where you are selecting columns!**)

`rename()`

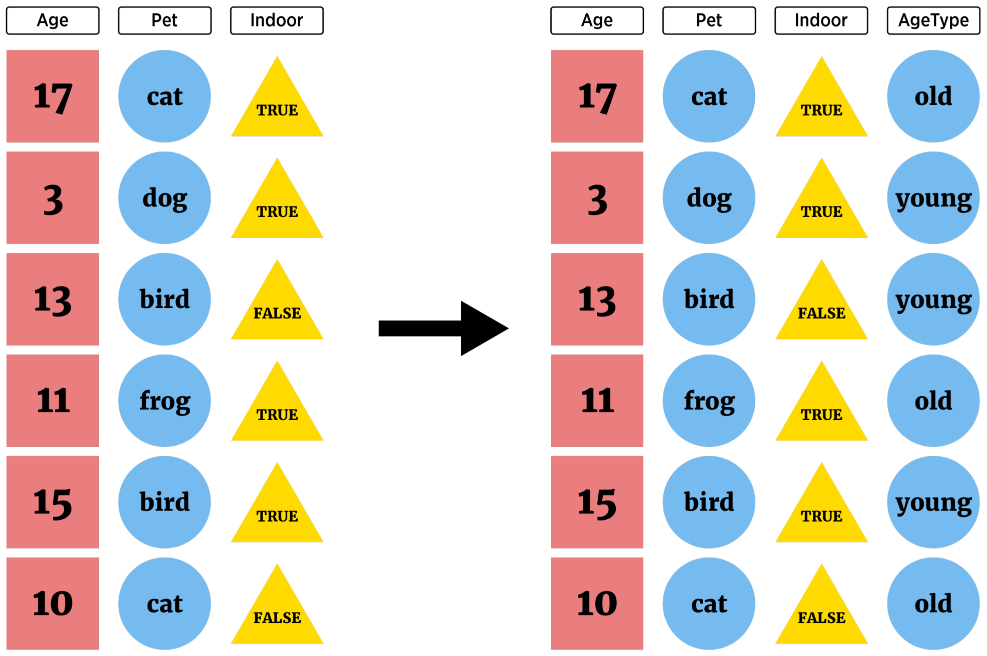
We've seen the use of `colnames()` or `names()` to rename columns. Those are great but aren't easy to chain. `rename()` comes in handy in this case!

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(desc(teamID), playerID) |>
  select(playerID, teamID, H:HR) |>
  rename("Doubles" = "X2B", "Triples" = "X3B")
```

```
# A tibble: 1,172 x 6
   playerID  teamID     H Doubles Triples    HR
   <chr>     <fct>  <int>   <int>   <int> <int>
 1 adamsma01 WAS       64       9       0    18
 2 adamsma01 WAS       70      14       0    20
 3 cabreas01 WAS       46       9       3     8
 4 difowi01  WAS       94      14       7     7
 5 doolise01 WAS        0       0       0     0
 6 doziebr01 WAS       99      20       0    20
 7 eatonad02 WAS       96      18       1     5
 8 eatonad02 WAS      158      25       7    15
 9 gomesya01 WAS       70      16       0    12
10 gracema02 WAS        1       0       0     0
# i 1,162 more rows
```

Creating New Variables with `dplyr`

Often we want to create new variables!



This can be accomplished using `mutate()`. This function allows us to create one or more variables and append them to our tibble.

- For our dataset from above, suppose we wanted to create an "extra base hits" type column that is the sum of the doubles, triples, and home runs.

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
```

```
        arrange(desc(teamID), playerID) |>
        select(playerID, teamID, H:HR) |>
        rename("Doubles" = "X2B", "Triples" = "X3B") |>
        mutate(Extra_Base_Hits = Doubles + Triples + HR)
```

```
# A tibble: 1,172 x 7
   playerID  teamID     H Doubles Triples    HR Extra_Base_Hits
   <chr>     <fct>  <int>   <int>   <int> <int>           <int>
 1 adamsma01 WAS       64       9       0    18              27
 2 adamsma01 WAS       70      14       0    20              34
 3 cabreas01 WAS       46       9       3     8              20
 4 difowi01  WAS       94      14       7     7              28
 5 doolise01 WAS        0       0       0     0               0
 6 doziebr01 WAS       99      20       0    20              40
 7 eatonad02 WAS       96      18       1     5              24
 8 eatonad02 WAS      158      25       7    15              47
 9 gomesya01 WAS       70      16       0    12              28
10 gracema02 WAS        1       0       0     0               0
# i 1,162 more rows
```

- If we want to add more than one variable, we just separate the variable definitions with a comma.
  - Let's add a `Singles` variable representing the number of hits minus the number of extra base hits

```
      batting_tbl |>
        filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
        arrange(desc(teamID), playerID) |>
        select(playerID, teamID, H:HR) |>
        rename("Doubles" = "X2B", "Triples" = "X3B") |>
        mutate(Extra_Base_Hits = Doubles + Triples + HR,
               Singles = H - Extra_Base_Hits) |>
        select(playerID, teamID, Singles, Doubles:HR, H, Extra_Base_Hits
```

```
# A tibble: 1,172 x 8
   playerID  teamID Singles Doubles Triples    HR     H Extra_Base_Hits
   <chr>     <fct>    <int>   <int>   <int> <int> <int>           <int>
 1 adamsma01 WAS         37       9       0    18    64              27
 2 adamsma01 WAS         36      14       0    20    70              34
 3 cabreas01 WAS         26       9       3     8    46              20
 4 difowi01  WAS         66      14       7     7    94              28
 5 doolise01 WAS          0       0       0     0     0               0
 6 doziebr01 WAS         59      20       0    20    99              40
 7 eatonad02 WAS         72      18       1     5    96              24
 8 eatonad02 WAS        111      25       7    15   158              47
 9 gomesya01 WAS         42      16       0    12    70              28
10 gracema02 WAS          1       0       0     0     1               0
# i 1,162 more rows
```

- We can of course use lots of functions when creating a new variable as well. Some common functions are `log()`, `lead()`, `lag()`, `percent_rank()`, `cumsum()`, etc. (see the help for `mutate` for a nice list).

    - Let's use `percent_rank()` to get a new column telling us where they rank for number of hits

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(desc(teamID), playerID) |>
  select(playerID, teamID, H:HR) |>
  rename("Doubles" = "X2B", "Triples" = "X3B") |>
  mutate(Extra_Base_Hits = Doubles + Triples + HR,
         Singles = H - Extra_Base_Hits,
         H_Percentile = percent_rank(H)) |>
  select(playerID, teamID, H, H_Percentile, everything())
```

```
# A tibble: 1,172 x 9
   playerID  teamID     H H_Percentile Doubles Triples    HR
Extra_Base_Hits
   <chr>     <fct>  <int>        <dbl>   <int>   <int> <int>
<int>
 1 adamsma01 WAS       64        0.512       9       0    18
27
 2 adamsma01 WAS       70        0.546      14       0    20
34
 3 cabreas01 WAS       46        0.352       9       3     8
20
 4 difowi01  WAS       94        0.675      14       7     7
28
 5 doolise01 WAS        0        0           0       0     0
0
 6 doziebr01 WAS       99        0.698      20       0    20
40
 7 eatonad02 WAS       96        0.686      18       1     5
24
 8 eatonad02 WAS      158        0.933      25       7    15
47
 9 gomesya01 WAS       70        0.546      16       0    12
28
10 gracema02 WAS        1        0.194       0       0     0
0
# i 1,162 more rows
# i 1 more variable: Singles <int>
```

- A common comparison we want to do is to take a particular value and compare it to its mean. Let's add in a mean variable for hits as well.

```
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(desc(teamID), playerID) |>
  select(playerID, teamID, H:HR) |>
  rename("Doubles" = "X2B", "Triples" = "X3B") |>
  mutate(Extra_Base_Hits = Doubles + Triples + HR,
         Singles = H - Extra_Base_Hits,
         H_Percentile = percent_rank(H),
         H_Mean = mean(H)) |>
  select(playerID, teamID, H, H_Mean, H_Percentile, everything())
```

```
# A tibble: 1,172 x 10
   playerID  teamID     H H_Mean H_Percentile Doubles Triples    HR
   <chr>     <fct>  <int>  <dbl>        <dbl>   <int>   <int> <int>
 1 adamsma01 WAS       64   69.7        0.512       9       0    18
 2 adamsma01 WAS       70   69.7        0.546      14       0    20
 3 cabreas01 WAS       46   69.7        0.352       9       3     8
 4 difowi01  WAS       94   69.7        0.675      14       7     7
 5 doolise01 WAS        0   69.7        0           0       0     0
 6 doziebr01 WAS       99   69.7        0.698      20       0    20
 7 eatonad02 WAS       96   69.7        0.686      18       1     5
 8 eatonad02 WAS      158   69.7        0.933      25       7    15
 9 gomesya01 WAS       70   69.7        0.546      16       0    12
10 gracema02 WAS        1   69.7        0.194       0       0     0
# i 1,162 more rows
# i 2 more variables: Extra_Base_Hits <int>, Singles <int>
```

- Useful, but what if we want to show the mean by team? Easy to do in `dplyr` using `group_by()`!
- If we add `group_by()` in our chain, any summary statistics created will honor those groups (`ungroup()` exists if you want to remove a grouping).

```
          batting_tbl |>
            filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
            arrange(desc(teamID), playerID) |>
            select(playerID, teamID, H:HR) |>
            rename("Doubles" = "X2B", "Triples" = "X3B") |>
            group_by(teamID)
```

```
# A tibble: 1,172 x 6
# Groups:   teamID [30]
   playerID  teamID     H Doubles Triples    HR
   <chr>     <fct>  <int>   <int>   <int> <int>
 1 adamsma01 WAS       64       9       0    18
 2 adamsma01 WAS       70      14       0    20
 3 cabreas01 WAS       46       9       3     8
 4 difowi01  WAS       94      14       7     7
 5 doolise01 WAS        0       0       0     0
 6 doziebr01 WAS       99      20       0    20
 7 eatonad02 WAS       96      18       1     5
 8 eatonad02 WAS      158      25       7    15
 9 gomesya01 WAS       70      16       0    12
10 gracema02 WAS        1       0       0     0
# i 1,162 more rows
```

- Notice there is now an additional attribute associated with this `tibble`!

```
          batting_tbl |>
            filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
            arrange(desc(teamID), playerID) |>
            select(playerID, teamID, H:HR) |>
            rename("Doubles" = "X2B", "Triples" = "X3B") |>
            group_by(teamID) |>
          attributes()
```

```
$class
[1] "grouped_df" "tbl_df"     "tbl"        "data.frame"

$row.names
   [1]    1    2    3    4    5    6    7    8    9   10   11   12   13
14
  [15]   15   16   17   18   19   20   21   22   23   24   25   26   27
28
  [29]   29   30   31   32   33   34   35   36   37   38   39   40   41
42
  [43]   43   44   45   46   47   48   49   50   51   52   53   54   55
56
  [57]   57   58   59   60   61   62   63   64   65   66   67   68   69
70
  [71]   71   72   73   74   75   76   77   78   79   80   81   82   83
84
  [85]   85   86   87   88   89   90   91   92   93   94   95   96   97
98
  [99]   99  100  101  102  103  104  105  106  107  108  109  110  111
112
 [113]  113  114  115  116  117  118  119  120  121  122  123  124  125
126
 [127]  127  128  129  130  131  132  133  134  135  136  137  138  139
140
 [141]  141  142  143  144  145  146  147  148  149  150  151  152  153
154
 [155]  155  156  157  158  159  160  161  162  163  164  165  166  167
168
 [169]  169  170  171  172  173  174  175  176  177  178  179  180  181
182
 [183]  183  184  185  186  187  188  189  190  191  192  193  194  195
196
 [197]  197  198  199  200  201  202  203  204  205  206  207  208  209
210
 [211]  211  212  213  214  215  216  217  218  219  220  221  222  223
224
 [225]  225  226  227  228  229  230  231  232  233  234  235  236  237
238
 [239]  239  240  241  242  243  244  245  246  247  248  249  250  251
252
 [253]  253  254  255  256  257  258  259  260  261  262  263  264  265
266
 [267]  267  268  269  270  271  272  273  274  275  276  277  278  279
280
 [281]  281  282  283  284  285  286  287  288  289  290  291  292  293
294
 [295]  295  296  297  298  299  300  301  302  303  304  305  306  307
308
 [309]  309  310  311  312  313  314  315  316  317  318  319  320  321
322
 [323]  323  324  325  326  327  328  329  330  331  332  333  334  335
336
```

```
 [337]  337  338  339  340  341  342  343  344  345  346  347  348  349
350
 [351]  351  352  353  354  355  356  357  358  359  360  361  362  363
364
 [365]  365  366  367  368  369  370  371  372  373  374  375  376  377
378
 [379]  379  380  381  382  383  384  385  386  387  388  389  390  391
392
 [393]  393  394  395  396  397  398  399  400  401  402  403  404  405
406
 [407]  407  408  409  410  411  412  413  414  415  416  417  418  419
420
 [421]  421  422  423  424  425  426  427  428  429  430  431  432  433
434
 [435]  435  436  437  438  439  440  441  442  443  444  445  446  447
448
 [449]  449  450  451  452  453  454  455  456  457  458  459  460  461
462
 [463]  463  464  465  466  467  468  469  470  471  472  473  474  475
476
 [477]  477  478  479  480  481  482  483  484  485  486  487  488  489
490
 [491]  491  492  493  494  495  496  497  498  499  500  501  502  503
504
 [505]  505  506  507  508  509  510  511  512  513  514  515  516  517
518
 [519]  519  520  521  522  523  524  525  526  527  528  529  530  531
532
 [533]  533  534  535  536  537  538  539  540  541  542  543  544  545
546
 [547]  547  548  549  550  551  552  553  554  555  556  557  558  559
560
 [561]  561  562  563  564  565  566  567  568  569  570  571  572  573
574
 [575]  575  576  577  578  579  580  581  582  583  584  585  586  587
588
 [589]  589  590  591  592  593  594  595  596  597  598  599  600  601
602
 [603]  603  604  605  606  607  608  609  610  611  612  613  614  615
616
 [617]  617  618  619  620  621  622  623  624  625  626  627  628  629
630
 [631]  631  632  633  634  635  636  637  638  639  640  641  642  643
644
 [645]  645  646  647  648  649  650  651  652  653  654  655  656  657
658
 [659]  659  660  661  662  663  664  665  666  667  668  669  670  671
672
 [673]  673  674  675  676  677  678  679  680  681  682  683  684  685
686
 [687]  687  688  689  690  691  692  693  694  695  696  697  698  699
700
 [701]  701  702  703  704  705  706  707  708  709  710  711  712  713
714
 [715]  715  716  717  718  719  720  721  722  723  724  725  726  727
```

```
728
 [729]  729  730  731  732  733  734  735  736  737  738  739  740  741
742
 [743]  743  744  745  746  747  748  749  750  751  752  753  754  755
756
 [757]  757  758  759  760  761  762  763  764  765  766  767  768  769
770
 [771]  771  772  773  774  775  776  777  778  779  780  781  782  783
784
 [785]  785  786  787  788  789  790  791  792  793  794  795  796  797
798
 [799]  799  800  801  802  803  804  805  806  807  808  809  810  811
812
 [813]  813  814  815  816  817  818  819  820  821  822  823  824  825
826
 [827]  827  828  829  830  831  832  833  834  835  836  837  838  839
840
 [841]  841  842  843  844  845  846  847  848  849  850  851  852  853
854
 [855]  855  856  857  858  859  860  861  862  863  864  865  866  867
868
 [869]  869  870  871  872  873  874  875  876  877  878  879  880  881
882
 [883]  883  884  885  886  887  888  889  890  891  892  893  894  895
896
 [897]  897  898  899  900  901  902  903  904  905  906  907  908  909
910
 [911]  911  912  913  914  915  916  917  918  919  920  921  922  923
924
 [925]  925  926  927  928  929  930  931  932  933  934  935  936  937
938
 [939]  939  940  941  942  943  944  945  946  947  948  949  950  951
952
 [953]  953  954  955  956  957  958  959  960  961  962  963  964  965
966
 [967]  967  968  969  970  971  972  973  974  975  976  977  978  979
980
 [981]  981  982  983  984  985  986  987  988  989  990  991  992  993
994
 [995]  995  996  997  998  999 1000 1001 1002 1003 1004 1005 1006 1007
1008
[1009] 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
1022
[1023] 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035
1036
[1037] 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049
1050
[1051] 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063
1064
[1065] 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077
1078
[1079] 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091
1092
[1093] 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105
1106
```

```
[1107] 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119
1120
[1121] 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133
1134
[1135] 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147
1148
[1149] 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161
1162
[1163] 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172

$names
[1] "playerID" "teamID"   "H"        "Doubles"  "Triples"  "HR"

$groups
# A tibble: 30 x 2
   teamID       .rows
   <fct>  <list<int>>
 1 ARI           [43]
 2 ATL           [38]
 3 BAL           [39]
 4 BOS           [41]
 5 CHA           [39]
 6 CHN           [38]
 7 CIN           [44]
 8 CLE           [41]
 9 COL           [39]
10 DET           [40]
# i 20 more rows
```

- Let's find our mean relative to each team using a `group_by()` in our chain (this finds the percentile by `teamID` as well).

```
          batting_tbl |>
            filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
            arrange(desc(teamID), playerID) |>
            select(playerID, teamID, H:HR) |>
            rename("Doubles" = "X2B", "Triples" = "X3B") |>
            group_by(teamID) |>
            mutate(Extra_Base_Hits = Doubles + Triples + HR,
                   Singles = H - Extra_Base_Hits,
                   H_Percentile = percent_rank(H),
                   H_Mean = mean(H)) |>
            select(playerID, teamID, H, H_Mean, H_Percentile, everything())
            print(n = 50)
```

```
# A tibble: 1,172 x 10
# Groups:   teamID [30]
   playerID  teamID     H H_Mean H_Percentile Doubles Triples    HR
   <chr>     <fct>  <int>  <dbl>        <dbl>   <int>   <int> <int>
 1 adamsma01 WAS       64   72.0        0.486       9       0    18
 2 adamsma01 WAS       70   72.0        0.514      14       0    20
 3 cabreas01 WAS       46   72.0        0.351       9       3     8
 4 difowi01  WAS       94   72.0        0.676      14       7     7
 5 doolise01 WAS        0   72.0        0               0       0     0
```

```
  6 doziebr01 WAS      99   72.0         0.730       20         0    20
  7 eatonad02 WAS      96   72.0         0.703       18         1     5
  8 eatonad02 WAS     158   72.0         0.919       25         7    15
  9 gomesya01 WAS      70   72.0         0.514       16         0    12
 10 gracema02 WAS       1   72.0         0.162        0         0     0
 11 gracema02 WAS       0   72.0         0            0         0     0
 12 harpebr03 WAS     137   72.0         0.811       34         0    34
 13 kendrho01 WAS     115   72.0         0.757       23         1    17
 14 kiebosp01 WAS      29   72.0         0.243        5         0     2
 15 milleju02 WAS       0   72.0         0            0         0     0
 16 murphda08 WAS      57   72.0         0.459        9         0     6
 17 parrage01 WAS      47   72.0         0.378       11         1     8
 18 raineta01 WAS       0   72.0         0            0         0     0
 19 rendoan01 WAS     163   72.0         0.946       44         2    24
 20 rendoan01 WAS     174   72.0         0.973       44         3    34
 21 reynoma01 WAS      51   72.0         0.405        8         0    13
 22 roblevi01 WAS     139   72.0         0.838       33         3    17
 23 roblevi01 WAS      37   72.0         0.297        5         1     3
 24 severpe01 WAS      32   72.0         0.270        9         0     2
 25 solissa01 WAS       0   72.0         0            0         0     0
 26 sotoju01  WAS     121   72.0         0.784       25         1    22
 27 sotoju01  WAS     153   72.0         0.865       32         5    34
 28 stevean01 WAS      19   72.0         0.189        2         0     1
 29 suerowa01 WAS       0   72.0         0            0         0     0
 30 suzukku01 WAS      74   72.0         0.568       11         0    17
 31 taylomi02 WAS      80   72.0         0.649       22         3     6
 32 taylomi02 WAS      22   72.0         0.216        7         0     1
 33 turnetr01 WAS     180   72.0         1           27         6    19
 34 turnetr01 WAS     155   72.0         0.892       37         5    19
 35 turnetr01 WAS      78   72.0         0.622       15         4    12
 36 wietema01 WAS      56   72.0         0.432        8         0     8
 37 zimmery01 WAS      76   72.0         0.595       21         2    13
 38 zimmery01 WAS      44   72.0         0.324        9         0     6
 39 biggica01 TOR      83   72.9         0.485       17         2    16
 40 biggica01 TOR      55   72.9         0.242       16         0     8
 41 clippty01 TOR       0   72.9         0            0         0     0
 42 diazal02  TOR     111   72.9         0.818       26         0    18
 43 drurybr01 TOR      91   72.9         0.667       21         1    15
 44 galvifr01 TOR     120   72.9         0.879       24         1    18
 45 gavigsa01 TOR       0   72.9         0            0         0     0
 46 gileske01 TOR       0   72.9         0            0         0     0
 47 grandcu01 TOR      74   72.9         0.455       21         1    11
 48 grichra01 TOR     104   72.9         0.758       32         1    25
 49 grichra01 TOR     136   72.9         1           29         5    31
 50 grichra01 TOR      59   72.9         0.333        9         0    12
# ℹ 1,122 more rows
# ℹ 2 more variables: Extra_Base_Hits <int>, Singles <int>
```

- We can get a secondary grouping too! Let's group by year as well

```r
batting_tbl |>
  filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
  arrange(desc(teamID), playerID) |>
  select(playerID, yearID, teamID, H:HR) |>
  rename("Doubles" = "X2B", "Triples" = "X3B") |>
```

```
        group_by(teamID, yearID) |>
        mutate(Extra_Base_Hits = Doubles + Triples + HR,
               Singles = H - Extra_Base_Hits,
               H_Percentile = percent_rank(H),
               H_Mean = mean(H)) |>
        select(playerID, teamID, yearID, H, H_Mean, H_Percentile, everytl
```

```
# A tibble: 1,172 x 11
# Groups:   teamID, yearID [90]
   playerID  teamID yearID     H H_Mean H_Percentile Doubles Triples    HR
   <chr>     <fct>   <int> <int>  <dbl>        <dbl>   <int>   <int> <int>
 1 adamsma01 WAS      2018    64   69.8        0.529       9       0    18
 2 adamsma01 WAS      2019    70   77.6        0.438      14       0    20
 3 cabreas01 WAS      2020    46   53.7        0.5         9       3     8
 4 difowi01  WAS      2018    94   69.8        0.706      14       7     7
 5 doolise01 WAS      2019     0   77.6        0           0       0     0
 6 doziebr01 WAS      2019    99   77.6        0.625      20       0    20
 7 eatonad02 WAS      2018    96   69.8        0.765      18       1     5
 8 eatonad02 WAS      2019   158   77.6        0.938      25       7    15
 9 gomesya01 WAS      2019    70   77.6        0.438      16       0    12
10 gracema02 WAS      2018     1   69.8        0.118       0       0     0
# i 1,162 more rows
# i 2 more variables: Extra_Base_Hits <int>, Singles <int>
```

We are really able to do a lot quickly with these functions! Nice. One other commonly used function in `mutate()` is `ifelse()` or `if_else()` (the `tidyverse` version with slightly more restrictive functionality).

- Let's add a new variable that compares a number of hits to the mean. If it is more than the mean we'll say "Great", if it is less than the mean we'll say "Needs some work".
  - Recall `ifelse()` takes in a vector of conditions as the first argument. The second argument is what to do when `TRUE` and the third what to do when `FALSE`.

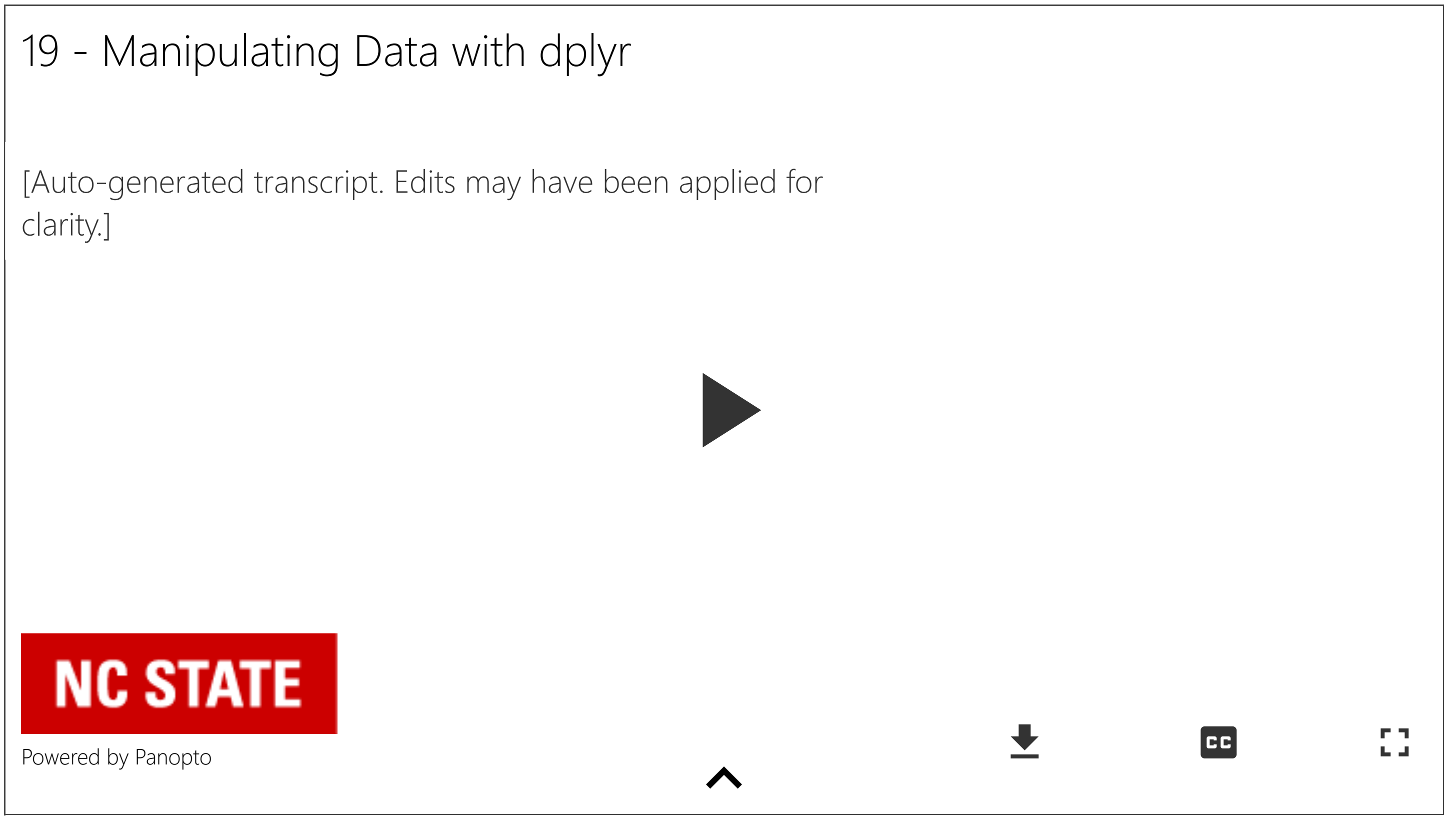
```
      batting_tbl |>
        filter(G > 50, yearID %in% c(2018, 2019, 2020)) |>
        arrange(desc(teamID), playerID) |>
        select(playerID, yearID, teamID, H:HR) |>
        rename("Doubles" = "X2B", "Triples" = "X3B") |>
        group_by(teamID, yearID) |>
        mutate(Extra_Base_Hits = Doubles + Triples + HR,
               Singles = H - Extra_Base_Hits,
               H_Percentile = percent_rank(H),
               H_Mean = mean(H),
               Status = ifelse(H > H_Mean,
                               "Great",
                               "Needs some work")) |>
        select(playerID, teamID, yearID, H, H_Mean, Status, H_Percentile,
```

```
# A tibble: 1,172 x 12
# Groups:   teamID, yearID [90]
```

```
   playerID teamID yearID     H H_Mean Status H_Percentile Doubles Triples
HR
   <chr>    <fct>   <int> <int>  <dbl> <chr>         <dbl>   <int>   <int>
<int>
 1 adamsma~ WAS      2018    64   69.8 Needs~        0.529       9       0
18
 2 adamsma~ WAS      2019    70   77.6 Needs~        0.438      14       0
20
 3 cabreas~ WAS      2020    46   53.7 Needs~        0.5         9       3
8
 4 difowi01 WAS      2018    94   69.8 Great         0.706      14       7
7
 5 doolise~ WAS      2019     0   77.6 Needs~        0           0       0
0
 6 doziebr~ WAS      2019    99   77.6 Great         0.625      20       0
20
 7 eatonad~ WAS      2018    96   69.8 Great         0.765      18       1
5
 8 eatonad~ WAS      2019   158   77.6 Great         0.938      25       7
15
 9 gomesya~ WAS      2019    70   77.6 Needs~        0.438      16       0
12
10 gracema~ WAS      2018     1   69.8 Needs~        0.118       0       0
0
# i 1,162 more rows
# i 2 more variables: Extra_Base_Hits <int>, Singles <int>
```

Quick R Video

Please pop this video out and watch it in the full panopto player!



19 - Manipulating Data with dplyr

[Auto-generated transcript. Edits may have been applied for clarity.]

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Recap!

`dplyr` gives us a ton of functionality for doing common data manipulations

- `as_tibble()` - coerce a data frame to a tibble
- `filter()` - subset rows
- `arrange()` - reorder rows
- `select()` - subset/reorder columns
- `rename()` - rename columns
- `mutate()` - add new variables to the tibble

The functionality of selecting columns described in the help for `select()` can be used in many places across the `tidyverse` and the functions `group_by()` and `ifelse()` are really useful as well!

- `dplyr` Cheat Sheet (PDF version on the right hand side of the page)