

IDS 2020. Problem Set 1

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Last updated at 2021-03-17 19:15:55

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

gapminder07 <- filter(gapminder, year %in% 2007)
```

Note: in any graphs, try to provide meaningful labels whenever possible.

Question 1

What is this data set about? (hint: Try `?gapminder` to learn more about the data set) What are we doing when we write `gapminder07 <- filter(gapminder, year %in% 2007)`?

`?gapminder` it's a data set on life expectancy, GDP per capita, and population by country

```
gapminder07 <- filter(gapminder, year %in% 2007)
gapminder07
```

```
## # A tibble: 142 x 6
##   country    continent  year lifeExp      pop gdpPercap
##   <fct>      <fct>    <int> <dbl>    <int>    <dbl>
## 1 Afghanistan Asia      2007   43.8  31889923    975.
## 2 Albania    Europe    2007   76.4   3600523   5937.
## 3 Algeria    Africa    2007   72.3  33333216   6223.
## 4 Angola     Africa    2007   42.7  12420476   4797.
## 5 Argentina  Americas  2007   75.3  40301927  12779.
## 6 Australia  Oceania   2007   81.2  20434176  34435.
## 7 Austria    Europe    2007   79.8   8199783   36126.
## 8 Bahrain    Asia      2007   75.6    708573   29796.
## 9 Bangladesh Asia      2007   64.1 150448339   1391.
## 10 Belgium   Europe    2007   79.4  10392226   33693.
## # ... with 132 more rows
```

it means we are specifying the data set by the year of 2007. now it will show the all countries data on lifeExp, pop and gdpPercap of year 2007.

Question 2

How many different countries are in the data? (hint: try `glimpse`, `head`, `str`, `summary`, or any other commands to get some sense about the data)

```
glimpse(gapminder)
```

```
## Rows: 1,704
## Columns: 6
## $ country   <fct> Afghanistan, Afghanistan, Afghanistan, Afghanistan, Afgha...
## $ continent <fct> Asia, Asia, Asia, Asia, Asia, Asia, Asia, Asia, Asia, Asia, Asi...
## $ year      <int> 1952, 1957, 1962, 1967, 1972, 1977, 1982, 1987, 1992, 199...
## $ lifeExp   <dbl> 28.801, 30.332, 31.997, 34.020, 36.088, 38.438, 39.854, 4...
## $ pop       <int> 8425333, 9240934, 10267083, 11537966, 13079460, 14880372,...
## $ gdpPercap <dbl> 779.4453, 820.8530, 853.1007, 836.1971, 739.9811, 786.113...
```

```
str(gapminder)
```

```
## tibble [1,704 x 6] (S3: tbl_df/tbl/data.frame)
## $ country   : Factor w/ 142 levels "Afghanistan",...: 1 1 1 1 1 1 1 1 1 1 ...
## $ continent: Factor w/ 5 levels "Africa","Americas",...: 3 3 3 3 3 3 3 3 3 3 ...
## $ year      : int [1:1704] 1952 1957 1962 1967 1972 1977 1982 1987 1992 1997 ...
## $ lifeExp   : num [1:1704] 28.8 30.3 32 34 36.1 ...
## $ pop       : int [1:1704] 8425333 9240934 10267083 11537966 13079460 14880372 12881816 13867957 163...
## $ gdpPercap: num [1:1704] 779 821 853 836 740 ...
```

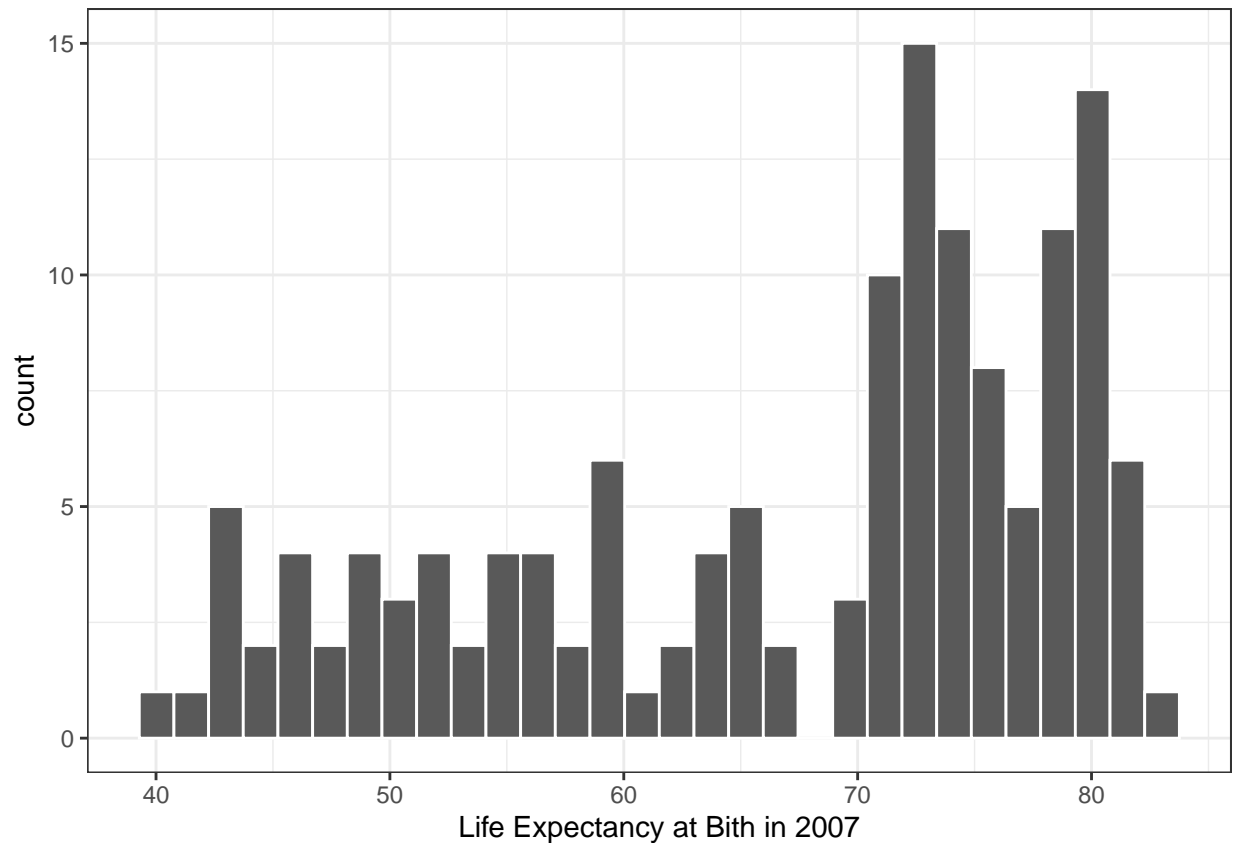
Total 142 different countries exist in the data level

Question 3

What is the distribution of the life expectancy at birth in 2007? (Note: here on out, we will be using the `gapminder07` data for the rest of the exercise. Hint: Try drawing a histogram)

```
histo007 <- ggplot(data = gapminder07) +
  geom_histogram(aes(x = lifeExp),
    color = "white") +
  scale_x_continuous("Life Expectancy at Bith in 2007") +
  theme_bw()
histo007
```

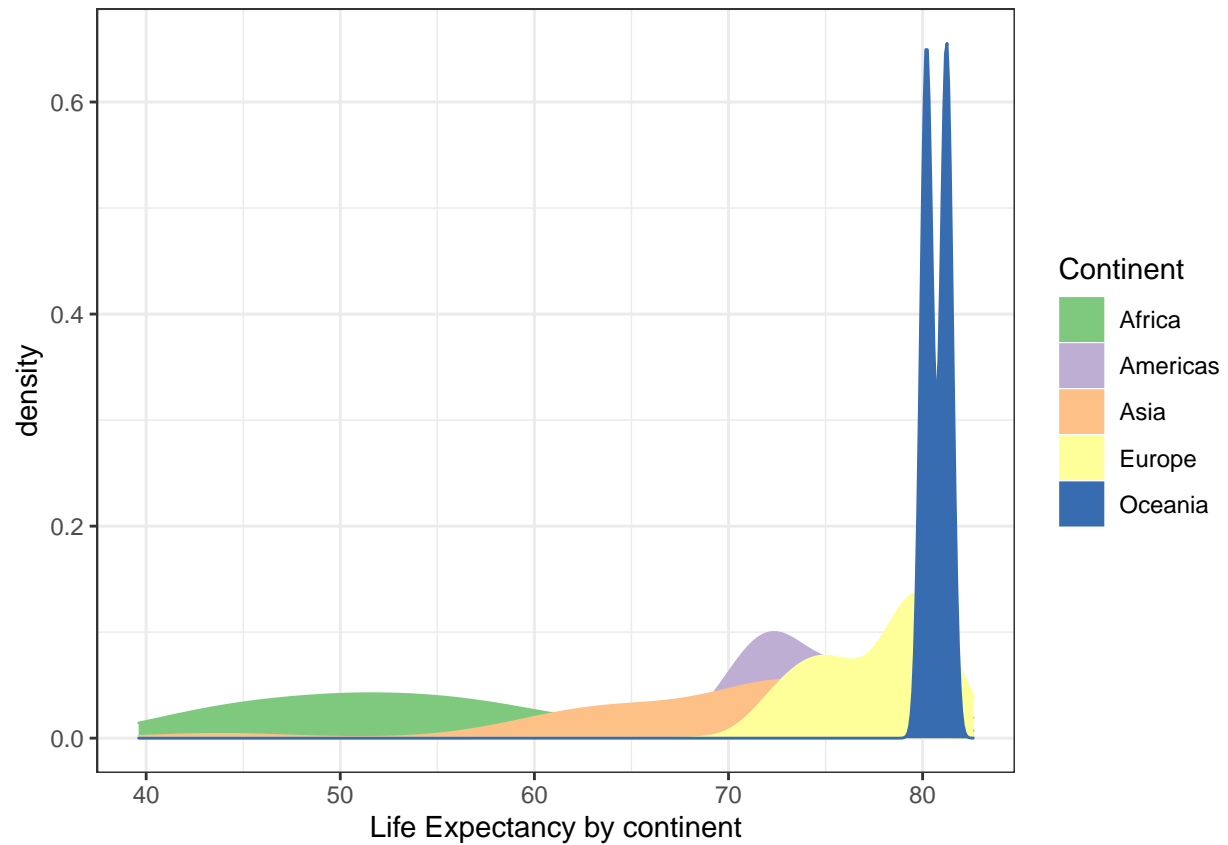
```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```



Question 4

Now try depicting the same information using a density plot. This time, try also to color the distribution by continent (hint: use aesthetic `fill` to specify the coloring for the continents.)

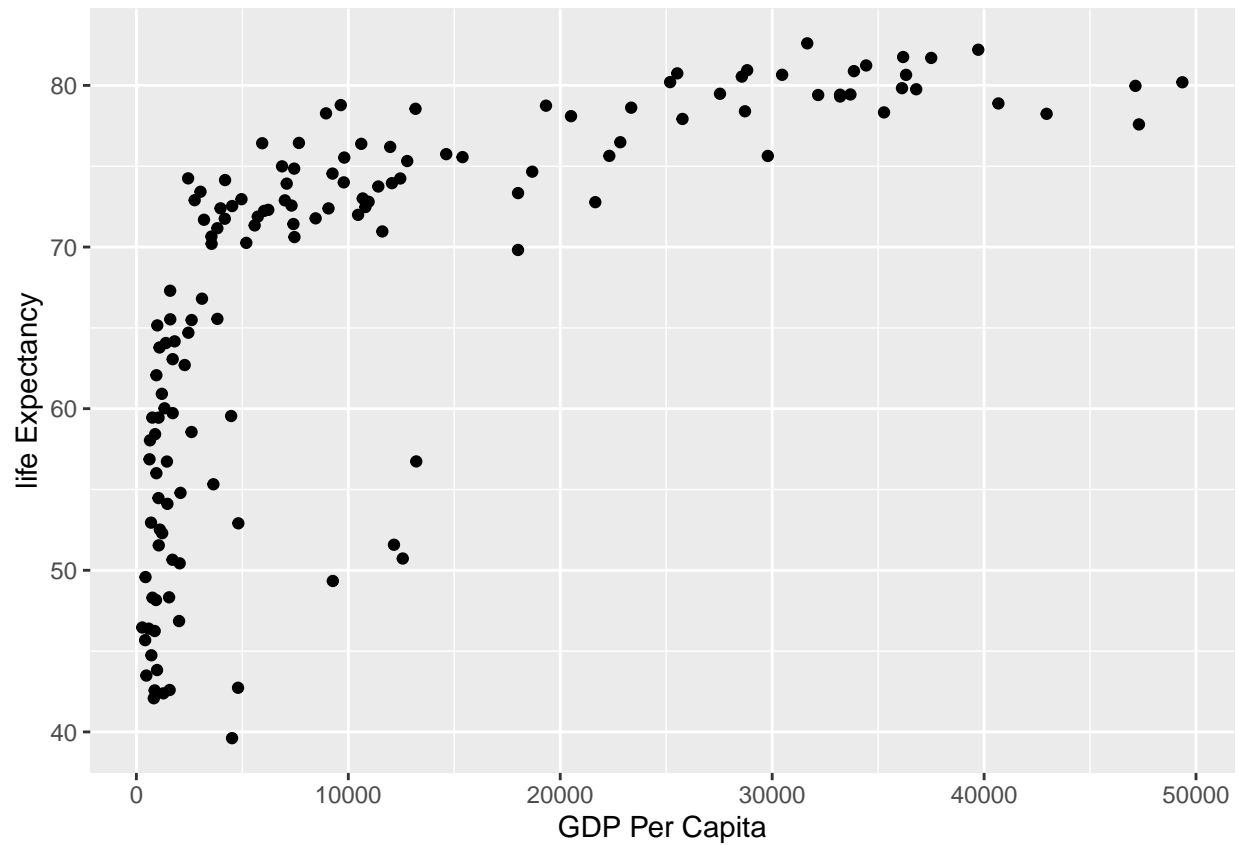
```
ggplot(data = gapminder07) +
  geom_density(aes(x = lifeExp, color = continent, fill = continent)) +
  scale_color_brewer("Continent", palette = "Accent") +
  scale_fill_brewer("Continent", palette = "Accent") +
  scale_x_continuous("Life Expectancy by continent") +
  theme_bw()
```



Question 5

What is the relationship between GDP per capita and life expectancy? (Hint: try to draw out a scatter plot using points)

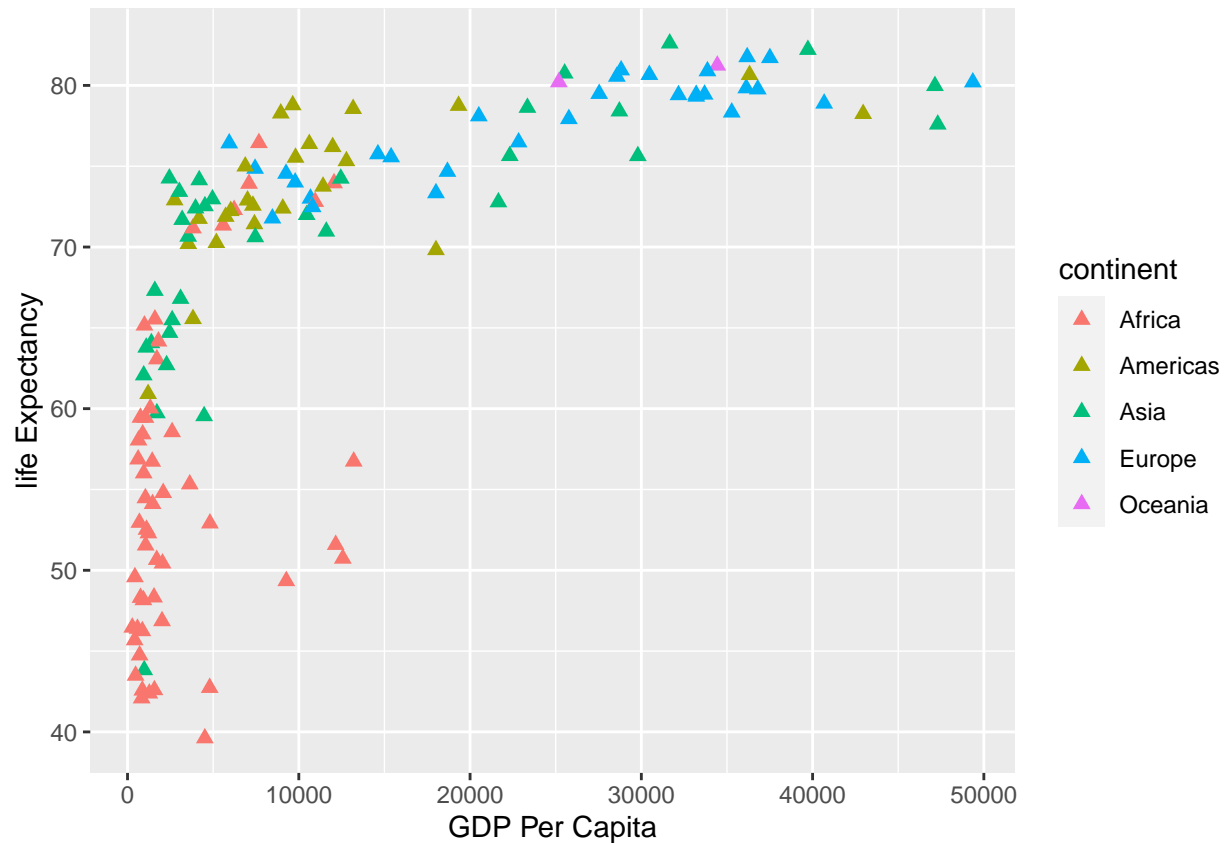
```
ggplot(data = gapminder07) +  
  geom_point(aes(x = gdpPercap, y = lifeExp)) +  
  xlab("GDP Per Capita") + ylab("life Expectancy")
```



Question 6

Next, try to plot the same information, this time with the points colored by continents and varying in their size by population (hint: try using `color` and `size` in the `aes`)

```
ggplot(data = gapminder07) +  
  geom_point(aes(x = gdpPercap, y = lifeExp, color = continent), size = 2, shape= 17) +  
  xlab("GDP Per Capita") + ylab("life Expectancy")
```



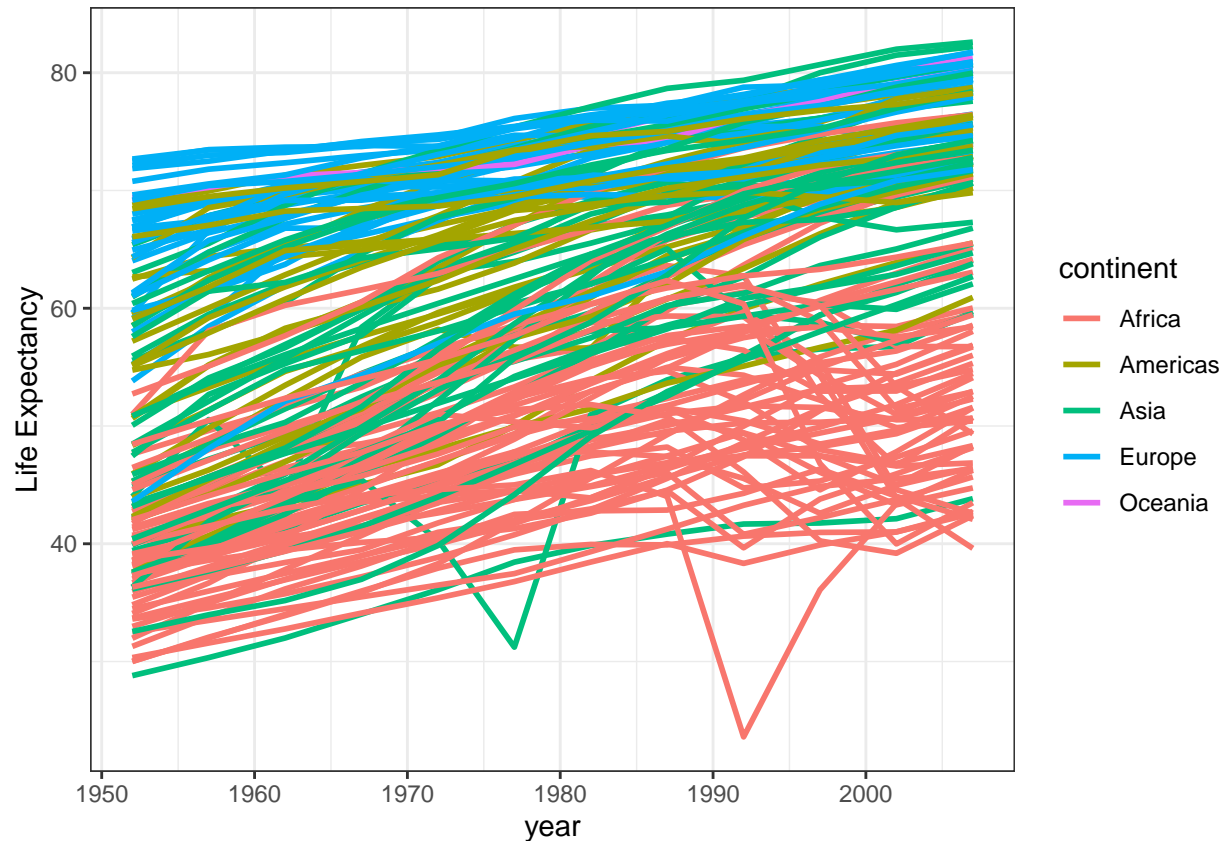
Question 7

This time, use `gapminder` instead of `gapminder07` as your dataset. Using a line graph, plot the overtime change in the life expectancy across different countries and color them by continents. (hint: draw a line graph. put the year on the x-axis and the life expectancy on the y-axis. Also specify `group = country` and `color=continent` in the aes.)

```
gapminder
```

```
## # A tibble: 1,704 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.
## 7 Afghanistan Asia      1982   39.9 12881816    978.
## 8 Afghanistan Asia      1987   40.8 13867957    852.
## 9 Afghanistan Asia      1992   41.7 16317921    649.
## 10 Afghanistan Asia      1997   41.8 22227415    635.
## # ... with 1,694 more rows
```

```
ggplot(data = gapminder)+
  geom_line(aes(x= year, y= lifeExp, group= country, color= continent), lwd=1)+
  xlab("year")+ ylab("Life Expectancy")+
  theme_bw()
```



Question 8

Finally, try executing the following code, and write in words what your take away is from the information provided in the resulting graph. (hint: you need to remove the `eval=FALSE` from the code chunk bracket below.)

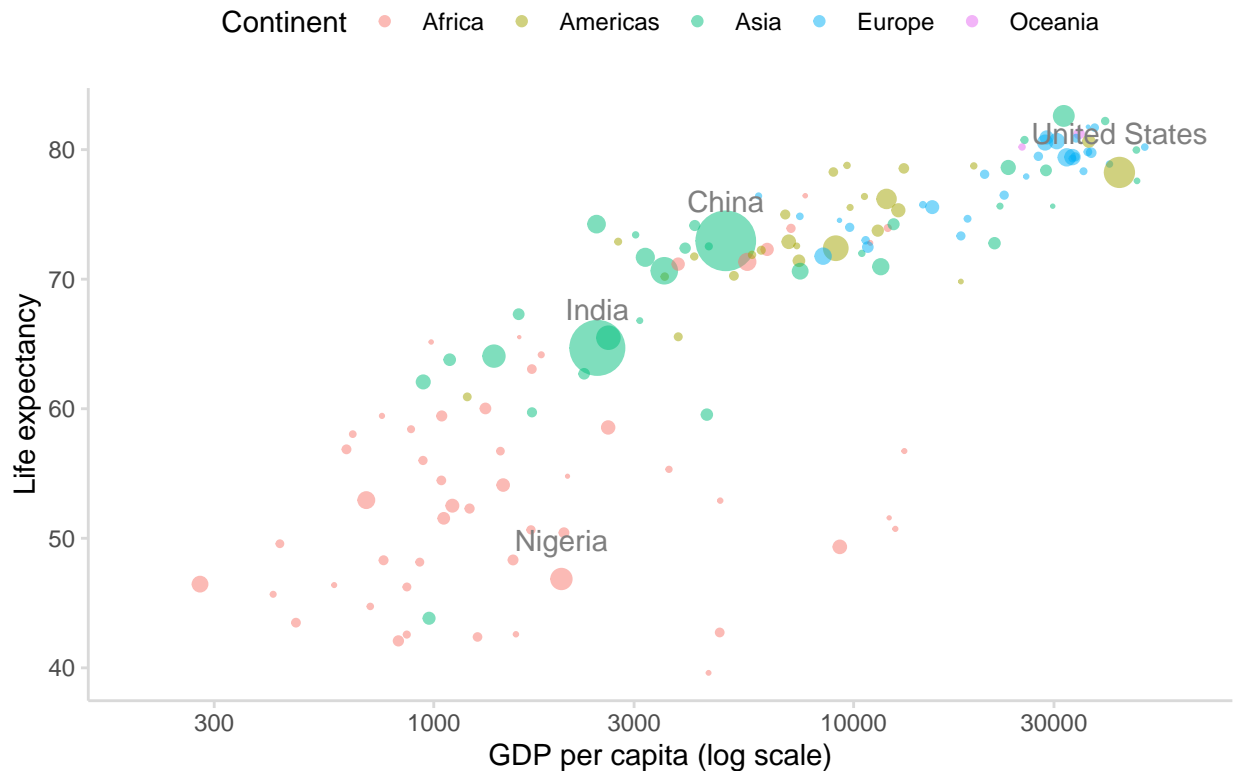
```
ggplot(gapminder07) +
  # add scatter points
  geom_point(aes(x = gdpPercap, y = lifeExp, color = continent, size = pop),
    alpha = 0.5) +
  # add some text annotations for the very large countries
  geom_text(aes(x = gdpPercap, y = lifeExp + 3, label = country),
    color = "grey50",
    data = filter(gapminder07, pop > 1000000000 | country %in% c("Nigeria", "United States"))) +
  # clean the axes names and breaks
  scale_x_log10(limits = c(200, 60000)) +
  # change labels
  labs(title = "GDP versus life expectancy in 2007",
    x = "GDP per capita (log scale)",
```

```

y = "Life expectancy",
size = "Popoulation",
color = "Continent") +
# change the size scale
scale_size(range = c(0.1, 10),
           # remove size legend
           guide = "none") +
# add a nicer theme
theme_classic() +
# place legend at top and grey axis lines
theme(legend.position = "top",
      axis.line = element_line(color = "grey85"),
      axis.ticks = element_line(color = "grey85"))

```

GDP versus life expectancy in 2007



This code used for creating scatterplot. it is usually shows us relationship between two continuous variables. In the code we try to discover “gapminder07” data, GDP per capital in the x-axis and life expectancy in the y-axis. we labeled continents in various color and marked bubble size with population size. we try to see the USA and Nigeria population and which countries population > 1000000000.

In the graph, we are seeing that USA has higher GDP per capita and higher life expectancy than designated criteria (Nigeria and population > 1000000000). we also get china and india are the largest population size (Bubble size). Finally we can conclude that, USA is the far ahead than china and India but Nigeria has very low life expectancy rate.