EVRN 745 Assignment 3: gganimate guide

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1) Goals of the package

The main goal of gganimate is to extend to ggplot syntax and aesthetic scheme to the generation of animated graphs. It does this by adding a few new types of functions dealing with implemeting different types of animations and rendering the resultant `gganim` objects as GIF files. These functions are appended to the ggplot call using the expected `+` operator. Here are some examples of these functions and their uses:

`transition_*()` defines how the data should be spread out and how it relates to itself across time. `view_*()` `defines`how the positional scales should change along the animation. `shadow_*() defines` how data from other points in time should be presented in the given point in time. `enter_*()/exit_*()` defines how new data should appear and how old data should disappear during the course of the animation. `ease_aes()`defines how different aesthetics should be eased during transitions.

2) Examples demonstrating the functionality of the package

For this first example, we need to load the `gganimte` package, as well as an ancillary package called `gifski`(this package allows gganimate to render gif files. I beleive there are other packages you can use that more or less do the same thing). The first example and figure below make use of the `mtcars` data set:

```
head(mtcars)
```

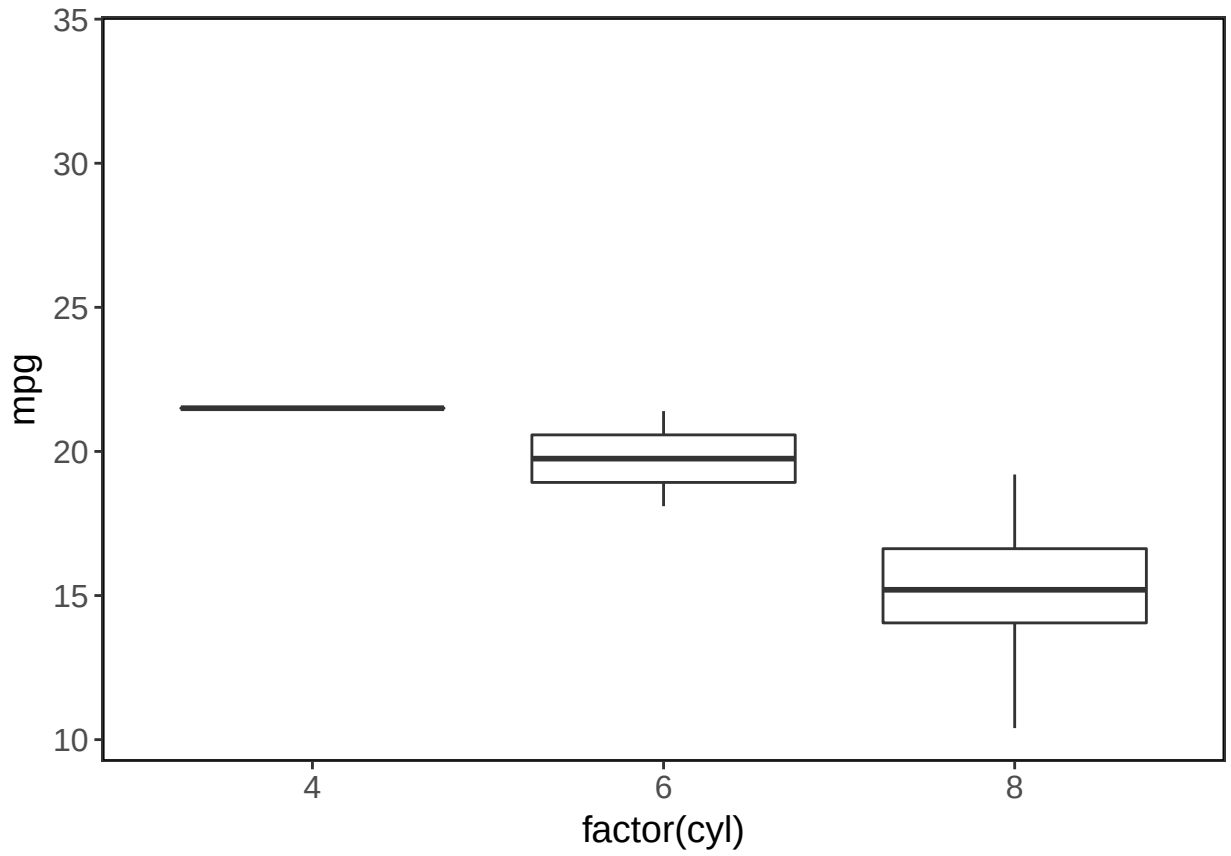
```
##                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

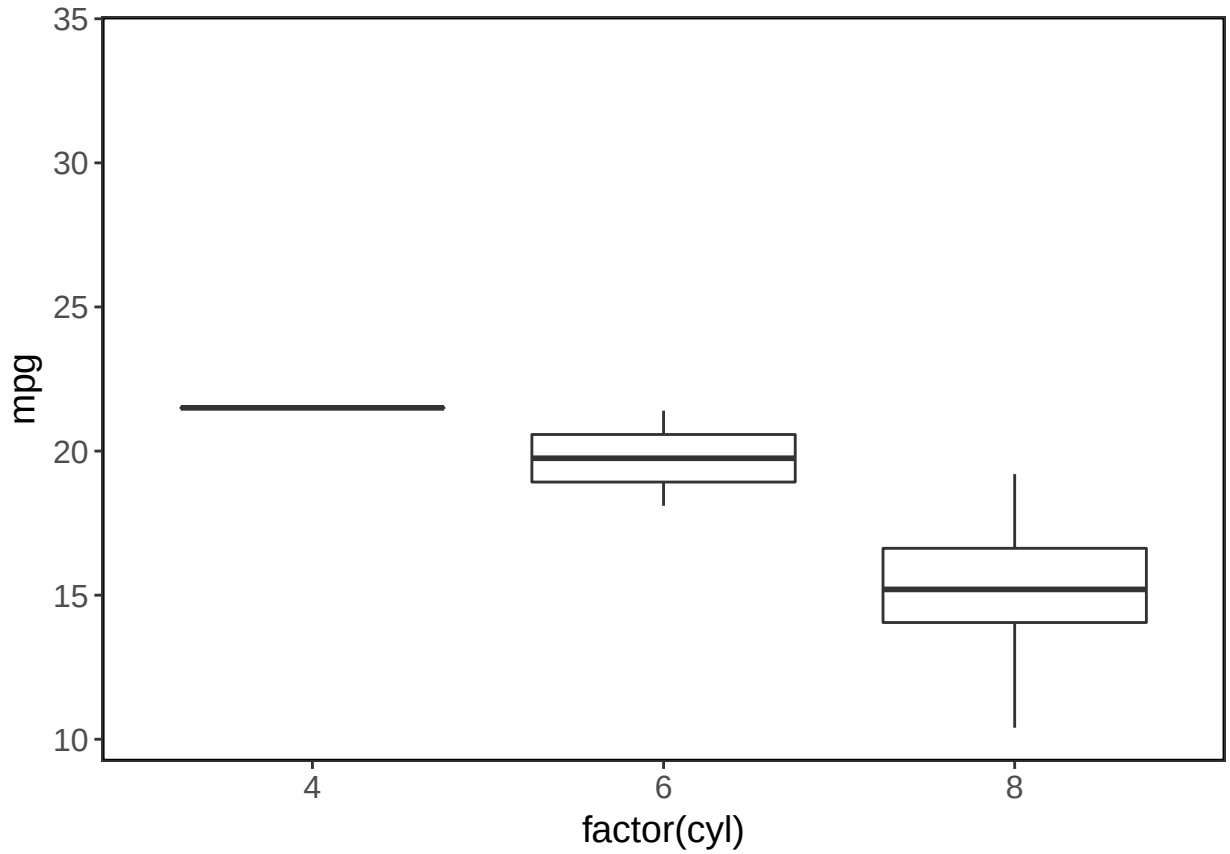
As you can see above, this data set list attributes of a number of car models. In this graph below, we are taking a base static boxplot showing the mpg distributions for groups of cars with different numbers of cylinders, but then using the number of forward gears (as a factor) to animate.

```
library(tidyverse)
library(gganimate)
library(gifski)

# Here is regular ggplot syntax
ggplot(mtcars, aes(factor(cyl), mpg)) +
  geom_boxplot() +
```

```
# Here is where we start adding gganimate code
# The transition_states function allows you to choose the variable (states = x) you want to animate w
transition_states(
# The states input is an unquoted column name
  states = gear,
# The transition_length input is the relative length of time the image transitions
  transition_length = 2,
# The state_length input is the relative length of time the image stays in each discrete state
  state_length = 1) +
# the enter and exit functions define how new data should appear and how old data should disappear
enter_fade() +
exit_shrink() +
# ease_aes() defines the rate of change during transitions between states
ease_aes('sine-in-out') +
# this is all theme stuff
 theme_bw() +
theme(panel.grid.major = element_blank(),
      panel.grid.minor = element_blank(),
      panel.background = element_rect(colour = "black", size = 1)) +
theme(axis.text = element_text(size = 12),
      axis.title = element_text(size = 14))
```

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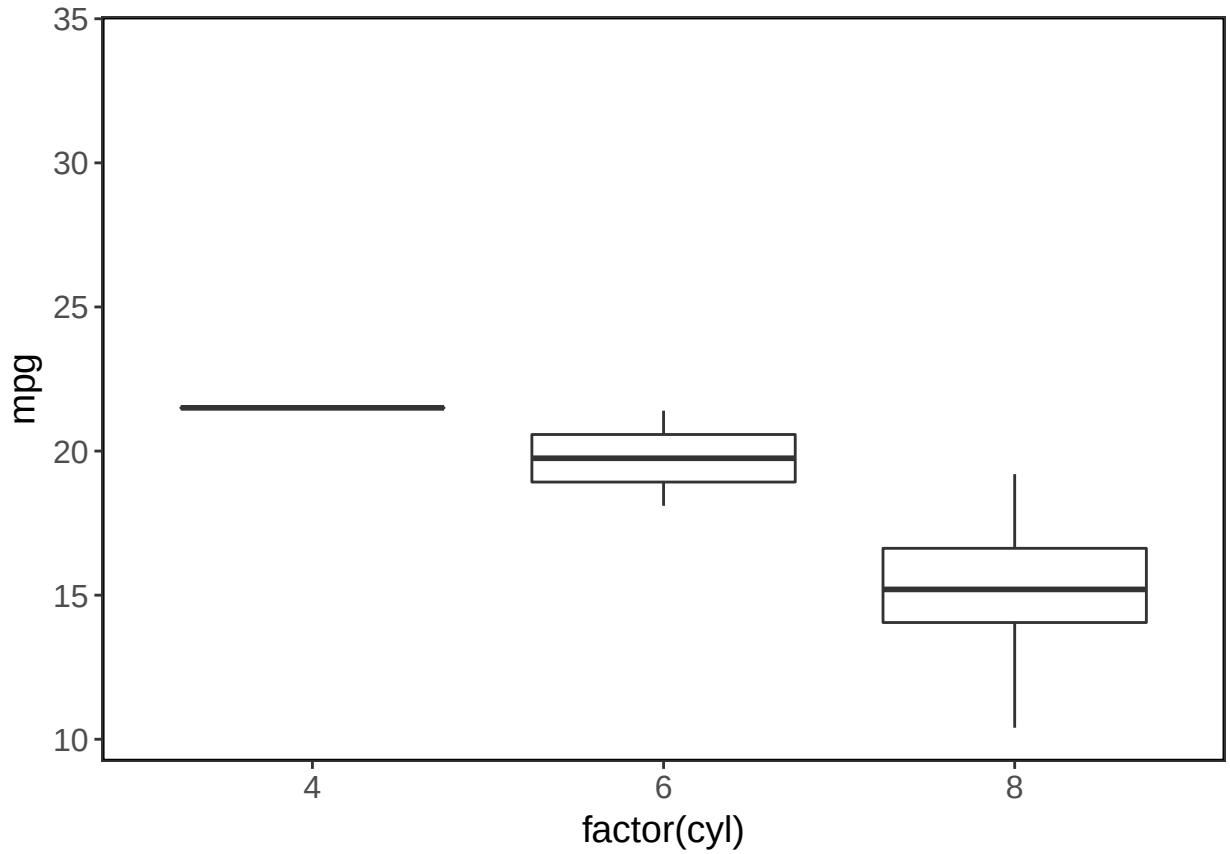
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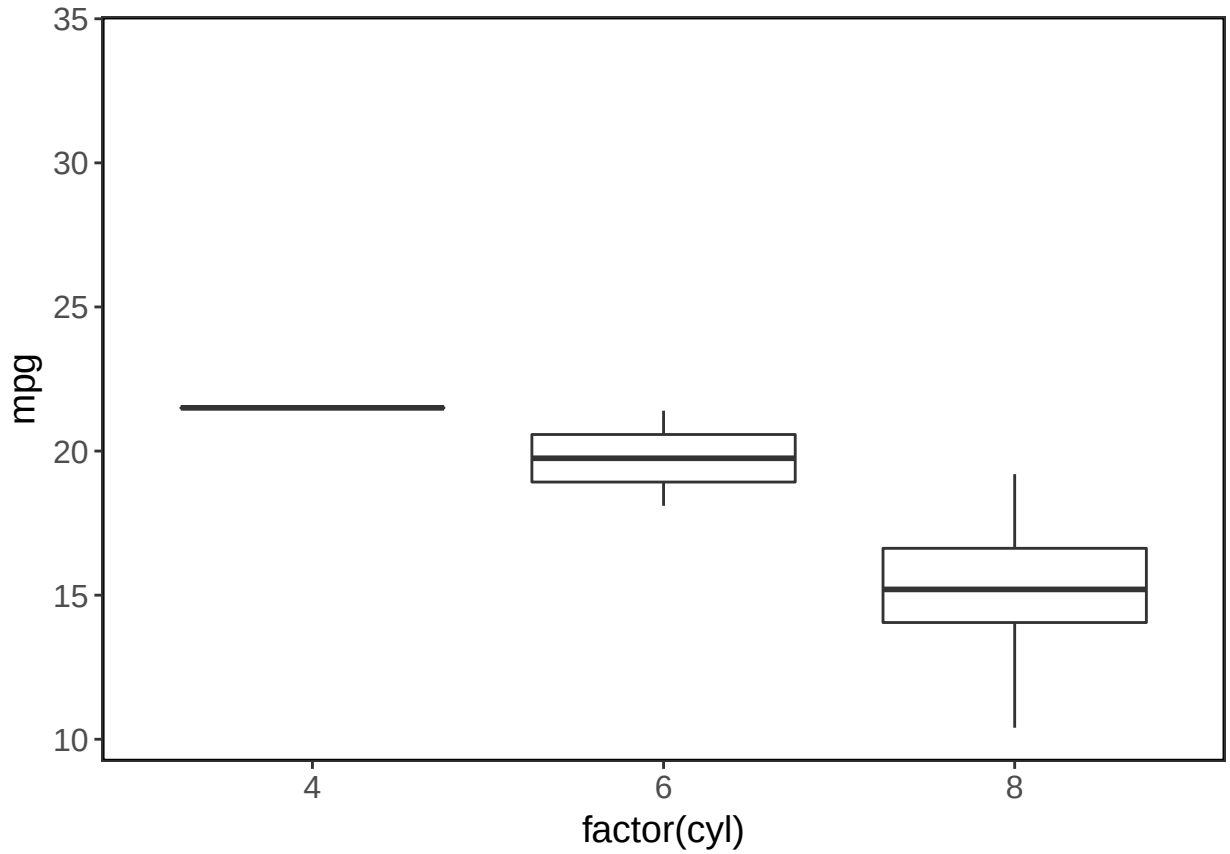
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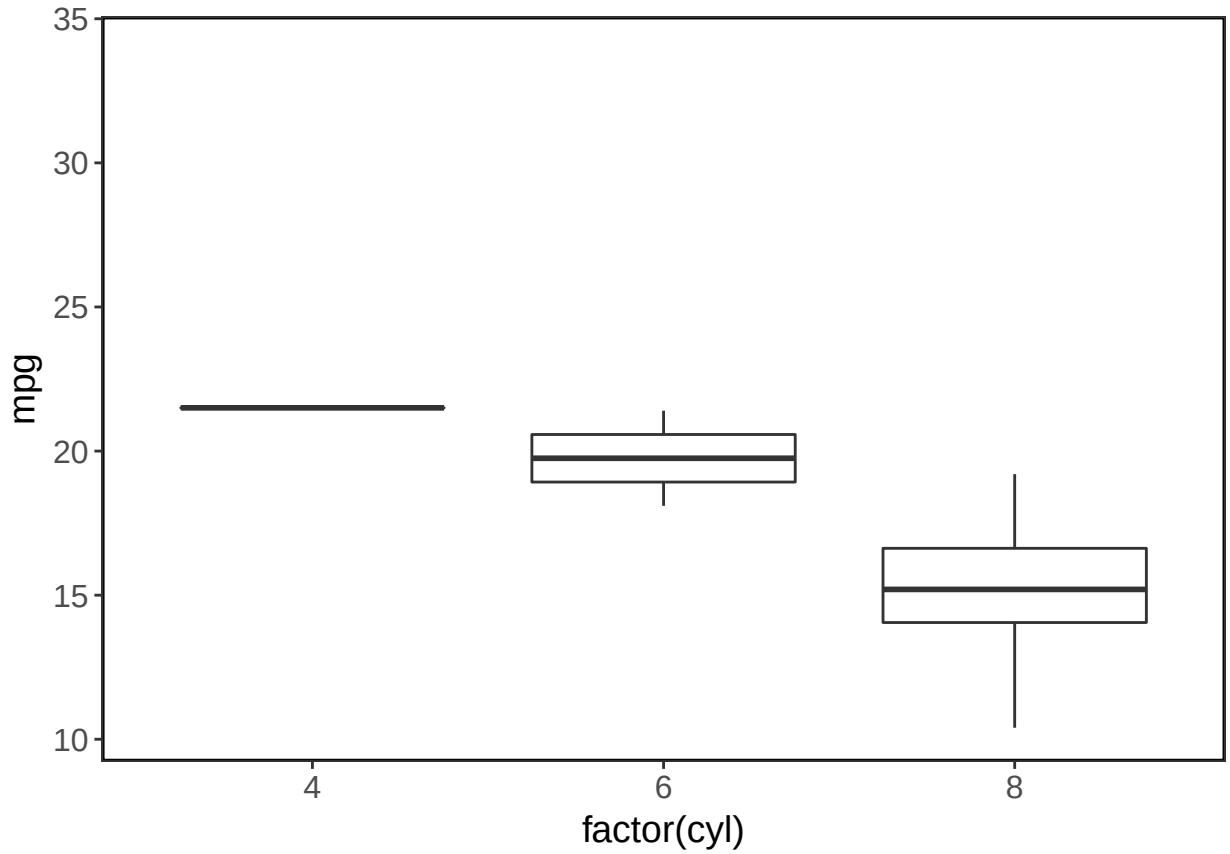
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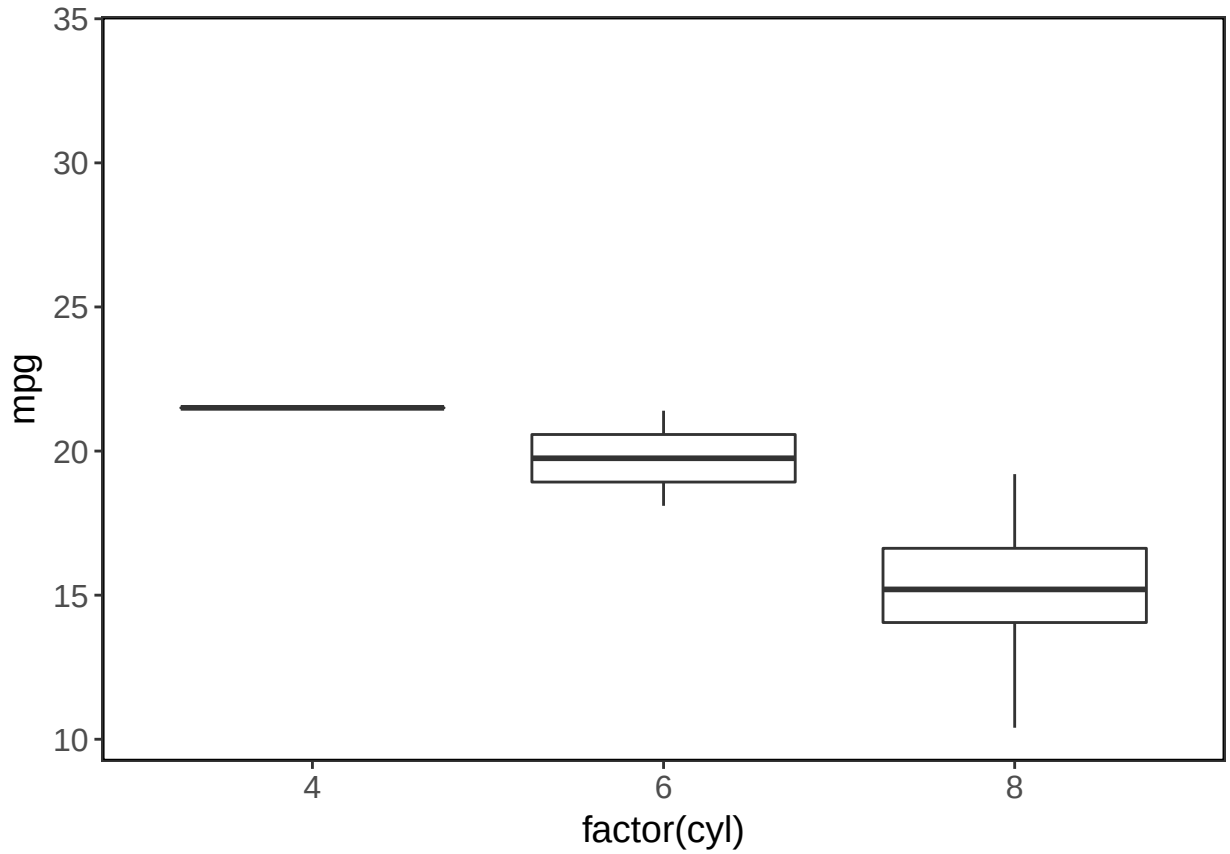
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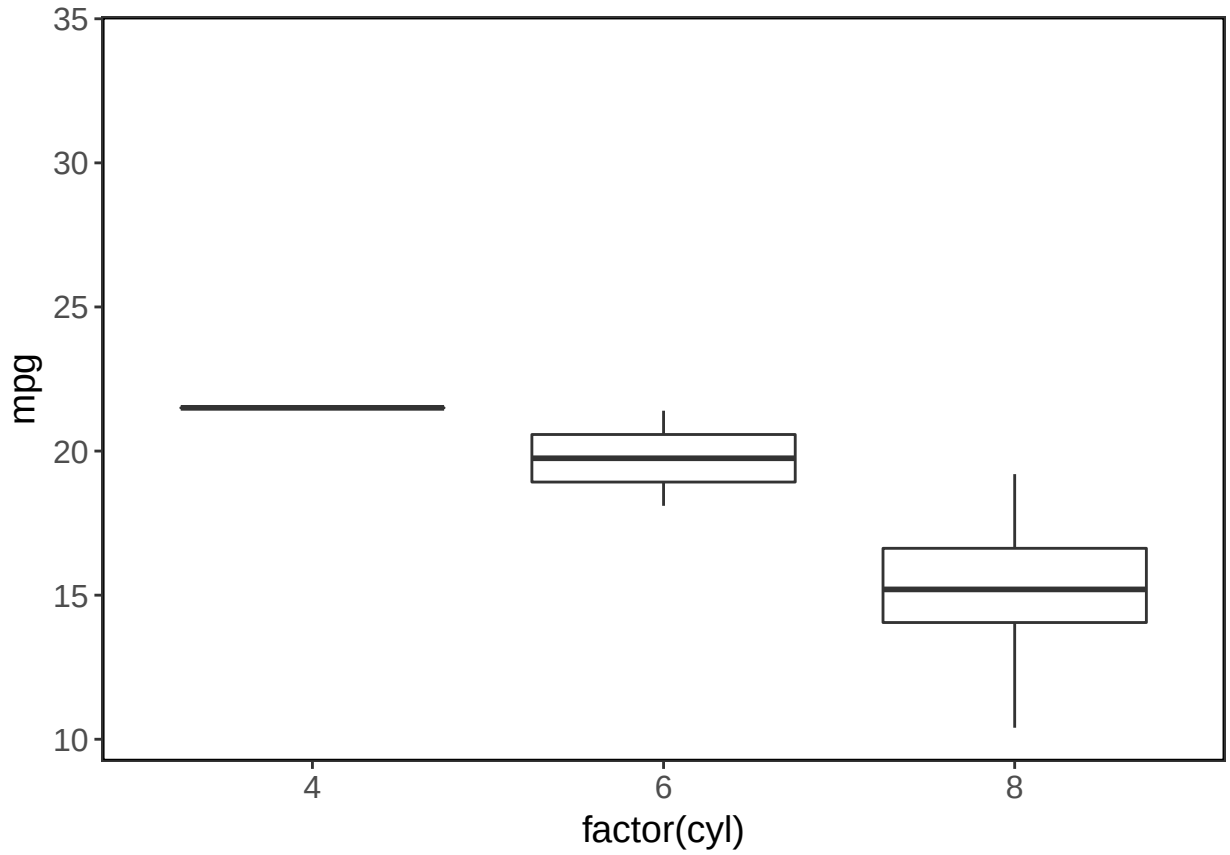
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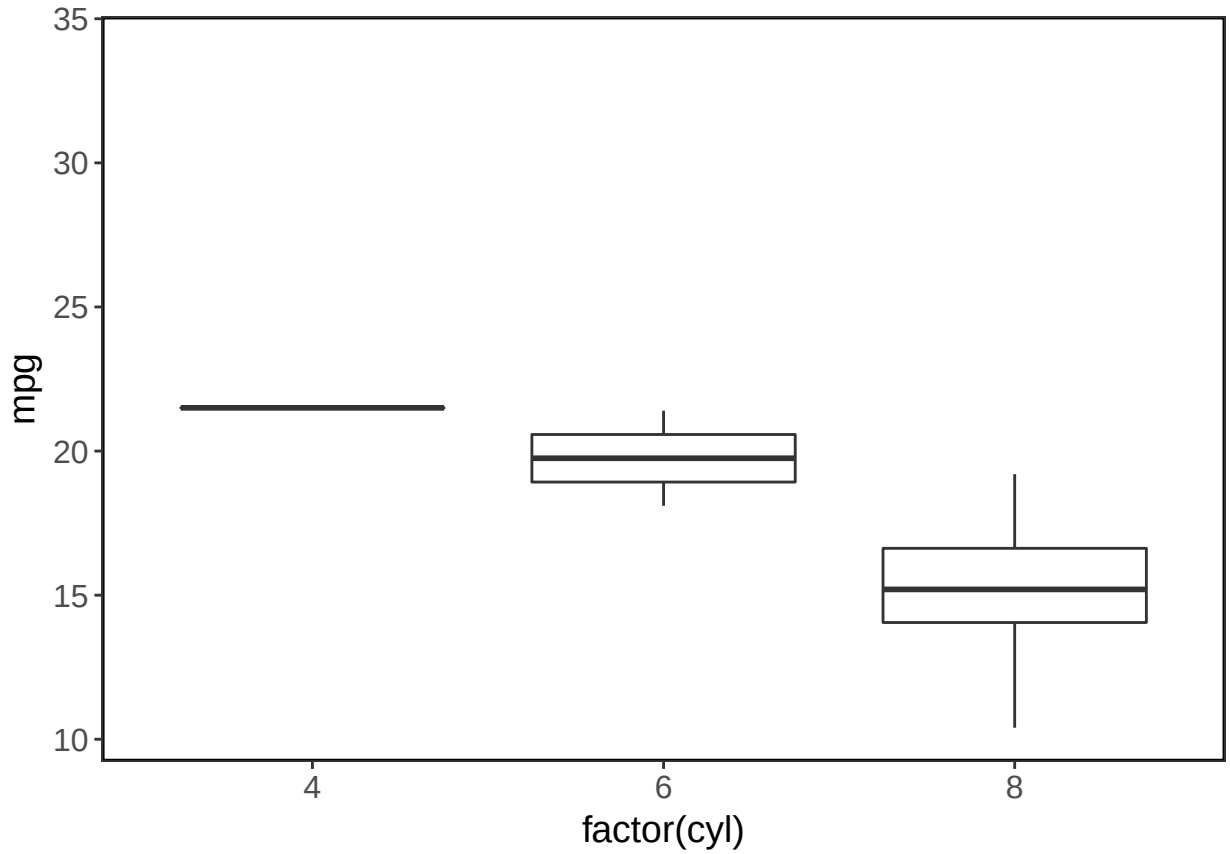
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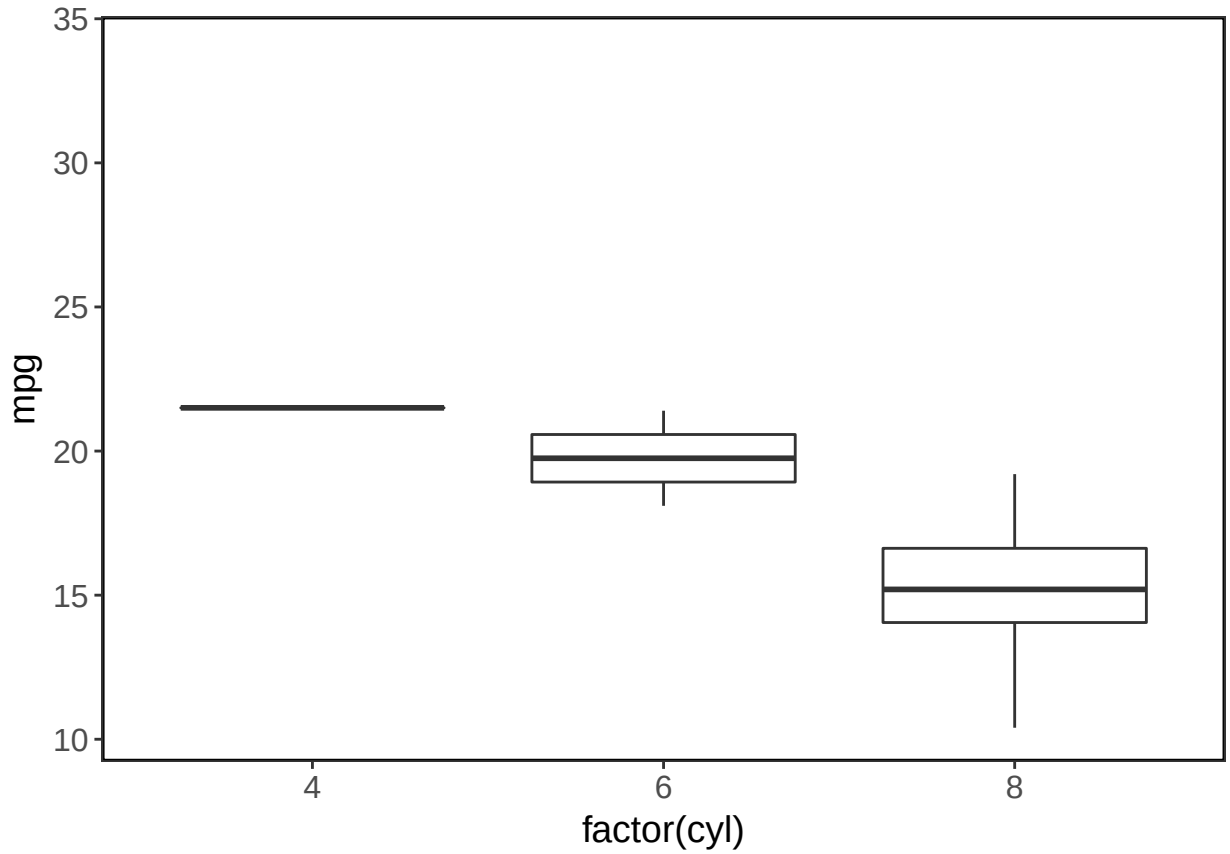
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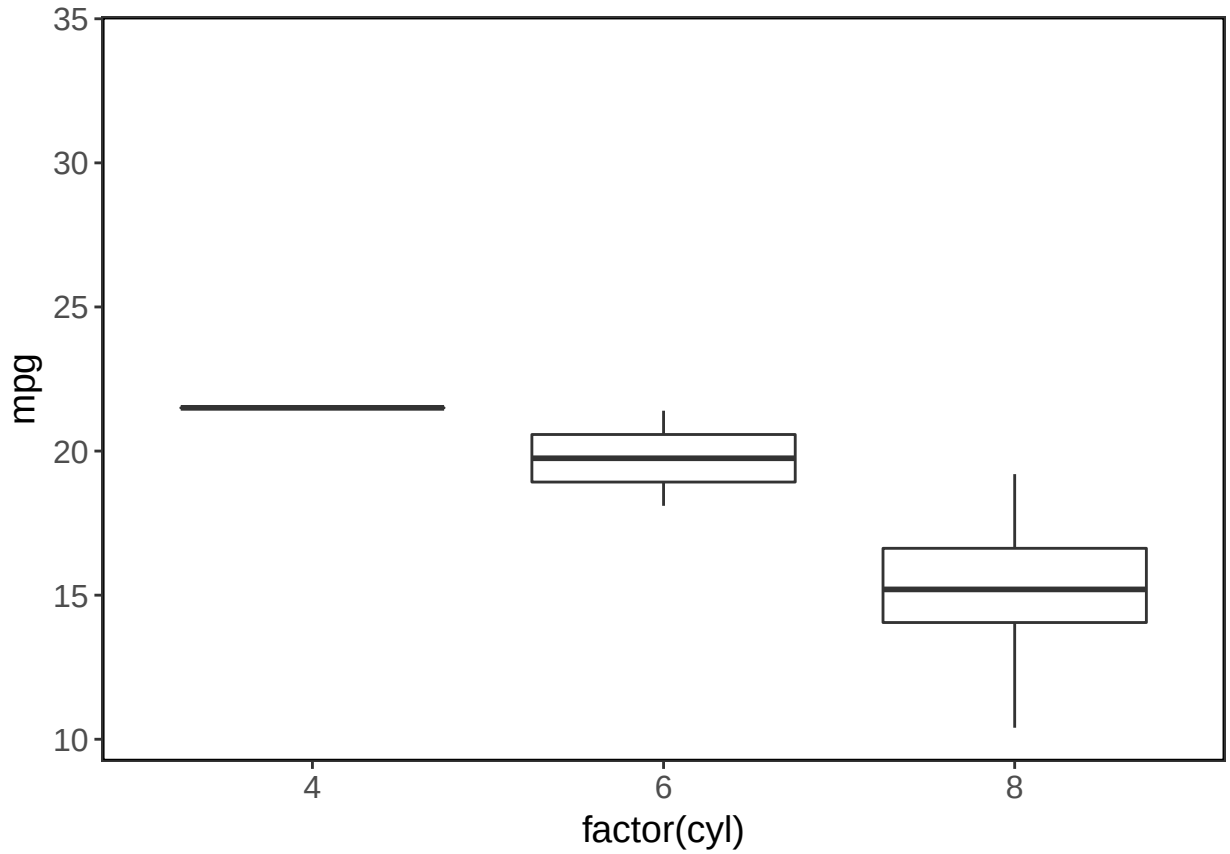
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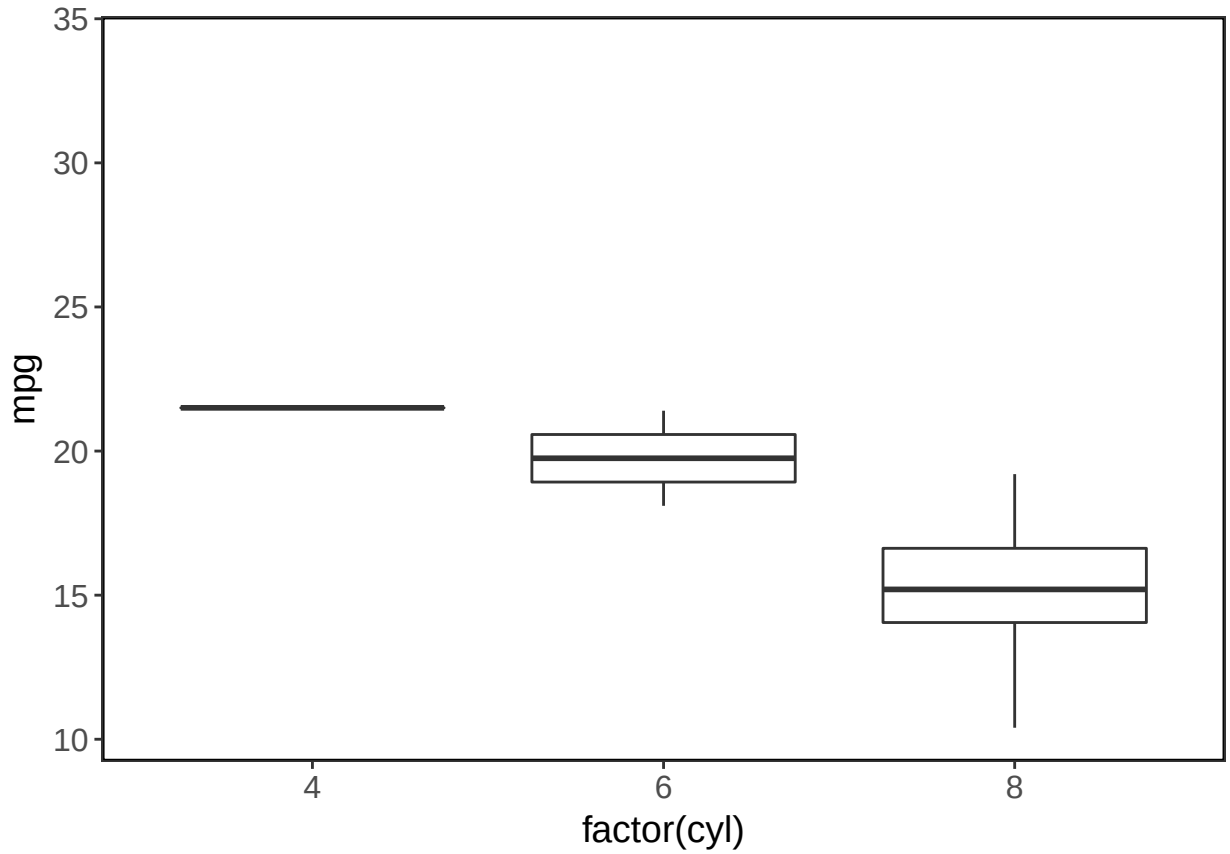
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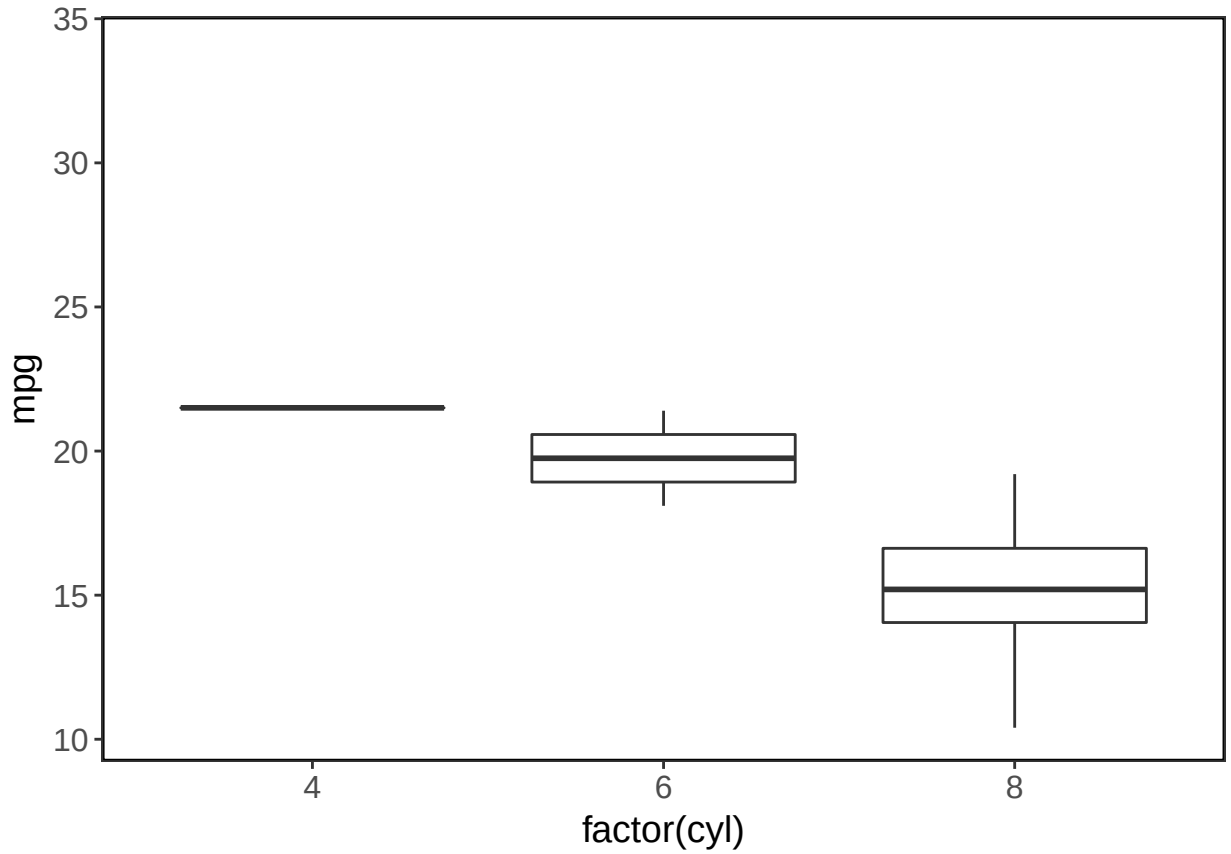
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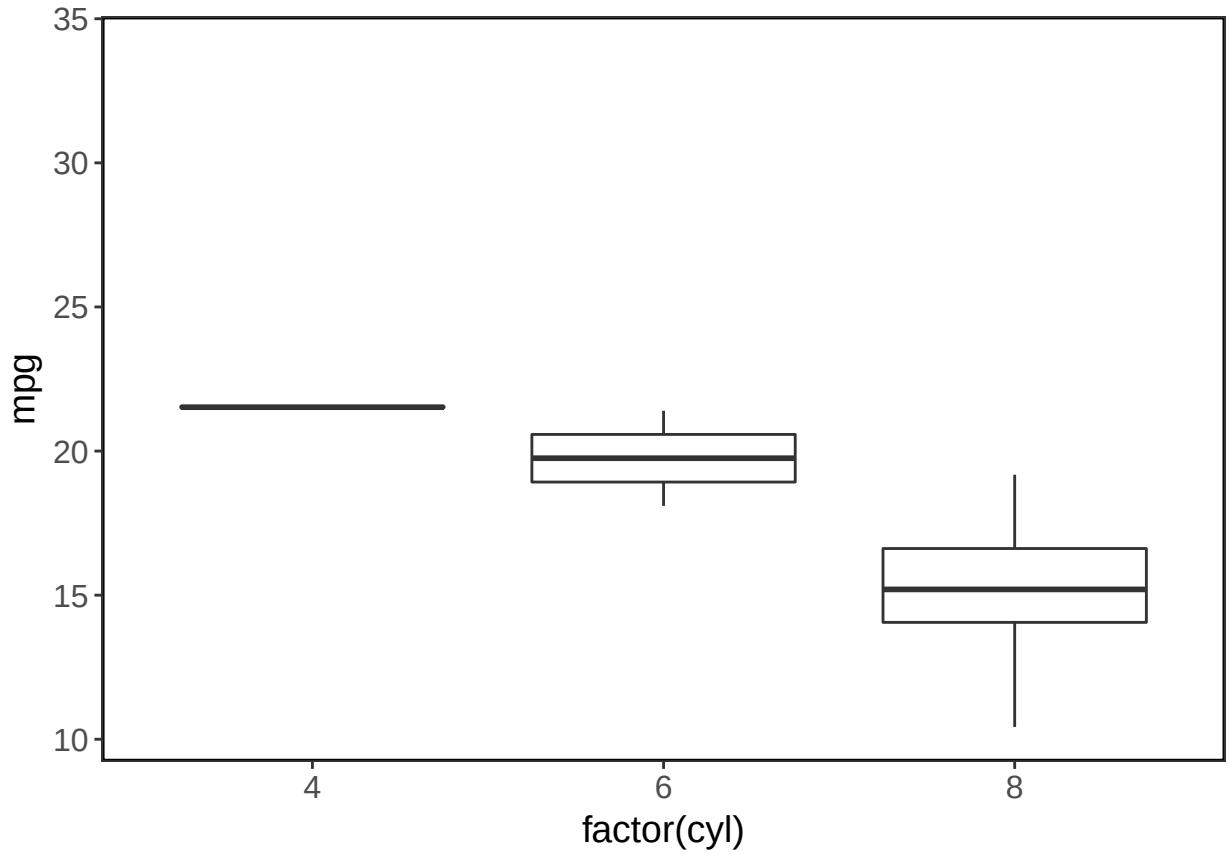
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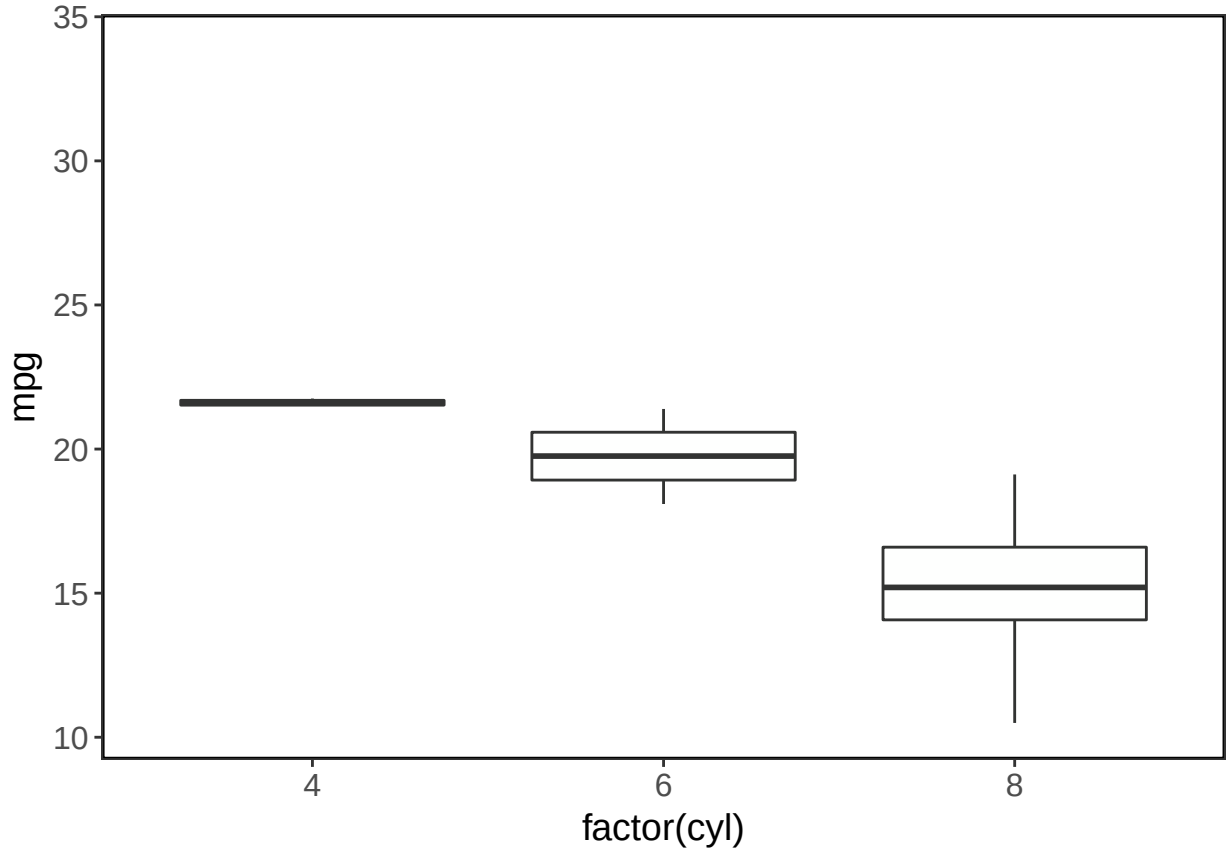
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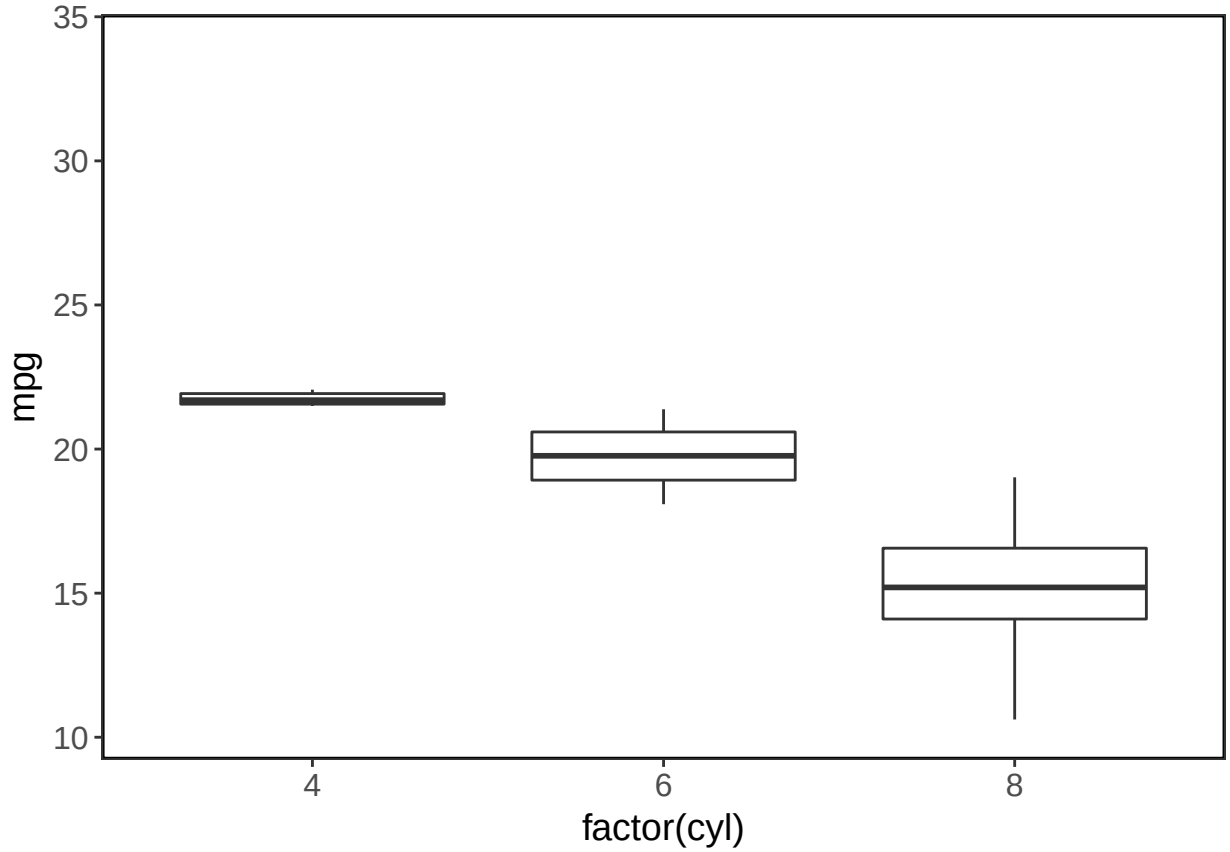
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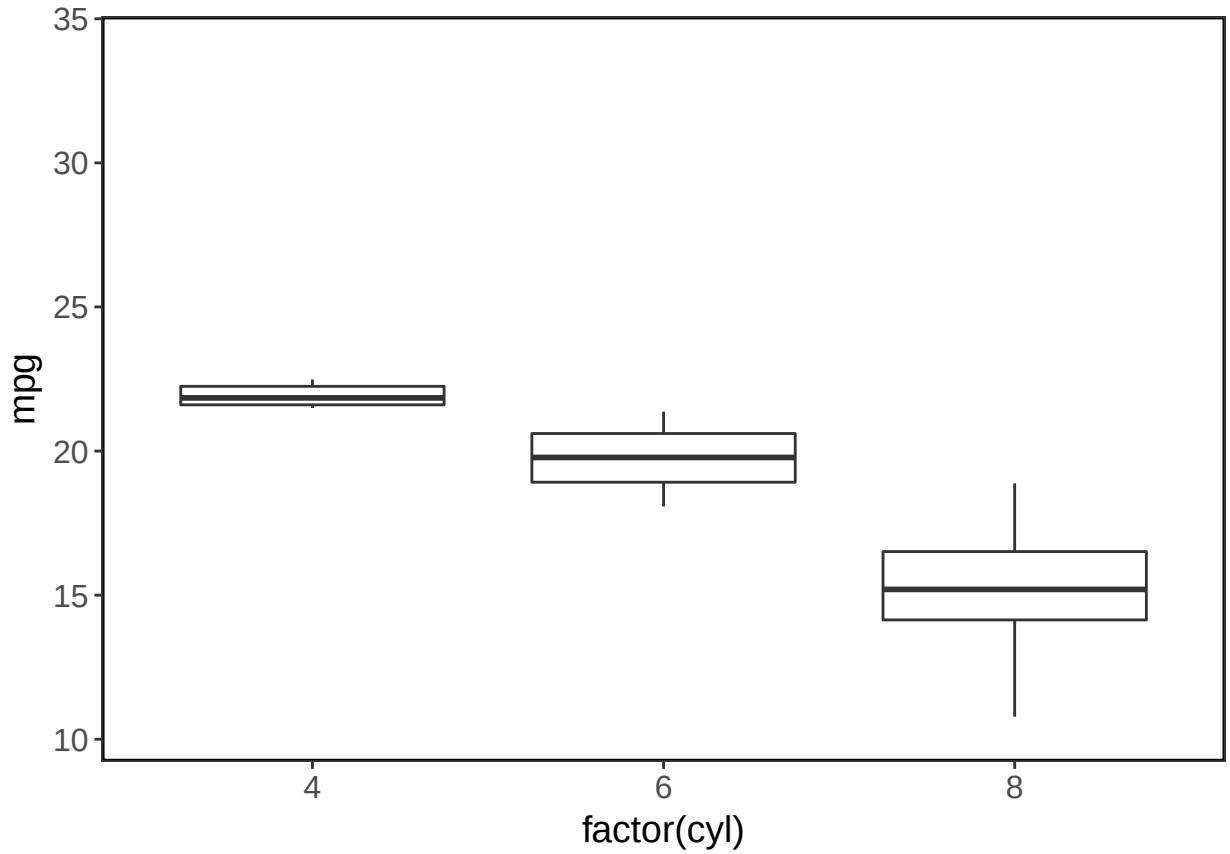
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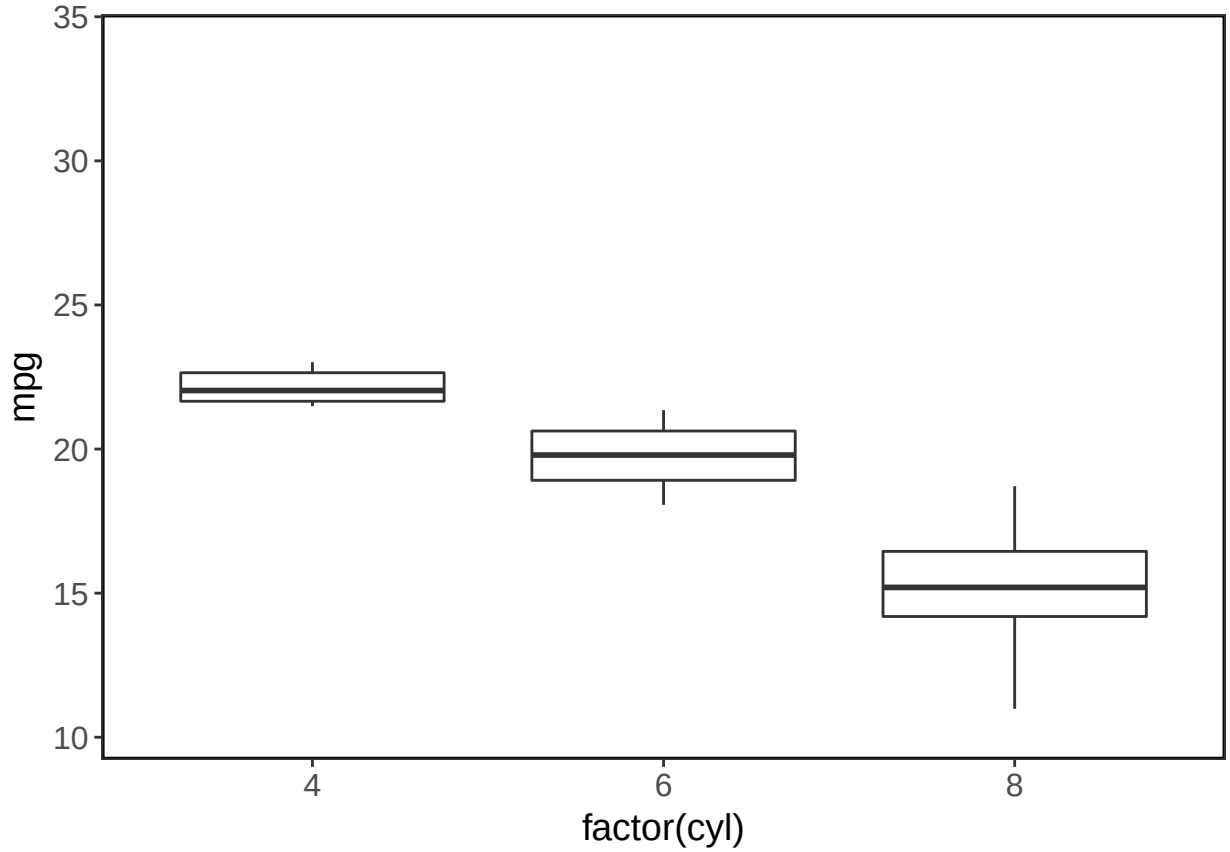
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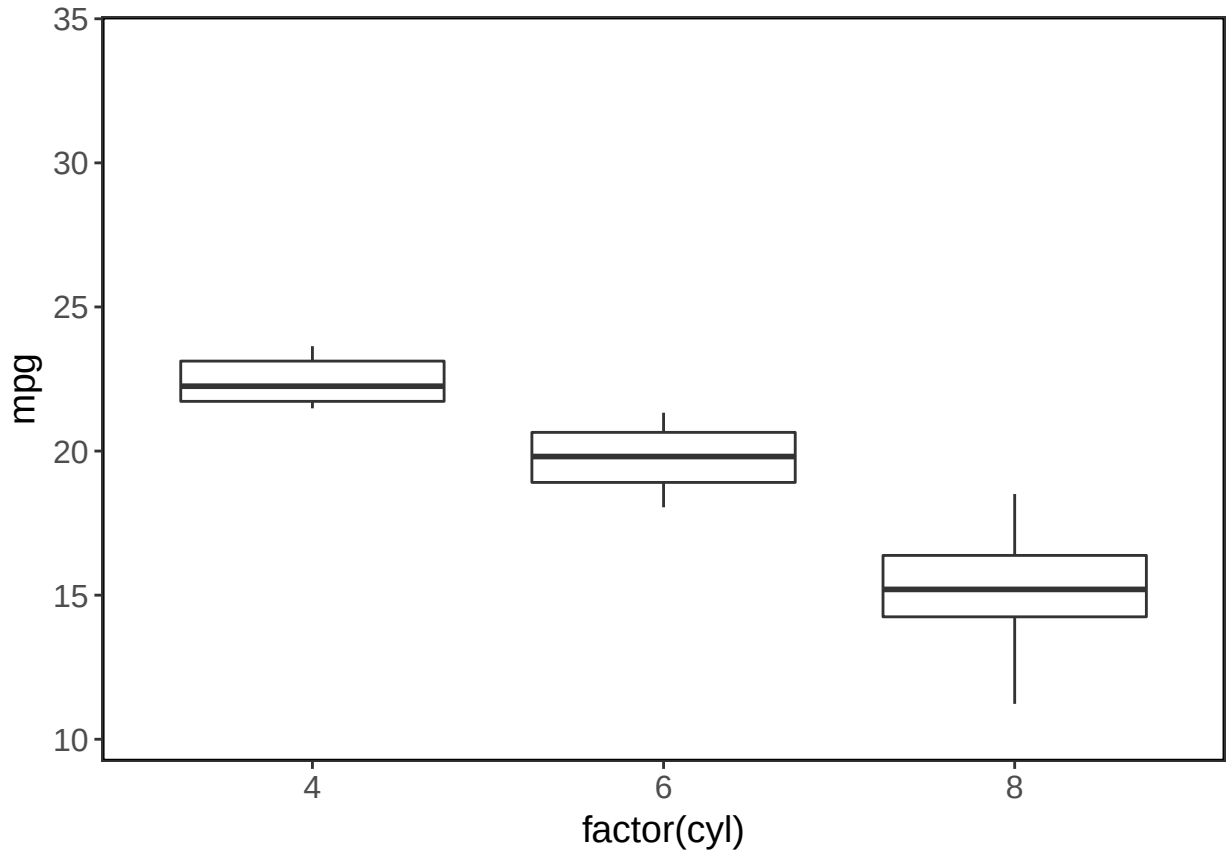
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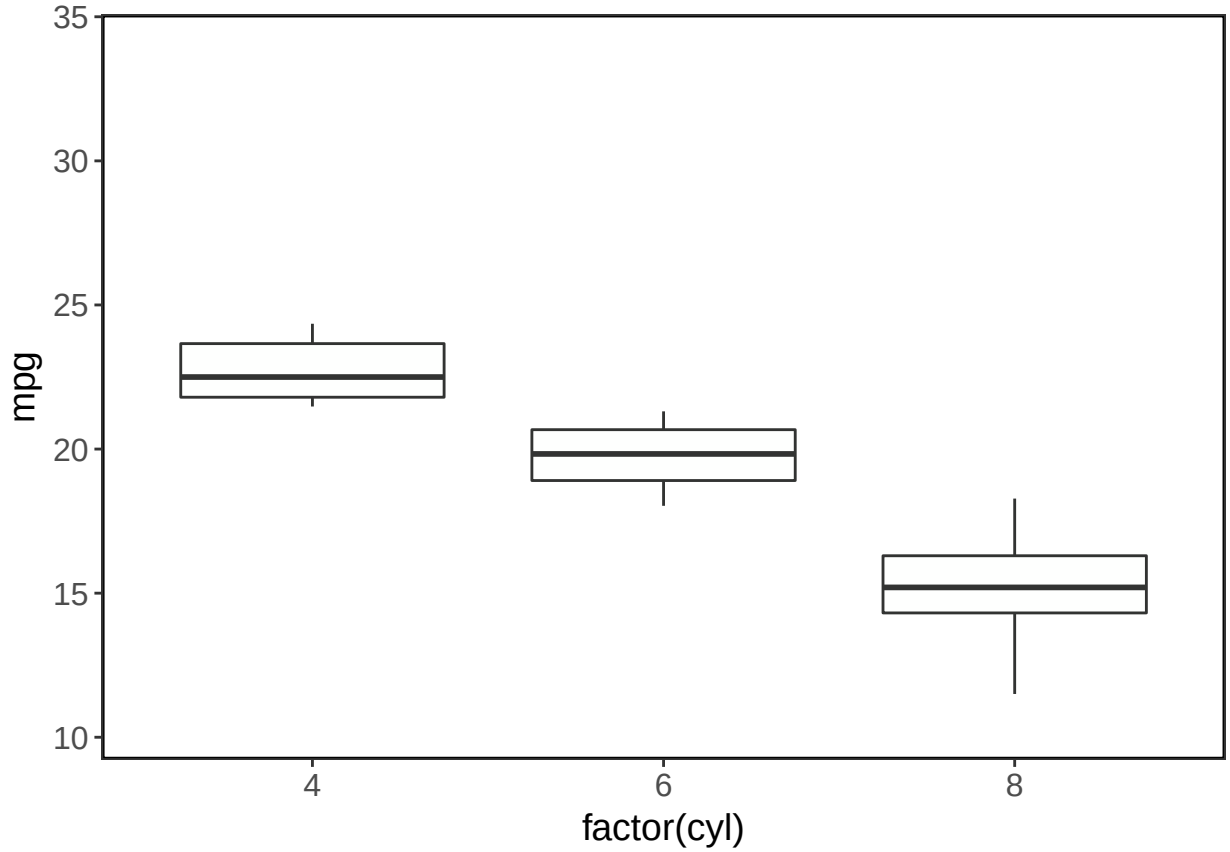
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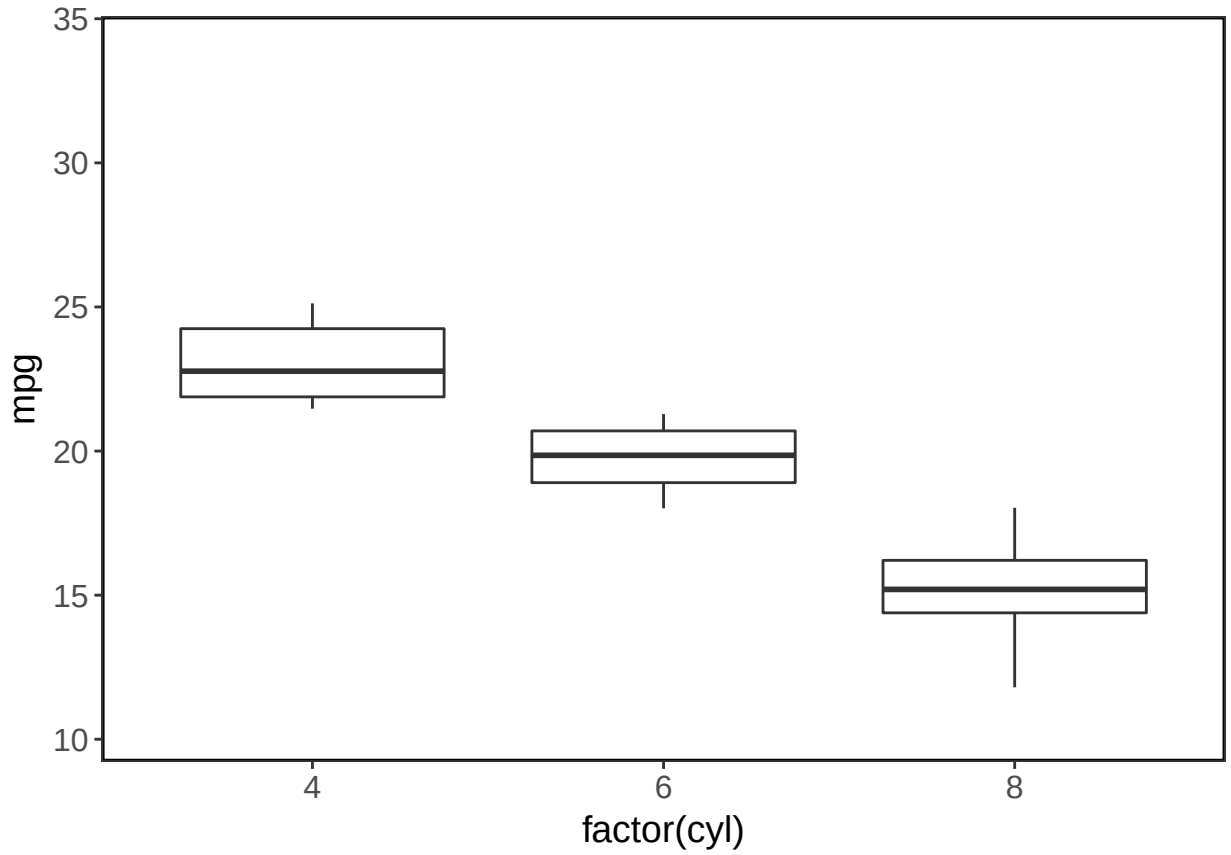
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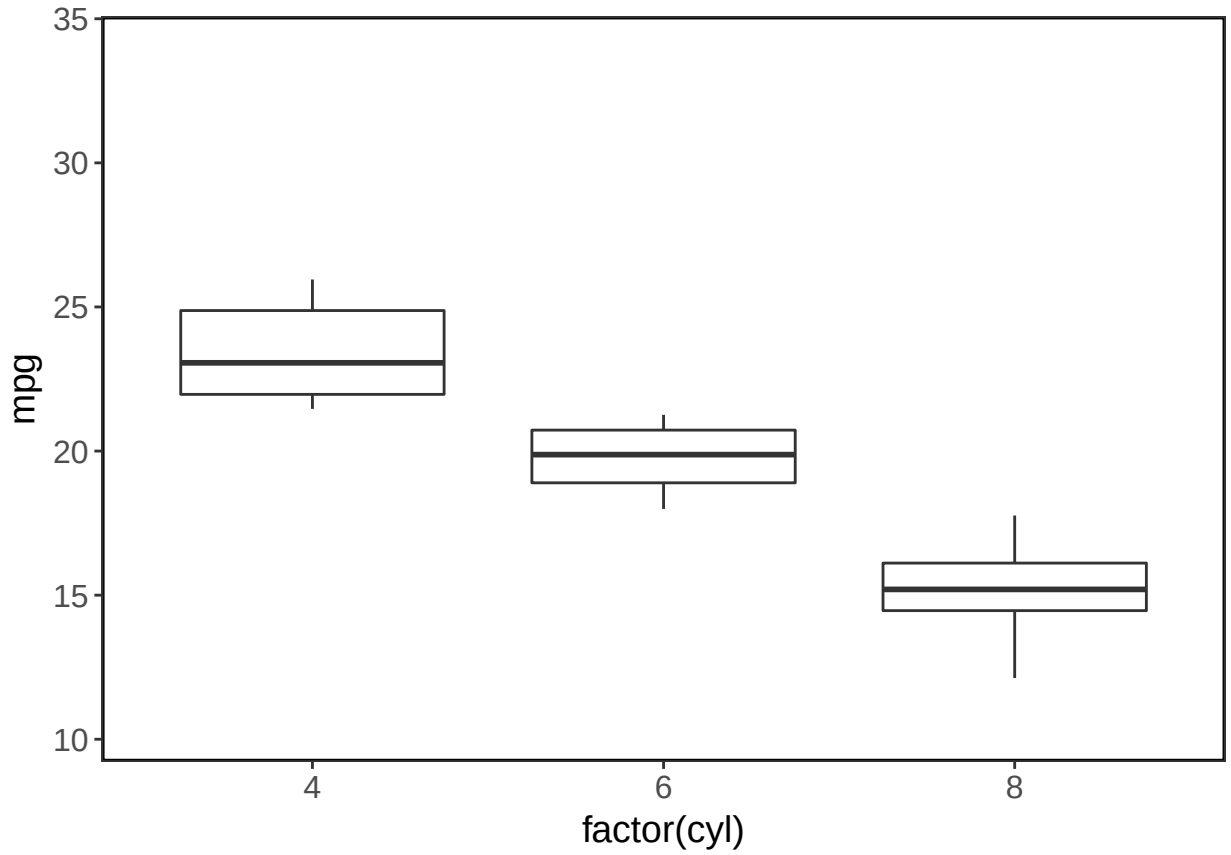
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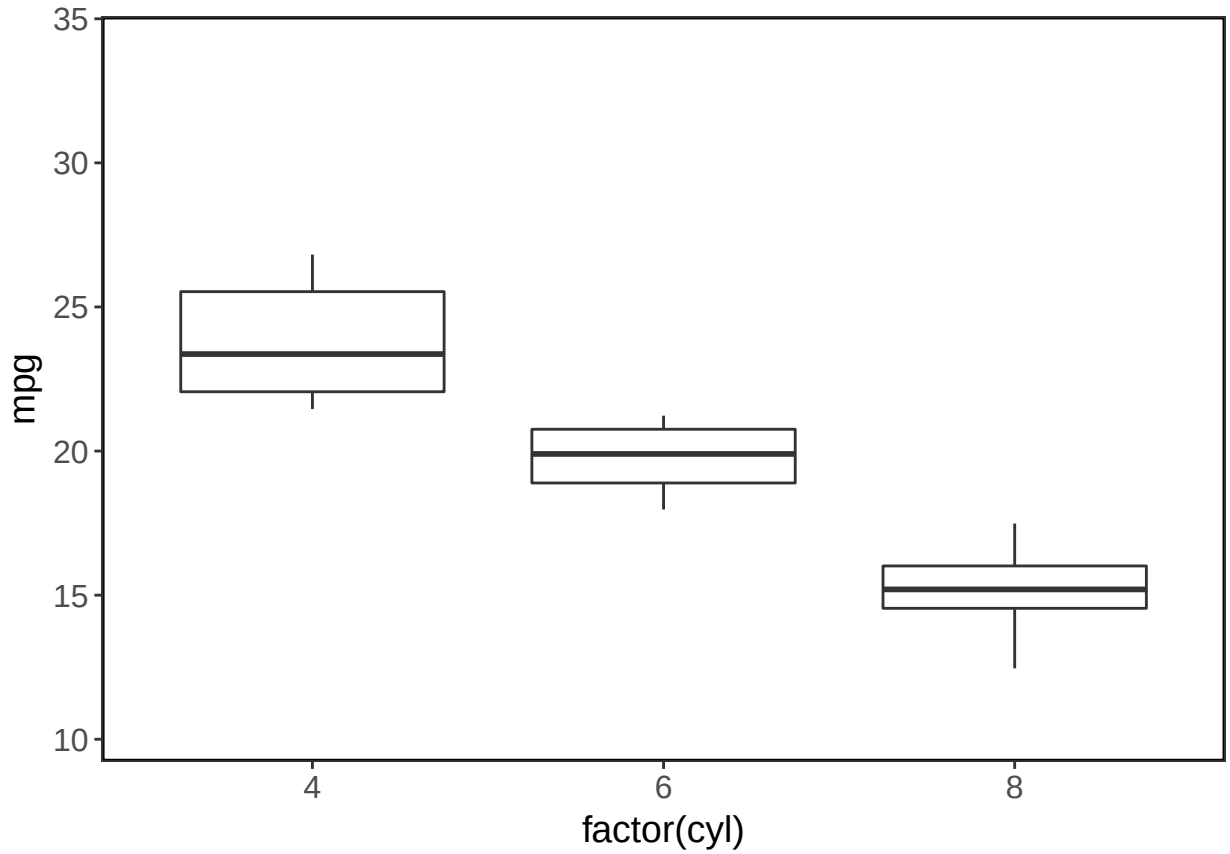
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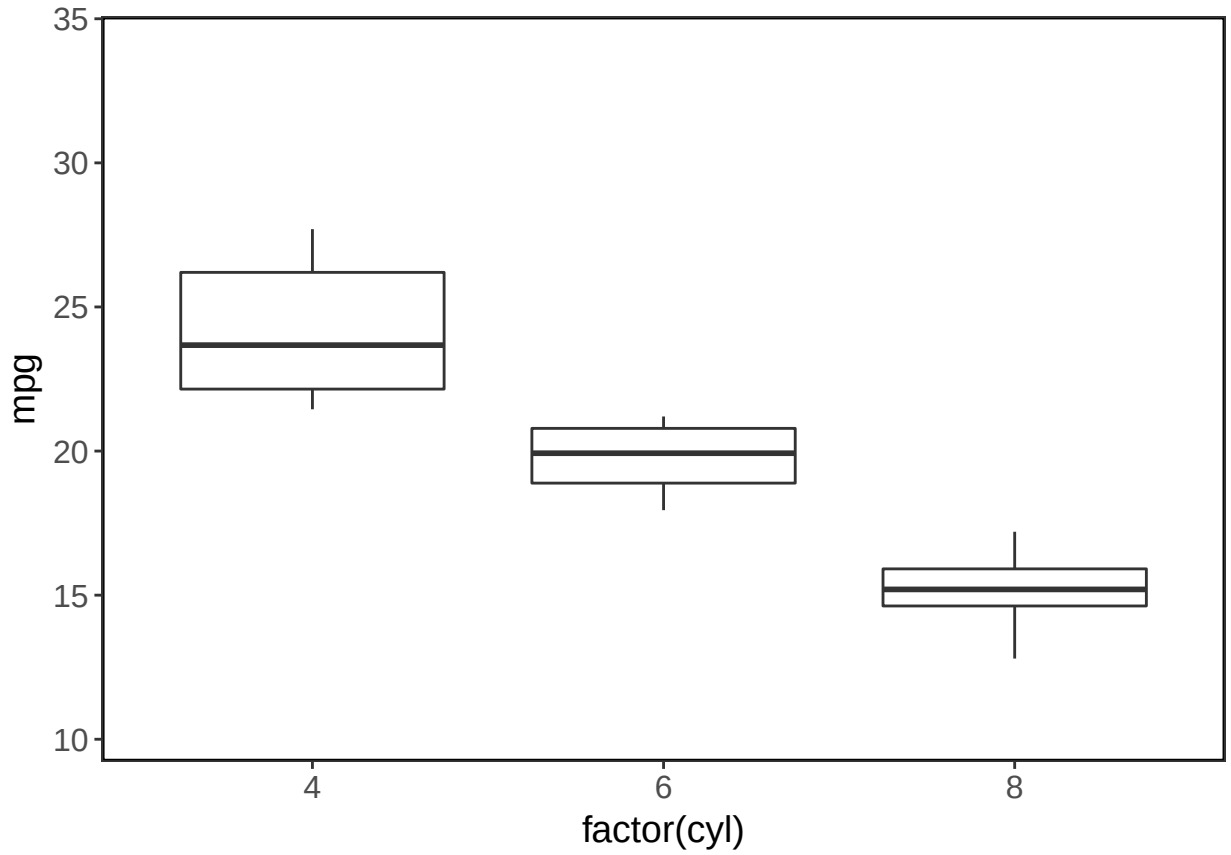
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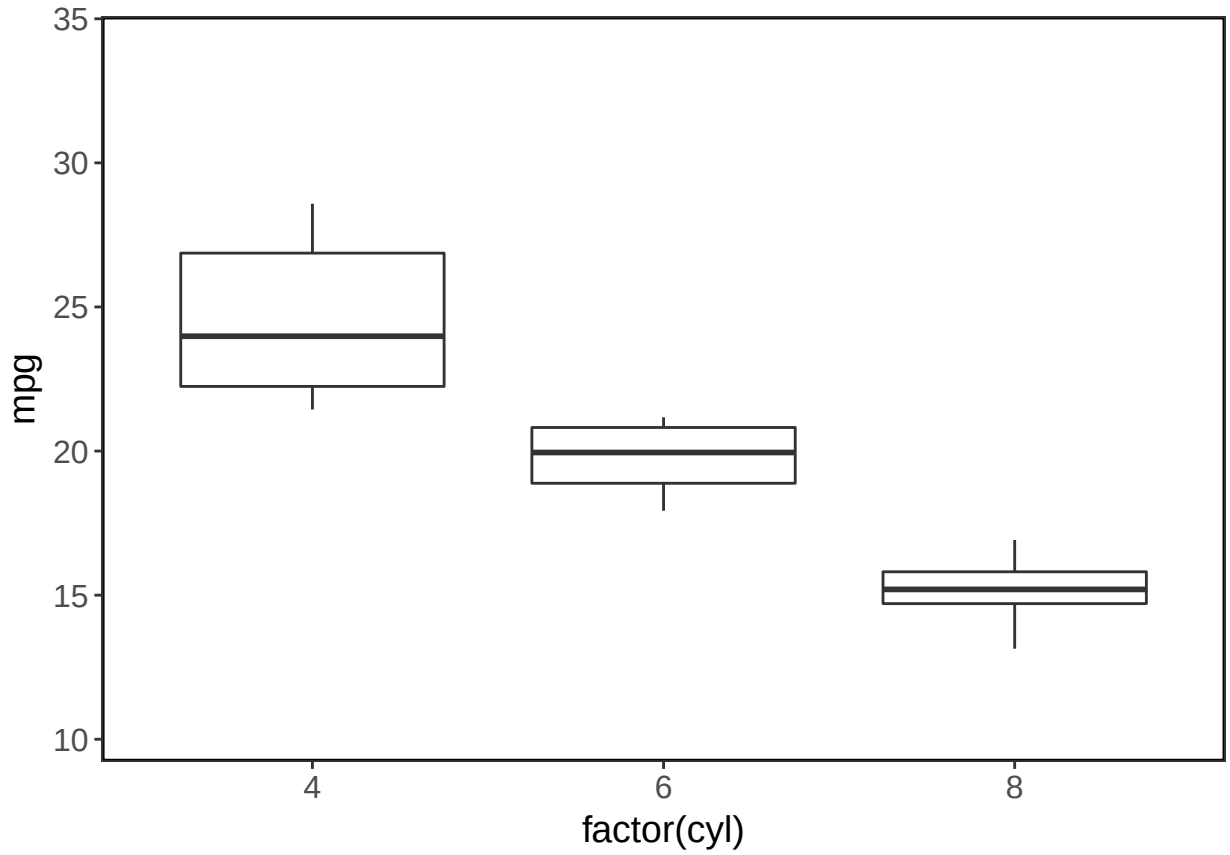
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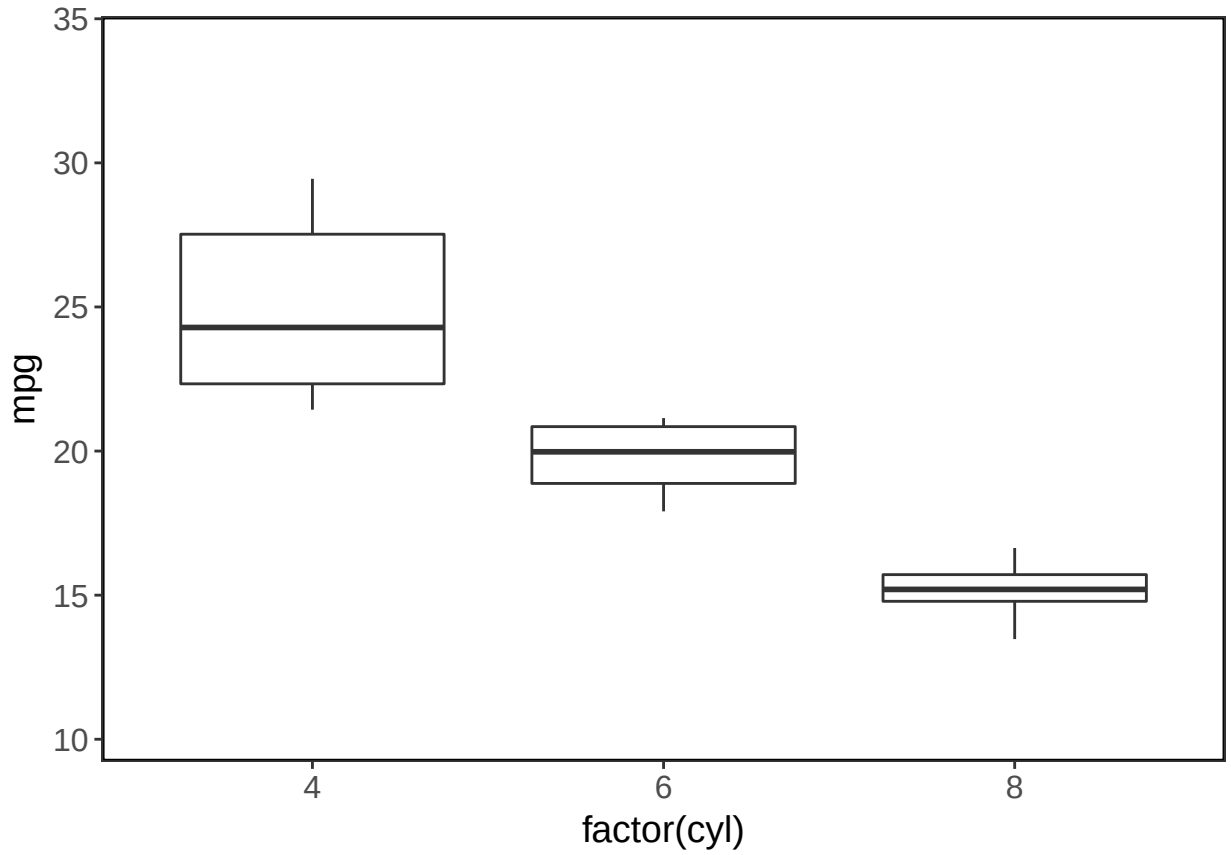
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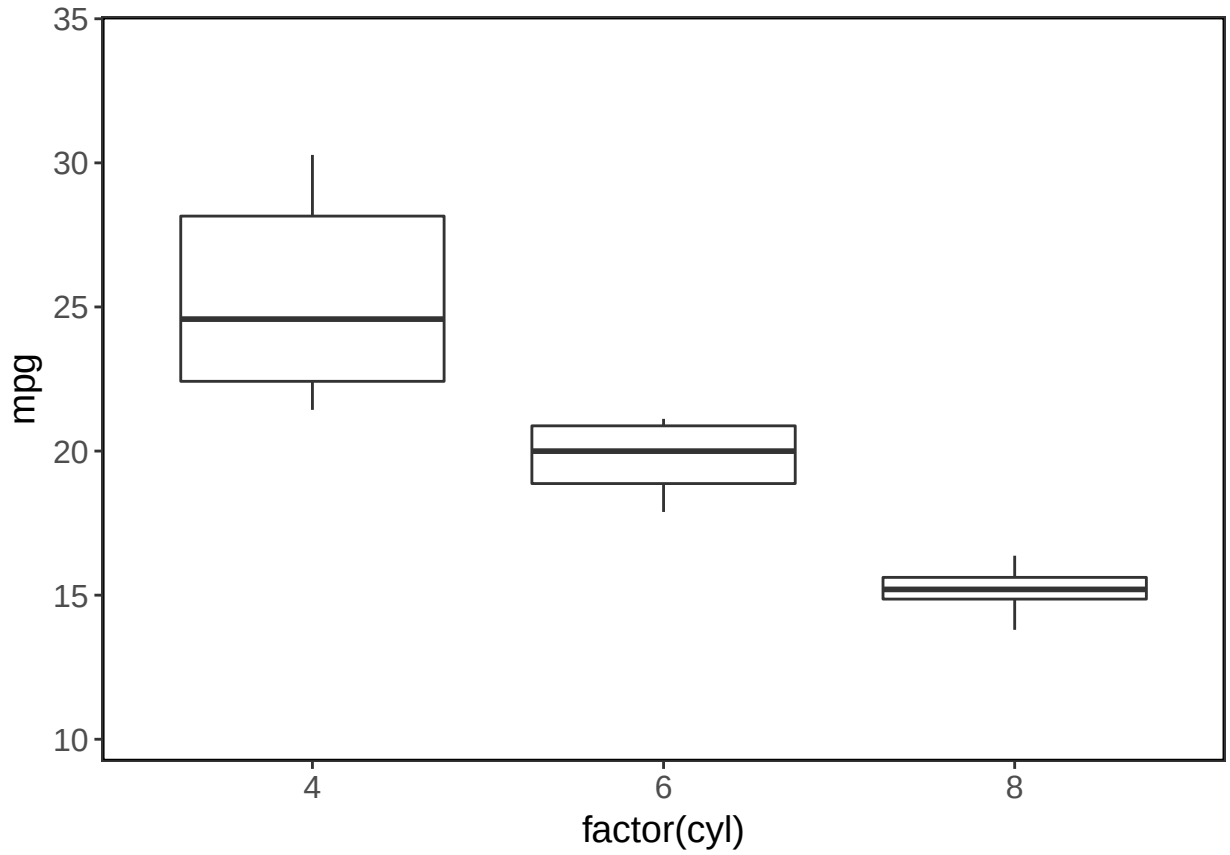
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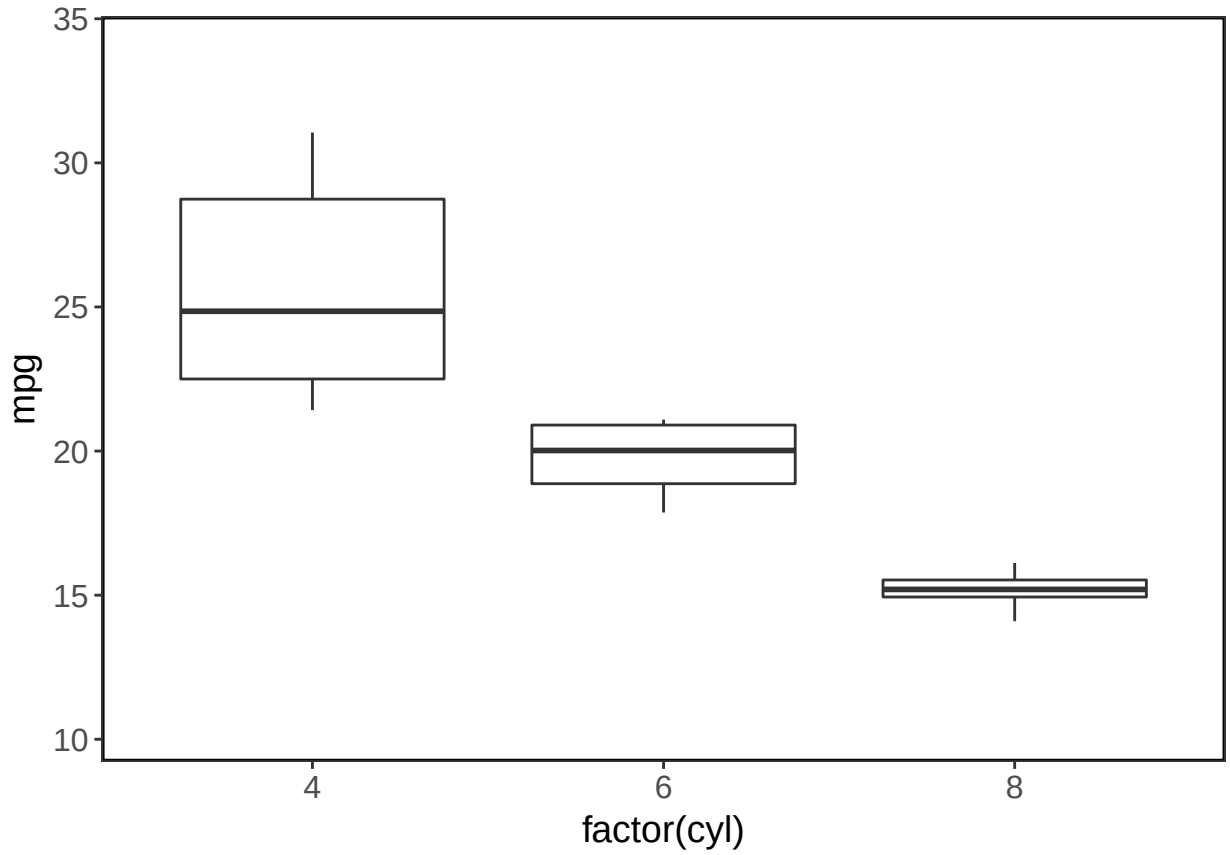
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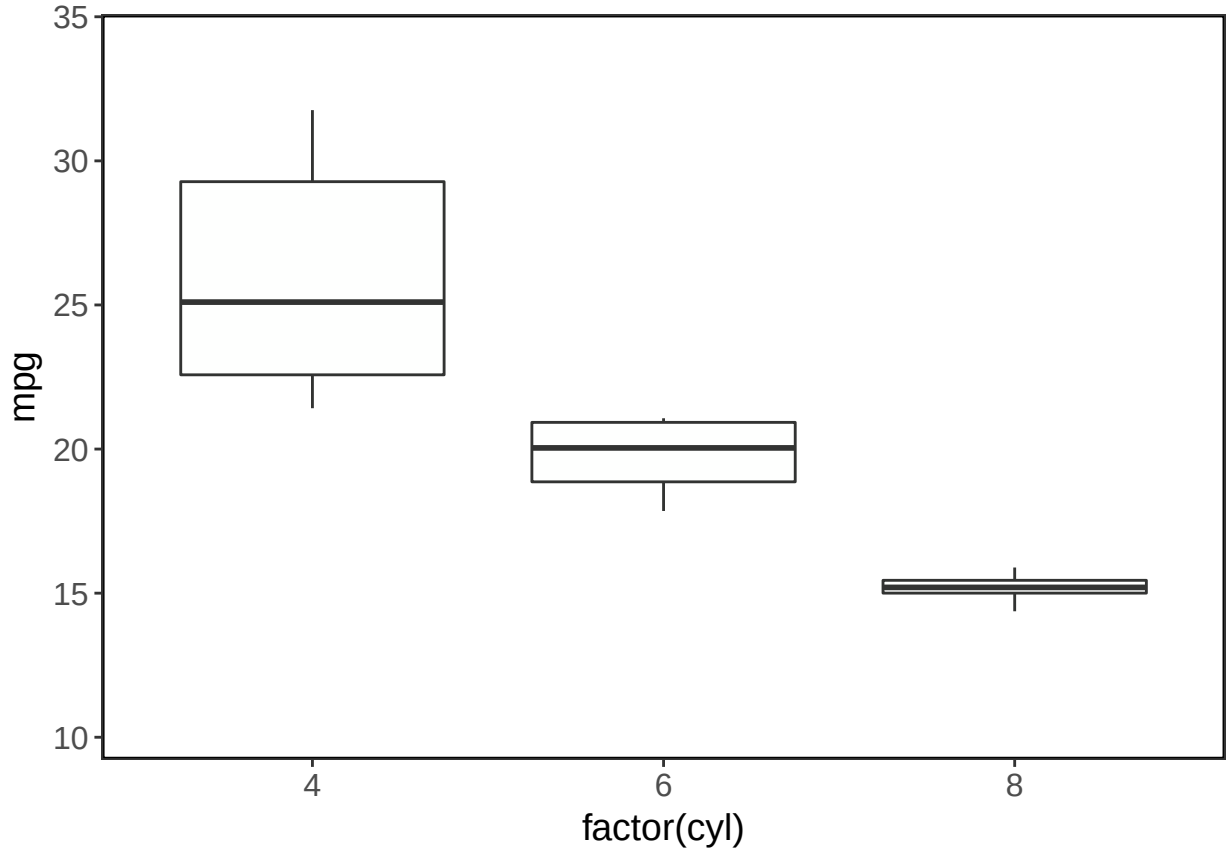
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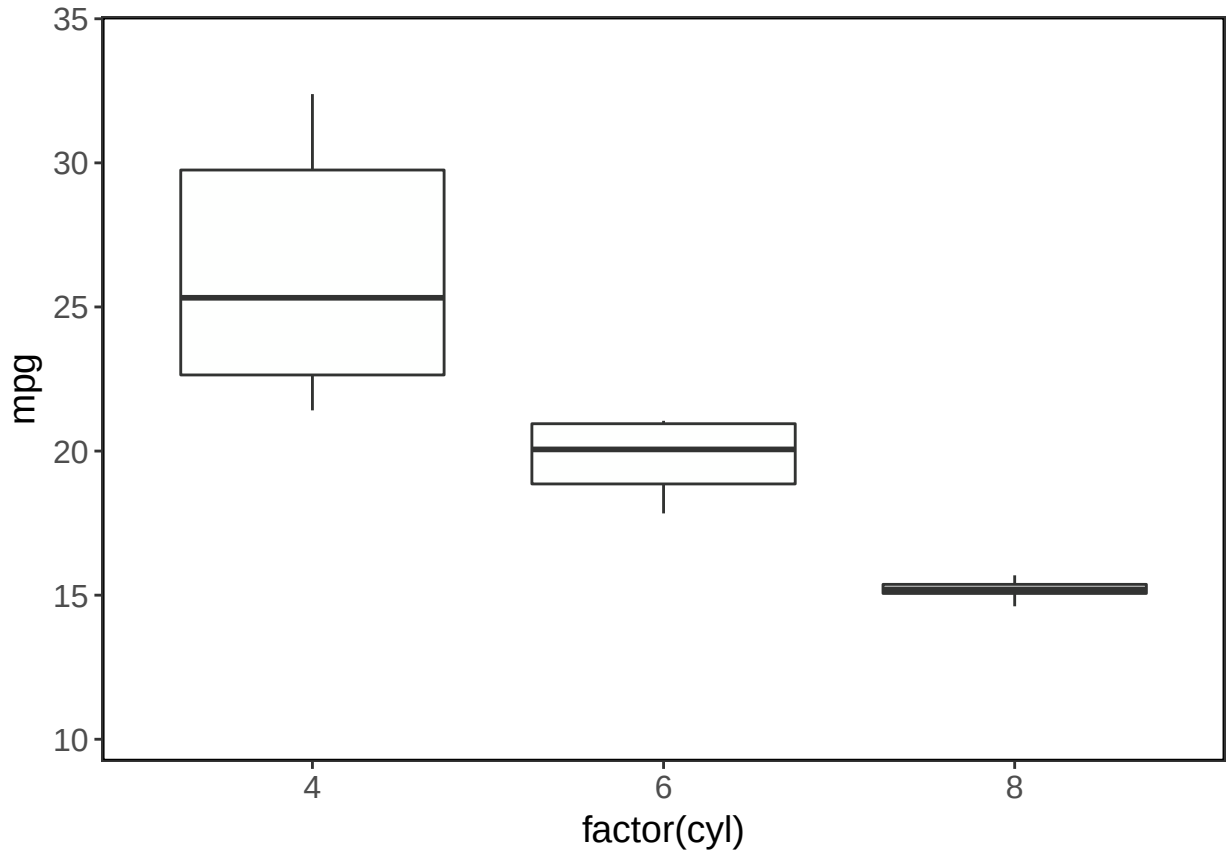
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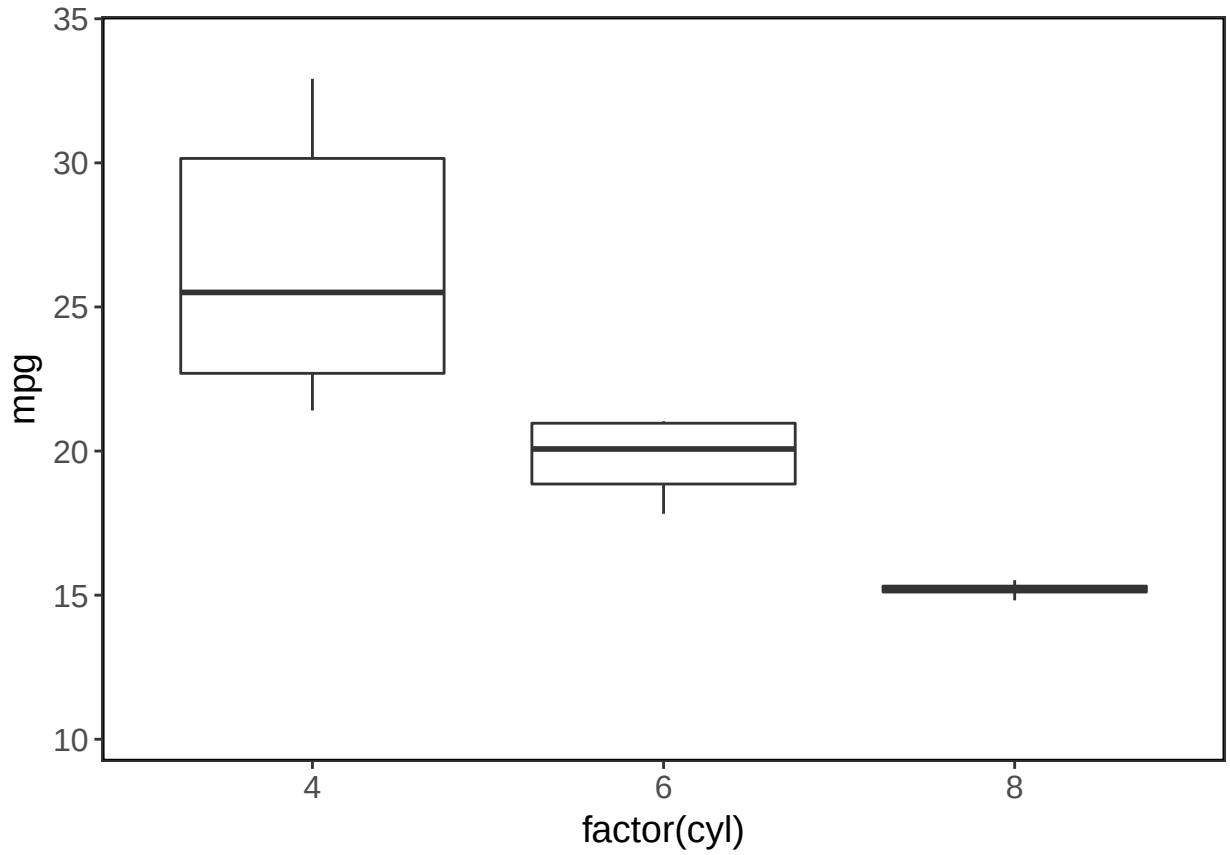
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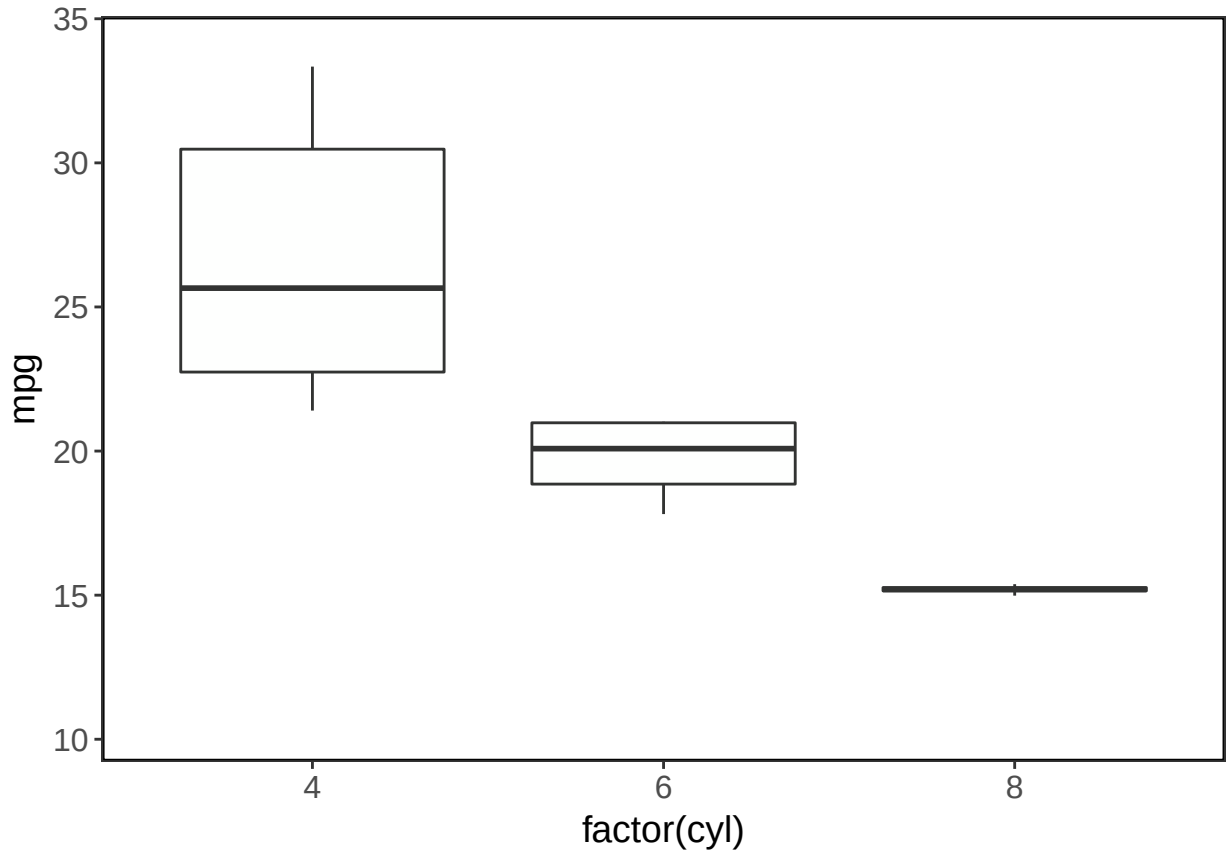
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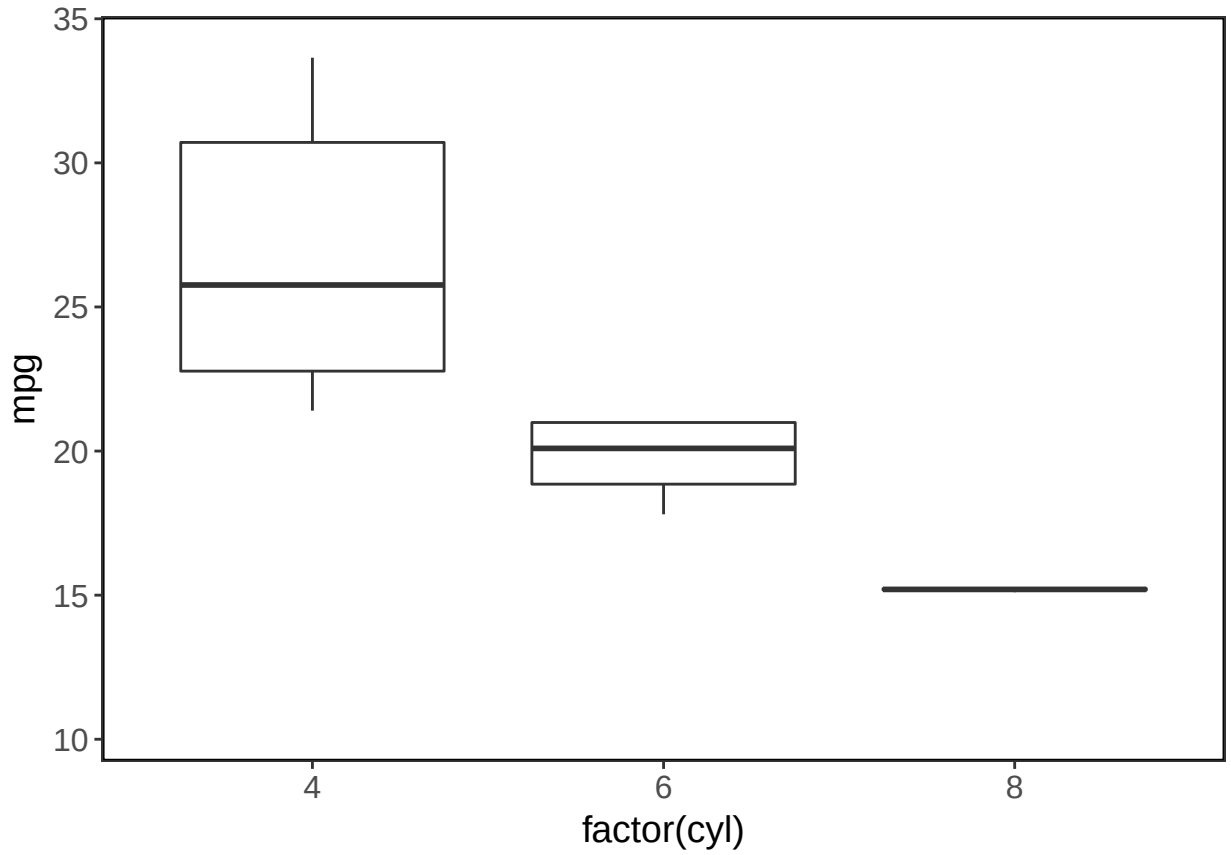
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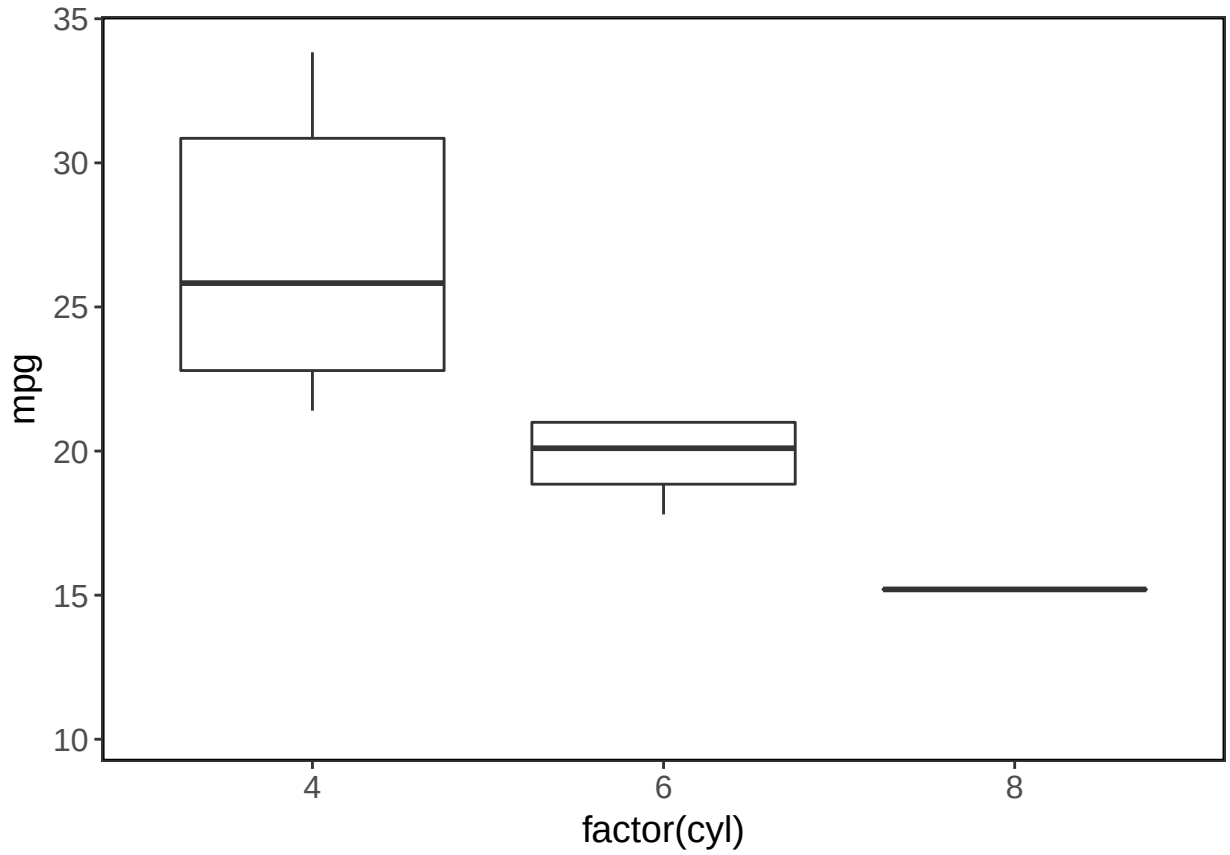
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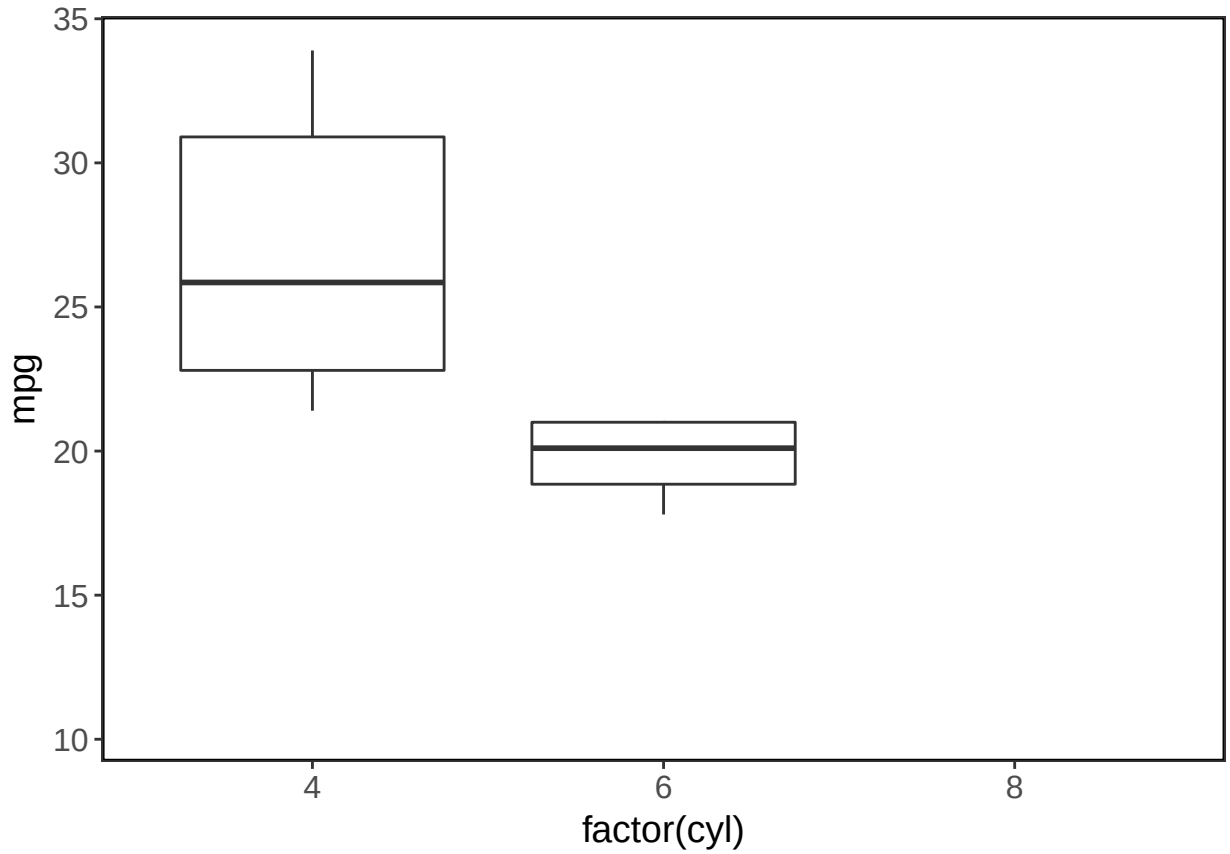
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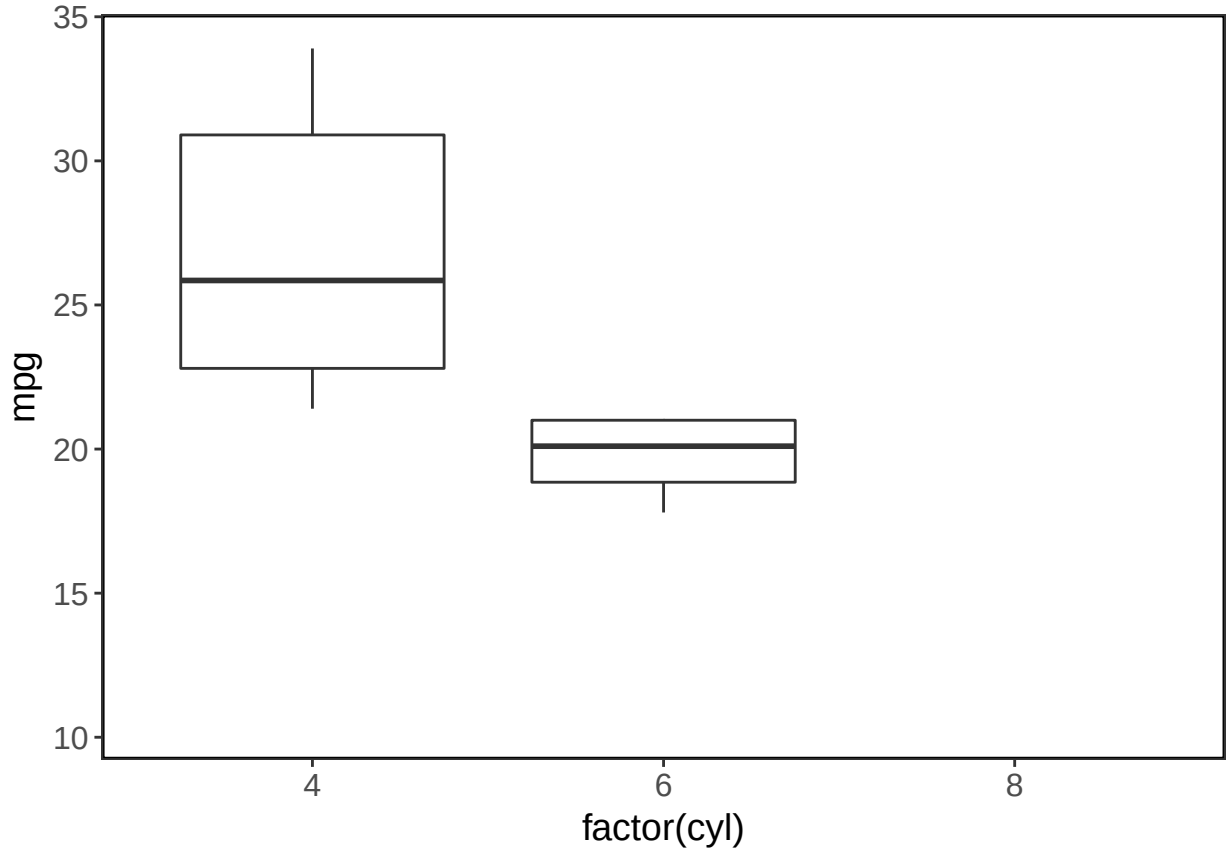
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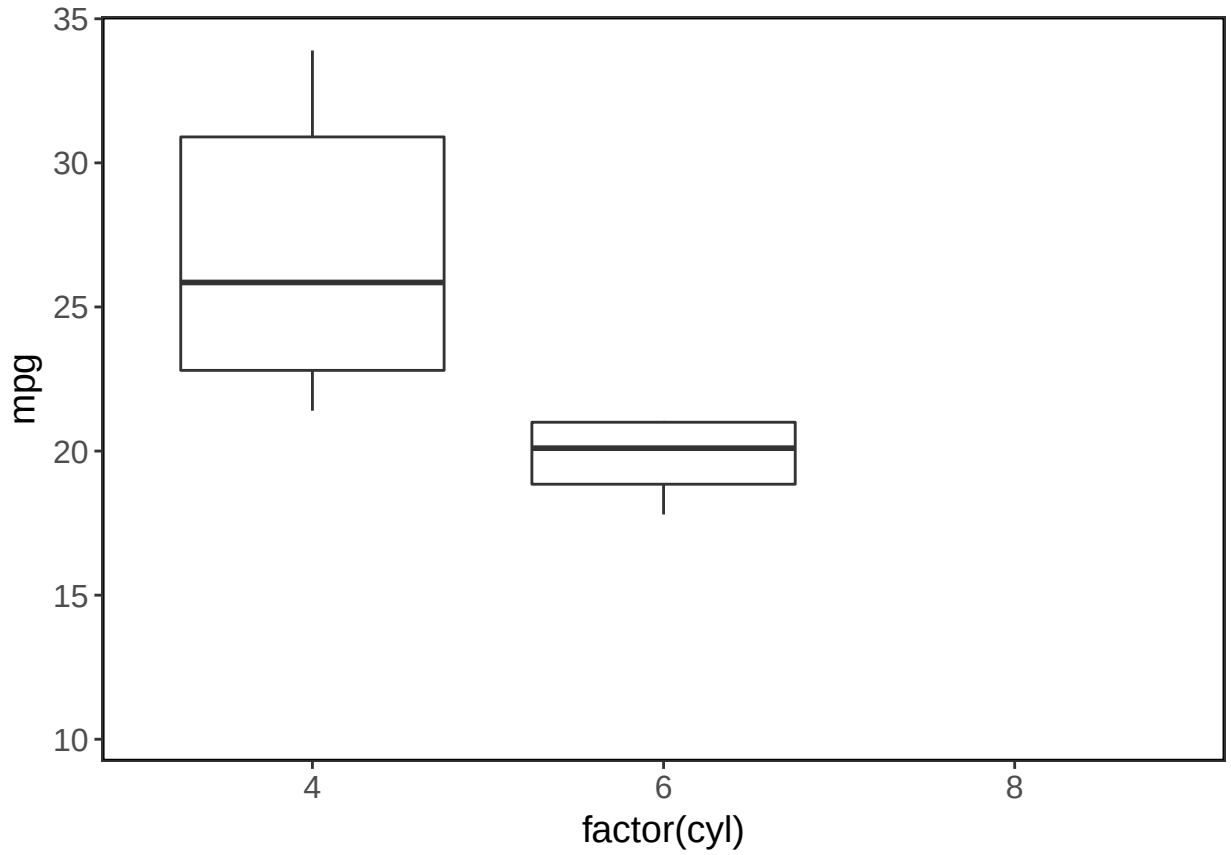
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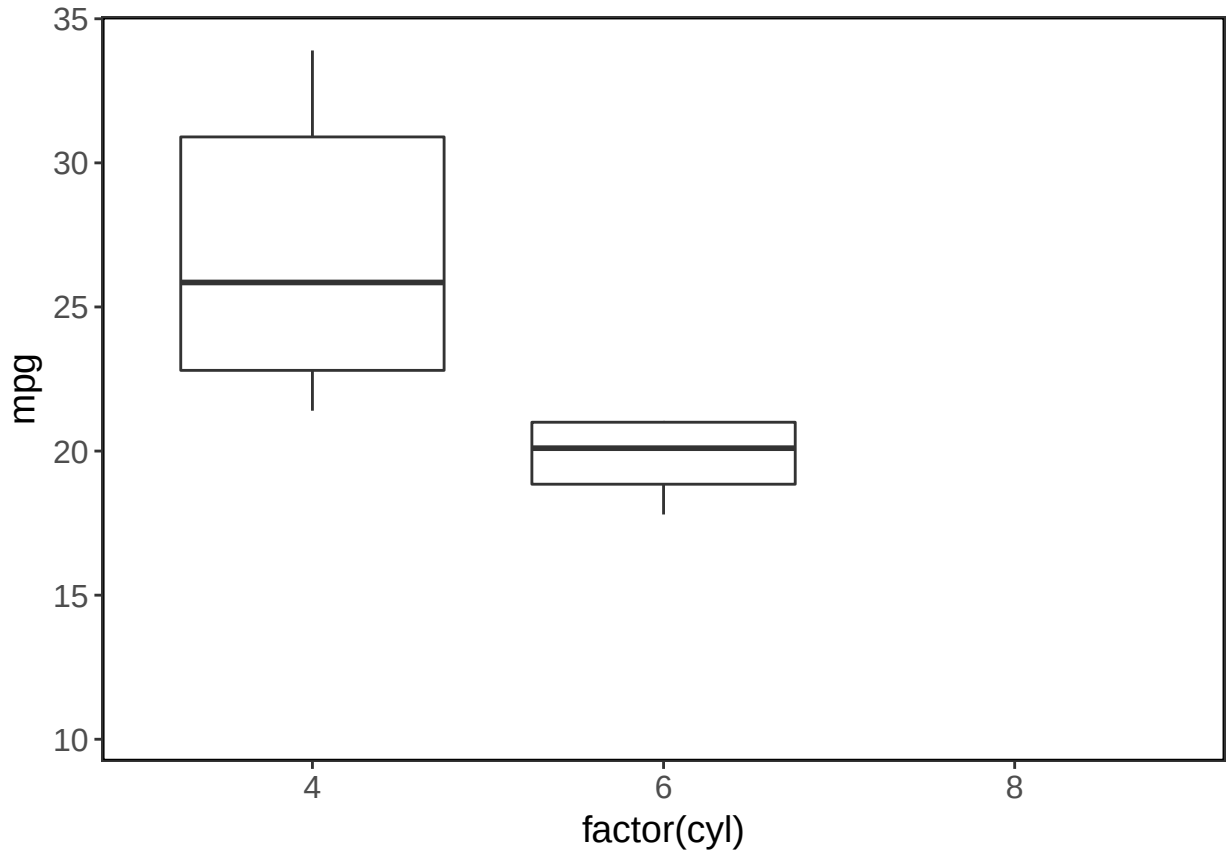
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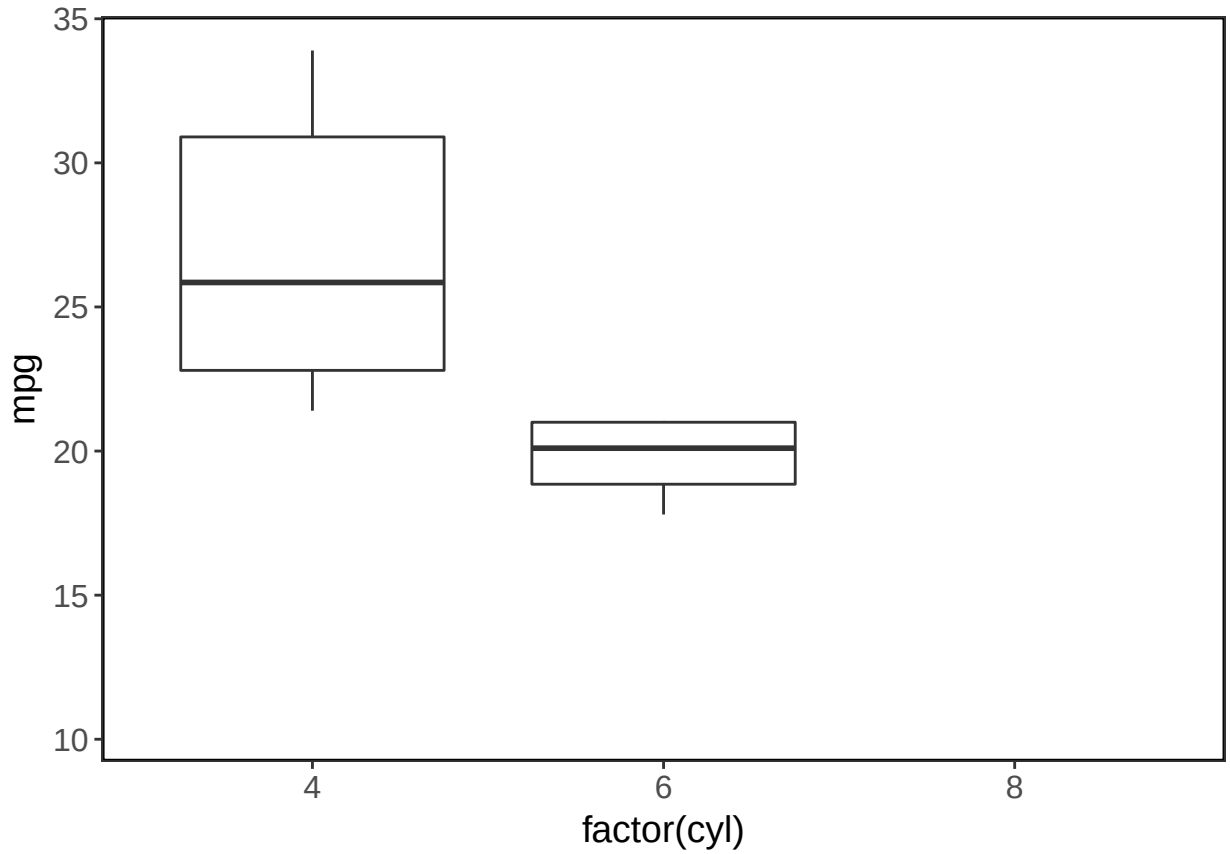
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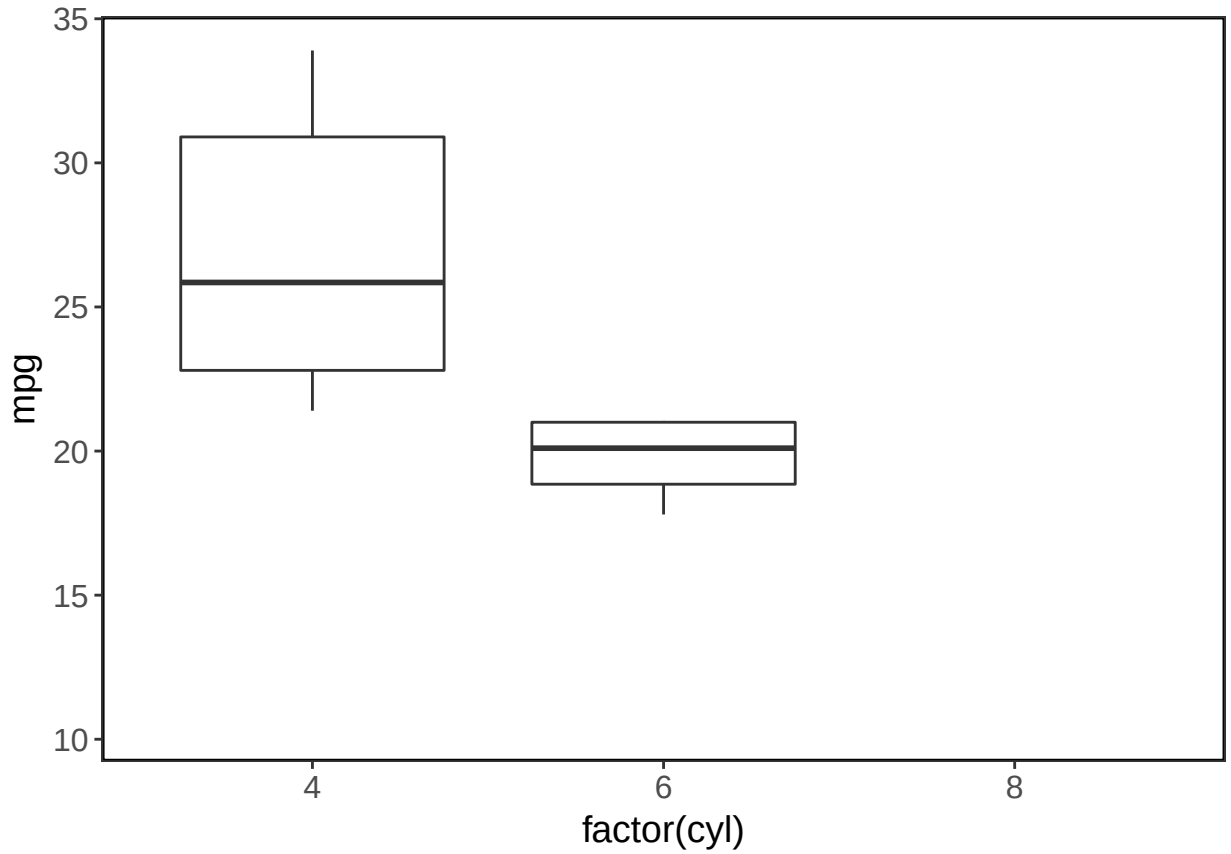
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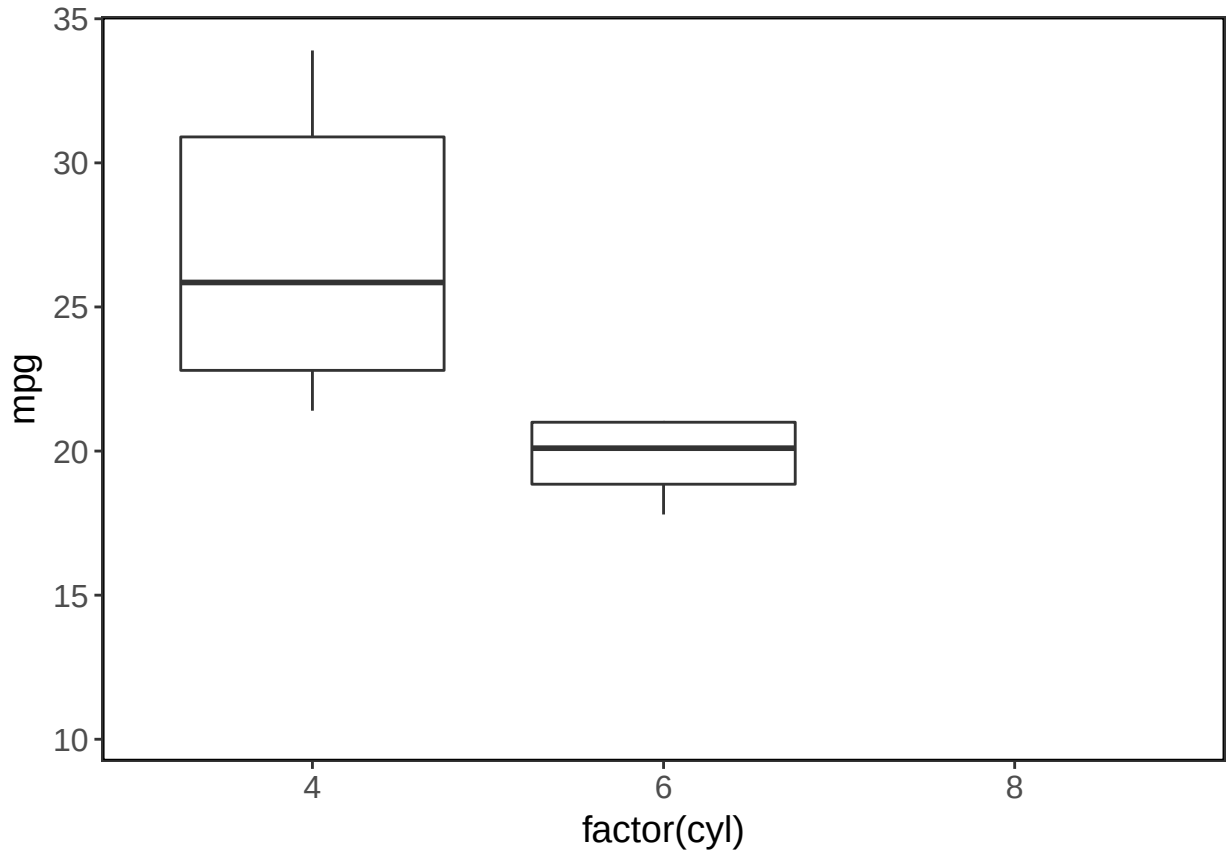
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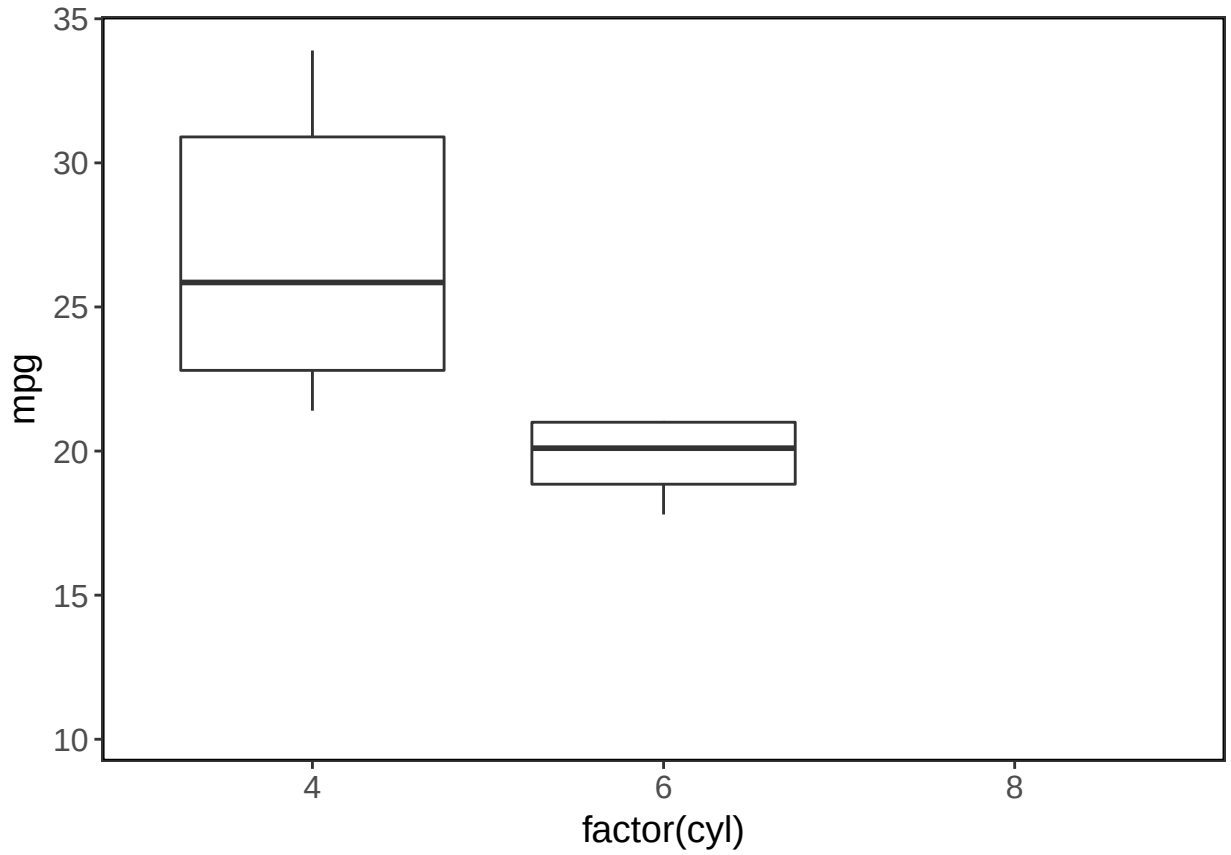
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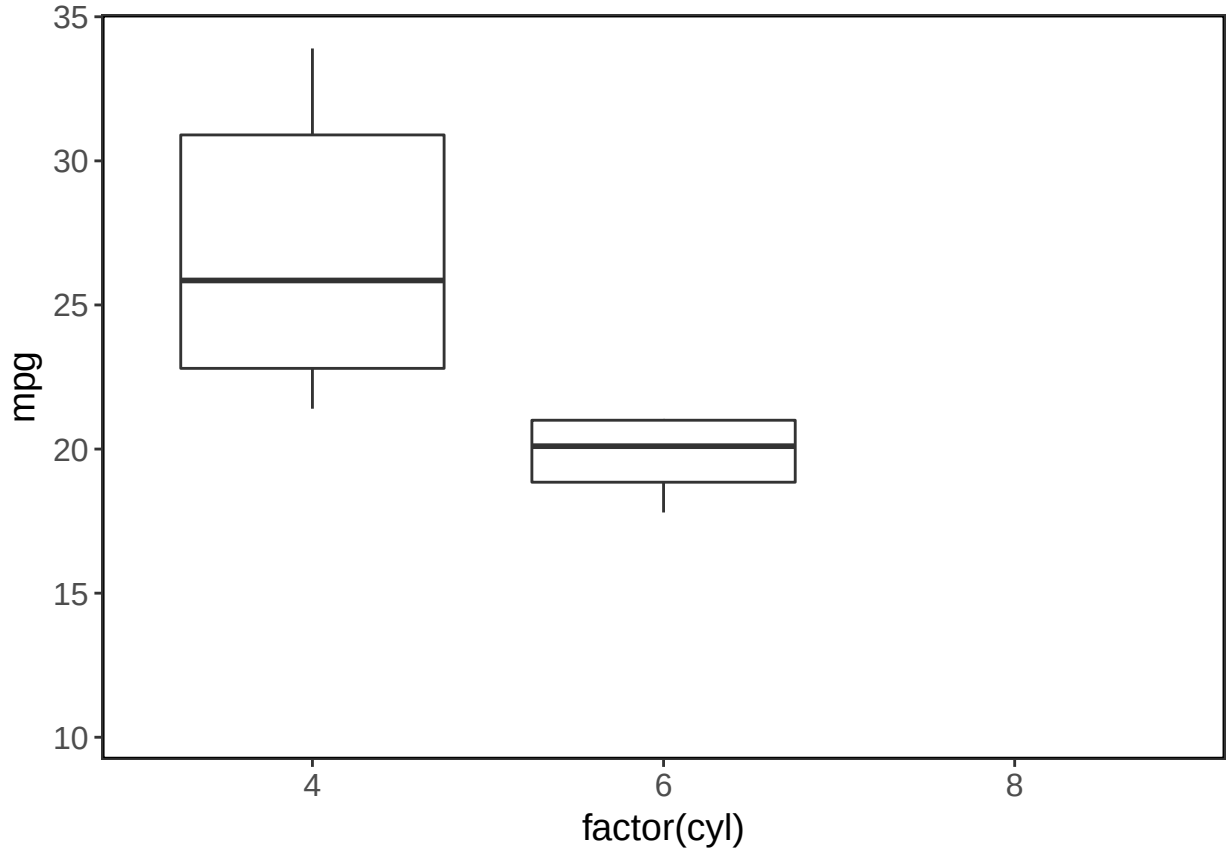
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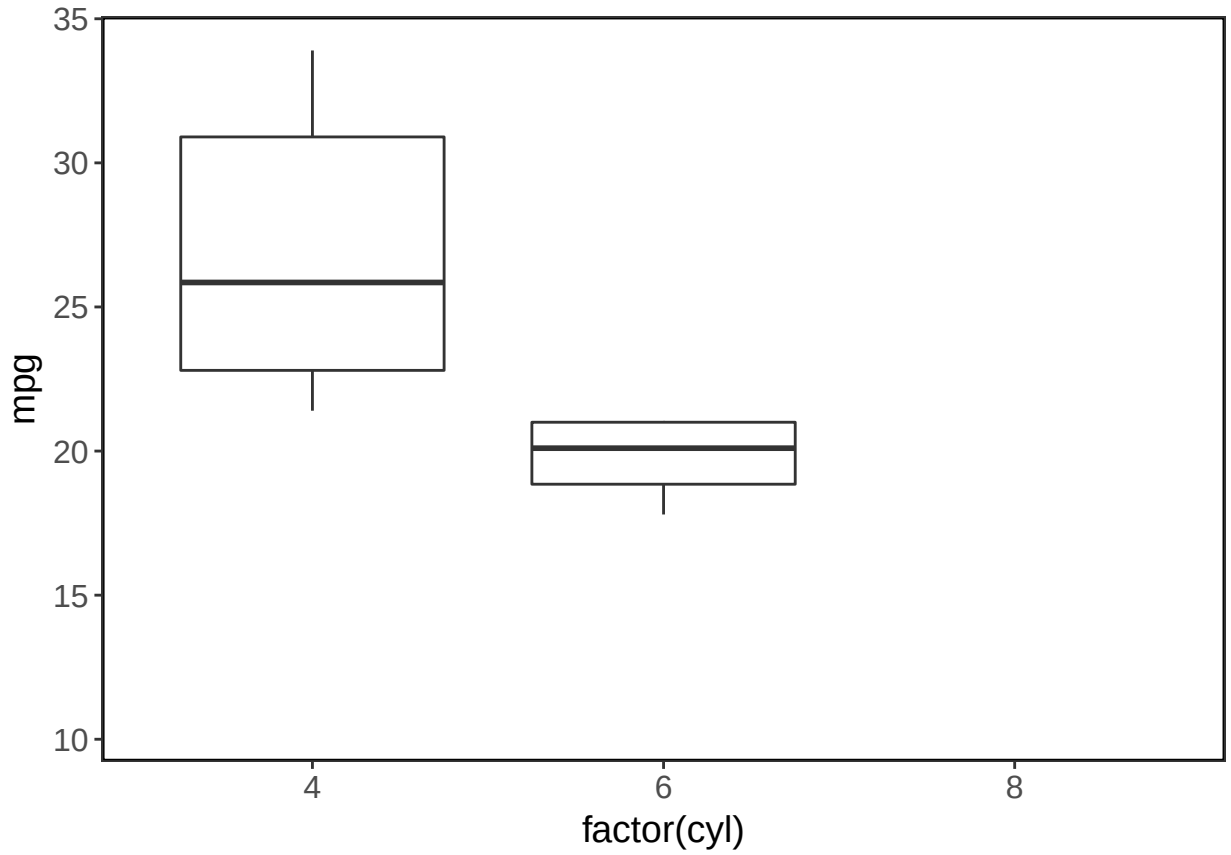
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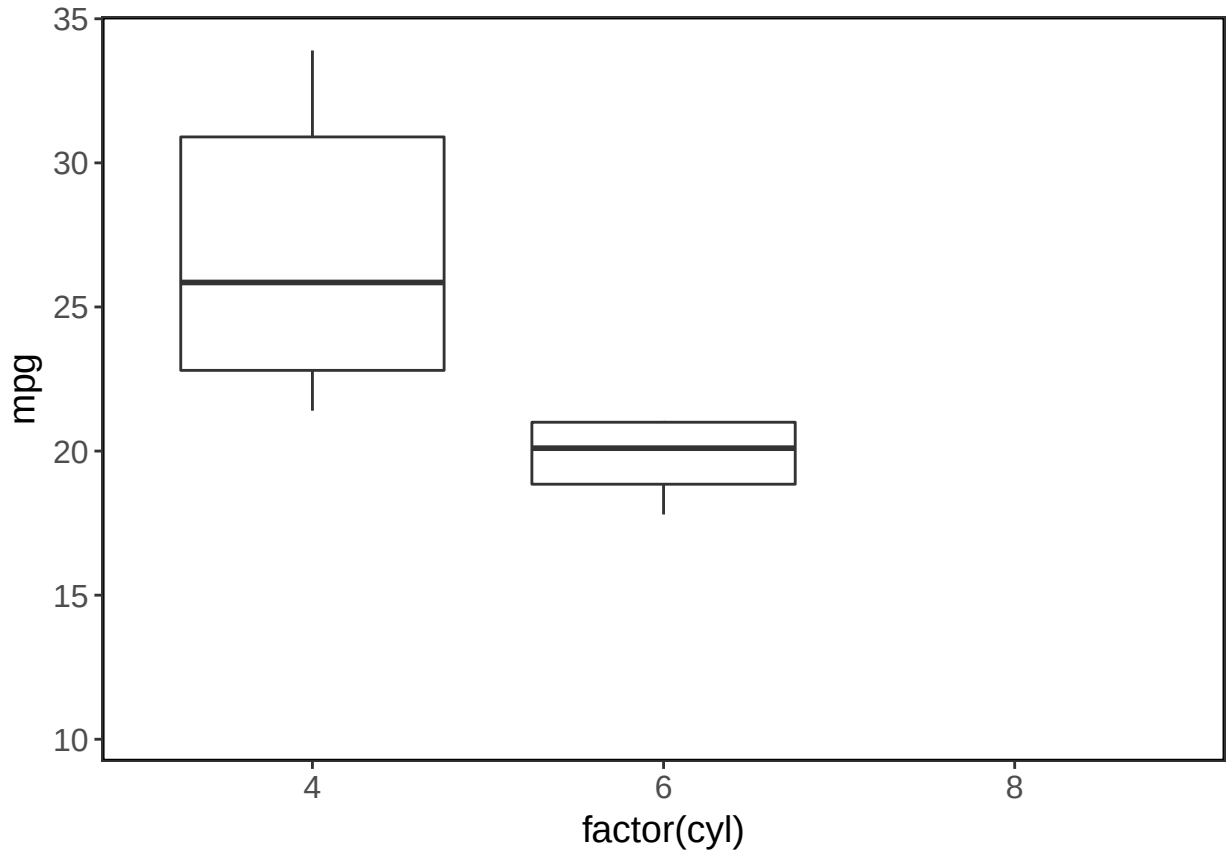
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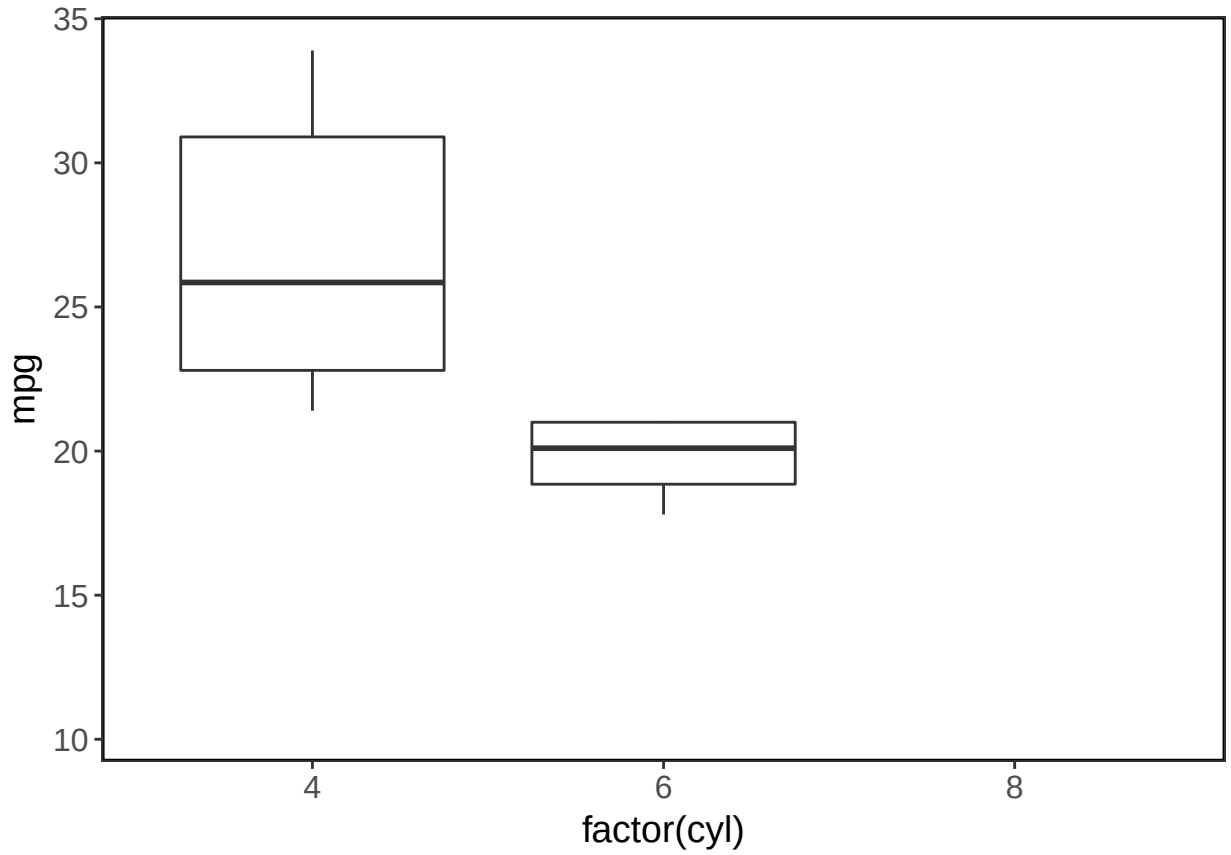
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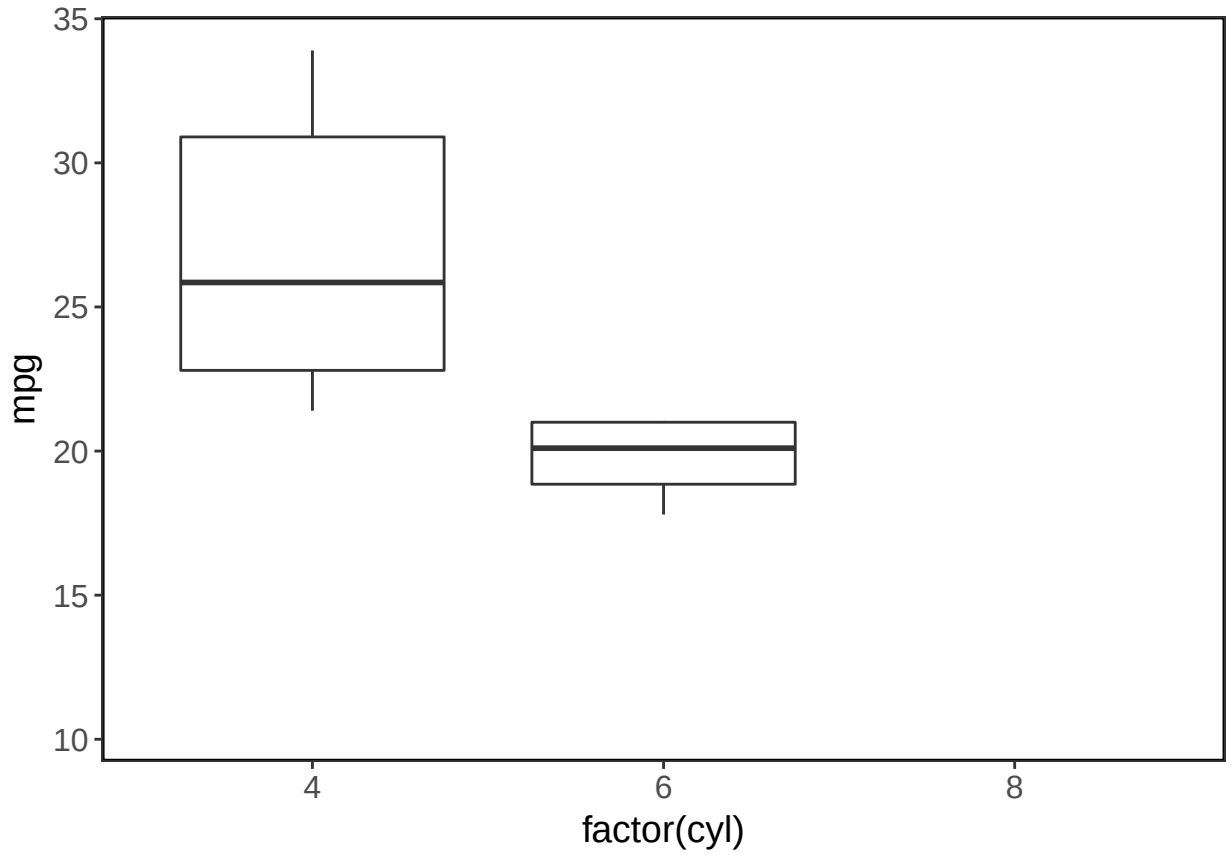
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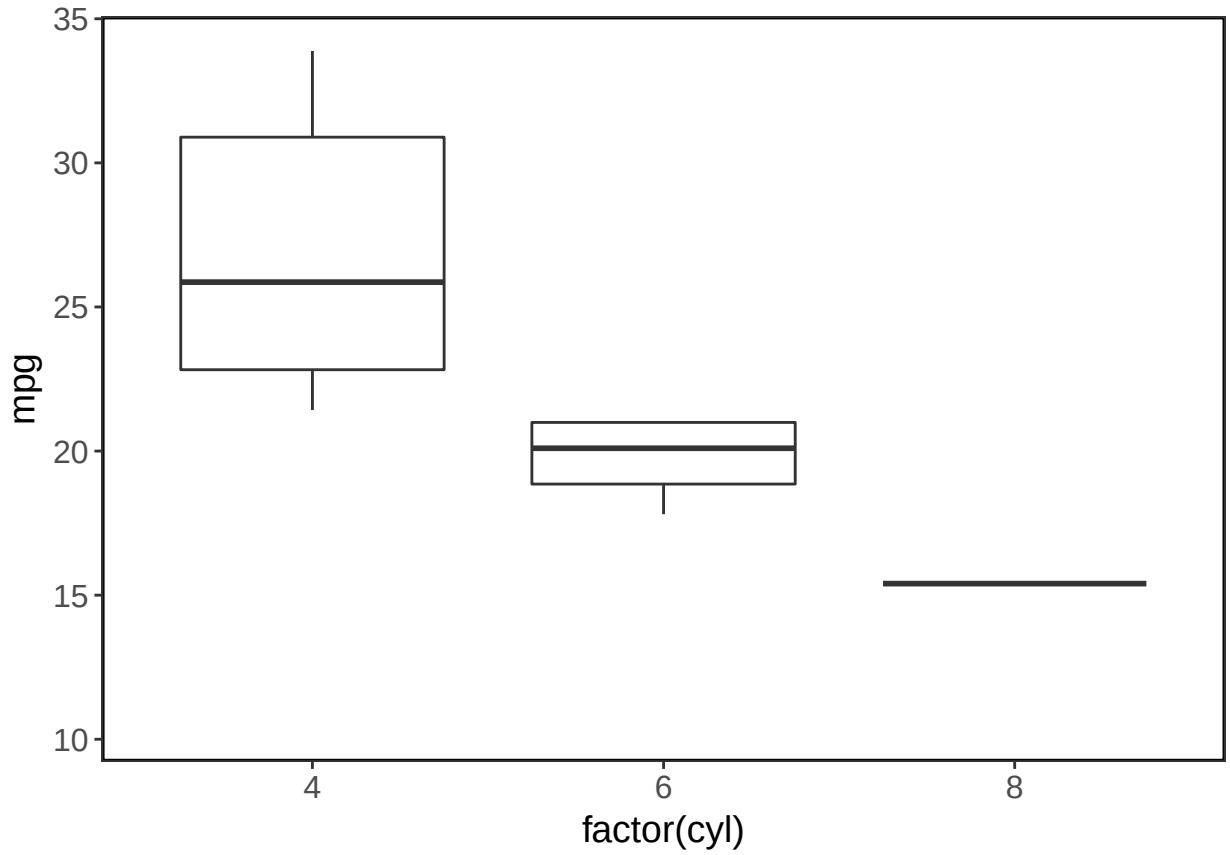
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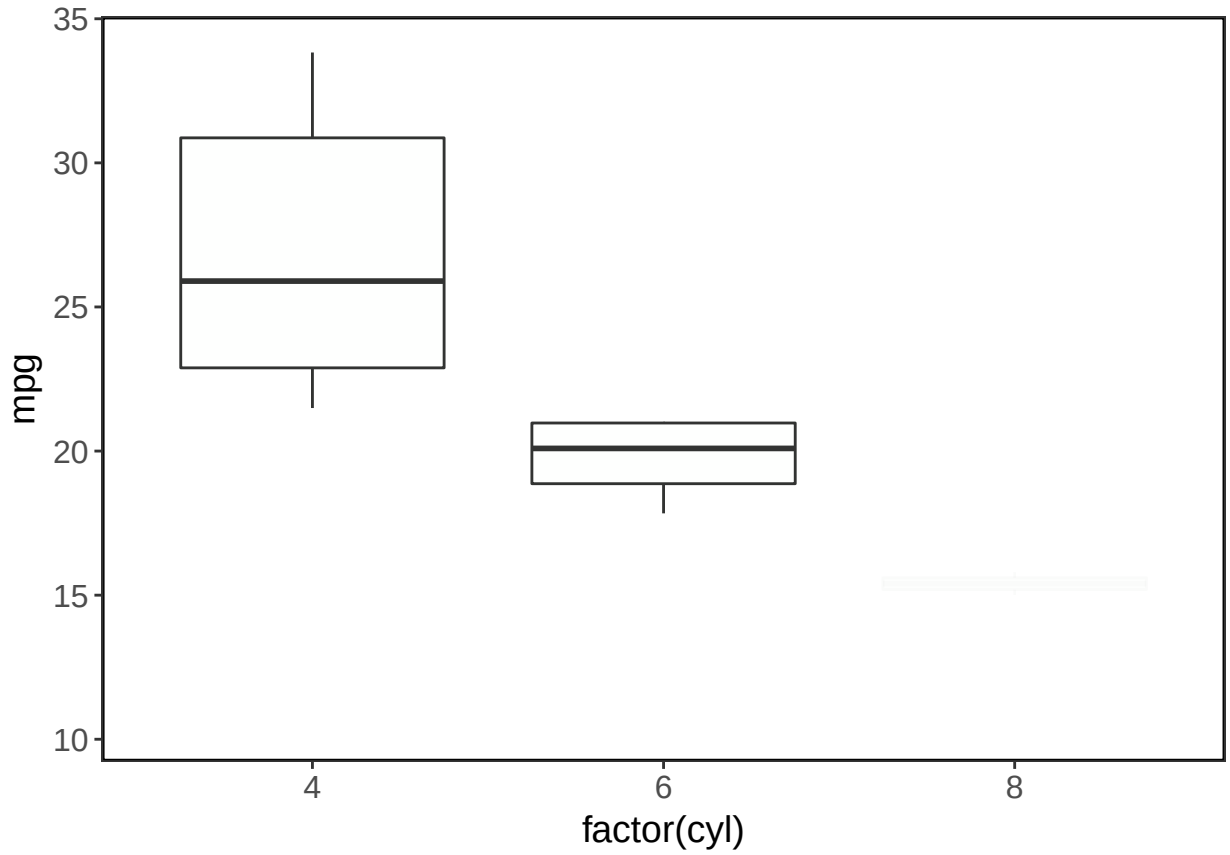
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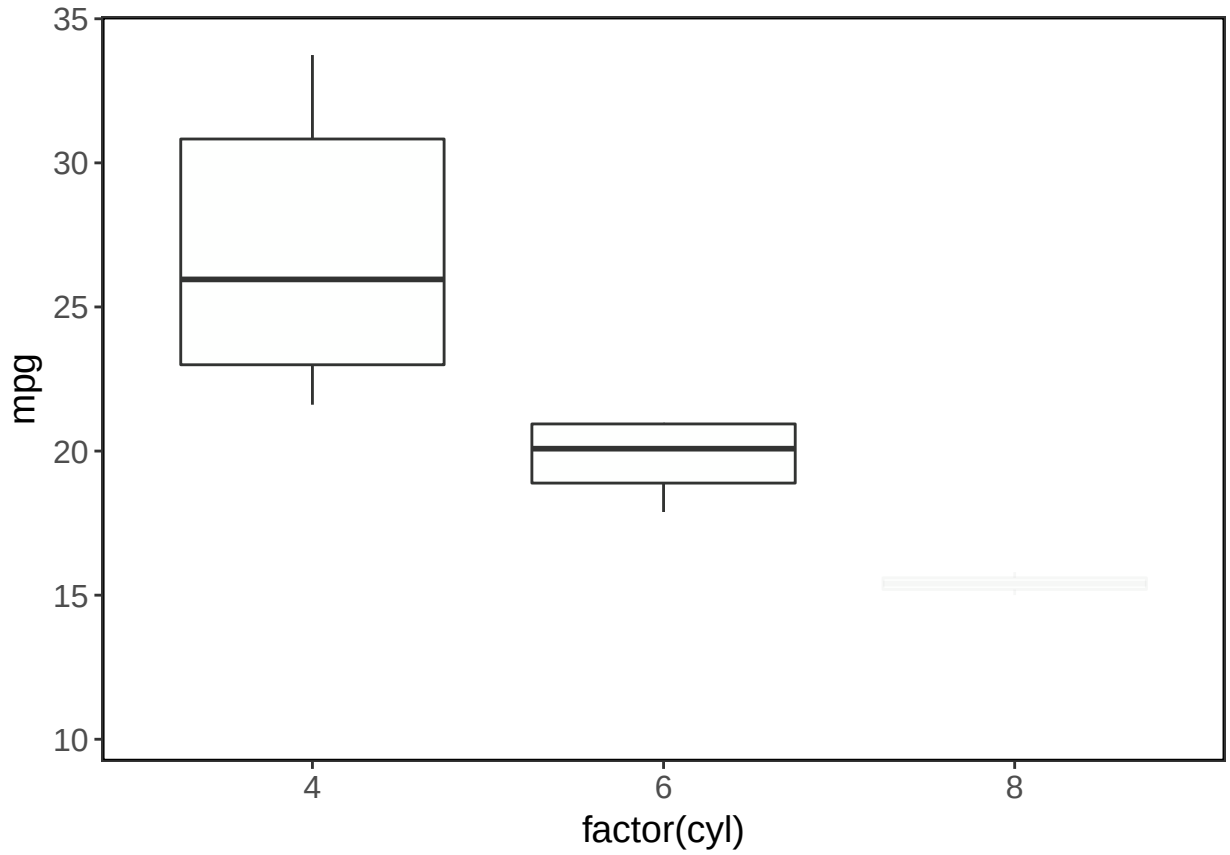
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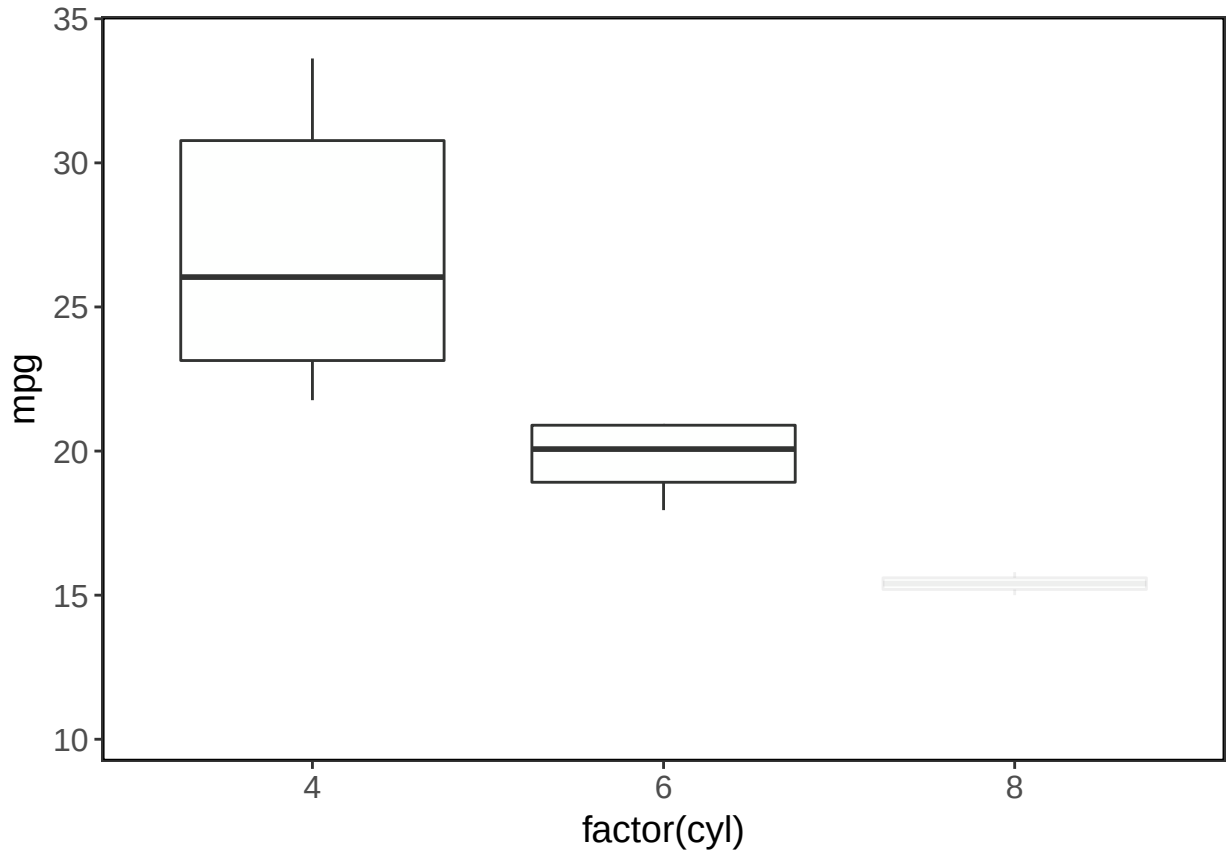
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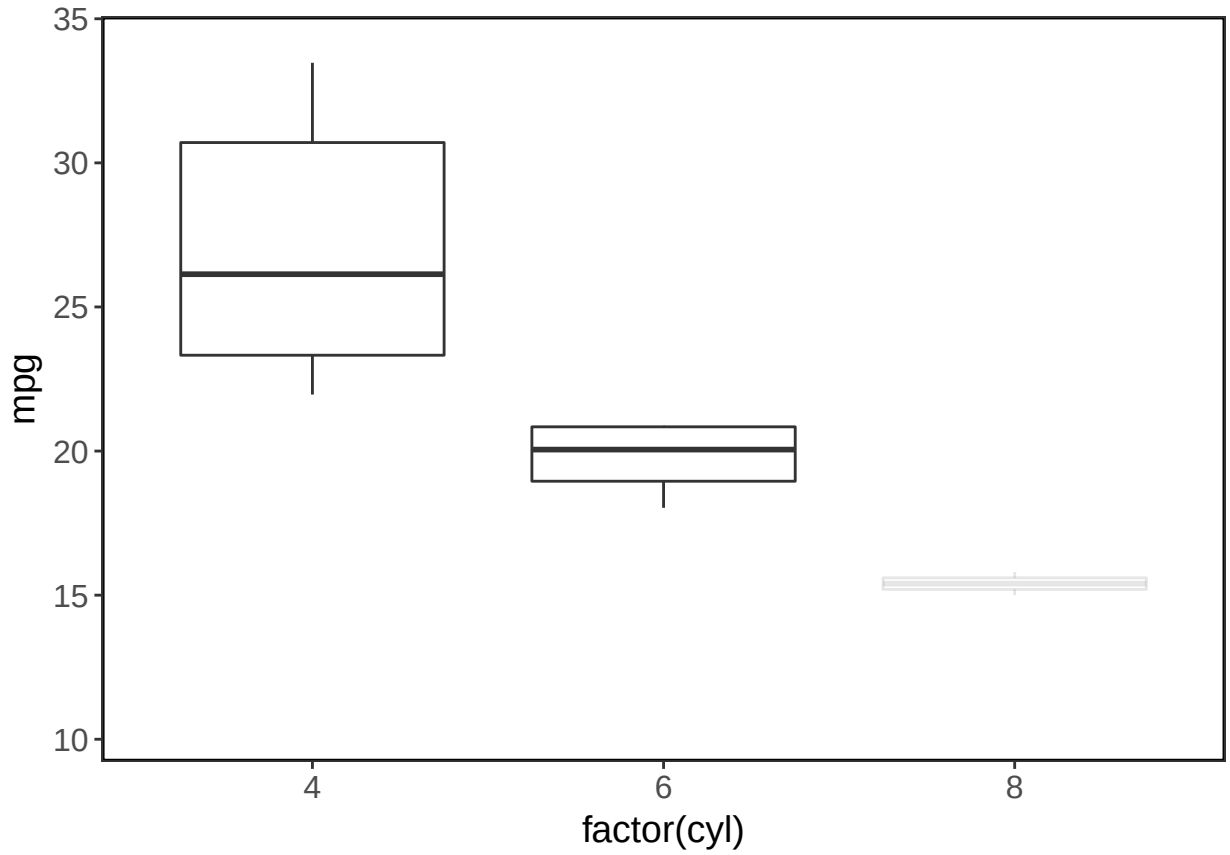
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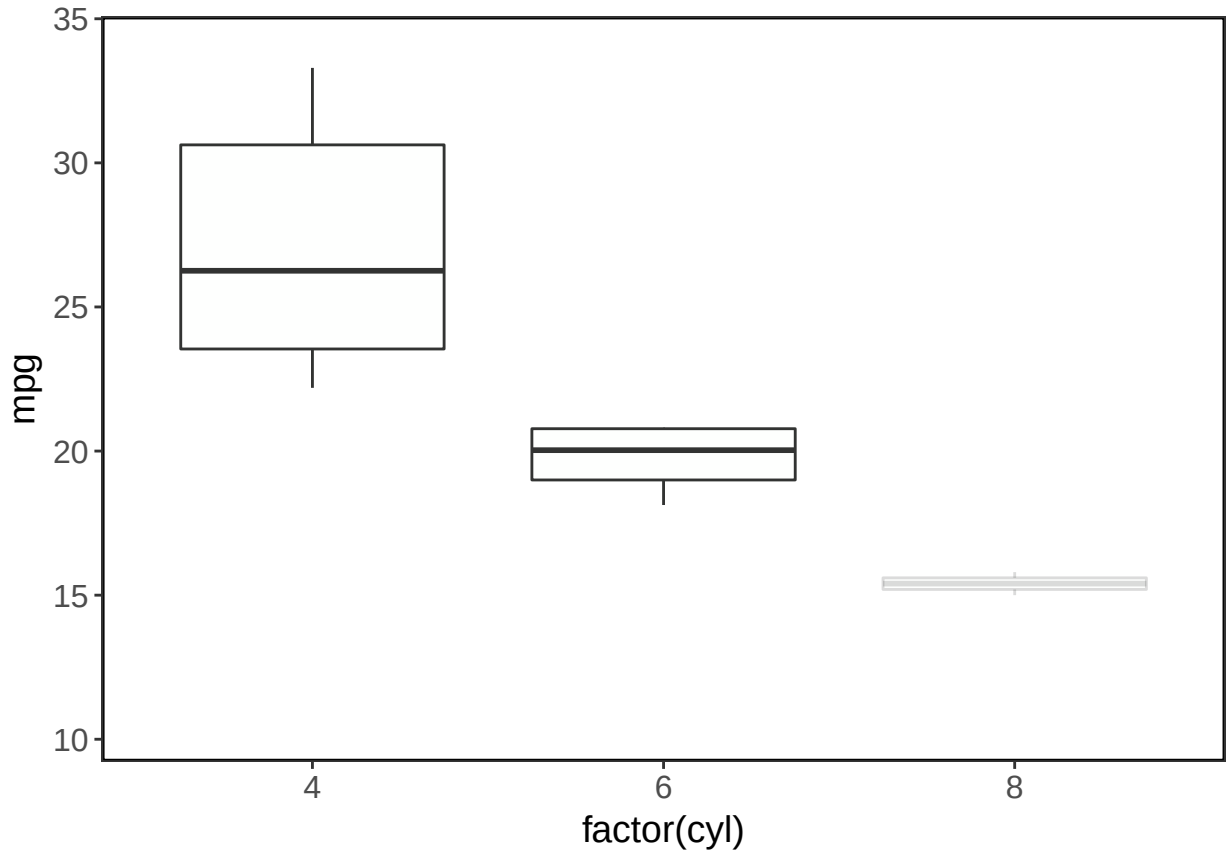
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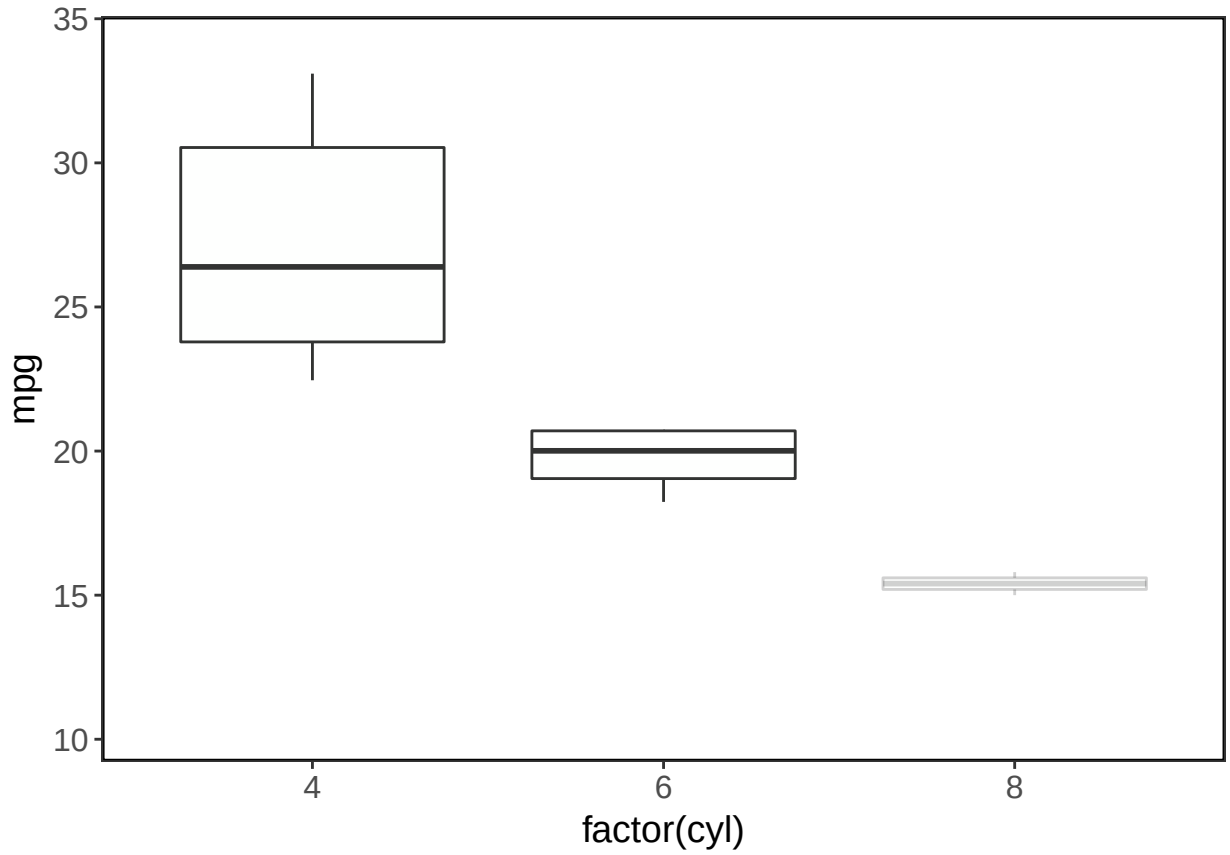
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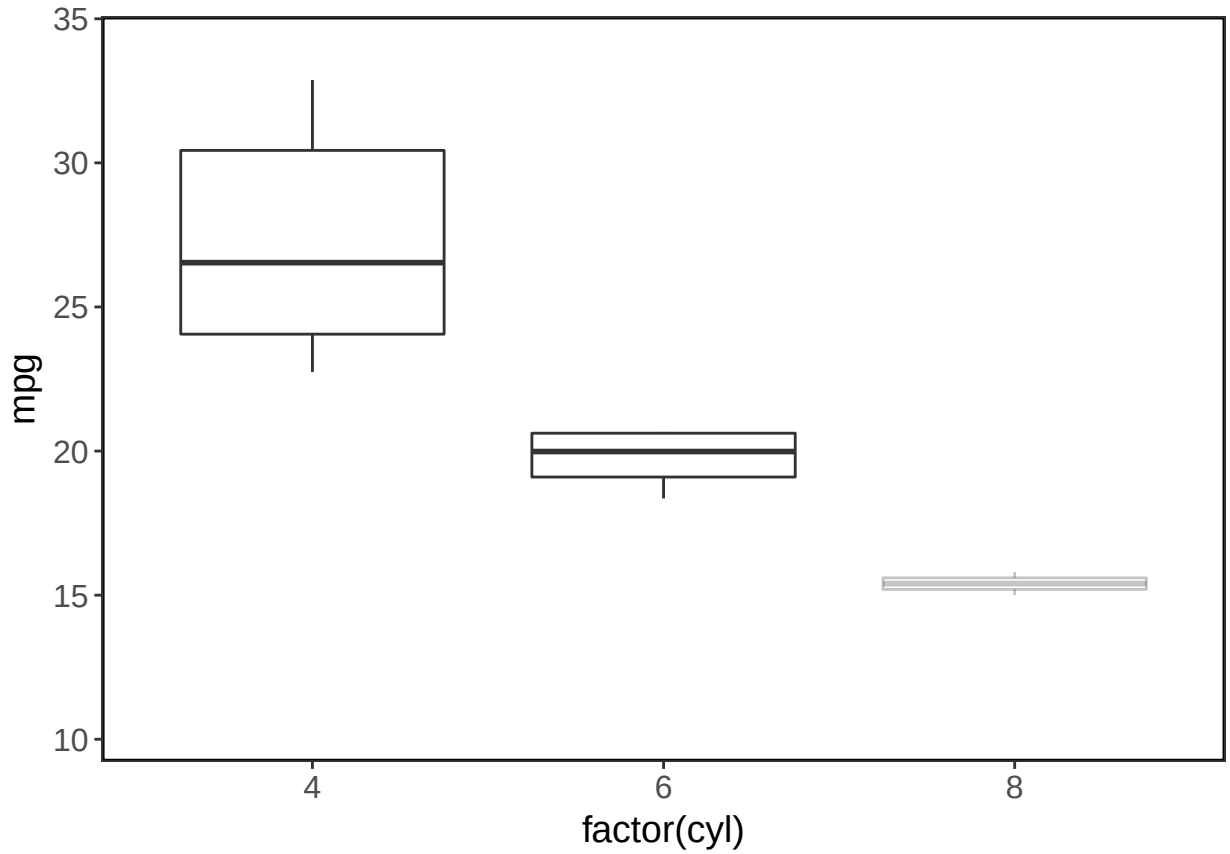
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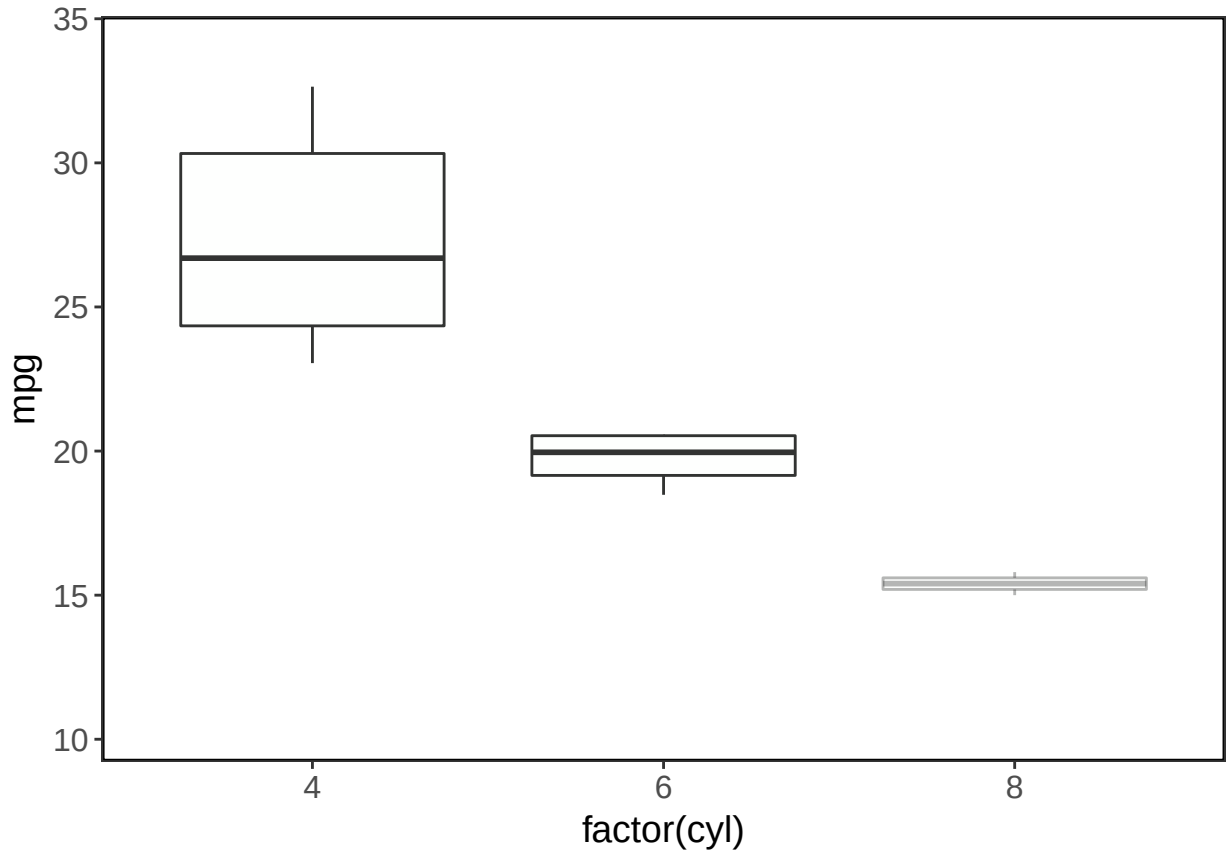
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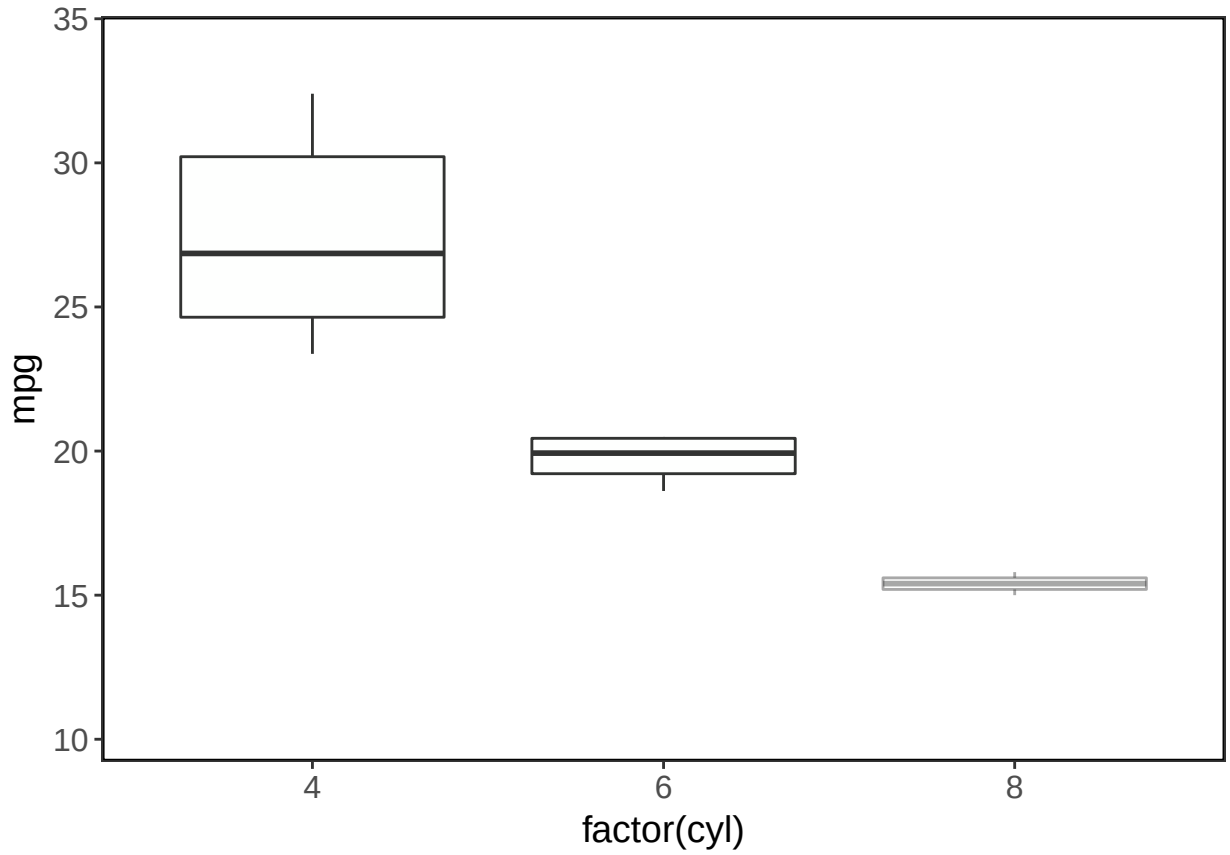
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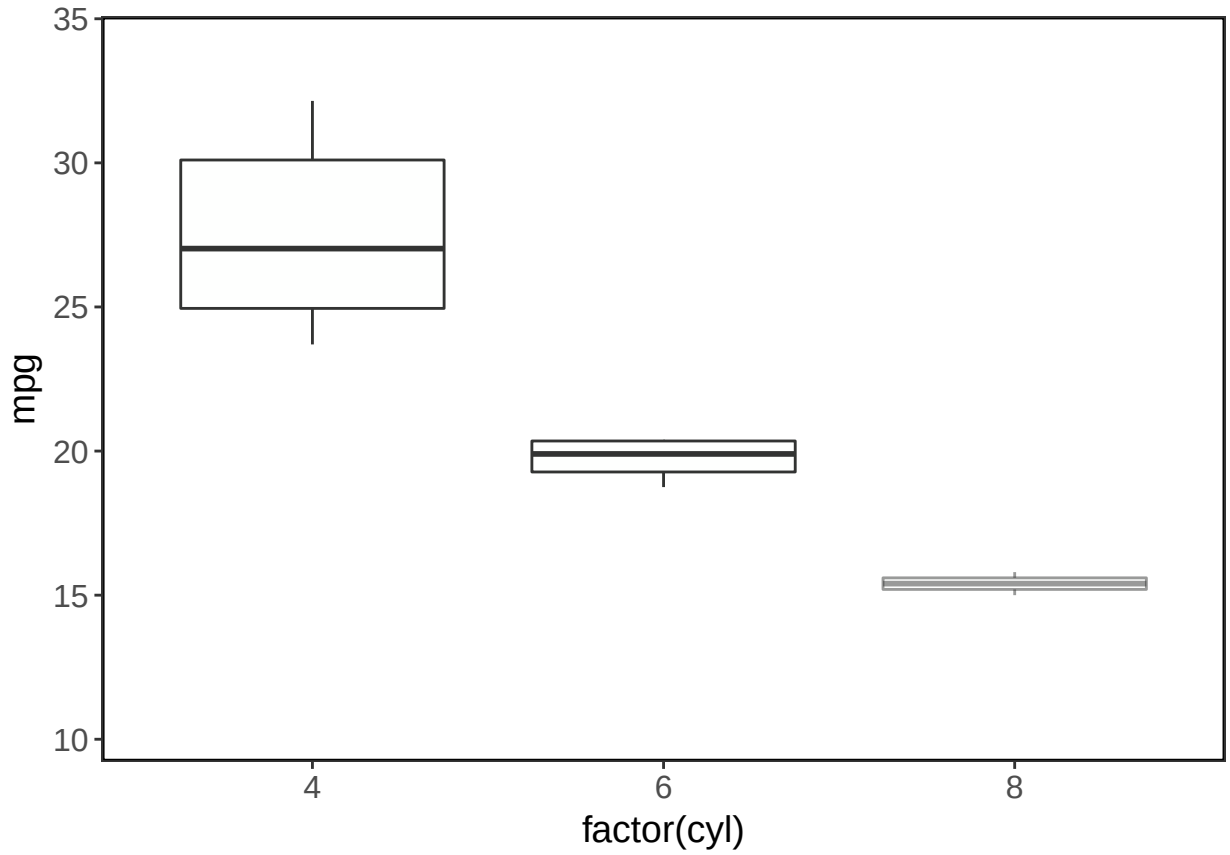
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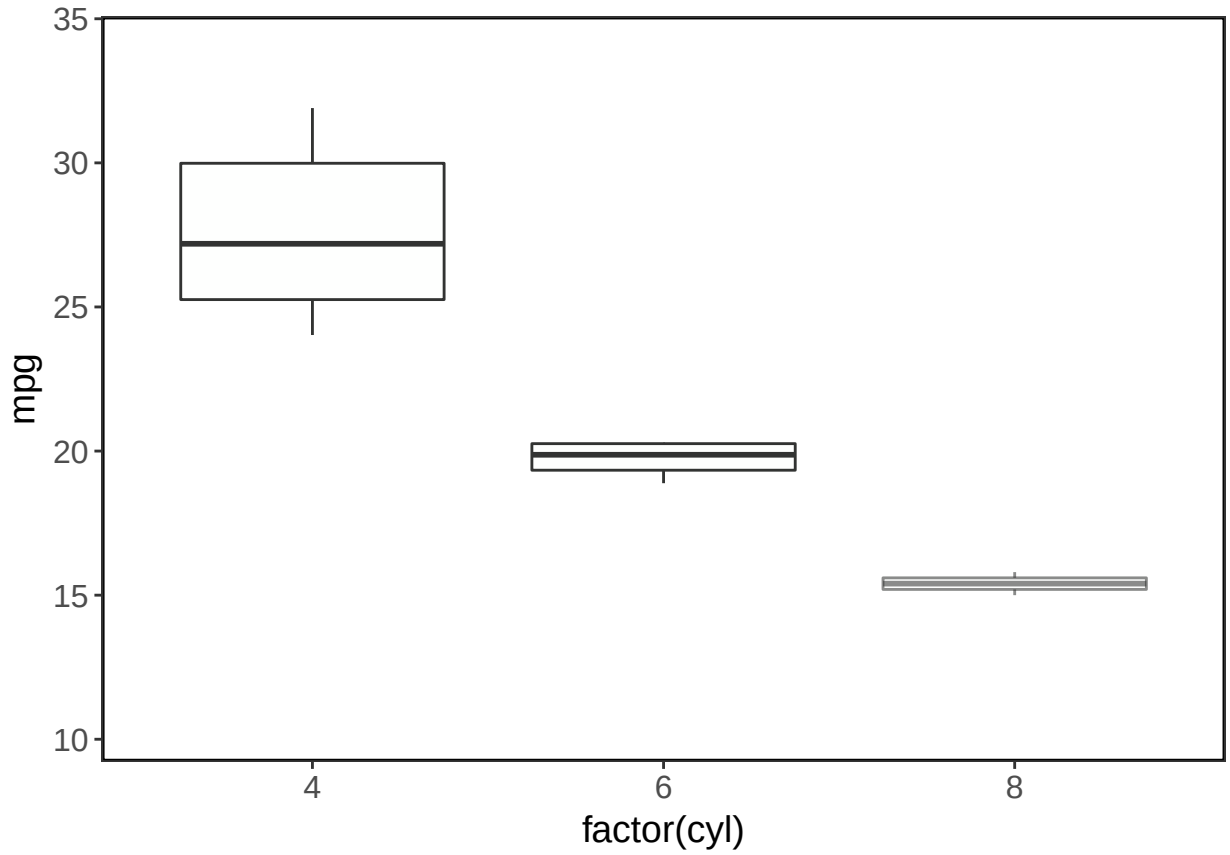
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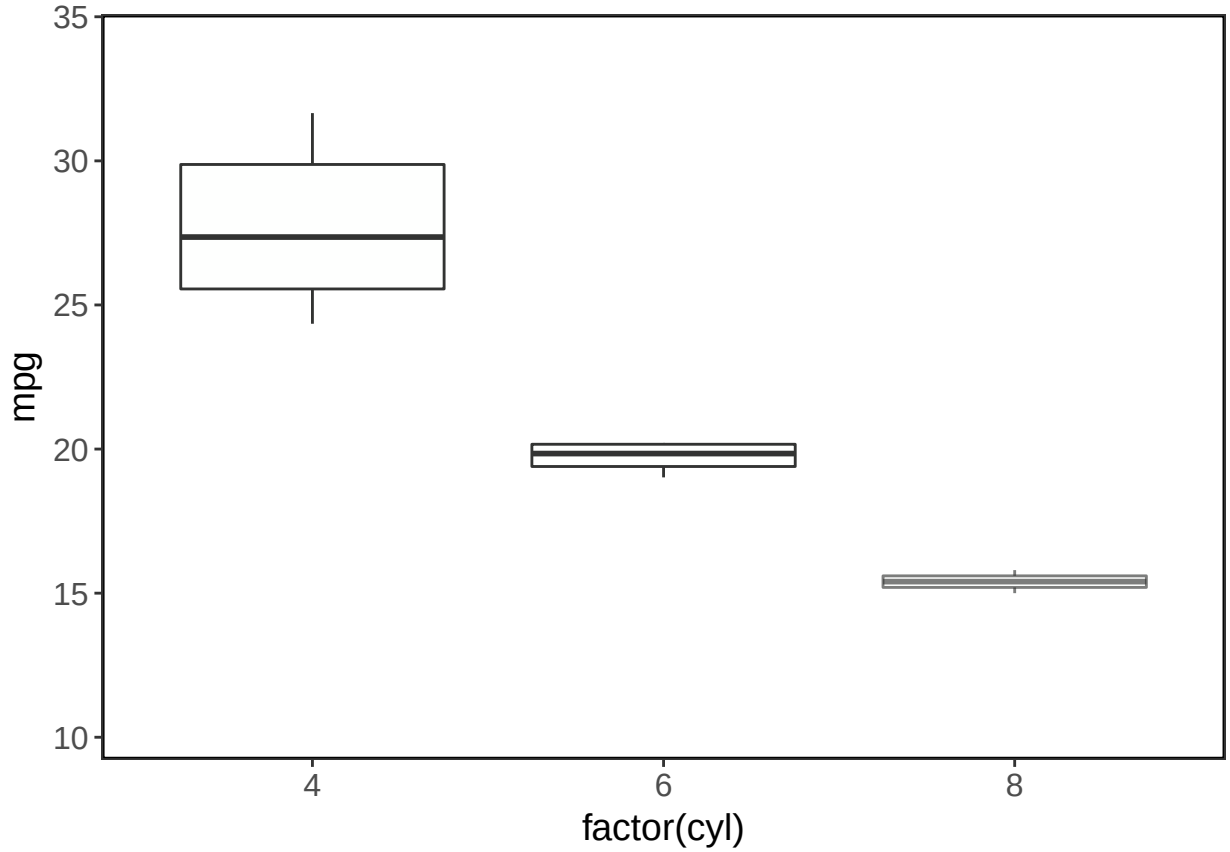
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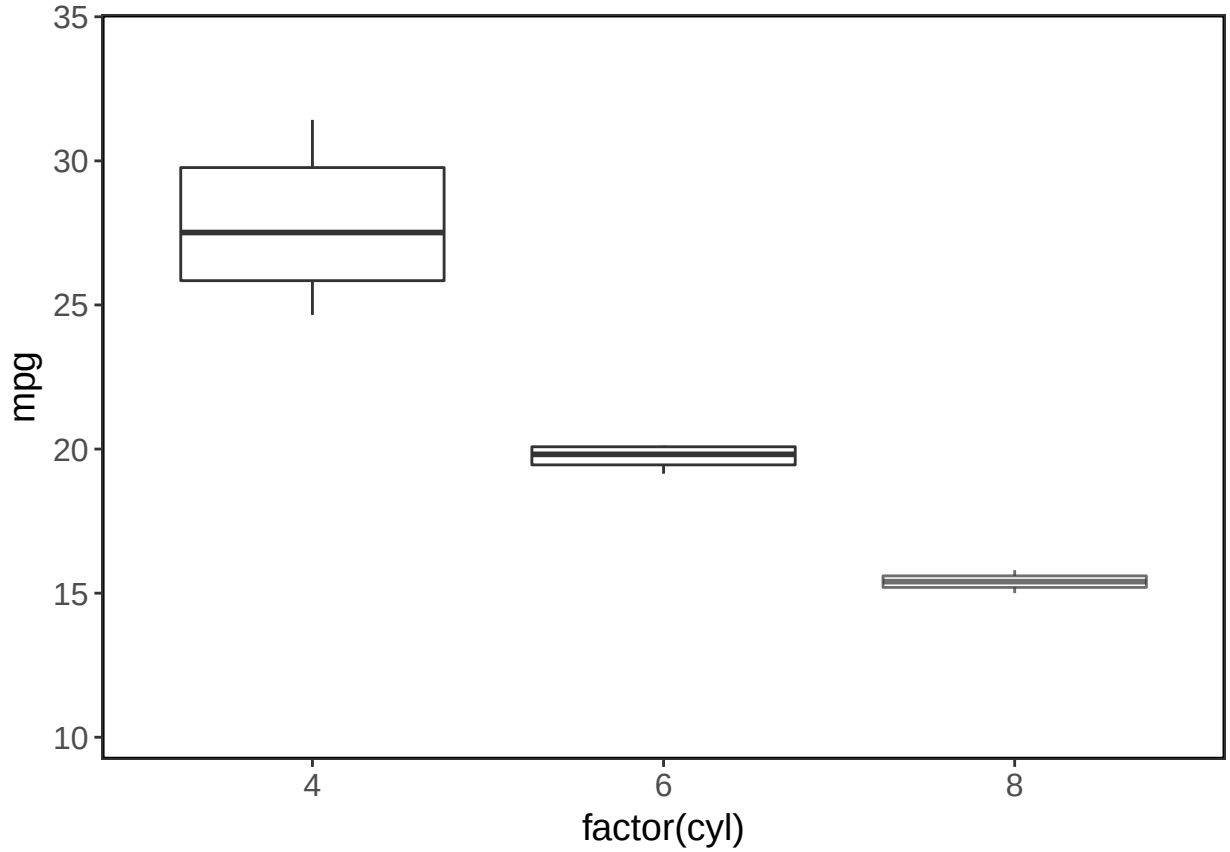
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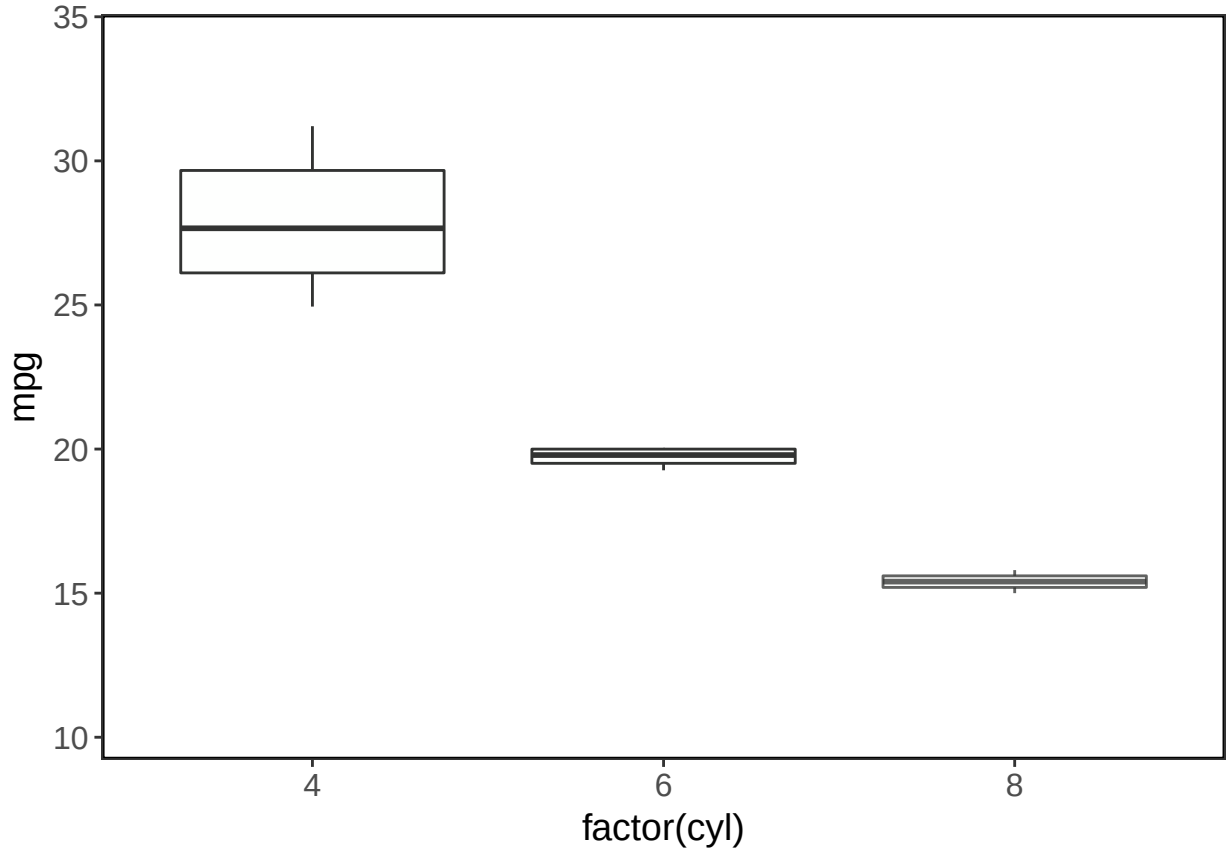
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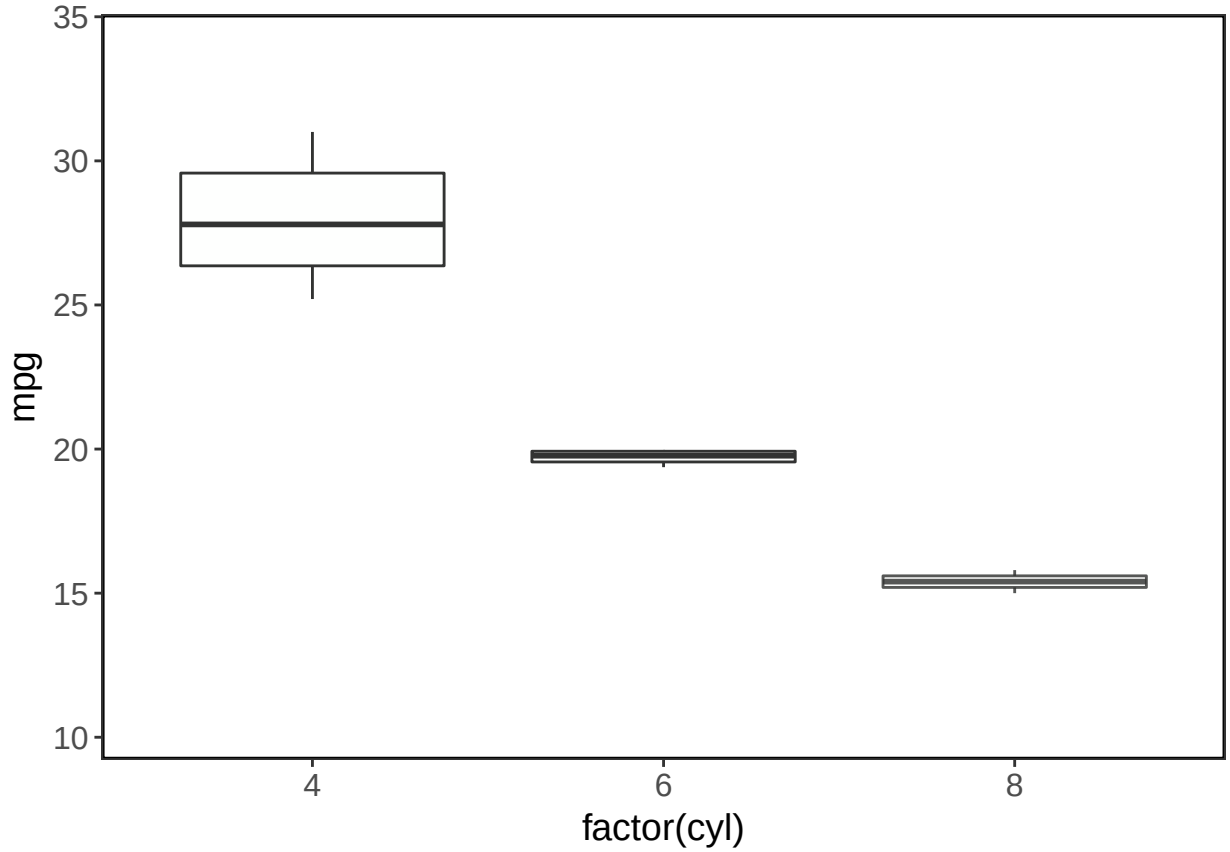
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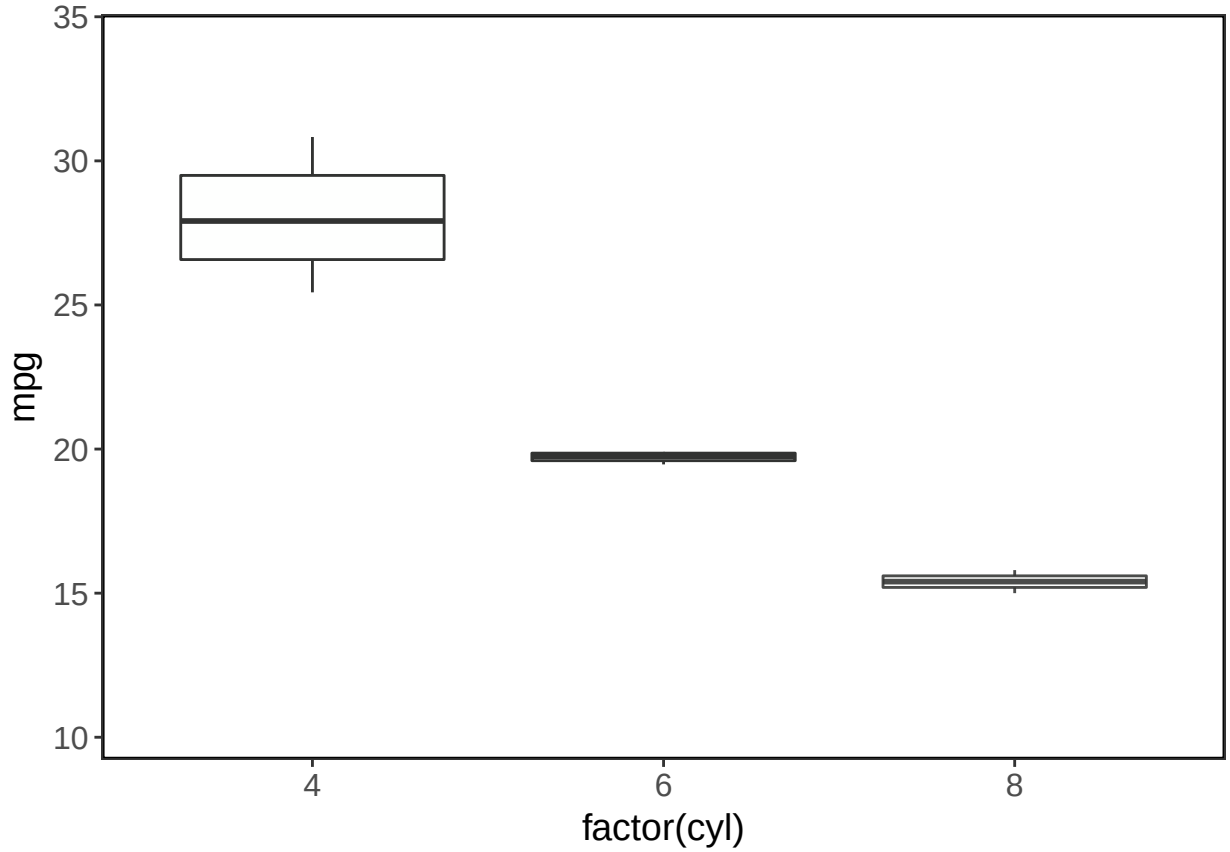
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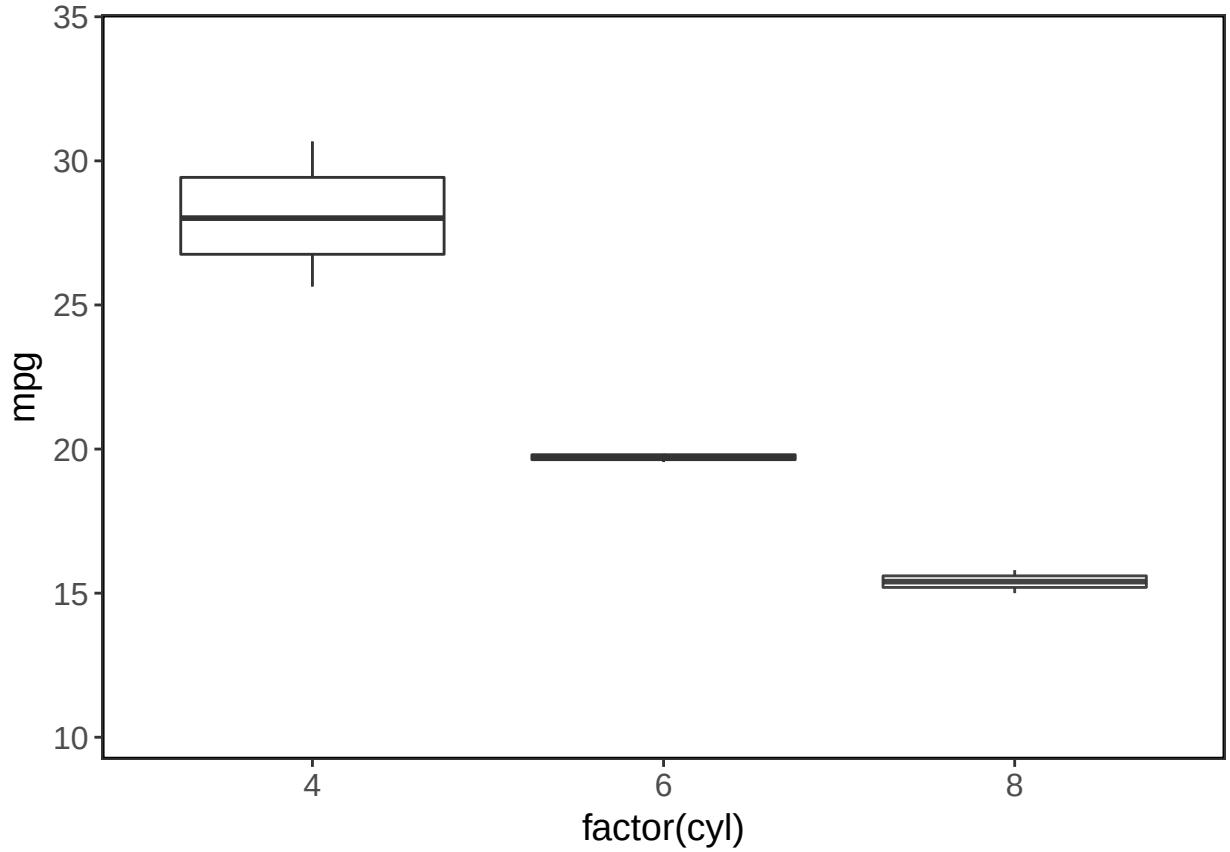
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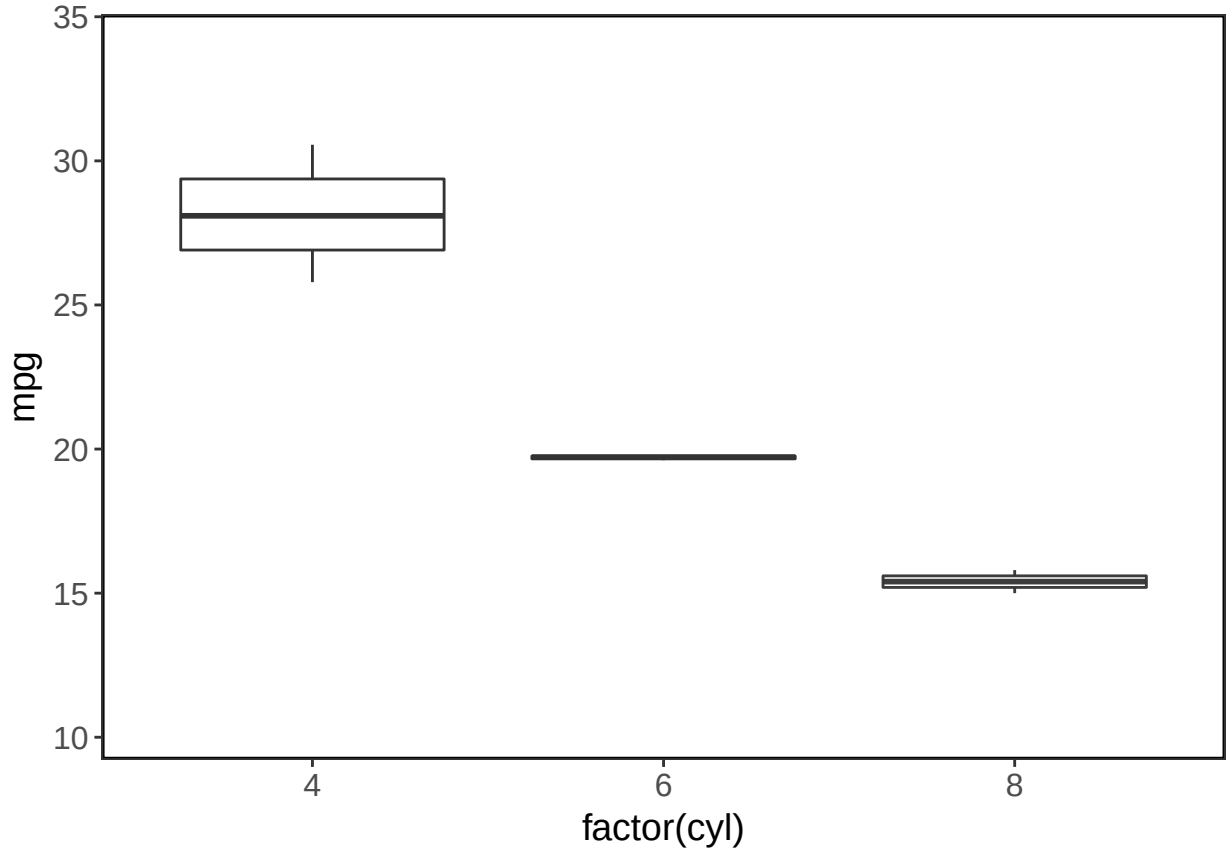
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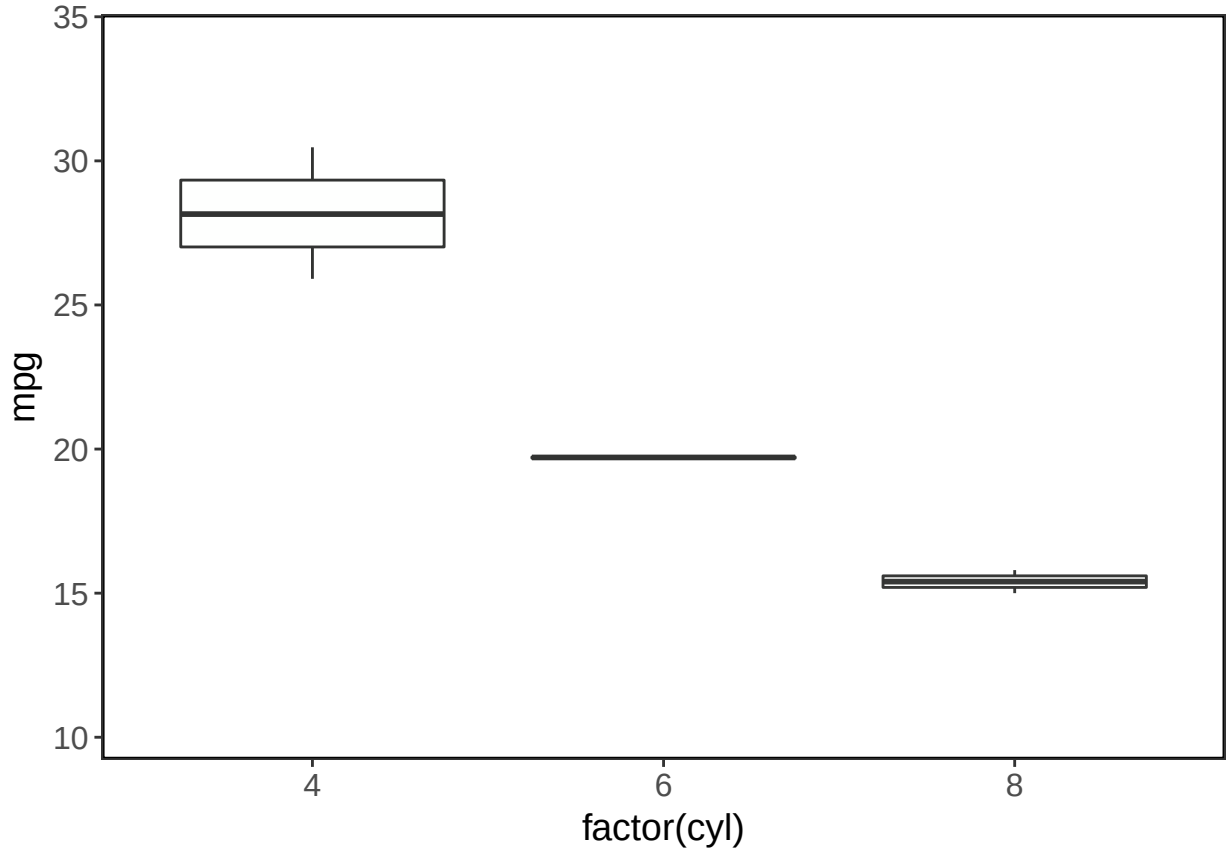
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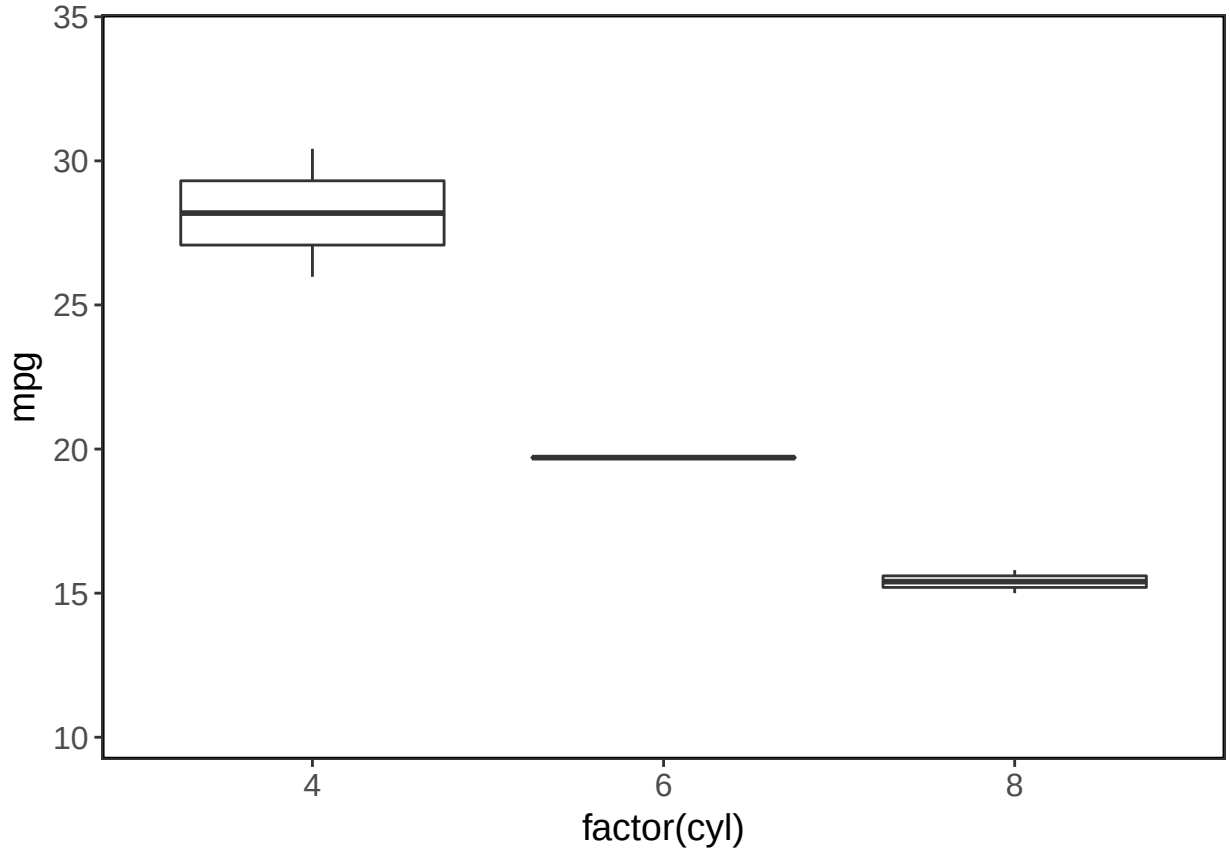
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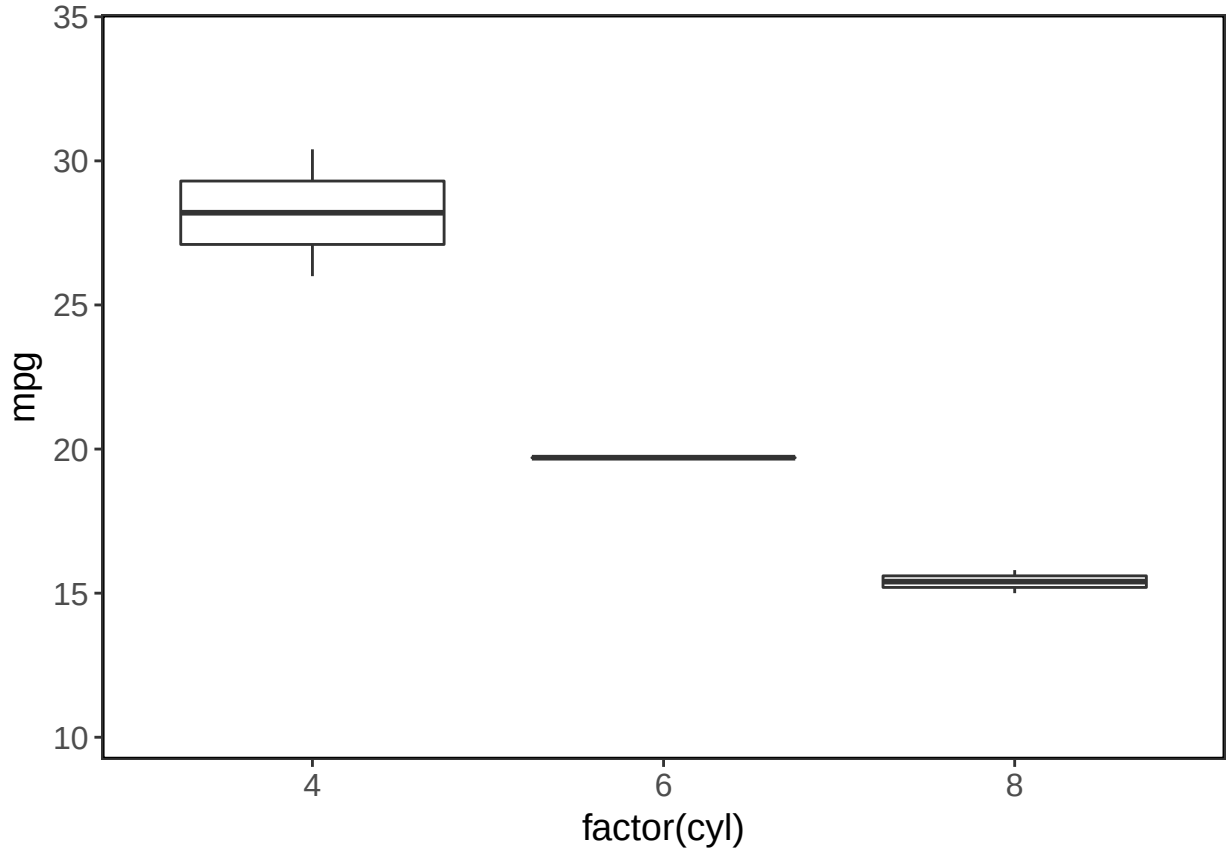
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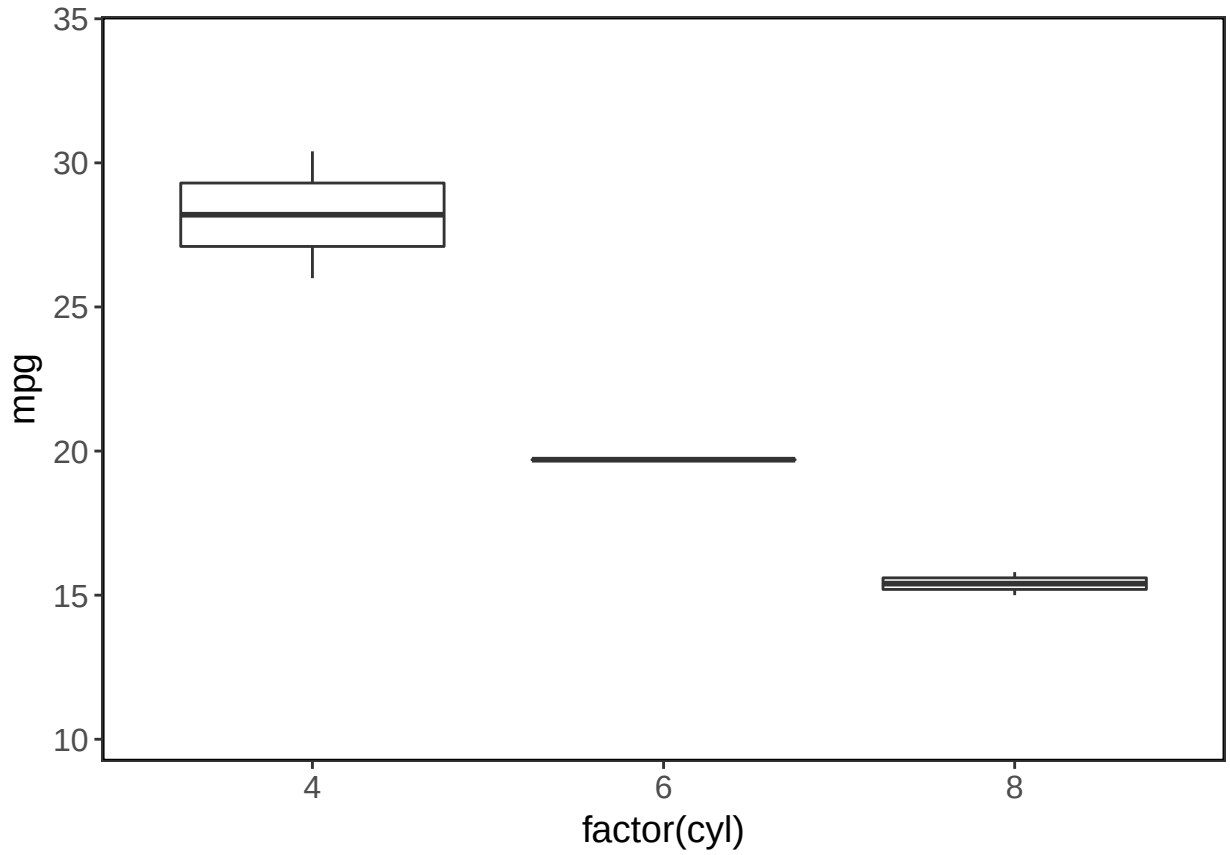
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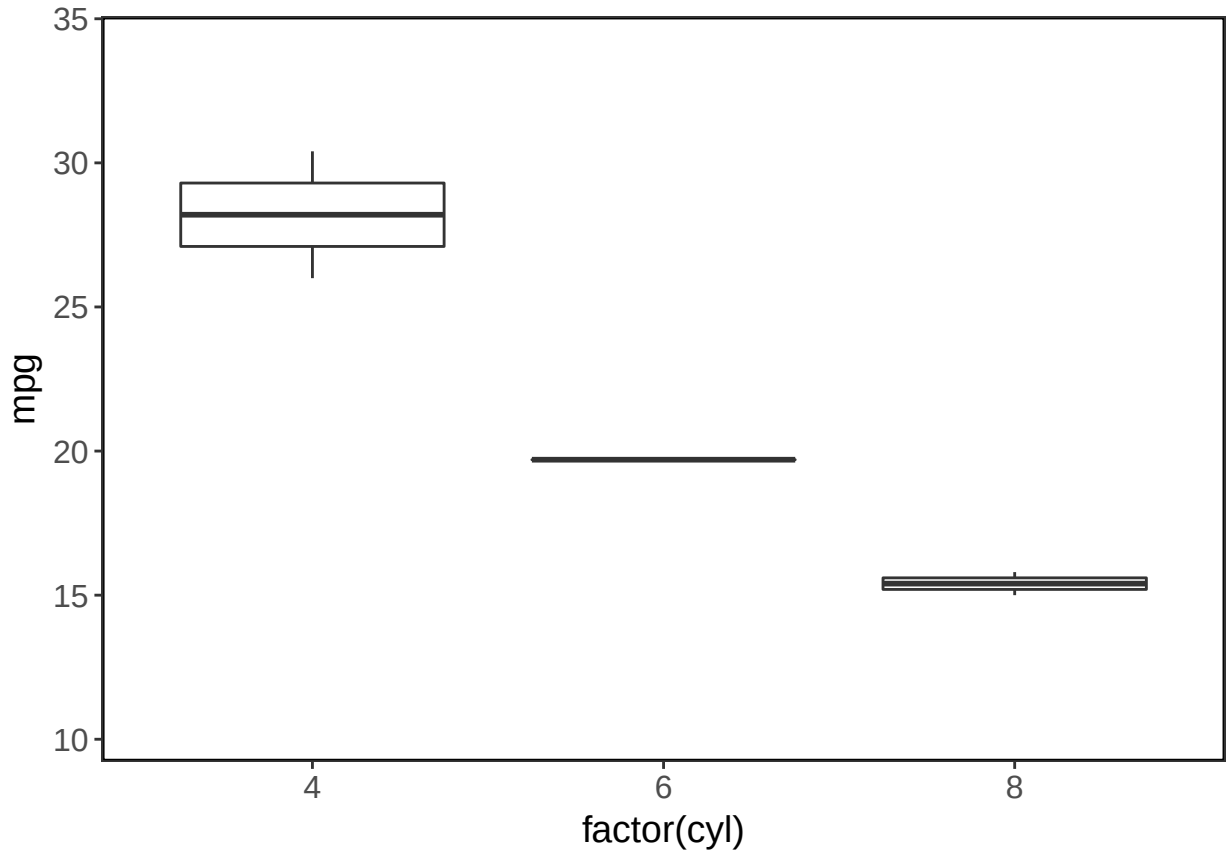
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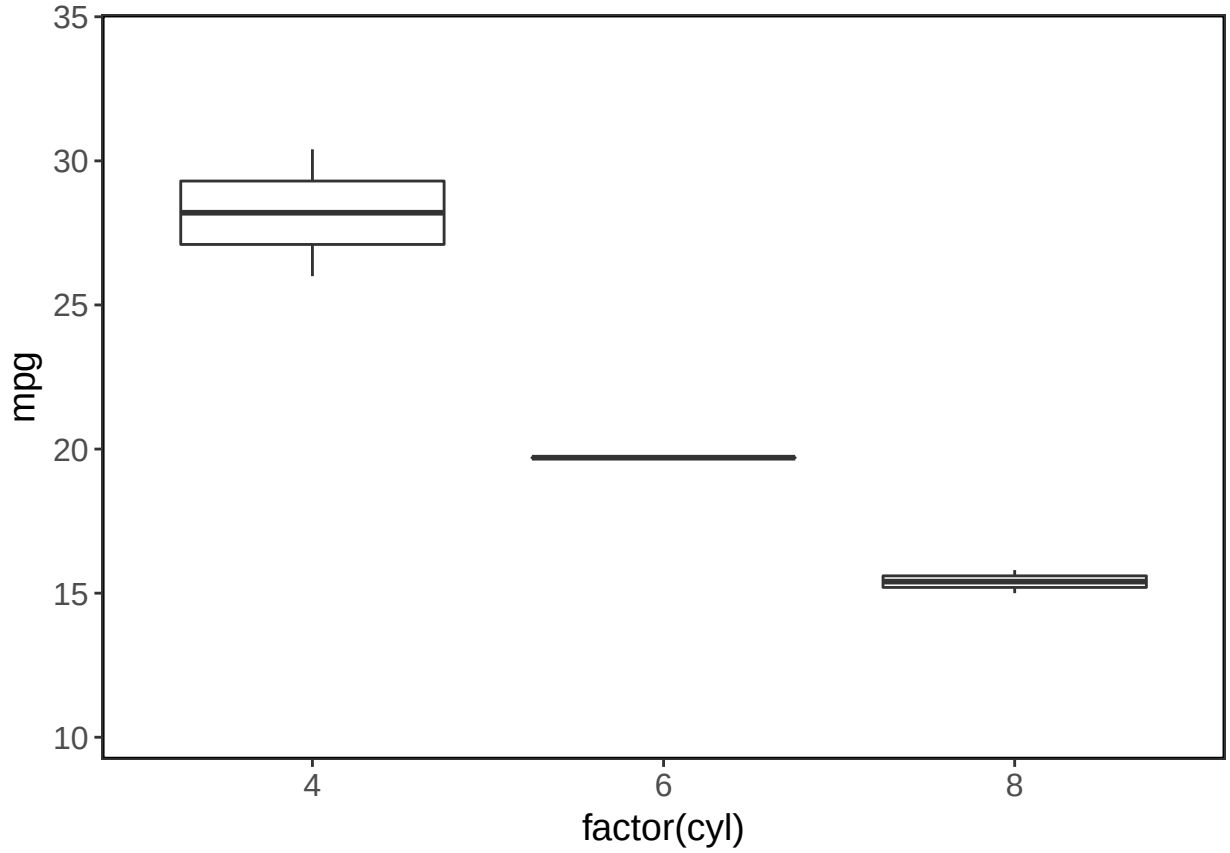
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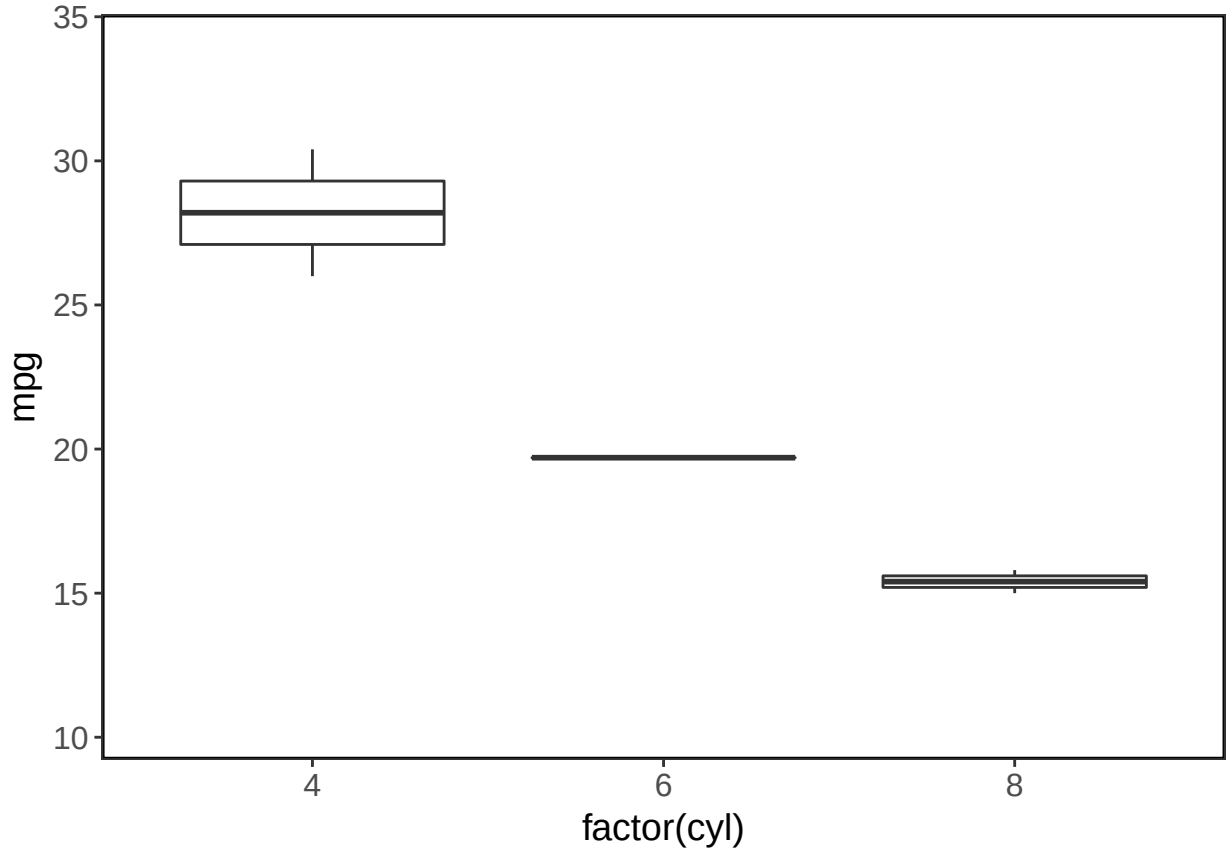
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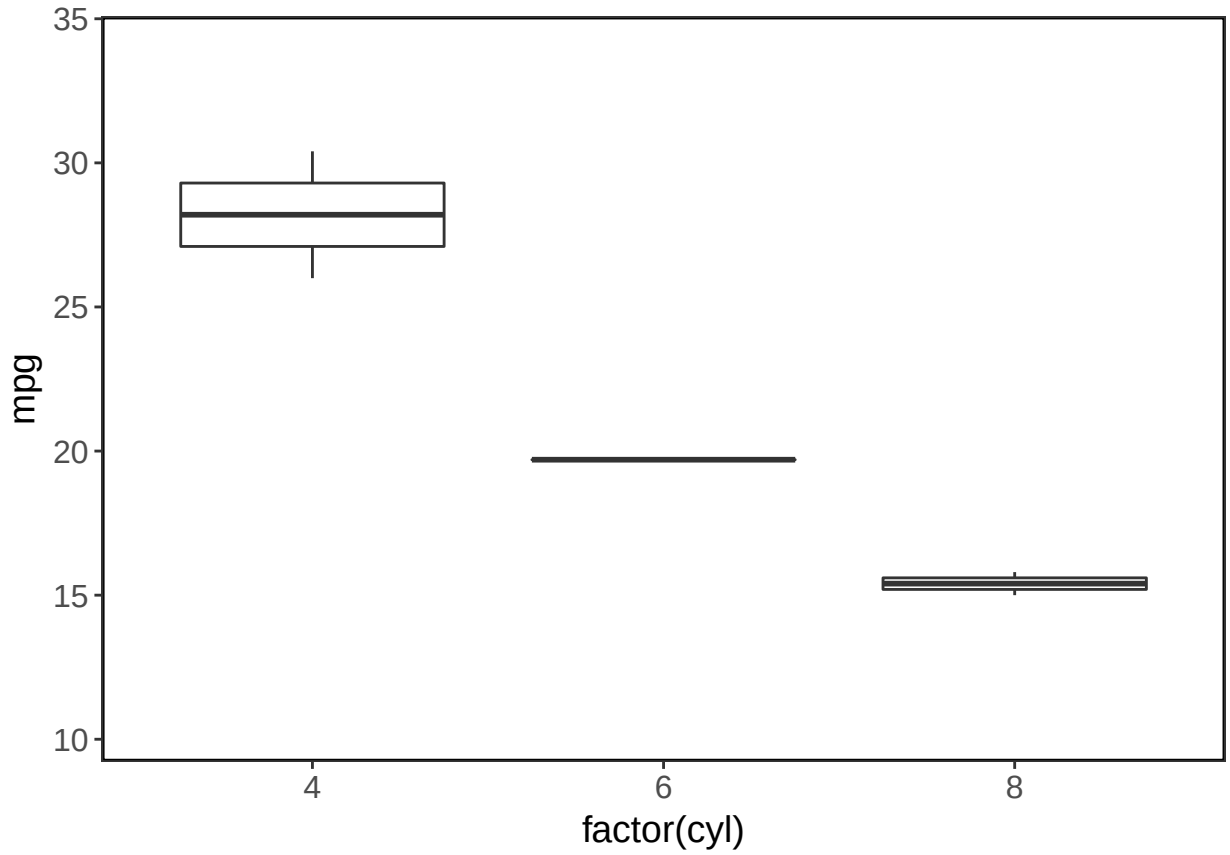
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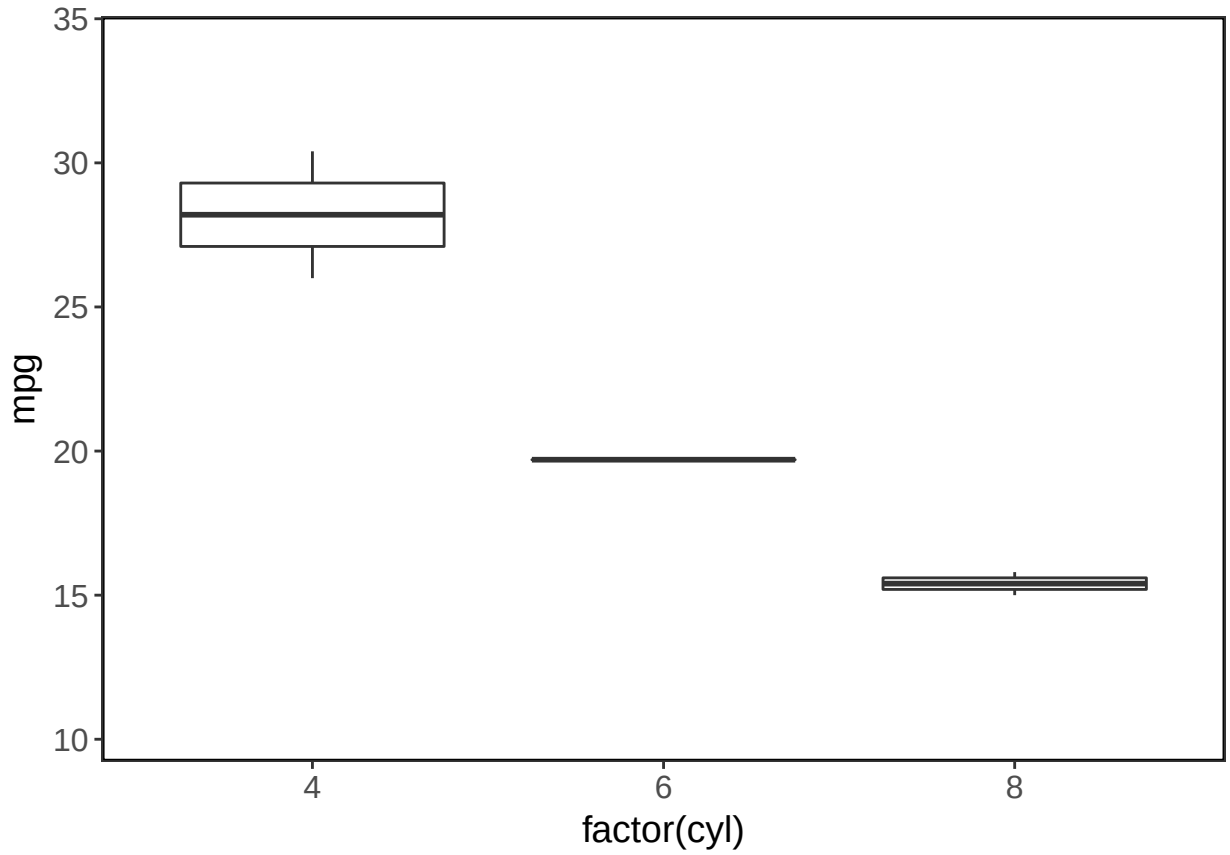
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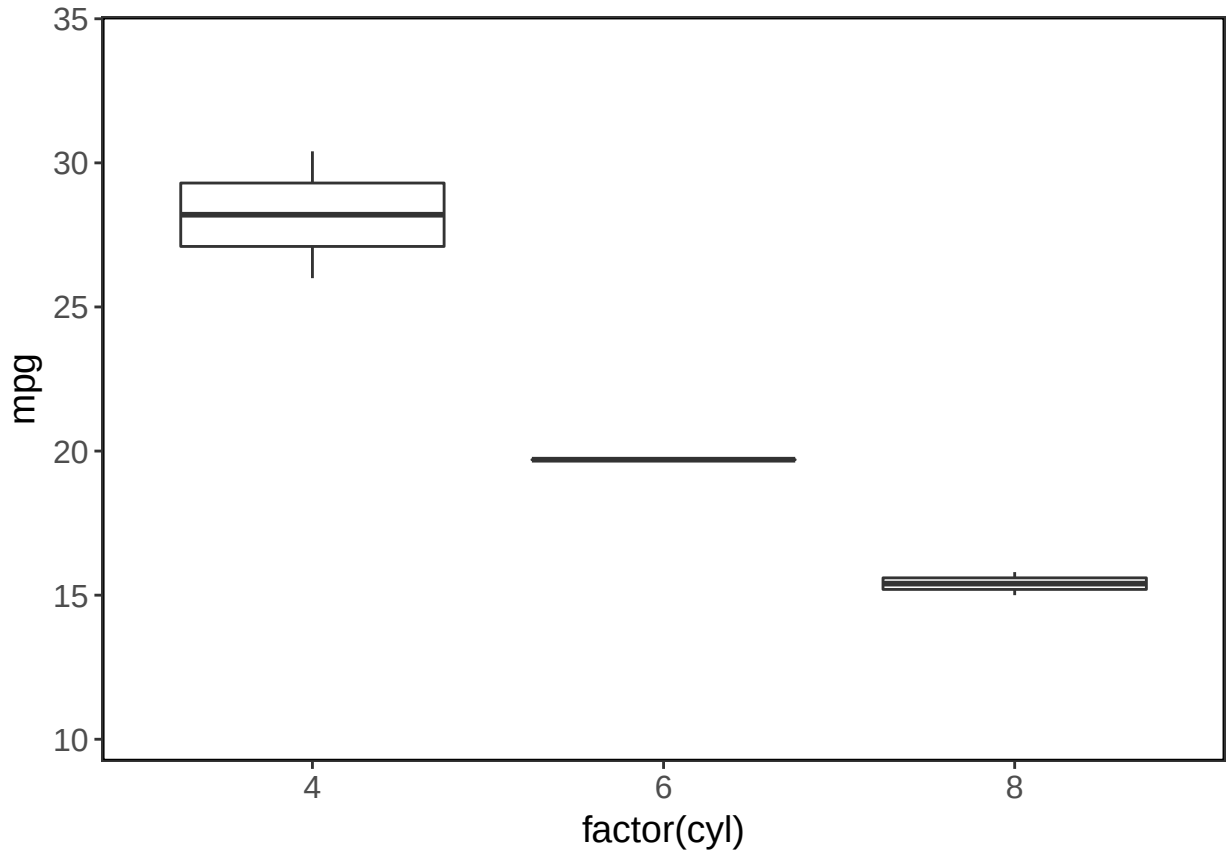
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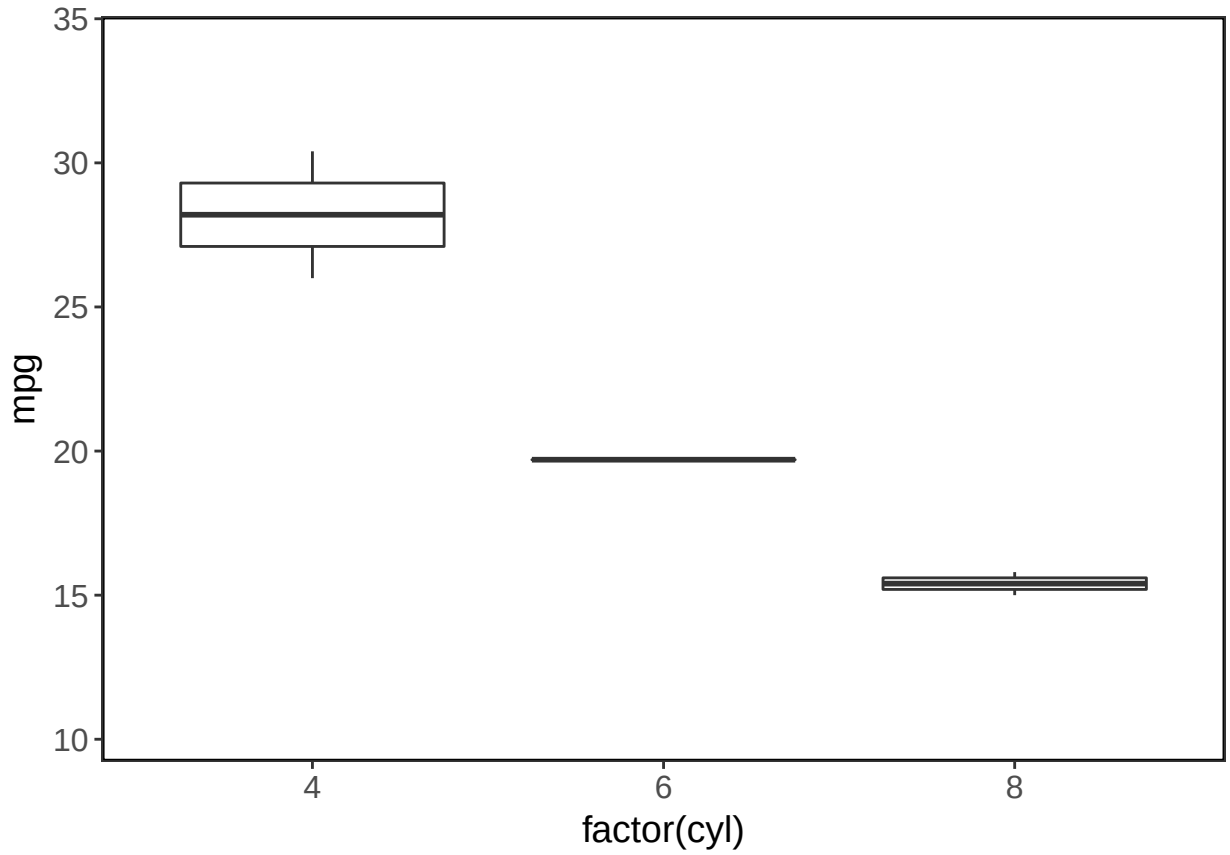
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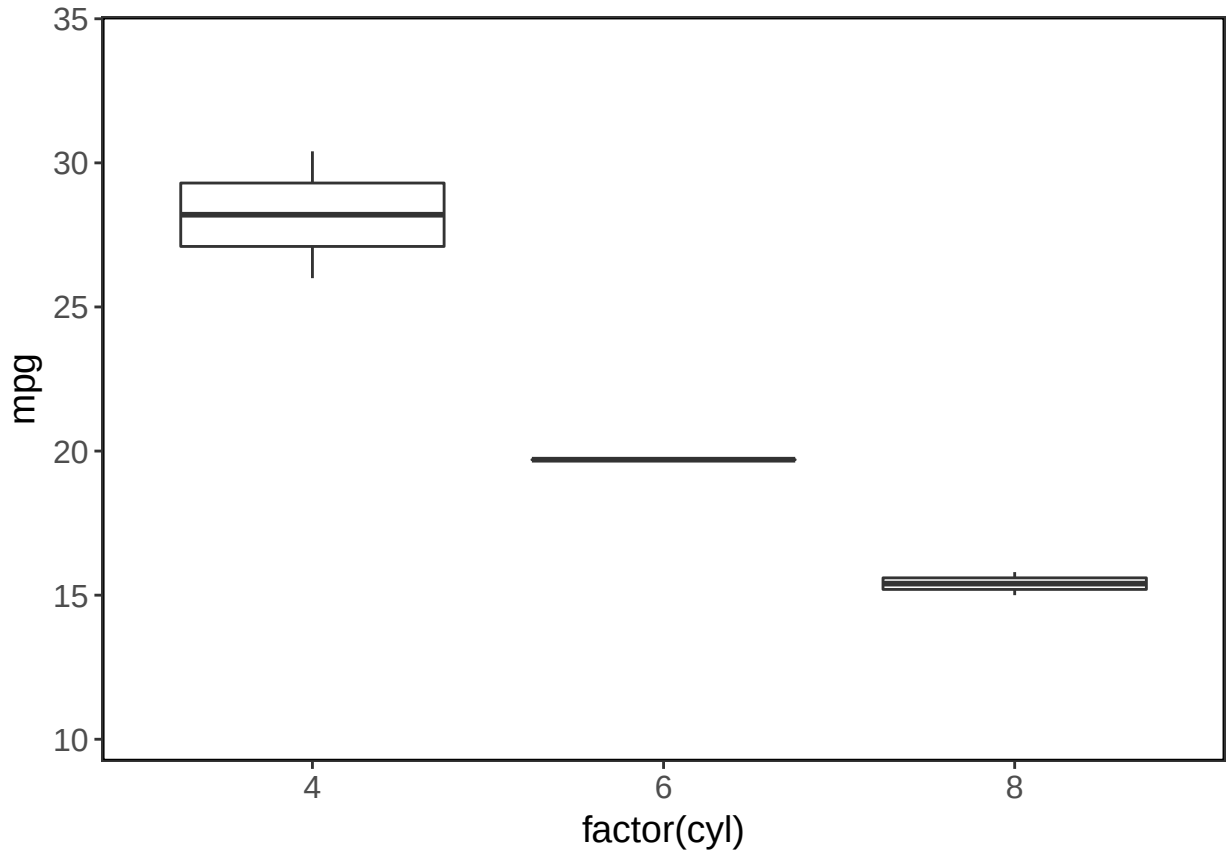
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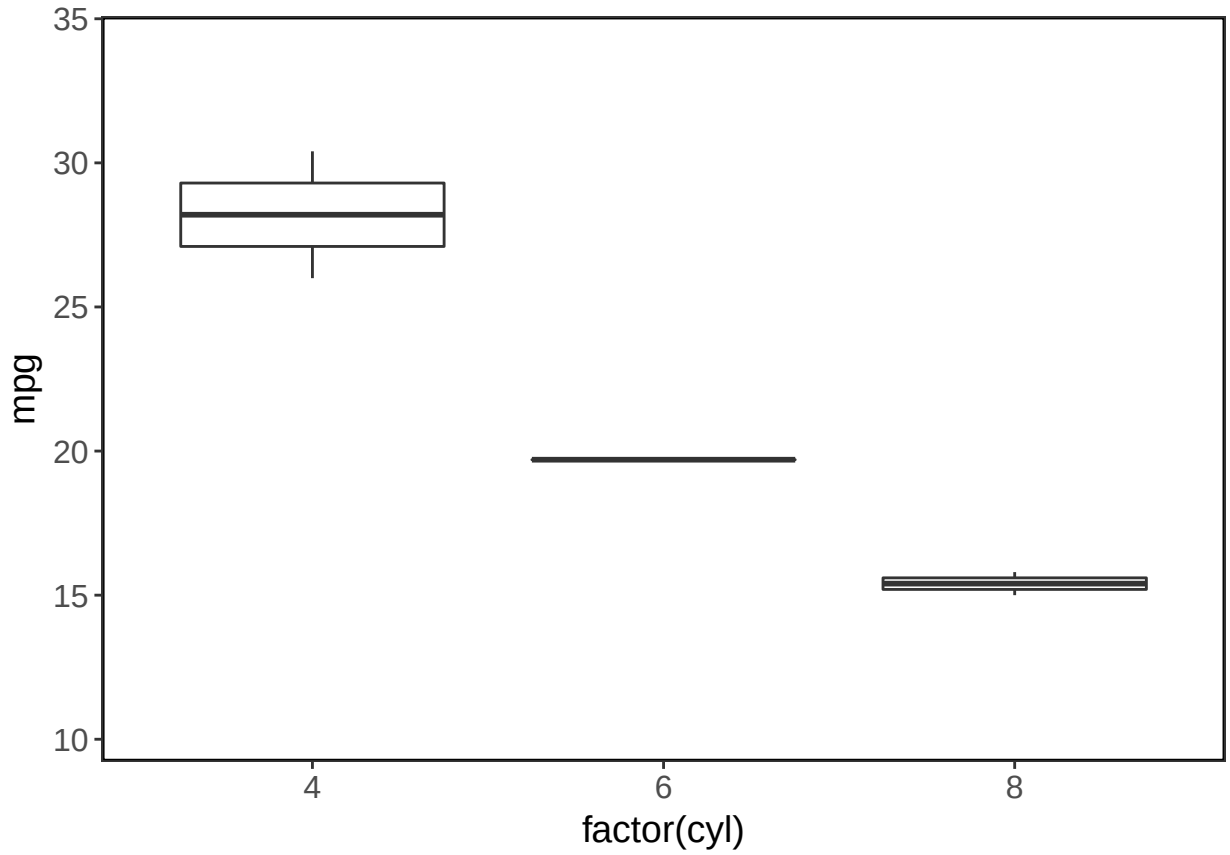
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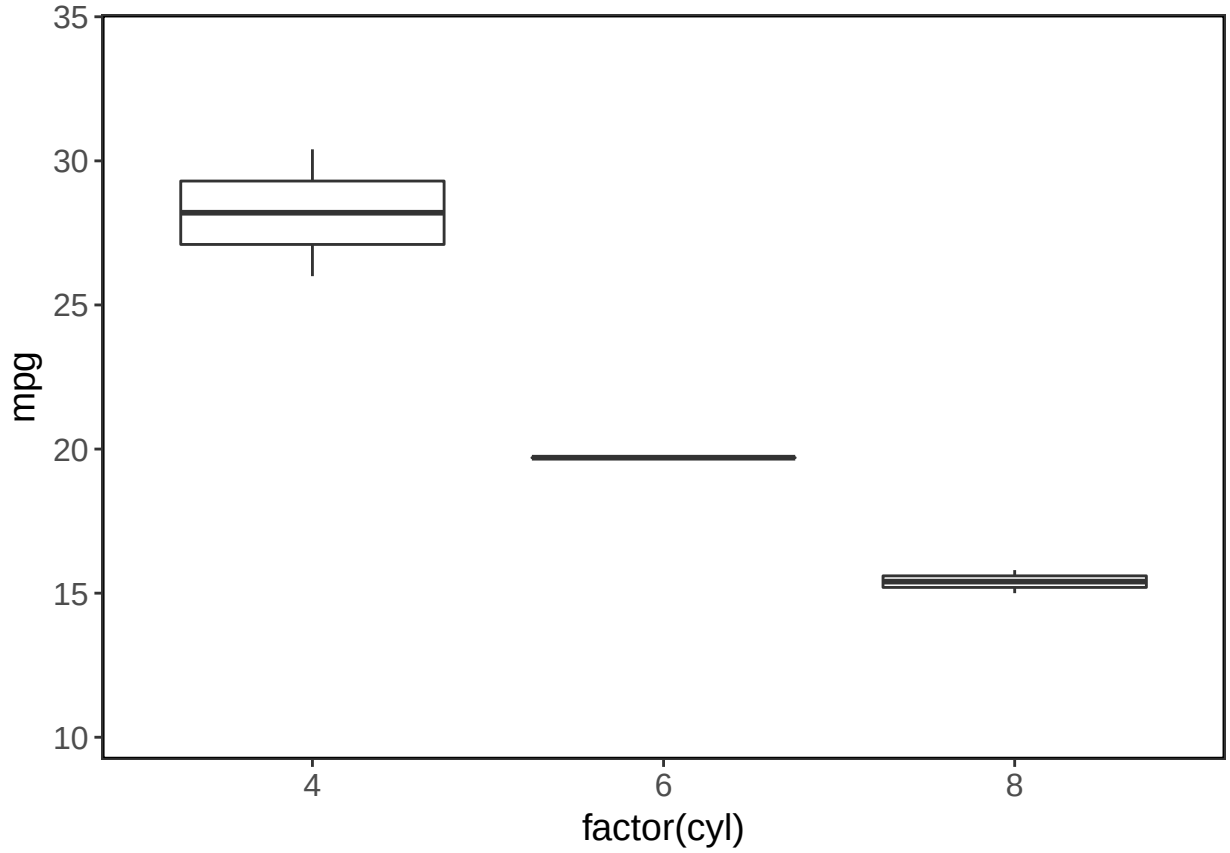
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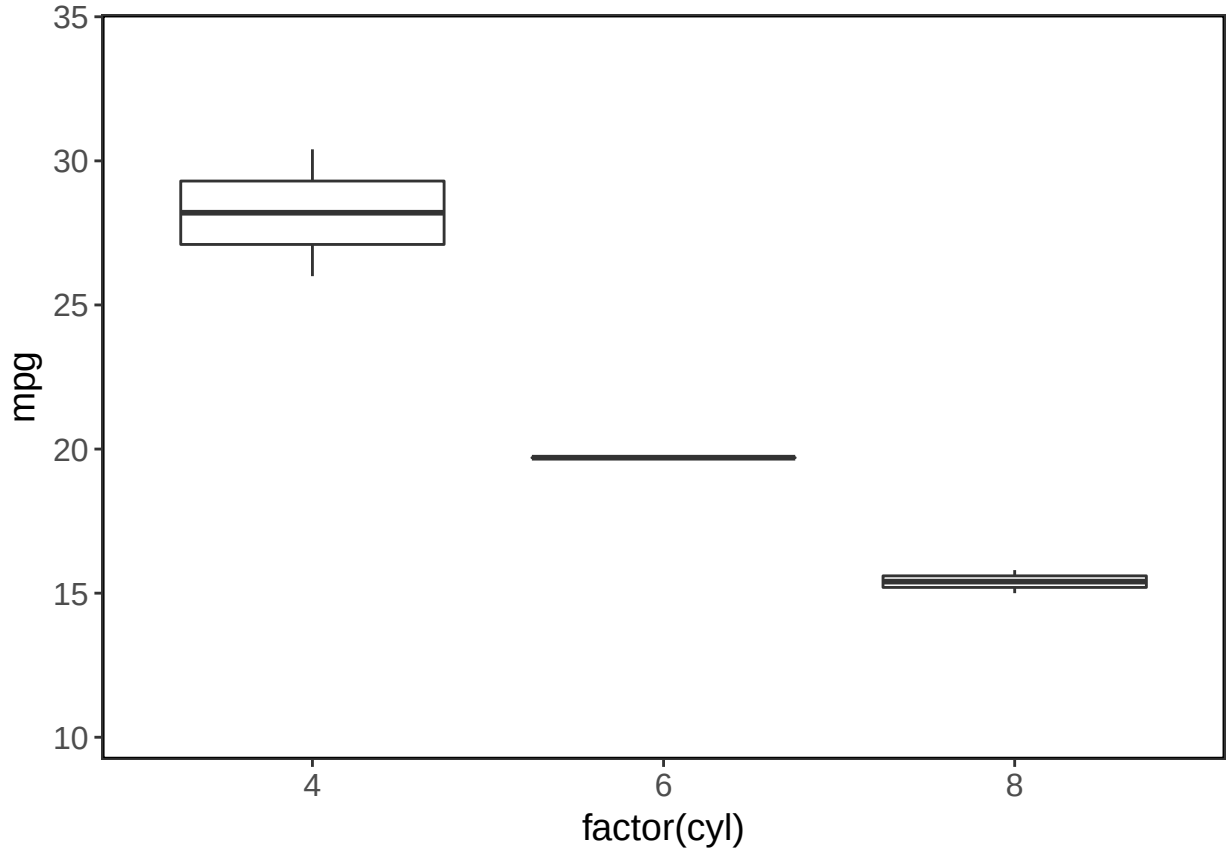
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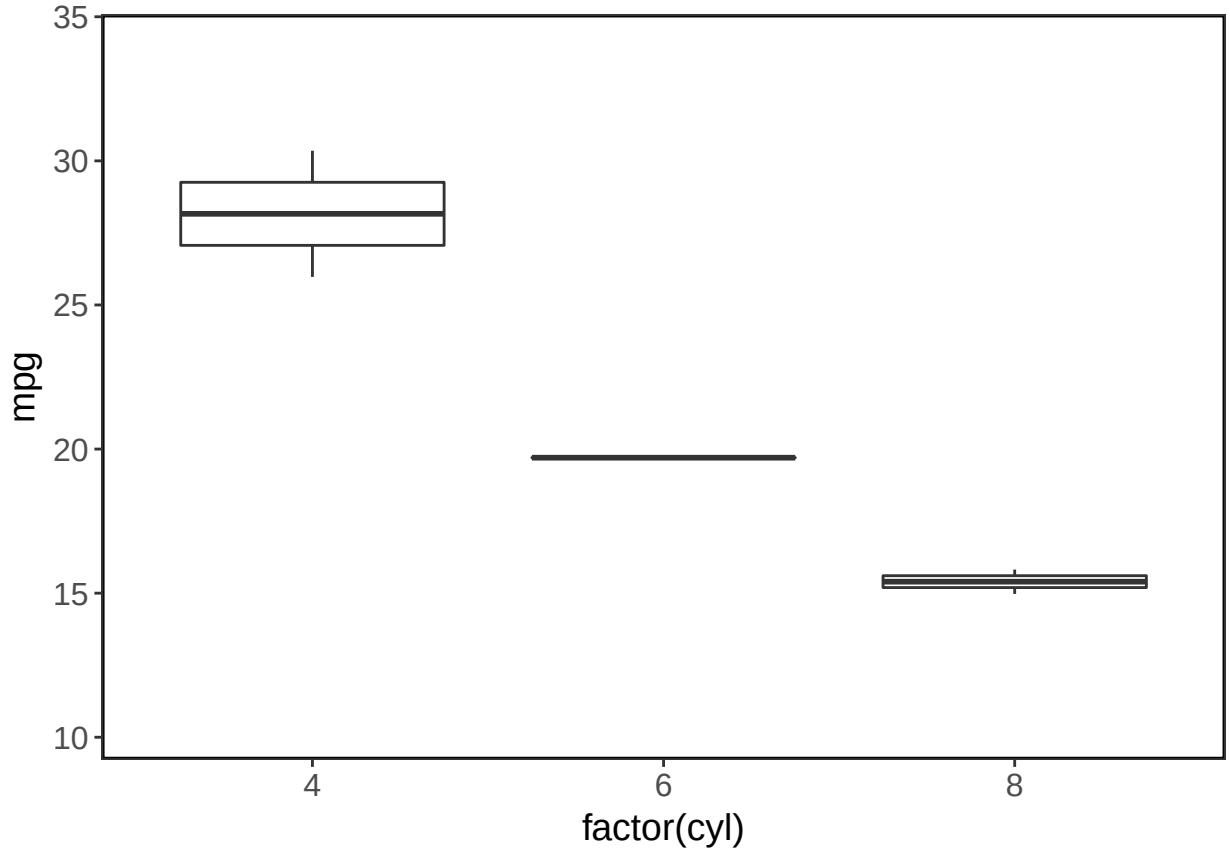
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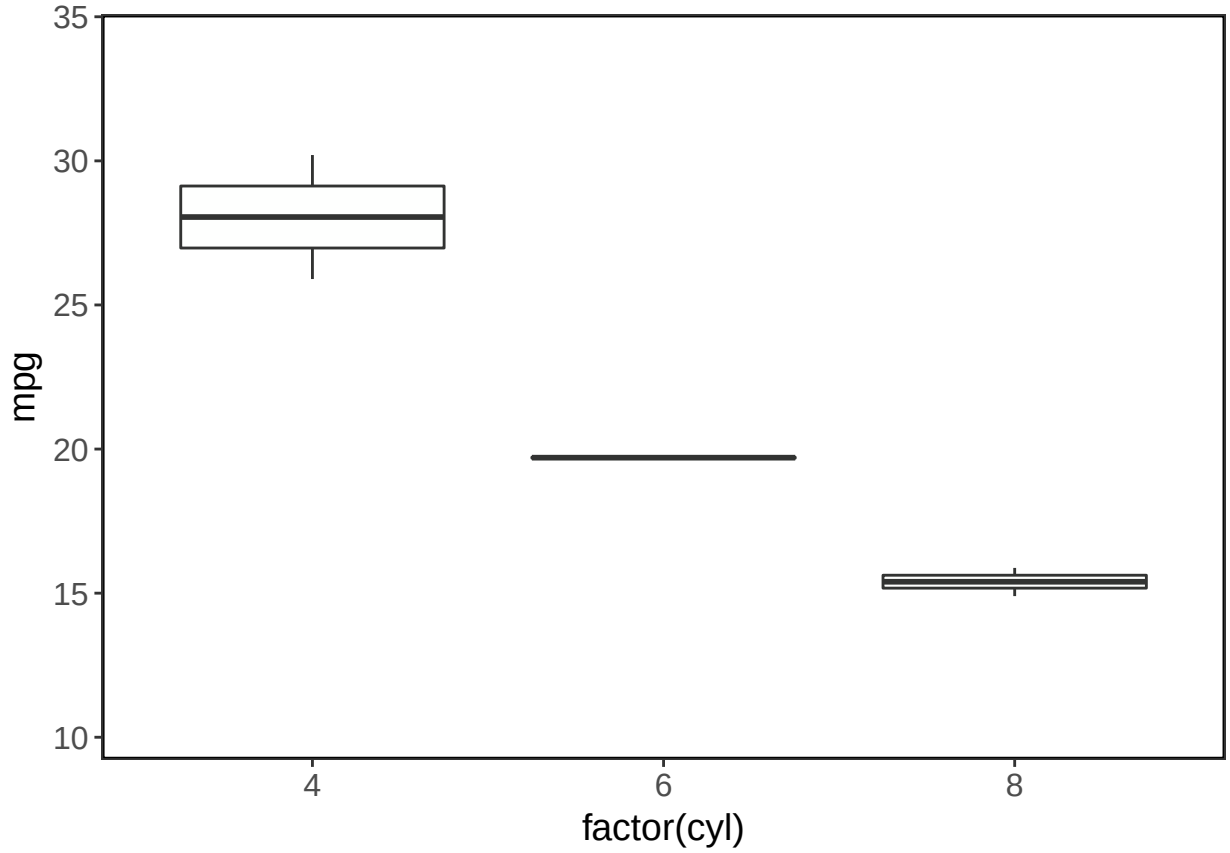
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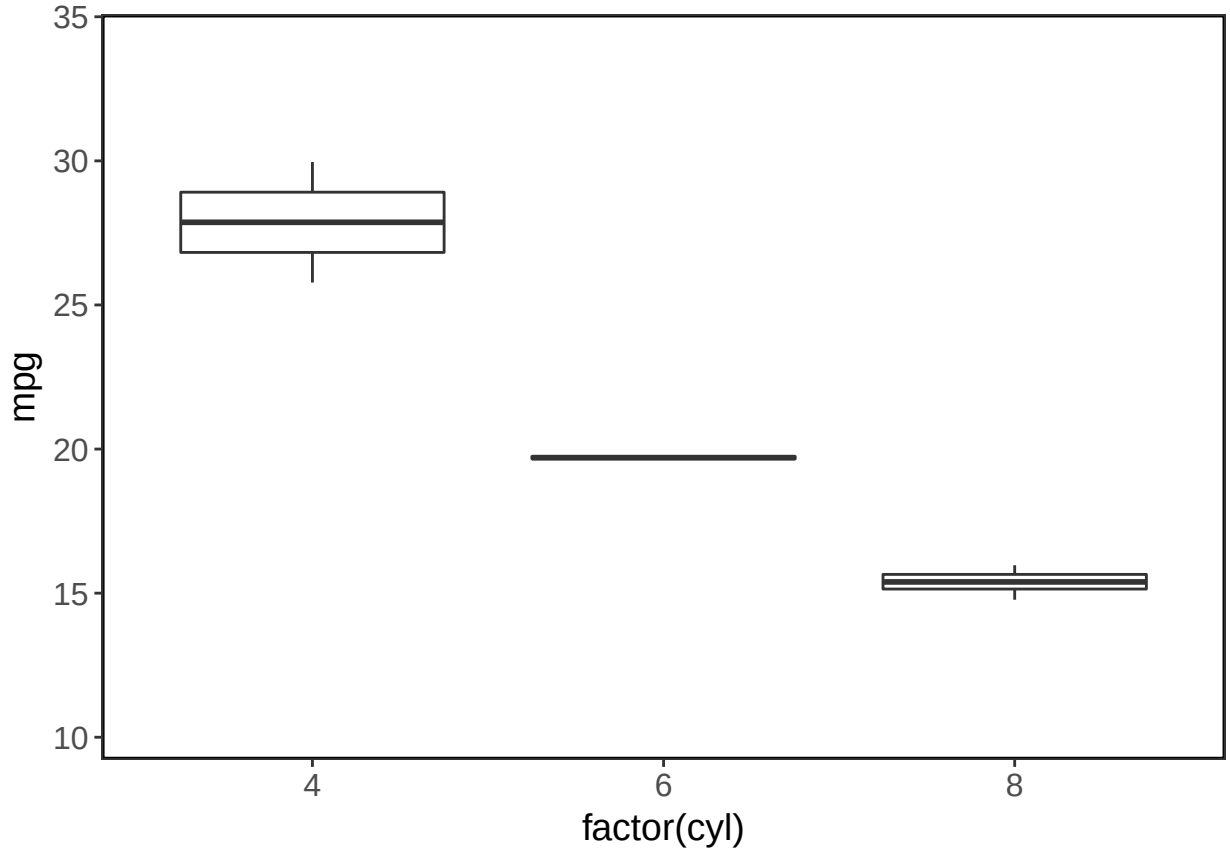
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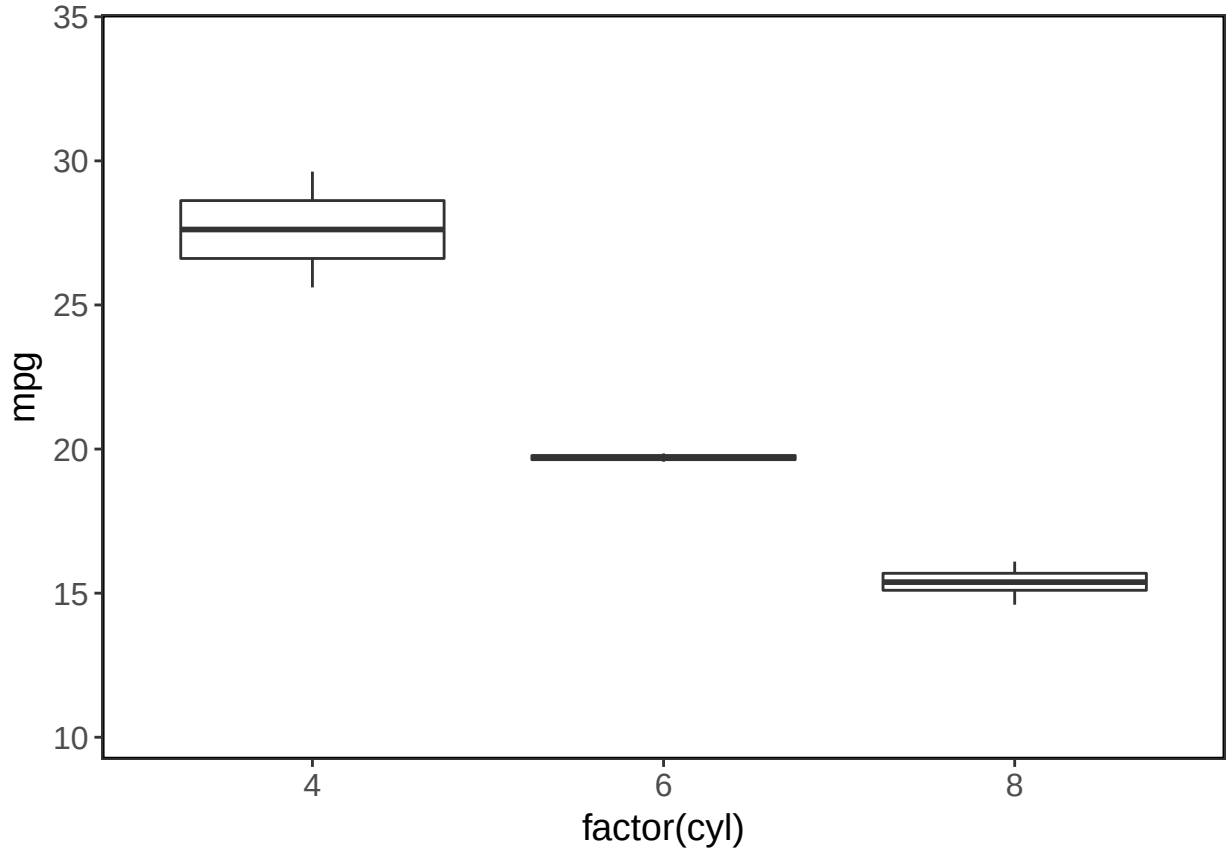
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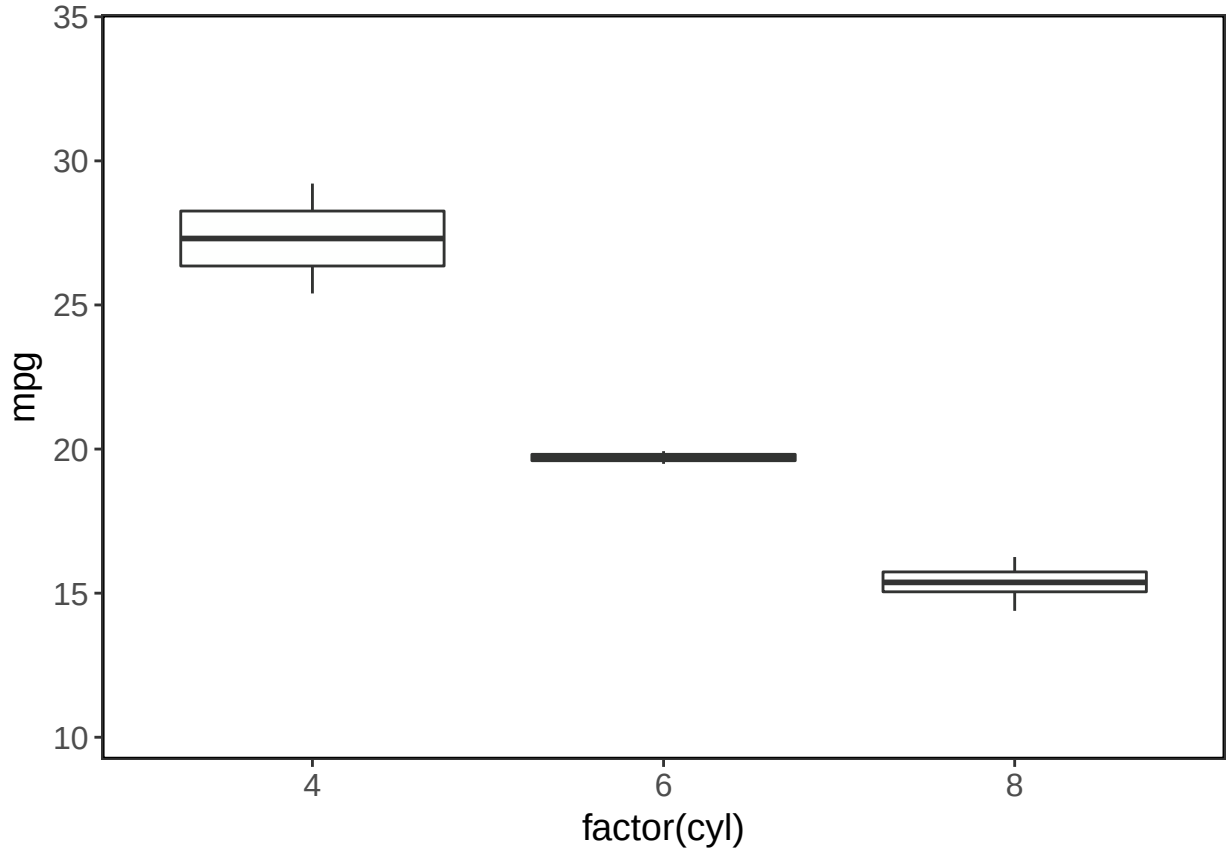
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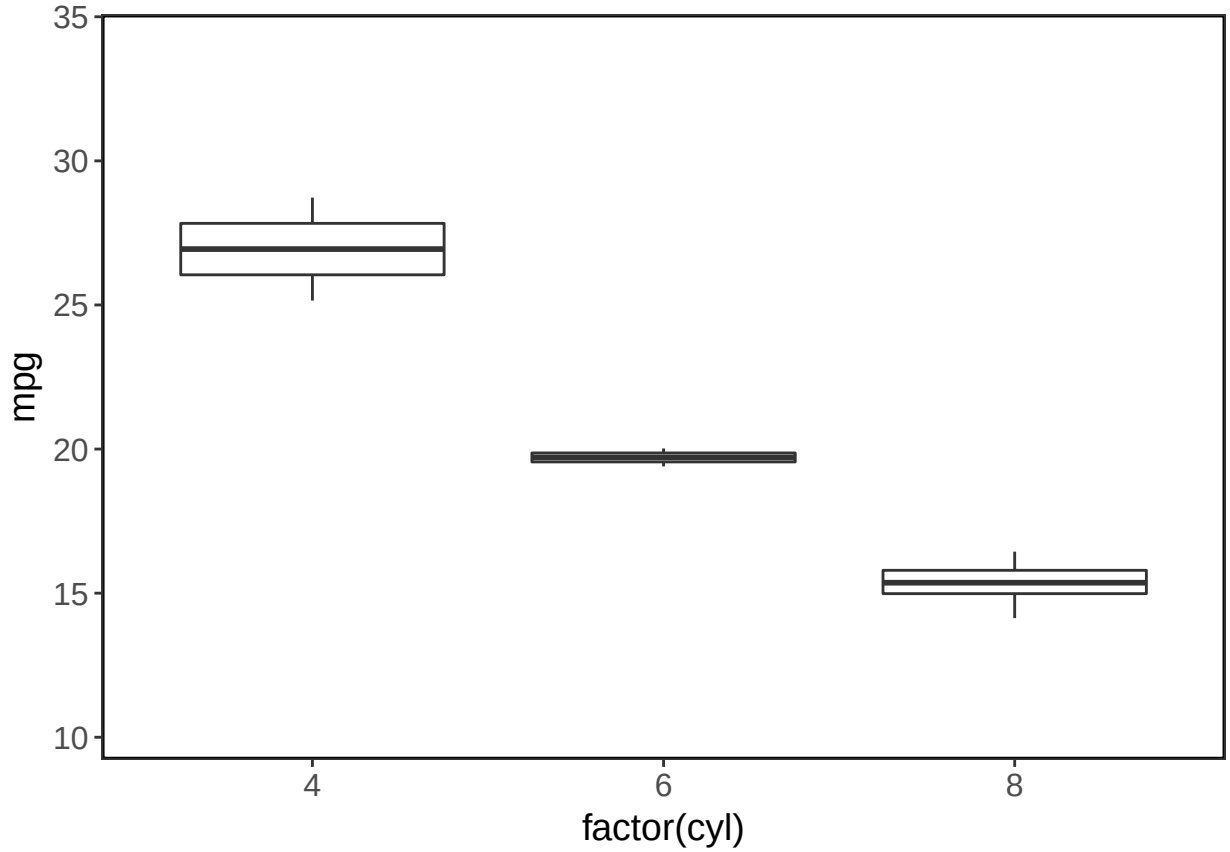
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mpg
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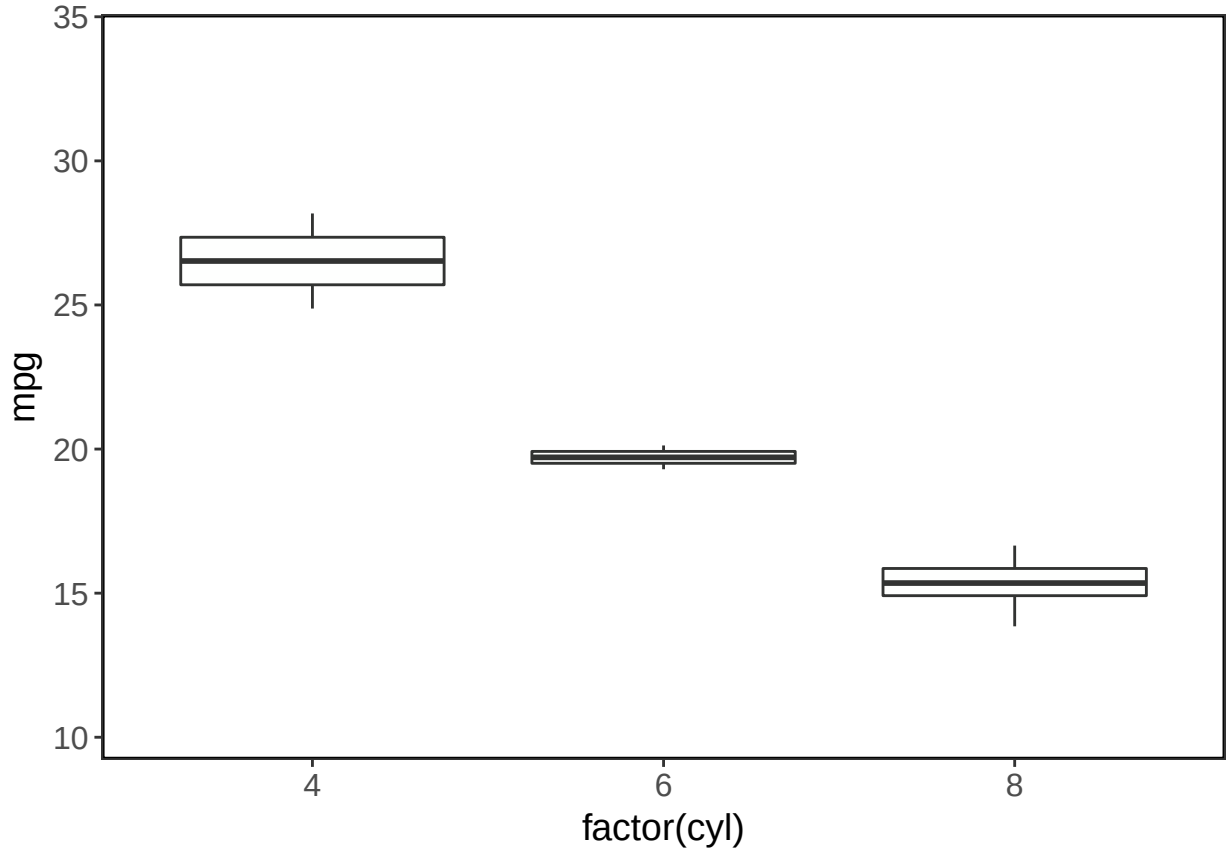
factor(cyl)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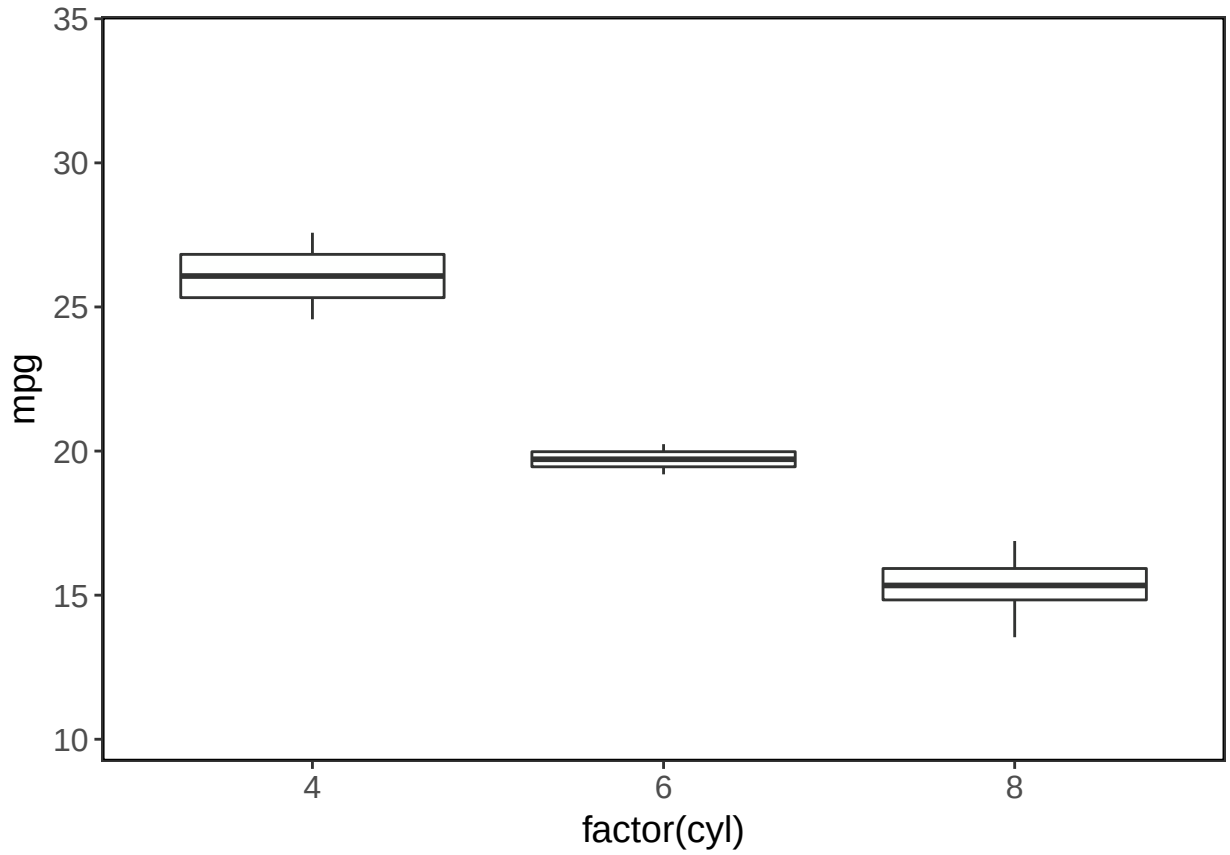
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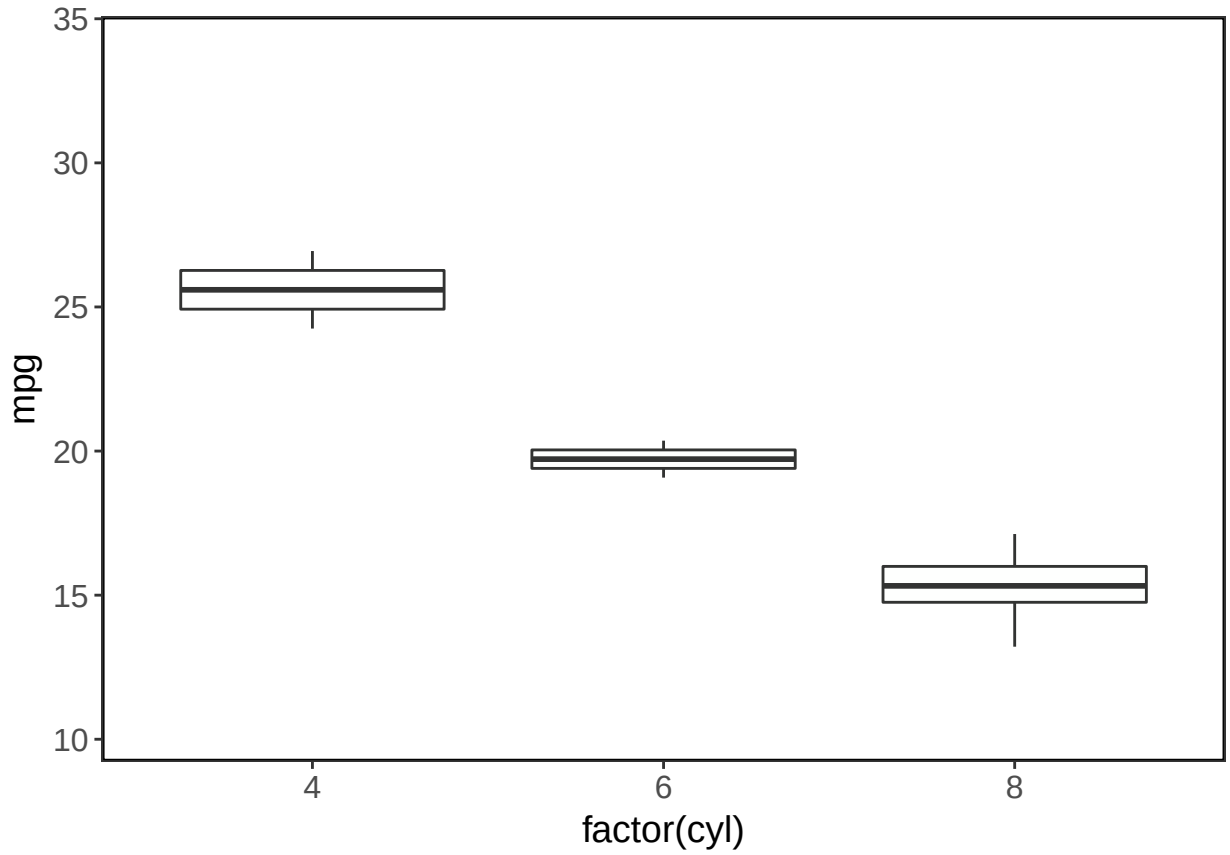
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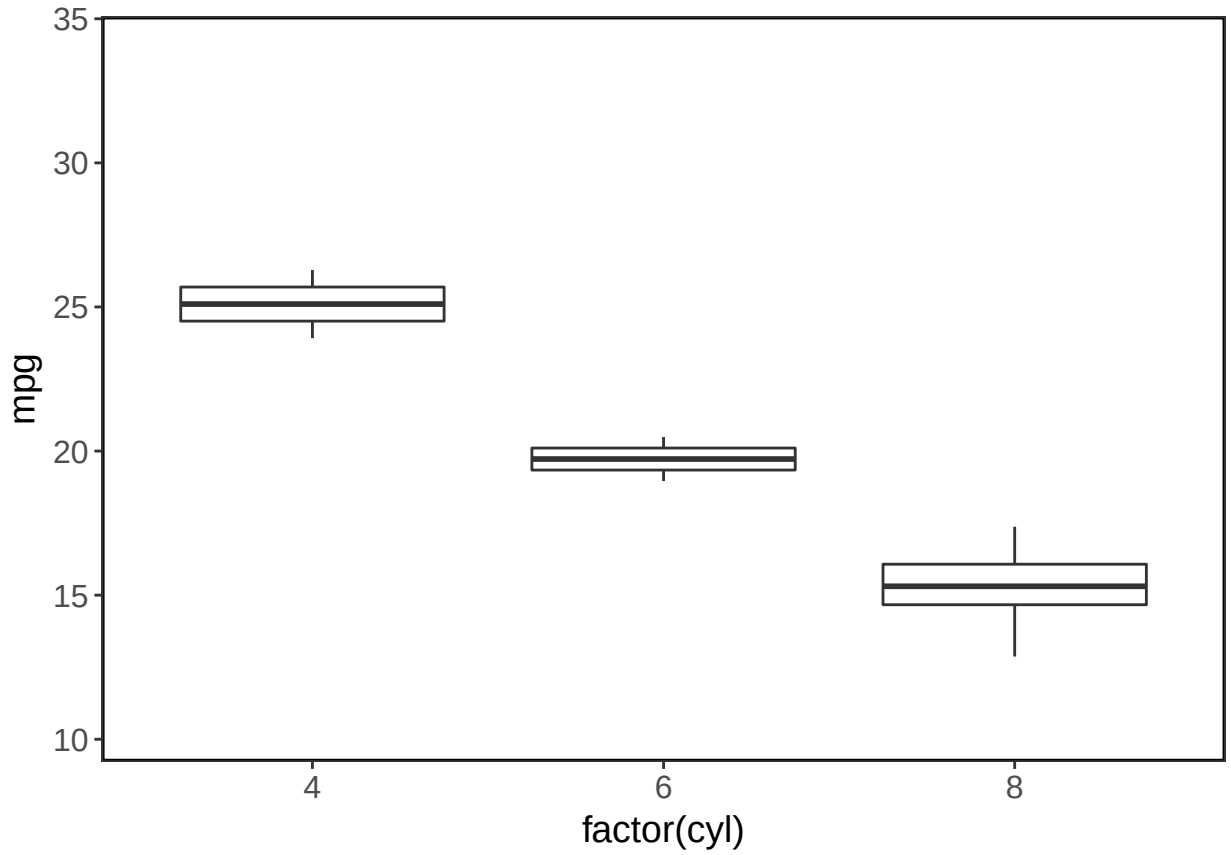
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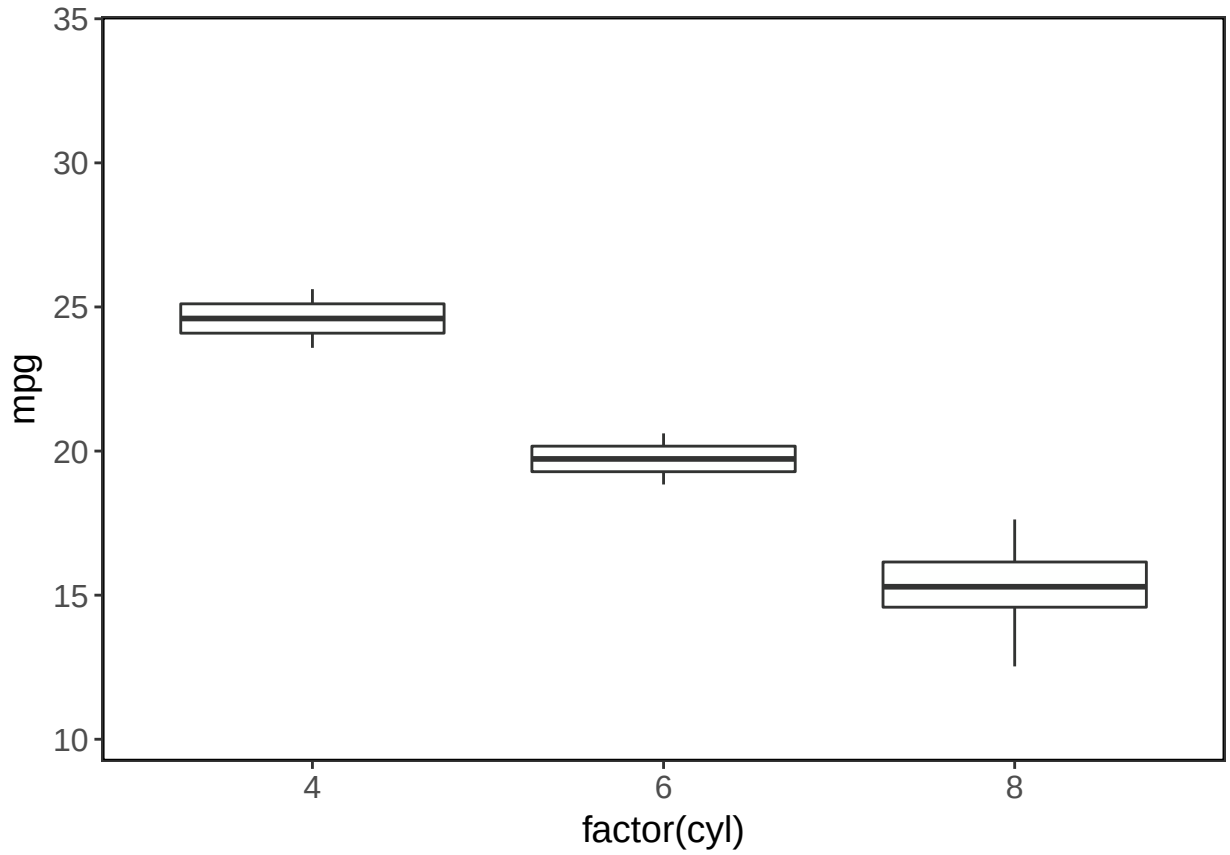
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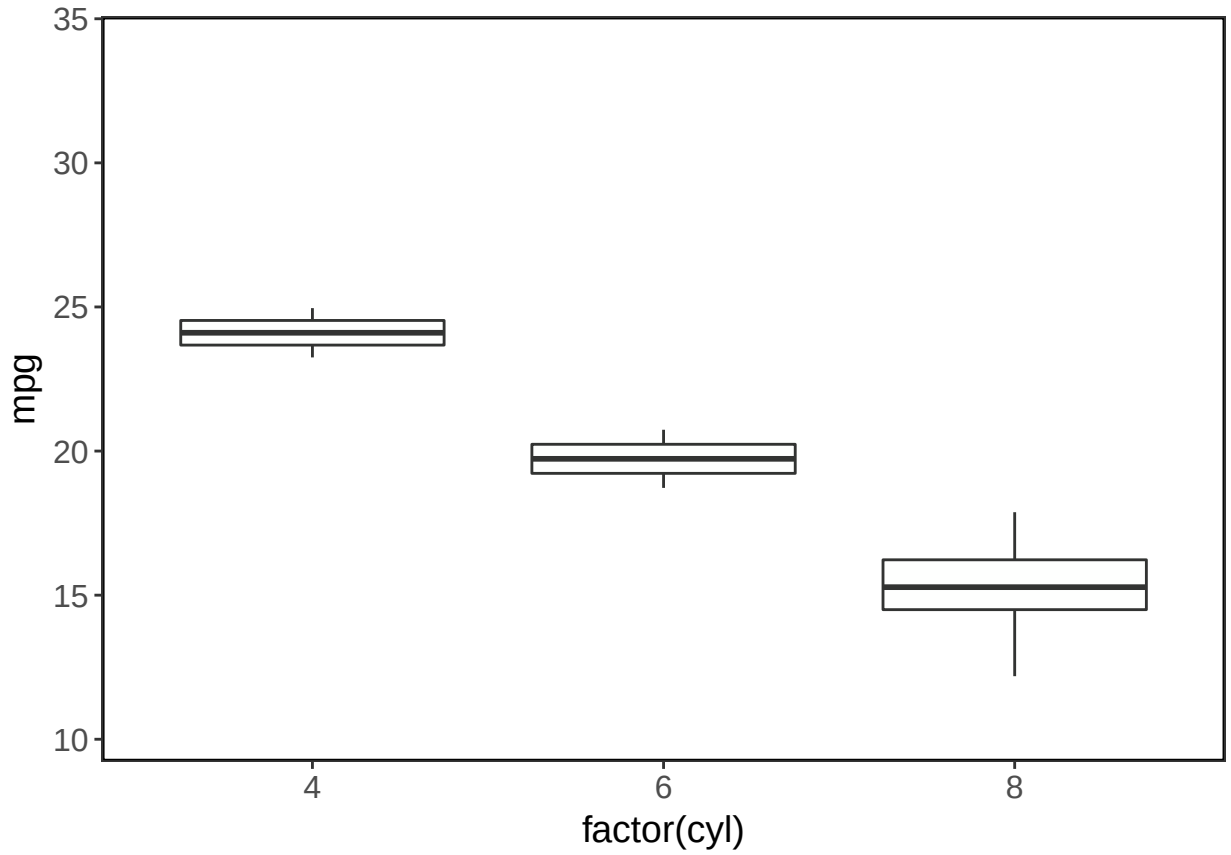
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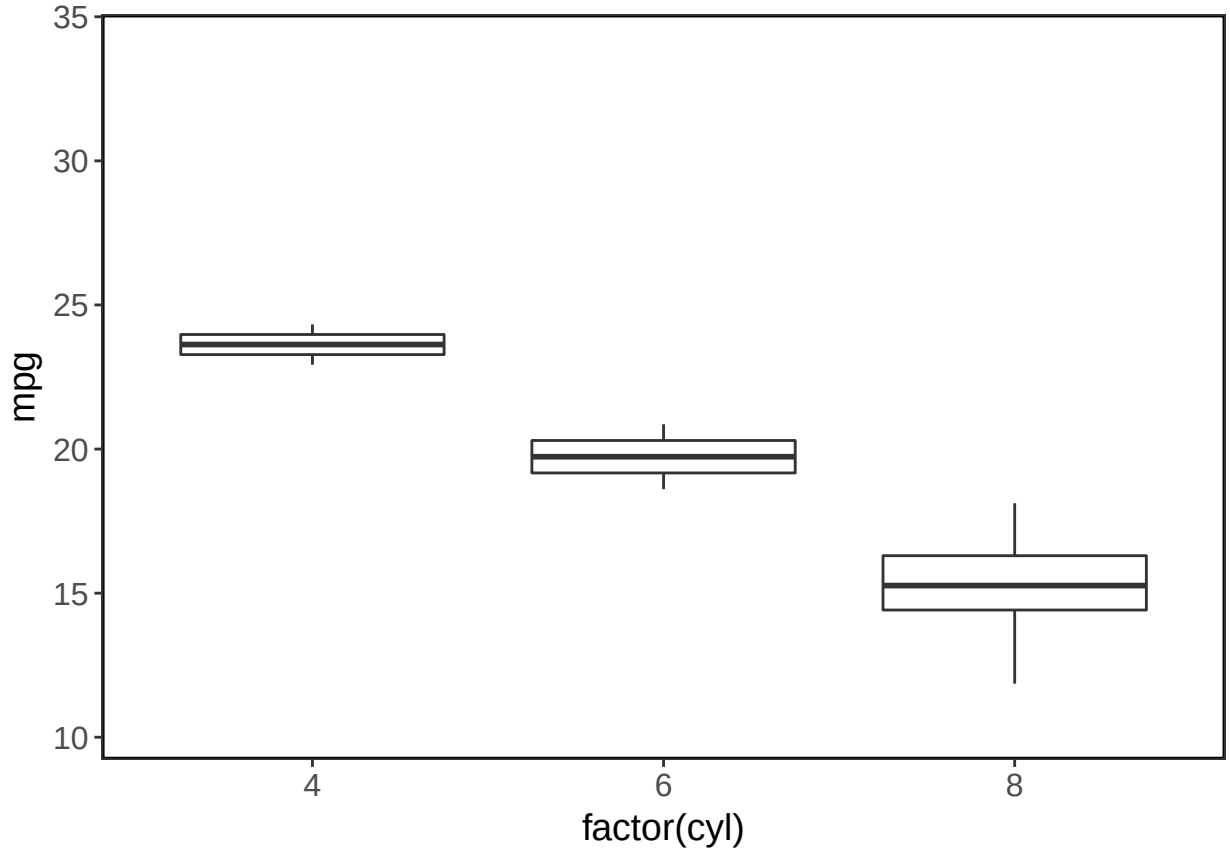
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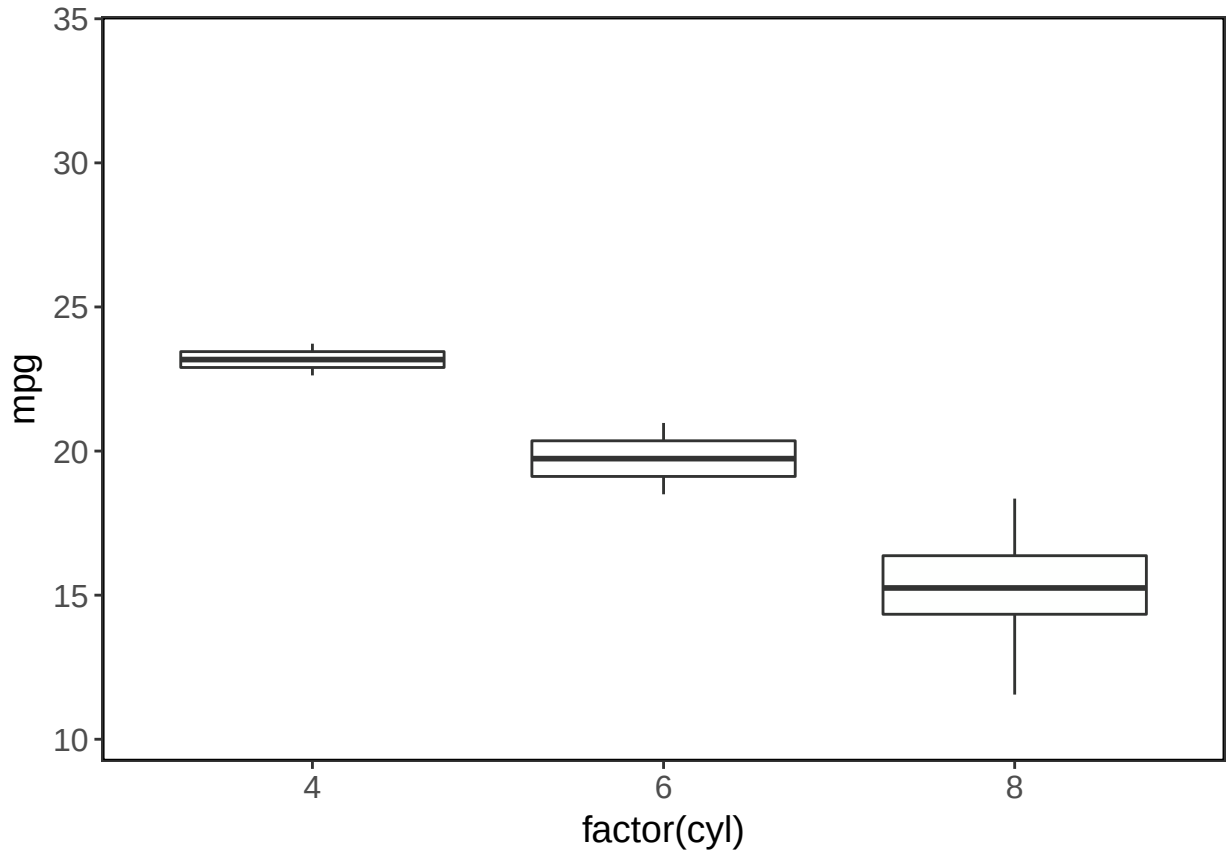
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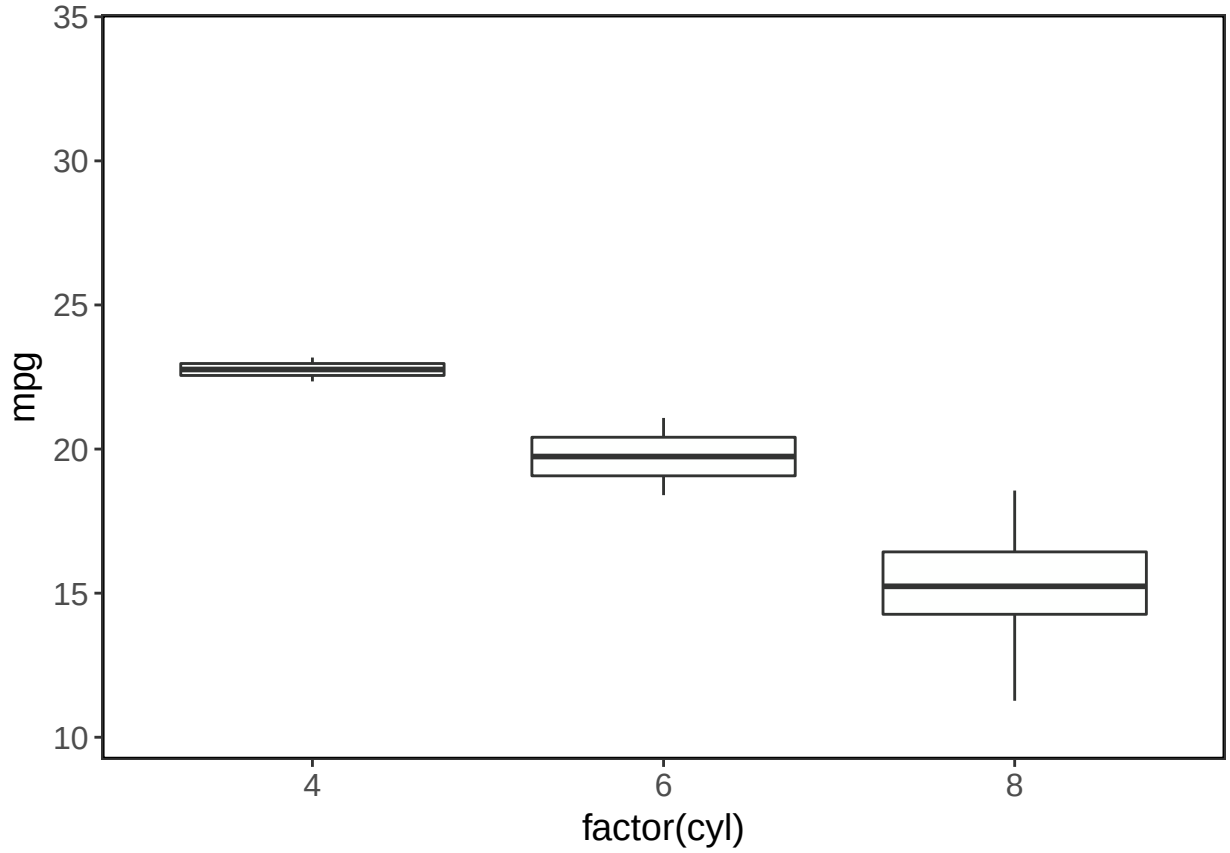
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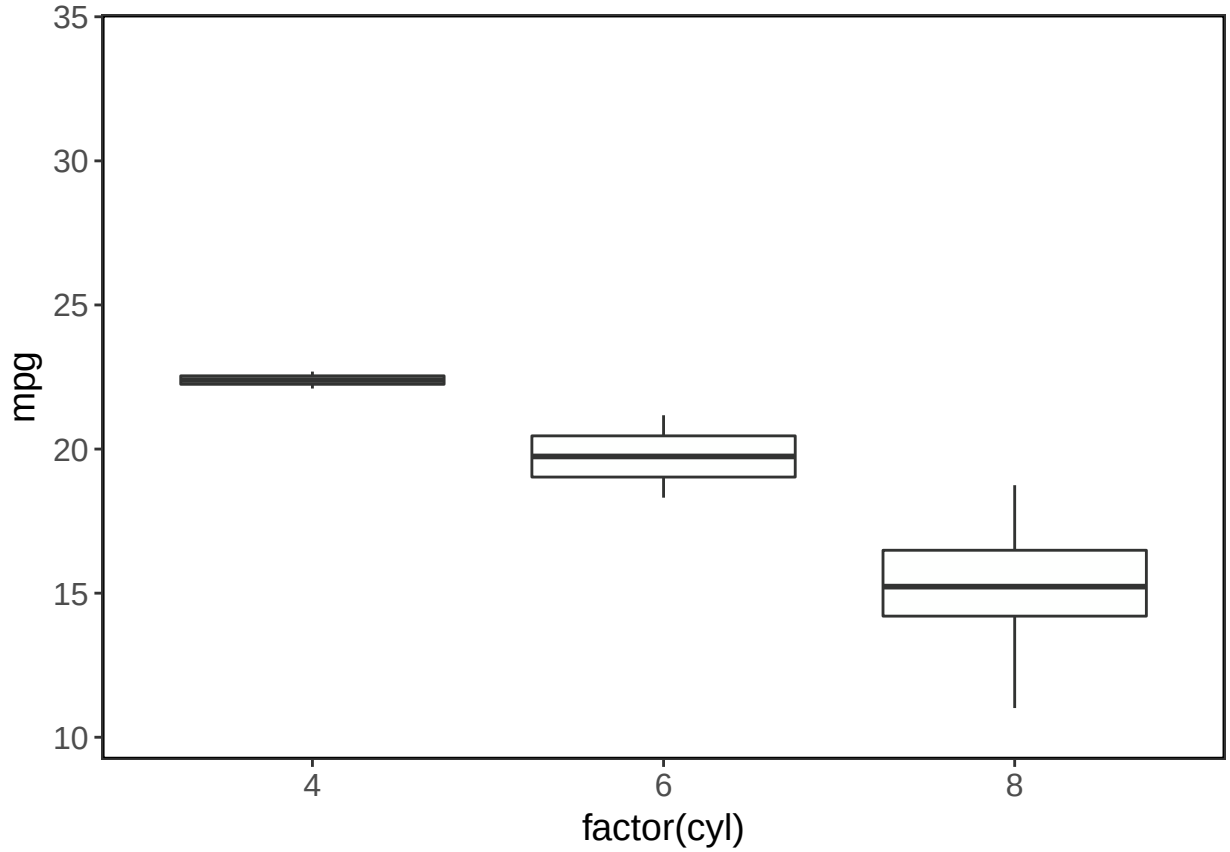
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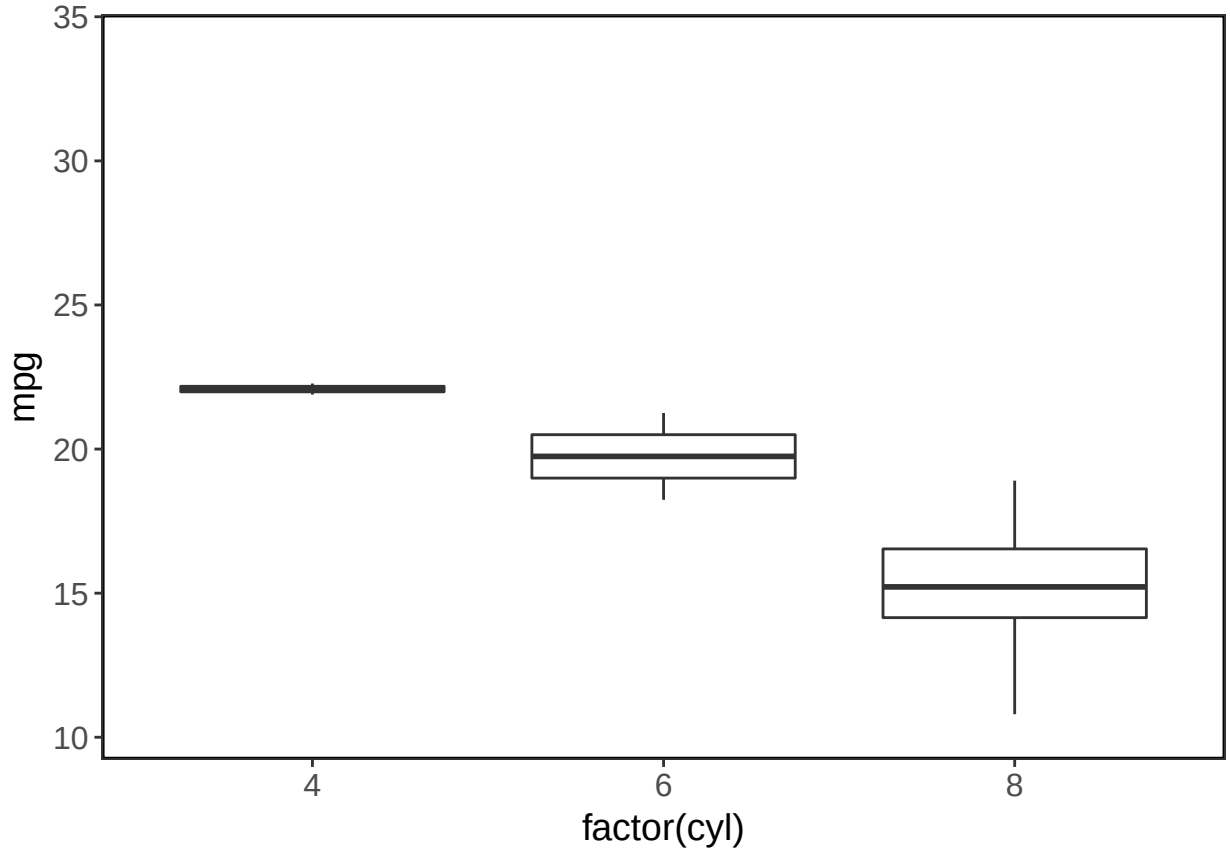
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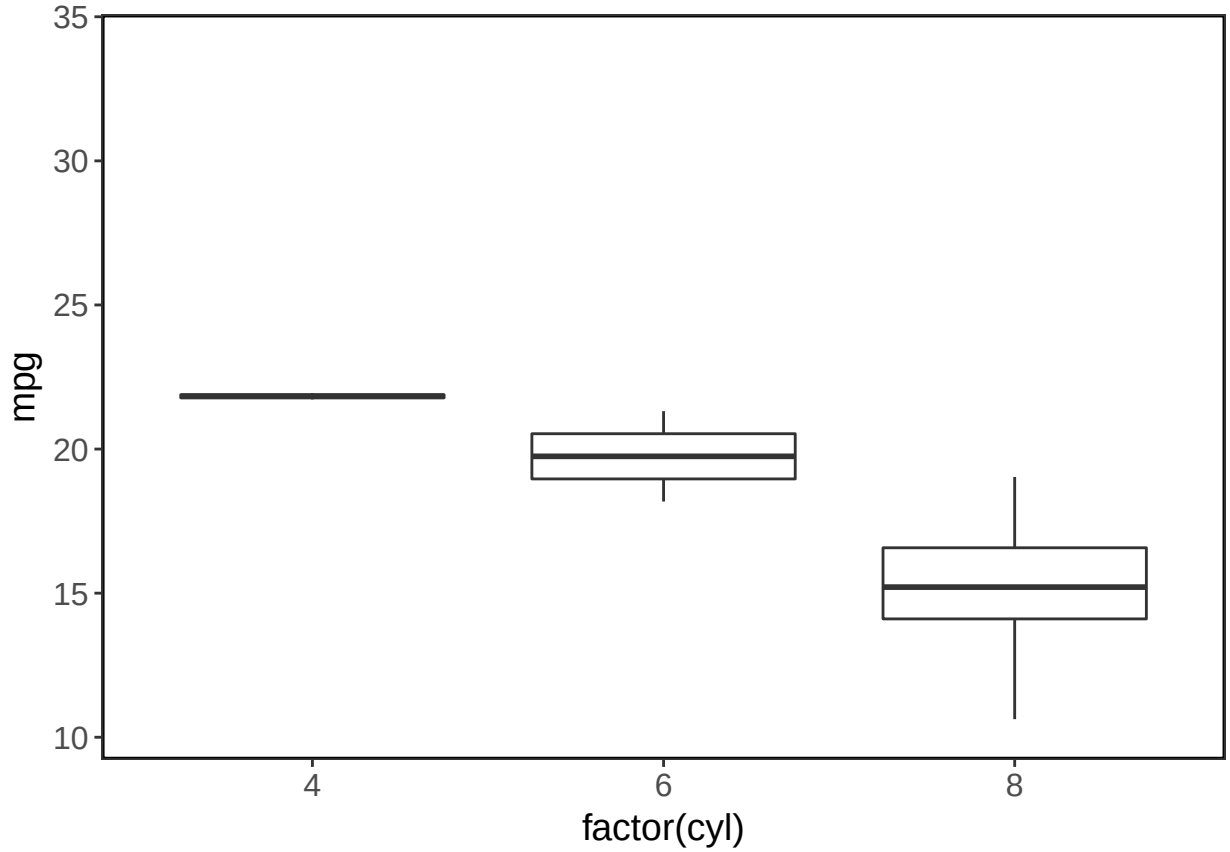
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mpg
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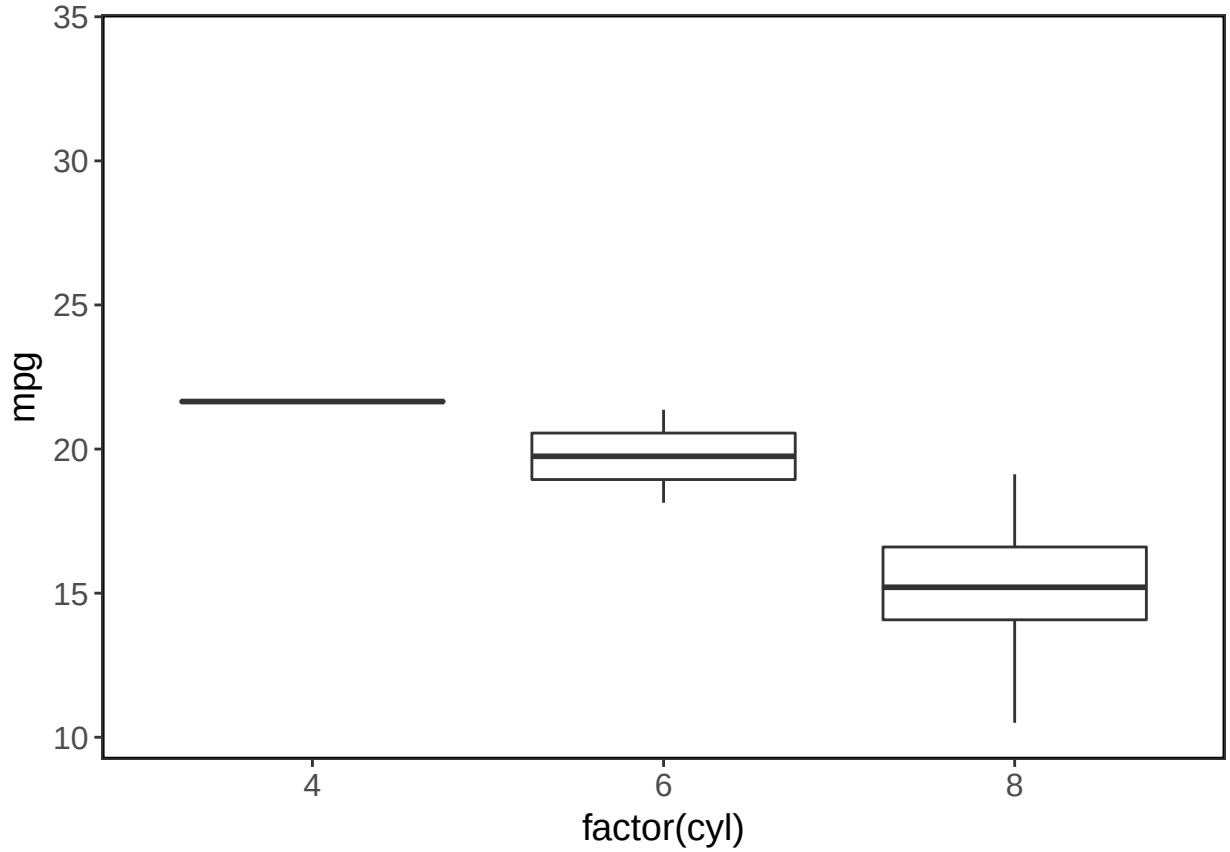
factor(cyl)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mpg
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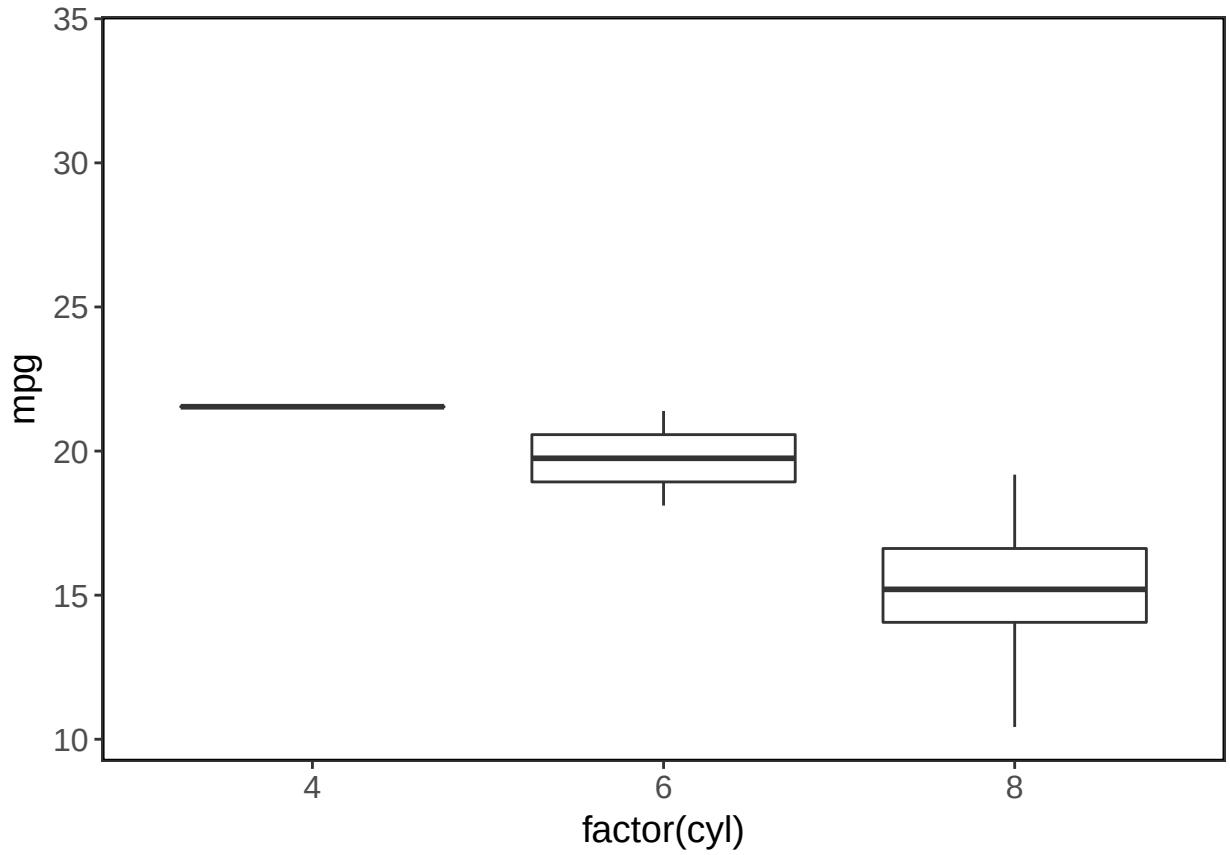
factor(cyl)



3) An example figure

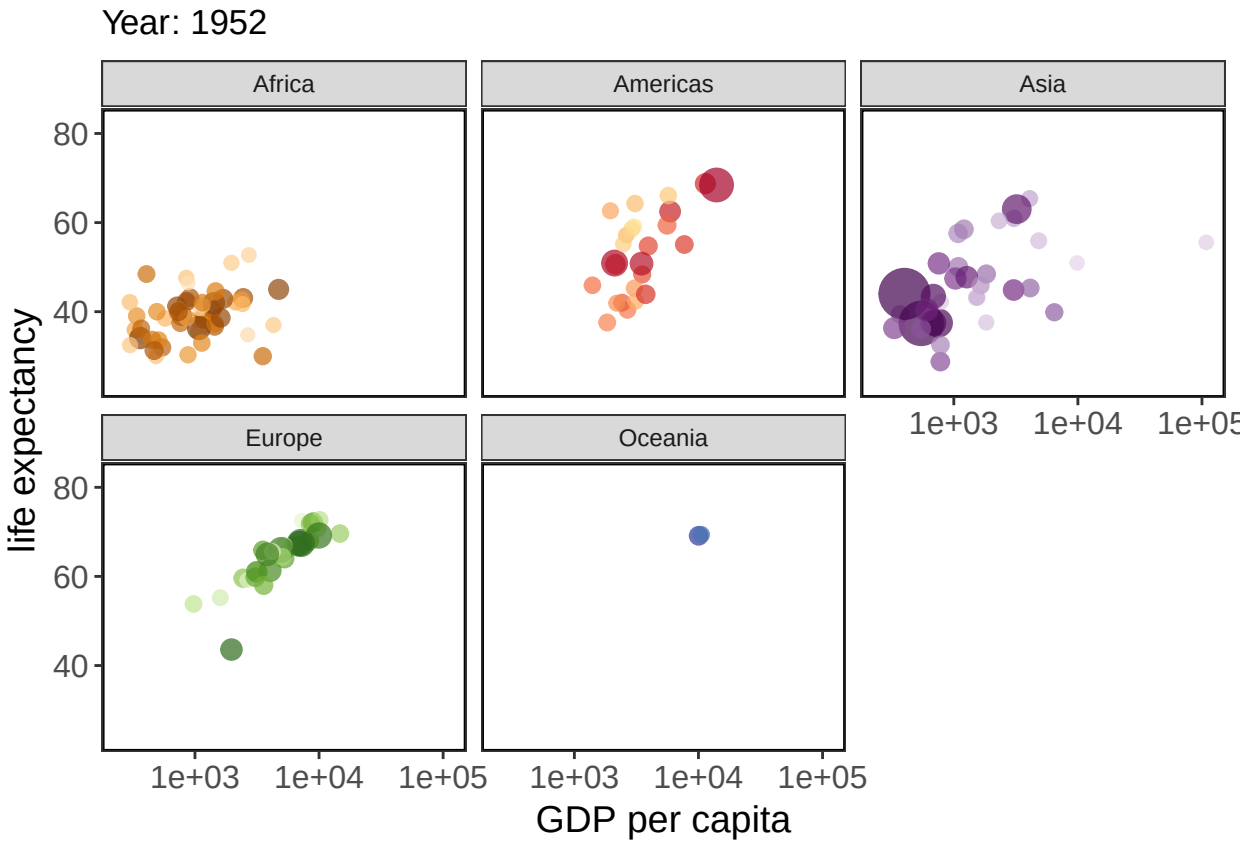
This next example uses the gapminder data set, which lists demographic statistics for multiple countries and how they change yearly throughout the 20th century. This graph uses time as its transition variable, and plots life expectancy versus GDP grouped by continent. Additionally, population for each country is mapped to the size of the point on the plot (i.e., the dot getting larger through time indicates increasing population).

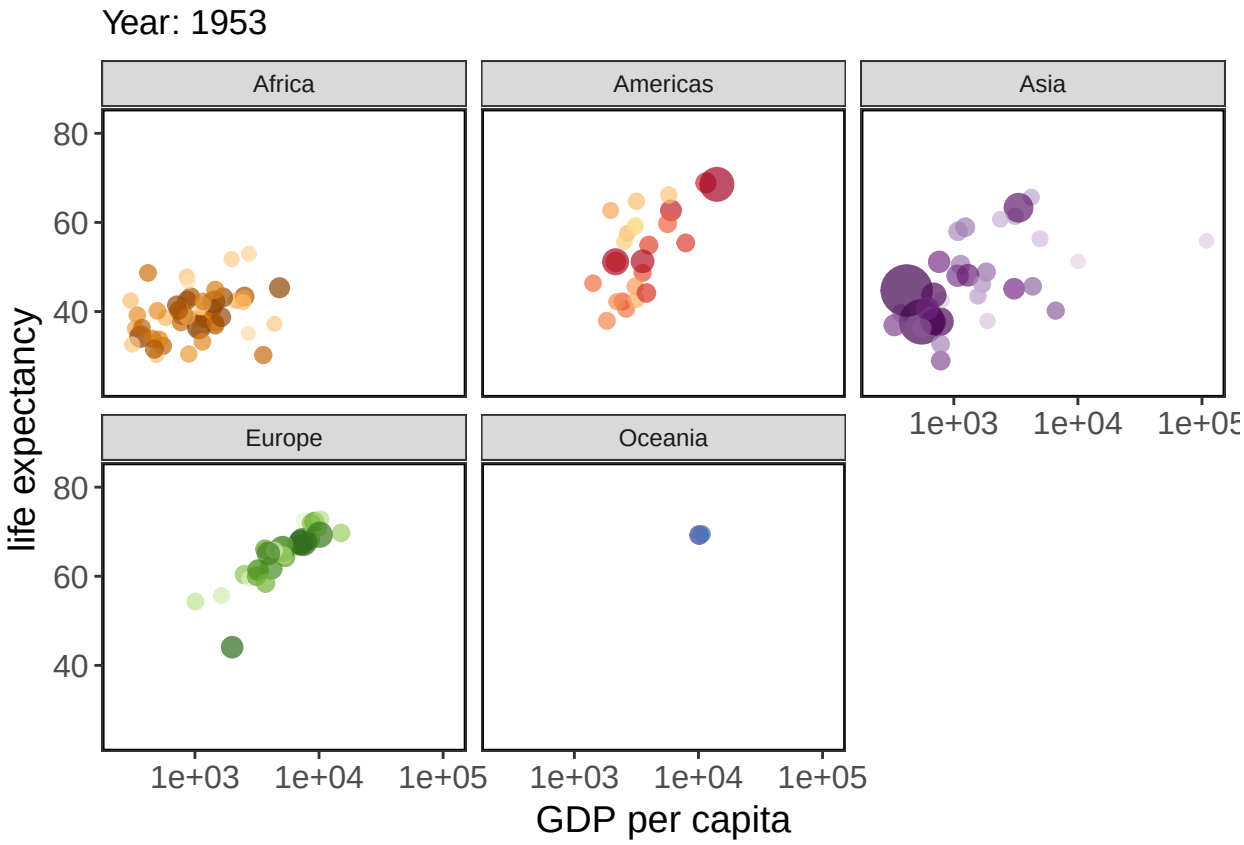
```
library(gapminder)
head(gapminder)
```

```
## # A tibble: 6 x 6
##   country     continent  year lifeExp      pop gdpPercap
##   <fct>       <fct>     <int>   <dbl>    <int>     <dbl>
## 1 Afghanistan Asia       1952    28.8  8425333      779.
## 2 Afghanistan Asia       1957    30.3  9240934      821.
## 3 Afghanistan Asia       1962    32.0 10267083      853.
## 4 Afghanistan Asia       1967    34.0 11537966      836.
## 5 Afghanistan Asia       1972    36.1 13079460      740.
## 6 Afghanistan Asia       1977    38.4 14880372      786.
```

```
# Here is regular ggplot syntax
ggplot(gapminder, aes(gdpPercap, lifeExp, size = pop, colour = country)) +
  geom_point(alpha = 0.7, show.legend = FALSE) +
```

```
scale_colour_manual(values = country_colors) +
scale_size(range = c(2, 12)) +
scale_x_log10() +
facet_wrap(~continent) +
# Here is the gganmimate code
# the labs function creates a label of the transition states as it changes, as well as the x and y ax
labs(title = 'Year: {frame_time}', x = 'GDP per capita', y = 'life expectancy') +
# the transition_time function accepts the an unquoted column name as the time series transition stat
# it is the time series version of the transition_states function above
transition_time(year) +
# ease_aes() defines the rate of change during transitions between states, as above
ease_aes('linear') +
# this is all theme stuff
theme_bw() +
theme(panel.grid.major = element_blank(),
      panel.grid.minor = element_blank(),
      panel.background = element_rect(colour = "black", size = 1)) +
theme(axis.text = element_text(size = 12),
      axis.title = element_text(size = 14))
```

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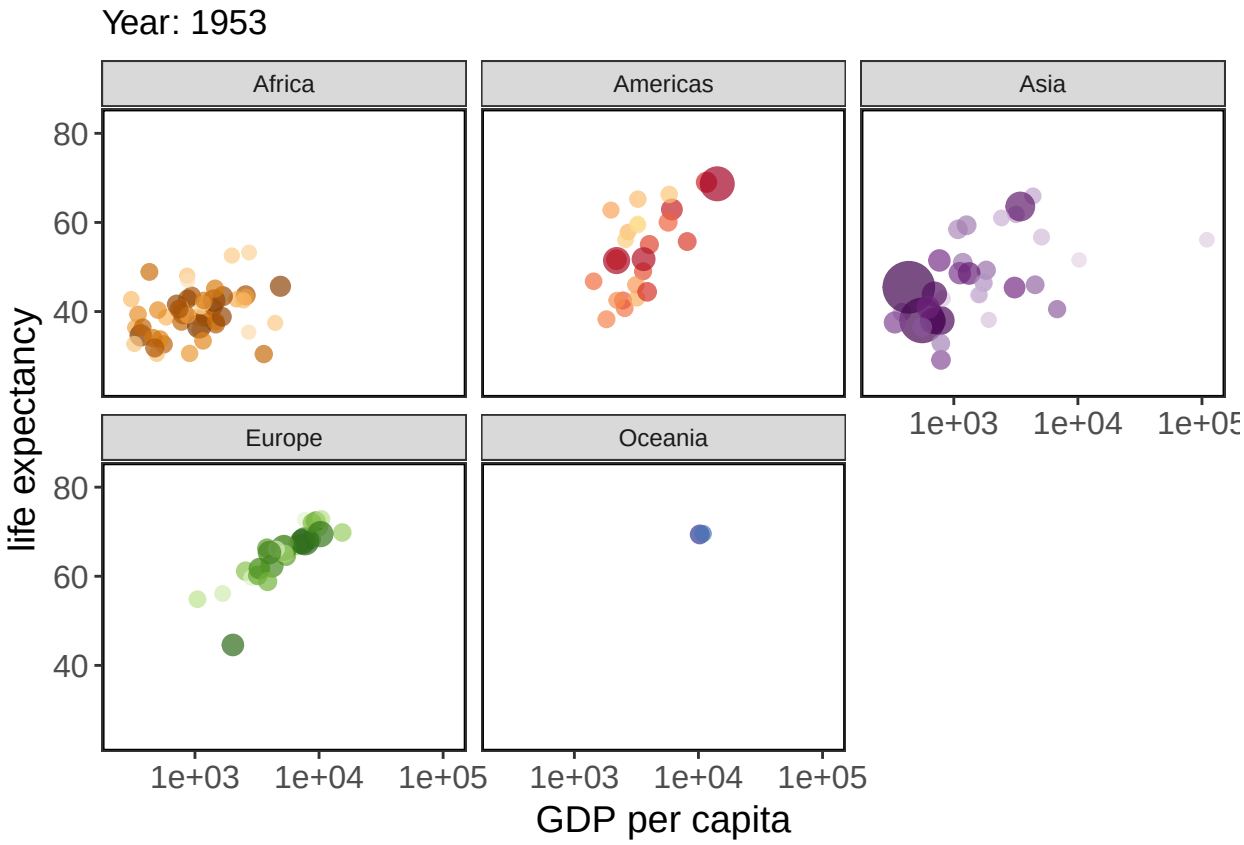
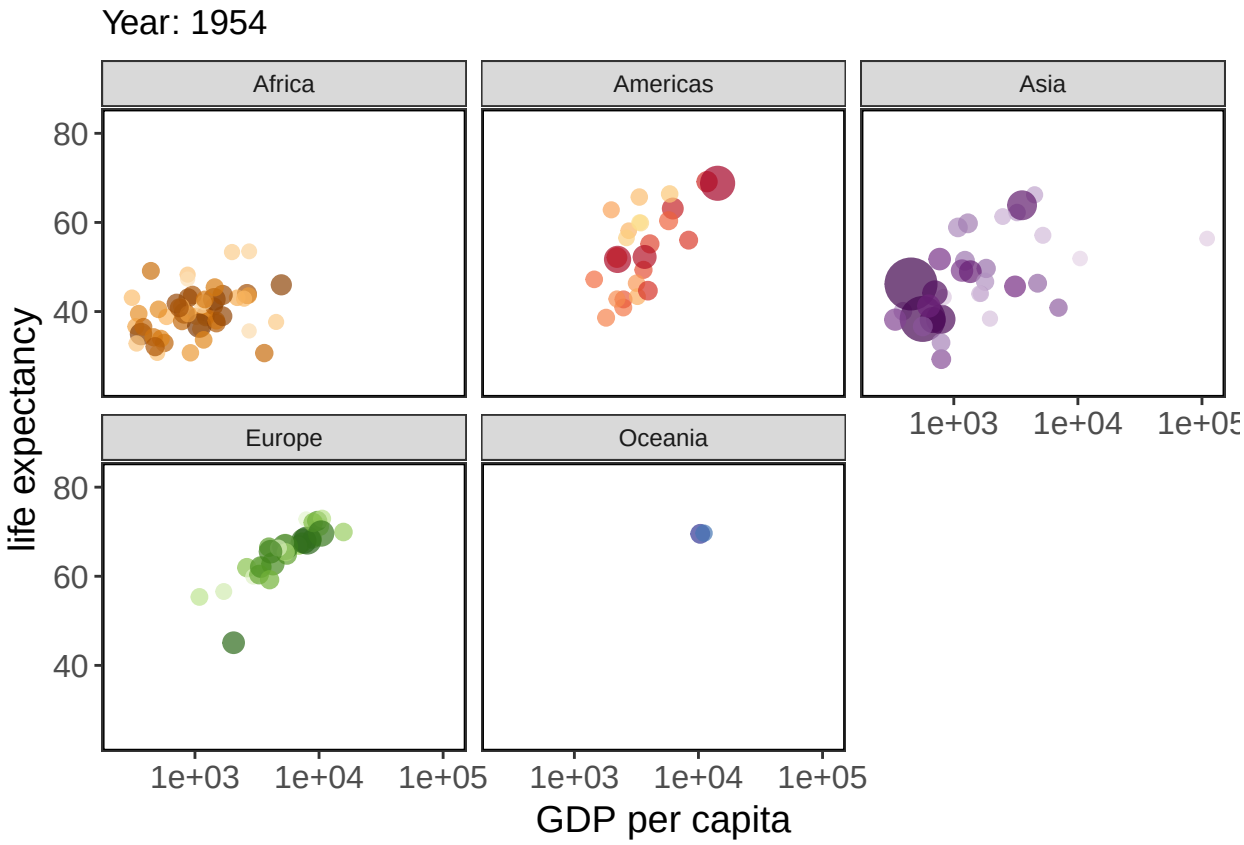
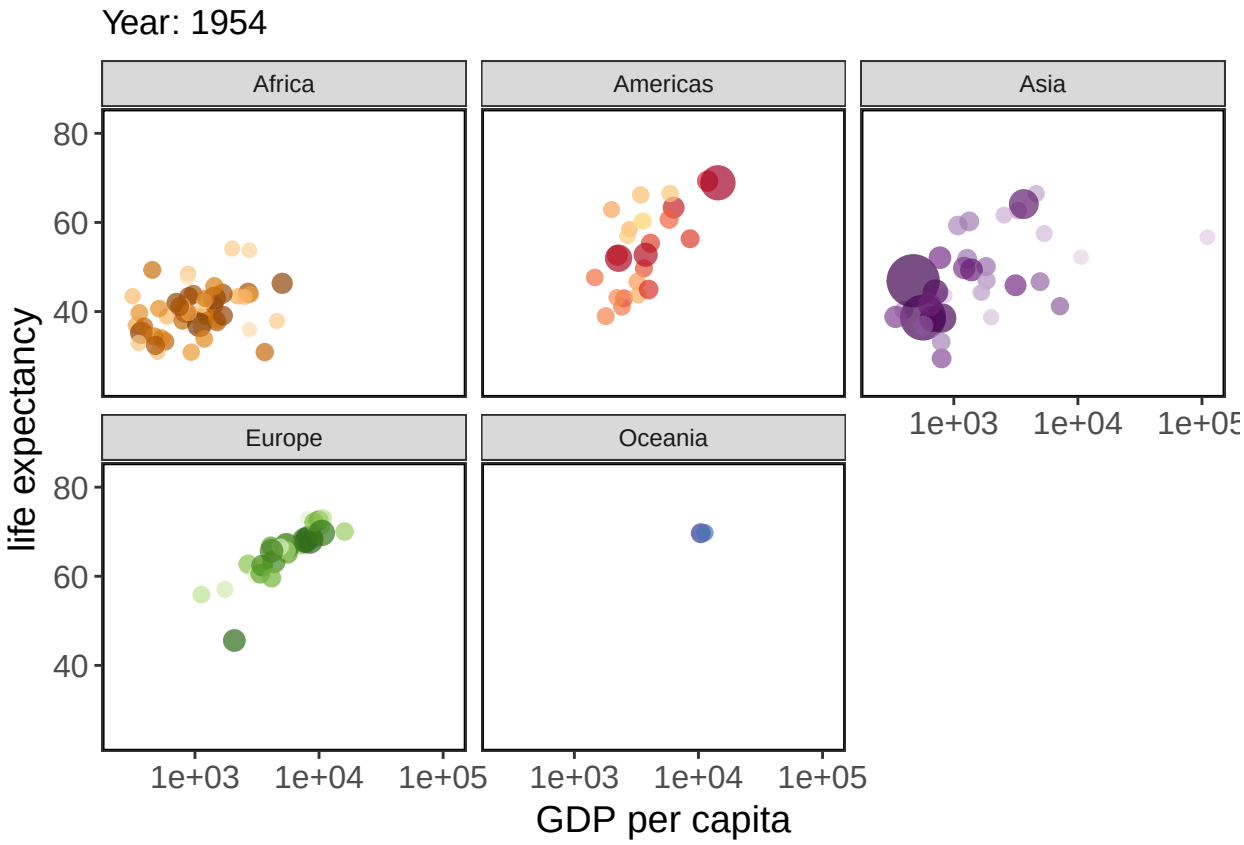
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1953
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1954
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita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Africa
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Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
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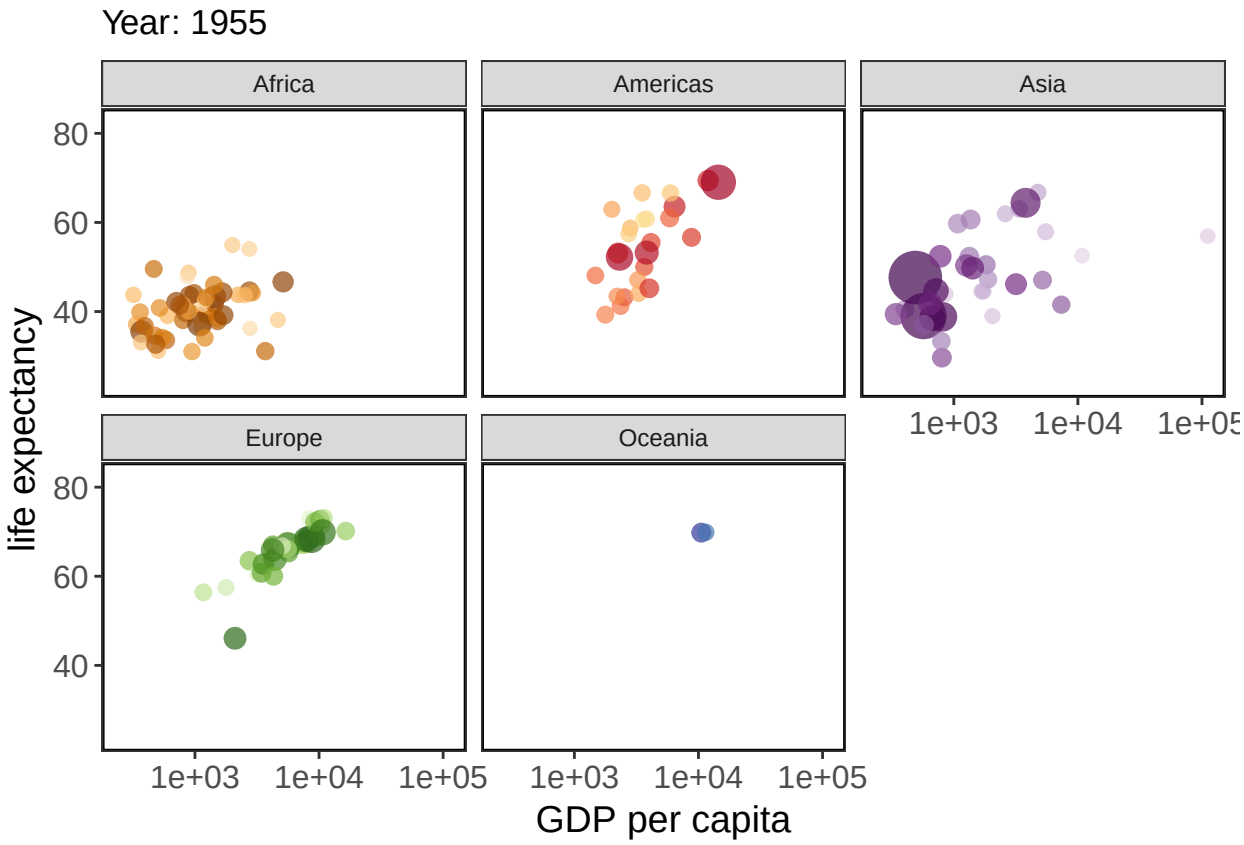
GDP per capita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Africa
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Asia
Europe
Oceania
life expectancy
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60
40
1e+03
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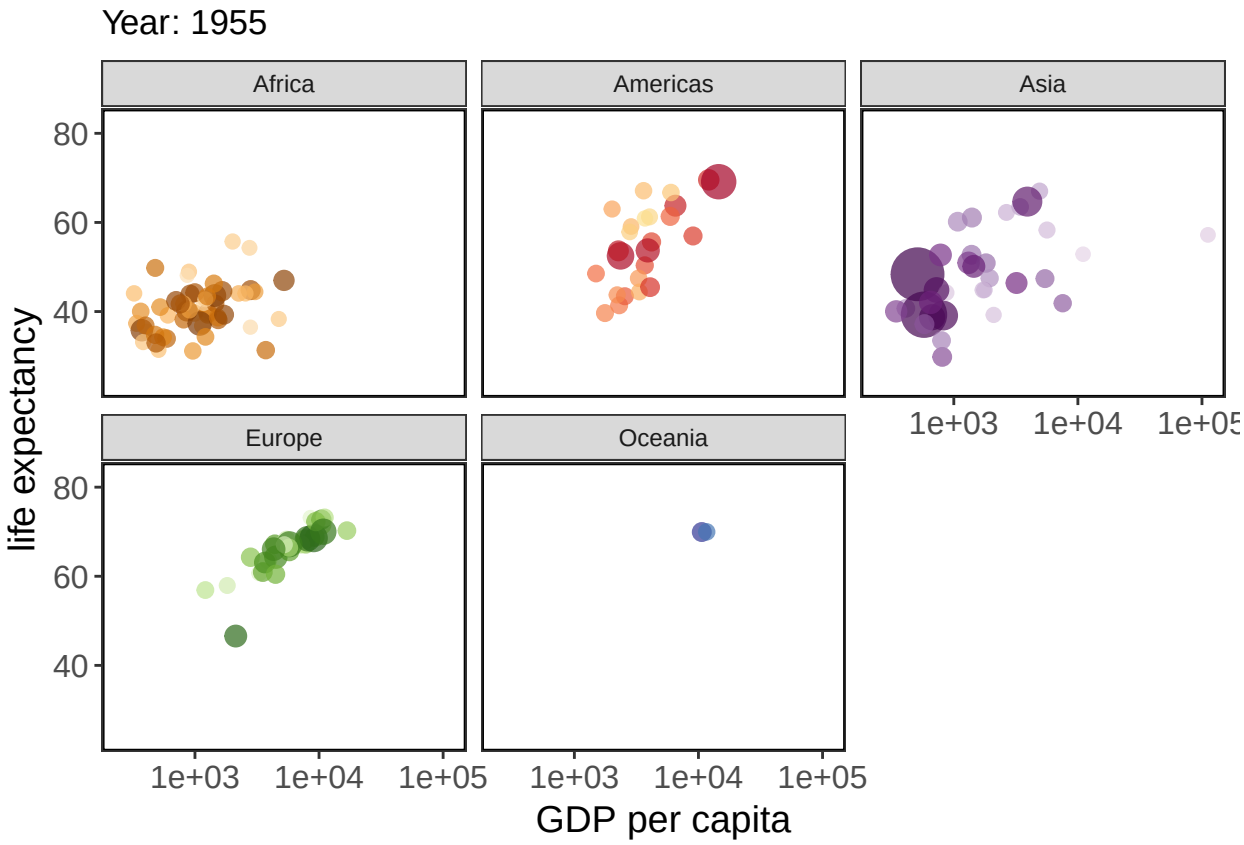
GDP per capita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Africa
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Europe
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60
40
1e+03
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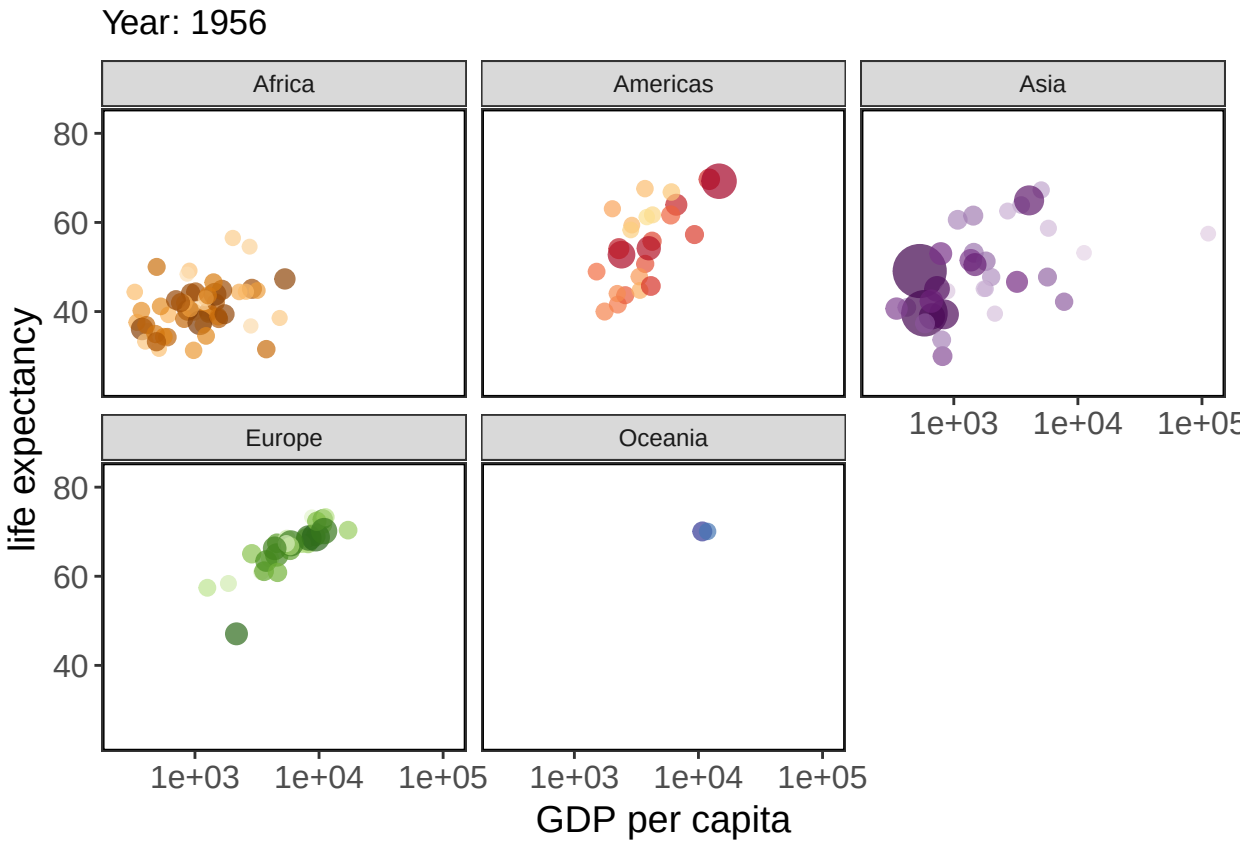
GDP per capita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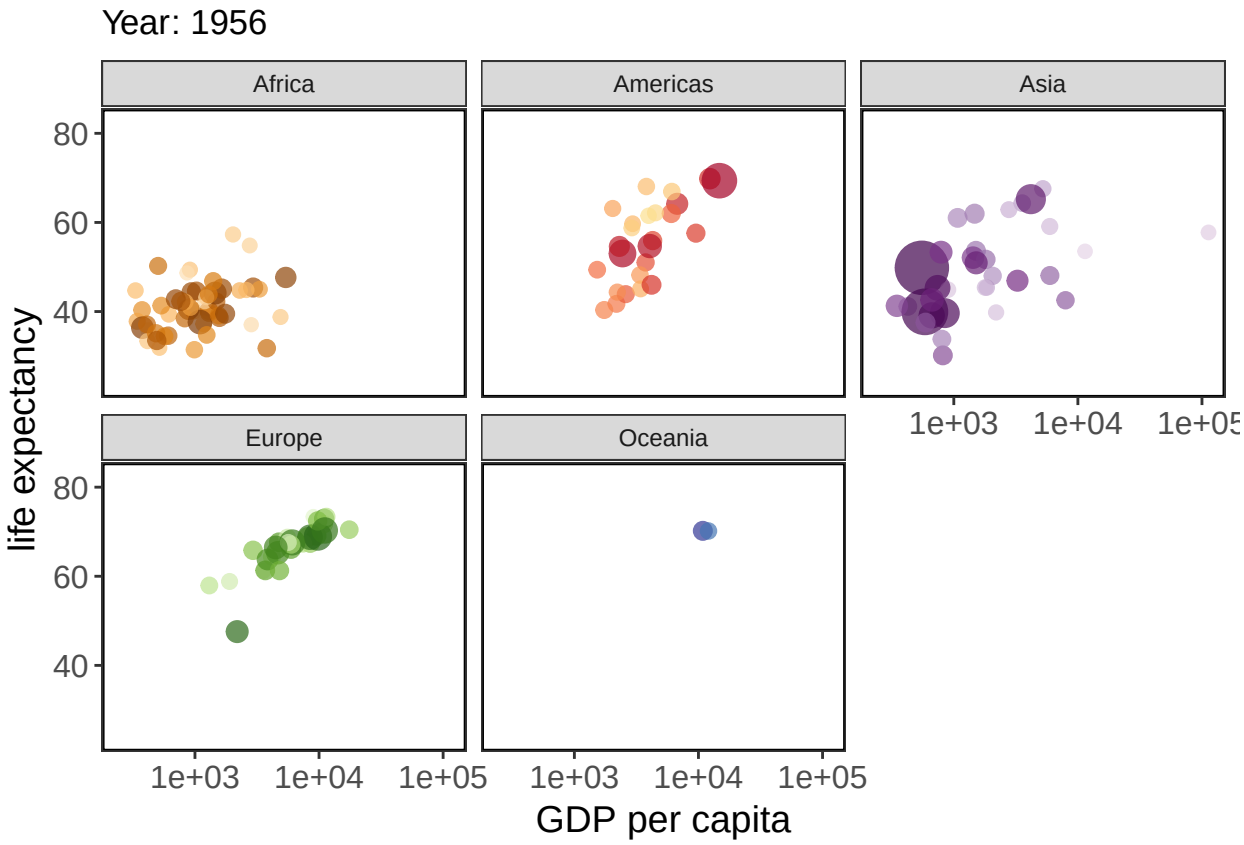
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Asia
Europe
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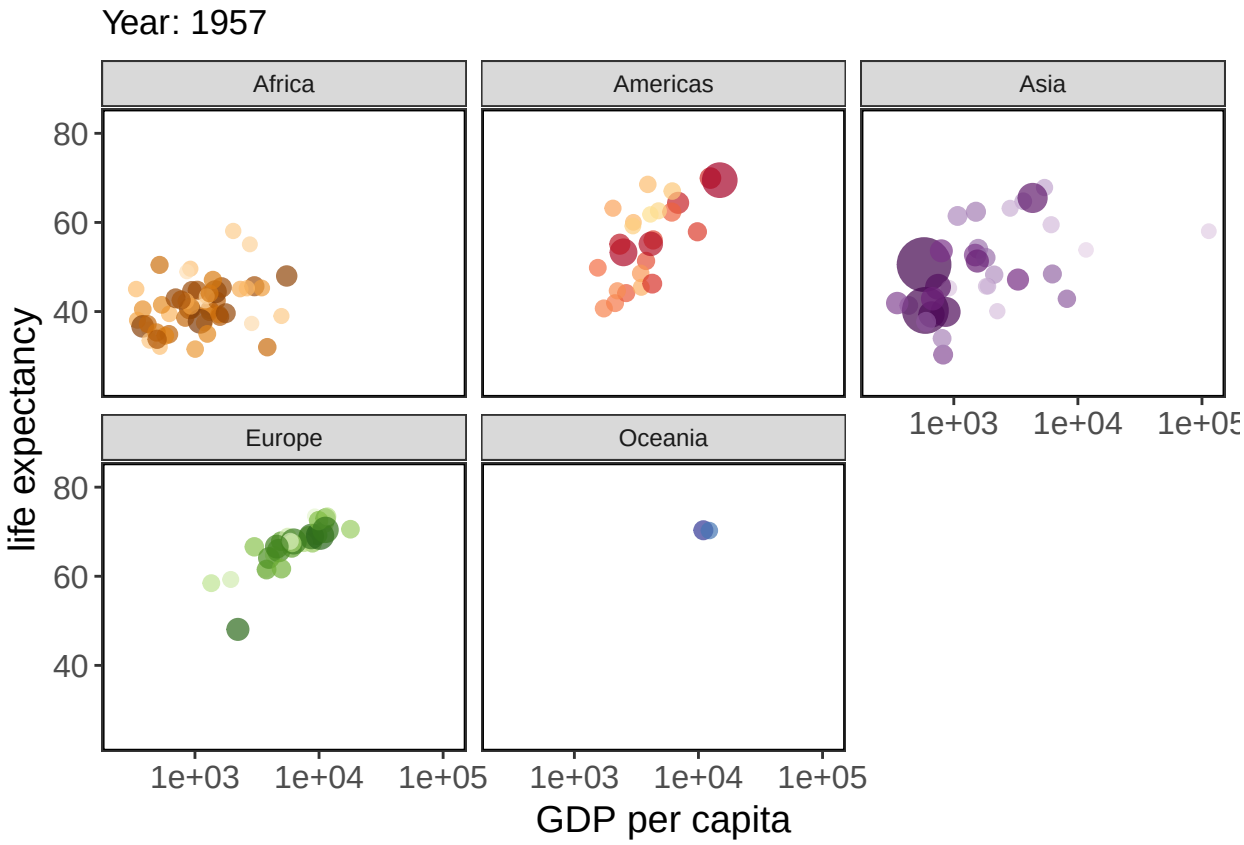
1e+05
GDP per capita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Asia
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Oceania
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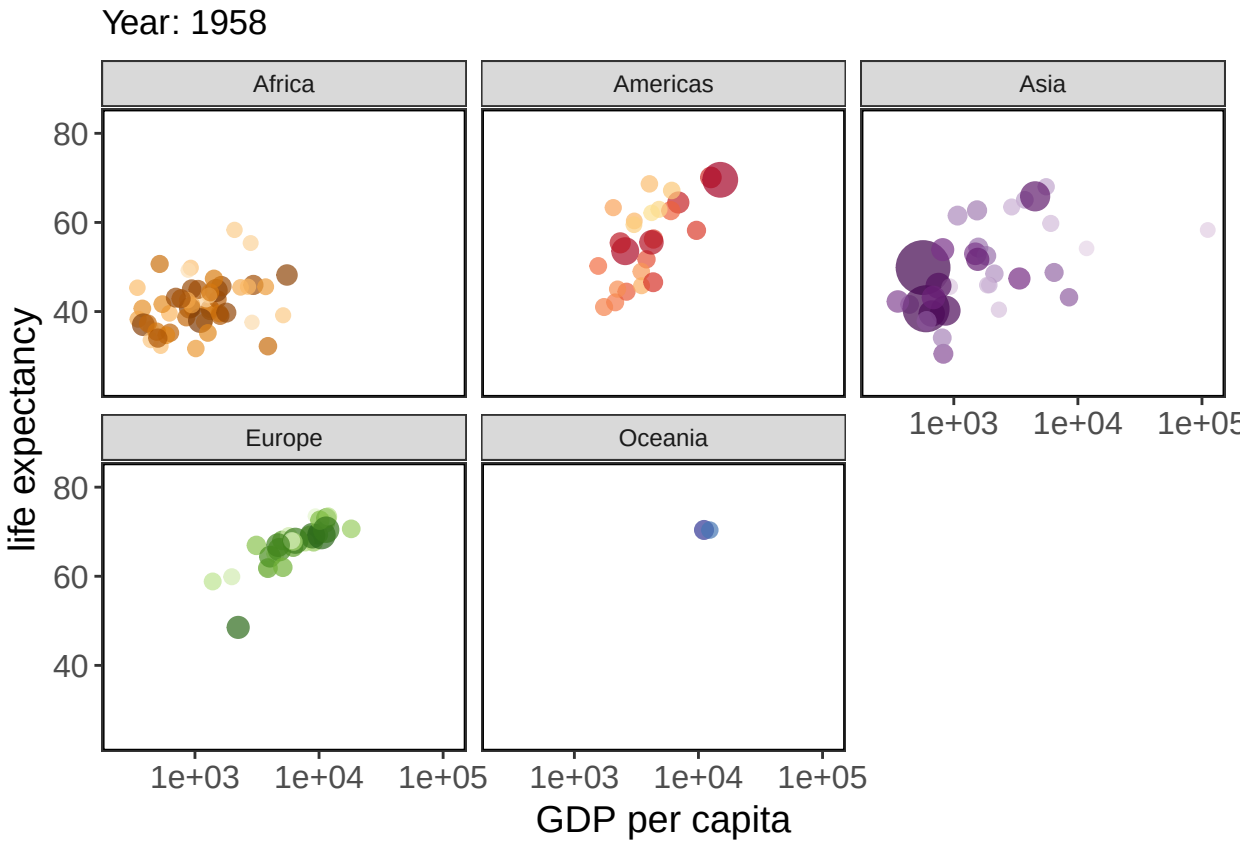
1e+04
1e+05
GDP per capita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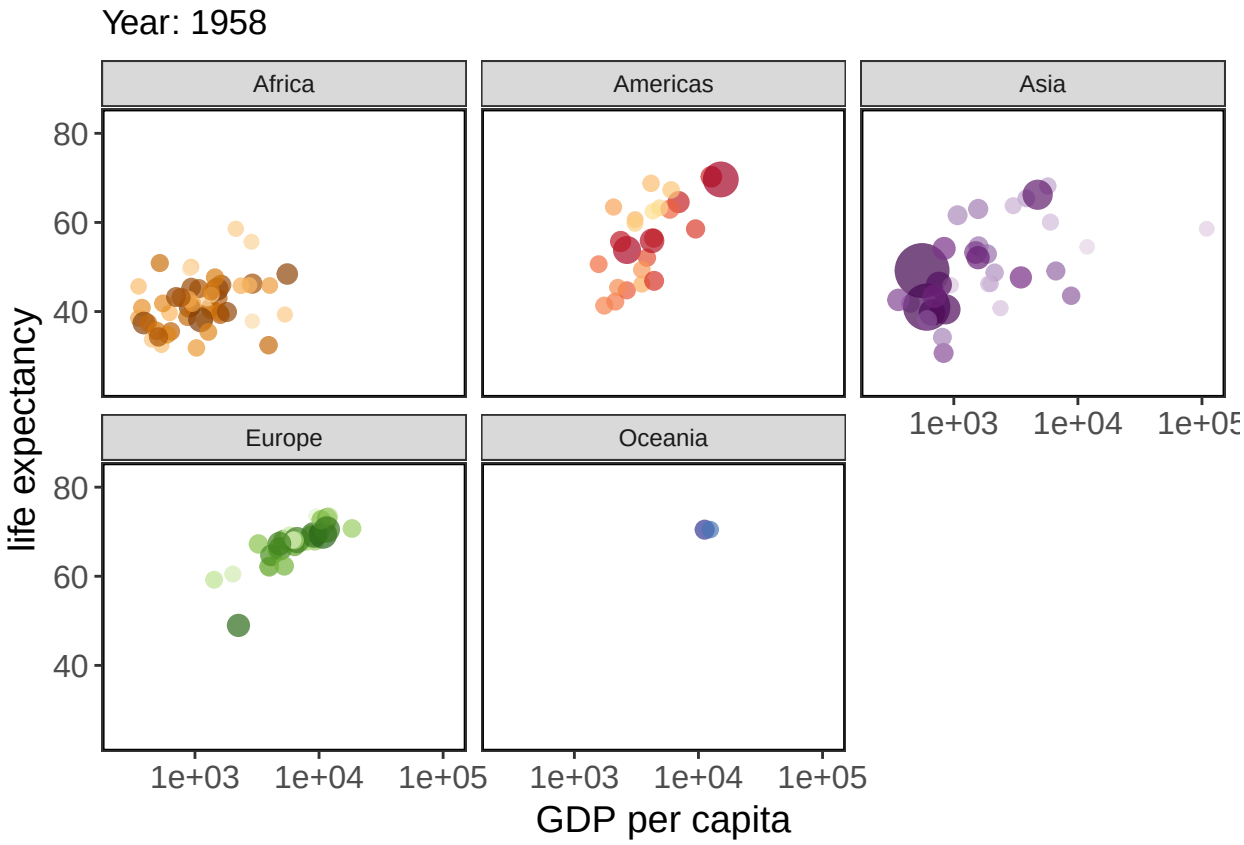
1e+05
GDP per capita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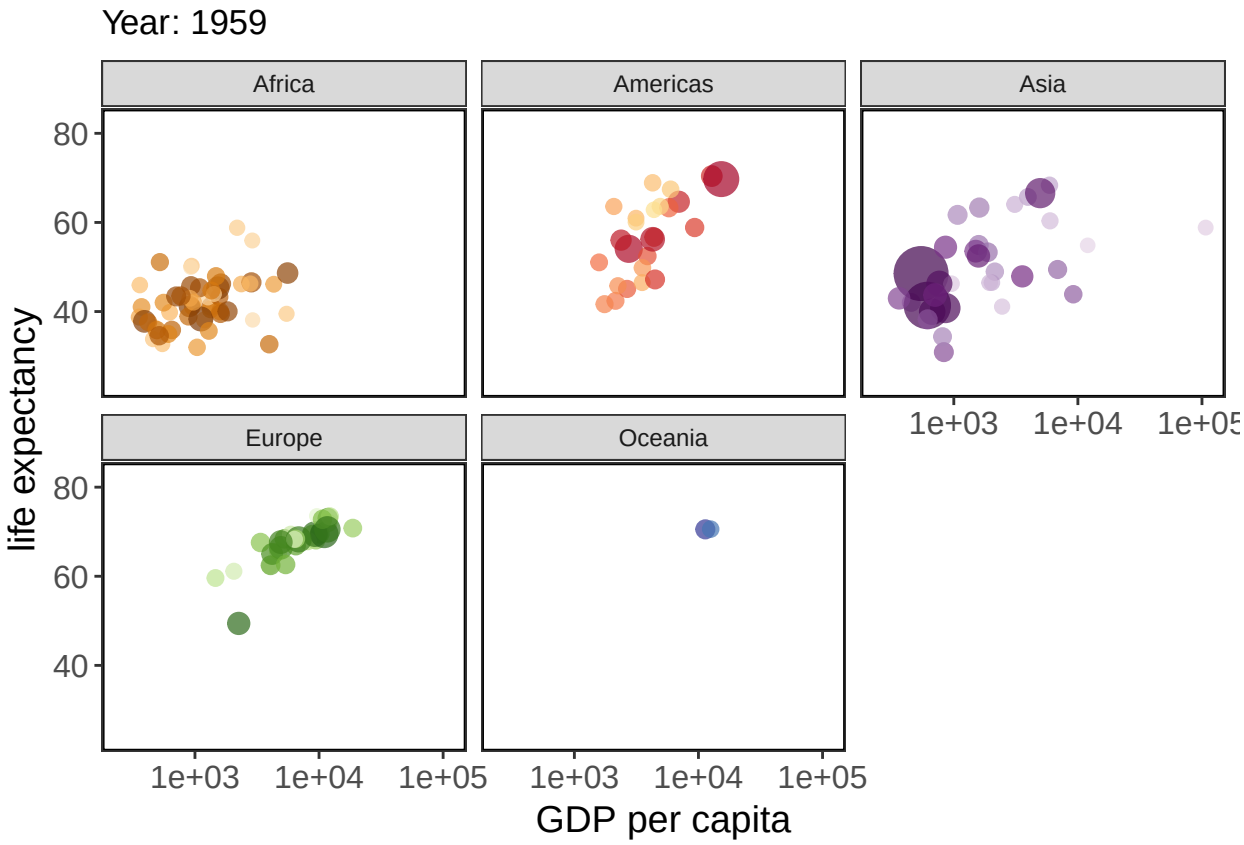
GDP per capita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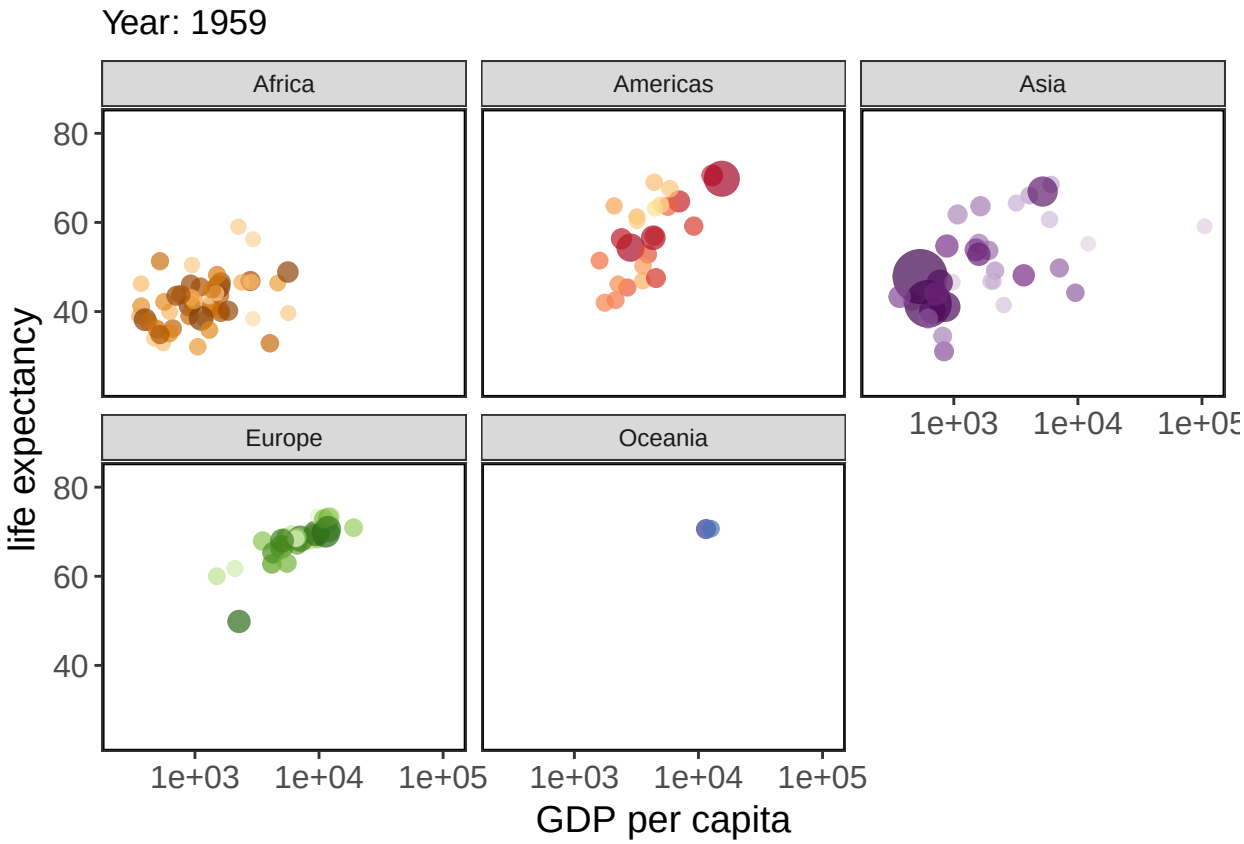
GDP per capita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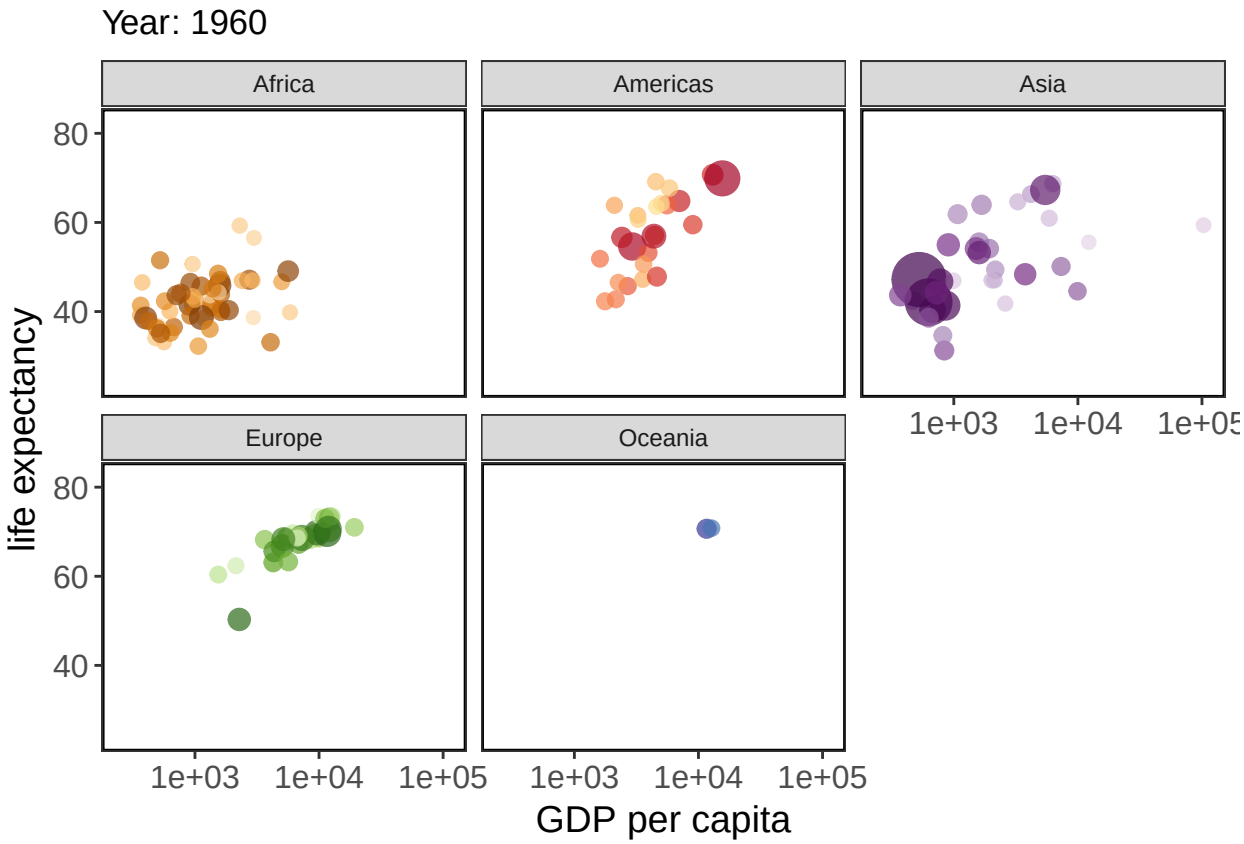
GDP per capita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Asia
Europe
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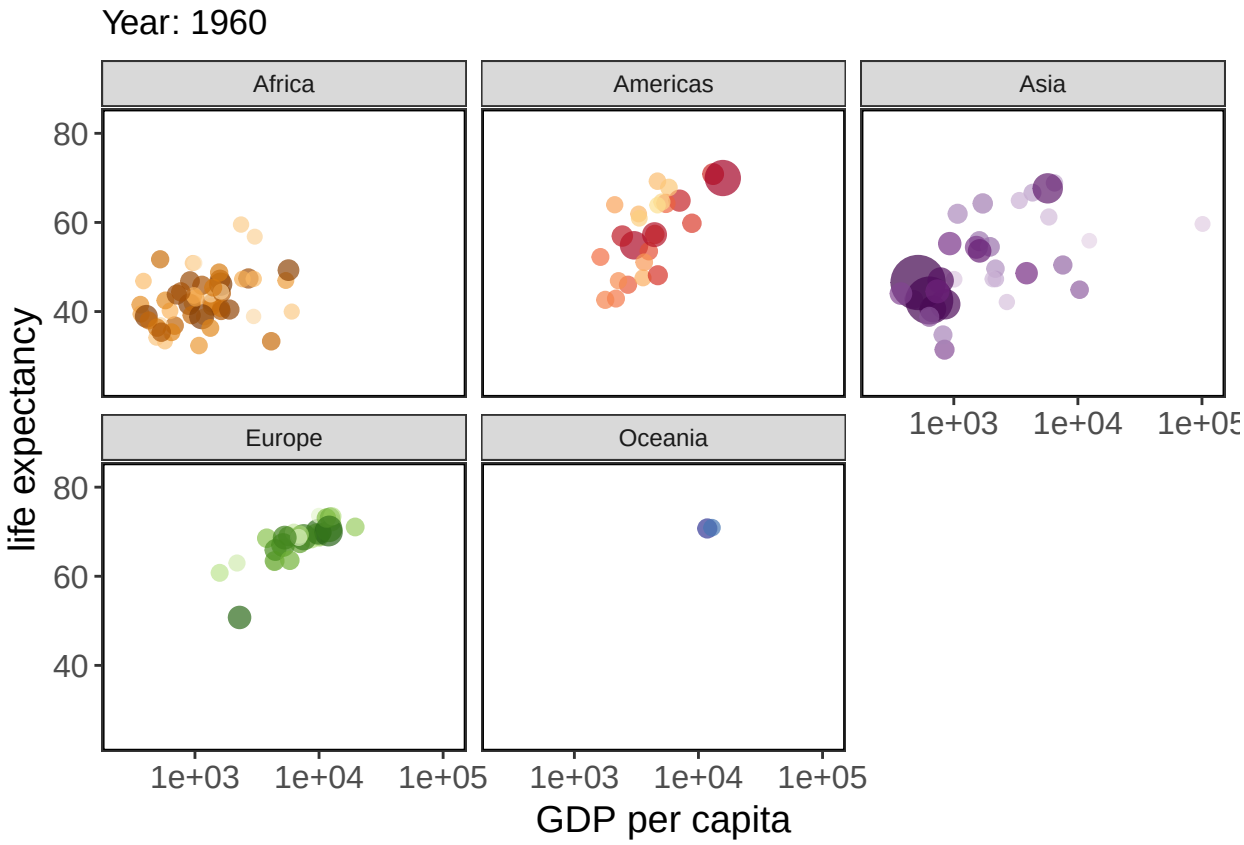
GDP per capita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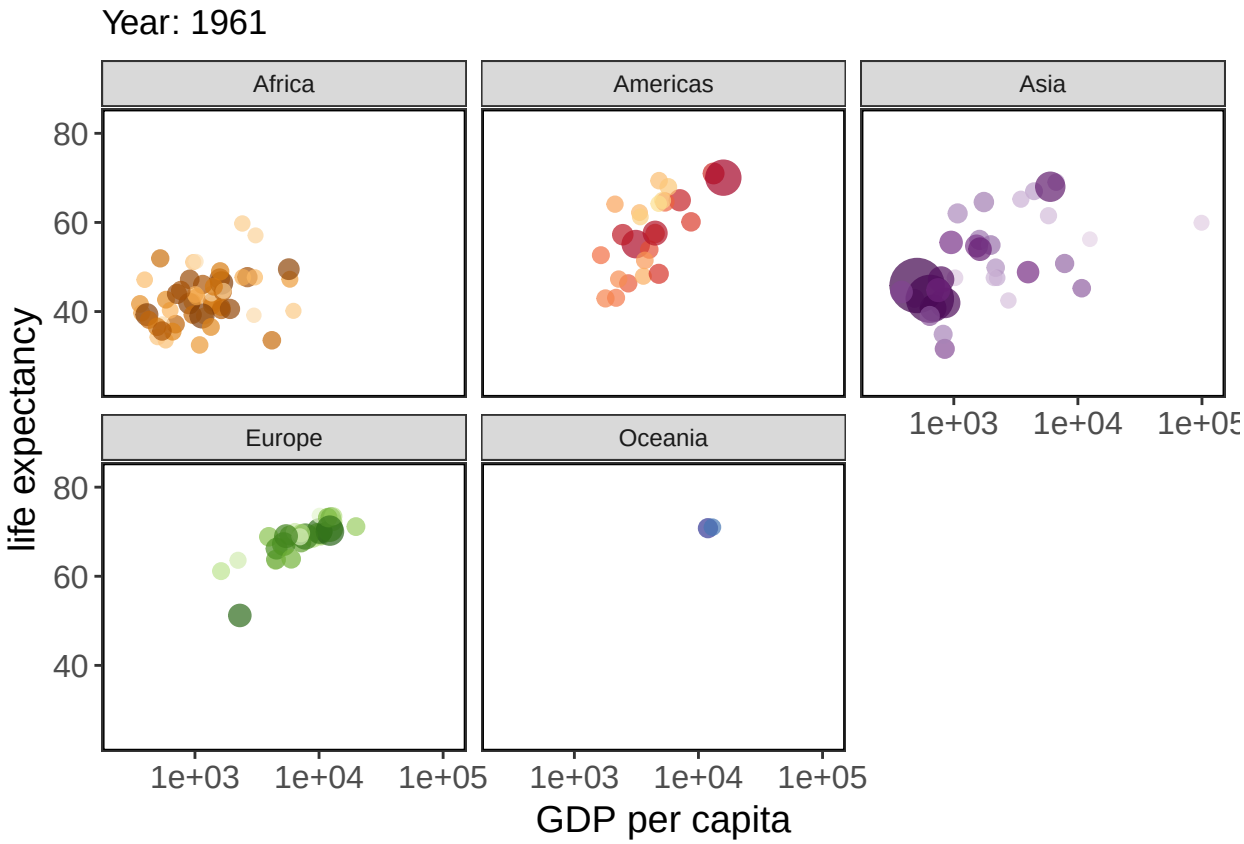
GDP per capita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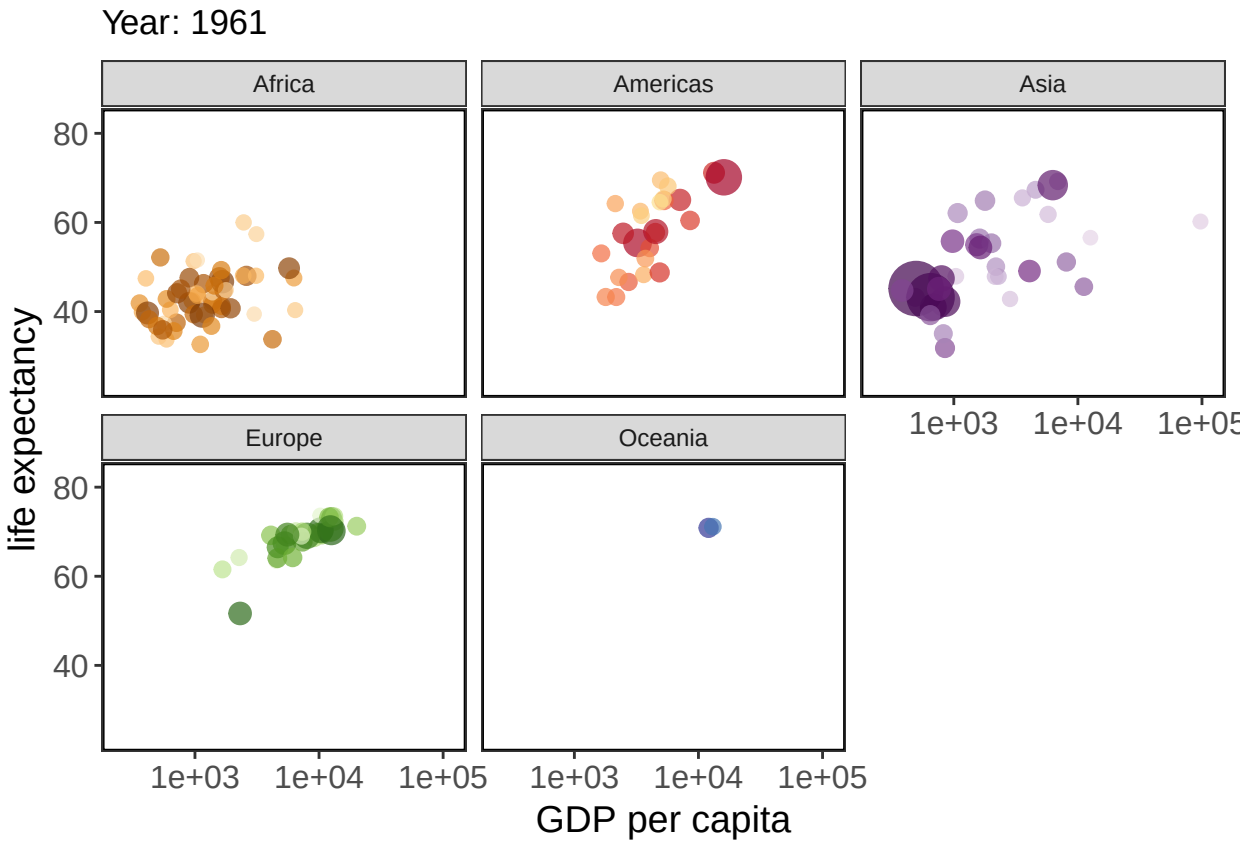
GDP per capita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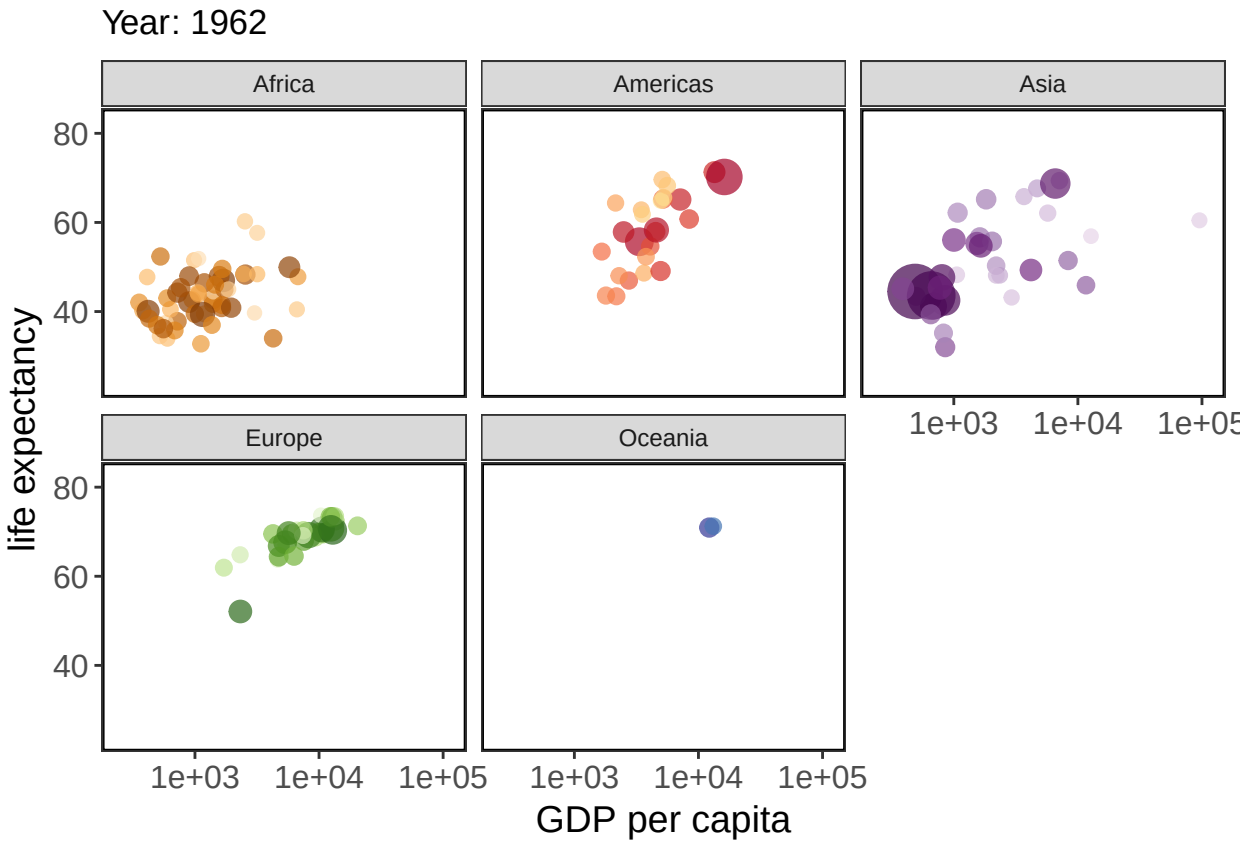
GDP per capita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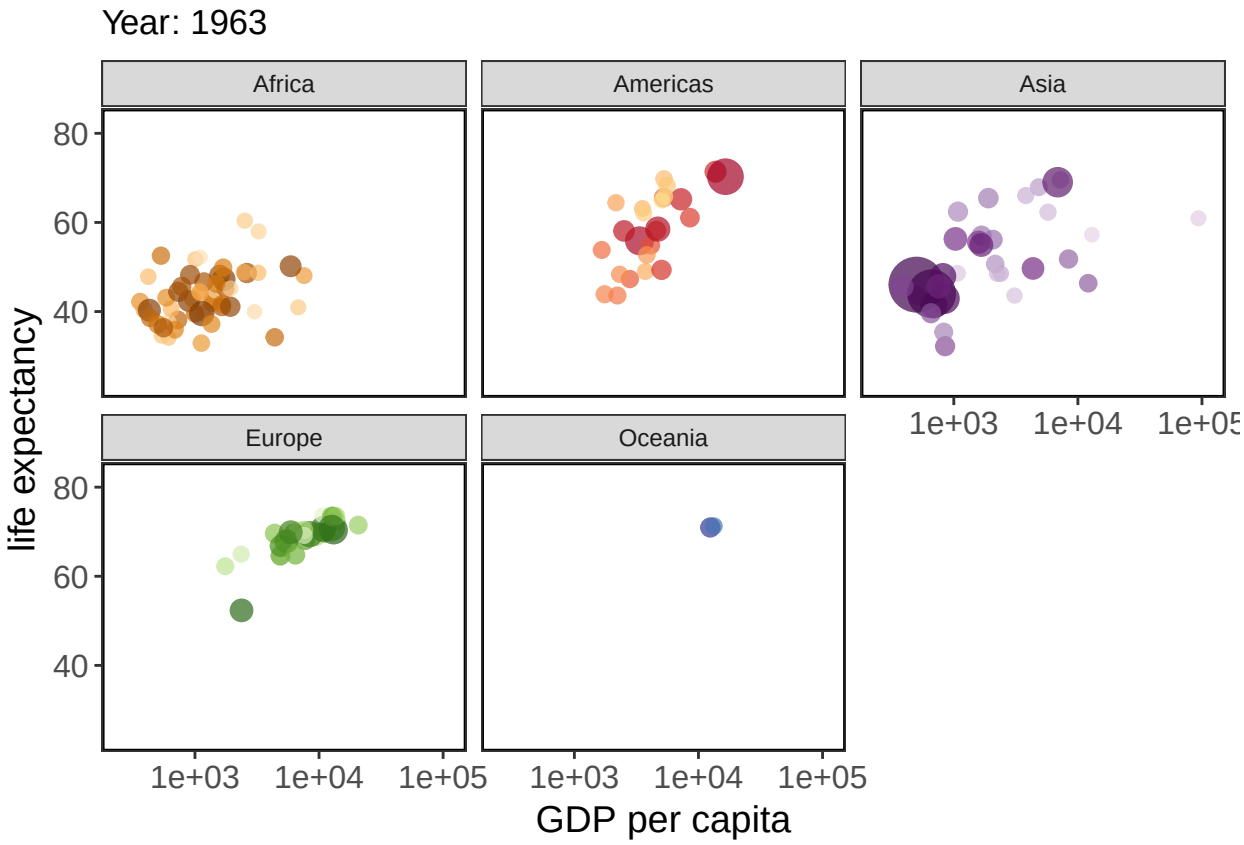
GDP per capita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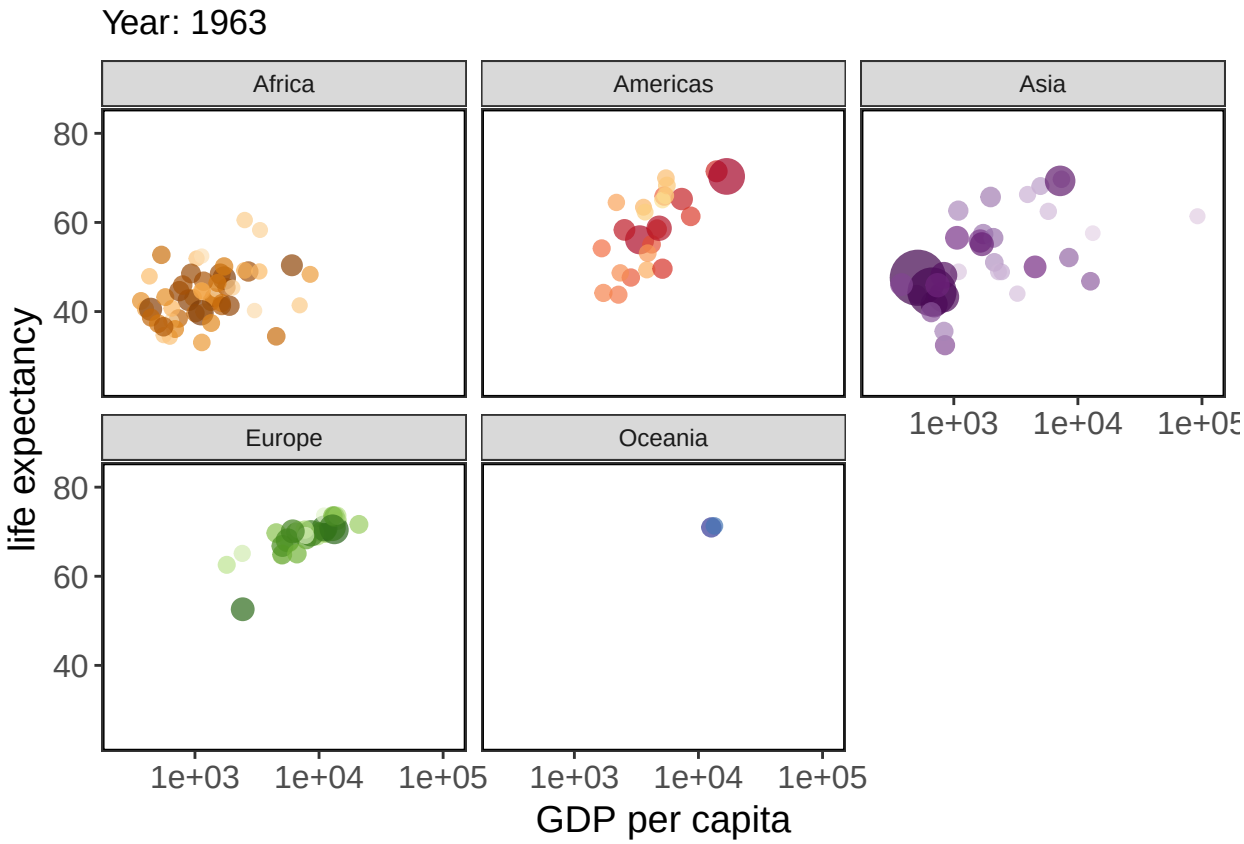
1e+04
1e+05
GDP per capita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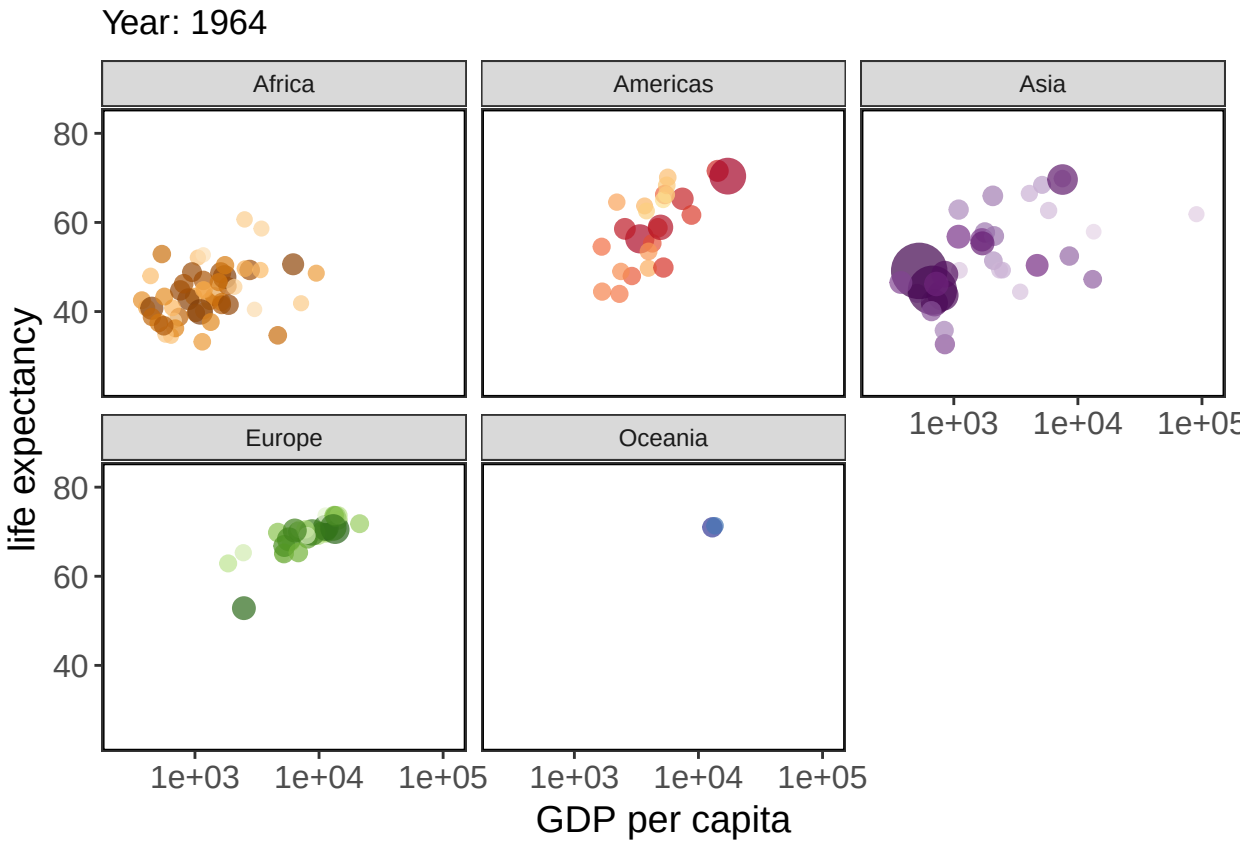
1e+05
GDP per capita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Asia
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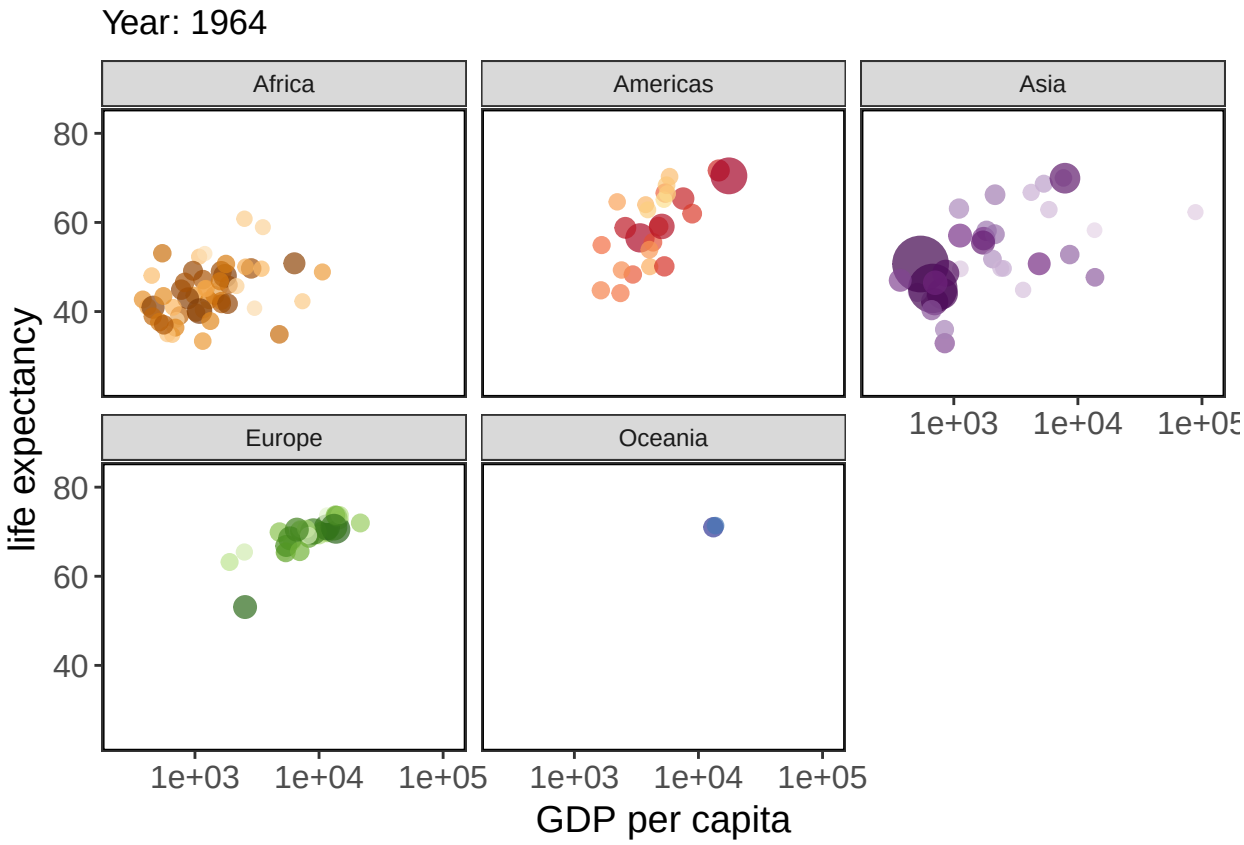
1e+05
GDP per capita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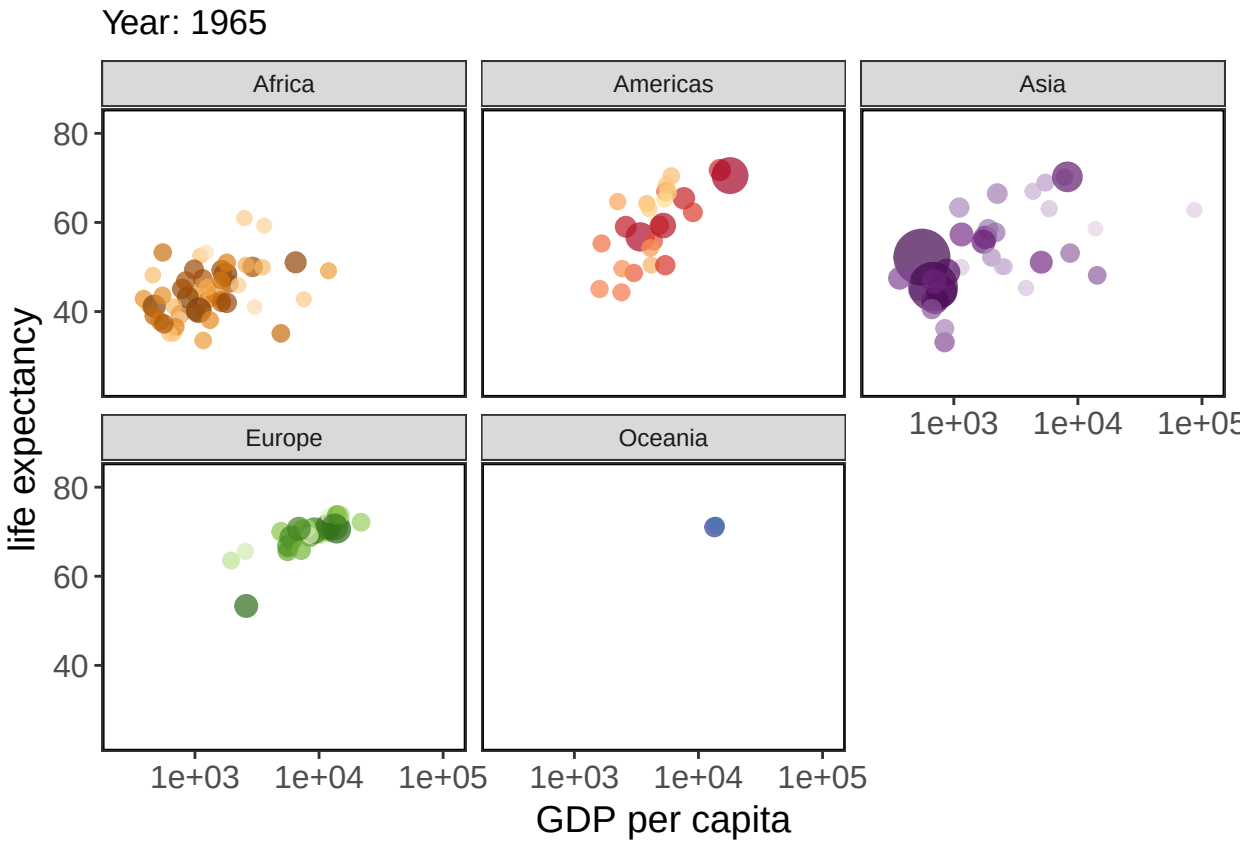
1e+05
GDP per capita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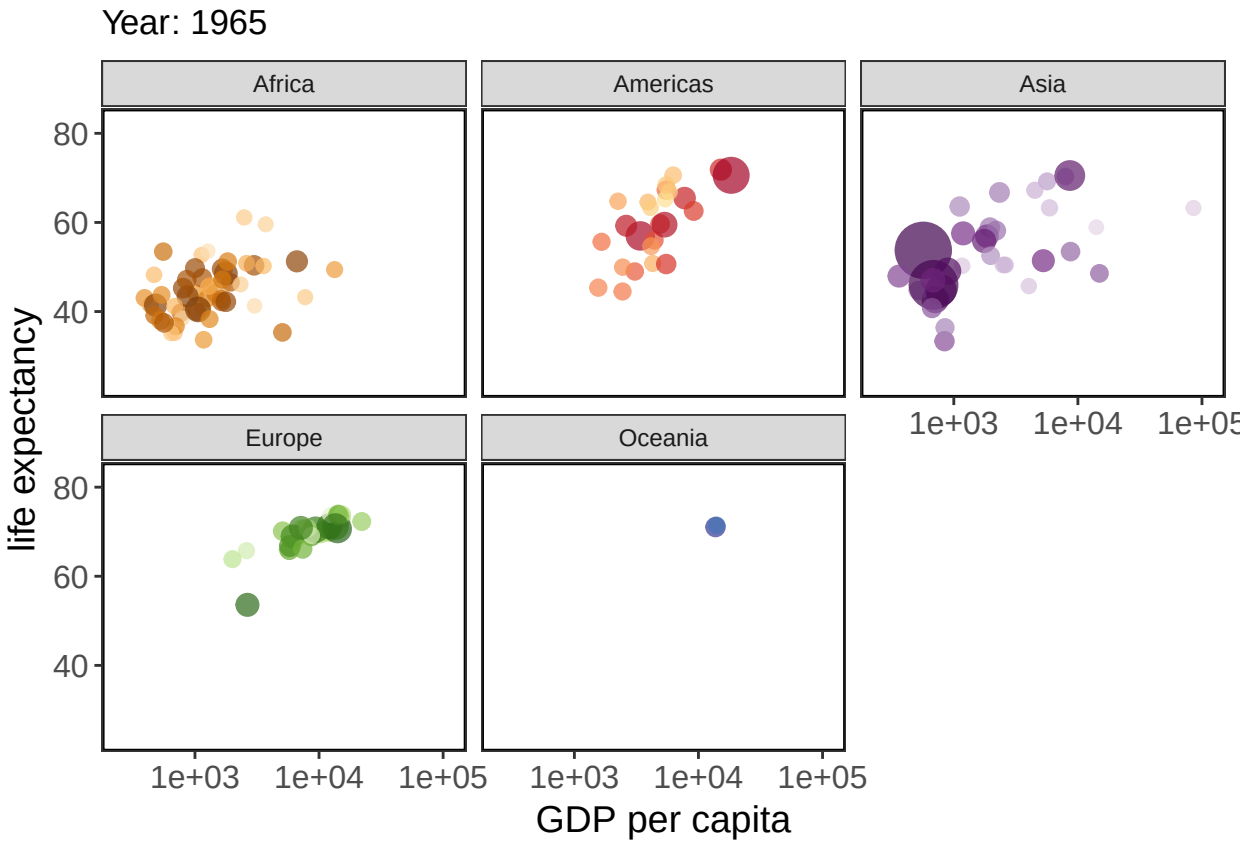
1e+04
1e+05
GDP per capita


Year: 1965
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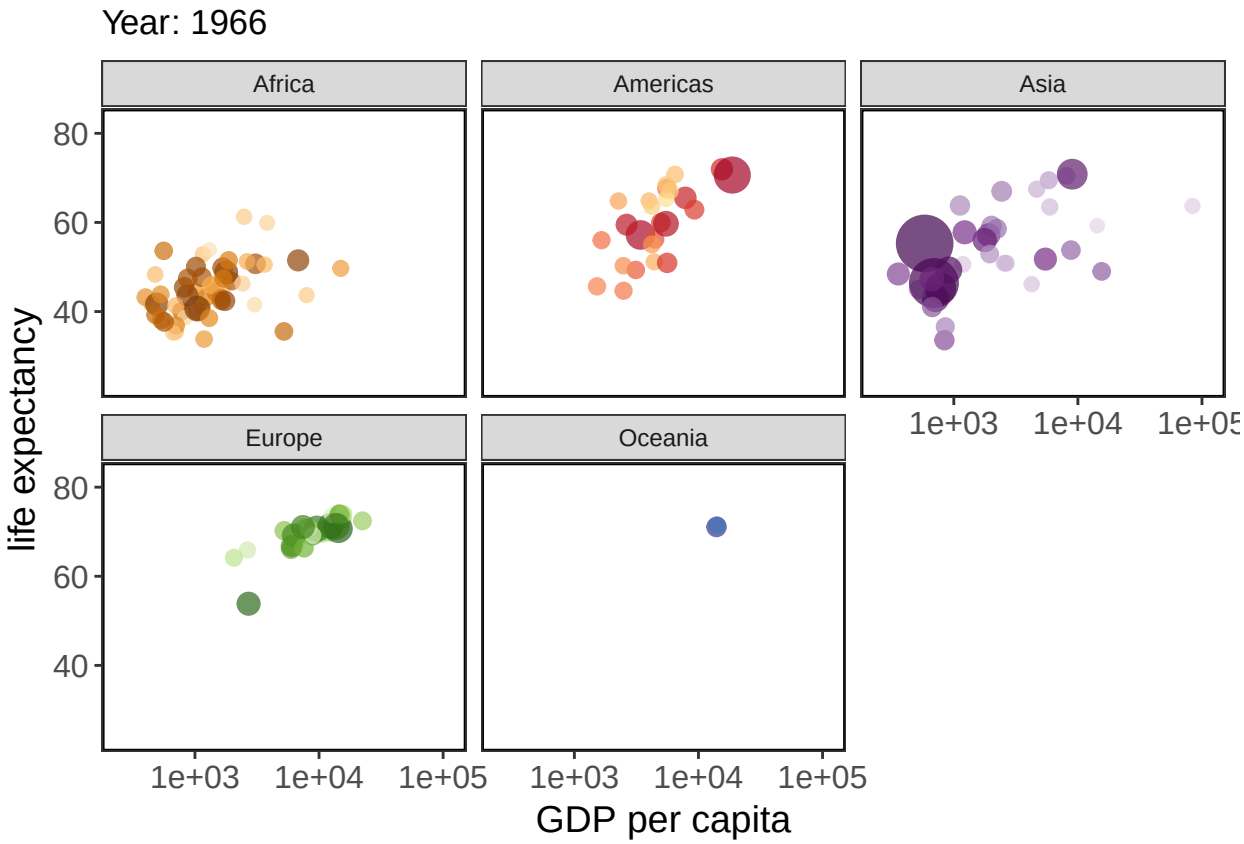
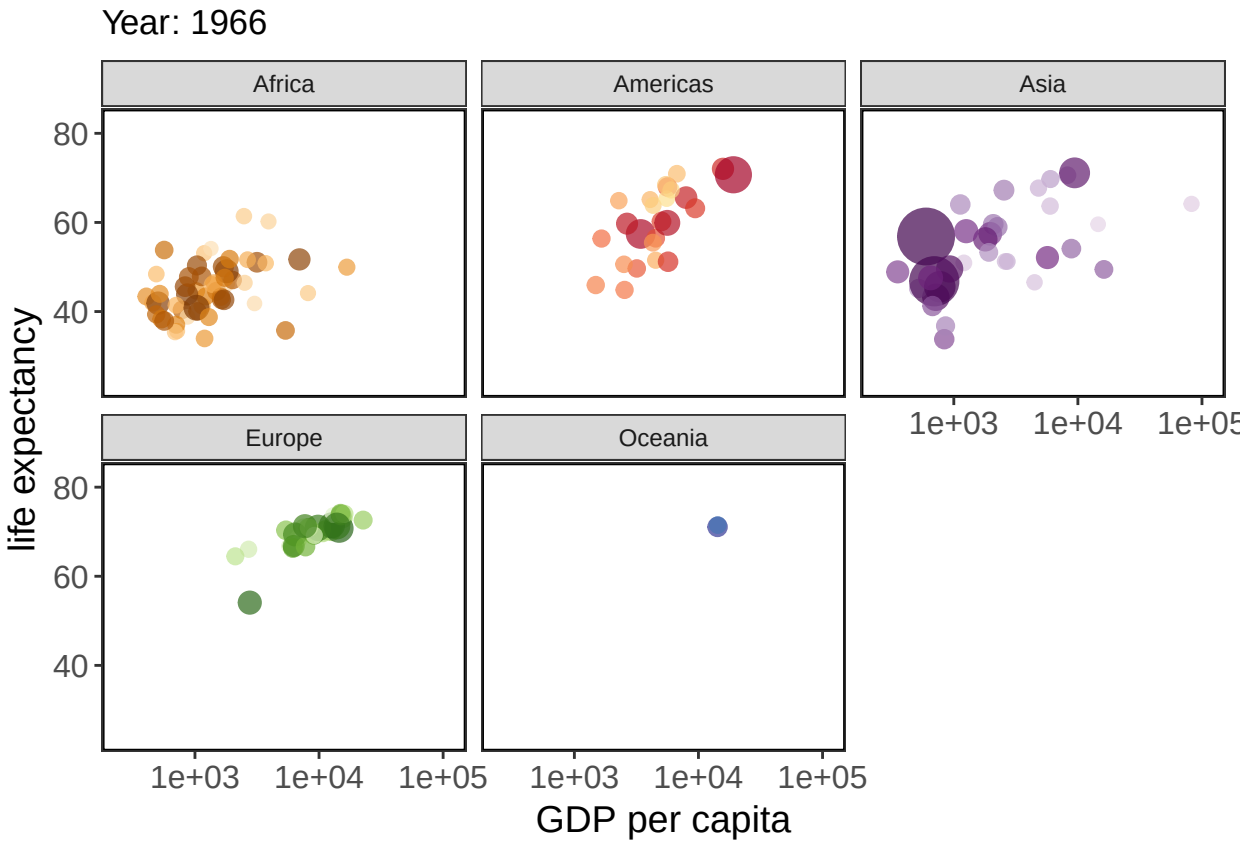
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1966
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1966
Africa
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Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
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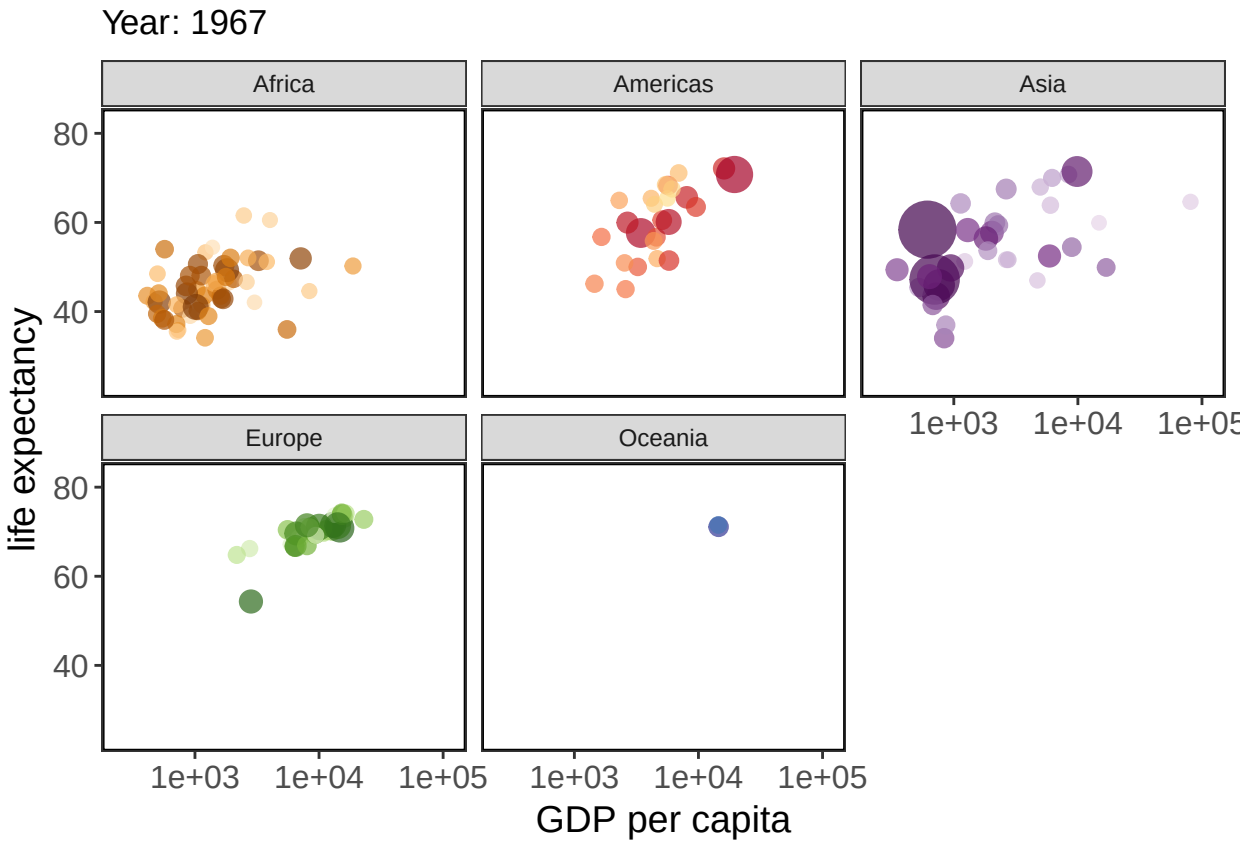
1e+05
GDP per capita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Europe
Oceania
life expectancy
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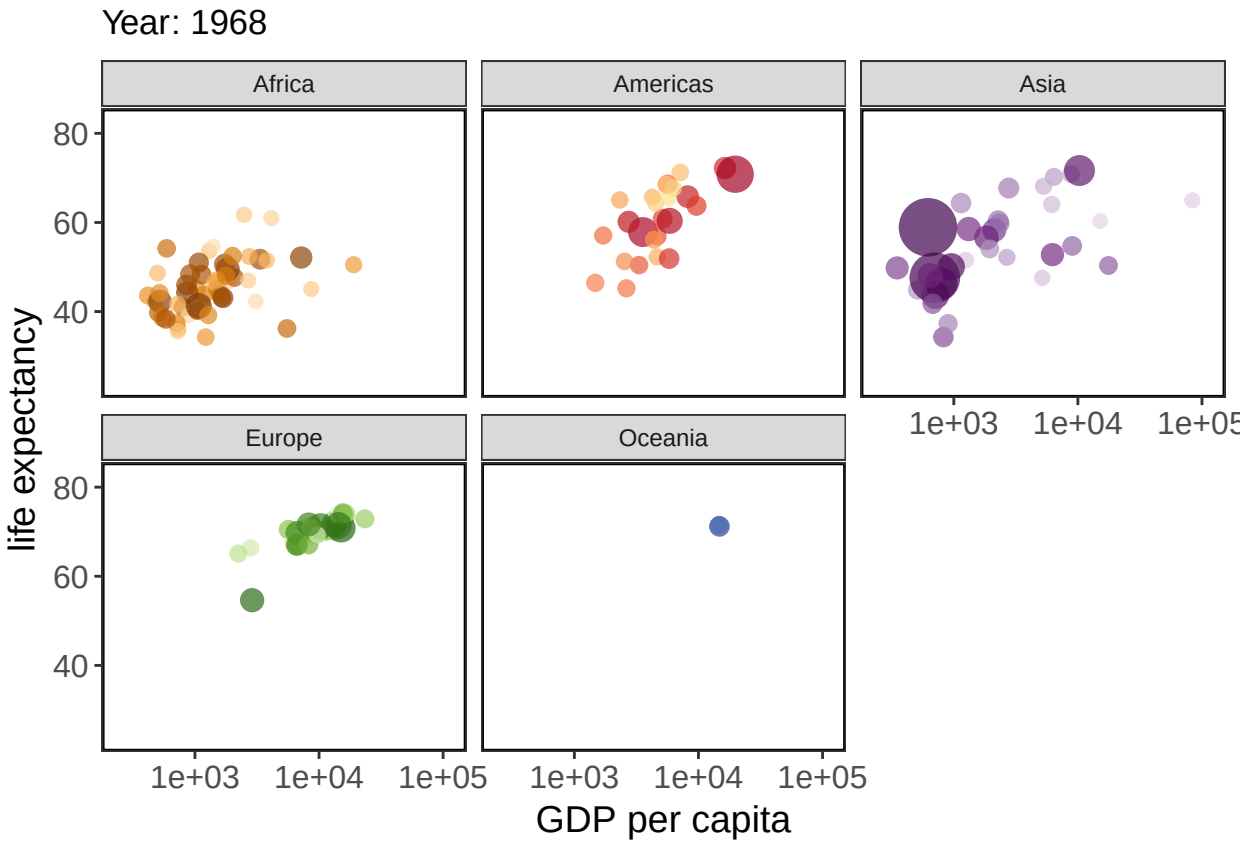
GDP per capita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Asia
Europe
Oceania
life expectancy
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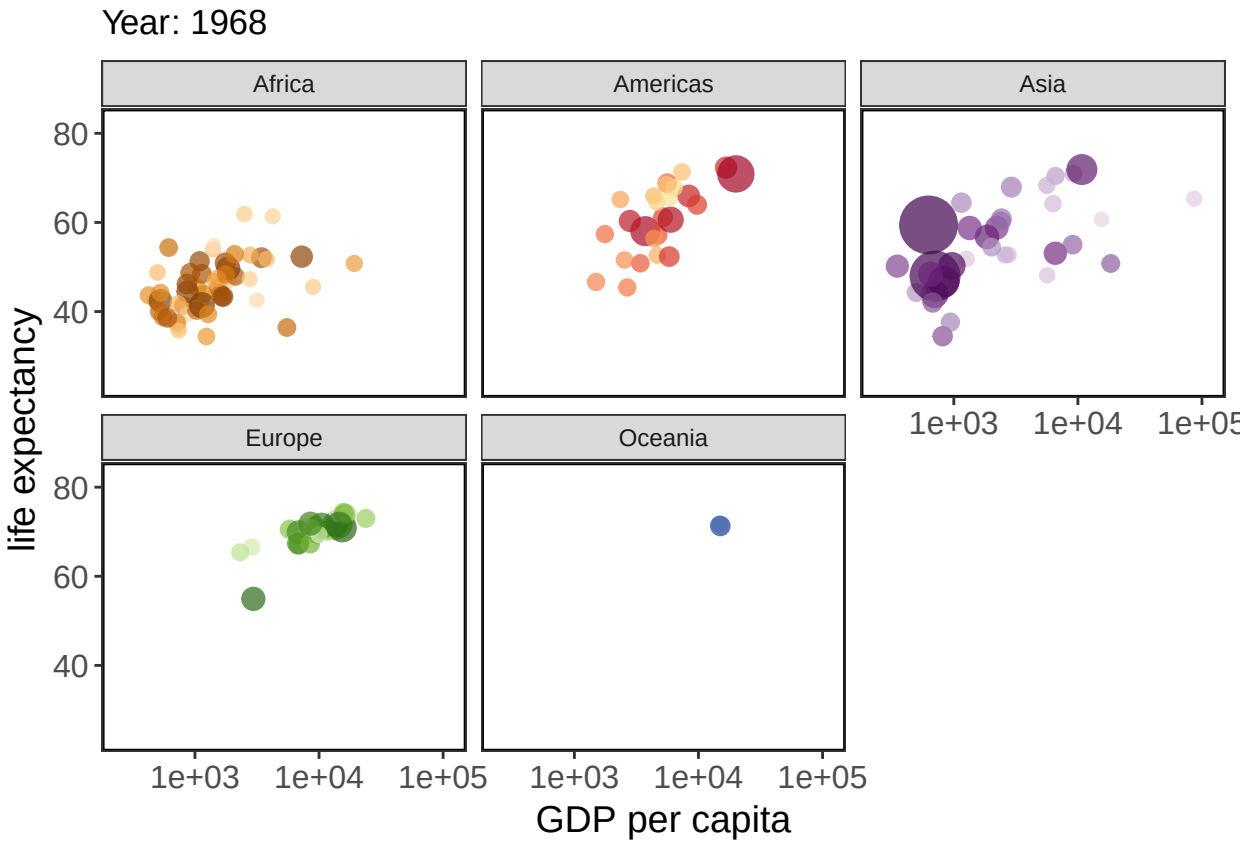
1e+05
GDP per capita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Oceania
life expectancy
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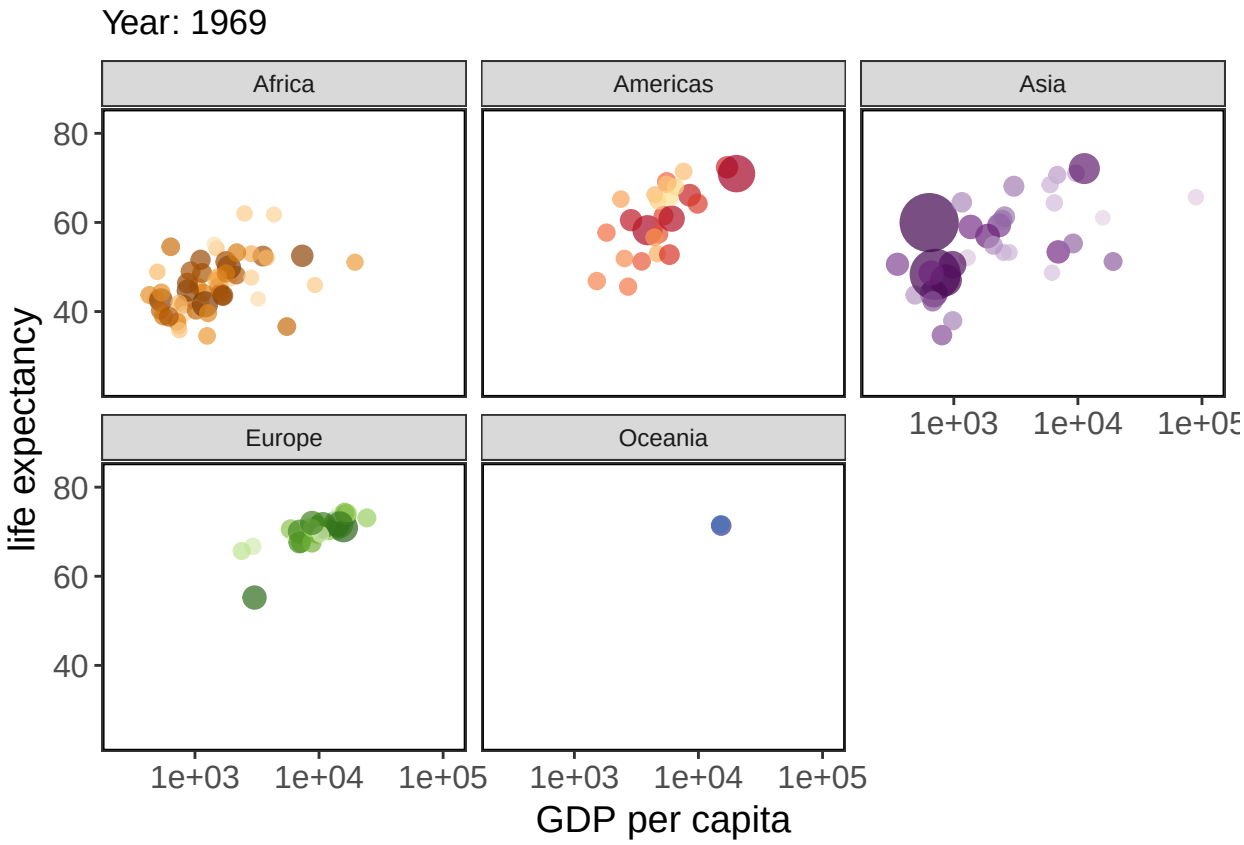
GDP per capita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Asia
Europe
Oceania
life expectancy
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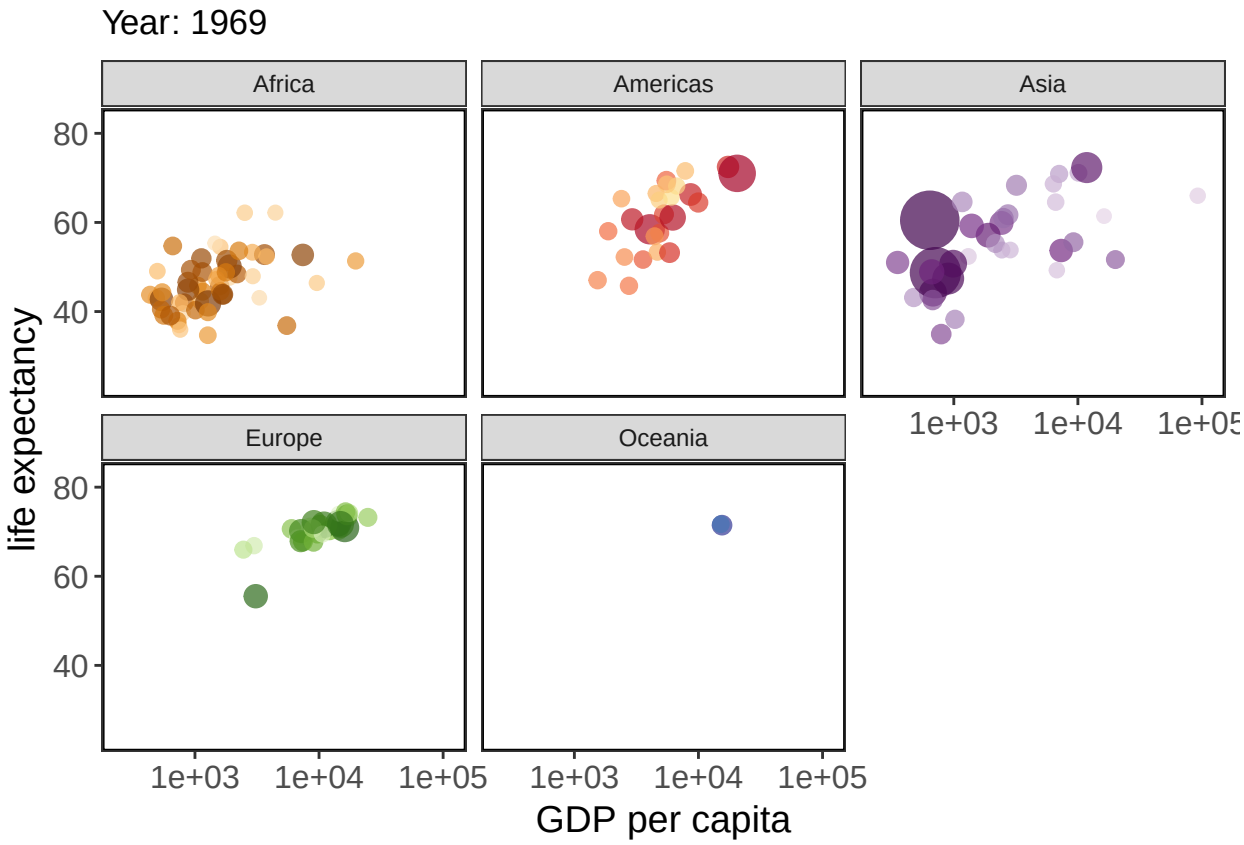
1e+05
GDP per capita


Year: 1969
Africa
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Asia
Europe
Oceania
life expectancy
80
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1e+03
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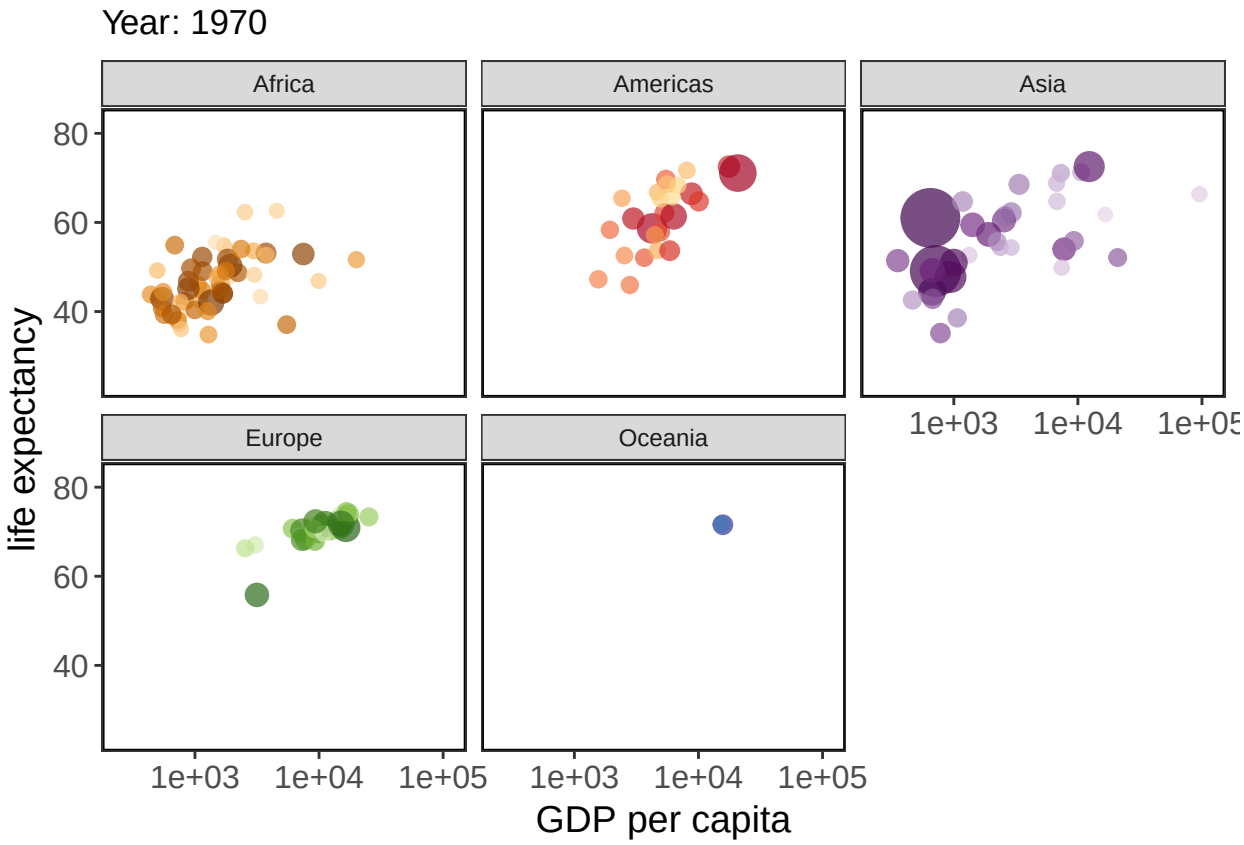
1e+05
GDP per capita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Africa
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Asia
Europe
Oceania
life expectancy
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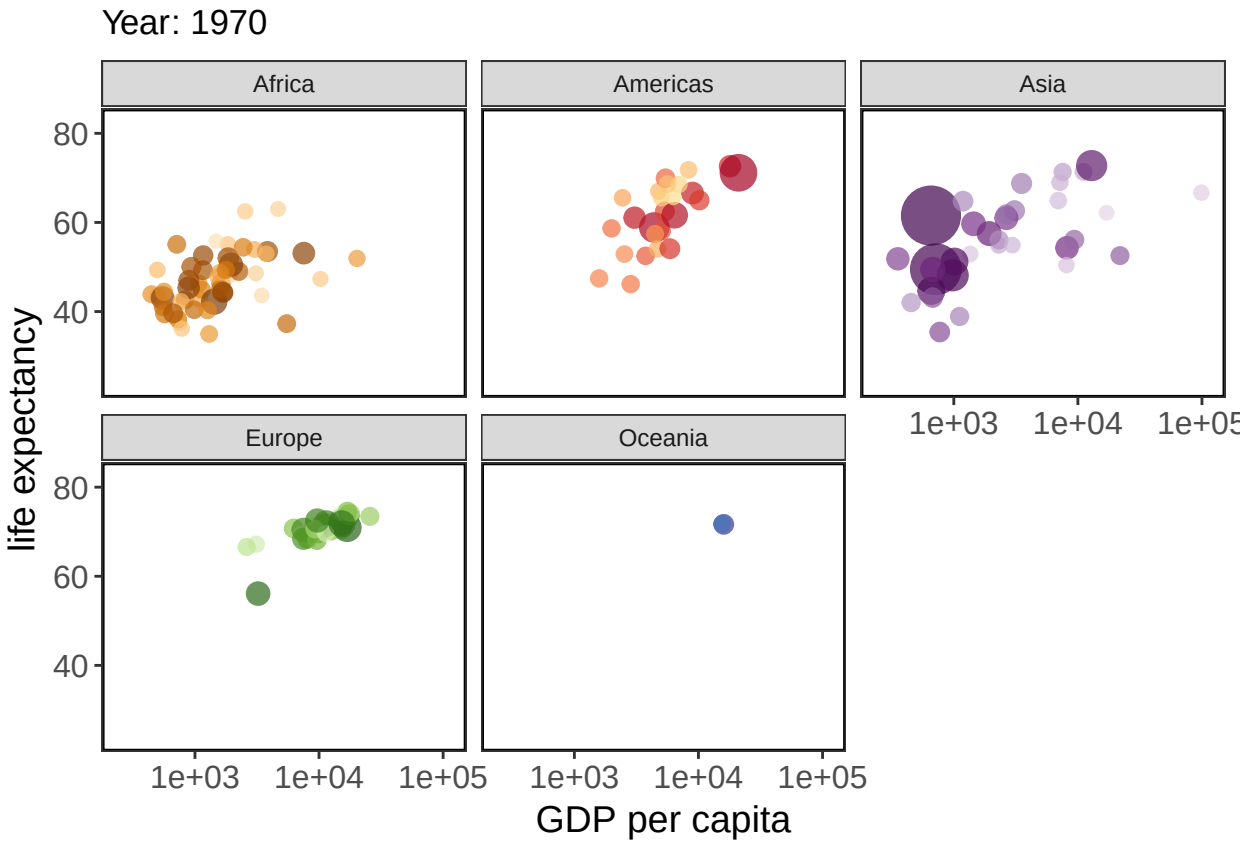
1e+05
GDP per capita


Year: 1970
Africa
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Asia
Europe
Oceania
life expectancy
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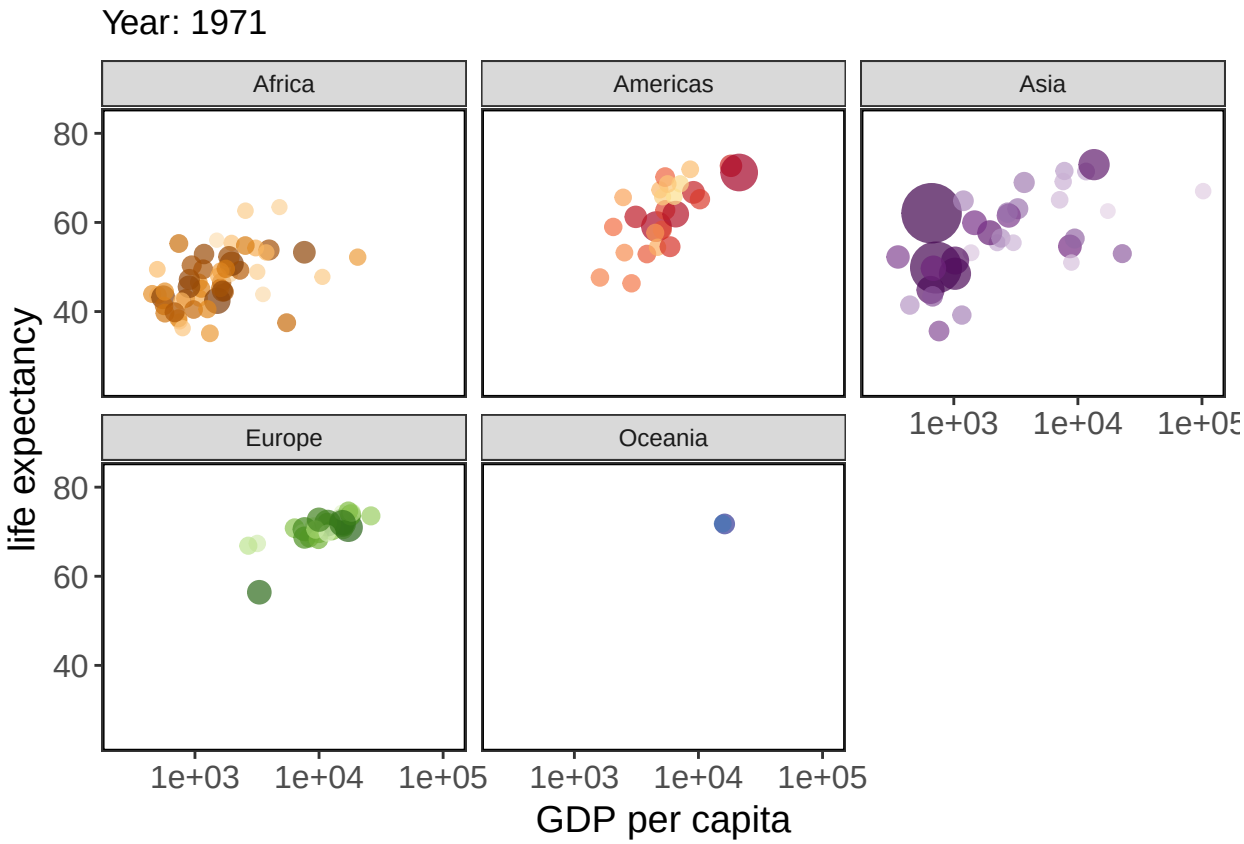
1e+03
1e+04
1e+05
GDP per capita


Year: 1971
Africa
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Asia
Europe
Oceania
life expectancy
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1e+03
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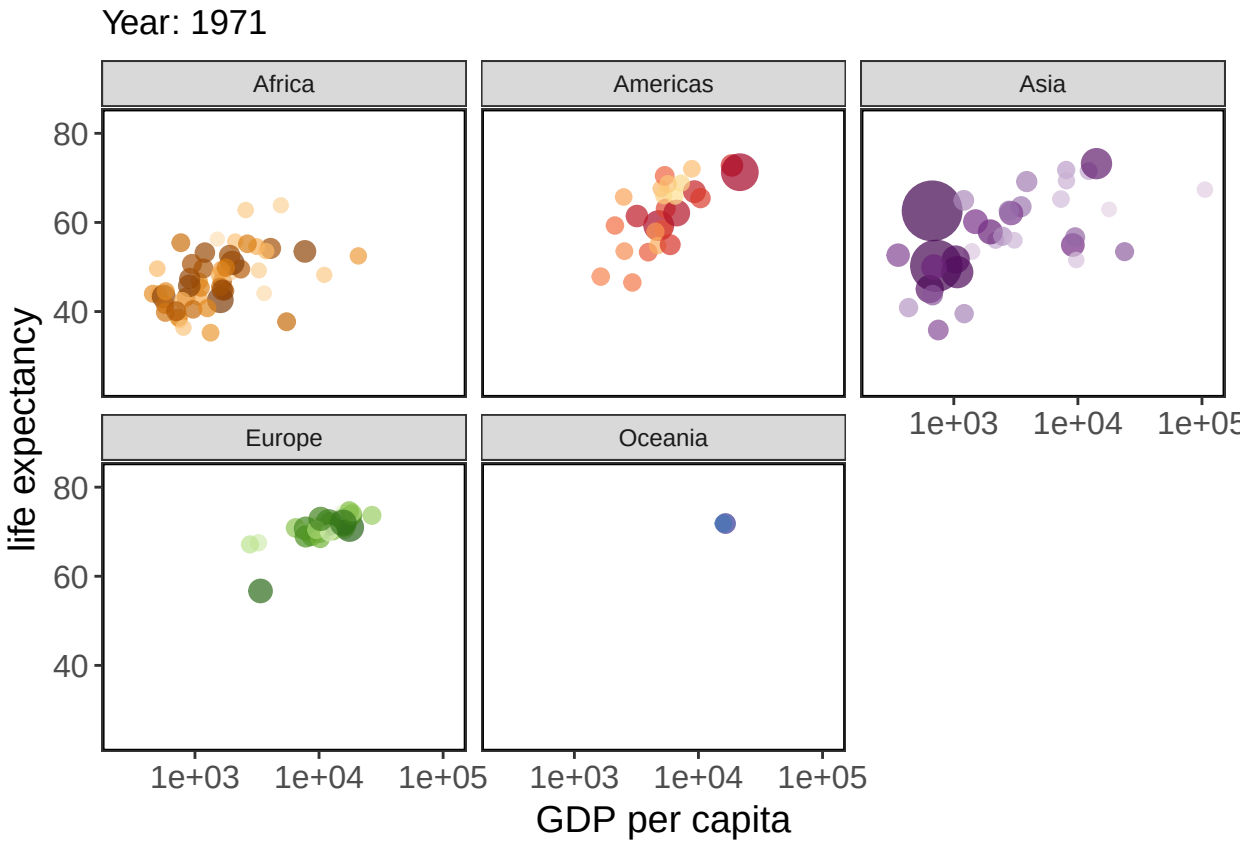
1e+05
GDP per capita


Year: 1971
Africa
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Europe
Oceania
life expectancy
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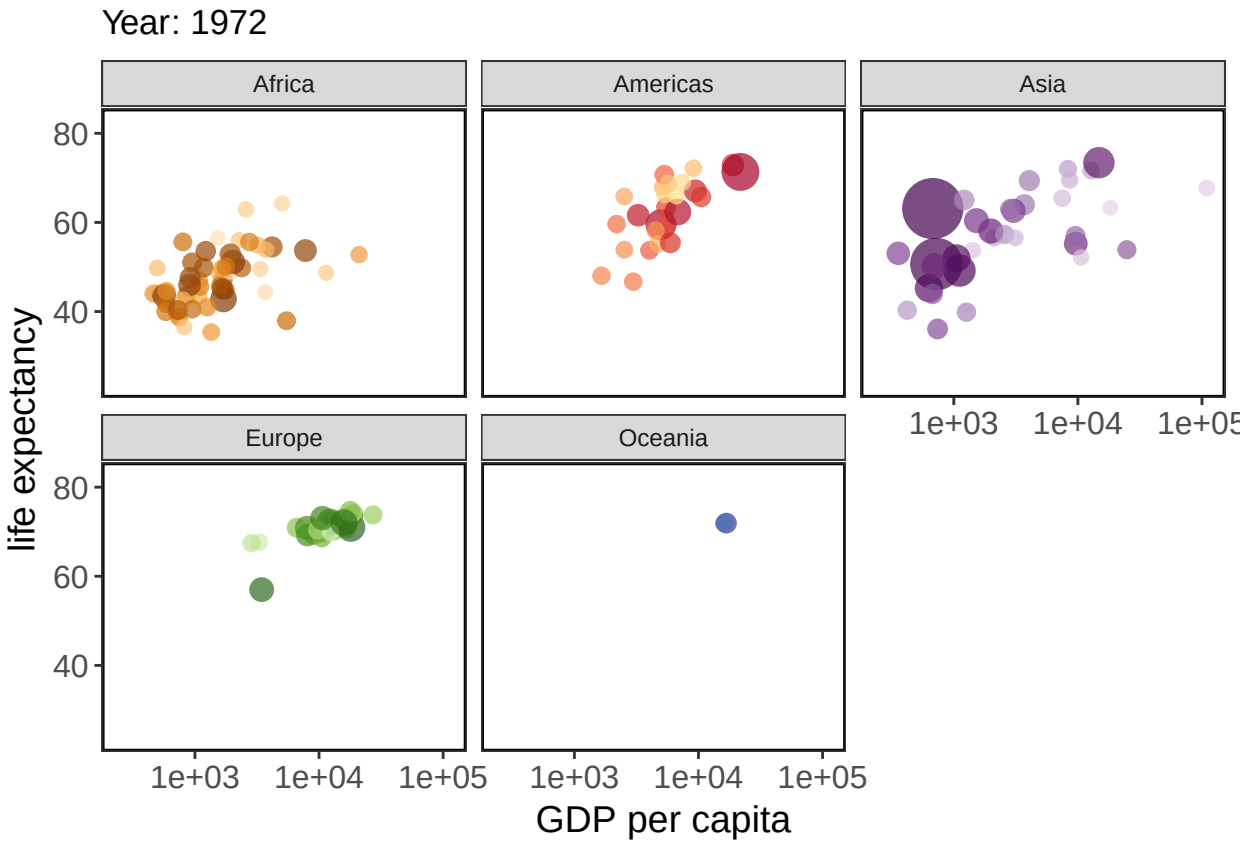
1e+03
1e+04
1e+05
GDP per capita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Africa
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Asia
Europe
Oceania
life expectancy
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1e+03
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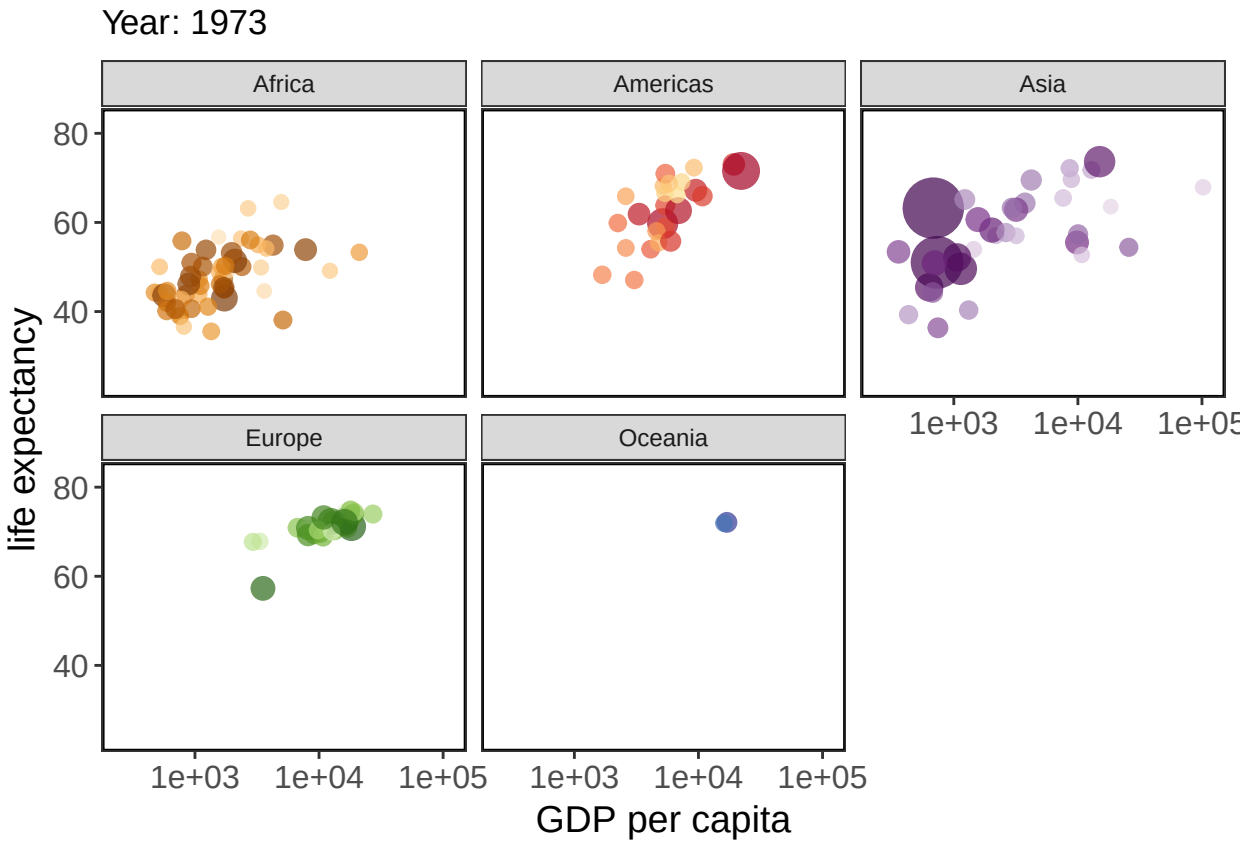
1e+05
GDP per capita


Year: 1973
Africa
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Asia
Europe
Oceania
life expectancy
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1e+03
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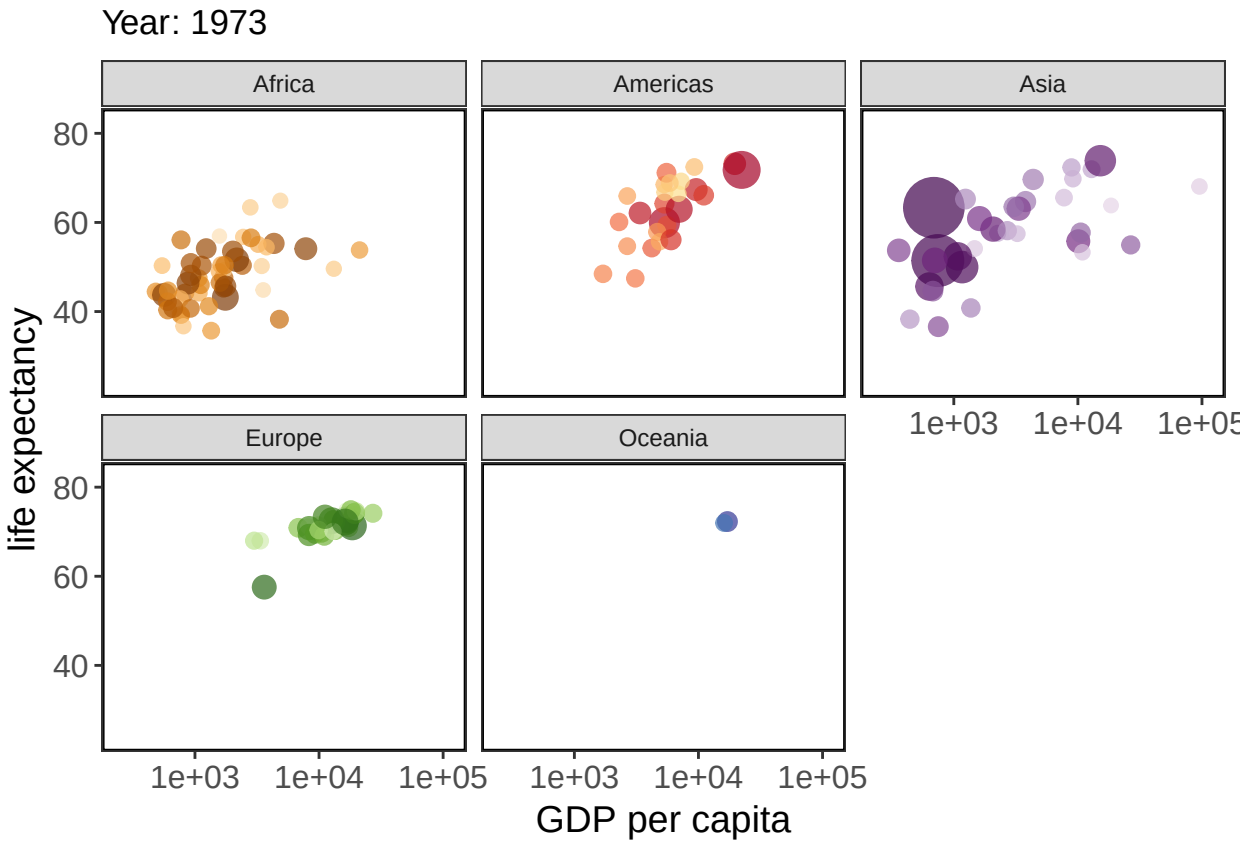
1e+05
GDP per capita


Year: 1973
Africa
Americas
Asia
Europe
Oceania
life expectancy
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1e+03
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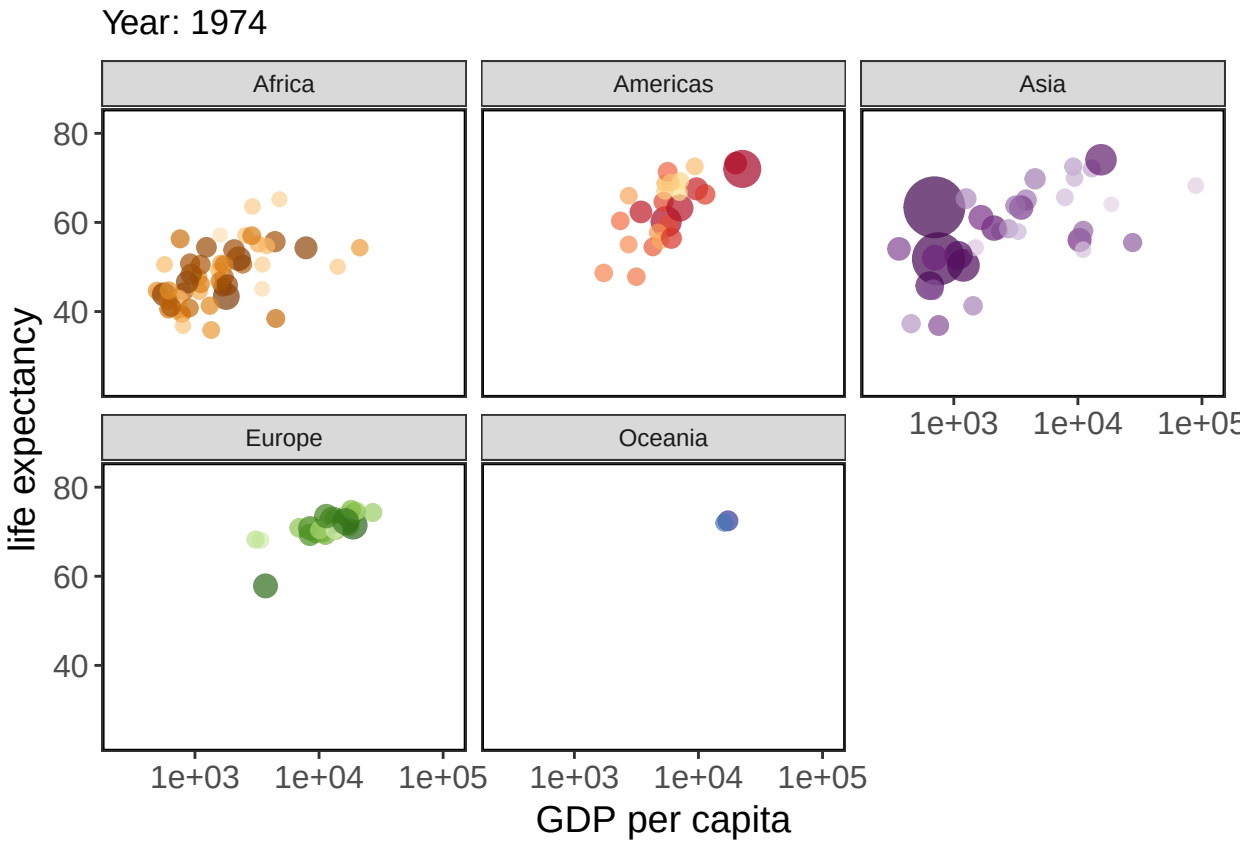
1e+05
GDP per capita


Year: 1974
Africa
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Europe
Oceania
life expectancy
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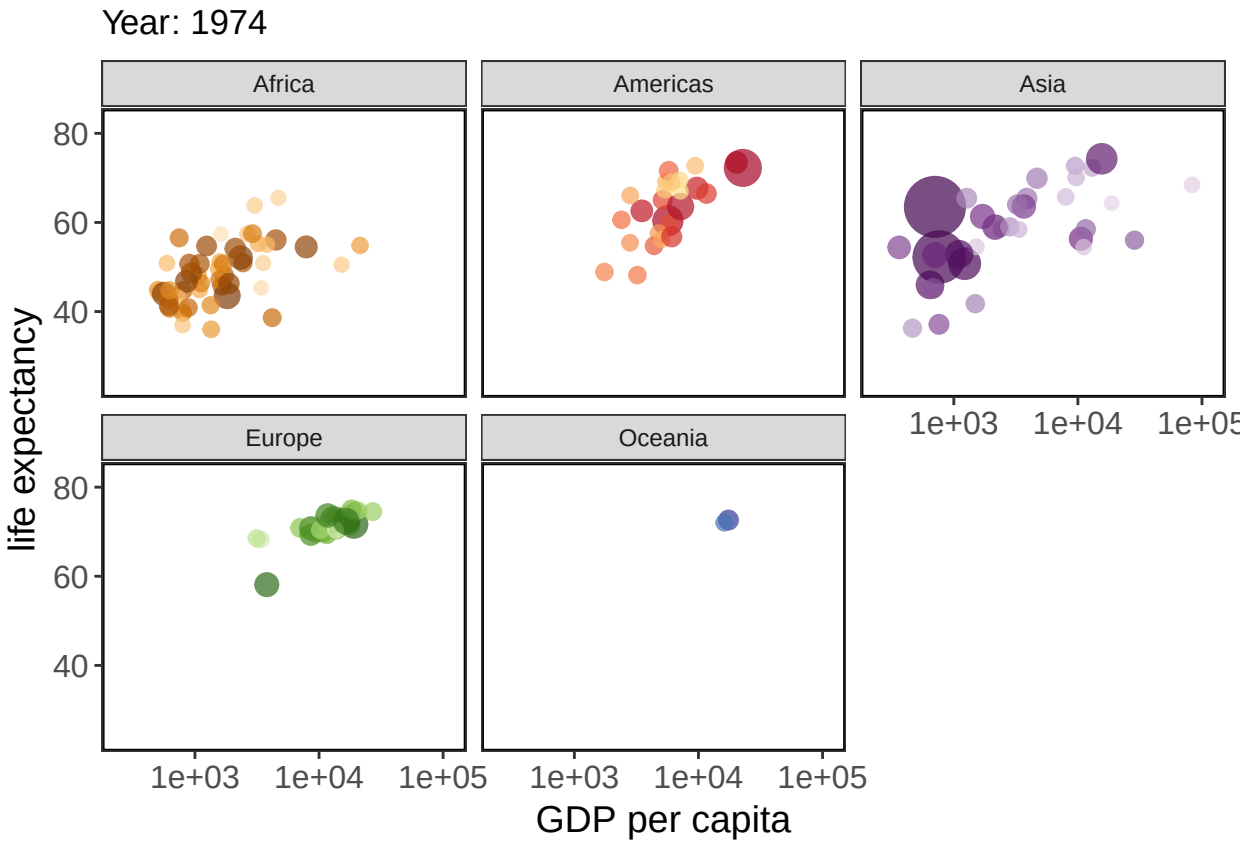
1e+03
1e+04
1e+05
GDP per capita


Year: 1974
Africa
Americas
Asia
Europe
Oceania
life expectancy
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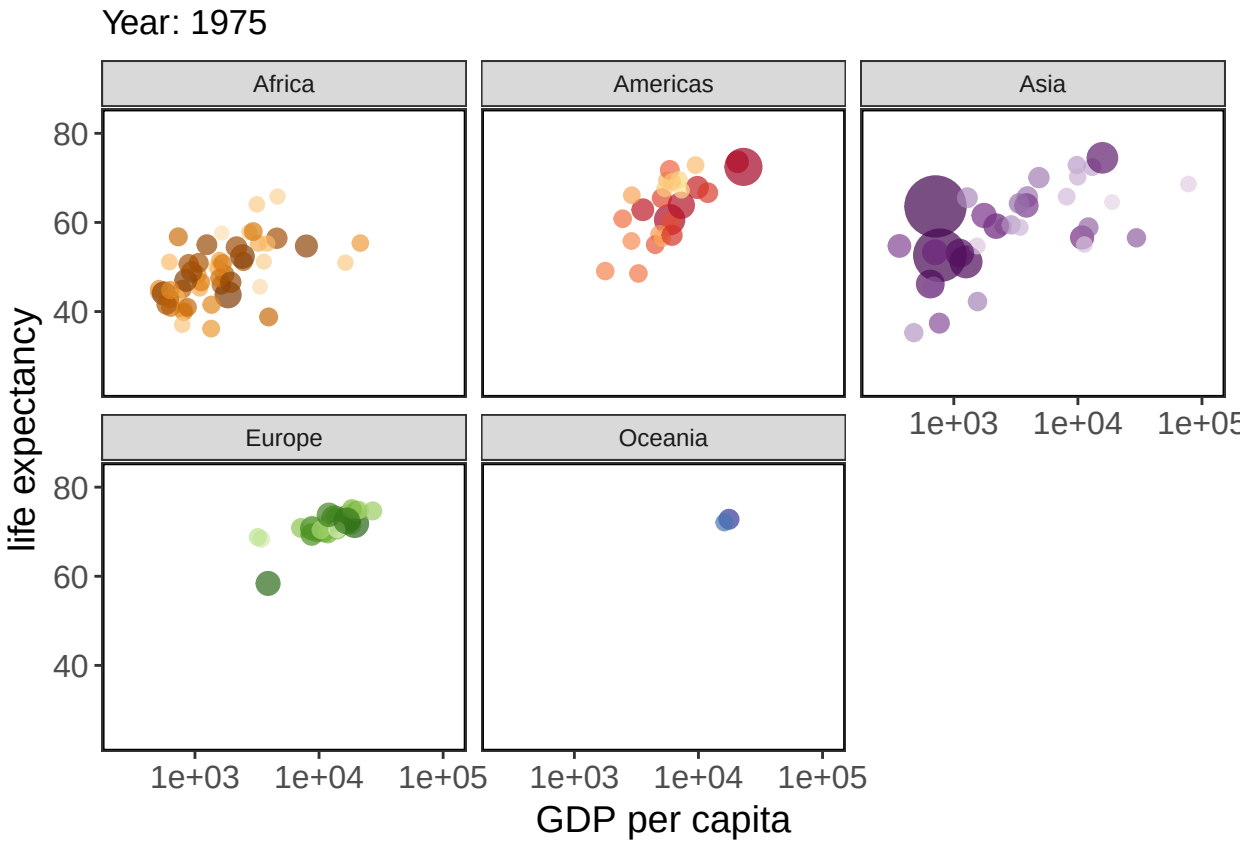
1e+03
1e+04
1e+05
GDP per capita


Year: 1975
Africa
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Asia
Europe
Oceania
life expectancy
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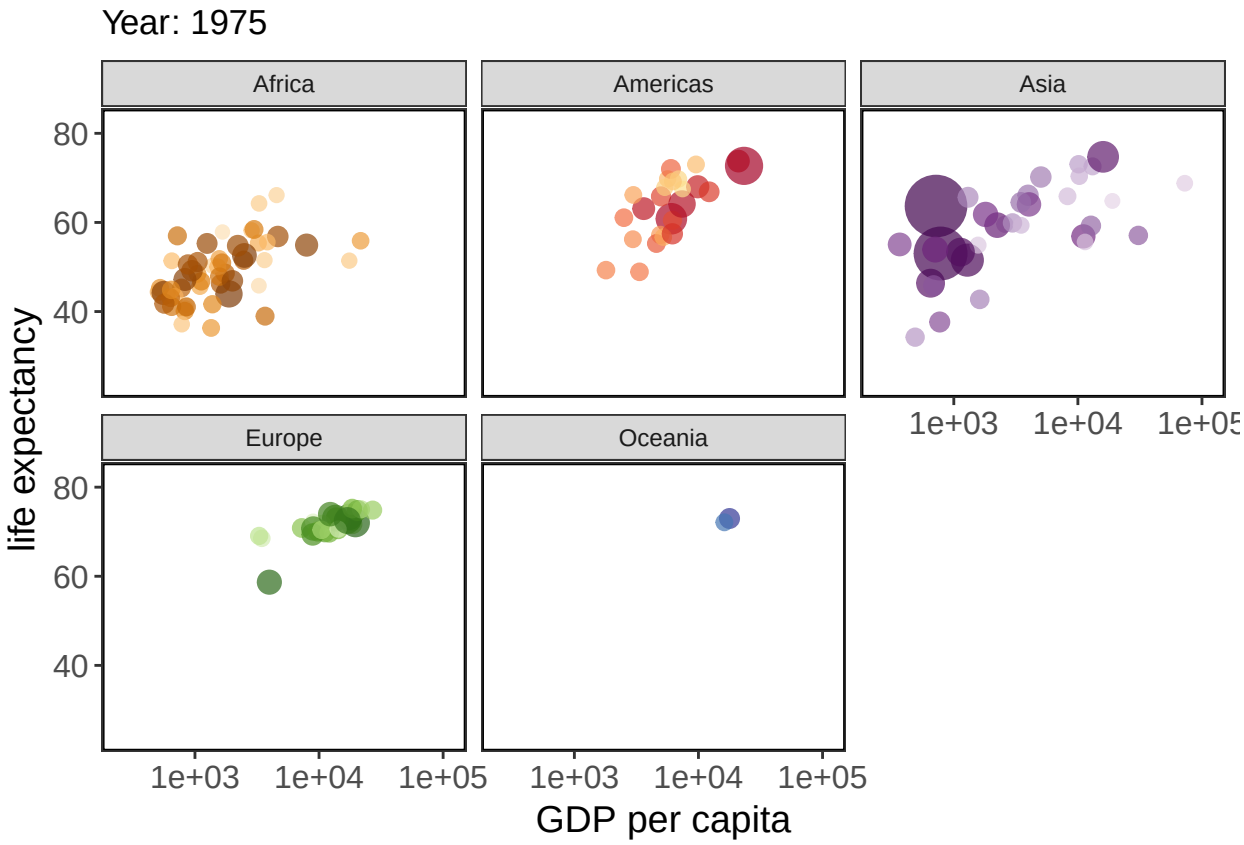
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1975
Africa
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Asia
Europe
Oceania
life expectancy
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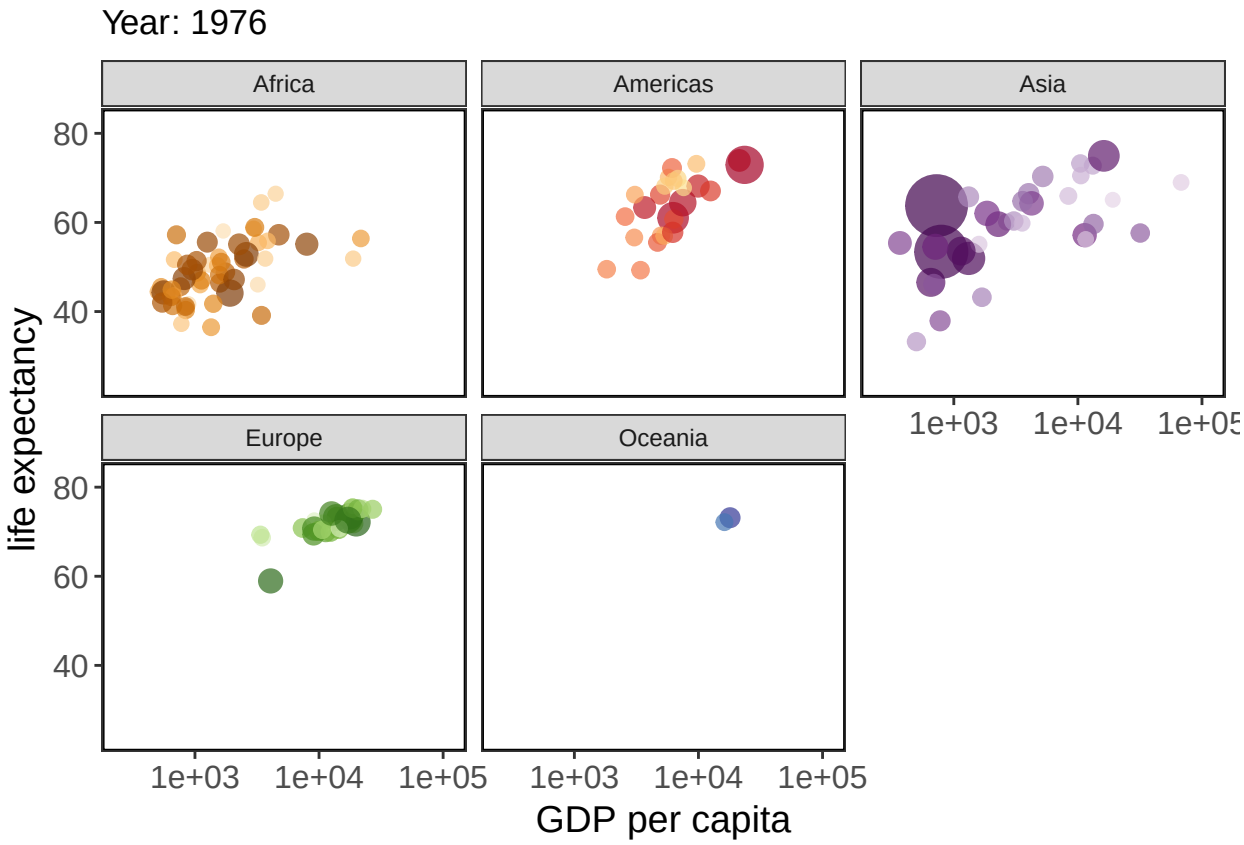
1e+03
1e+04
1e+05
GDP per capita


Year: 1976
Africa
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Asia
Europe
Oceania
life expectancy
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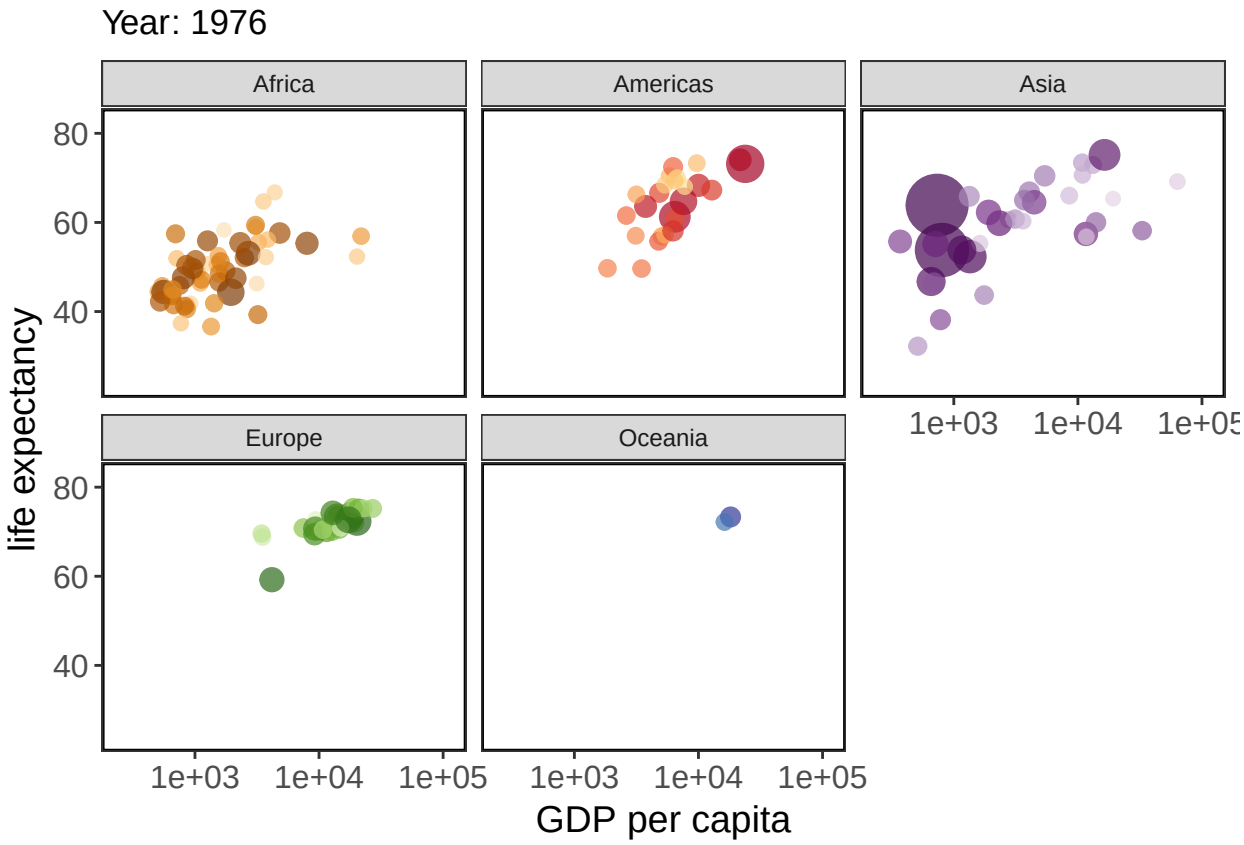
1e+03
1e+04
1e+05
GDP per capita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Europe
Oceania
life expectancy
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1e+03
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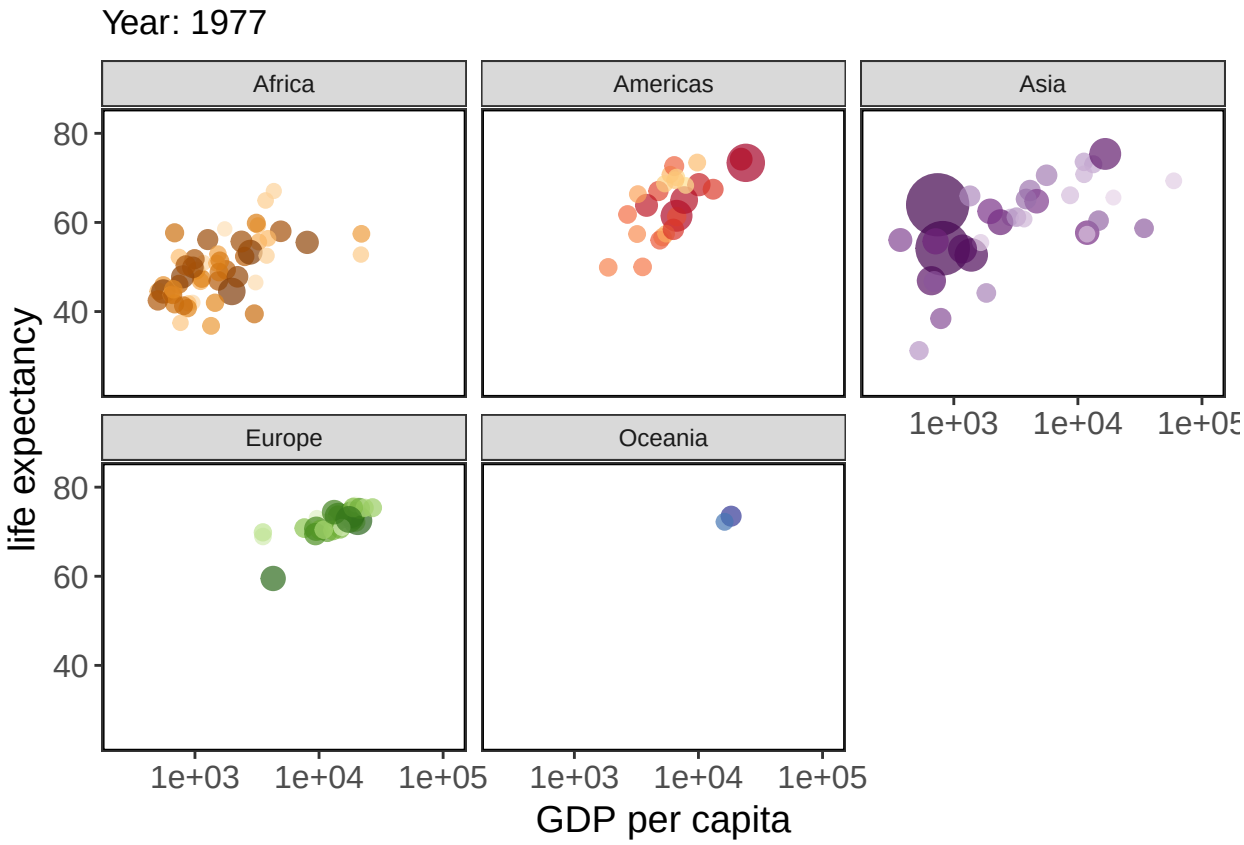
1e+05
GDP per capita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Africa
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Oceania
life expectancy
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1e+03
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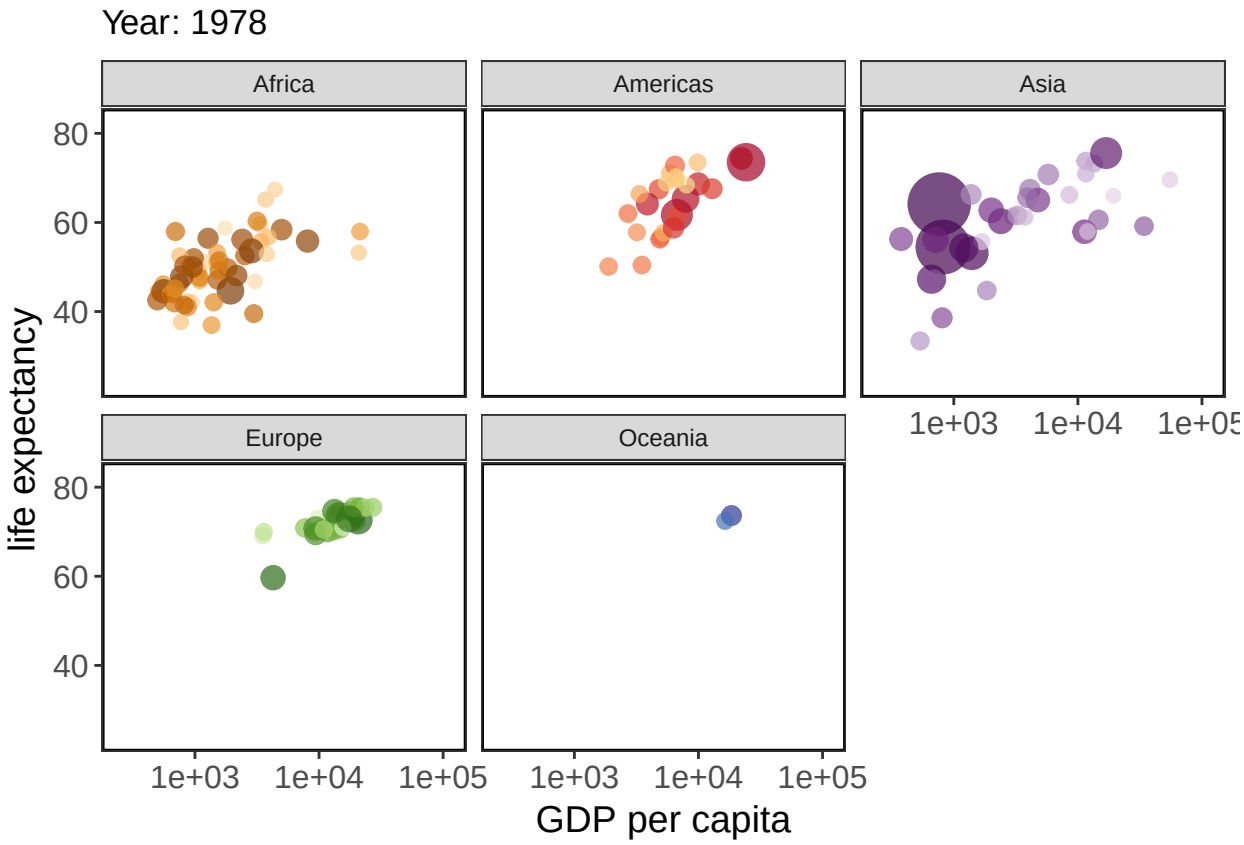
1e+05
GDP per capita


Year: 1978
Africa
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Asia
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Oceania
life expectancy
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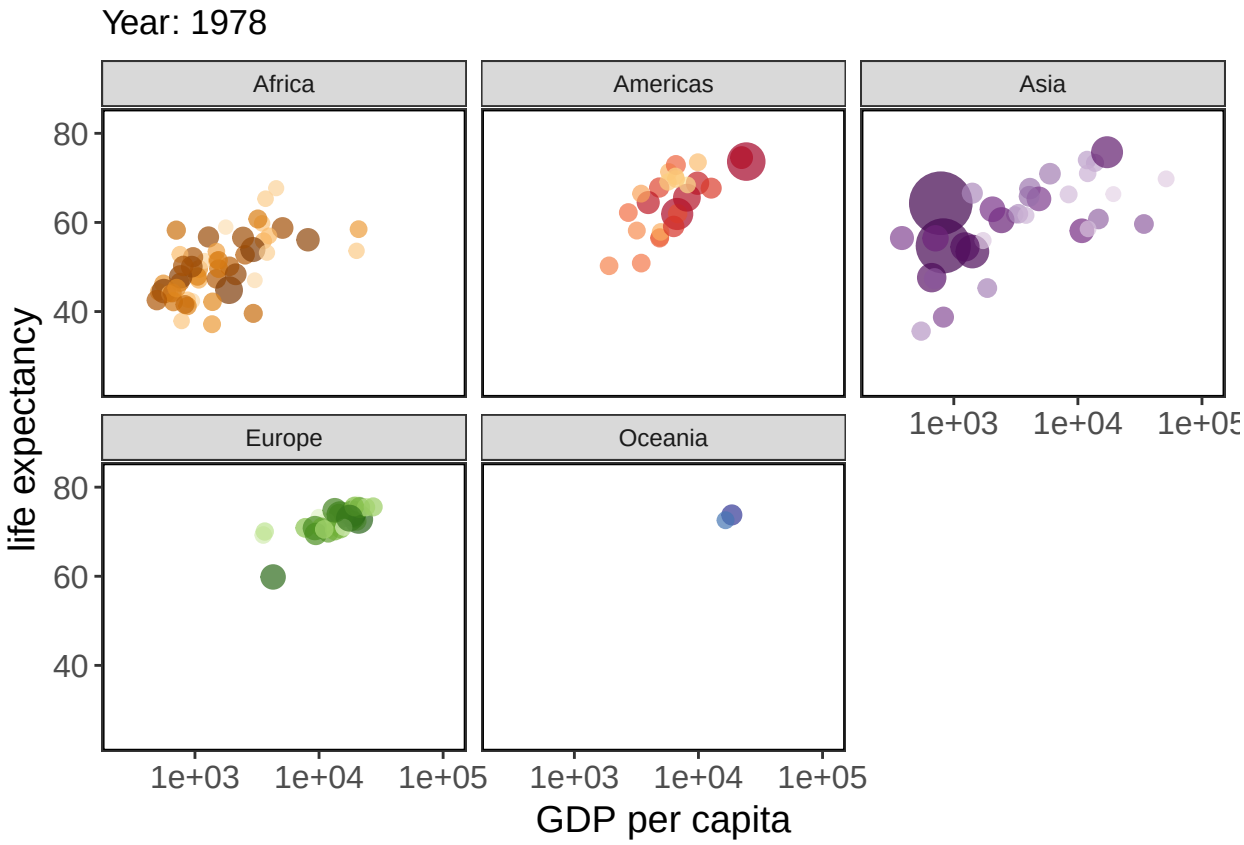
1e+03
1e+04
1e+05
GDP per capita


Year: 1978
Africa
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Asia
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Oceania
life expectancy
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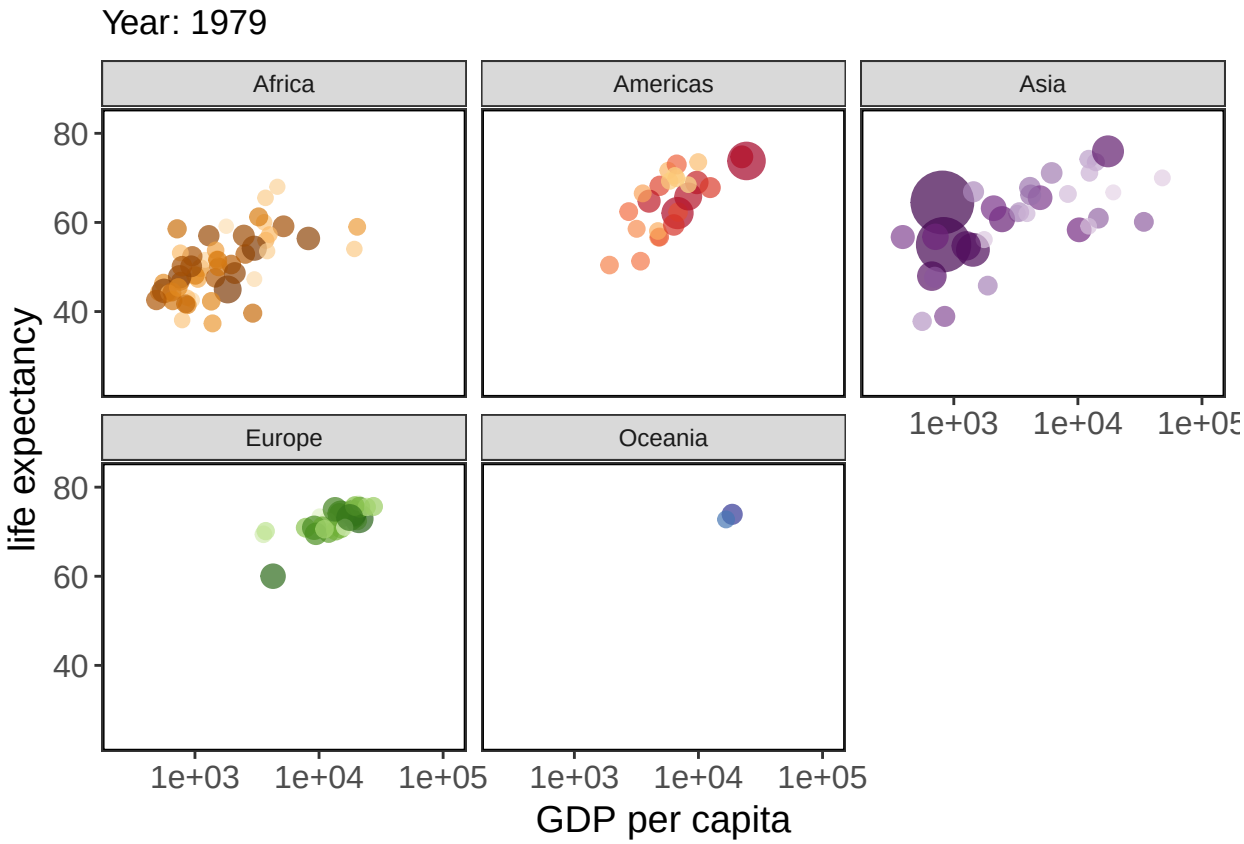
1e+03
1e+04
1e+05
GDP per capita


Year: 1979
Africa
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Oceania
life expectancy
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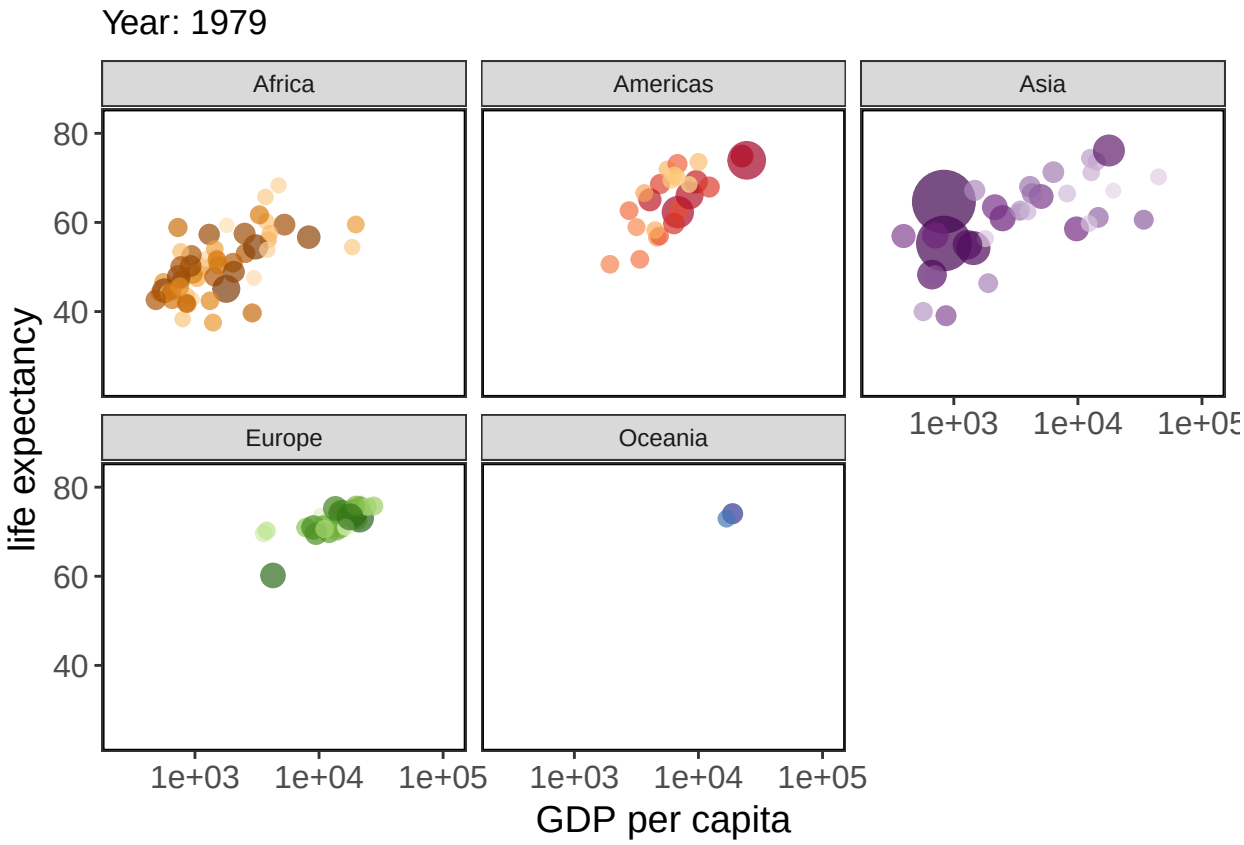
1e+03
1e+04
1e+05
GDP per capita


Year: 1979
Africa
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Oceania
life expectancy
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1e+03
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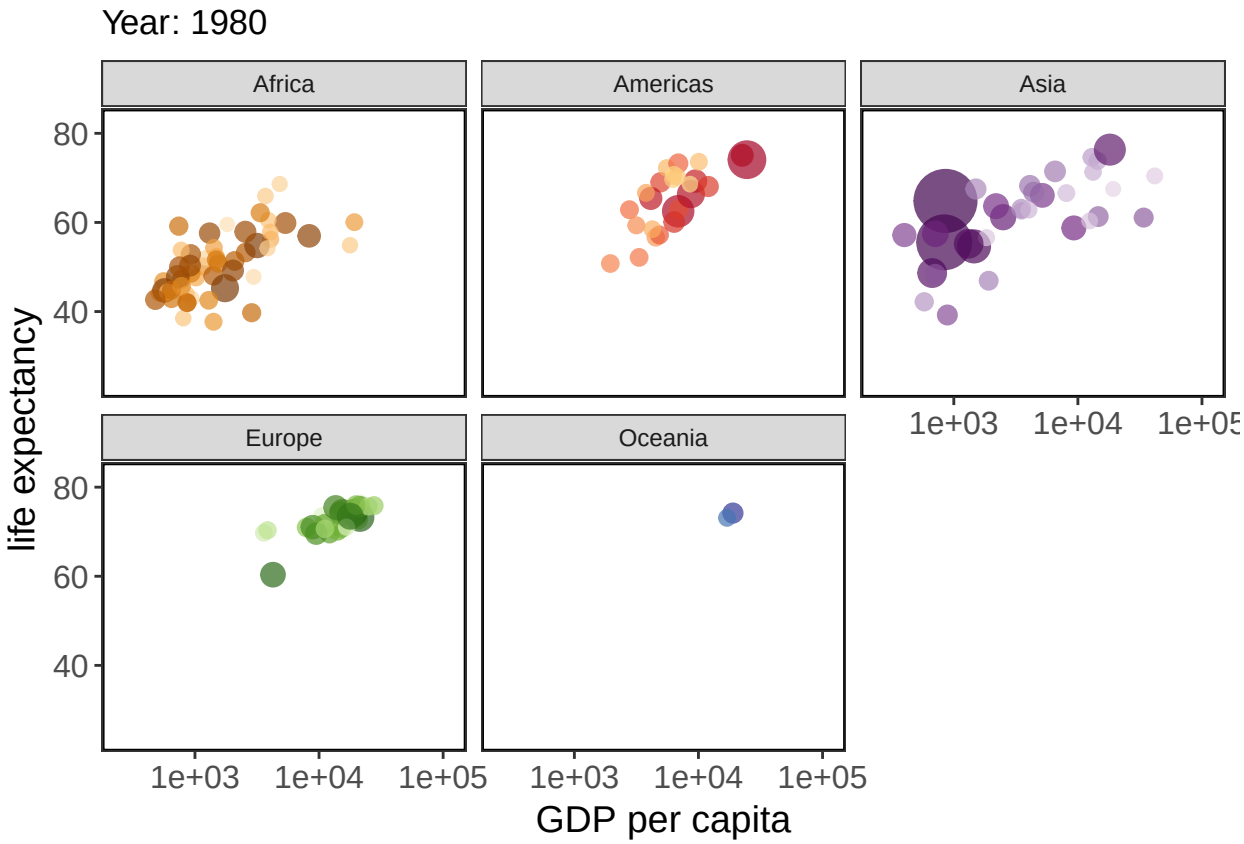
1e+05
GDP per capita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Africa
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Oceania
life expectancy
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1e+03
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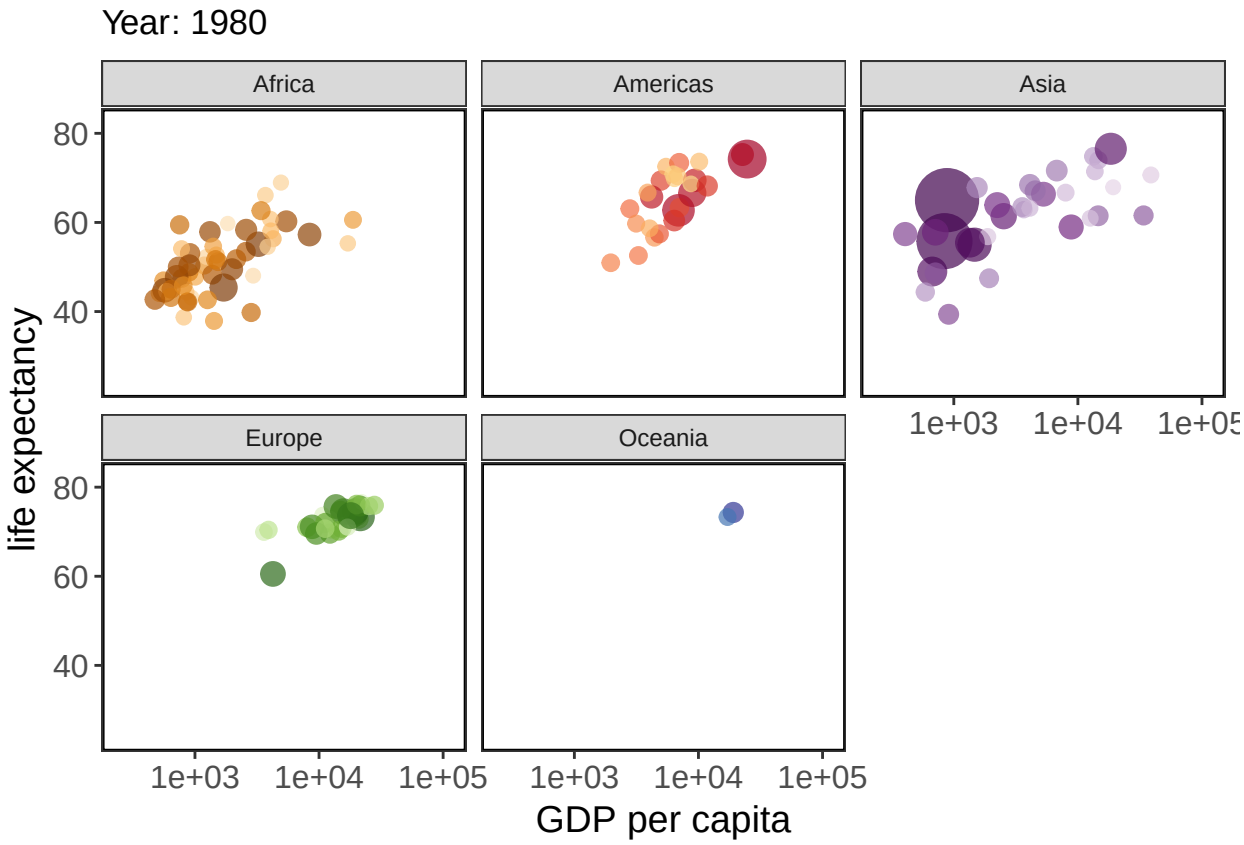
1e+05
GDP per capita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Africa
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Oceania
life expectancy
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1e+03
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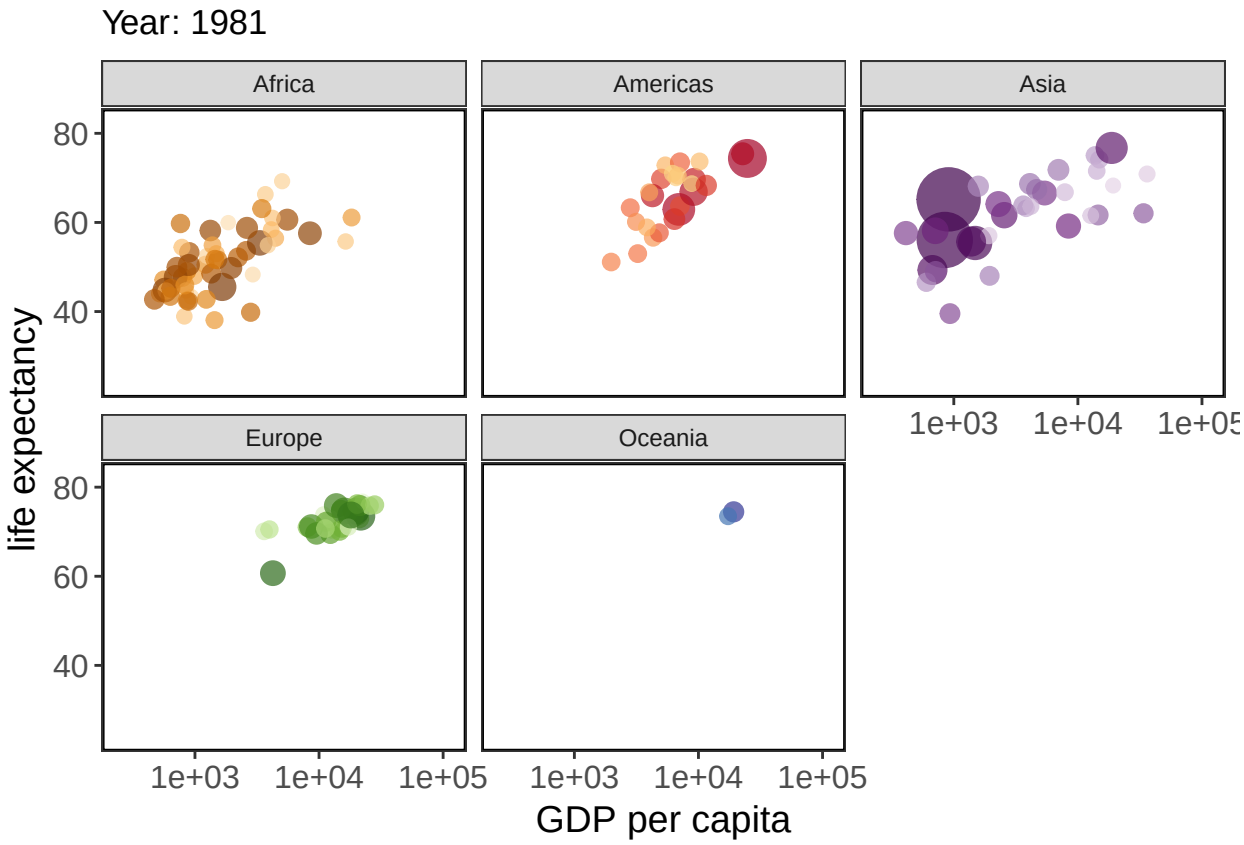
1e+05
GDP per capita


Year: 1981
Africa
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life expectancy
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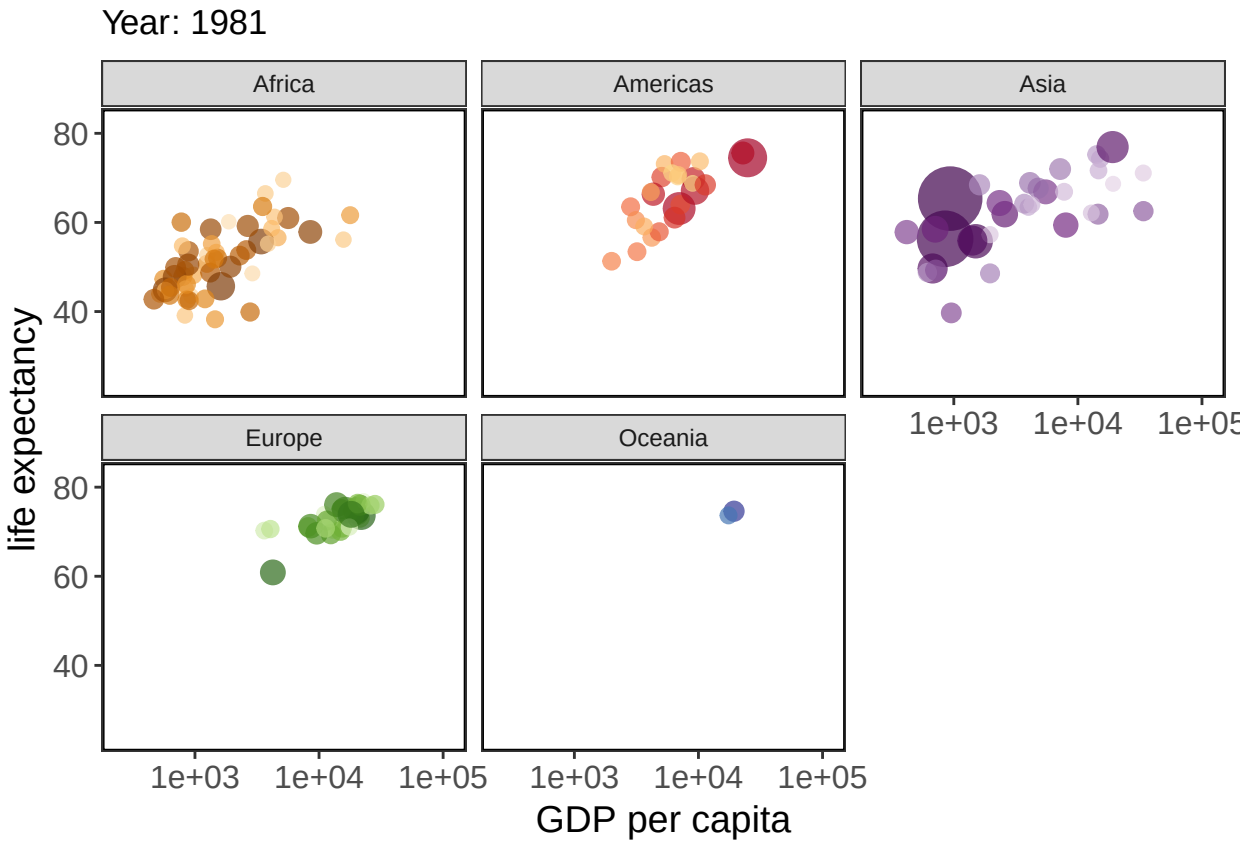
1e+05
GDP per capita


Year: 1981
Africa
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Oceania
life expectancy
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1e+03
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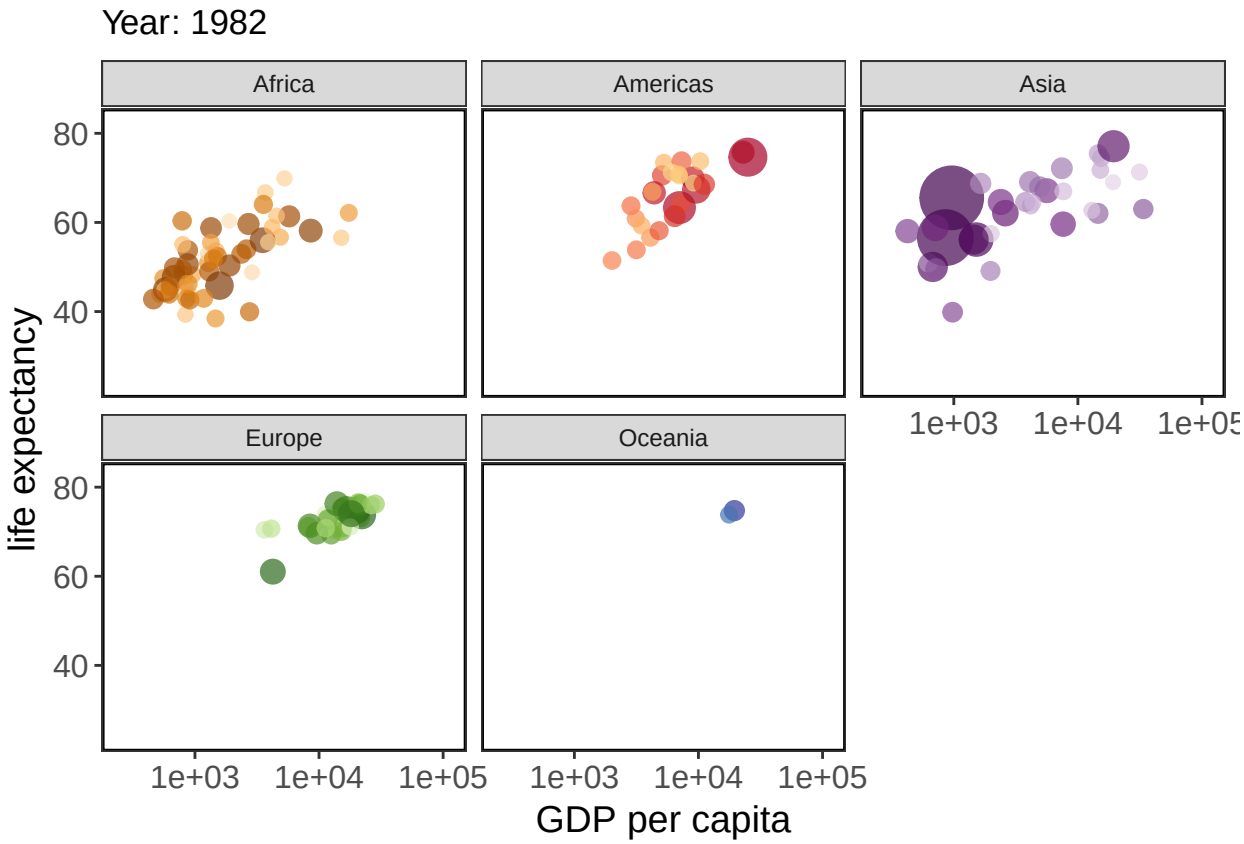
1e+05
GDP per capita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Oceania
life expectancy
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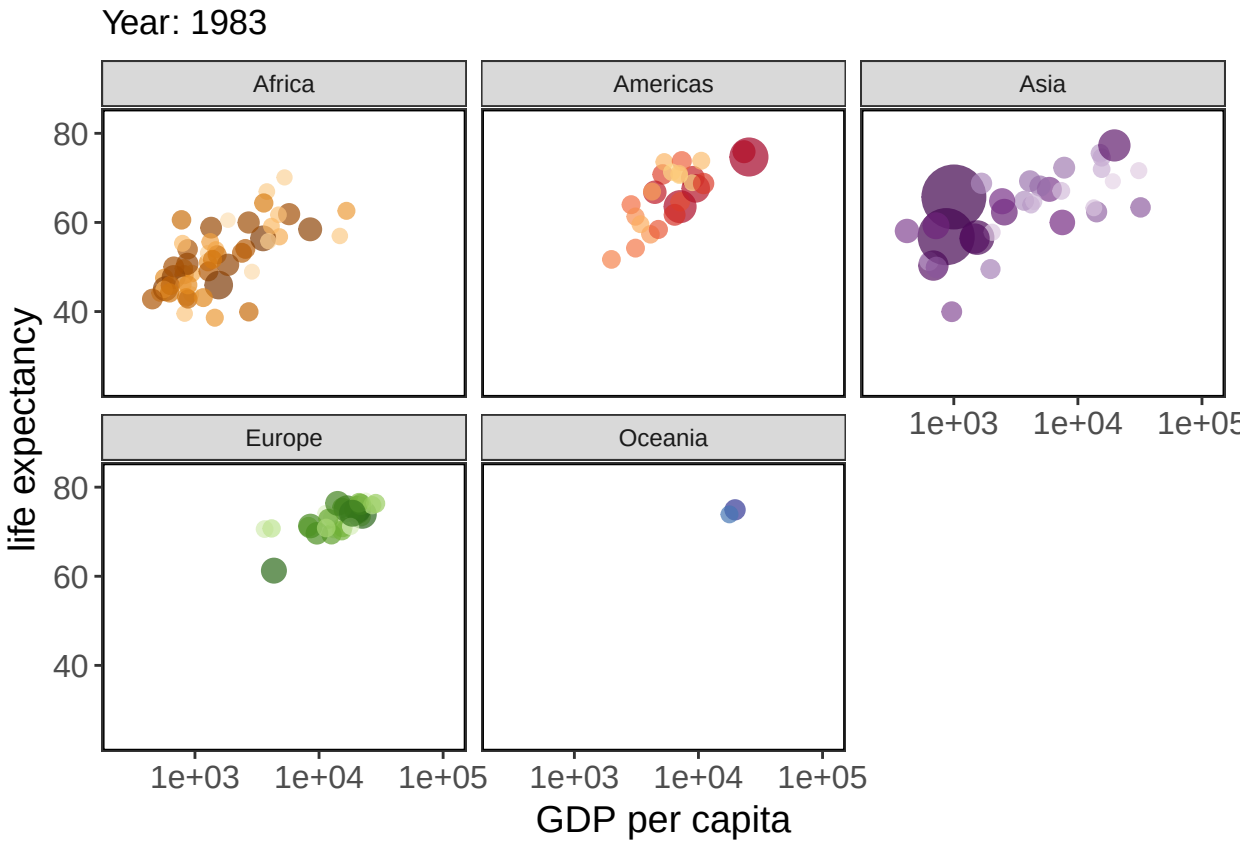
1e+03
1e+04
1e+05
GDP per capita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life expectancy
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1e+03
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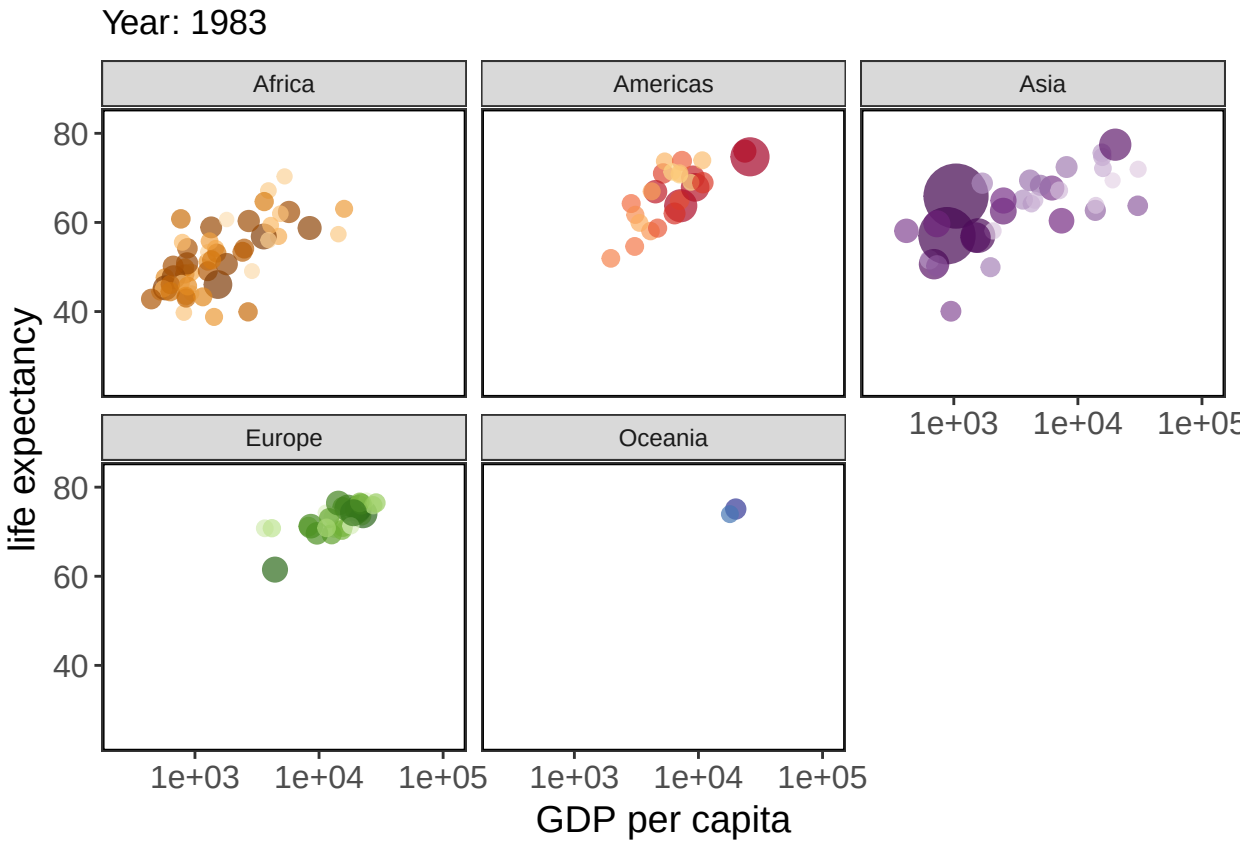
1e+05
GDP per capita


Year: 1983
Africa
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life expectancy
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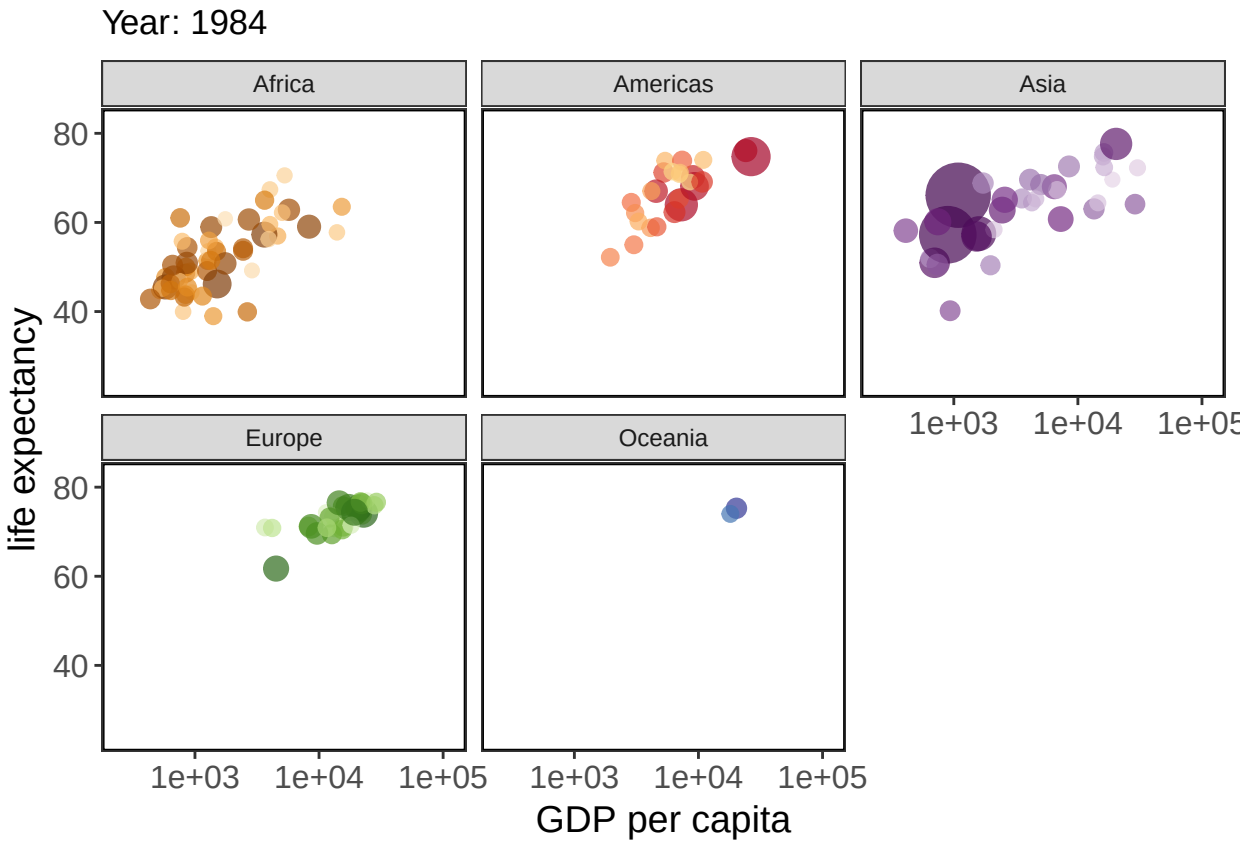
GDP per capita


Year: 1984
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Oceania
life expectancy
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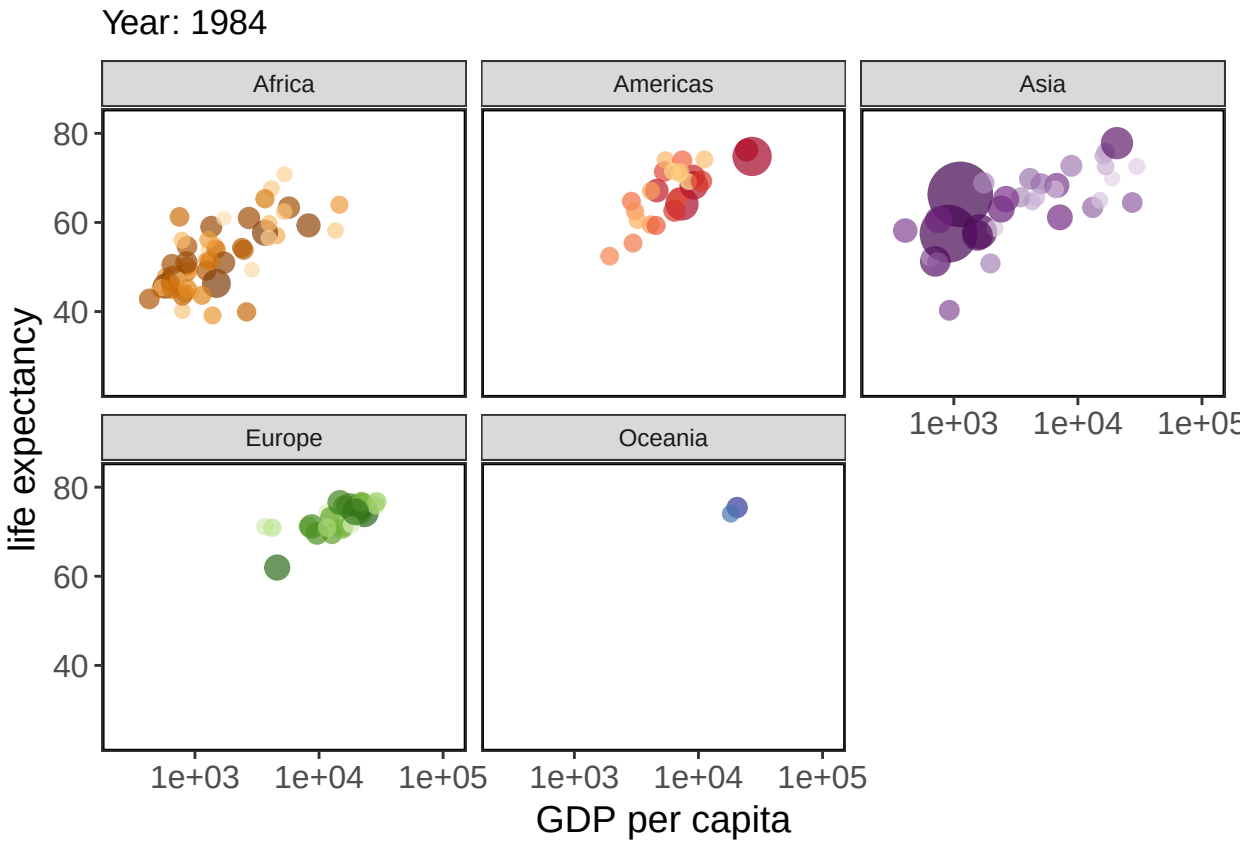
1e+03
1e+04
1e+05
GDP per capita


Year: 1984
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life expectancy
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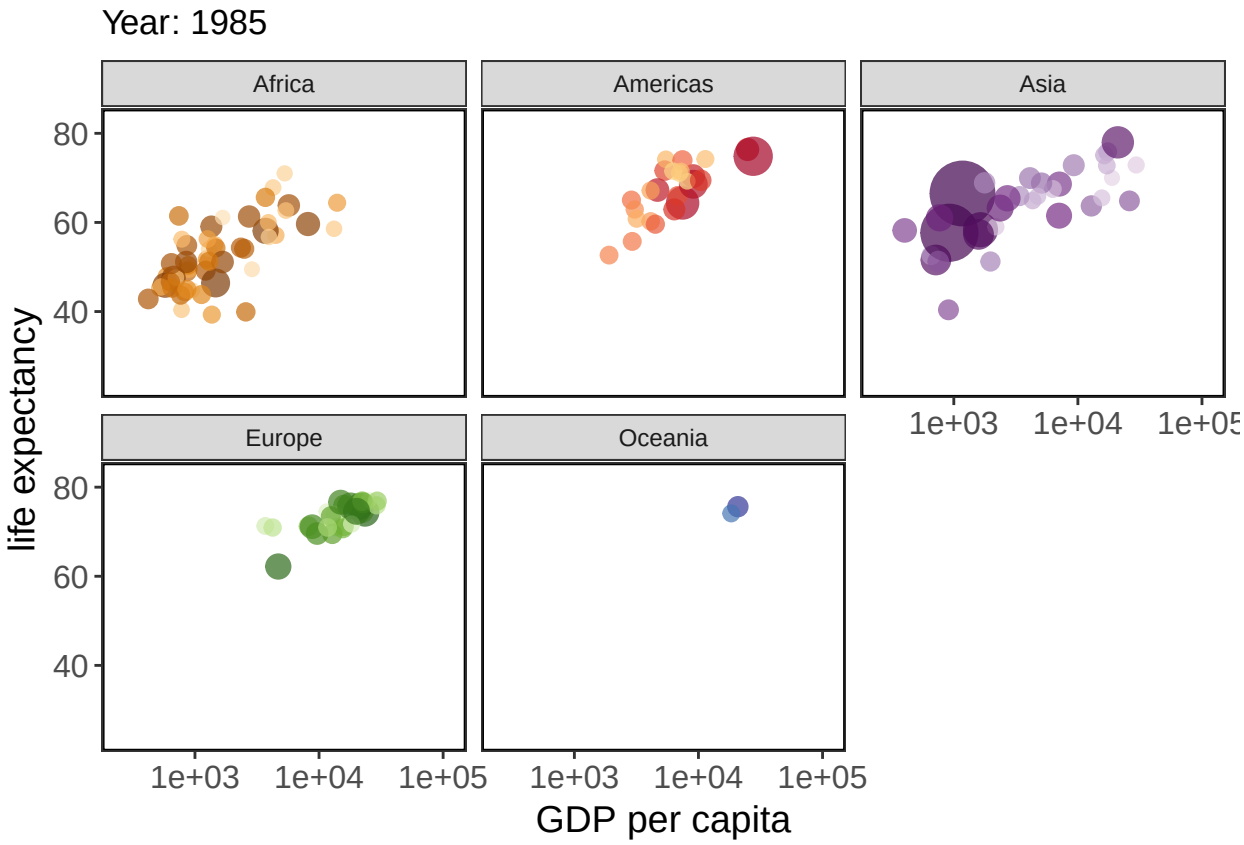
1e+05
GDP per capita


Year: 1985
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Oceania
life expectancy
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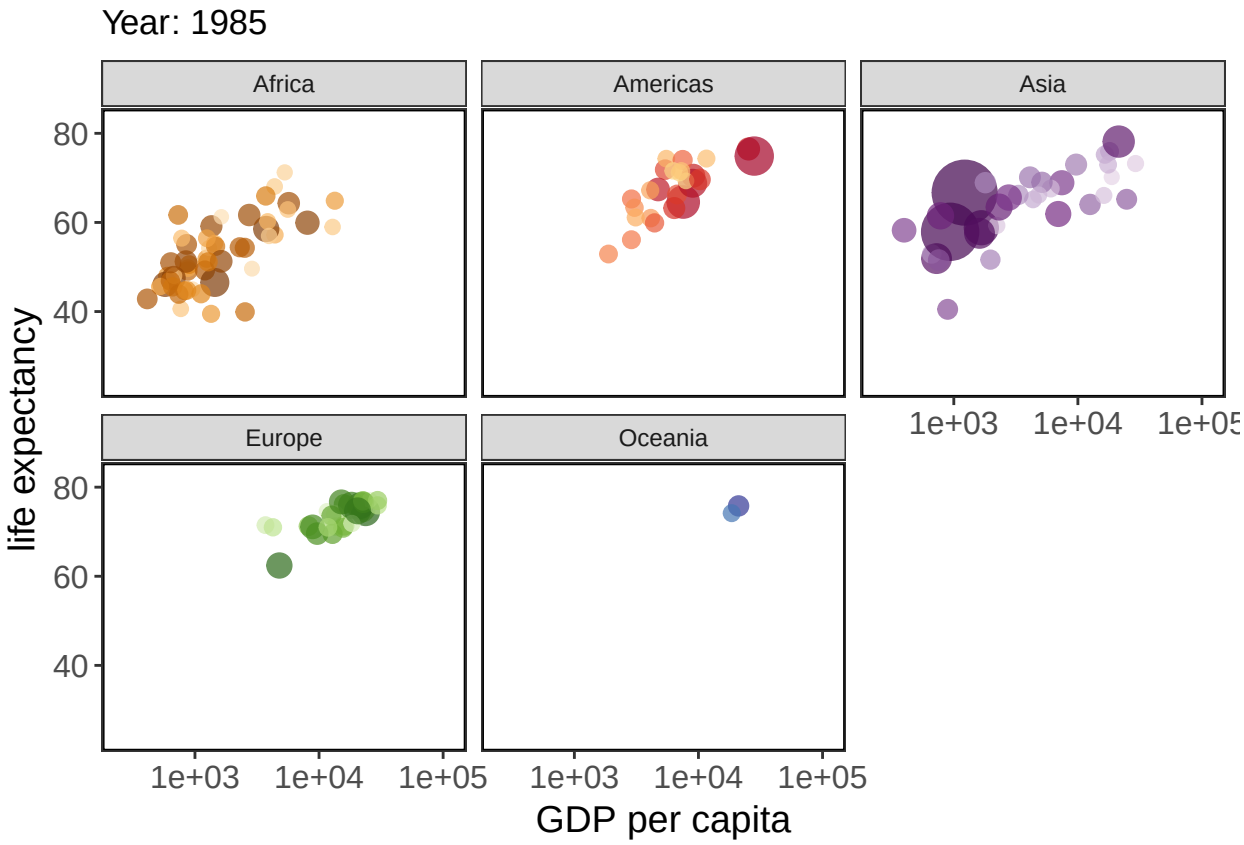
1e+04
1e+05
GDP per capita


Year: 1985
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Oceania
life expectancy
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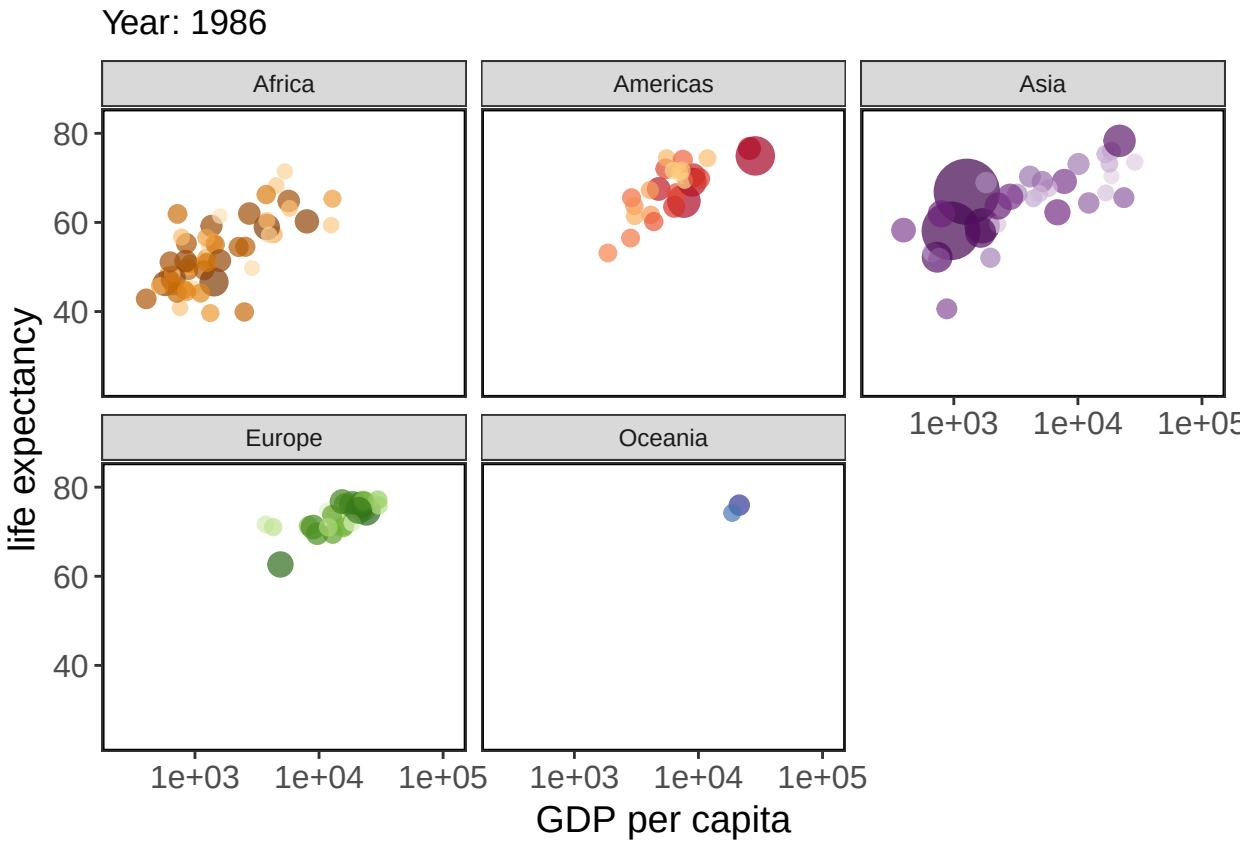
1e+03
1e+04
1e+05
GDP per capita


Year: 1986
Africa
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Asia
Europe
Oceania
life expectancy
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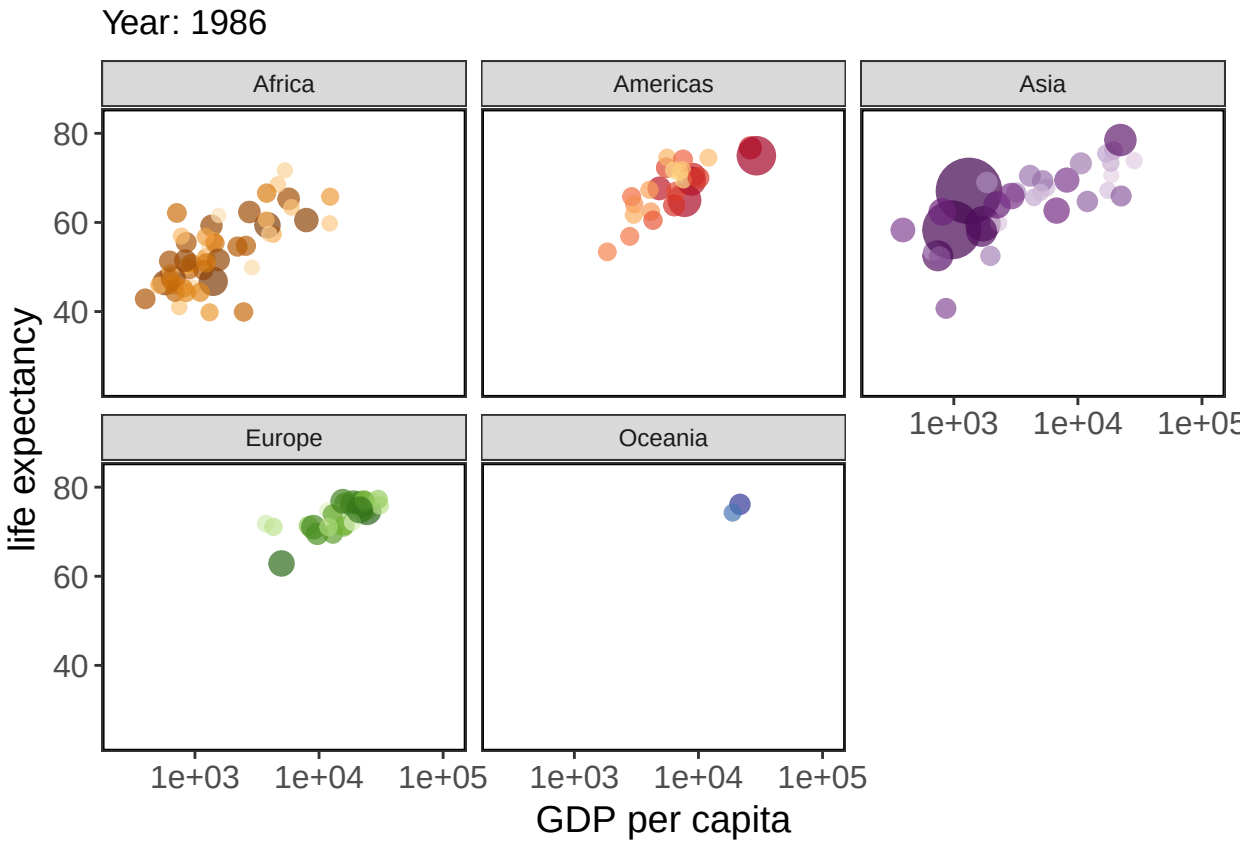
1e+03
1e+04
1e+05
GDP per capita


Year: 1986
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Americas
Asia
Europe
Oceania
life expectancy
80
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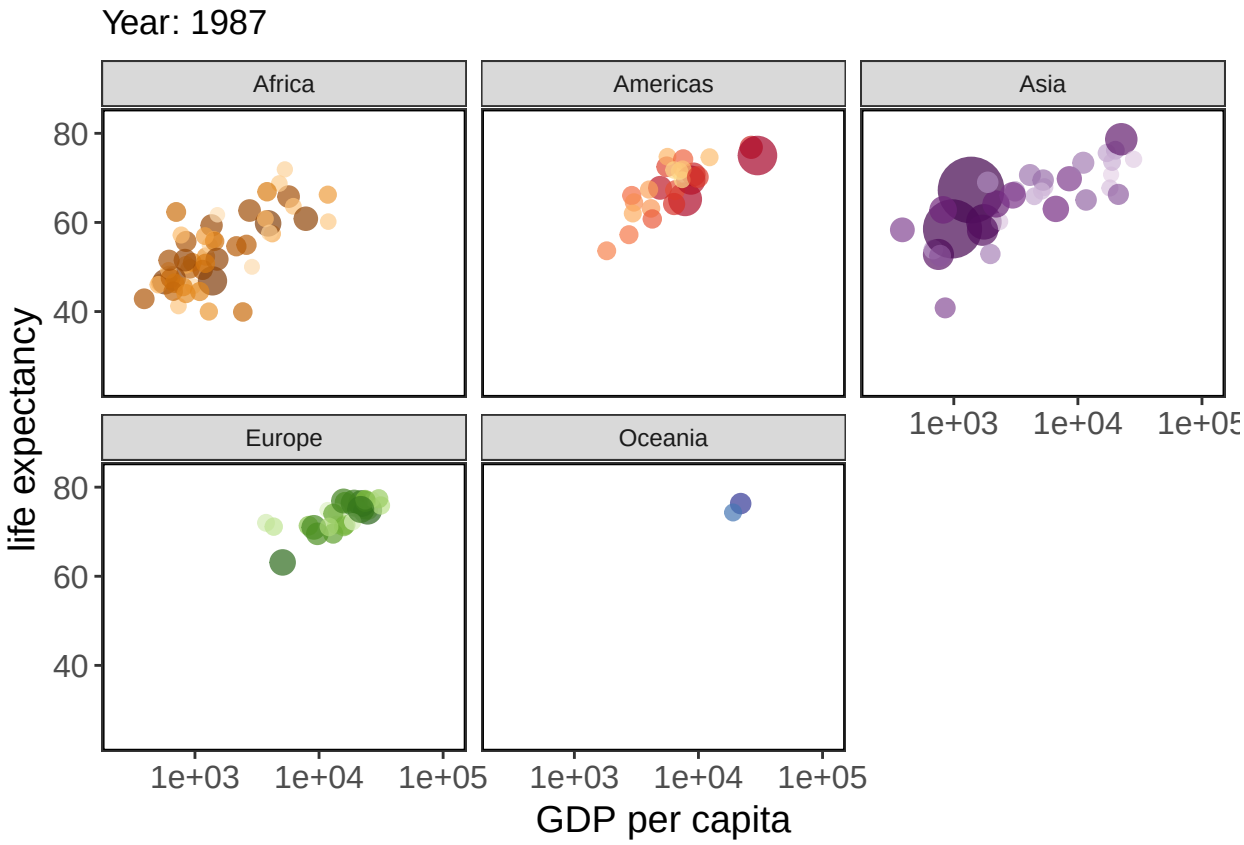
1e+03
1e+04
1e+05
GDP per capita


Year: 1987
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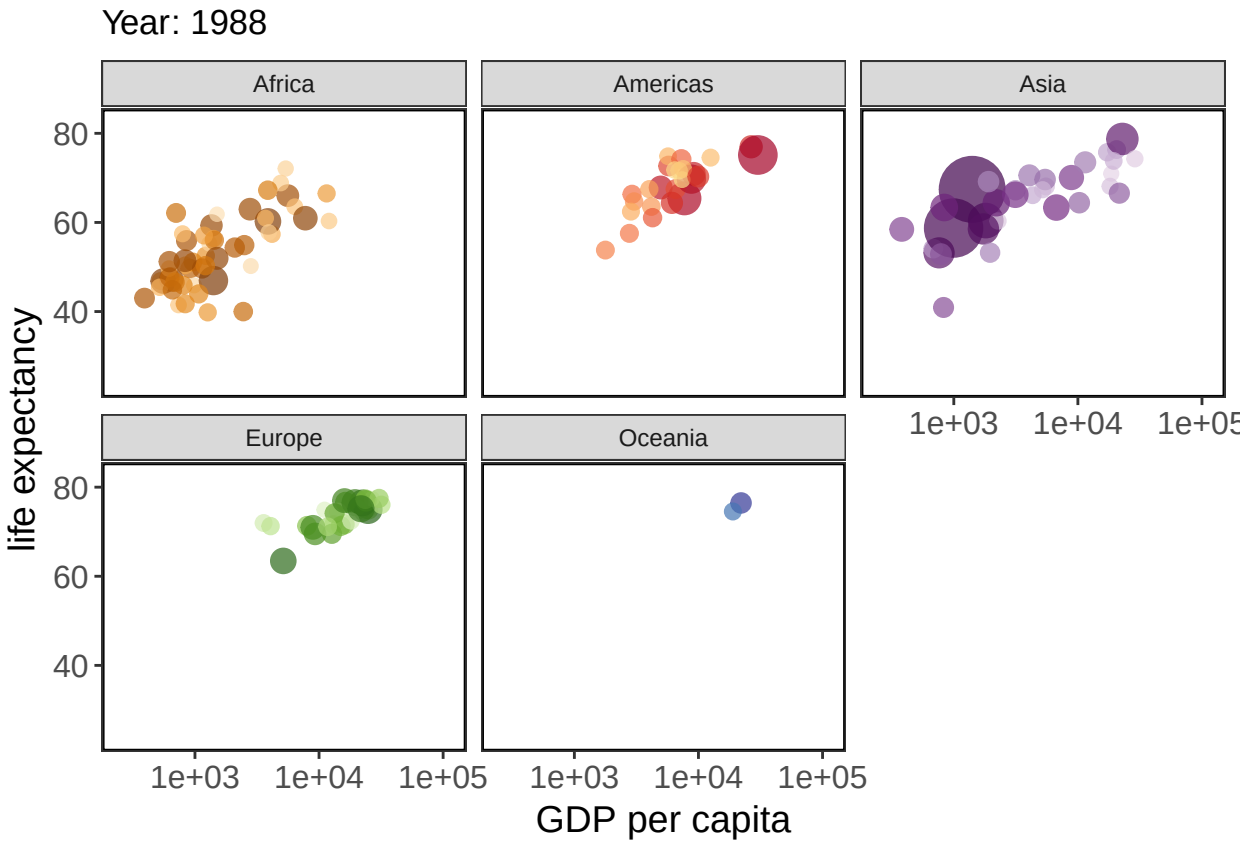
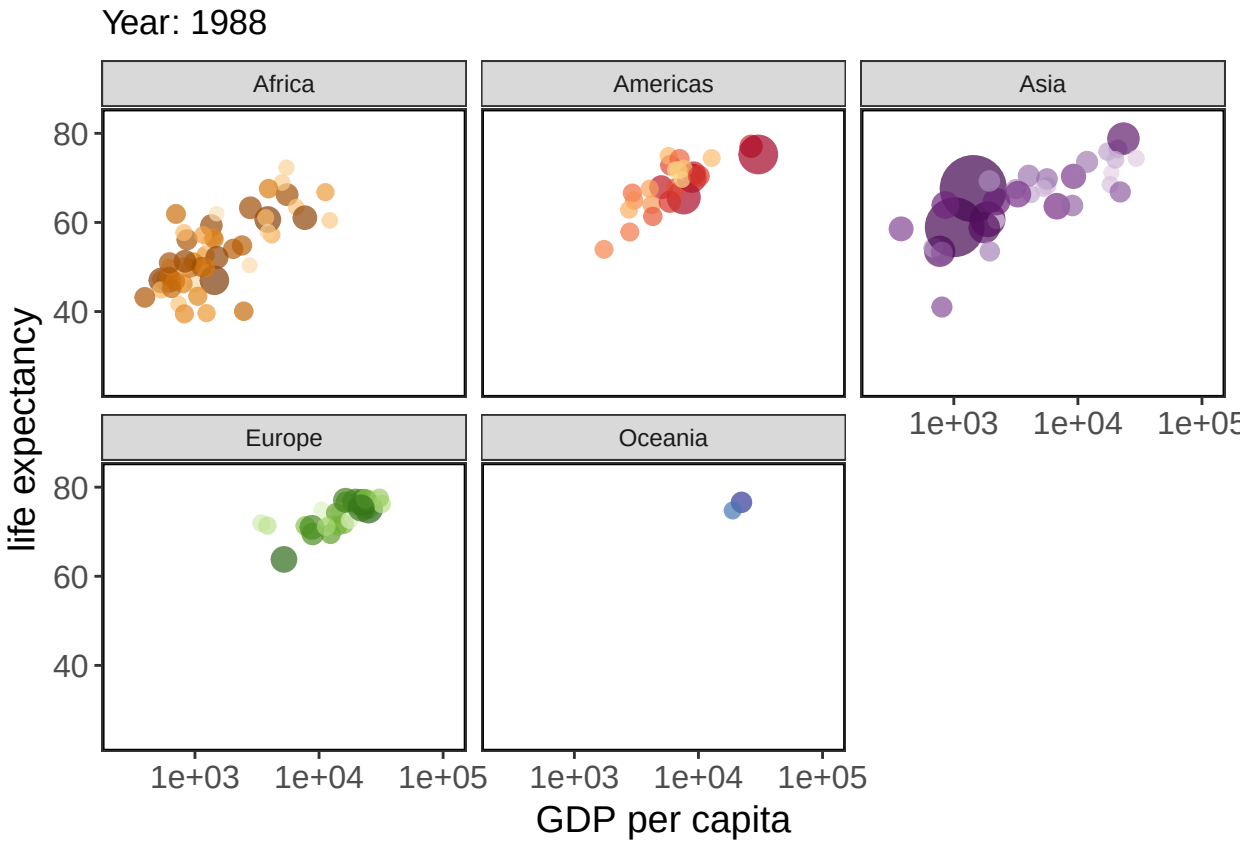
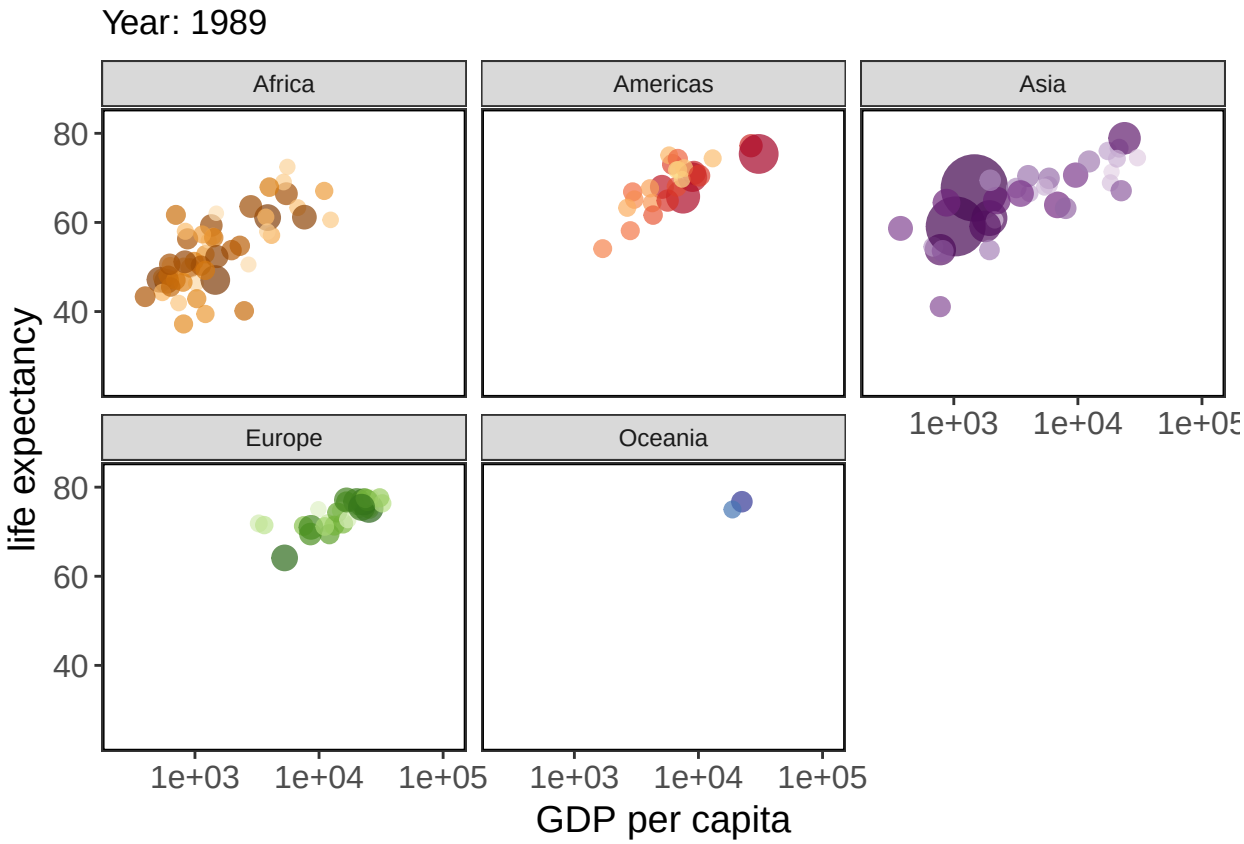
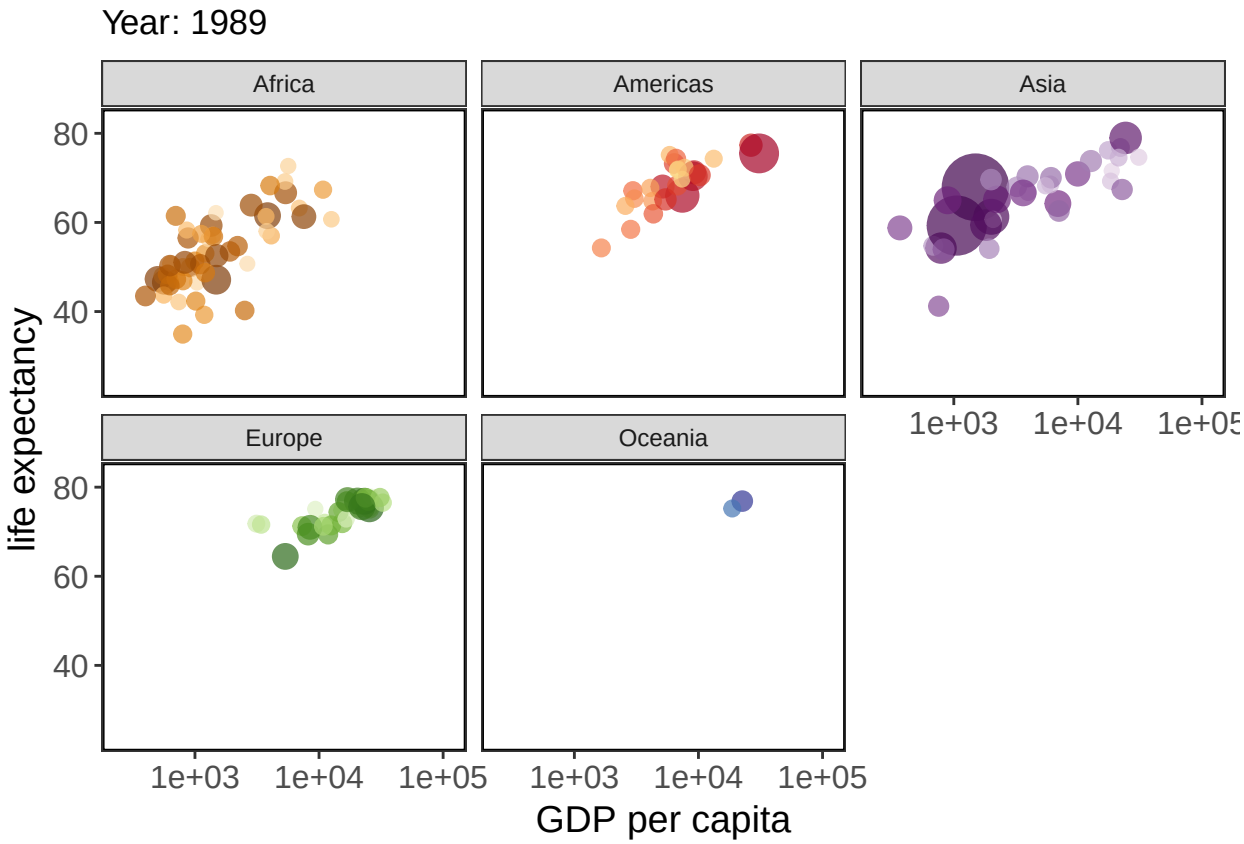
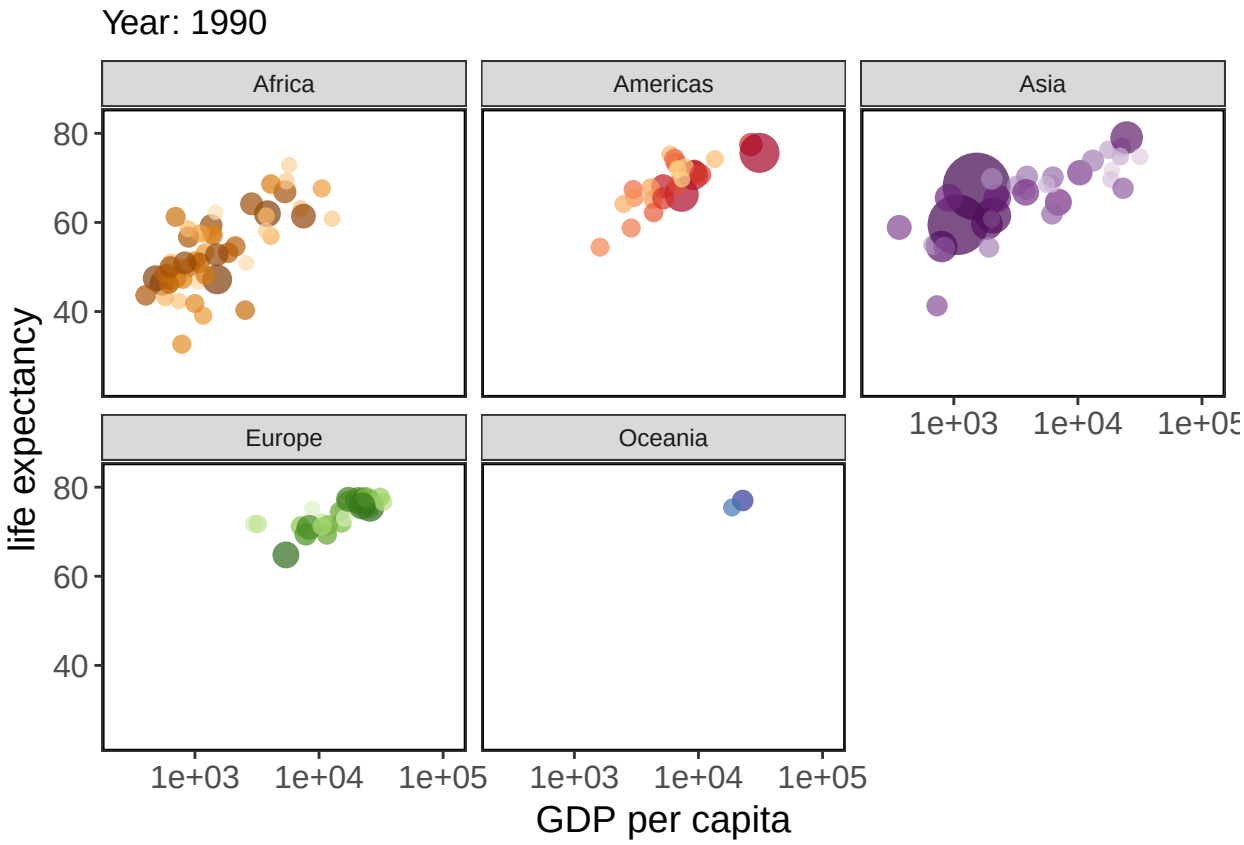
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita

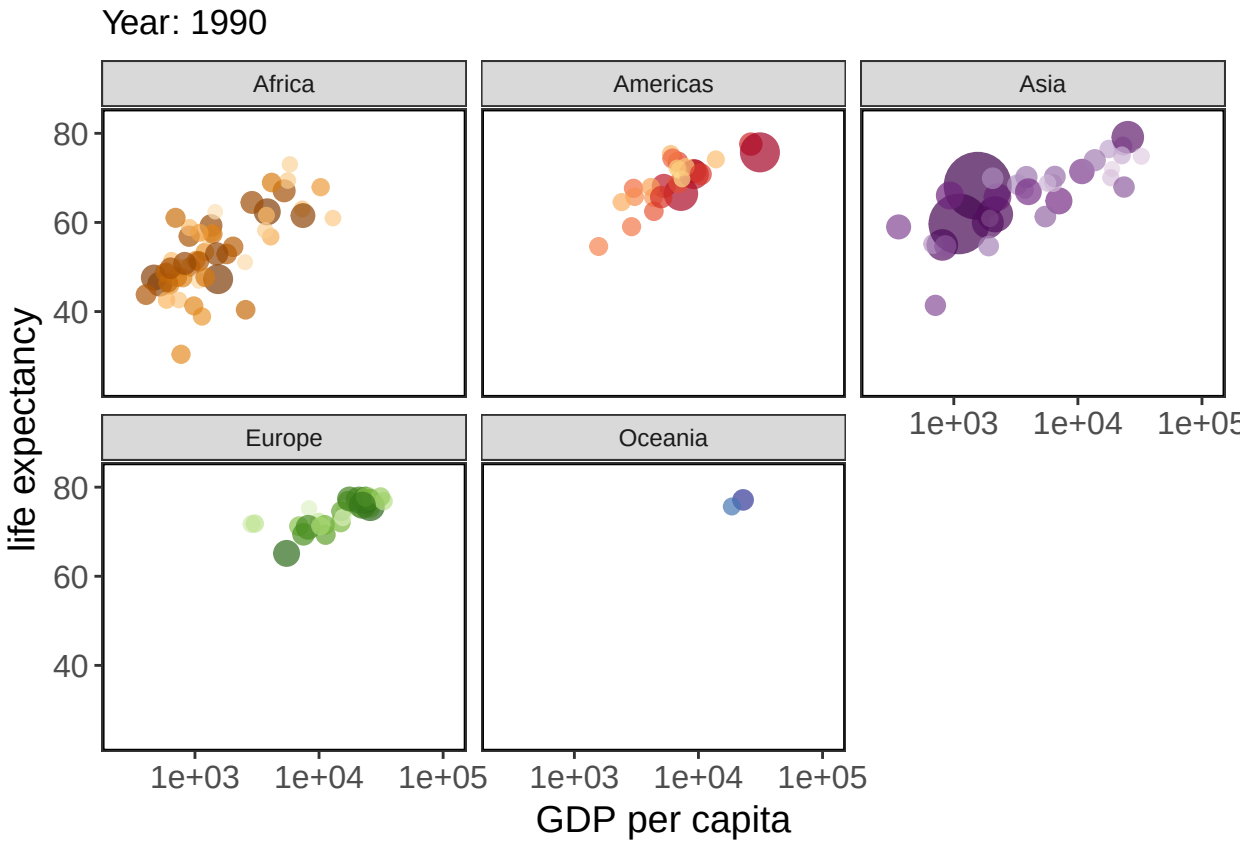

Year: 1988
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita

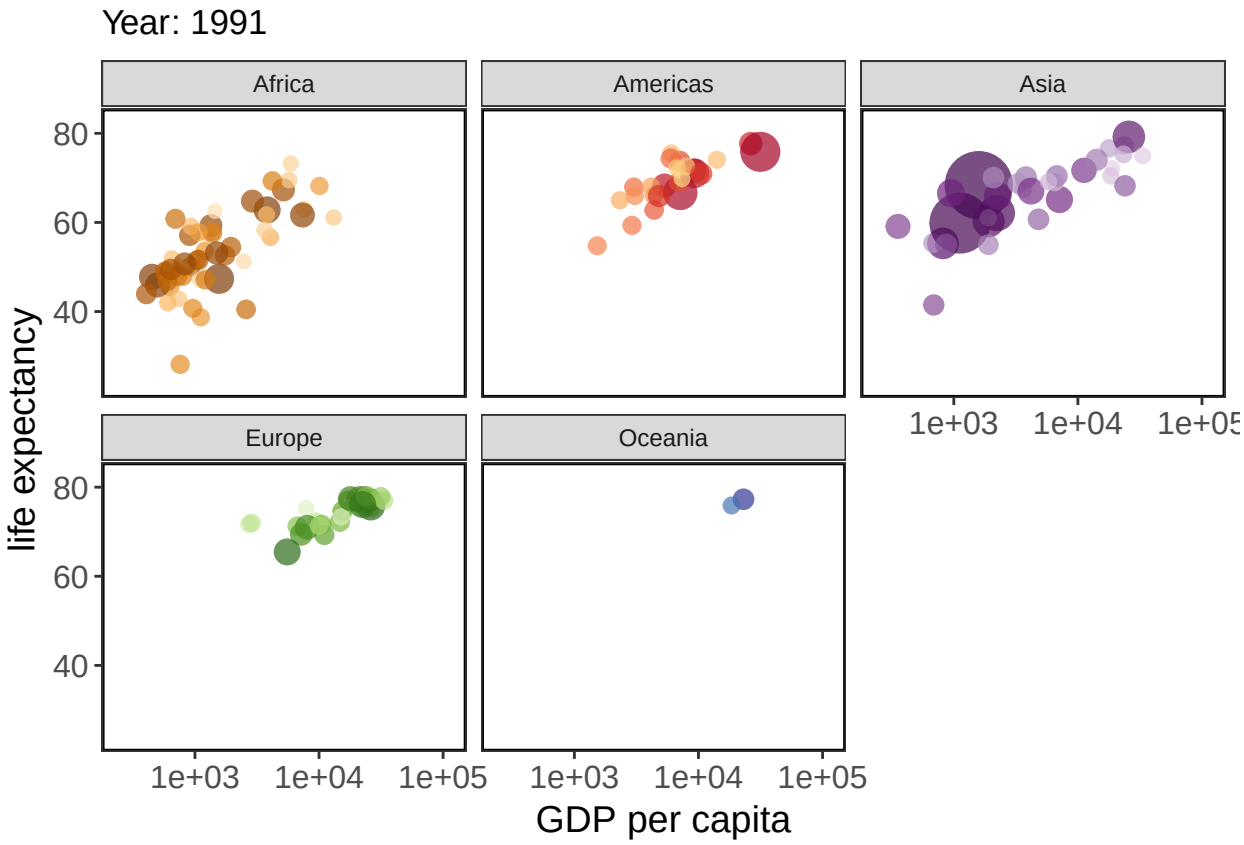

Year: 1988
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1989
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1989
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1990
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1990
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1991
Africa
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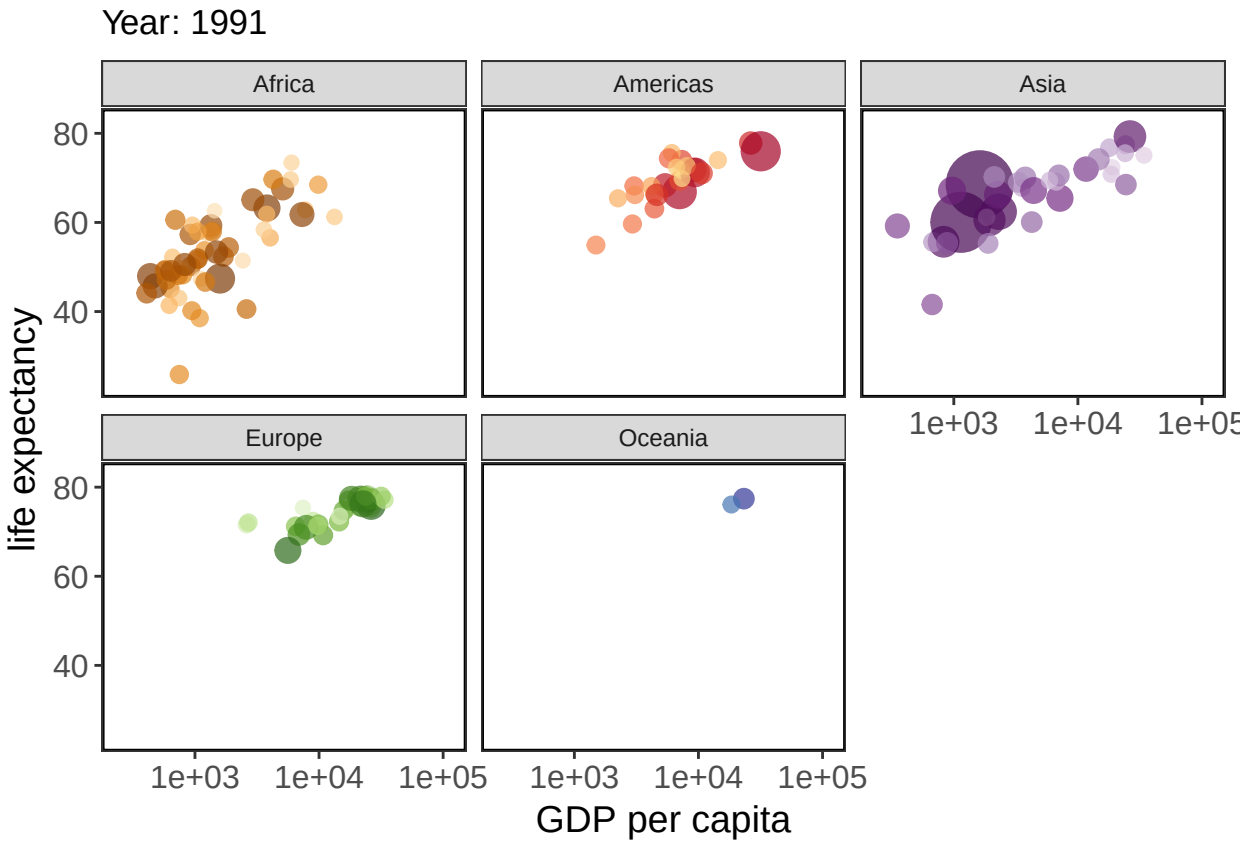
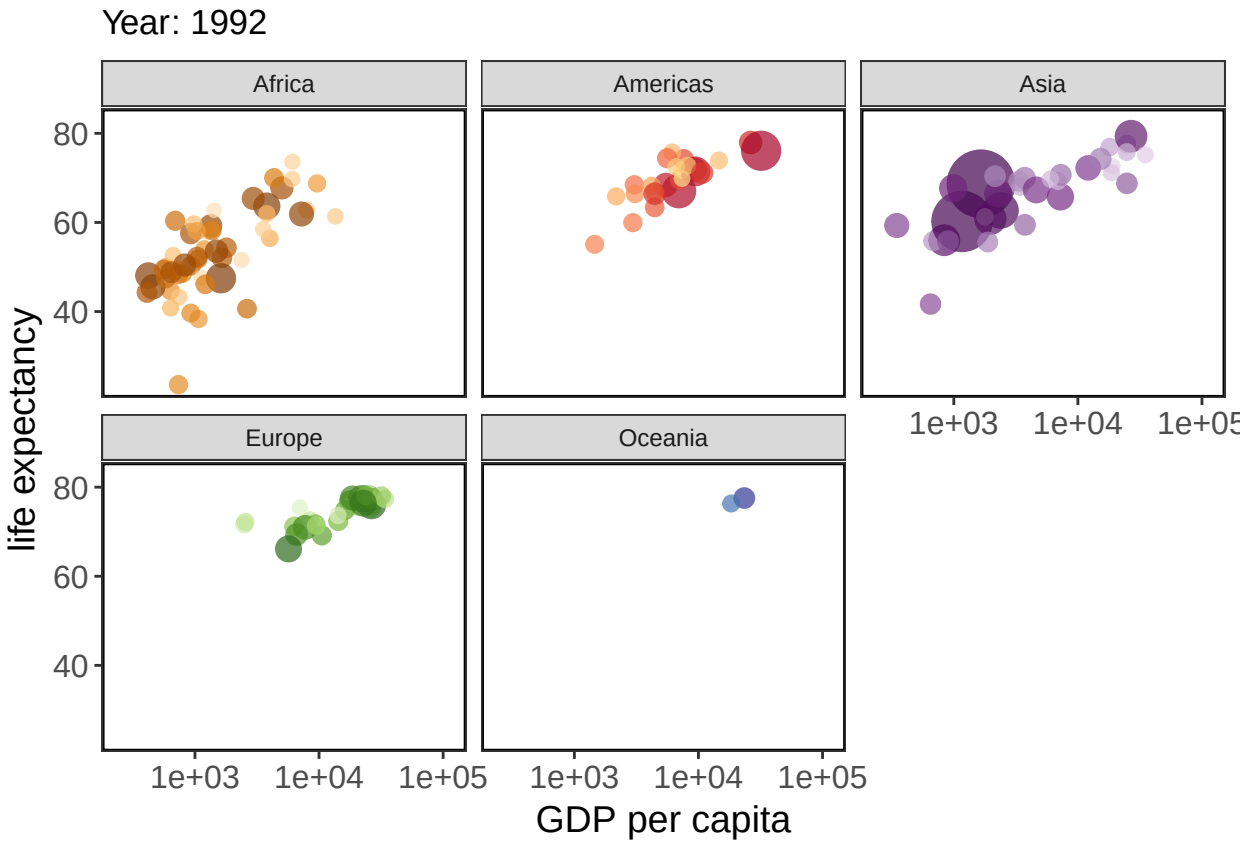
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1991
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita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Africa
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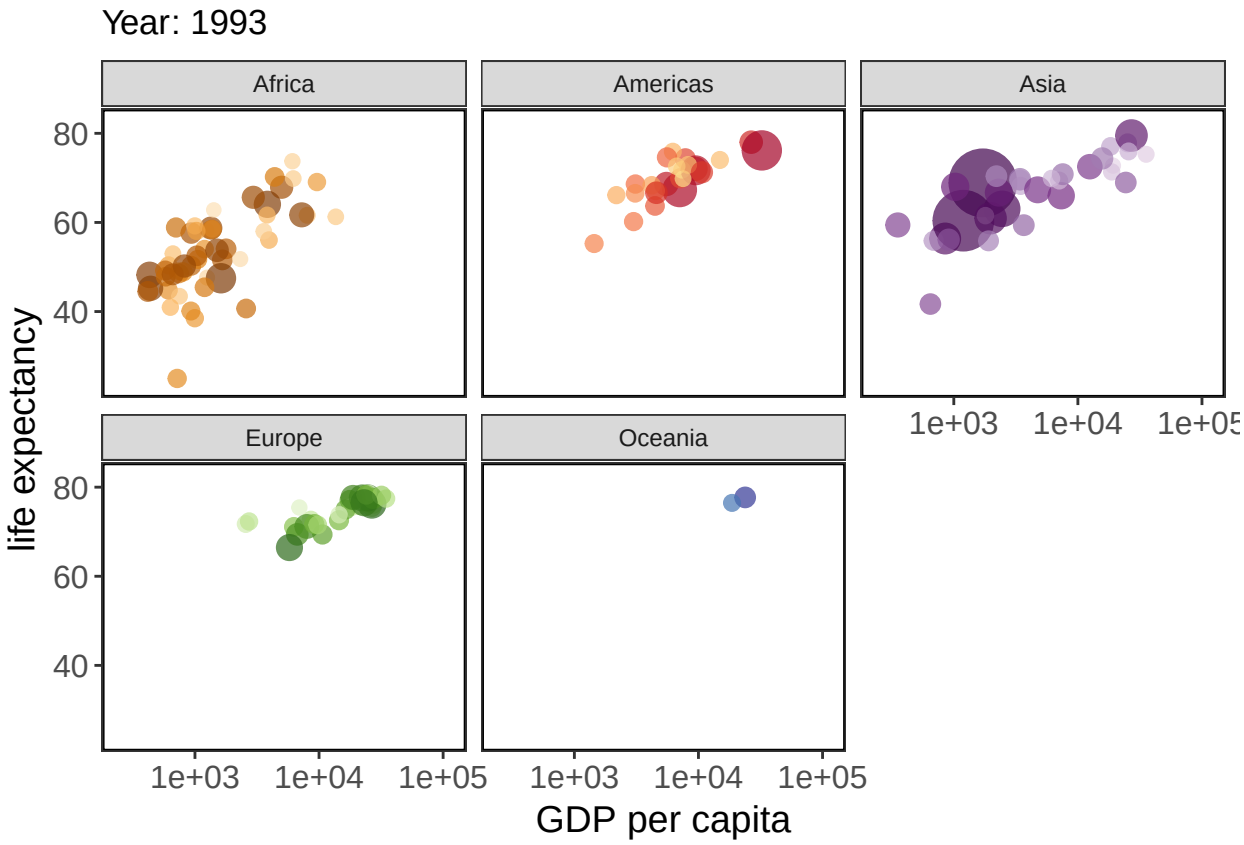
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1993
Africa
Americas
Asia
Europe
Oceania
life expectancy
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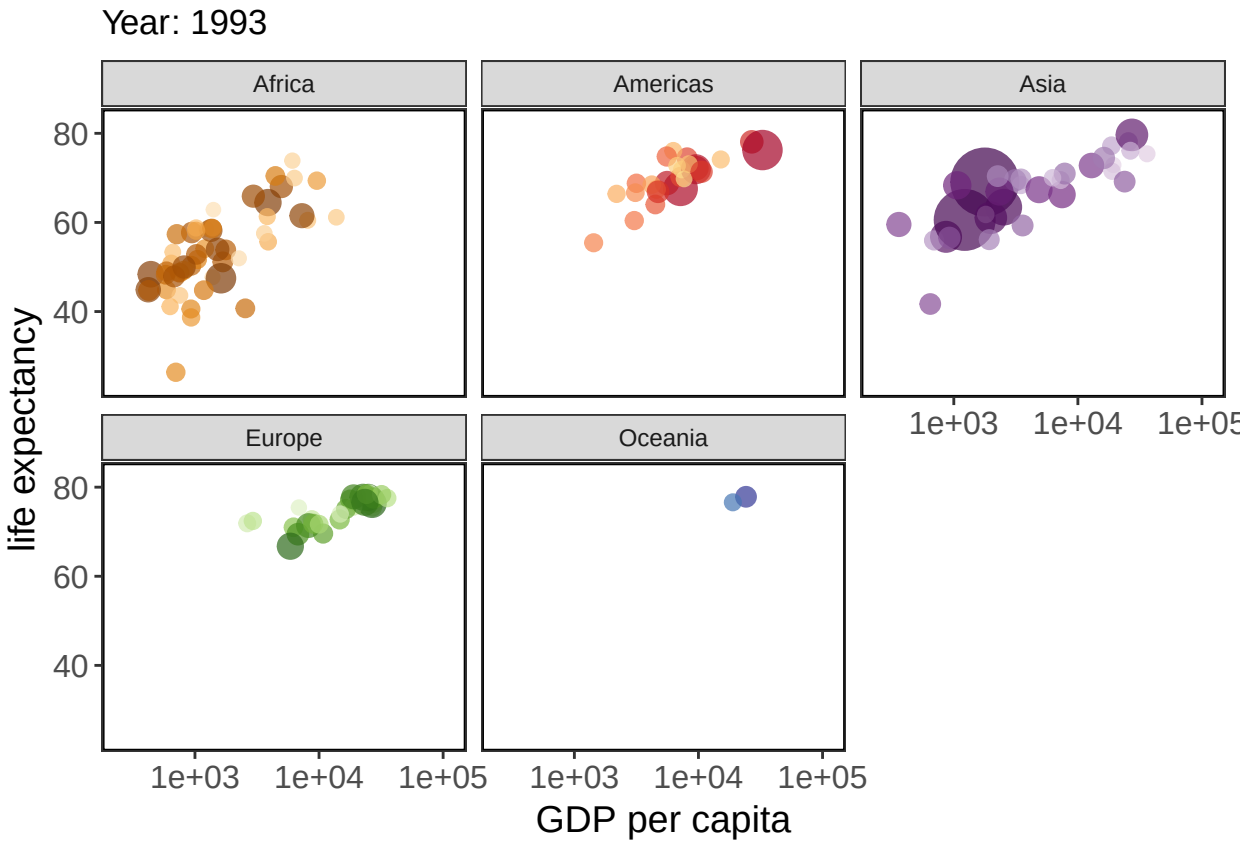
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1993
Africa
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Asia
Europe
Oceania
life expectancy
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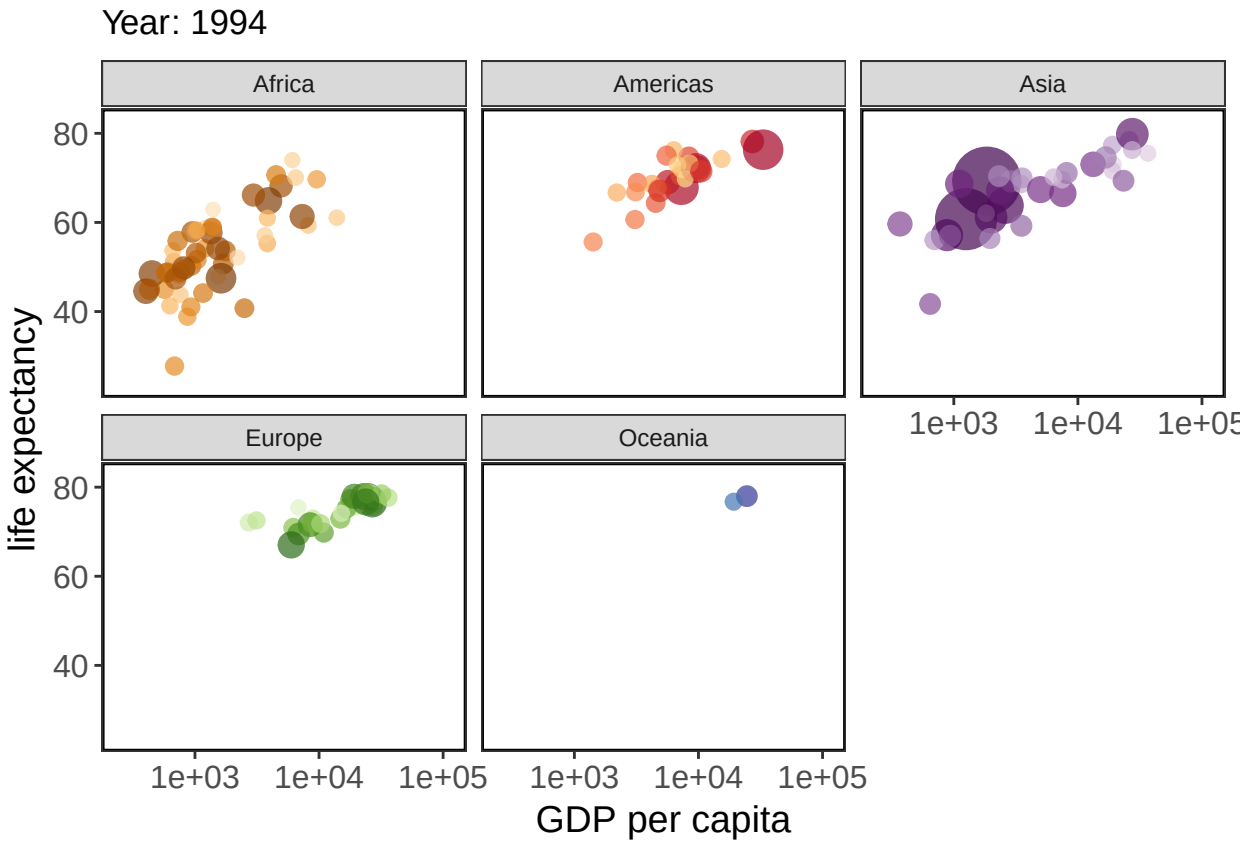
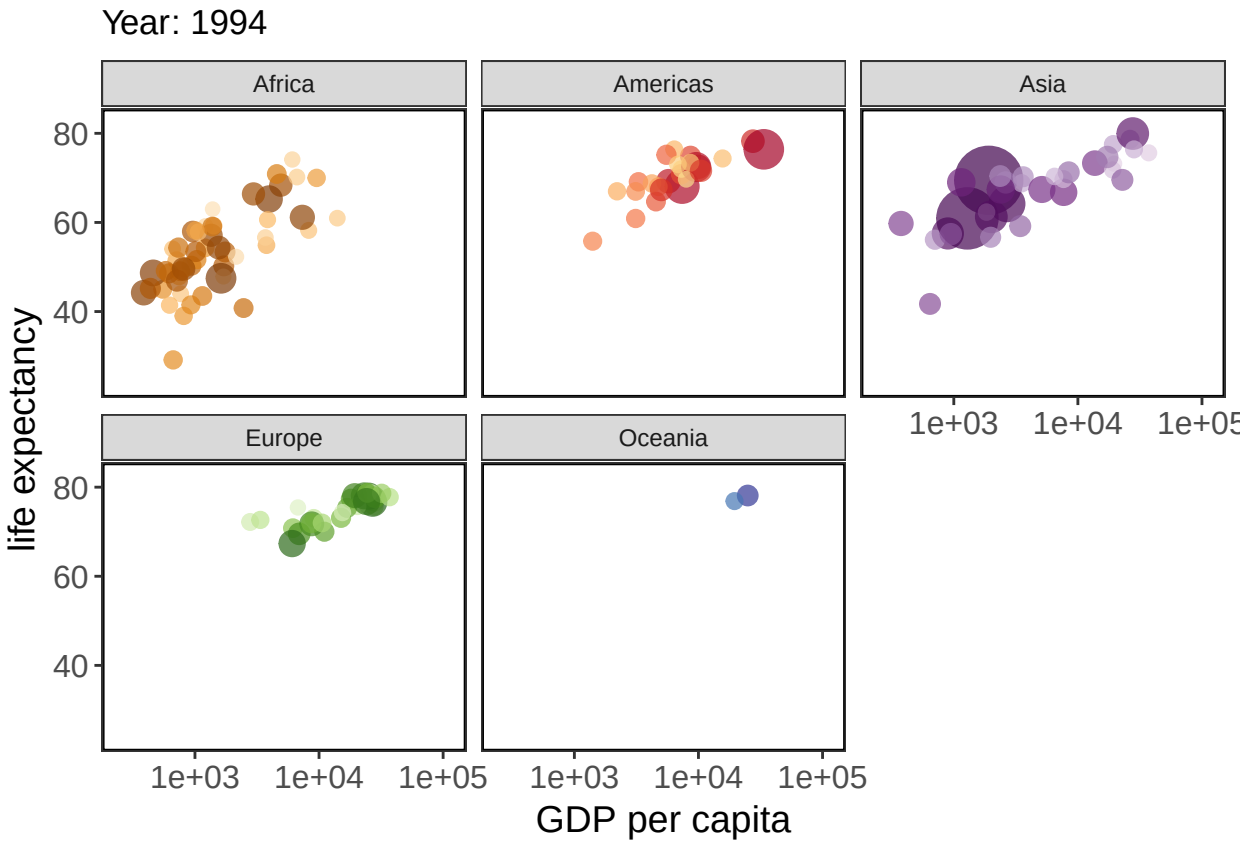
1e+03
1e+04
1e+05
GDP per capita


Year: 1994
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1994
Africa
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Asia
Europe
Oceania
life expectancy
80
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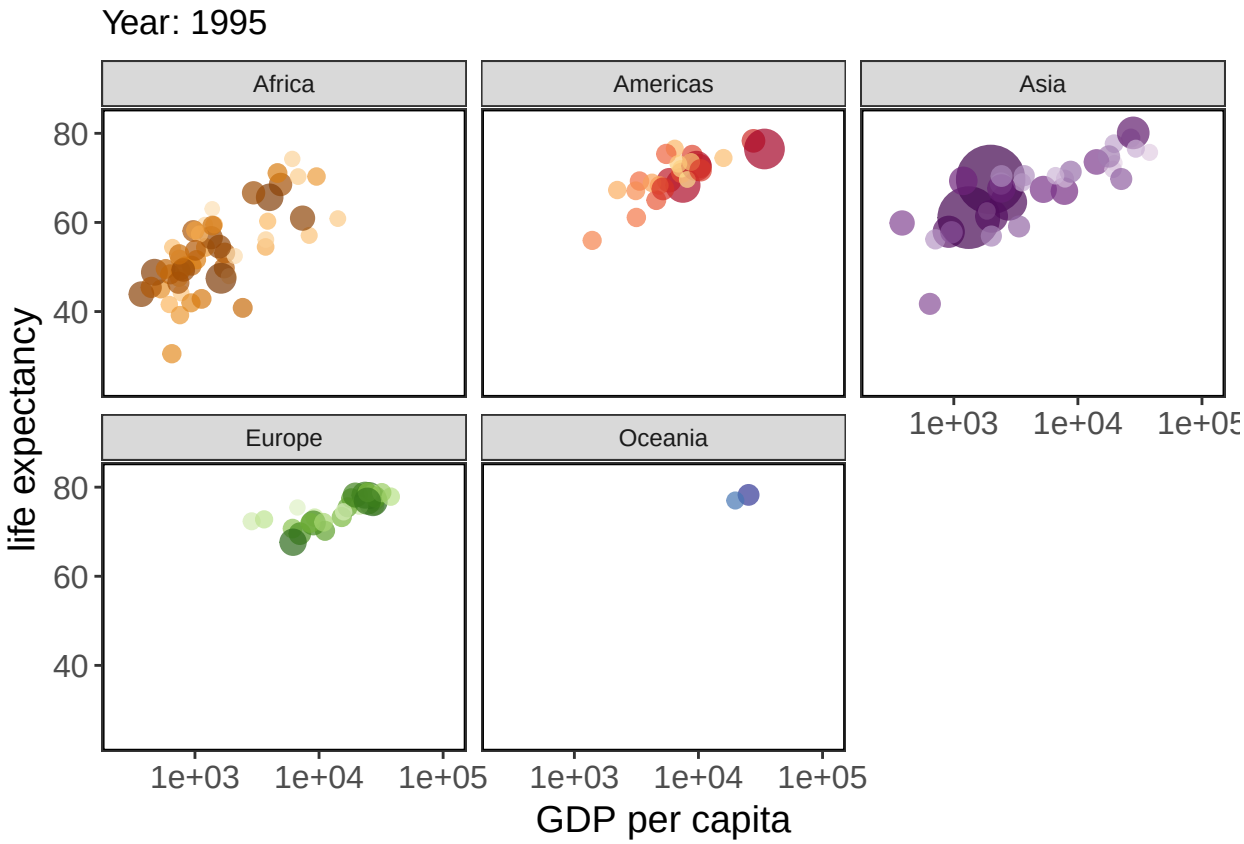
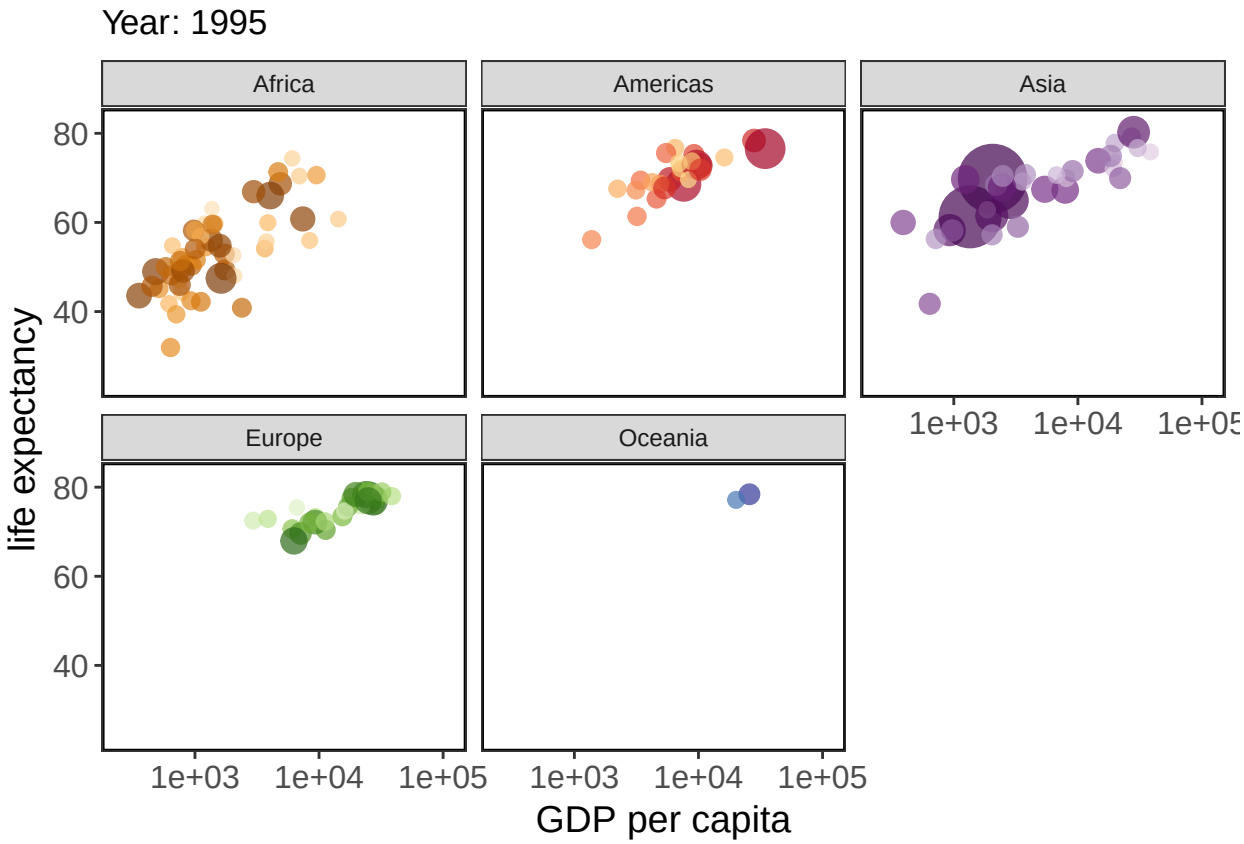
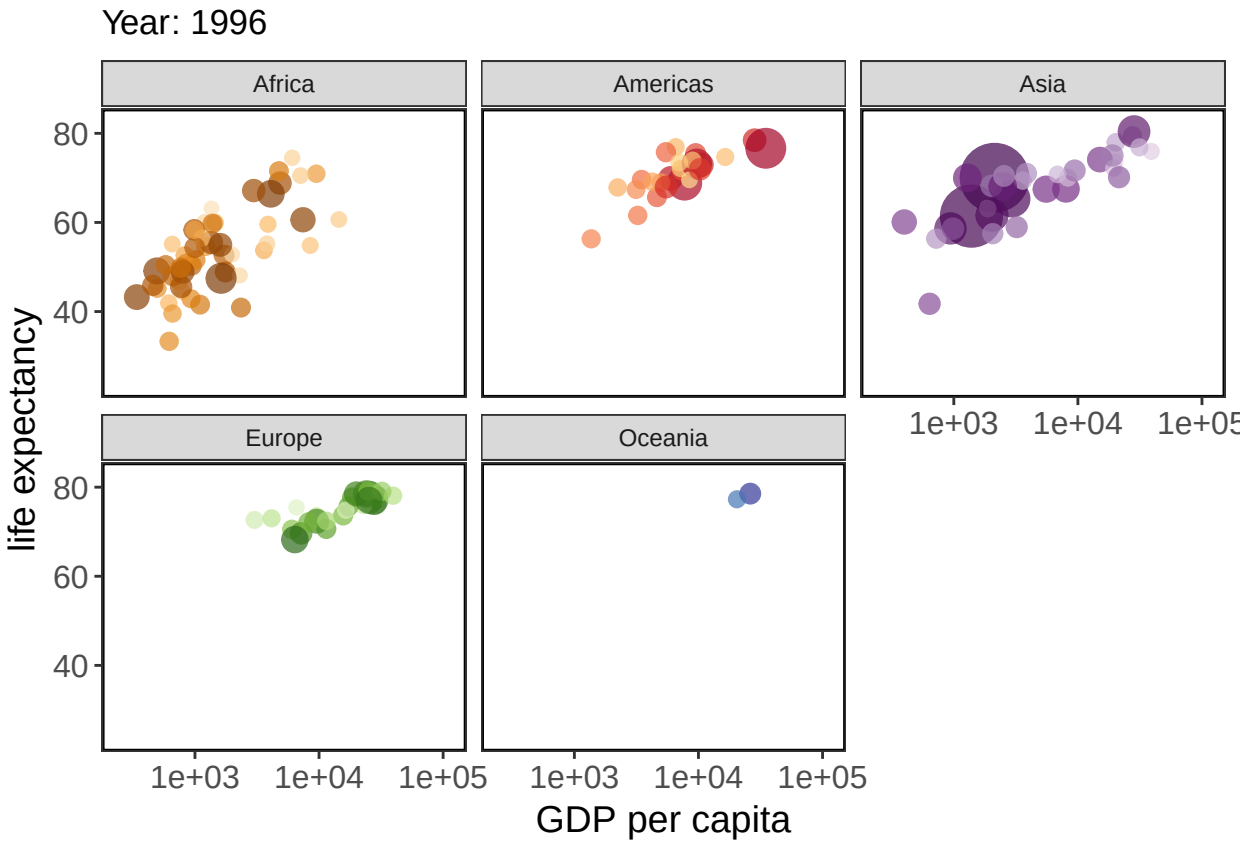
1e+03
1e+04
1e+05
GDP per capita


Year: 1995
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1995
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1996
Africa
Americas
Asia
Europe
Oceania
life expectancy
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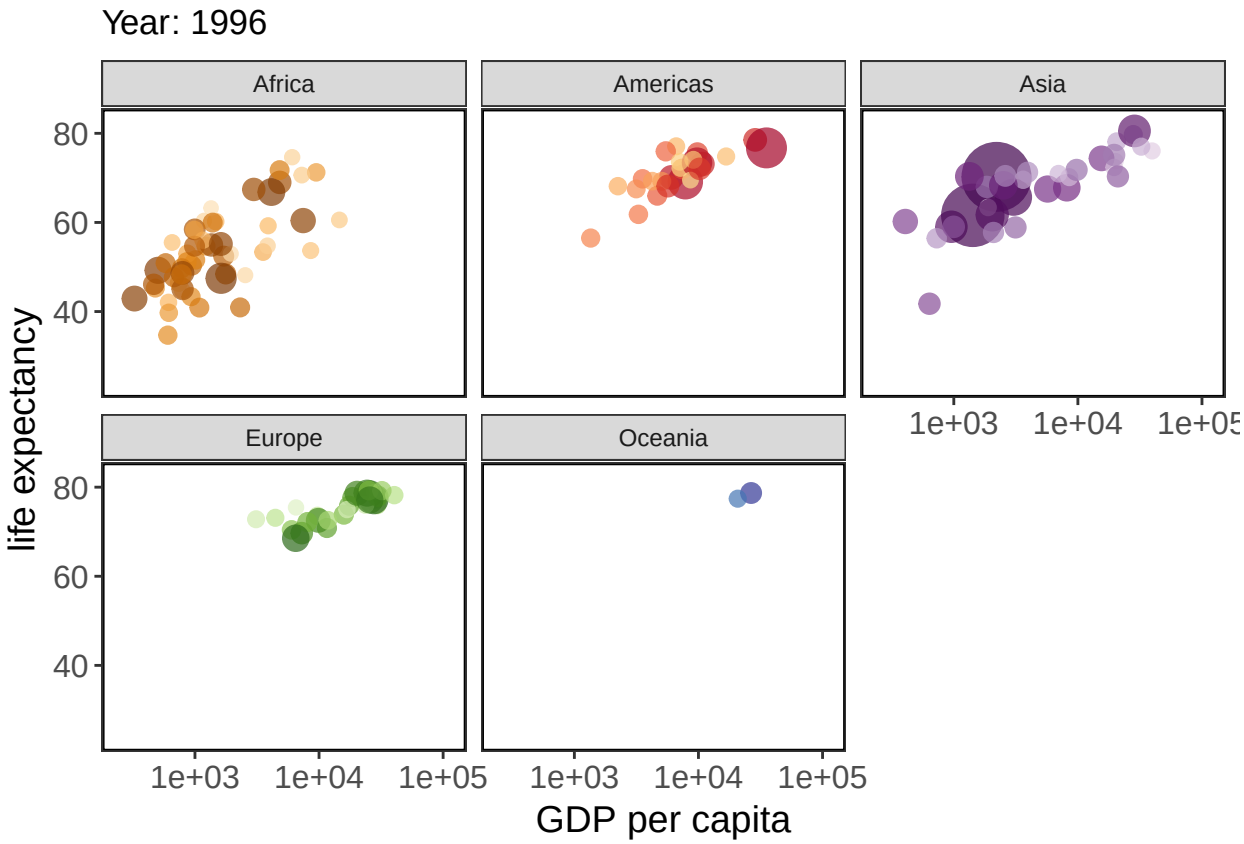
1e+03
1e+04
1e+05
GDP per capita


Year: 1996
Africa
Americas
Asia
Europe
Oceania
life expectancy
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60
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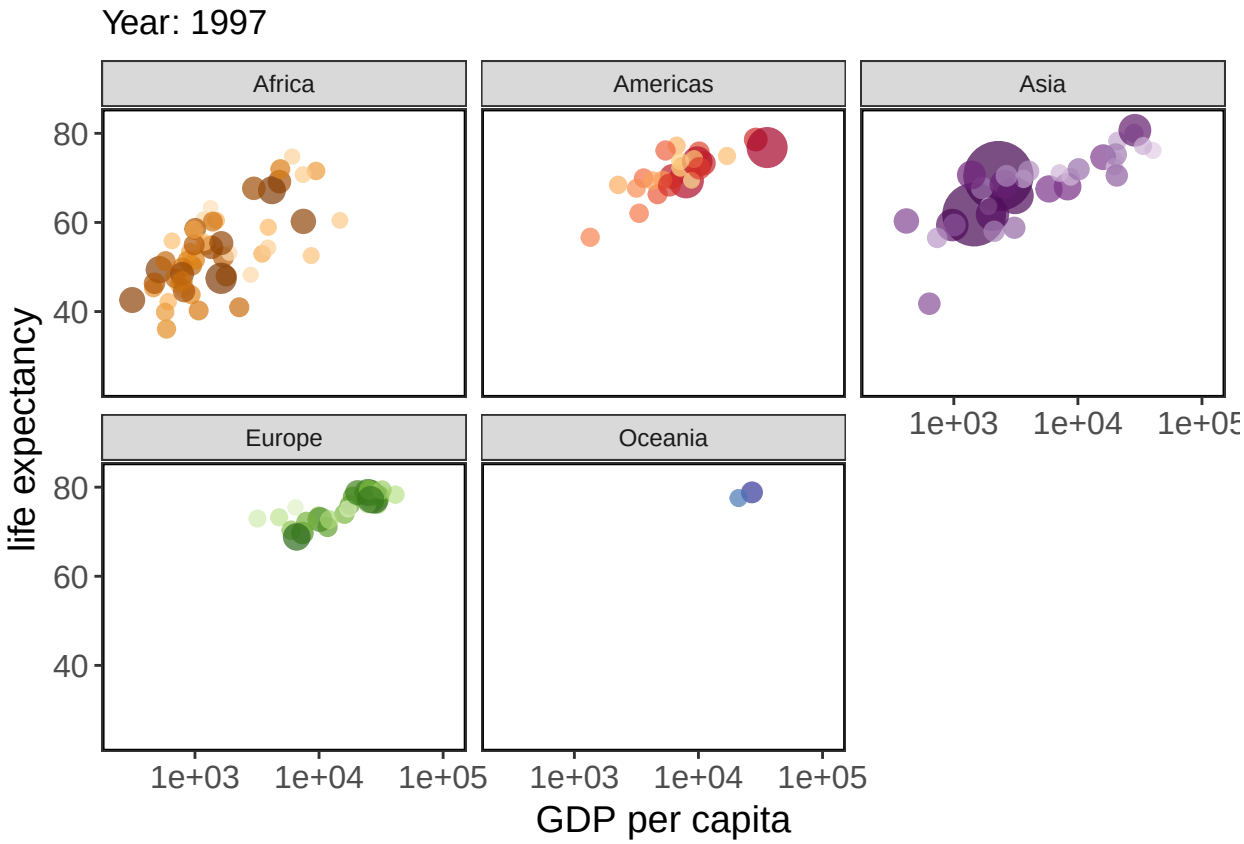
1e+03
1e+04
1e+05
GDP per capita


Year: 1997
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
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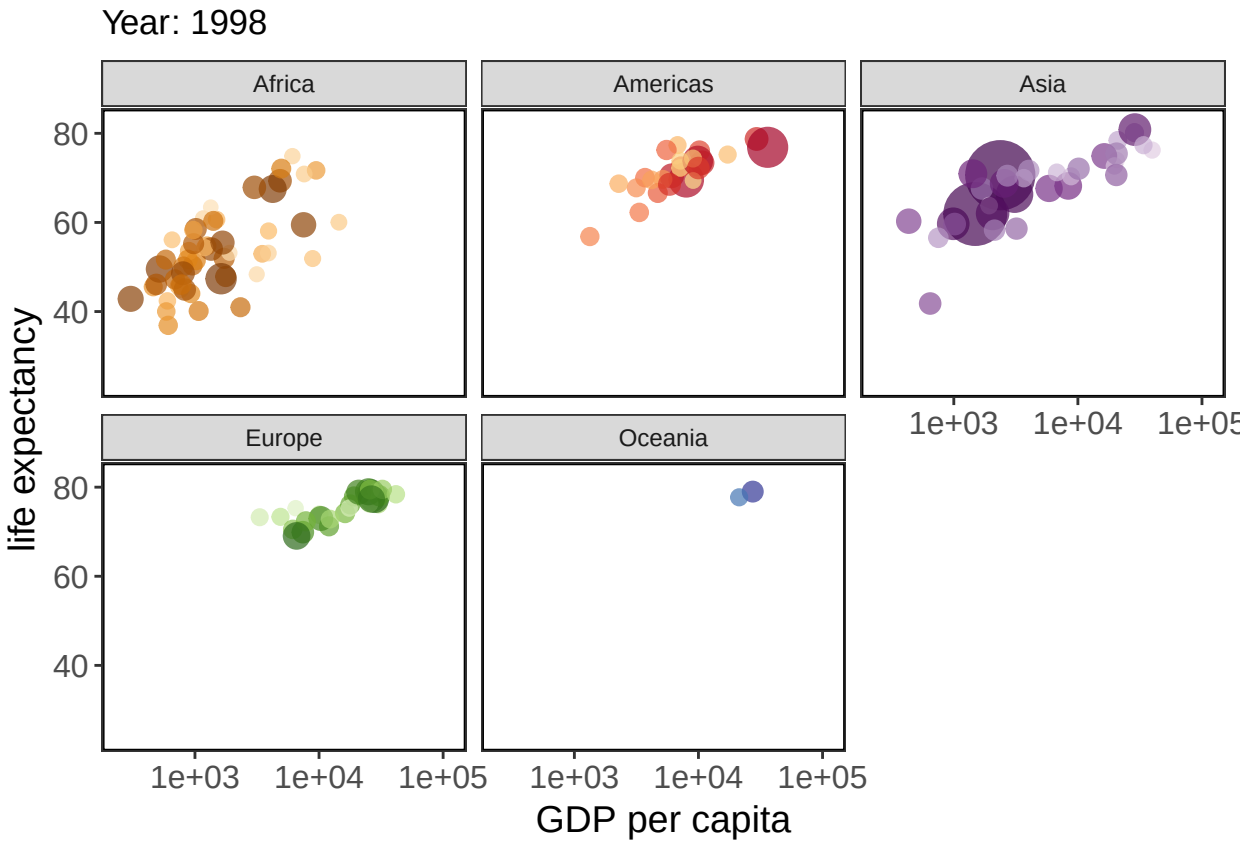
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1998
Africa
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Asia
Europe
Oceania
life expectancy
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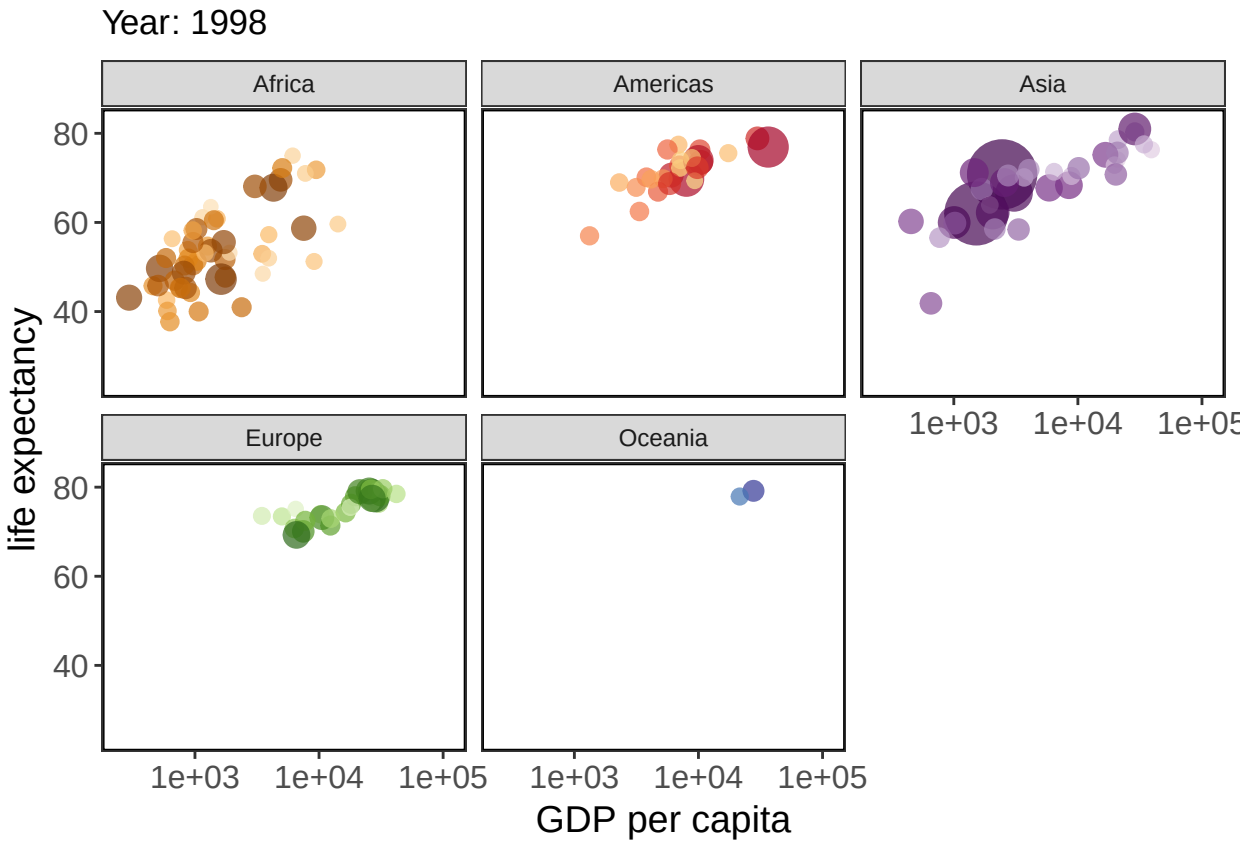
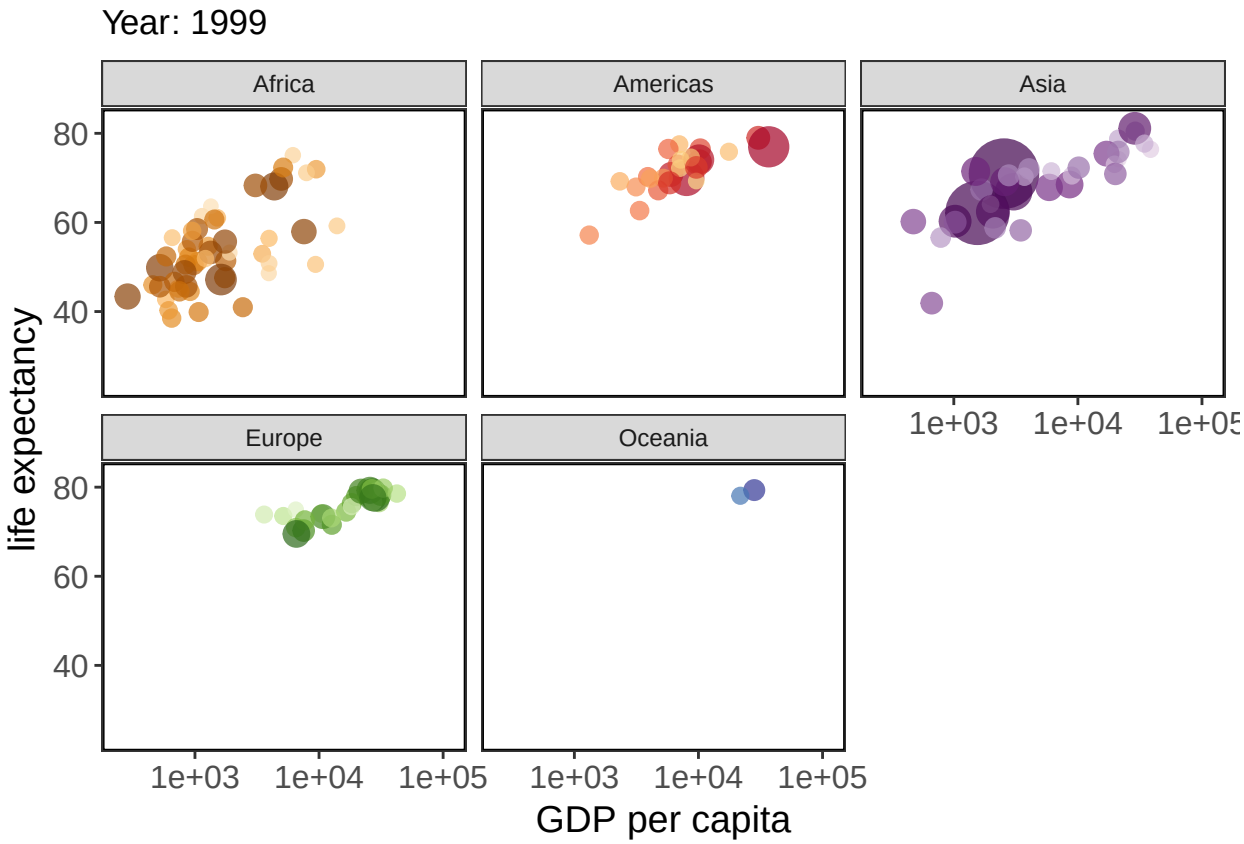
1e+03
1e+04
1e+05
GDP per capita


Year: 1998
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1999
Africa
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Asia
Europe
Oceania
life expectancy
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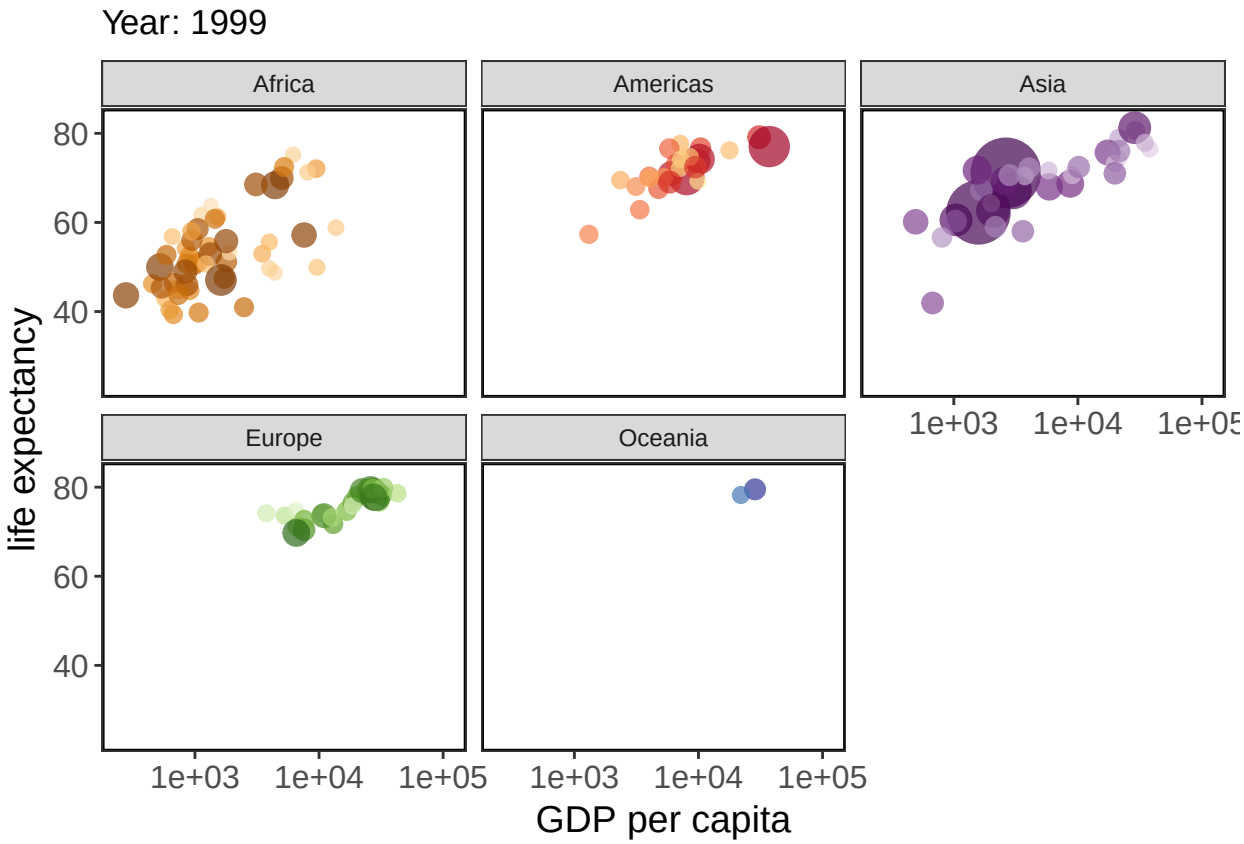
40
1e+03
1e+04
1e+05
GDP per capita


Year: 1999
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
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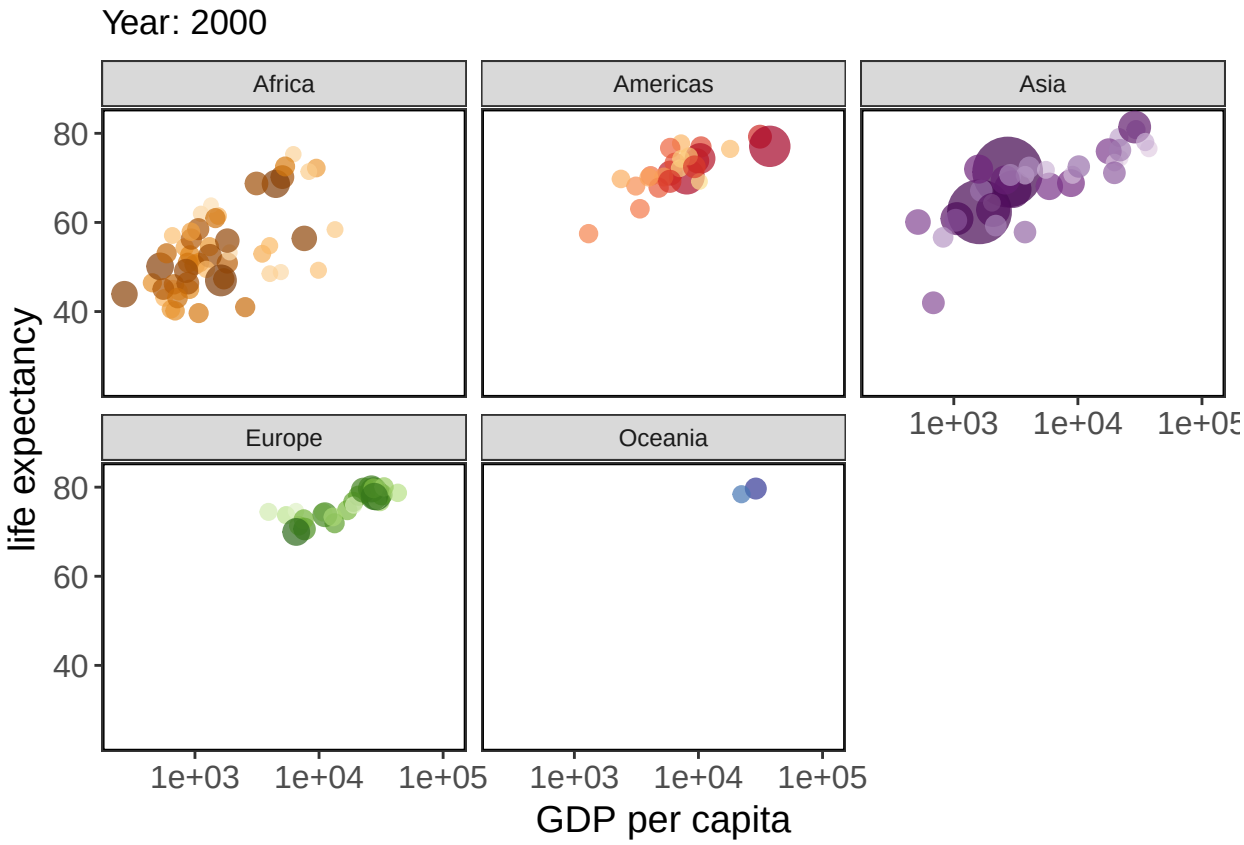
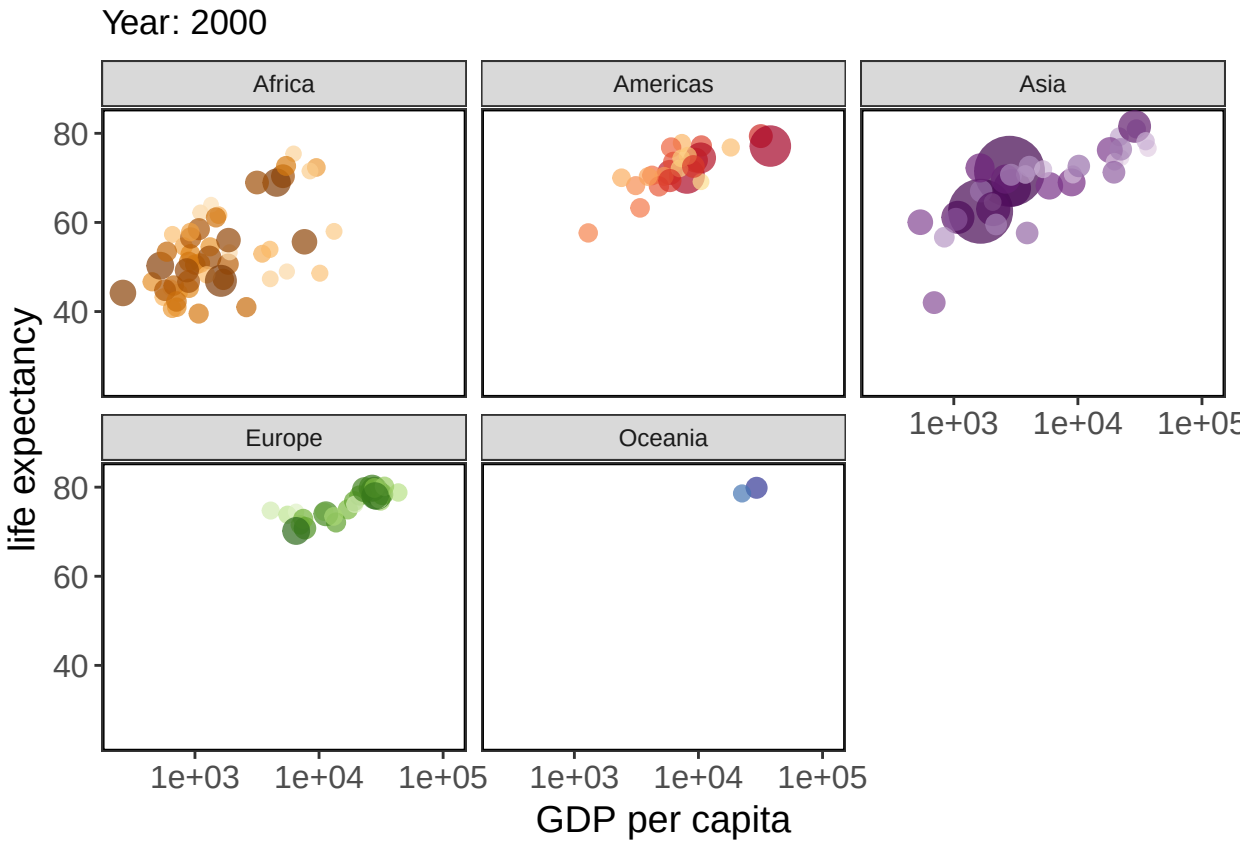
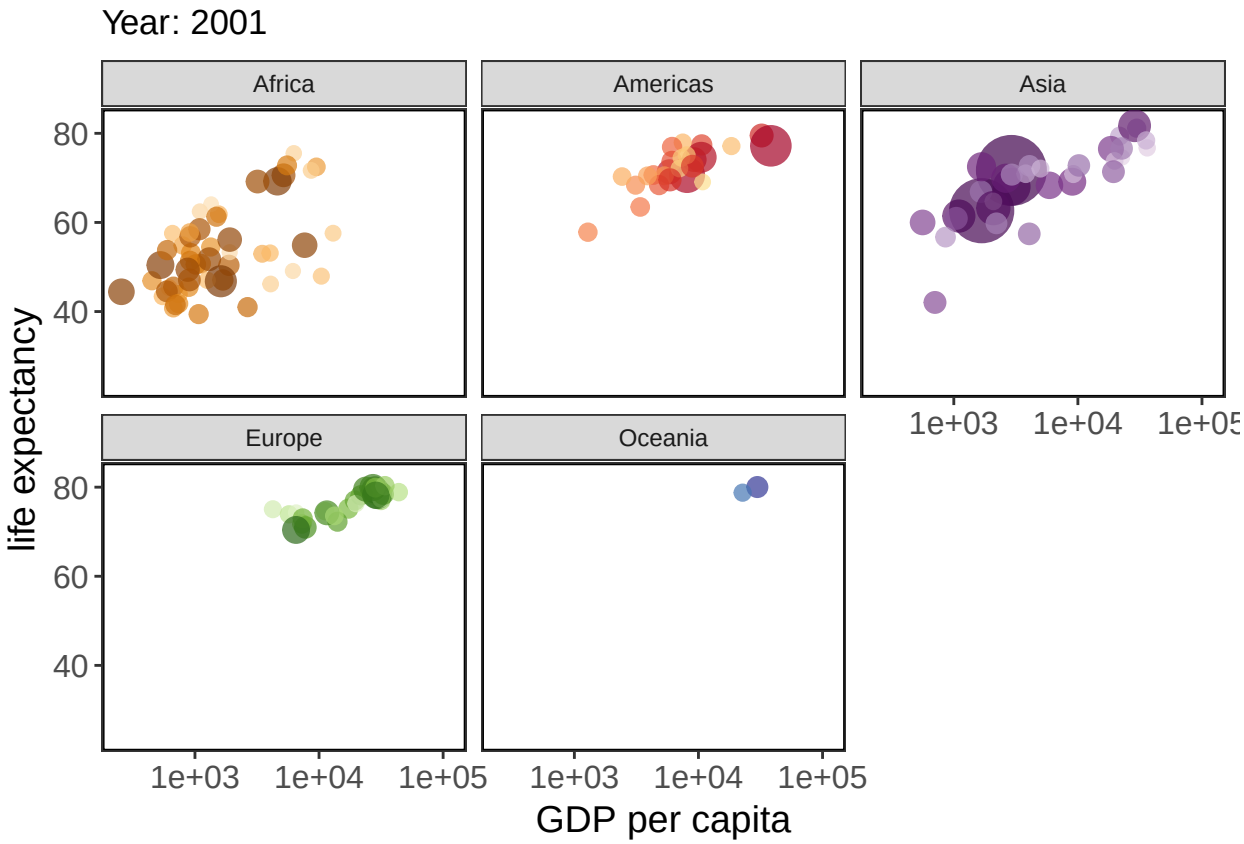
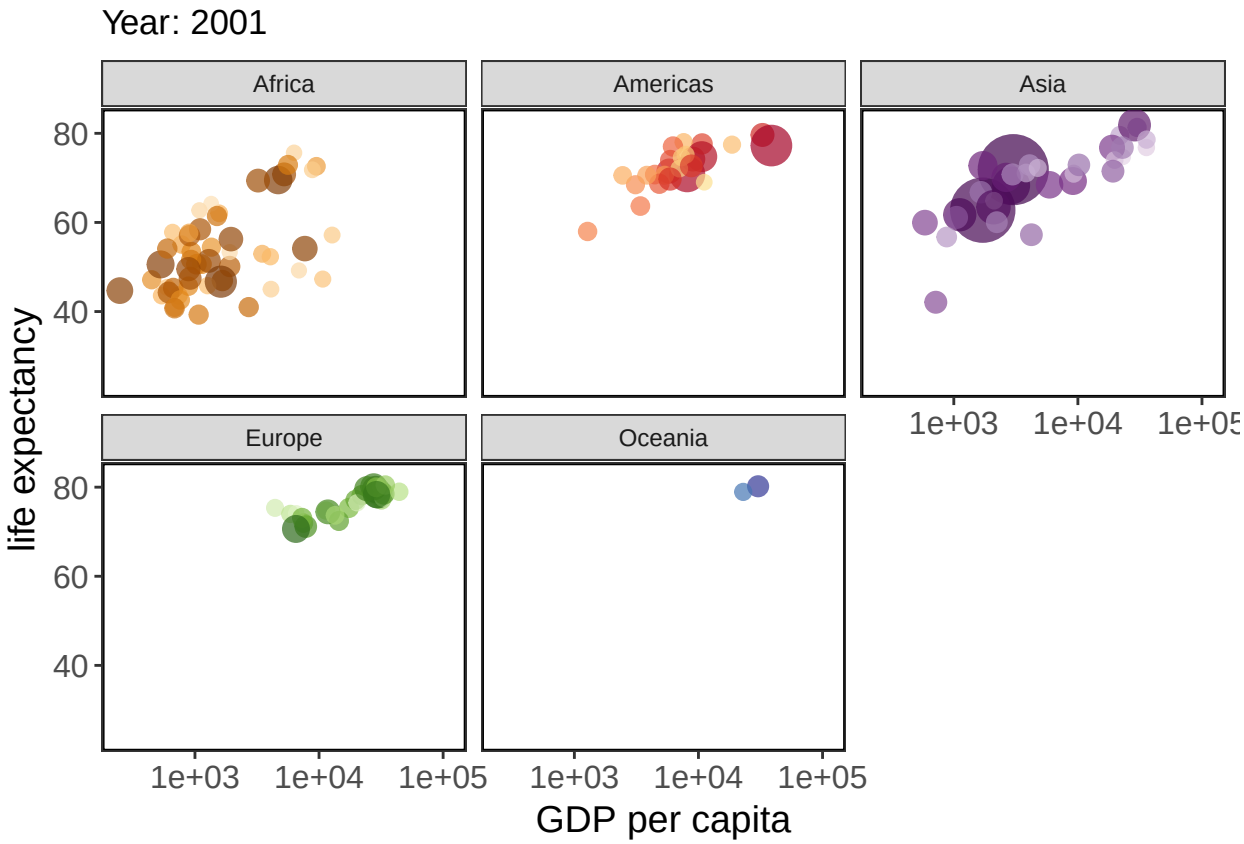
1e+03
1e+04
1e+05
GDP per capita


Year: 2000
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2000
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2001
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2001
Africa
Americas
Asia
Europe
Oceania
life expectancy
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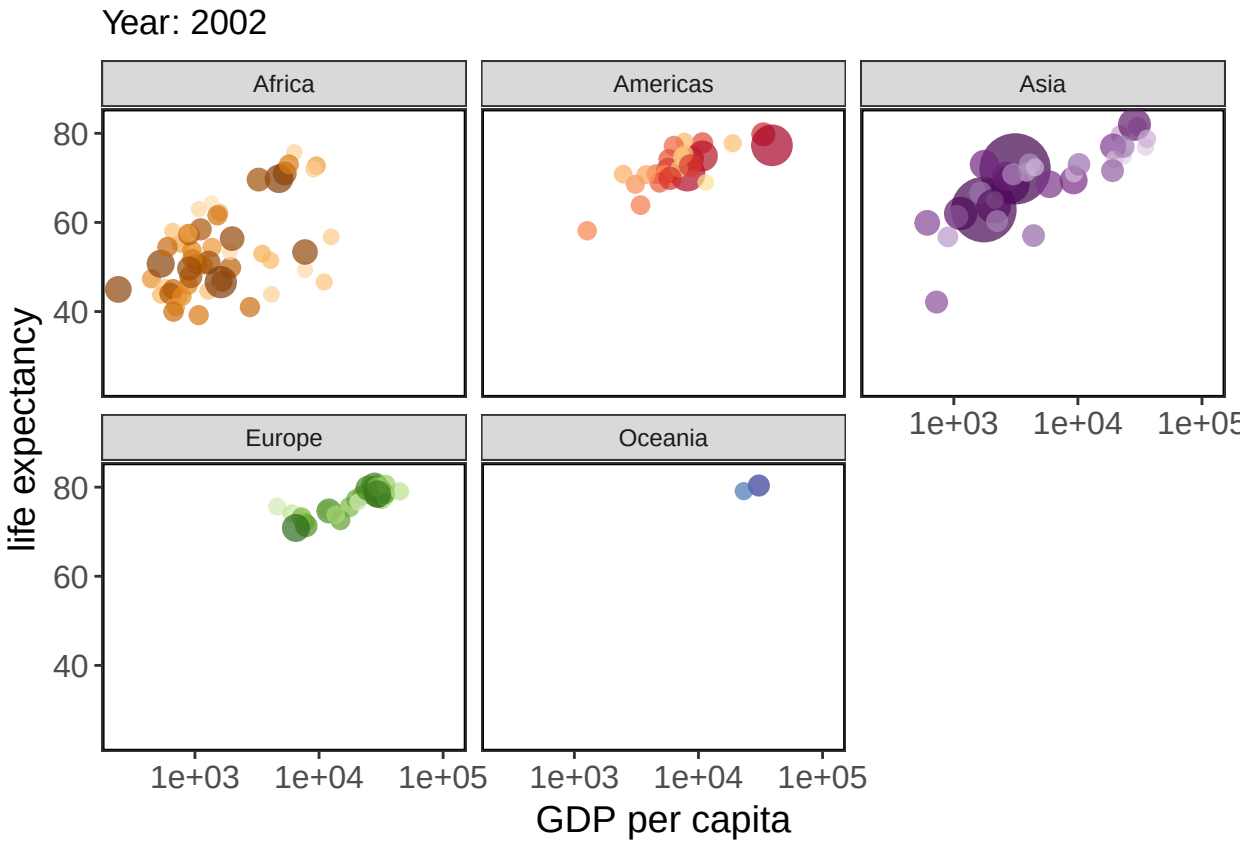
1e+03
1e+04
1e+05
GDP per capita


Year: 2002
Africa
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Asia
Europe
Oceania
life expectancy
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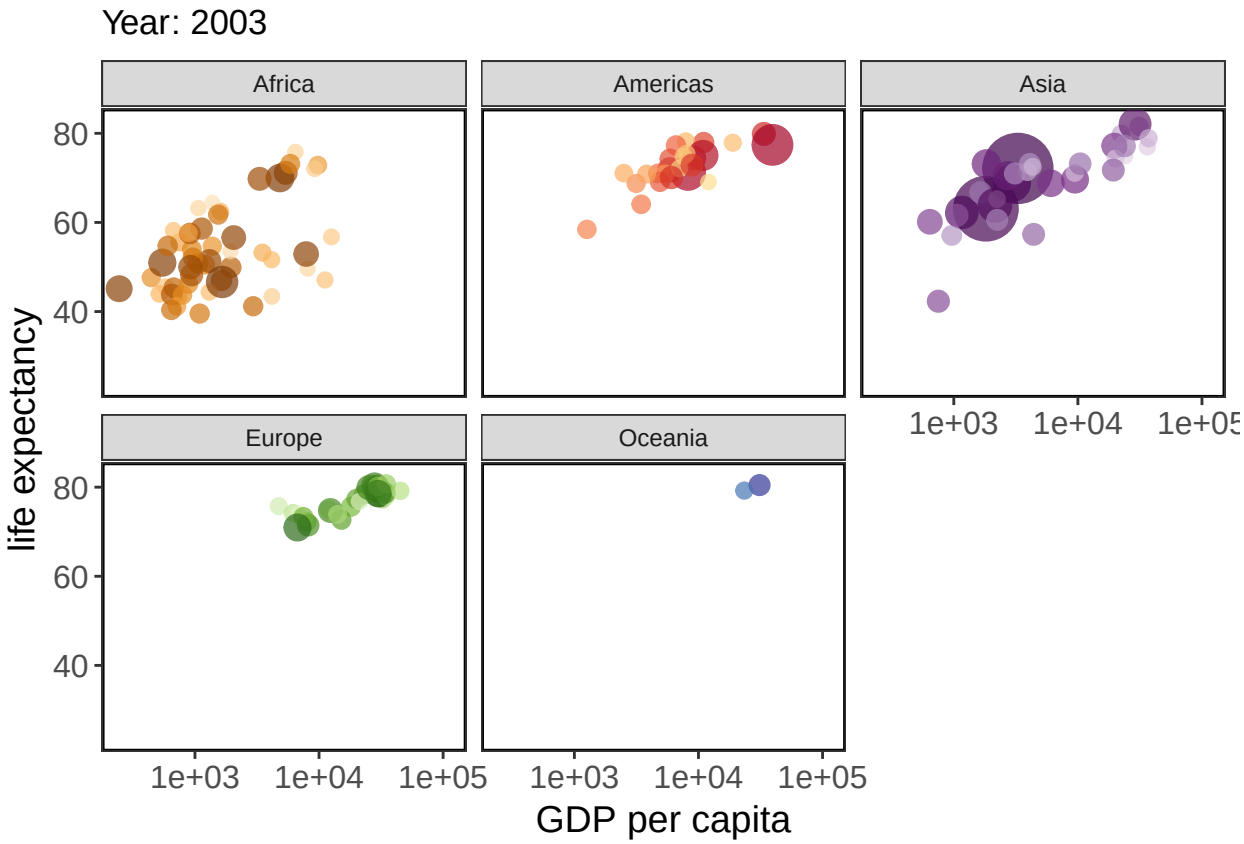
1e+03
1e+04
1e+05
GDP per capita


Year: 2003
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Americas
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Europe
Oceania
life expectancy
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60
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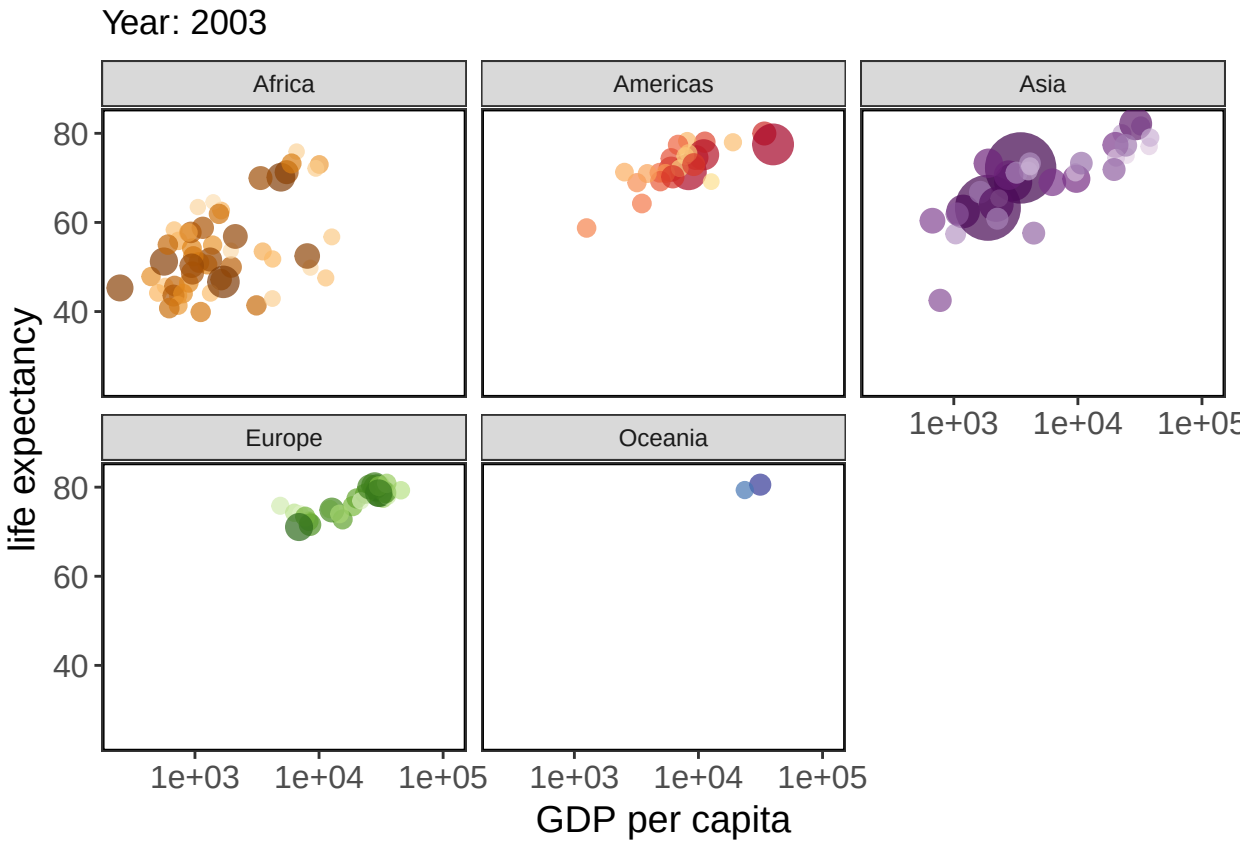
1e+03
1e+04
1e+05
GDP per capita


Year: 2003
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
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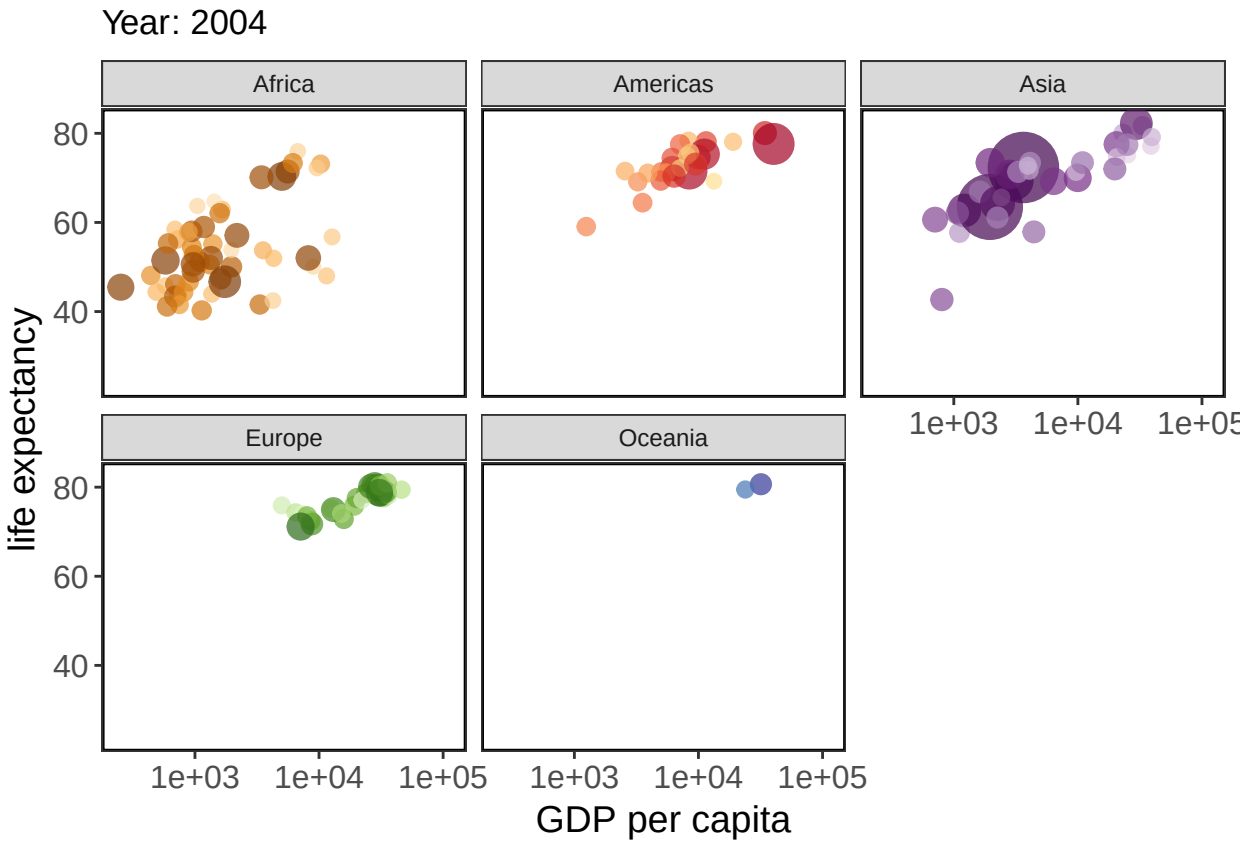
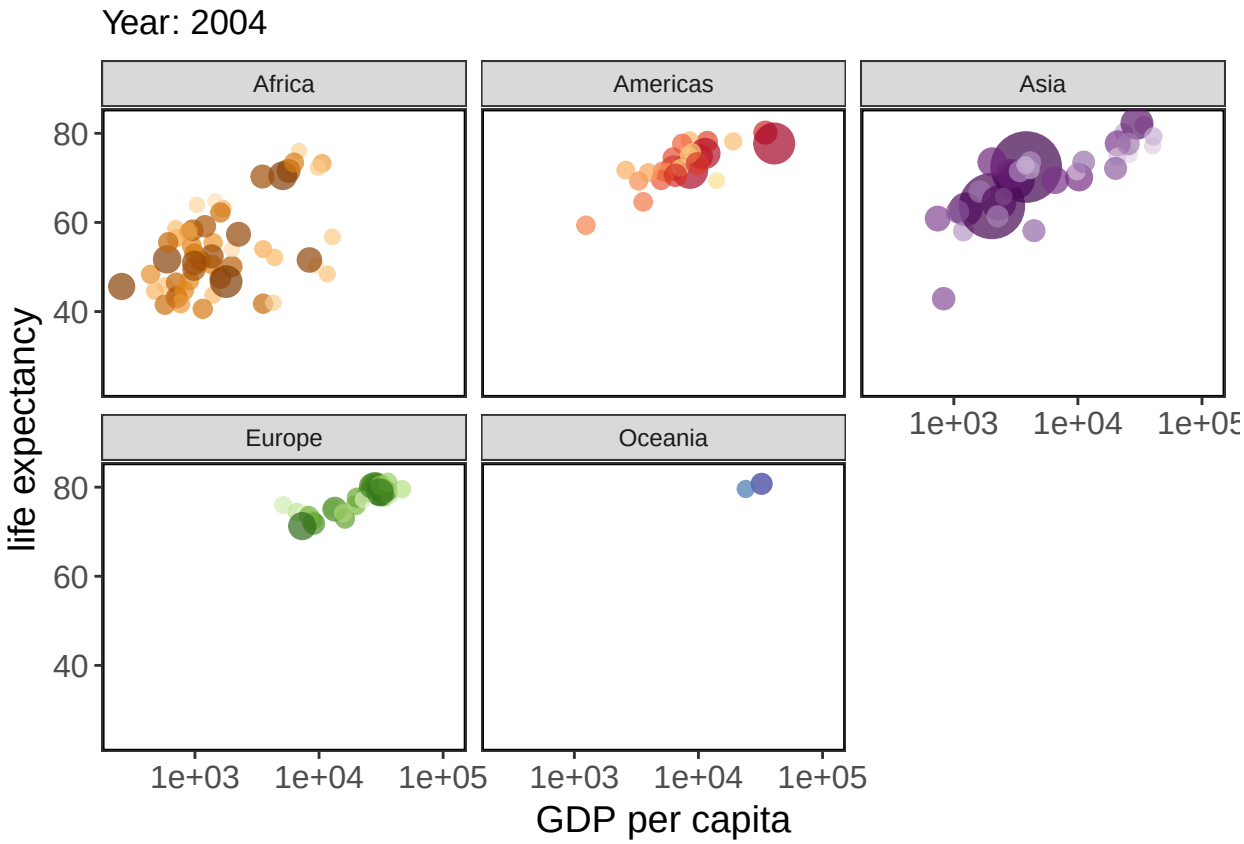
1e+03
1e+04
1e+05
GDP per capita


Year: 2004
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2004
Africa
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Europe
Oceania
life expectancy
80
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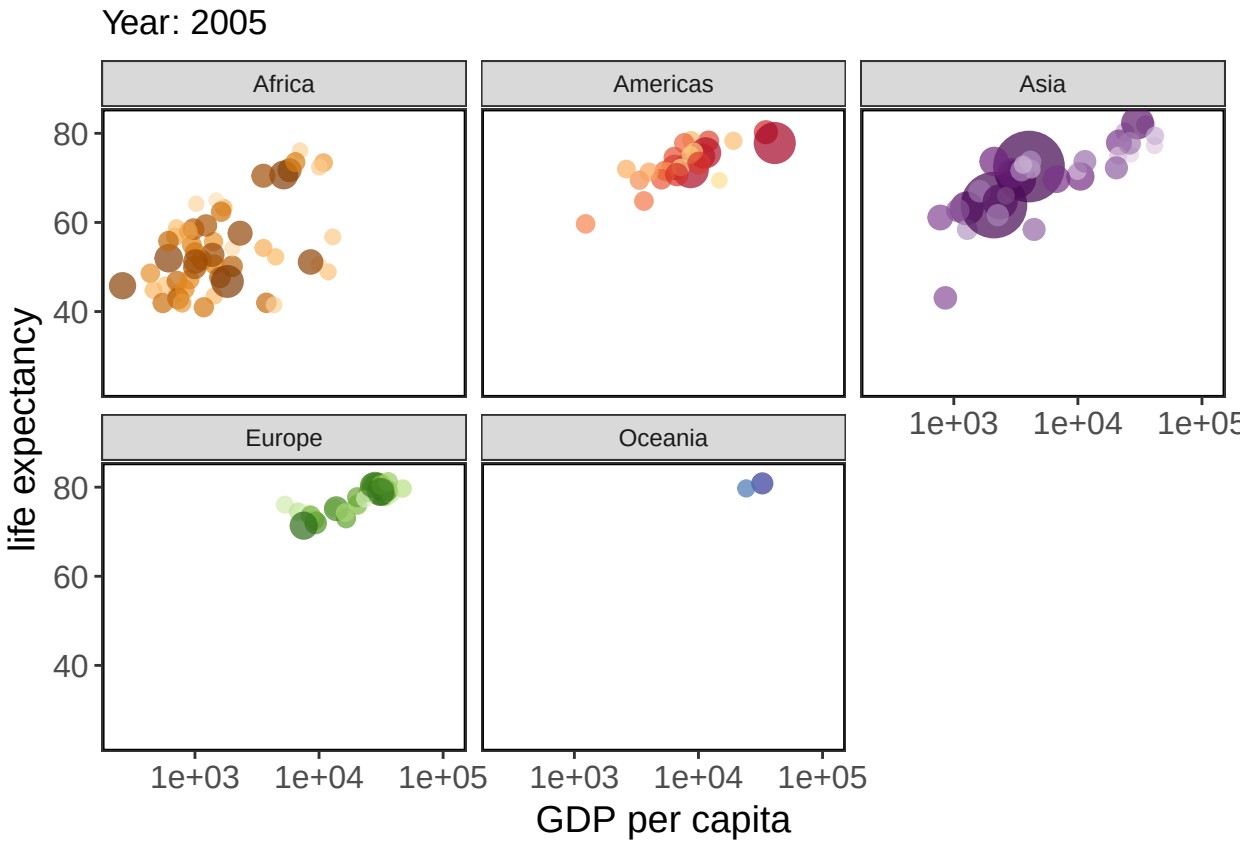
1e+03
1e+04
1e+05
GDP per capita


Year: 2005
Africa
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Europe
Oceania
life expectancy
80
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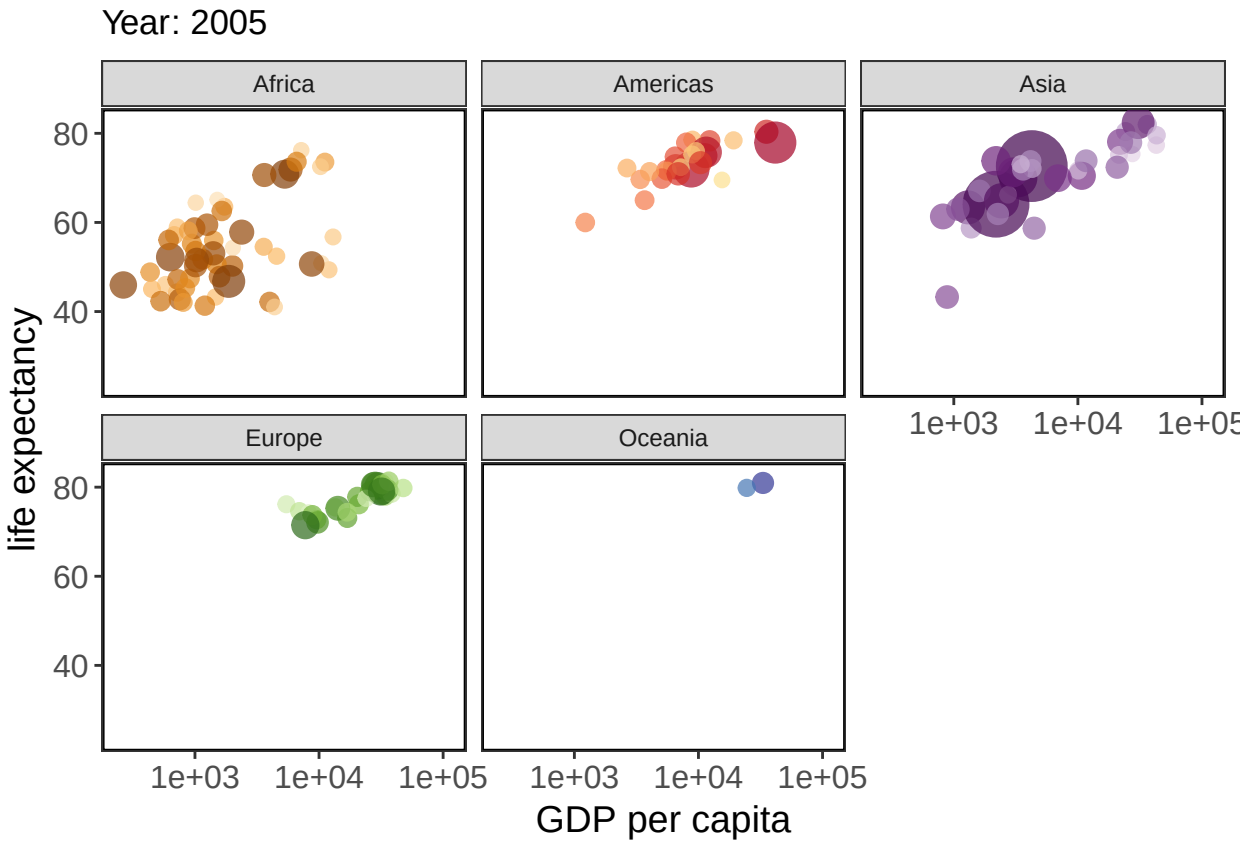
1e+03
1e+04
1e+05
GDP per capita


Year: 2005
Africa
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Oceania
life expectancy
80
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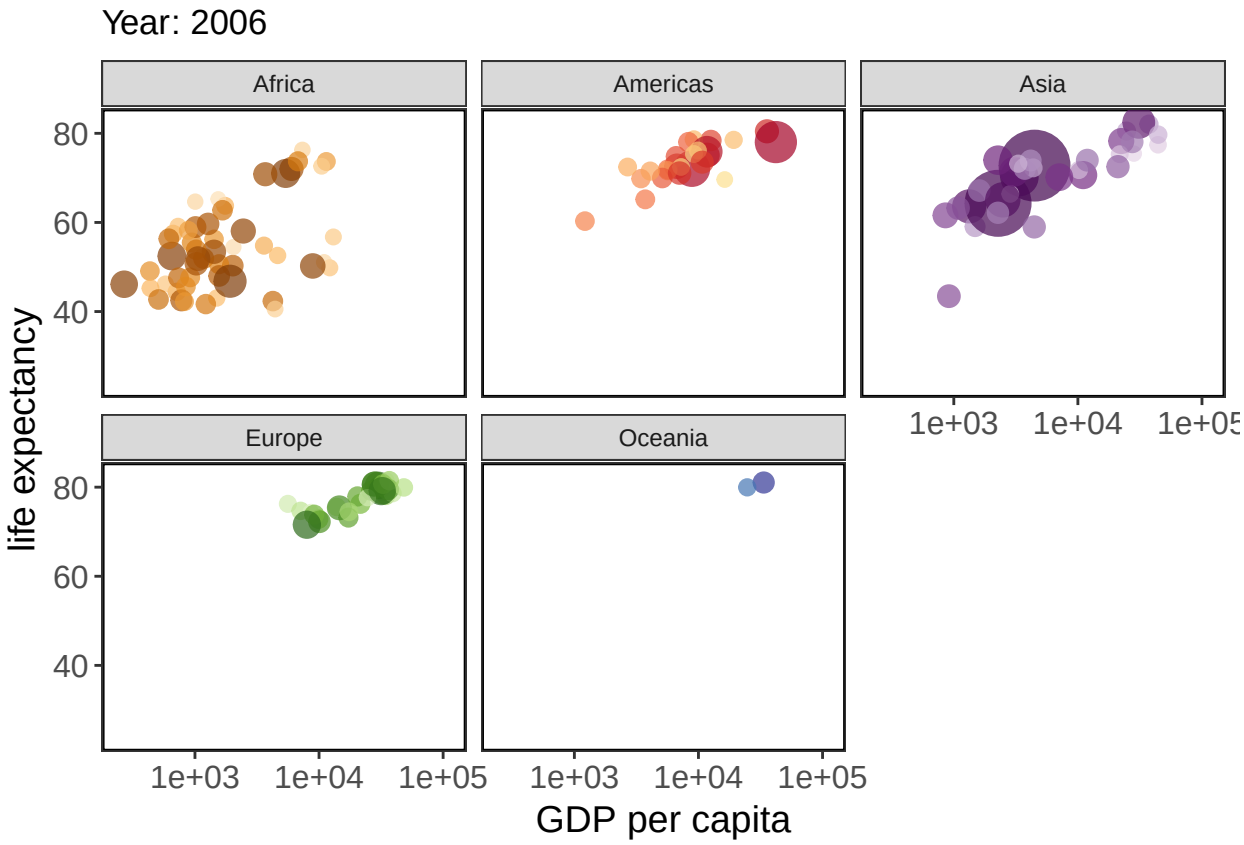
1e+03
1e+04
1e+05
GDP per capita


Year: 2006
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Oceania
life expectancy
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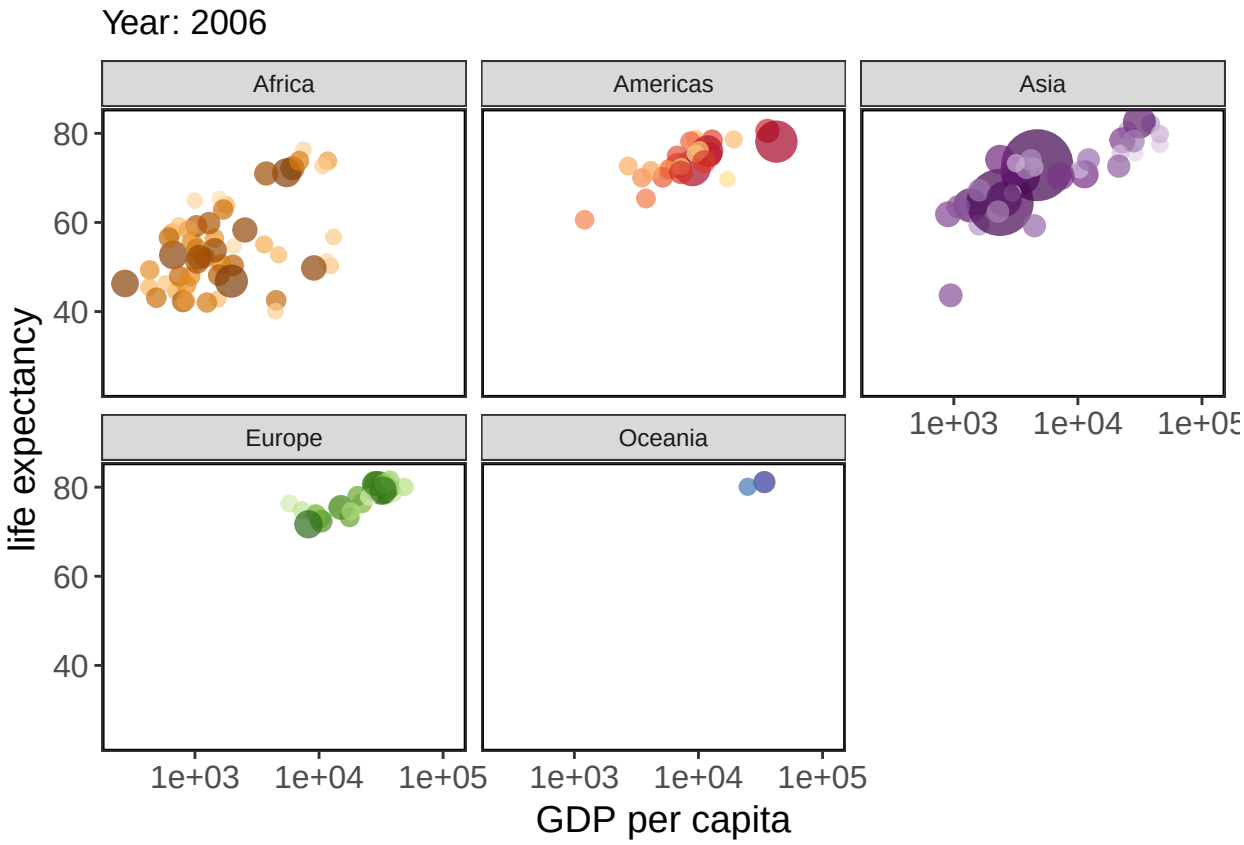
60
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2006
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Europe
Oceania
life expectancy
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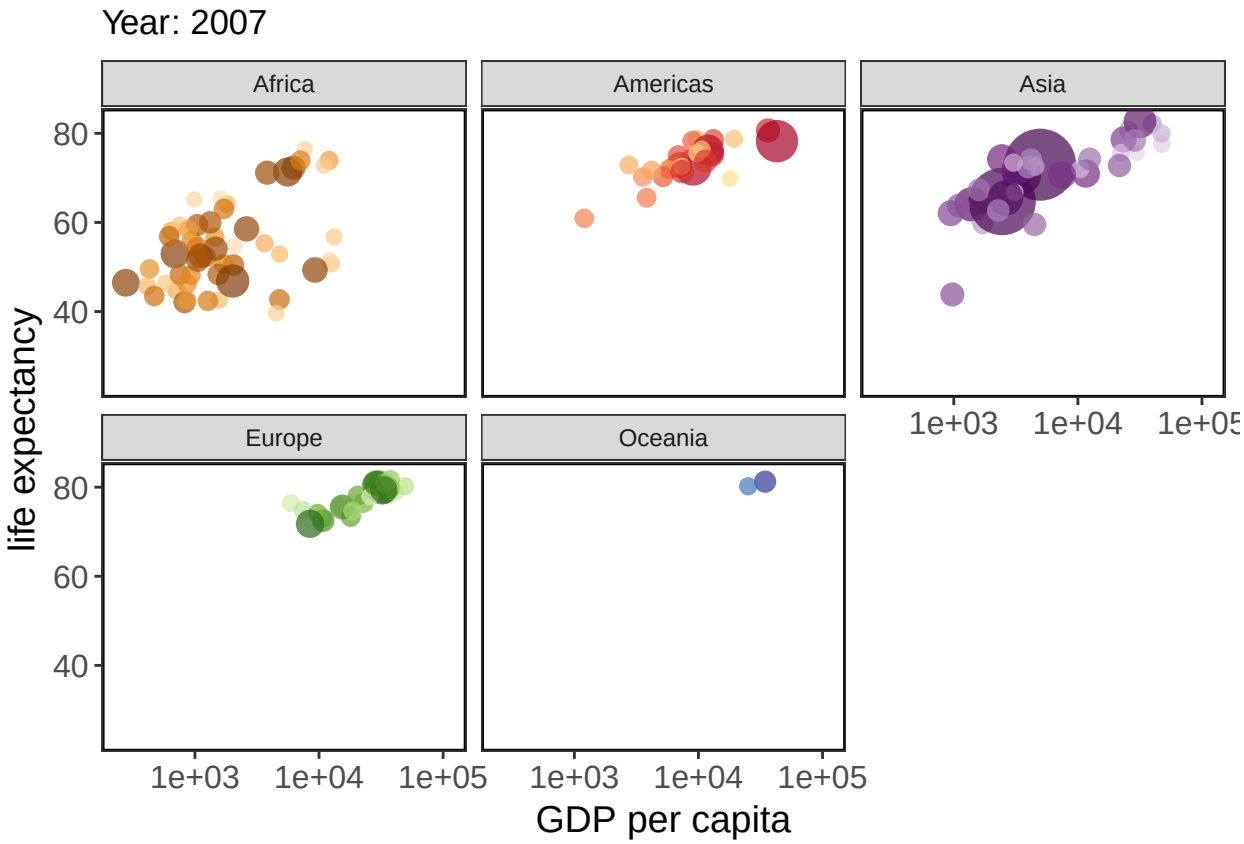
40
1e+03
1e+04
1e+05
GDP per capita


Year: 2007
Africa
Americas
Asia
Europe
Oceania
life expectancy
80
60
40
1e+03
1e+04
1e+05
GDP per capita