Themes from scratch

INTRODUCTION TO DATA VISUALIZATION WITH GGPLOT2

Rick Scavetta
Founder, Scavetta Academy

datacamp

The themes layer

- All non-data ink
- Visual elements not part of the data

The themes layer

- All non-data ink
- Visual elements not part of the data

Three types

type
text
line
rectangle

The themes layer

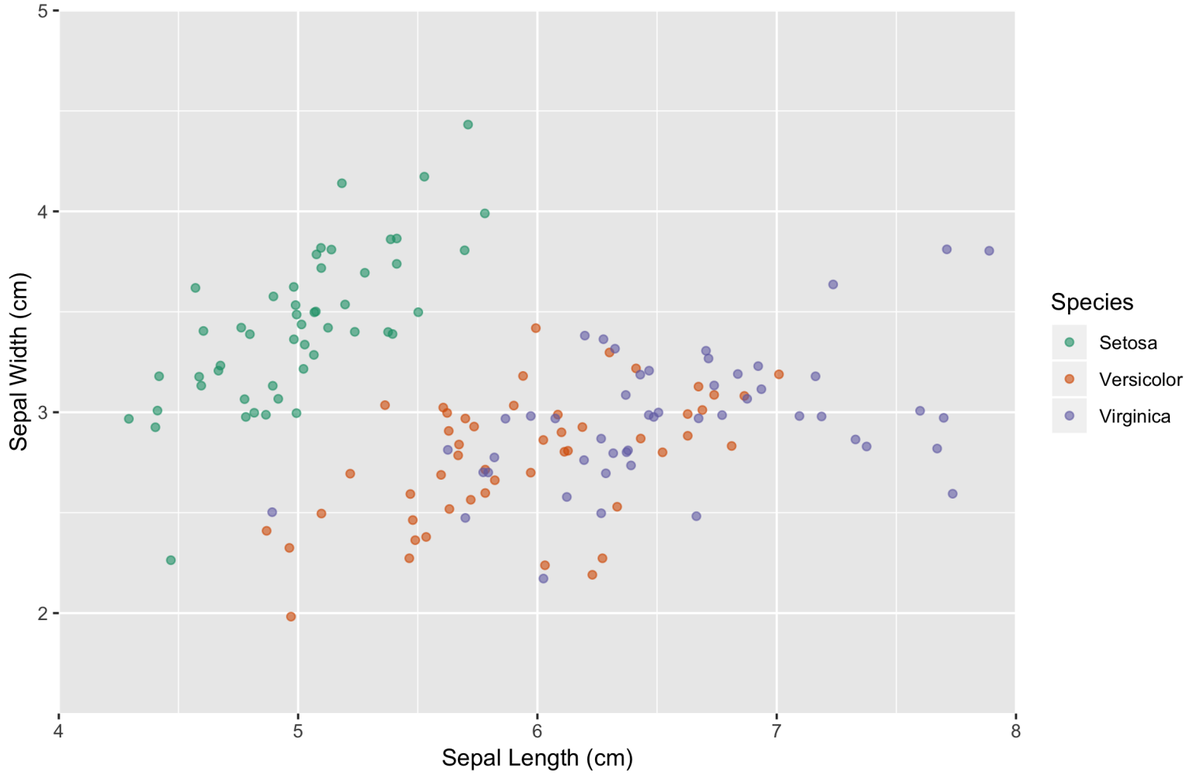
- All non-data ink
- Visual elements not part of the data

Three types

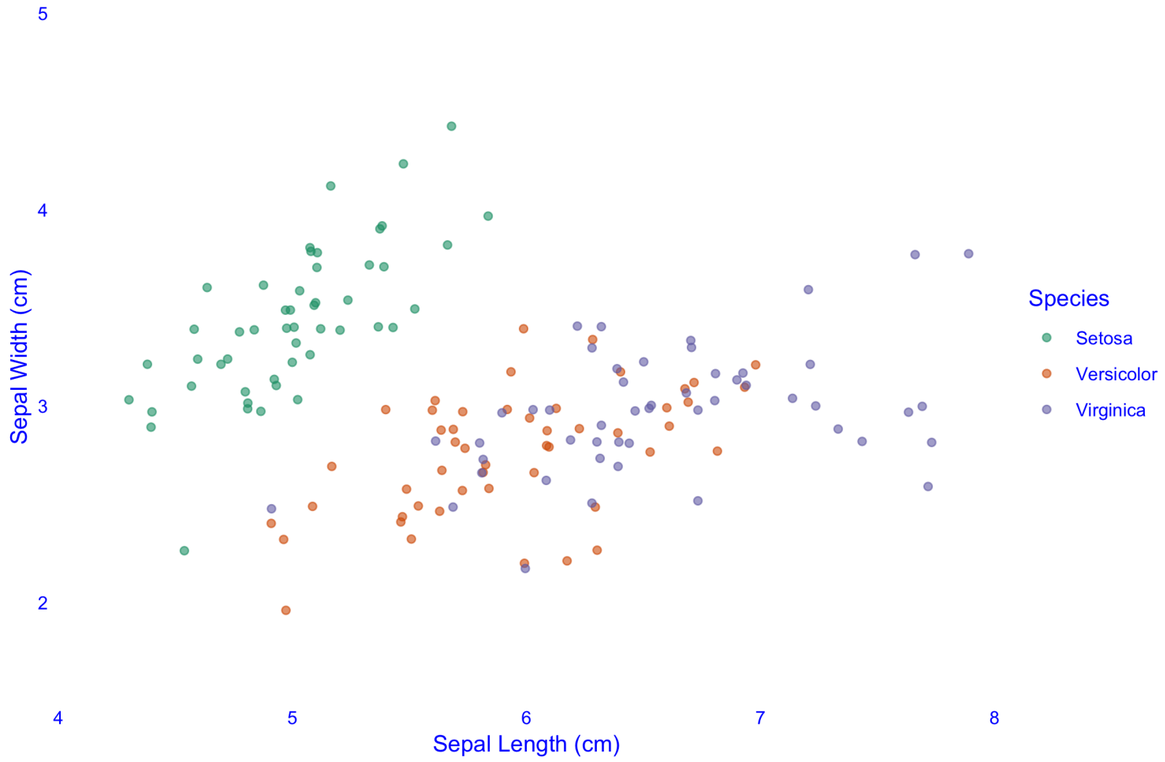
type	modified using
text	element_text()
line	element_line()
rectangle	element_rect()

A starting plot...

```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6)
```

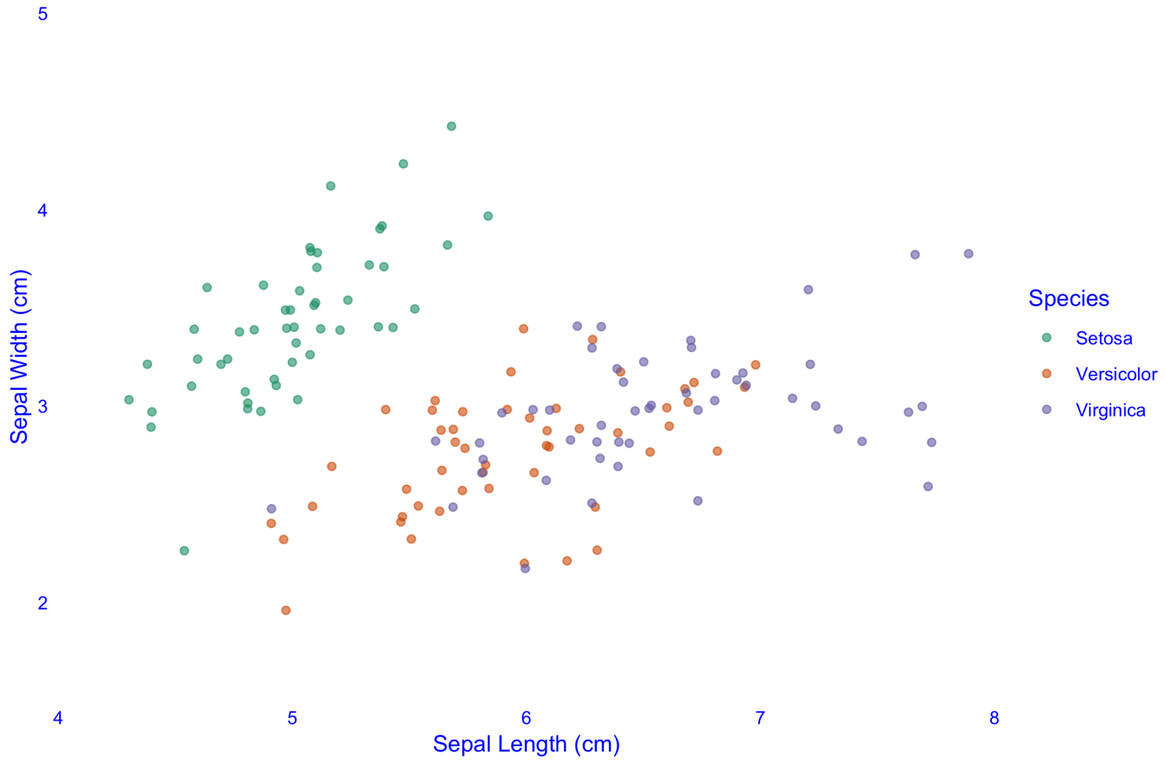


The text elements




```
text
  axis.title
    axis.title.x
      axis.title.x.top
      axis.title.x.bottom
    axis.title.y
      axis.title.y.left
      axis.title.y.right
  title
    legend.title
    plot.title
    plot.subtitle
    plot.caption
    plot.tag
  axis.text
    axis.text.x
      axis.text.x.top
      axis.text.x.bottom
    axis.text.y
      axis.text.y.left
      axis.text.y.right
  legend.text
  strip.text
    strip.text.x
    strip.text.y
```

The text elements



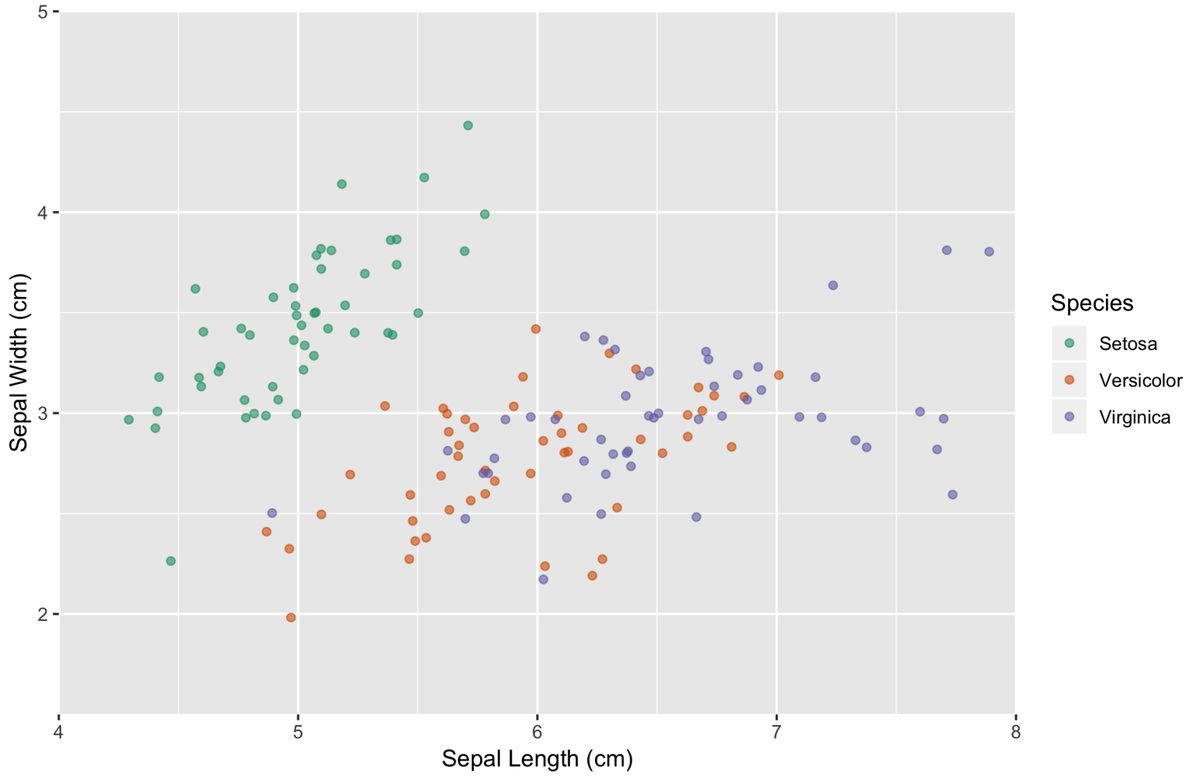

```
theme(
text,
  axis.title,
    axis.title.x,
      axis.title.x.top,
      axis.title.x.bottom,
    axis.title.y,
      axis.title.y.left,
      axis.title.y.right,
  title,
    legend.title,
    plot.title,
    plot.subtitle,
    plot.caption,
    plot.tag,
  axis.text,
    axis.text.x,
      axis.text.x.top,
      axis.text.x.bottom,
    axis.text.y,
      axis.text.y.left,
      axis.text.y.right,
  legend.text,
  strip.text,
    strip.text.x,
    strip.text.y)
```

Adjusting theme elements

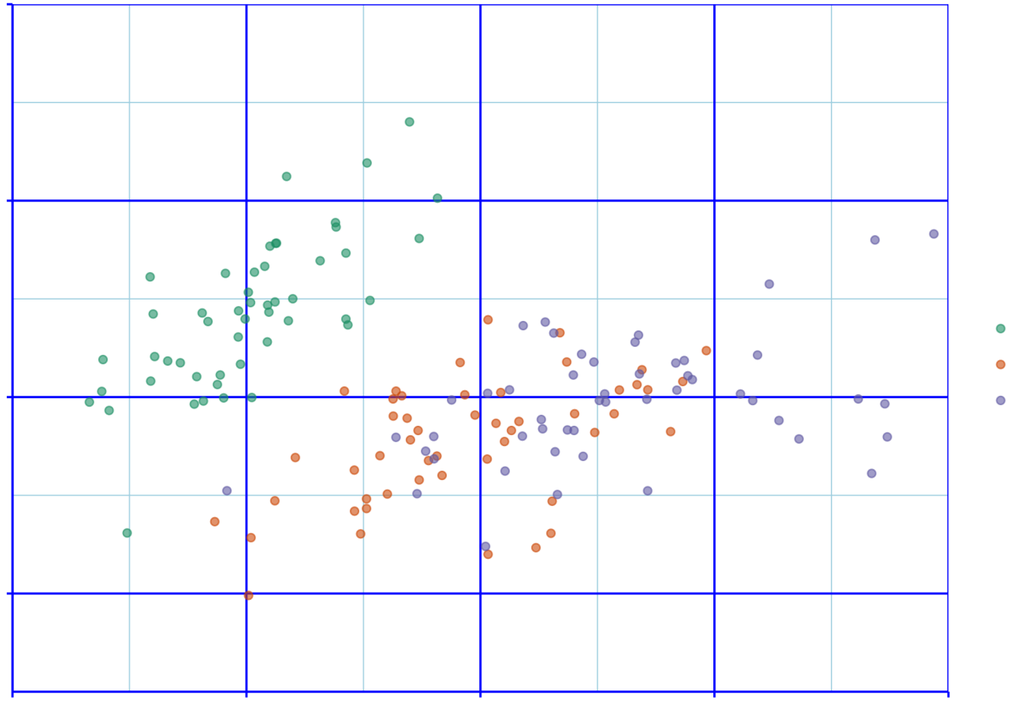
```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6) +
  theme(axis.title = element_text(color = "blue"))
```

A starting plot...

```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6)
```



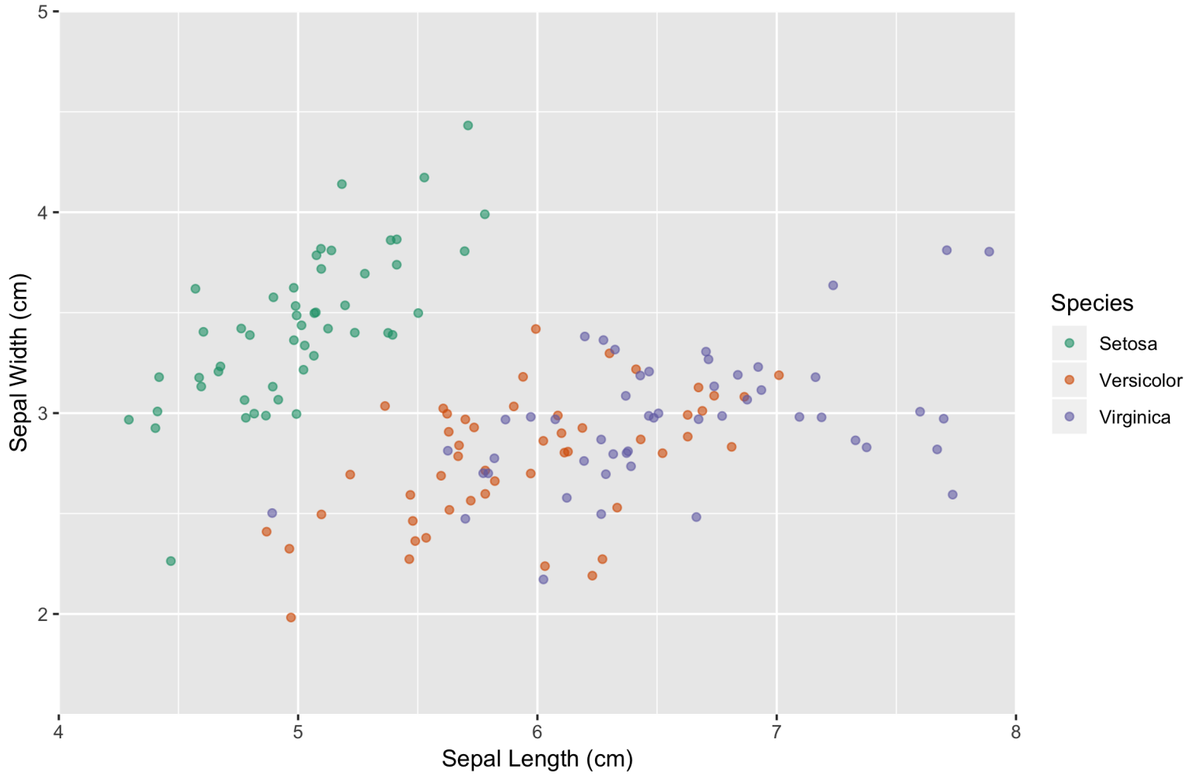
Line elements



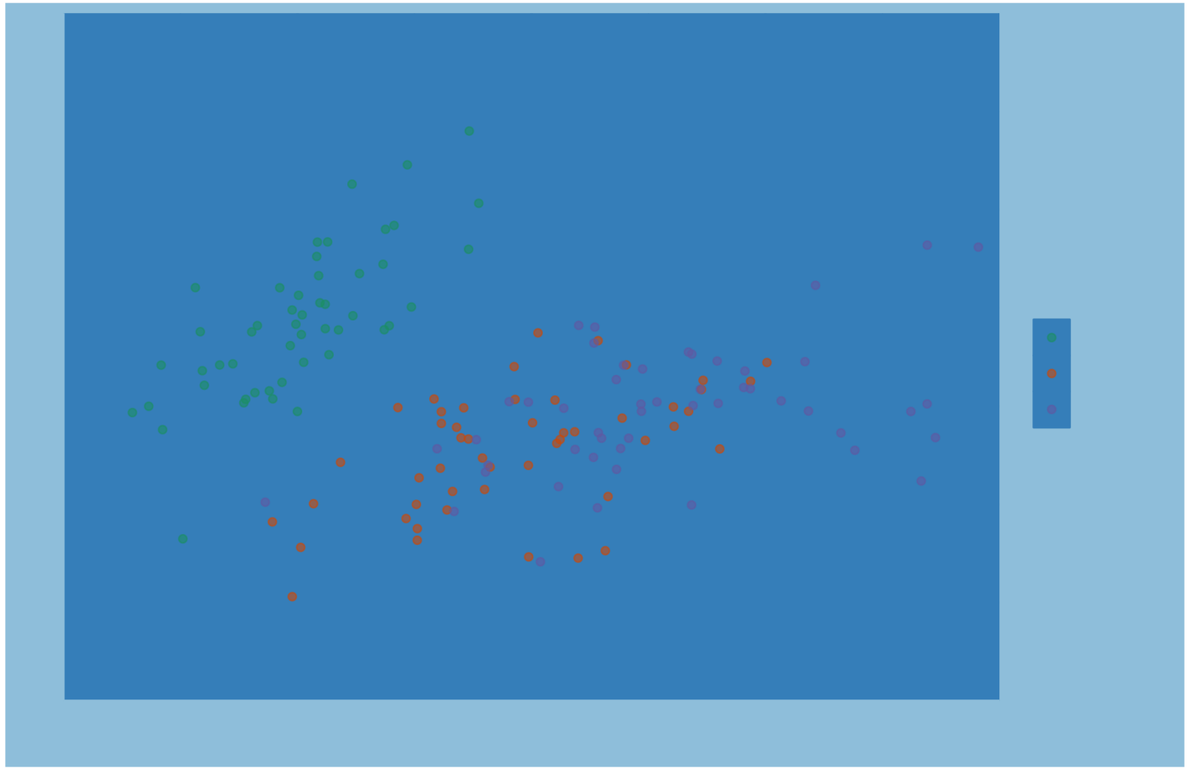
```
theme(
line,
  axis.ticks,
    axis.ticks.x,
      axis.ticks.x.top,
      axis.ticks.x.bottom,
    axis.ticks.y,
      axis.ticks.y.left,
      axis.ticks.y.right,
    axis.line,
      axis.line.x,
        axis.line.x.top,
        axis.line.x.bottom,
      axis.line.y,
        axis.line.y.left,
        axis.line.y.right,
  panel.grid,
    panel.grid.major,
      panel.grid.major.x,
      panel.grid.major.y,
    panel.grid.minor,
      panel.grid.minor.x,
      panel.grid.minor.y)
```

A starting plot...

```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6)
```



Rect elements



```
theme(
rect,
  legend.background,
  legend.key,
  legend.box.background,
  panel.background,
  panel.border,
  plot.background,
  strip.background,
    strip.background.x,
    strip.background.y)
```

Hierarchical naming reflects inheritance rules

e.g. Text

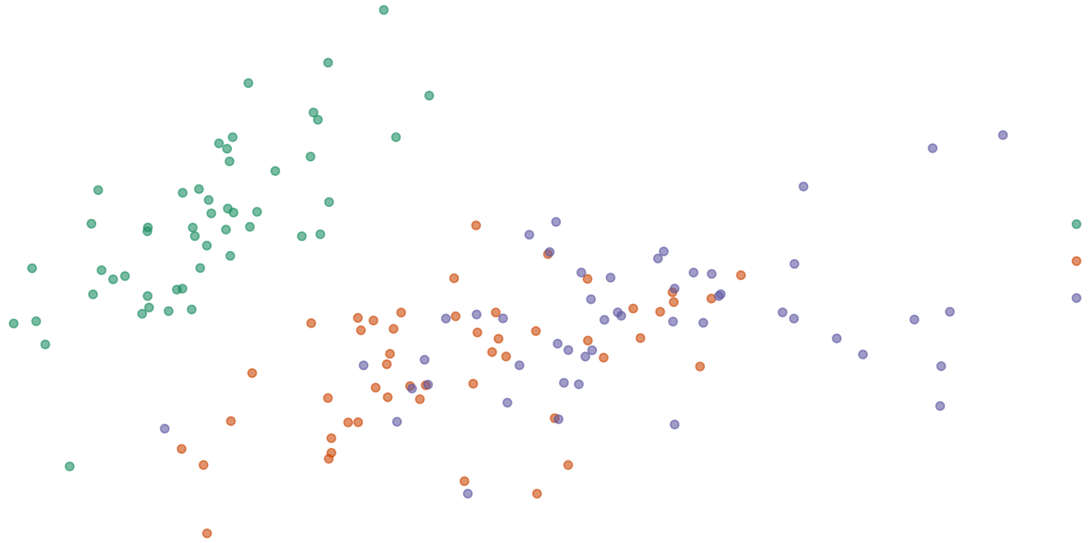
```
text
  axis.title
    axis.title.x
      axis.title.x.top
      axis.title.x.bottom
    axis.title.y
      axis.title.y.left
      axis.title.y.right
```

e.g. Lines

```
line
  axis.ticks
    axis.ticks.x
      axis.ticks.x.top
      axis.ticks.x.bottom
    axis.ticks.y
      axis.ticks.y.left,
      axis.ticks.y.right
    axis.line
      axis.line.x
        axis.line.x.top
        axis.line.x.bottom
      axis.line.y
        axis.line.y.left
        axis.line.y.right
```

element_blank()

```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6) +
  theme(line = element_blank(),
        rect = element_blank(),
        text = element_blank())
```



Theme flexibility

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Ways to use themes

1. From scratch (last video)

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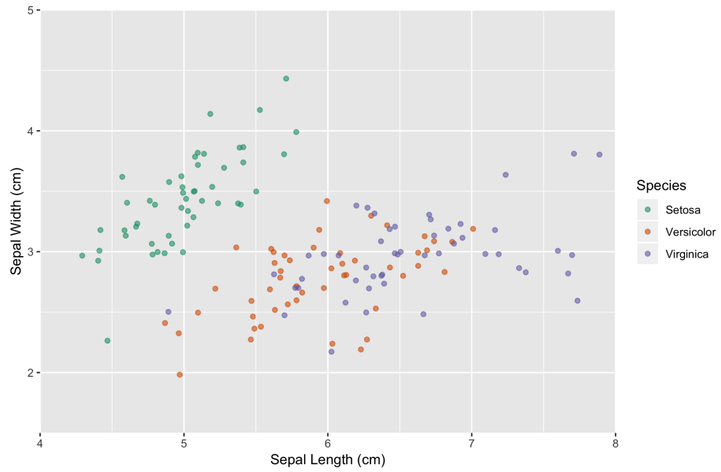
2. **Theme layer object**
3. Built-in themes
   - ggplot2 or ggthemes packages
4. Built-in themes from other packages
5. Update/Set default theme

Defining theme objects

- Useful when you have many plots
- Provides consistency in style
- Apply a specific theme everywhere

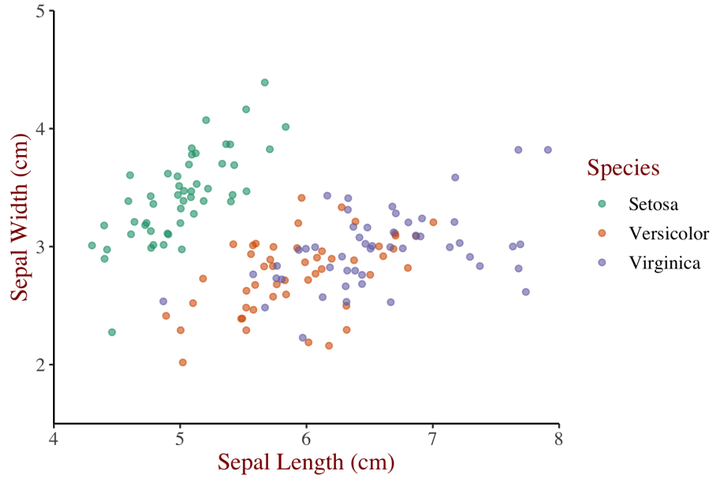
Defining theme objects

```
z <- ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_jitter(alpha = 0.6) +
  scale_x_continuous("Sepal Length (cm)", limits = c(4,8), expand = c(0,0)) +
  scale_y_continuous("Sepal Width (cm)", limits = c(1.5,5), expand = c(0,0)) +
  scale_color_brewer("Species", palette = "Dark2", labels = c("Setosa", "Versicolor", "Virginica"))
```



Defining theme objects

```
z + theme(text = element_text(family = "serif", size = 14),
          rect = element_blank(),
          panel.grid = element_blank(),
          title = element_text(color = "#8b0000"),
          axis.line = element_line(color = "black"))
```

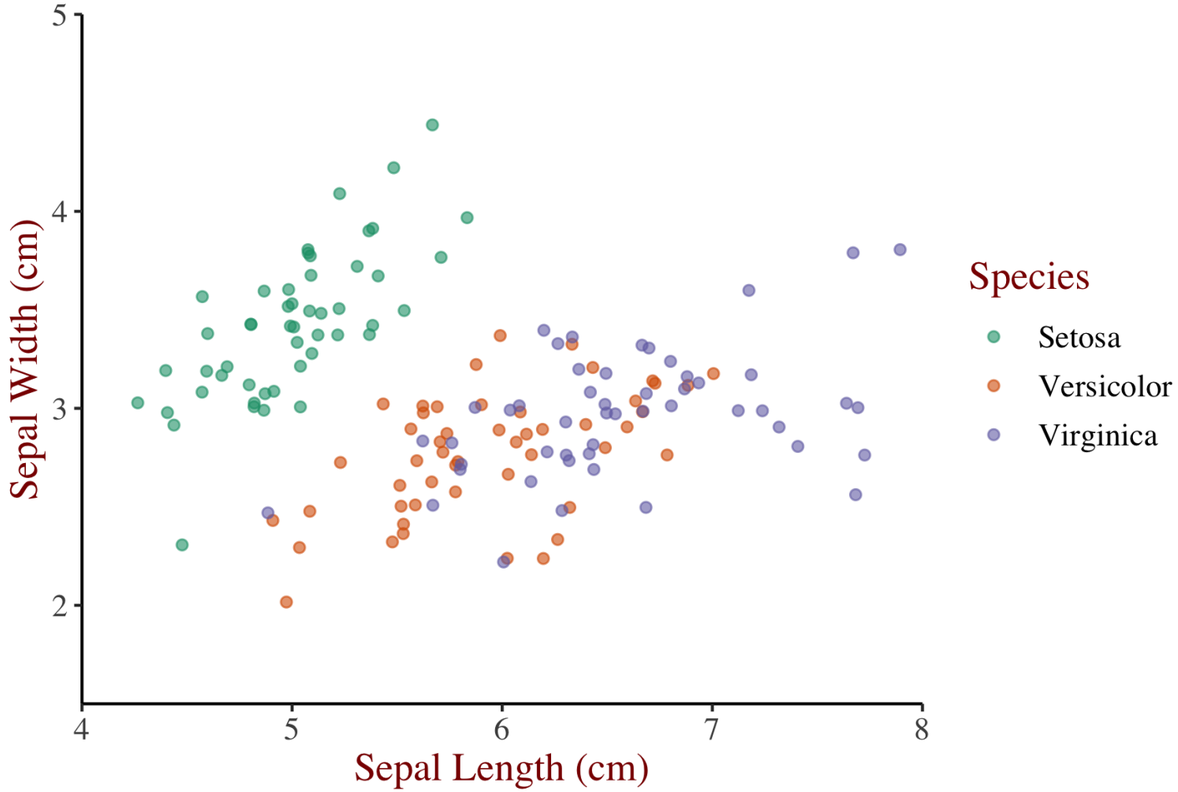


Defining theme objects

```
theme_iris <- theme(text = element_text(family = "serif", size = 14),
          rect = element_blank(),
          panel.grid = element_blank(),
          title = element_text(color = "#8b0000"),
          axis.line = element_line(color = "black"))
```

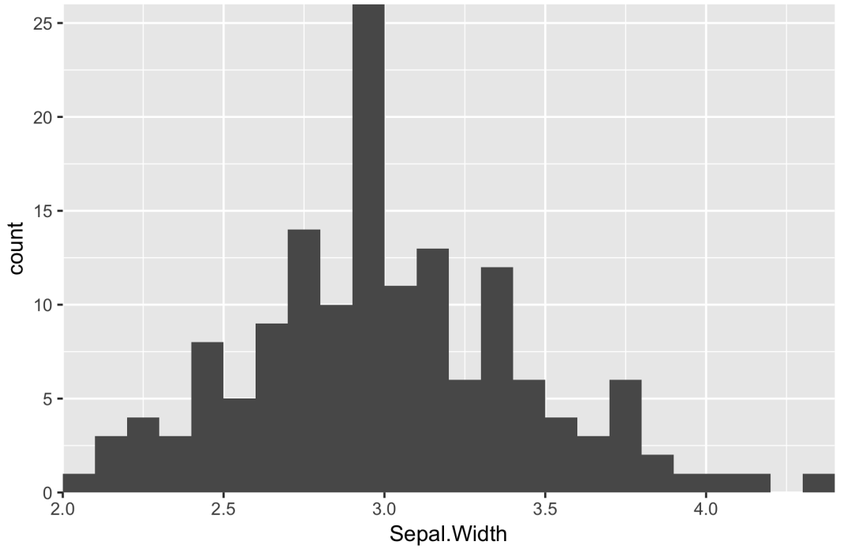
Reusing theme objects

```
z + theme_iris
```



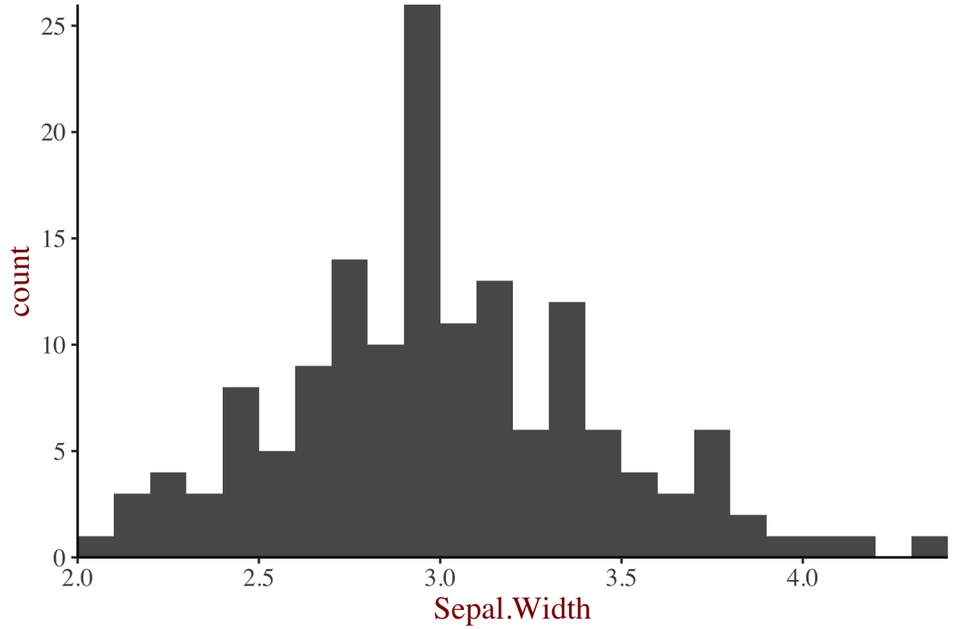
Reusing theme objects

```
m <- ggplot(iris, aes(x = Sepal.Width)) +
    geom_histogram(binwidth = 0.1,
                   center = 0.05)
m
```



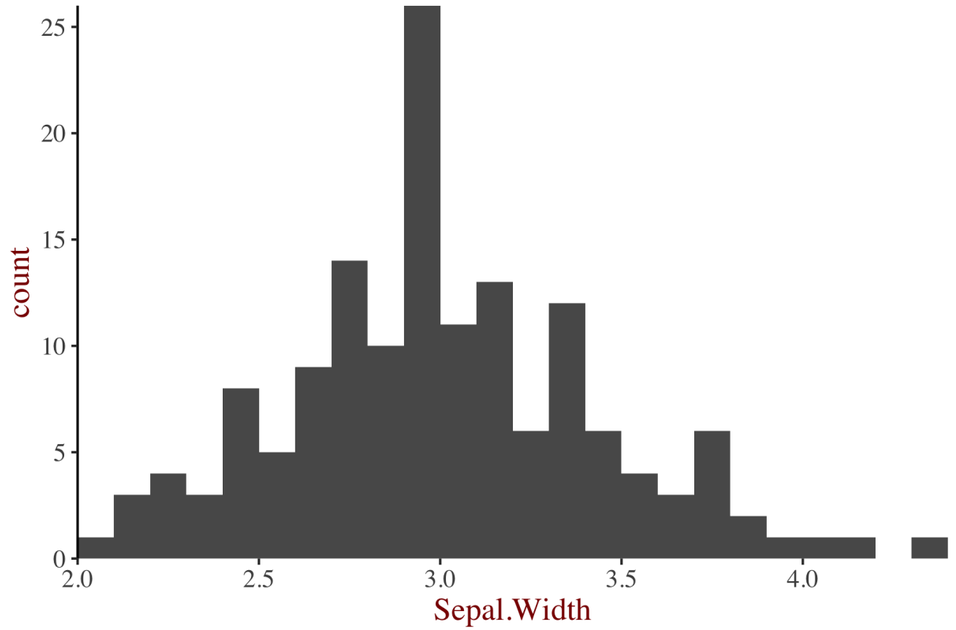
Reusing theme objects

```
m +
  theme_iris
```



Reusing theme objects

```
m +
  theme_iris +
  theme(axis.line.x = element_blank())
```



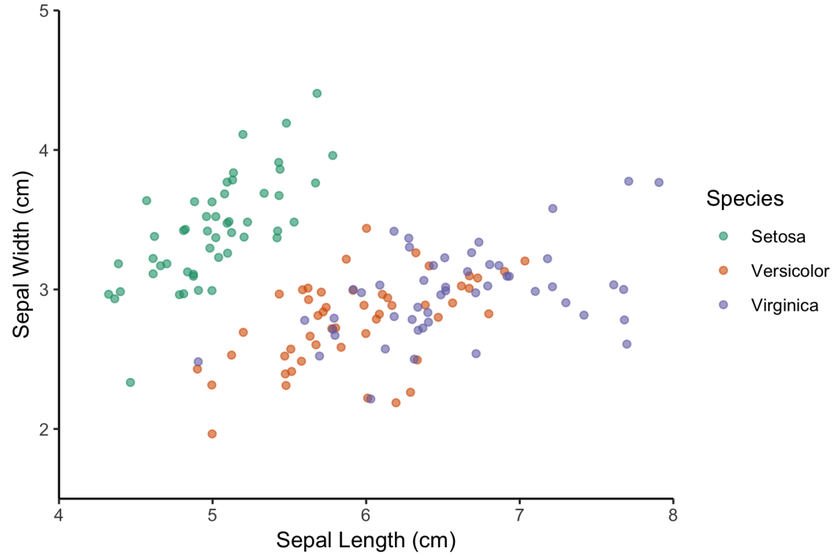
Ways to use themes

1. From scratch (last video)
2. Theme layer object
3. **Built-in themes**
   - ggplot2 or ggthemes packages
4. Built-in themes from other packages
5. Update/Set default theme

Using built-in themes

Use `theme_*()` functions to access built-in themes.

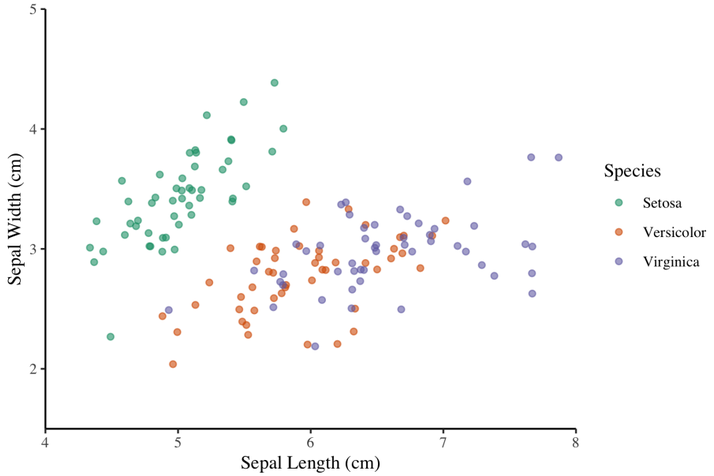
```
z +
  theme_classic()
```



Using built-in themes

Use `theme_*()` functions to access built-in themes.

```
z +
  theme_classic() +
  theme(text = element_text(family = "serif"))
```



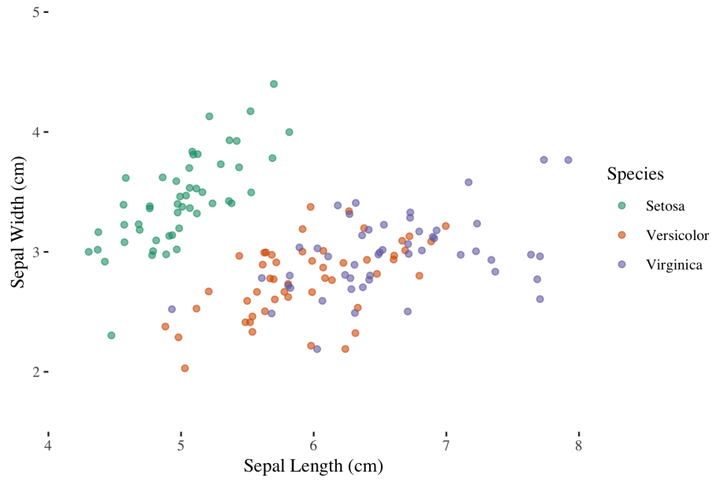
Ways to use themes

1. From scratch (last video)
2. Theme layer object
3. Built-in themes
   - ggplot2 or ggthemes packages
4. **Built-in themes from other packages**
5. Update/Set default theme

The ggthemes package

Use the `ggthemes` package for more functions.

```
library(ggthemes)
z +
  theme_tufte()
```



Ways to use themes

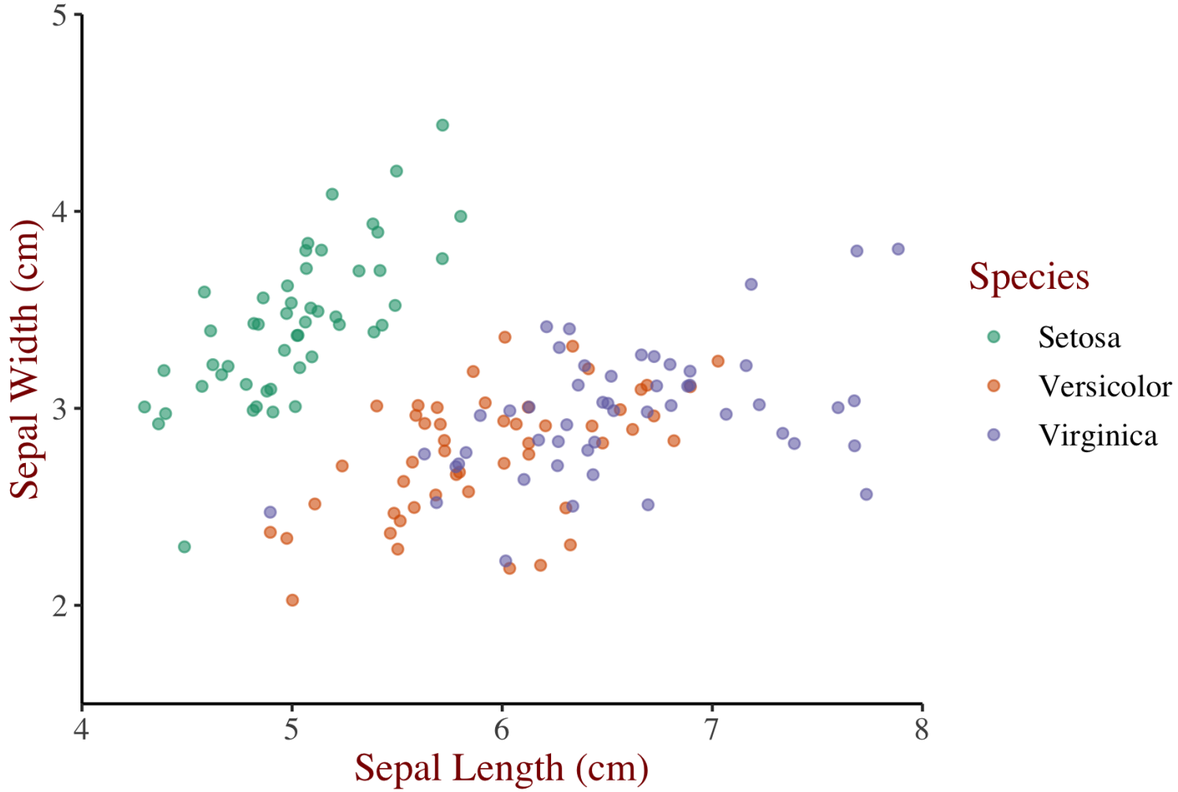
1. From scratch (last video)
2. Theme layer object
3. Built-in themes
   - ggplot2 or ggthemes packages
4. Built-in themes from other packages
5. **Update/Set default theme**

Updating themes

```
original <- theme_update(text = element_text(family = "serif", size = 14),
                         rect = element_blank(),
                         panel.grid = element_blank(),
                         title = element_text(color = "#8b0000"),
                         axis.line = element_line(color = "black"))
```

Updating themes

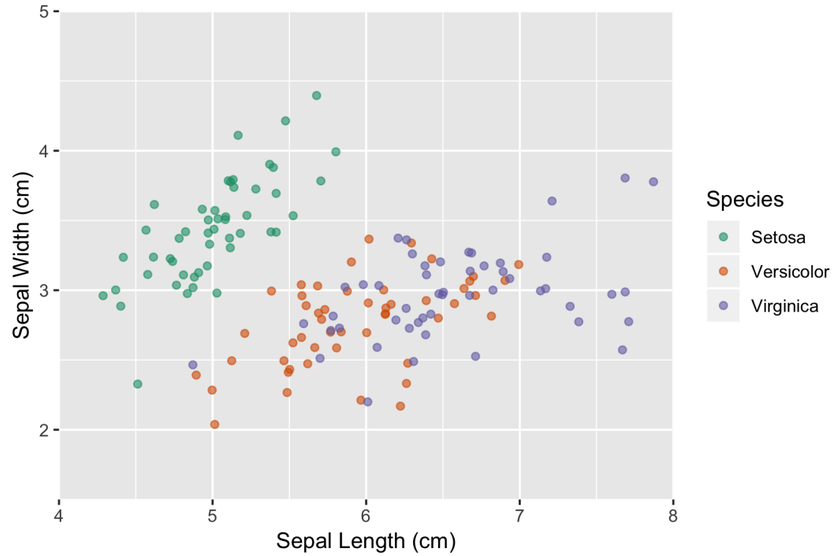
```
z
```



Setting themes

```
theme_set(original)


# Alternatively
# theme_set(theme_grey())
```



Effective explanatory plots

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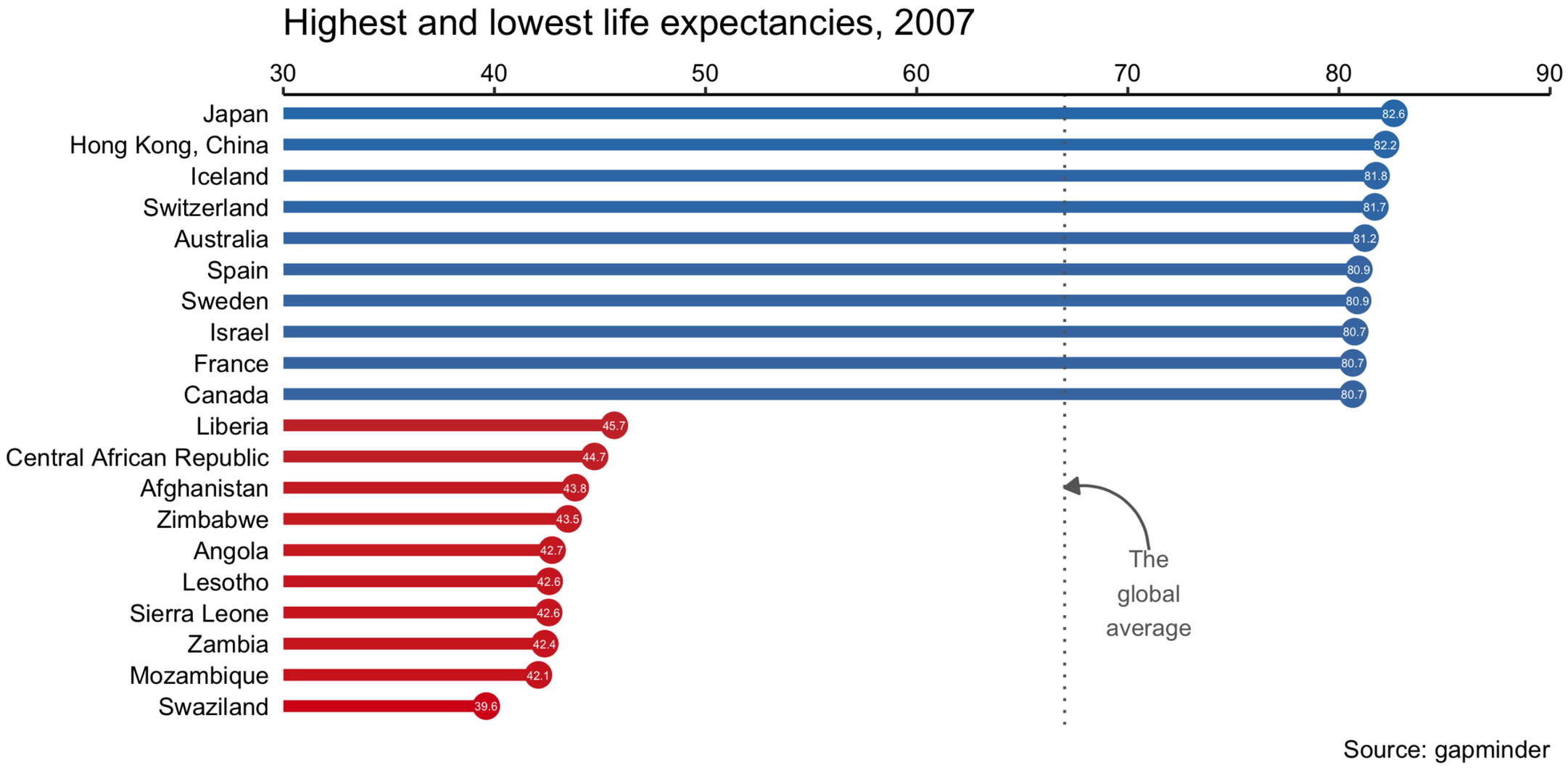
Our goal, an effective explanatory plot



Complete data

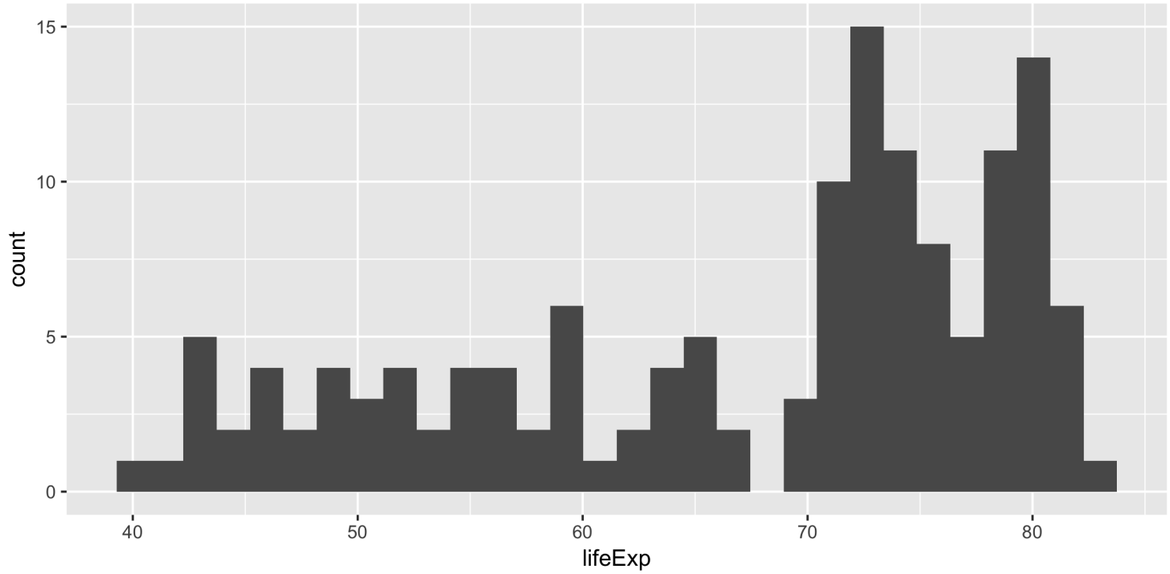
```
dplyr::glimpse(gm2007_full)
```

```
Observations: 142
Variables: 3
$ country   <fct> "Afghanistan", "Albania", "Algeria", "Angola", "Argentina", "Au...
$ lifeExp   <dbl> 43.828, 76.423, 72.301, 42.731, 75.320, 81.235, 79.829, 75.635,...
$ continent <fct> Asia, Europe, Africa, Africa, Americas, Oceania, Europe, Asia, ...
```

[1] We would begin with our complete data set, which contains three variables for 142 countries.

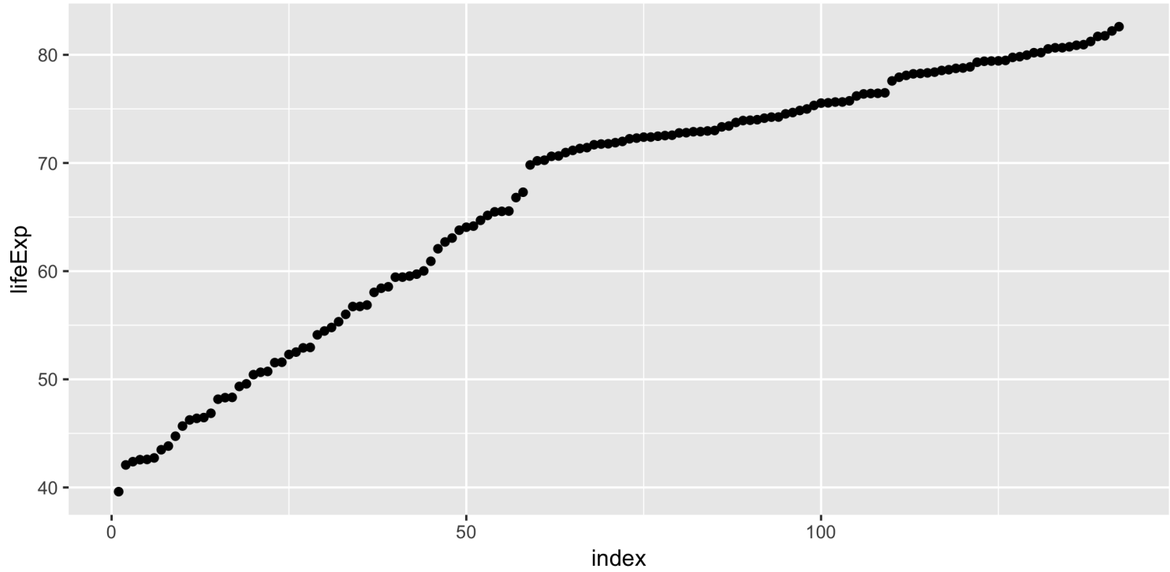
First exploratory plots - distributions

```
ggplot(gm2007_full, aes(lifeExp)) +
  geom_histogram()
```



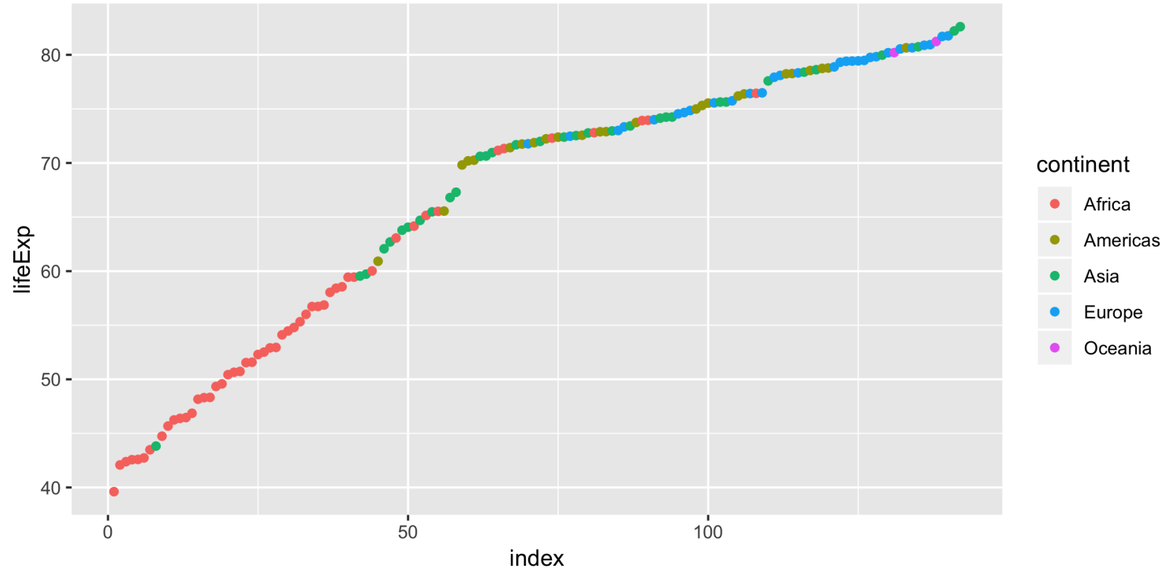
First exploratory plots - distributions

```
ggplot(gm2007_full_arranged,
       aes(index, lifeExp)) +
  geom_point()
```



First exploratory plots - distributions

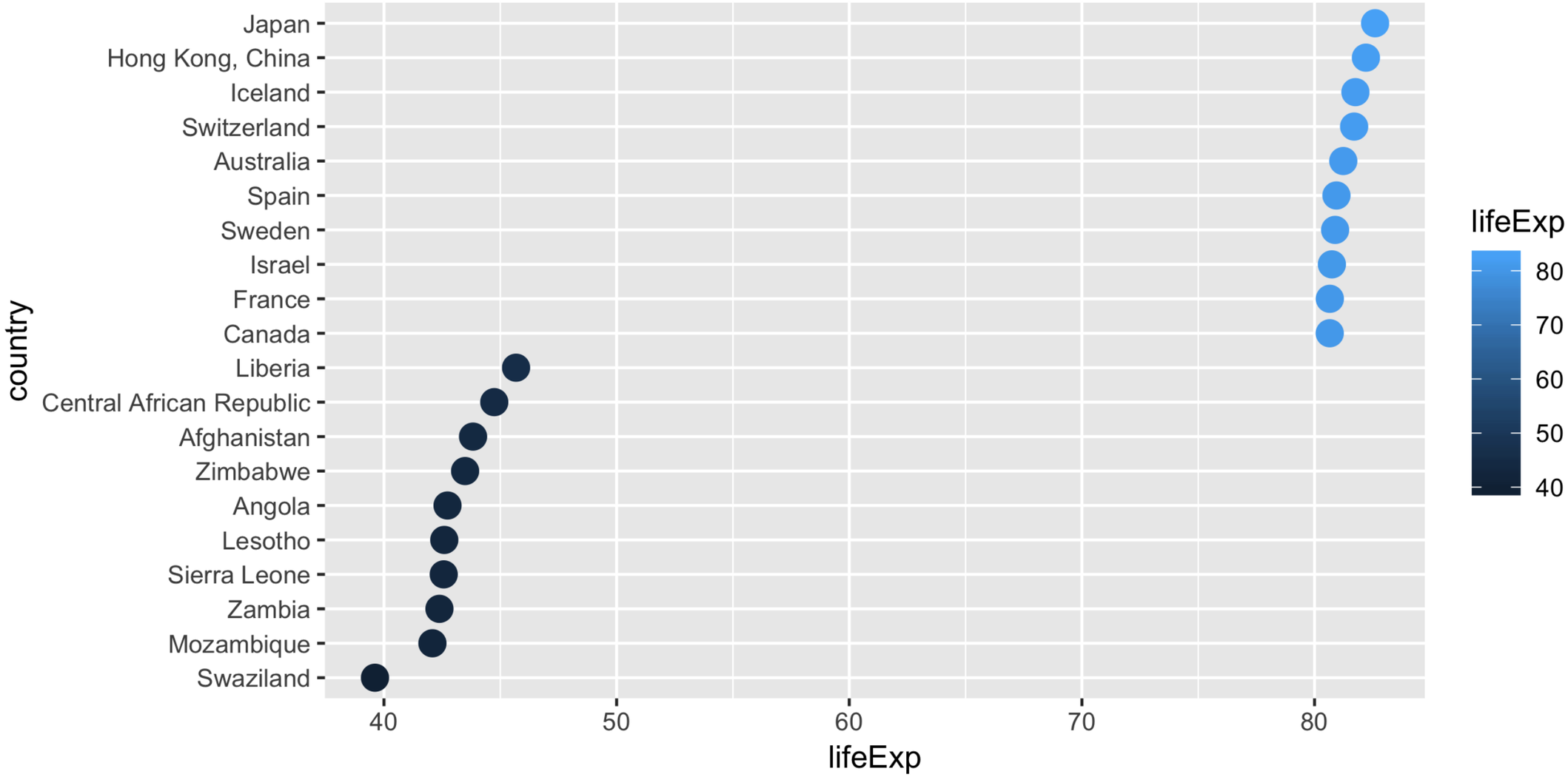
```
ggplot(gm2007_full_arranged,
       aes(index, lifeExp, col = continent)) +
  geom_point()
```



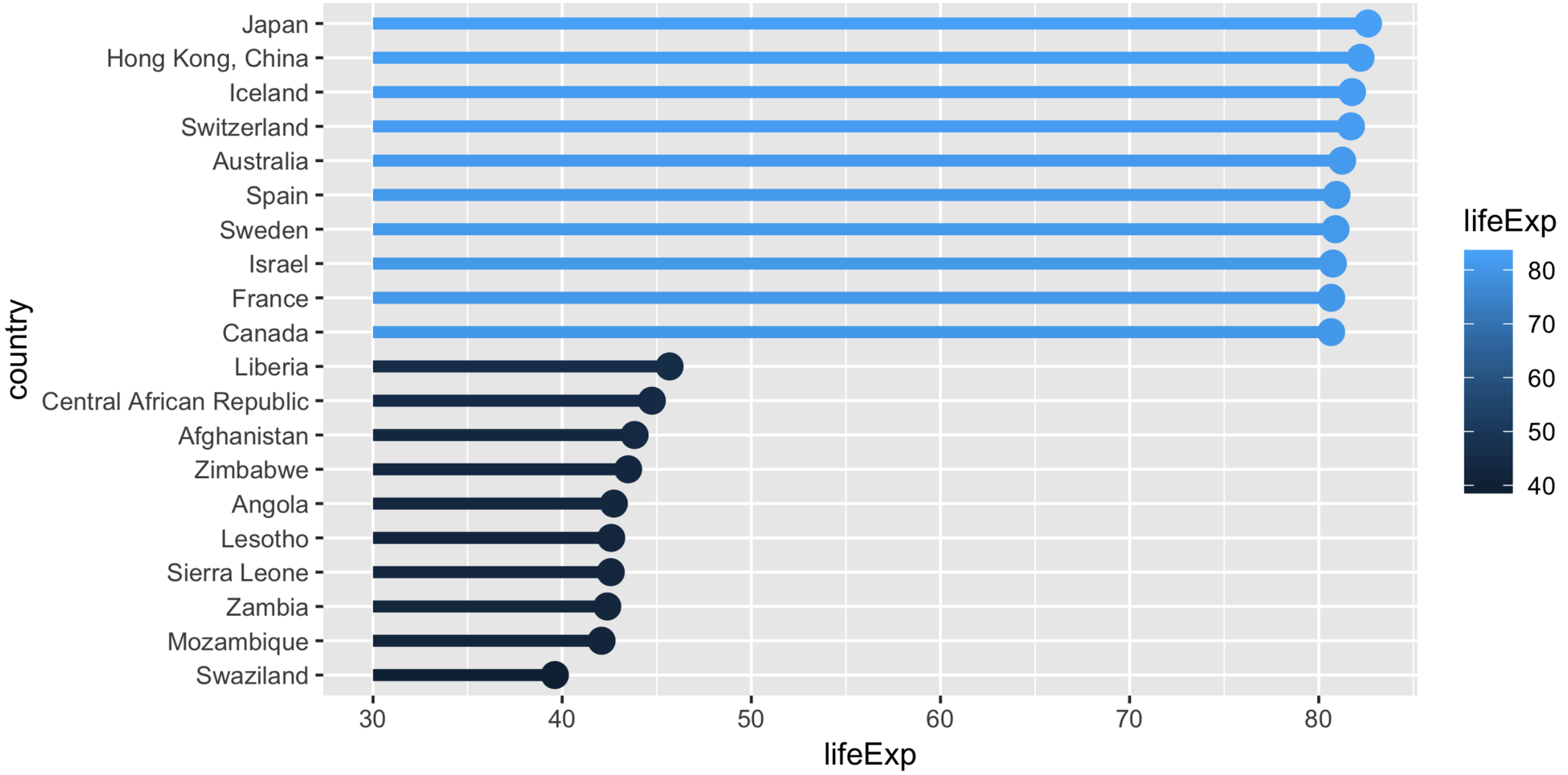
Our data

```
dplyr::glimpse(gm2007)
```

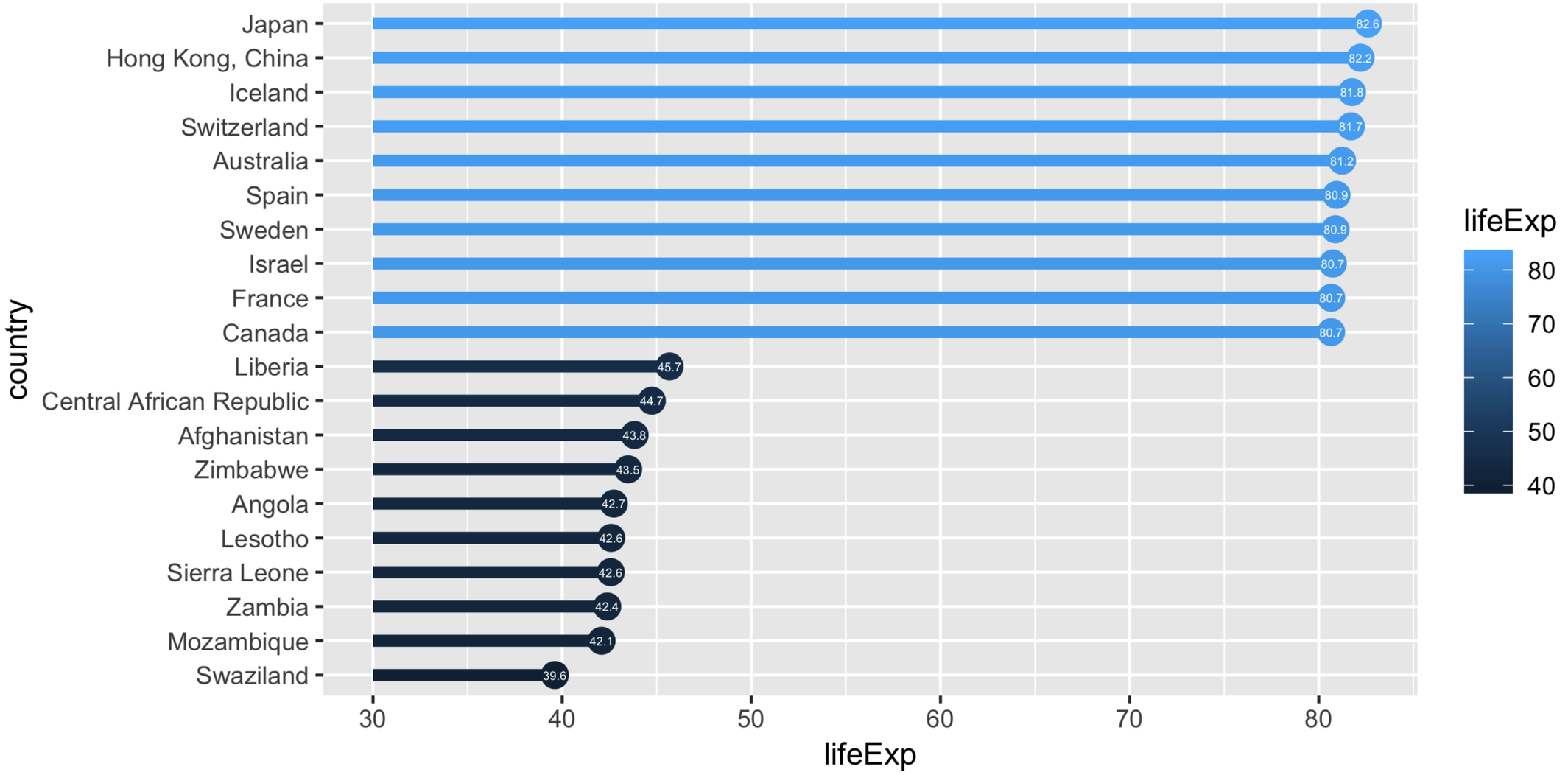
```
Observations: 20
Variables: 3
$ country   <fct> "Swaziland", "Mozambique", "Zambia", "Sierra Leone", "Lesotho...
$ lifeExp   <dbl> 39.613, 42.082, 42.384, 42.568, 42.592, 42.731, 43.487, 43.82...
$ continent <fct> Africa, Africa, Africa, Africa, Africa, Africa, Africa, Asia,...
>
```


Japan
Hong Kong, China
Iceland
Switzerland
Australia
Spain
Sweden
Israel
France
Canada
Liberia
Central African Republic
Afghanistan
Zimbabwe
Angola
Lesotho
Sierra Leone
Zambia
Mozambique
Swaziland
country
40
50
60
70
80
lifeExp
lifeExp
80
70
60
50
40

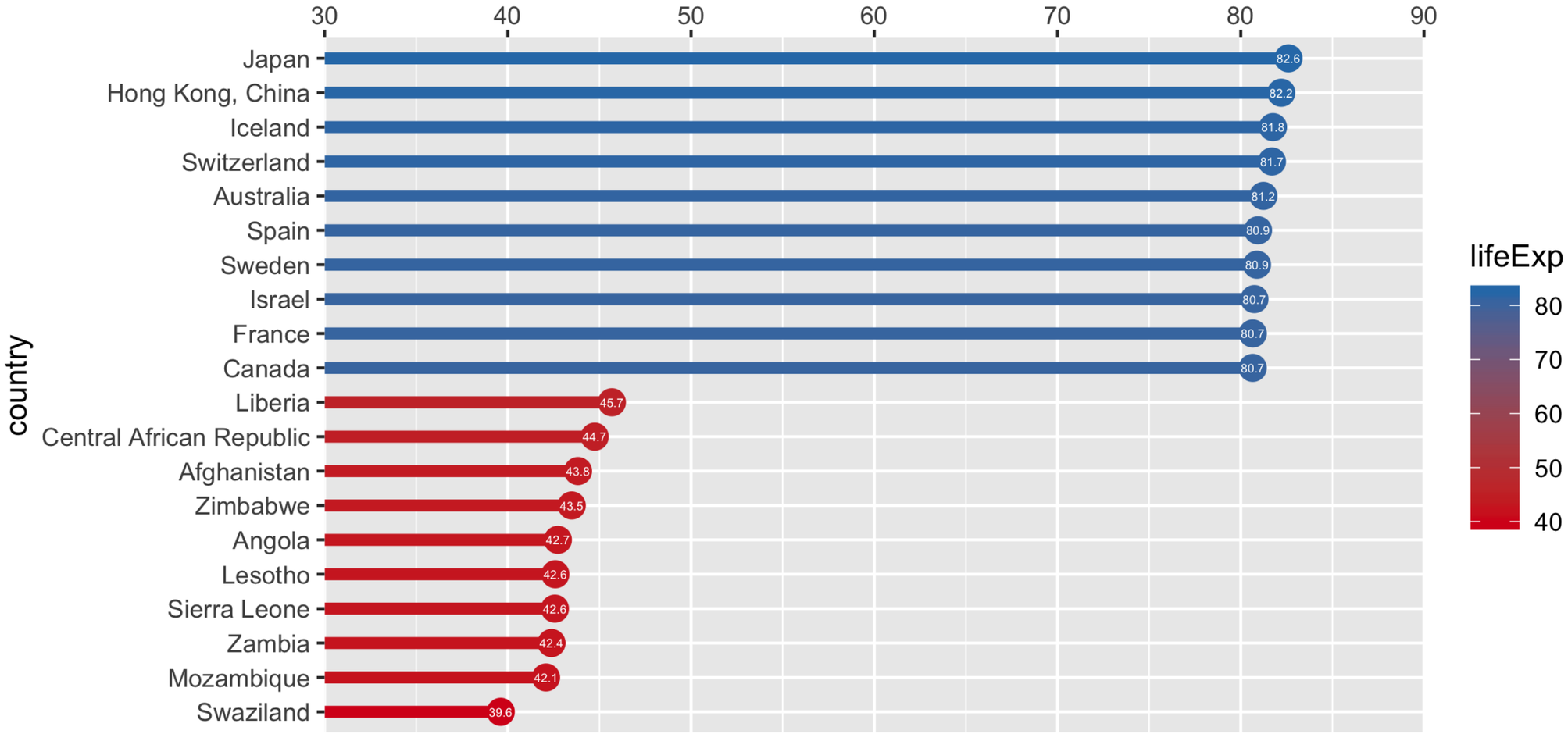
Use intuitive and attractive geoms



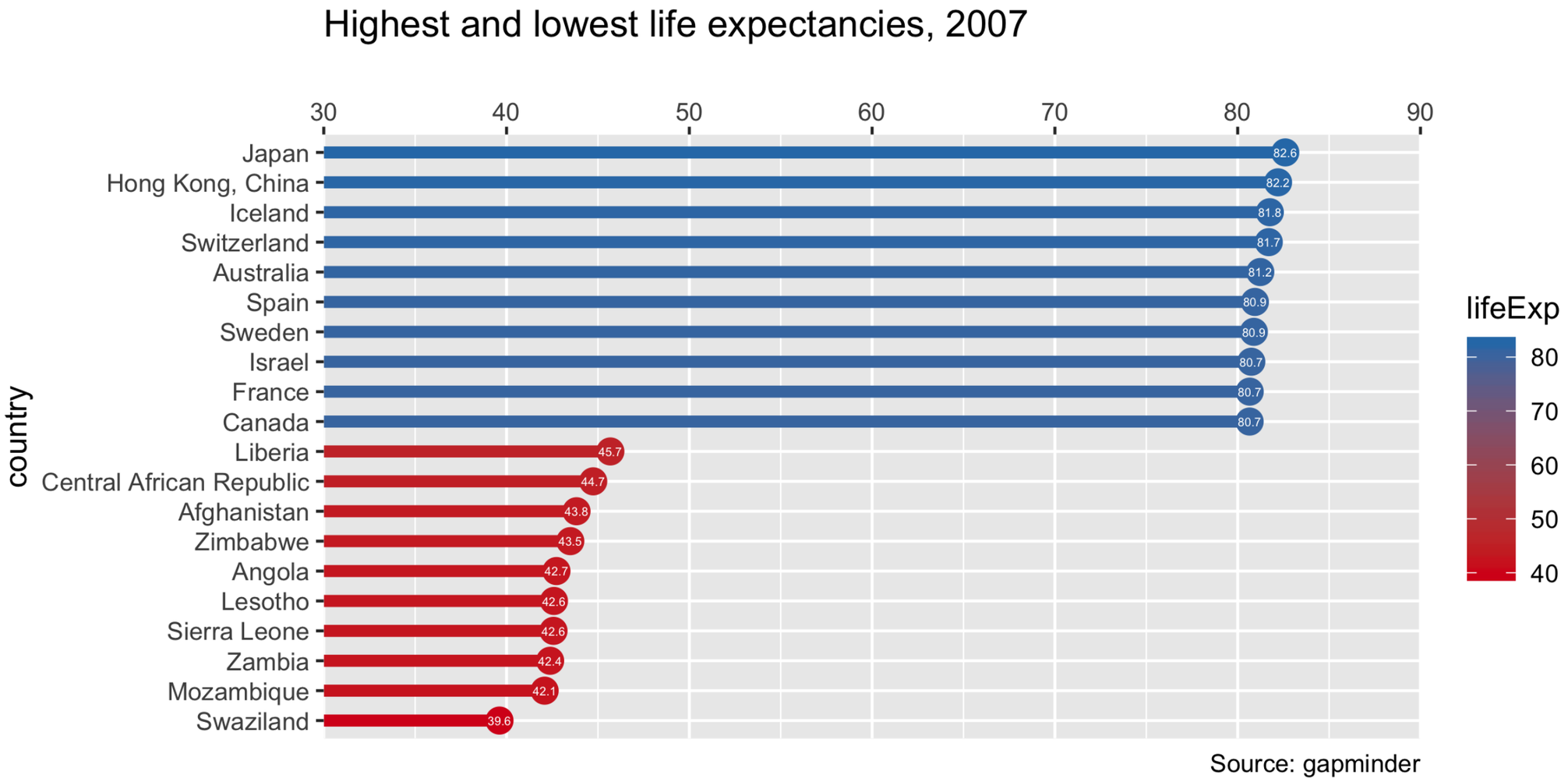
Add text labels to your plot



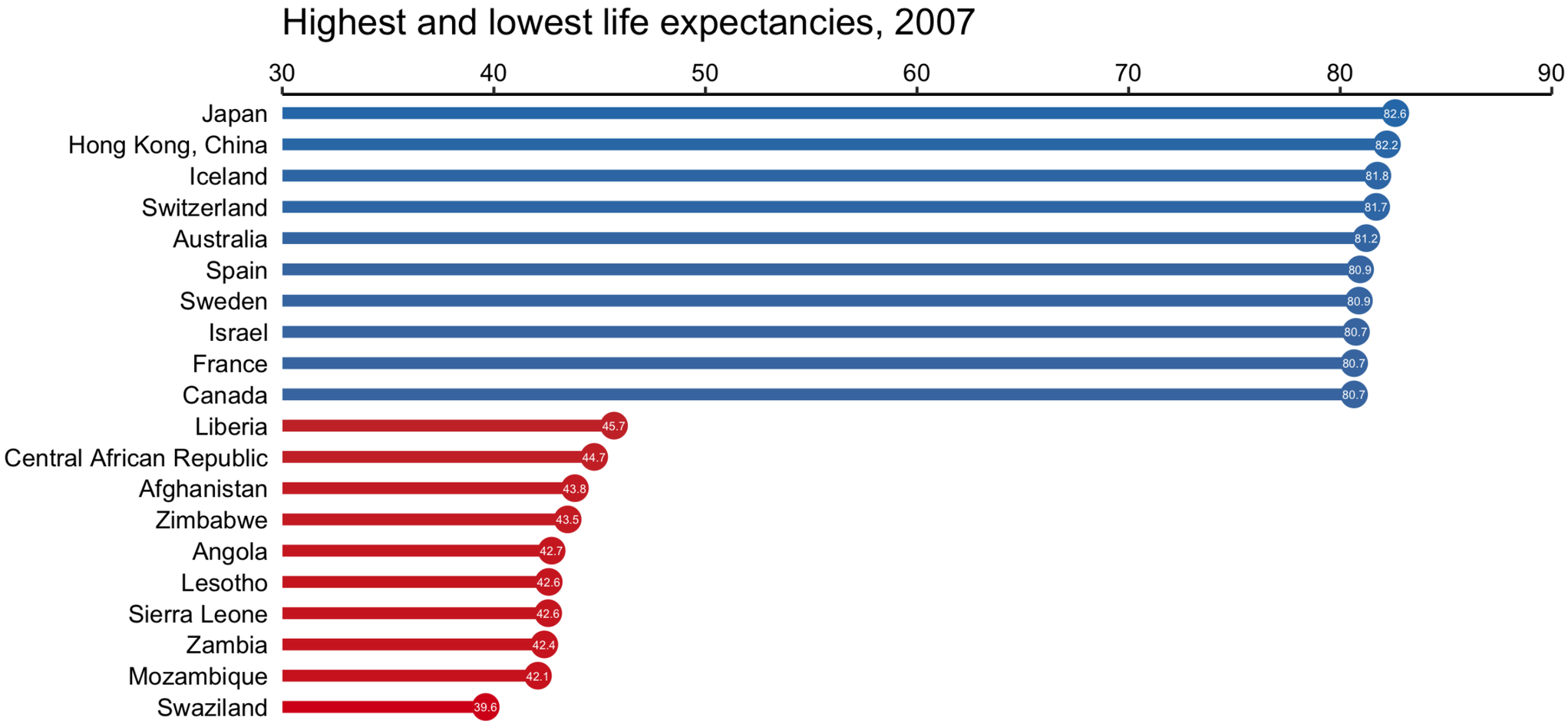
Use appropriate scales



Add useful titles and citations

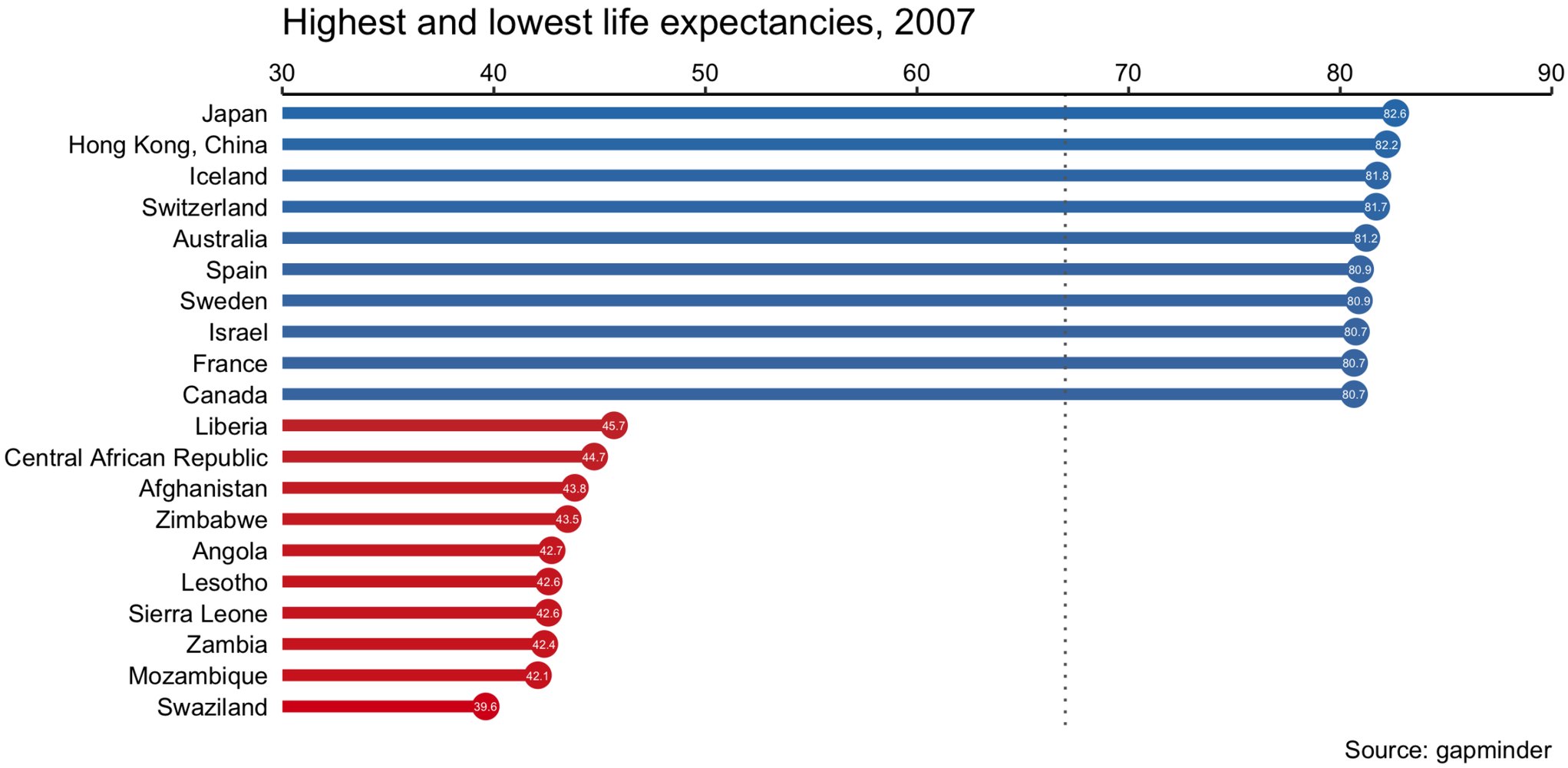


Remove non-data ink

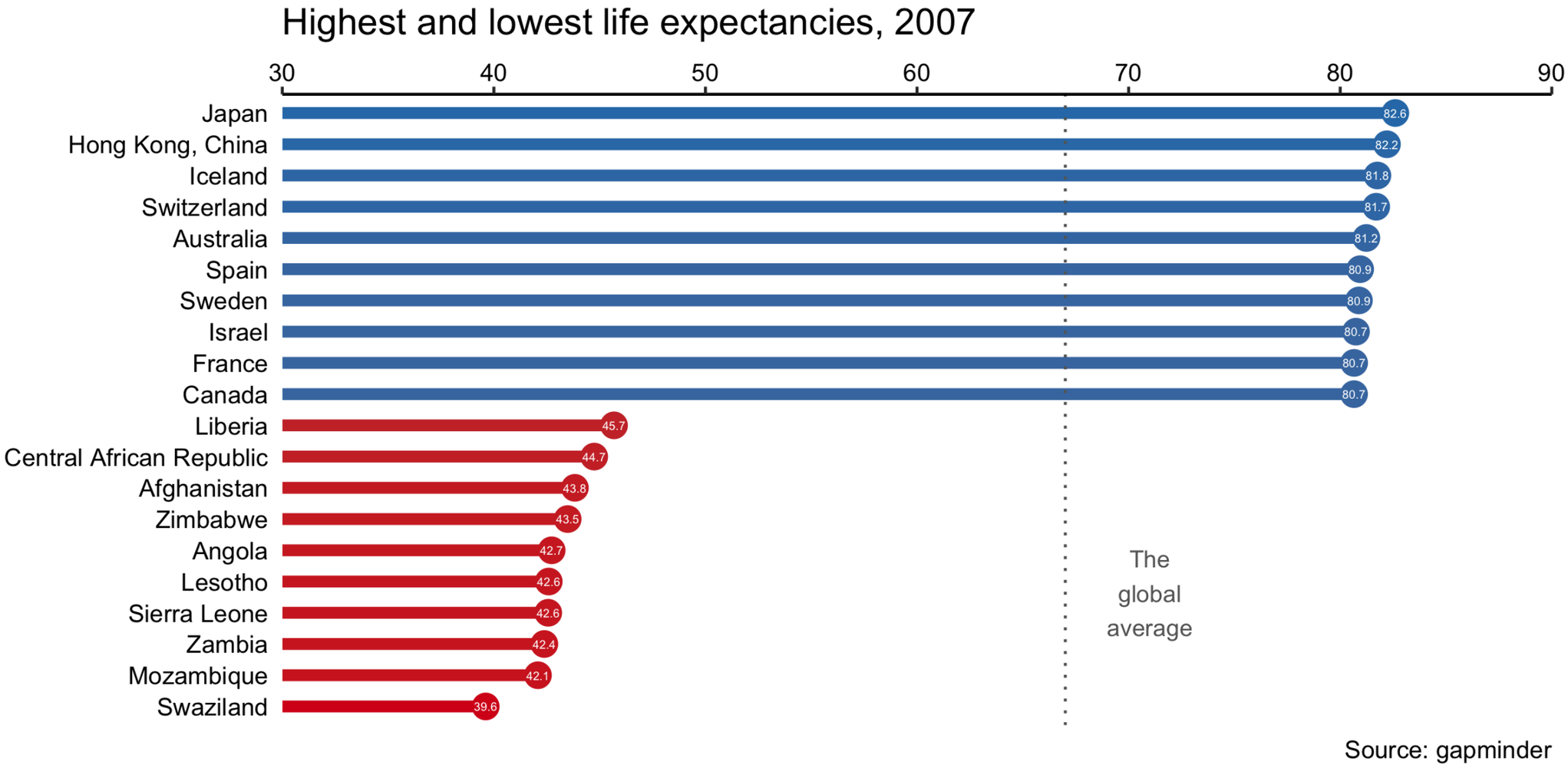


Source: gapminder

Add threshold lines



Add informative text



Add embellishments