Making report with Rmarkdown

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1 Introduction

Gapminder Foundation is a non-profit venture registered in Stockholm, Sweden, that promotes sustainable global development and achievement of the United Nations Millennium Development Goals by increased use and understanding of statistics and other information about social, economic and environmental development at local, national and global levels.

Gapminder(1) was founded in 2005 by Ola Rosling, Anna Rosling Rönnlund and Hans Rosling.[2] The name Gapminder was derived from the "Mind the Gap" warning messages on the London Underground.[3]

1.1 Overview

The Foundation initially developed the *Trendalyzer software*, which produced the now famous animated bubble graph.[4] This software was acquired by **Google** in March 2006. The team of developers for Gapminder joined Google in April 2007.[5] In 2010 *Anna Rosling Rönnlund* and *Ola Rosling* left Google and returned to Gapminder with the goal to develop free teaching material.

The current version of Trendalyzer is Gapminder World,[6] a web-service displaying time series of development statistics for all countries and many sub-national regions. Gapminder world uses "**Google Motion Charts**"[7] to power its graphics.

The founding board of the Gapminder Foundation was composed of Ambassador Gun-Britt Andersson,[8] Professor *Christer Gunnarsson*[9] of Lund University, Professor Bo Sundgren of the *Stockholm School of Economics*, Professor Hans Rosling of the Karolinska Institute, and Professor Hans Wigzell[10] of the **Karolinska Institute**.

The current president of the foundation is *Ola Rosling.*Anna Rosling Rönnlund* is the foundation's vice president.[11]

The medical doctor Helena Nordenstedt is head of research. The head of software is *Jasper Heeffer*.

1.2 Projects

The Gapminder Foundation has produced a number of other projects, including:

- **World Income Distribution**, an interactive display of statistics on household income distribution for Bangladesh, Brazil, China, India, Indonesia, Japan, Nigeria, Pakistan and USA and the World as a whole in each year from 1970 to 1998.
- **Dollar Street**, an interactive display of the world as a street. The street number is the daily income per person in the family. All people of the world live on Dollar Street. The poorest live in the left end and the richest in the extreme right end. All other people live in between on a continuous scale of daily incomes.
- **Human Development Trends 2003**, a linear thematic Flash presentation is developed with United Nations Development Program (UNDP) for the release of the Human Development Report 200.
- **World Health Chart 2001**, a display of 50 to 100 years of health development for all countries of the World with time series for 35 indicators provided by the World Health Organization.

2 Methods

In this section, we want to show the method of visualizaton to make the overview and the relation between **Life Expectancy** and **GDP Per Capita** for 142 countries all over the world. Fortunately, RStudio support to use the library **ggplot2**, created by Widham Hadley in 2016 to make the nice and powerful plots.

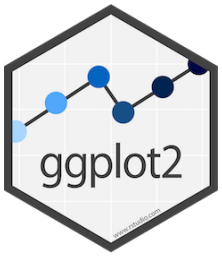

Figure 1: GGPLOT2 library

2.1 Dataset gapminder

Gapminder combines data from multiple sources into unique coherent time-series that can't be found elsewhere

Most of our data are not good enough for detailed numeric analysis. They are only good enough to revolutionize people's worldview. But we only fill in gaps whenever we believe we know roughly what the numbers would have been, had they existed. The uncertainties are often large. But we comfort ourselves by knowing the errors in peoples worldview are even larger. Our data is constantly improved by feedback in our data forum from users finding mistakes.

Data combined by Gapminder:

1. Average age at 1st marriage (girls)
2. Babies per woman (total fertility rate)
3. Child Mortality Rate, under age five
4. GDP per capita in constant PPP dollars
5. Gini
6. HIV/AIDS
7. Income Mountains
8. Infant Mortality Rate, under age one
9. Legal slavery
10. Life Expectancy at Birth
11. Maternal mortality
12. Population
13. World Health Chart, data sources

2.2 Library ggplot2

ggplot2 is a system for declaratively creating graphics, based on The Grammar of Graphics. You provide the data, tell ggplot2 how to map variables to aesthetics, what graphical primitives to use, and it takes care of the details.

2.2.1 Installation

```
# The easiest way to get ggplot2 is to install the whole tidyverse:
# install.packages("tidyverse")

# Alternatively, install just ggplot2:
# install.packages("ggplot2")

# Or the development version from GitHub:
# install.packages("devtools")
# devtools::install_github("tidyverse/ggplot2")
```

2.2.2 Usage

It's hard to succinctly describe how ggplot2 works because it embodies a deep philosophy of visualisation. However, in most cases you start with *ggplot()*, supply a dataset and aesthetic mapping (with aes()). You then add on layers (like *geom_point()* or *geom_histogram()*), scales (like *scale_colour_brewer()*), faceting specifications (like *facet_wrap()*) and coordinate systems (like *coord_flip()*).

2.2.3 The equation

In this section, we show the system of equation for demonstrate the status of each country:

$$\begin{cases} x_1 + x_2 + x_3 = 6 \\ x_1 - x_2 = -1 \\ x_1 + x_2 + 2x_3 = 9 \end{cases}$$

3 Results

Visualize in RStudio with method of using ggplot2, we find out the relation between **Life Expectancy** and **GDP Per Capita** for 142 countries all over the world. In addition, we can make more elegant plot by using the library **ggthemes**

```
ggplot(data = gapminder, mapping = aes(x = gdpPercap, y = lifeExp)) +
  geom_point(aes(color = continent)) +
  geom_smooth(method = "loess") +
  scale_x_log10() +
  labs(x =" Log GDP per Capita", y = "Life Expectancy") +
  ggtitle("Association between GDP and LifeExp") +
  theme(plot.title = element_text(lineheight = 0.8, face = "bold", hjust = 0.5)) +
  theme_economist()
```

```
## `geom_smooth()` using formula 'y ~ x'
```

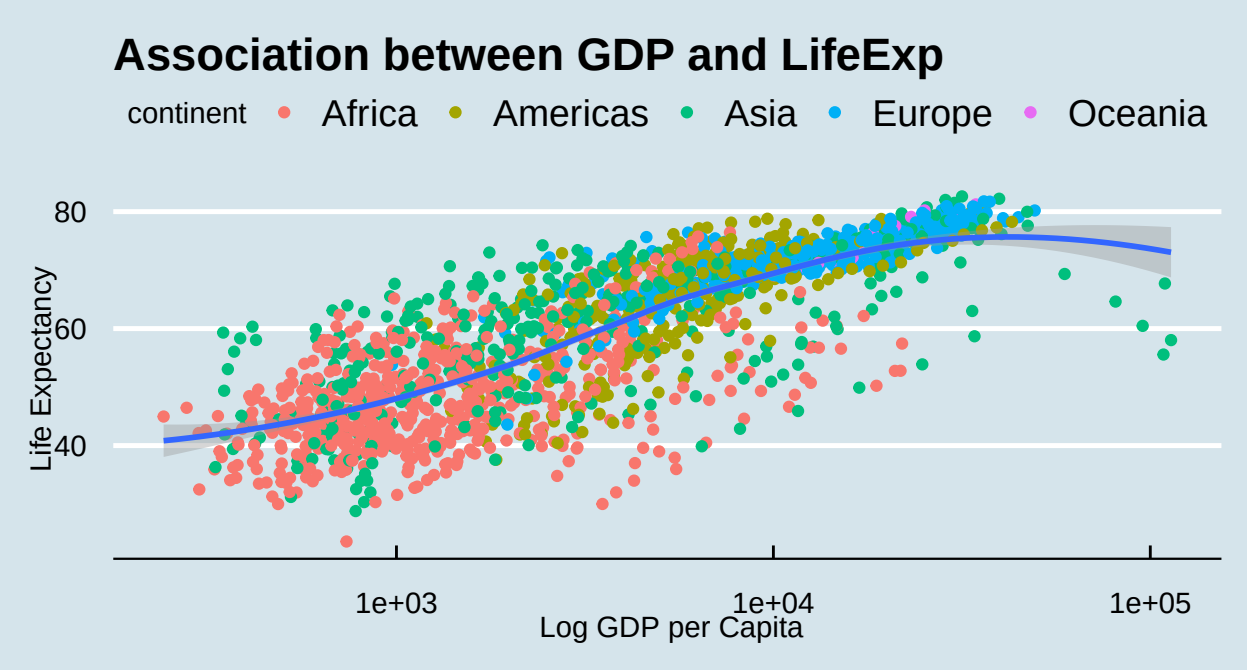

Figure 2: Visualization

4 Conclusion and Discussion

Gapminder's stated mission is 'Fighting devastating ignorance with fact-based worldviews everyone can understand.'[12]

The object of the Foundation is to promote sustainable global development and the achievement of the United Nations Millennium Goals by increased use and understanding of statistics and other information about social, economic and environmental development at the local, national and global levels.

The object of the Foundation shall be achieved by:[13]

1. use and development of information technology for easily understandable visualization of statistics and other information;
2. ownership, protection and free dissemination of development results;
3. use, together with various cooperation partners, of the development results with a view to making statistics and other information about development available and understandable to broad user groups via the Internet and other media.

5 The table

We collect the dataset and make the statistical table:

Table 1: The statistical table

	1_front	2_middle	3_back
female	19	16	5
male	8	16	7

References

1. Le D-T. 2013. Bringing data to life into an introductory statistics course with gapminder. Teaching Statistics 35:114–122.