data wrangling with dplyr

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Wrangling

Reshaping or transforming “raw” data into a format which is easier to work with

(for later visualisation, computing of statistics, and modelling.)

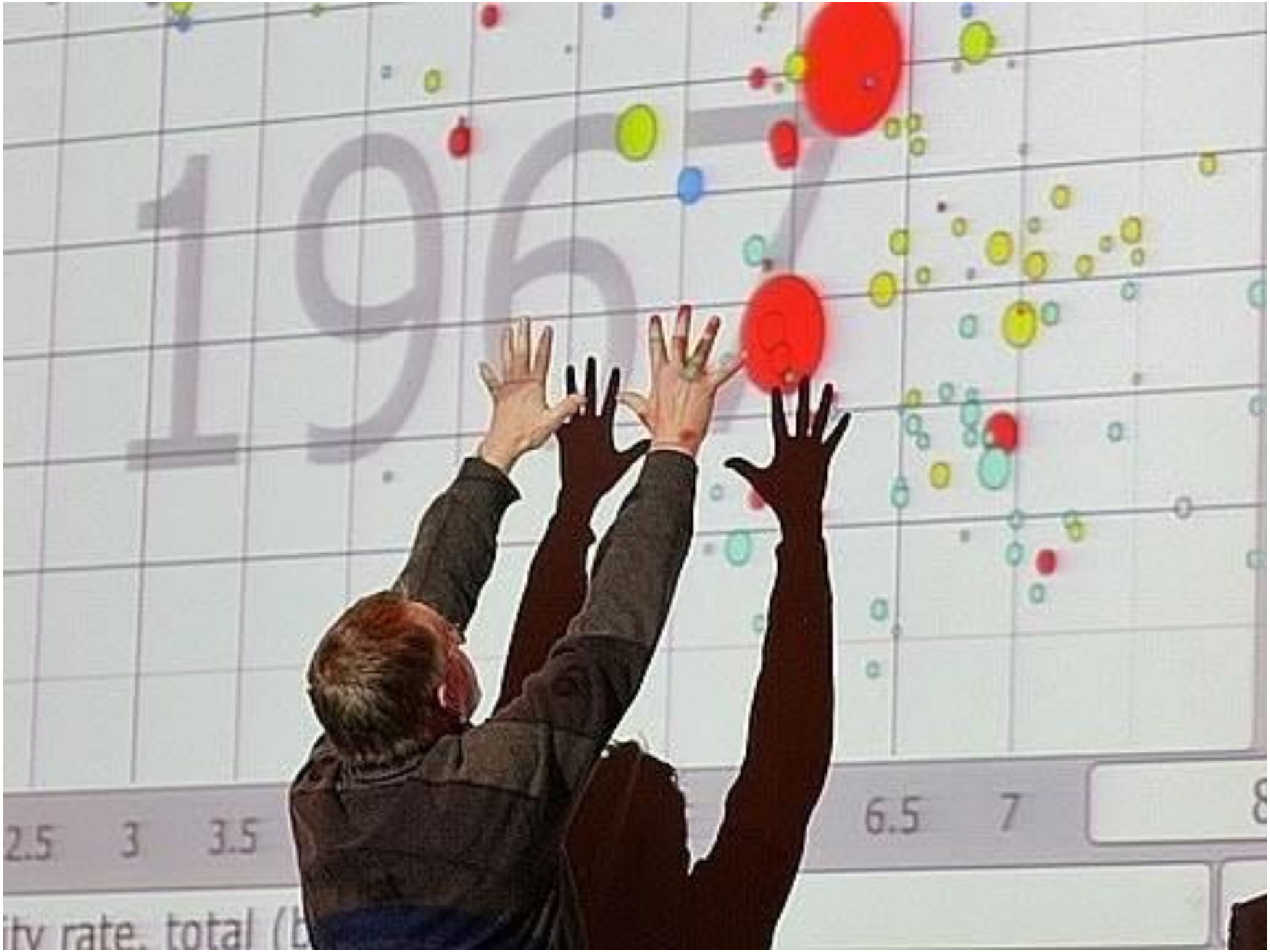
The dplyr package

Dplyr is a language for data manipulation.

Most wrangling puzzles can be solved with knowledge of just 5 dplyr verbs (5 functions).

These will be the subject of this session.

Gapminder



Gapminder

Data from gapminder.org

```
install.packages("gapminder")
library(gapminder)
```

Q. How many variables here?
Meaningful names?
What type?
(more on this tomorrow)

dplyr

5 verbs

arrange
filter
mutate
summarise
group_by

Will help us gain a deeper understanding of our data sets.

Newspaper puzzles

Level 2				
18	÷3	x7	−6	÷3

Visualising instructions

Input

18	then	÷3	then	x7	then	−6

Output = new number

Visualising Instructions

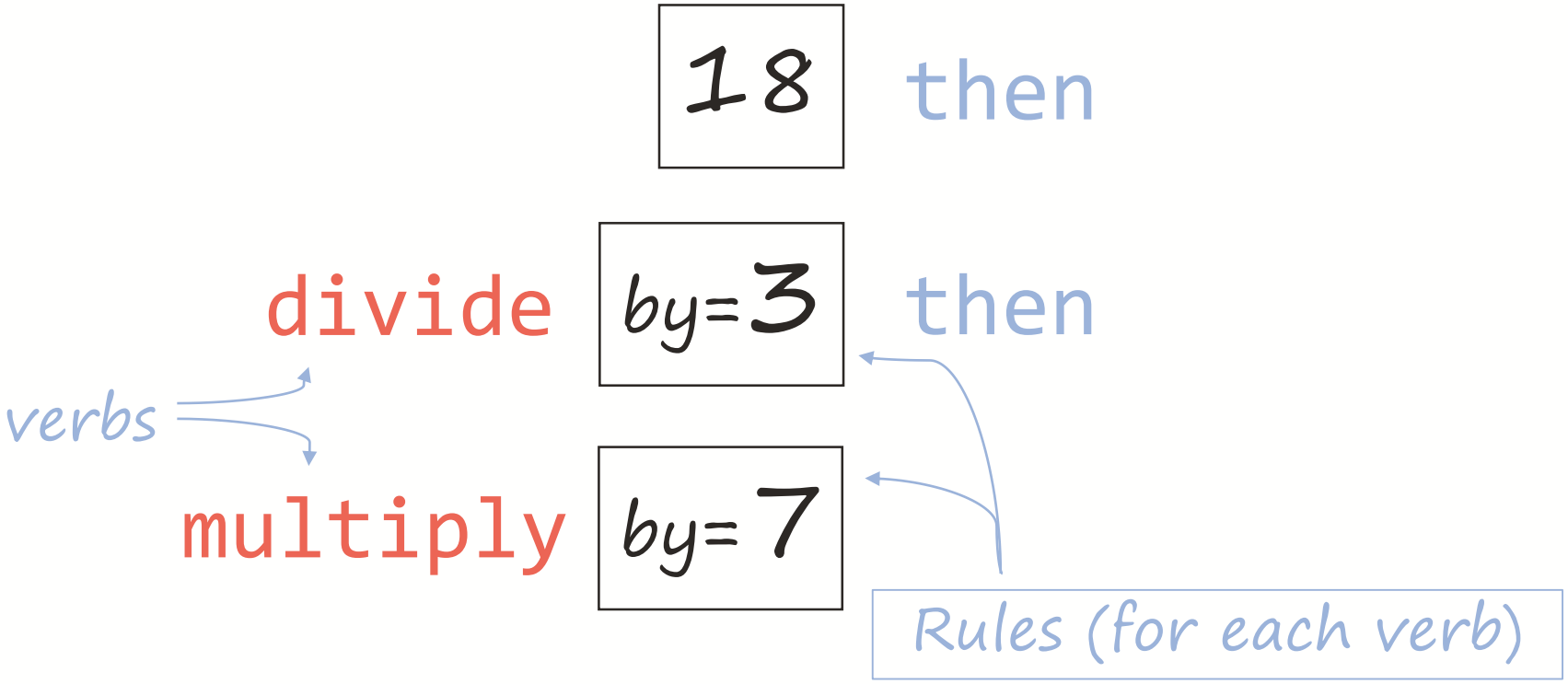
18 then

÷3 then

x7

	18	then
÷	3	then
x	7	

	18	then
divide by	3	then
multiply by	7	


18
then
divide
by=3
then
verbs
multiply
by=7
Rules (for each verb)

```
18  then

divide( by=3 )then

multiply( by=7 )
```

verbs

Rules (for each verb)

```
18 %>%
divide( by=3 ) %>%
multiply( by=7 )
```

Input (number)

```
18 %>%

divide( by=3 ) %>%

multiply( by=7 )
```

Output (new number)

Input (number)

```
18 %>%
divide( by=3 ) %>%
multiply( by=7 )
```

What is the output at this step?

Input (number)

```
18 %>%
divide( by=3 ) %>%
multiply( by=7 )
```

What is the output at this step?

The next step builds on the previous one

Tidyverse syntax

Input

```
data_frame then
do_this(rules) then
do_this(rules)
```

dplyr verb

Output
(new data frame)

Tidyverse syntax

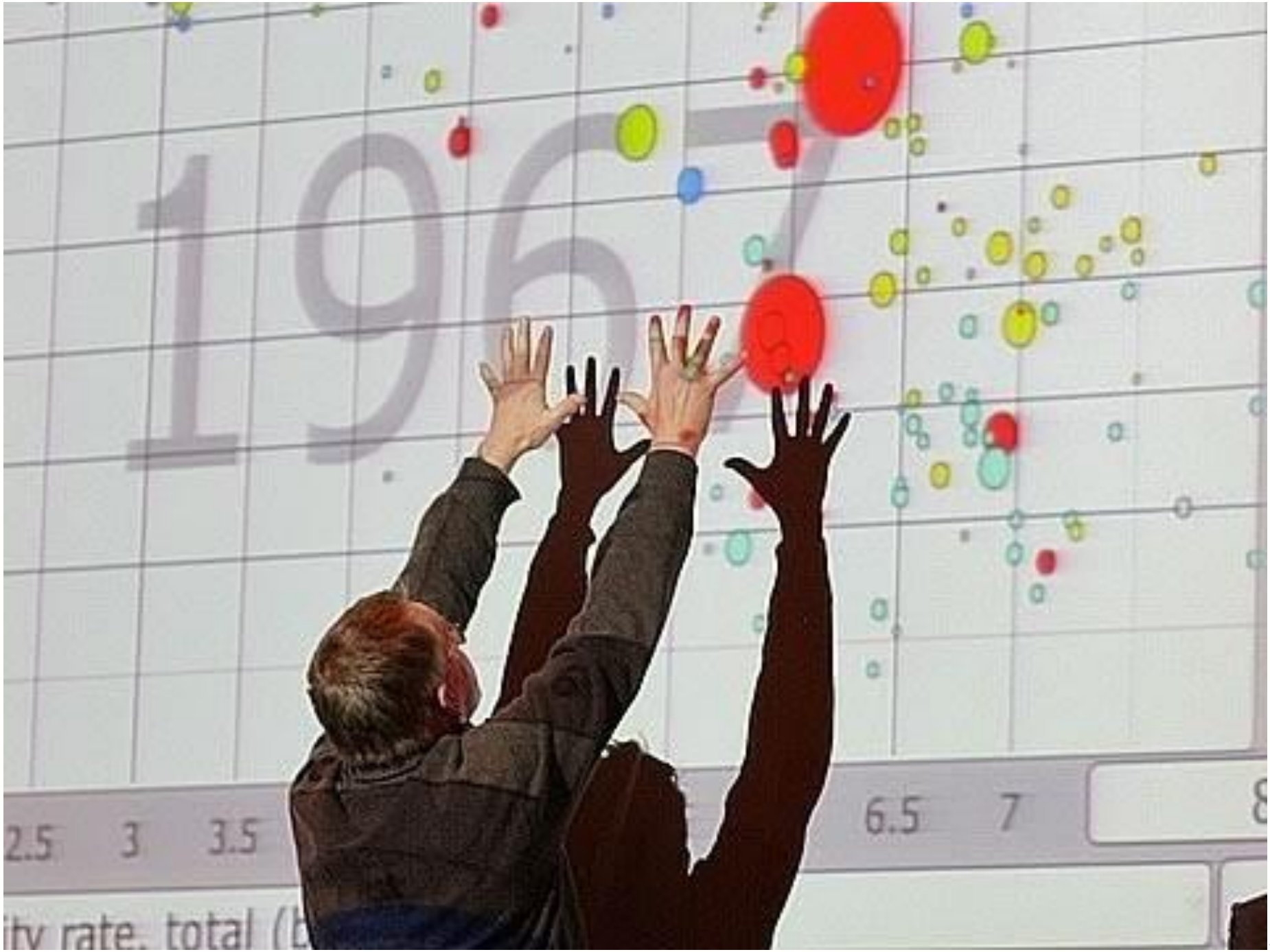
```
data_frame %>%
  do_this(rules) %>%
  do_this(rules)
```

The tidyverse

Combine simple pieces to solve complex puzzles

```
data_frame %>%
  do_this(rules) %>%
  do_this(rules)
```

Gapminder



Q1. How many years does this Gapminder excerpt cover?

1. arrange

Reorder rows based on selected variable

Input data frame

"then"

```
gapminder %>%
  arrange(year)
```

dplyr verb

variable to arrange by

1. arrange

Reorder rows based on selected variable

Input data frame

"then" – Ctrl + Shift + m

```
gapminder %>%
  arrange(year)
```

dplyr verb

variable to arrange by

1. arrange

In descending order:

```
gapminder %>%
  arrange(desc(year))
```

for text and numeric variables

1. arrange

In descending order (easy way):

"then" – Ctrl + Shift + m

```
gapminder %>%
  arrange(-year)
```

Q2. Which 5 countries have the highest human populations? (2007)

```
gapminder %>%
  arrange(desc(pop))
```

2. filter

pick observations by their value

Input data frame

"then"

```
gapminder %>%
filter(      )
```

dplyr verb

2. filter

pick observations by their value

```
gapminder %>%
  filter(year == 2007)
```

2. filter

pick observations by their value

```
gapminder %>%
  filter(year == 2007)
```

The expression inside brackets should be TRUE or FALSE

We are testing equality so ==

Here we are choosing rows where this expression is TRUE

2. filter

"then"
strings multiple
verbs
together

```
gapminder %>%
    filter(year == 2007) %>%
    arrange(desc(pop))
```

2. filter

Use quotes if referring to text (character) strings

```
gapminder %>%
    filter(continent == “Africa”) %>%
    arrange(desc(pop))
```

‘single’ or “double” as you wish

Break / Quiz

What is this not?

Picture: White, K. (2011). 101 Things to Learn in Art School. MIT Press.

Q3. Which 5 countries* have the lowest GDP? (2007)

*Not all countries represented in data

Q3. Which 5 countries have the lowest GDP?

```
gapminder %>%
  filter(year == 2007) %>%
  arrange(gdpPercap)
```

This is per capita GDP
(but we can get what we need from existing variables)

3. mutate

create new variables from existing ones

```
gapminder %>%
    mutate(gdp = pop * gdpPercap)
```

3. mutate

```
gapminder %>%
    mutate(gdp = pop*gdpPercap)
```

Usually a function of existing variable(s)

new column name

NOT a test of equality, so =

3. mutate

```
gapminder %>%
        mutate(gdp = pop*gdpPercap) %>%
        filter(year == 2007) %>%
        arrange(gdp)
```

We can refer to variables we've just created in the pipe chain

Q4. Which country has the highest population for each year of data?

5. summarise

collapse many values into a single summary value

```
gapminder %>%
  summarise(pop_high = max(pop))
```

Similar to mutate:

new column name

(summary) function

4. group_by

For each group...

... summarise (collapse into a single summary value)

```
gapminder %>%
  group_by(year) %>%
  summarise(pop_high = max(pop))
```

4. group_by

Useful if we desire breakdowns by variable(s)

```
gapminder %>%
  group_by(year) %>%
   summarise(pop_high = max(pop))
```

4. group_by and 5. summarise

A column is created for each grouping variable

A column for the summary

year	pop_high

```
gapminder %>%
    group_by(year) %>%
    summarise(pop_high = max(pop))
```

4. group_by and 5. summarise

A row for each year group

year	pop_high
1952	
1957	

```
gapminder %>%
    group_by(year) %>%
    summarise(pop_high = max(pop))
```

4. group_by and 5. summarise

A column is created for each grouping variable

year	continent	pop_high
1952	Africa	
1957	Africa	

```
gapminder %>%
    group_by(year, continent) %>%
    summarise(mean_life = mean(lifeExp))
```

4.group_by and 5.summarise

A row for each unique combo of the grouping variables

year	continent	pop_high
1952	Africa	
1957	Africa	

```
gapminder %>%
    group_by(year, continent) %>%
    summarise(mean_life = max(pop))
```

Q5. How has mean life expectancy in Africa changed (1952–2007)?

A summary value...

Q5. How has mean life expectancy in Africa changed (1952–2007)?

A summary value...

Q5. How has mean life expectancy in Africa changed (1952–2007)?

for each year...

A summary value...

Q5. How has mean life expectancy in Africa changed (1952–2007)?

but pick only the African continent

for each year...

Over to you:

A summary value...

Q5. How has mean life expectancy in Africa changed (1952–2007)?

but pick only the African continent

for each year...

Extension:

Q. How many countries from each continent?

Hint:
filter for one year then use:

```
summarise(any_name = n())
```

This is a common pattern – it will count the number of rows in each group

Q5.~solution

```
gapminder %>%
  filter(continent == "Africa") %>%
  group_by(year) %>%
  summarise(mean_life = mean(lifeExp))
```

Extension~solution

```
gapminder %>%
  filter(year == 2007) %>%
  group_by(continent) %>%
  summarise(n = n())
```

I'll just call this column "n"

6. select

select a subset of variables from existing data set

```
gapminder %>%
        select(var1, var2)
```

6. select

select a subset of variables from existing data set

```
gapminder %>%
        select(-var2)
```

To remove a column

6. select

select a subset of variables from existing data set

```
gapminder %>%
        select(1:5)
```

You can also refer to columns by number. Here 1:5 saves having to type: 1,2,3,4,5

6. select

select a subset of variables from existing data set

```
gapminder %>%
        select(var6, everything())
```

If you want this column at the start of your data frame

This work is licensed as

End