Life Expectancy Analysis

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INTRODUCTION :

Life Expectancy of human life has been one of the central idea behind various researches and increasing it has been a constant effort of humanity.Thus, understanding the available data about it as well as various parameters that effect the life expectancy becomes increasingly important. In light of this notion, this study is trying to fundamentally analyse the available LIfe expectancy data as well as make suggestions on how we can try to improve it by influencing various primary and secondary parameters associated with it. This study will focus on immunization factors, mortality factors, economic factors, social factors and other health related factors as well. Since the observations this dataset are based on different countries, it will be easier for a country to determine the predicting factor which is contributing to lower value of life expectancy. This will help in suggesting a country which area should be given importance in order to efficiently improve the life expectancy of its population.

DATA SOURCE :

This given data has been sourced from the data repository of *Kaggle*.

url : *https://www.kaggle.com/kumarajarshi/life-expectancy-who*

This dataset related to life expectancy, health factors for 193 countries has been collected from the The Global Health Observatory (GHO) data repository under World Health Organization (WHO) and its corresponding economic data was collected from United Nation website. Among all categories of health-related factors only those critical factors were chosen which are more representative. It has been observed that in the 15 years period ranging from 2000-2015 , there has been a huge development in health sector resulting in improvement of human mortality rates especially in the developing nations in comparison to the past 30 years. Therefore, in this project we have considered data from year 2000-2015 for 193 countries for further analysis. The individual data files have been merged together into a single dataset. All predicting variables was then divided into several broad categories:Immunization related factors, Mortality factors, Economical factors and Social factors.

QUESTIONS OF INTEREST :

The data-set aims to answer the following key questions: -Compare the life expectancy trends of Developed world and Developing world.

-Does various predicting factors which has been chosen initially really affect the Life expectancy? What are the predicting variables actually affecting the life expectancy?

-Does Life Expectancy has positive or negative correlation with eating habits, lifestyle, exercise, smoking, drinking alcohol etc.

-How does mortality factors like Infant and Adult mortality rates affect life expectancy?

-What is the impact of Immunization coverage on life Expectancy?

-What is the impact of increased health spending on the lifespan of humans?Analyse the relationship of various economic factors vis-a-vis Life Expectancy.

-Find the mean life expectancy for all the people across globe, averaged over the given time period ?

-Top 10 countries with highest and Least Life expectancy across globe ?

-Probability density function of global Avg. Life Expectancies to find most likely L.E. for world countries.

-Country-wise comparison of top performers : in terms of LIfe Expectancy

-Linear Model to predict Life expectancy against the parameter of schooling

DETAILED STATISTICAL ANALYSIS :

Importing relevant *libraries*

```
library(readr)
library(httr)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse
1.3.1 --
```

```
## v ggplot2 3.3.5     v dplyr   1.0.7
## v tibble  3.1.4     v stringr 1.4.0
## v tidyr   1.1.3     v forcats 0.5.1
## v purrr   0.3.4
```

```
## -- Conflicts ------------------------------------------
tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
library(dplyr)
library(ggplot2)
library(readr)
```

Importing the *data* for Analysis

```
data<- read_csv( "Life Expectancy Data.csv",show_col_types = FALSE)
data
```

```
## # A tibble: 2,938 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2015 Developing             65                263
62
##  2 Afghanistan  2014 Developing             59.9              271
64
##  3 Afghanistan  2013 Developing             59.9              268
66
##  4 Afghanistan  2012 Developing             59.5              272
69
##  5 Afghanistan  2011 Developing             59.2              275
71
##  6 Afghanistan  2010 Developing             58.8              279
74
##  7 Afghanistan  2009 Developing             58.6              281
77
##  8 Afghanistan  2008 Developing             58.1              287
80
##  9 Afghanistan  2007 Developing             57.5              295
82
## 10 Afghanistan  2006 Developing             57.3              295
84
## # ... with 2,928 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
```

```
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

Understanding the Data-set

We are looking at the tibble and the summary statistics to get more insight about the data such as size of data, quantum of data, nature of data (clean/unclean). The above results indicates that some of the data entries are missing or N/A. The most of the missing data was for population, Hepatitis B and GDP. The missing data were from less known countries like Vanuatu, Tonga, Togo,Cabo Verde etc.The final merged file(final dataset) consists of 22 Columns and 2938 rows which meant 20 predicting variables.

```
summary(data)
```

```
##    Country               Year         Status          Life expectancy
##  Length:2938        Min.   :2000   Length:2938        Min.   :36.30
##  Class :character   1st Qu.:2004   Class :character   1st Qu.:63.10
##  Mode  :character   Median :2008   Mode  :character   Median :72.10
##                     Mean   :2008                      Mean   :69.22
##                     3rd Qu.:2012                      3rd Qu.:75.70
##                     Max.   :2015                      Max.   :89.00
##                                                       NA's   :10
##  Adult Mortality infant deaths       Alcohol        percentage expenditure
##  Min.   :  1.0   Min.   :   0.0   Min.   : 0.0100   Min.   :    0.000
##  1st Qu.: 74.0   1st Qu.:   0.0   1st Qu.: 0.8775   1st Qu.:    4.685
##  Median :144.0   Median :   3.0   Median : 3.7550   Median :   64.913
##  Mean   :164.8   Mean   :  30.3   Mean   : 4.6029   Mean   :  738.251
##  3rd Qu.:228.0   3rd Qu.:  22.0   3rd Qu.: 7.7025   3rd Qu.:  441.534
##  Max.   :723.0   Max.   :1800.0   Max.   :17.8700   Max.   :19479.912
##  NA's   :10                       NA's   :194
##   Hepatitis B       Measles               BMI        under-five deaths
##  Min.   : 1.00   Min.   :     0.0   Min.   : 1.00   Min.   :   0.00
##  1st Qu.:77.00   1st Qu.:     0.0   1st Qu.:19.30   1st Qu.:   0.00
##  Median :92.00   Median :    17.0   Median :43.50   Median :   4.00
##  Mean   :80.94   Mean   :  2419.6   Mean   :38.32   Mean   :  42.04
##  3rd Qu.:97.00   3rd Qu.:   360.2   3rd Qu.:56.20   3rd Qu.:  28.00
##  Max.   :99.00   Max.   :212183.0   Max.   :87.30   Max.   :2500.00
##  NA's   :553                        NA's   :34
##      Polio       Total expenditure   Diphtheria       HIV/AIDS
##  Min.   : 3.00   Min.   : 0.370    Min.   : 2.00   Min.   : 0.100
##  1st Qu.:78.00   1st Qu.: 4.260    1st Qu.:78.00   1st Qu.: 0.100
##  Median :93.00   Median : 5.755    Median :93.00   Median : 0.100
##  Mean   :82.55   Mean   : 5.938    Mean   :82.32   Mean   : 1.742
##  3rd Qu.:97.00   3rd Qu.: 7.492    3rd Qu.:97.00   3rd Qu.: 0.800
##  Max.   :99.00   Max.   :17.600    Max.   :99.00   Max.   :50.600
##  NA's   :19      NA's   :226       NA's   :19
##       GDP              Population        thinness  1-19 years
```

```
##  Min.   :     1.68   Min.   :3.400e+01   Min.   : 0.10
##  1st Qu.:   463.94   1st Qu.:1.958e+05   1st Qu.: 1.60
##  Median :  1766.95   Median :1.387e+06   Median : 3.30
##  Mean   :  7483.16   Mean   :1.275e+07   Mean   : 4.84
##  3rd Qu.:  5910.81   3rd Qu.:7.420e+06   3rd Qu.: 7.20
##  Max.   :119172.74   Max.   :1.294e+09   Max.   :27.70
##  NA's   :448         NA's   :652         NA's   :34
##  thinness 5-9 years Income composition of resources   Schooling
##  Min.   : 0.10      Min.   :0.0000                  Min.   : 0.00
##  1st Qu.: 1.50      1st Qu.:0.4930                  1st Qu.:10.10
##  Median : 3.30      Median :0.6770                  Median :12.30
##  Mean   : 4.87      Mean   :0.6276                  Mean   :11.99
##  3rd Qu.: 7.20      3rd Qu.:0.7790                  3rd Qu.:14.30
##  Max.   :28.60      Max.   :0.9480                  Max.   :20.70
##  NA's   :34         NA's   :167                     NA's   :163
```

Cleaning the data set

looking at the *summary of the data* to see if there are any problems. Summary statistics show that there are many rows which contain NA values.Hence, cleaning the data by deleting the rows which contain NA's.

```
data_clean <-na.omit(data)
print(data_clean)
```

```
## # A tibble: 1,649 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2015 Developing             65                263
62
##  2 Afghanistan  2014 Developing             59.9              271
64
##  3 Afghanistan  2013 Developing             59.9              268
66
##  4 Afghanistan  2012 Developing             59.5              272
69
##  5 Afghanistan  2011 Developing             59.2              275
71
##  6 Afghanistan  2010 Developing             58.8              279
74
##  7 Afghanistan  2009 Developing             58.6              281
77
##  8 Afghanistan  2008 Developing             58.1              287
80
##  9 Afghanistan  2007 Developing             57.5              295
82
```

```
## 10 Afghanistan  2006 Developing             57.3              295
84
## # ... with 1,639 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

Understanding the Clean Data

Clearly, the summary of the clean data shows that there are no more missing data fields.Though the minimum value for certain attributes are still 0, but 0 is a possible minimum value for those columns. Hence assuming zero to be the part of data and retaining them in the clean dataset. After cleaning the datasets, the final cleaned tibble contains 1649 rows with 22 columns. To get some more insight into the clean data, looking at the summary statistics.

```
summary(data_clean)
```

```
##    Country               Year         Status           Life expectancy
##  Length:1649        Min.   :2000   Length:1649        Min.   :44.0
##  Class :character   1st Qu.:2005   Class :character   1st Qu.:64.4
##  Mode  :character   Median :2008   Mode  :character   Median :71.7
##                     Mean   :2008                      Mean   :69.3
##                     3rd Qu.:2011                      3rd Qu.:75.0
##                     Max.   :2015                      Max.   :89.0
##  Adult Mortality infant deaths        Alcohol       percentage expenditure
##  Min.   :  1.0   Min.   :   0.00   Min.   : 0.010   Min.   :    0.00
##  1st Qu.: 77.0   1st Qu.:   1.00   1st Qu.: 0.810   1st Qu.:   37.44
##  Median :148.0   Median :   3.00   Median : 3.790   Median :  145.10
##  Mean   :168.2   Mean   :  32.55   Mean   : 4.533   Mean   :  698.97
##  3rd Qu.:227.0   3rd Qu.:  22.00   3rd Qu.: 7.340   3rd Qu.:  509.39
##  Max.   :723.0   Max.   :1600.00   Max.   :17.870   Max.   :18961.35
##   Hepatitis B       Measles            BMI        under-five deaths
##  Min.   : 2.00   Min.   :     0   Min.   : 2.00   Min.   :   0.00
##  1st Qu.:74.00   1st Qu.:     0   1st Qu.:19.50   1st Qu.:   1.00
##  Median :89.00   Median :    15   Median :43.70   Median :   4.00
##  Mean   :79.22   Mean   :  2224   Mean   :38.13   Mean   :  44.22
##  3rd Qu.:96.00   3rd Qu.:   373   3rd Qu.:55.80   3rd Qu.:  29.00
##  Max.   :99.00   Max.   :131441   Max.   :77.10   Max.   :2100.00
##      Polio       Total expenditure   Diphtheria       HIV/AIDS
##  Min.   : 3.00   Min.   : 0.740    Min.   : 2.00   Min.   : 0.100
##  1st Qu.:81.00   1st Qu.: 4.410    1st Qu.:82.00   1st Qu.: 0.100
##  Median :93.00   Median : 5.840    Median :92.00   Median : 0.100
##  Mean   :83.56   Mean   : 5.956    Mean   :84.16   Mean   : 1.984
##  3rd Qu.:97.00   3rd Qu.: 7.470    3rd Qu.:97.00   3rd Qu.: 0.700
```

```
##  Max.   :99.00   Max.   :14.390    Max.   :99.00   Max.   :50.600
##       GDP              Population        thinness  1-19 years
##  Min.   :     1.68   Min.   :3.400e+01   Min.   : 0.100
##  1st Qu.:   462.15   1st Qu.:1.919e+05   1st Qu.: 1.600
##  Median :  1592.57   Median :1.420e+06   Median : 3.000
##  Mean   :  5566.03   Mean   :1.465e+07   Mean   : 4.851
##  3rd Qu.:  4718.51   3rd Qu.:7.659e+06   3rd Qu.: 7.100
##  Max.   :119172.74   Max.   :1.294e+09   Max.   :27.200
##  thinness 5-9 years Income composition of resources   Schooling
##  Min.   : 0.100     Min.   :0.0000                  Min.   : 4.20
##  1st Qu.: 1.700     1st Qu.:0.5090                  1st Qu.:10.30
##  Median : 3.200     Median :0.6730                  Median :12.30
##  Mean   : 4.908     Mean   :0.6316                  Mean   :12.12
##  3rd Qu.: 7.100     3rd Qu.:0.7510                  3rd Qu.:14.00
##  Max.   :28.200     Max.   :0.9360                  Max.   :20.70
```

** Data Visualization and Analysis**

In order to answer the above mentioned questions of interest,we will be going through various visualizations along with their subsequent analysis in a orderly manner.

Comparing the life expectancy of Developed world and Developing world

```
data_global_trend <- data_clean %>% group_by(Year,Status)%>%
select(-c(Country))%>% summarise_each(funs( mean( .,na.rm =
TRUE)))%>%ungroup()
```

```
## Warning: `summarise_each_()` was deprecated in dplyr 0.7.0.
## Please use `across()` instead.
```

```
## Warning: `funs()` was deprecated in dplyr 0.8.0.
## Please use a list of either functions or lambdas:
##
##   # Simple named list:
##   list(mean = mean, median = median)
##
##   # Auto named with `tibble::lst()`:
##   tibble::lst(mean, median)
##
##   # Using lambdas
##   list(~ mean(., trim = .2), ~ median(., na.rm = TRUE))
```

```
ungroup(data_clean)
```

```
## # A tibble: 1,649 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2015 Developing             65                263
```

```
62
##  2 Afghanistan  2014 Developing             59.9              271
64
##  3 Afghanistan  2013 Developing             59.9              268
66
##  4 Afghanistan  2012 Developing             59.5              272
69
##  5 Afghanistan  2011 Developing             59.2              275
71
##  6 Afghanistan  2010 Developing             58.8              279
74
##  7 Afghanistan  2009 Developing             58.6              281
77
##  8 Afghanistan  2008 Developing             58.1              287
80
##  9 Afghanistan  2007 Developing             57.5              295
82
## 10 Afghanistan  2006 Developing             57.3              295
84
## # ... with 1,639 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>

print(data_global_trend)

## # A tibble: 31 x 21
##     Year Status     `Life expectancy` `Adult Mortality` `infant deaths`
Alcohol
##    <dbl> <chr>                  <dbl>             <dbl>           <dbl>
<dbl>
##  1  2000 Developed               76.1              91.7            1.38
10.6
##  2  2000 Developing              68.6             197.            26.7
3.76
##  3  2001 Developed               76.6              84.9            1.29
10.4
##  4  2001 Developing              68.6             181.            25.8
3.85
##  5  2002 Developed               76.9              94.9            1.29
10.7
##  6  2002 Developing              66.9             188.            25.7
3.81
##  7  2003 Developed               77.2              78.9            1.07
10.6
```

```
##  8  2003 Developing              66.7             191.            30.2
3.59
##  9  2004 Developed               77.9              87.8            1.07
10.9
## 10  2004 Developing              66.8             201.            45.7
3.67
## # ... with 21 more rows, and 15 more variables: percentage expenditure
<dbl>,
## #   Hepatitis B <dbl>, Measles <dbl>, BMI <dbl>, under-five deaths <dbl>,
## #   Polio <dbl>, Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS
<dbl>,
## #   GDP <dbl>, Population <dbl>, thinness  1-19 years <dbl>,
## #   thinness 5-9 years <dbl>, Income composition of resources <dbl>,
## #   Schooling <dbl>
```

Plotting the avg. Life expectancy trend for Developed Vs Developing.

Below is the plot of Avg. Life Expectancy of developed nations Vs developing nations, averaged over the past few years (2000-2015) period .

```
data_global_trend %>%
  ggplot(aes(x = Year, y = `Life expectancy`)) +
  geom_line(aes(color = data_global_trend$`Life expectancy`, shape =
data_global_trend$Status)) +
  geom_point(aes(color = data_global_trend$`Life expectancy`, shape =
data_global_trend$Status)) +
  labs(shape = "Type", color = NULL)+
  ylim(60,90)+
  theme(legend.position="bottom",
        axis.text.x = element_text(angle = 90)) +
  labs(title = "Avg Life Expectancy Trend", y= "Life Expectancy (in years)" )
```

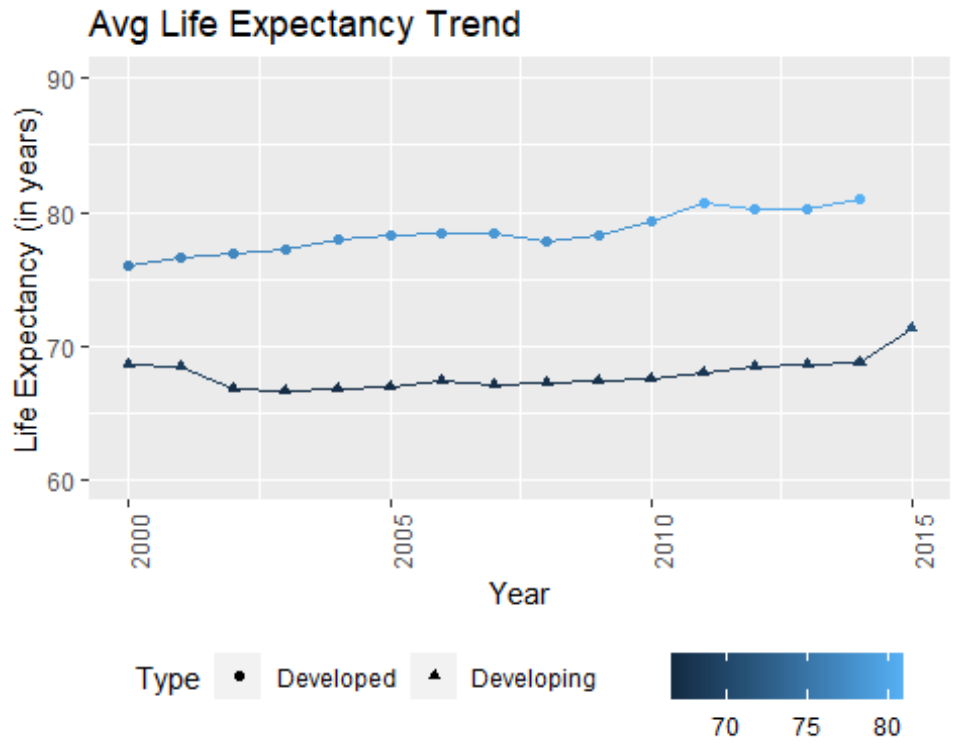
```
## Warning: Ignoring unknown aesthetics: shape
```

```
## Warning: Use of `data_global_trend$`Life expectancy`` is discouraged. Use
`Life
## expectancy` instead.
```

```
## Warning: Use of `data_global_trend$Status` is discouraged. Use `Status`
instead.
```

```
## Warning: Use of `data_global_trend$`Life expectancy`` is discouraged. Use
`Life
## expectancy` instead.
```

```
## Warning: Use of `data_global_trend$Status` is discouraged. Use `Status`
instead.
```



Analyzing the above plots.

As can be seen from the Plots, following observations are made : - Life expectancy of developed countries is significantly higher than developing countries (almost 10yr higher). - Though both developed and developing countries have shown an increase in Life expectancy but the increase is higher for developed countries as compared to developing countries. - Even the maximun Life expectancy for developing countries is lower than the least Life expectancy of developed countries.

Lets cross-check the observations with the summary statistics.

```
developed<- data_global_trend %>% filter (Status == "Developed")%>%
select(Year,`Life expectancy`)
developing<-data_global_trend %>% filter (Status == "Developing")%>%
select(Year, `Life expectancy`)
summary(developed)
```

```
##       Year      Life expectancy
##  Min.   :2000   Min.   :76.08
##  1st Qu.:2004   1st Qu.:77.55
##  Median :2007   Median :78.34
##  Mean   :2007   Mean   :78.52
##  3rd Qu.:2010   3rd Qu.:79.83
##  Max.   :2014   Max.   :81.03
```

```
summary(developing)
```

```
##       Year      Life expectancy
##  Min.   :2000   Min.   :66.68
##  1st Qu.:2004   1st Qu.:67.11
##  Median :2008   Median :67.51
##  Mean   :2008   Mean   :67.92
##  3rd Qu.:2011   3rd Qu.:68.57
##  Max.   :2015   Max.   :71.40
```

The summary statistics are also in tune with the observations of the Plots, with min. and Max. values of Life Expectancy as follows:

Developed : 76.08 to 81.03 Developing : 66.68 to 71.40 Gap b/w the two : approx: 10yrs

Finding the relationship between Avg Life Expectancy and various predicting variables.

Preparing copies of data in relevant format. - global: containing data for both developed and developing nations - developed_stats : containing data for developed nations - developing_stats : containing data for developing nations

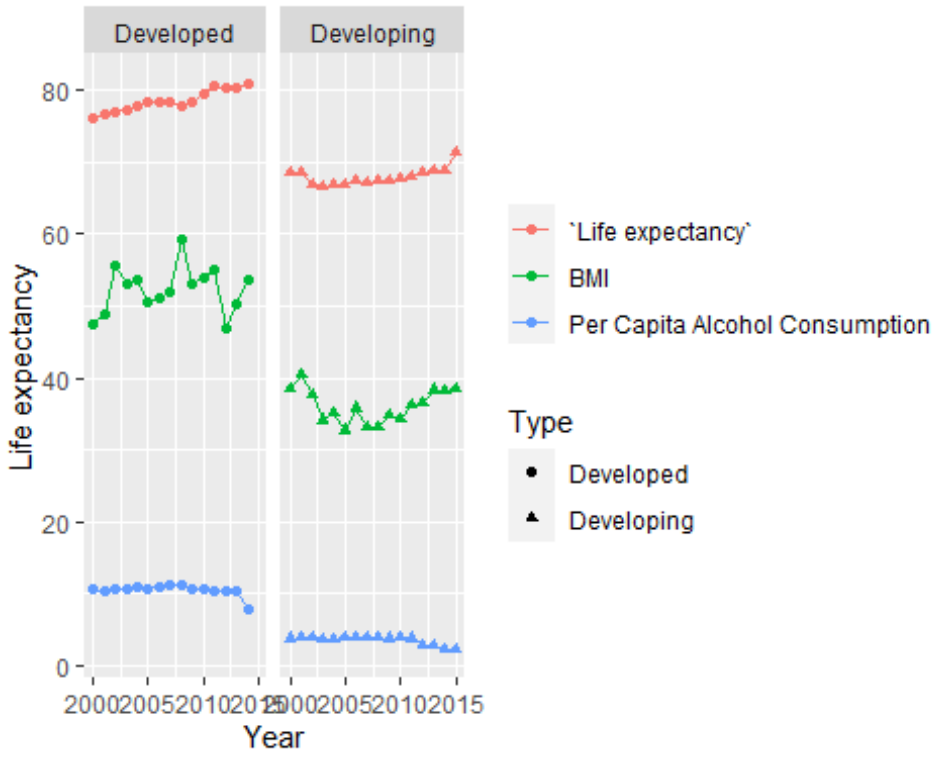
```
global <- data_global_trend
developed_stats<- data_global_trend %>% filter (Status == "Developed")
developing_stats<- data_global_trend %>% filter (Status == "Developing")
```

Finding the relationship between Avg. Life Expectancy and Social factors like BMI and Drinking Alcohol.

Plotting the required visualization.

```
global %>%
  ggplot(aes(x = Year, y =`Life expectancy` )) +
  geom_line(aes(color = "`Life expectancy`")) +
  geom_point(aes(color = "`Life expectancy`", shape = global$Status)) +
  geom_line(aes(y = Alcohol, color = "Per Capita Alcohol Consumption")) +
  geom_point(aes(y = Alcohol, color = "Per Capita Alcohol Consumption",
shape= global$Status)) +
  geom_line(aes(y = BMI, color = "BMI")) +
  geom_point(aes(y = BMI, color = "BMI", shape = global$Status)) +
  labs(shape = "Type", color = NULL) +
  facet_wrap(~Status)
```

```
## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.
```




```
  theme(legend.position="bottom",
        axis.text.x = element_text(angle = 90)) +
  labs(title = "Life Expectancy Vs Per Capita Alcohol consumption (in
litres)", y= NULL)
```

```
## List of 4
##  $ axis.text.x    :List of 11
##   ..$ family       : NULL
##   ..$ face         : NULL
##   ..$ colour       : NULL
##   ..$ size         : NULL
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : num 90
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi FALSE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
##  $ legend.position: chr "bottom"
##  $ y              : NULL
##  $ title          : chr "Life Expectancy Vs Per Capita Alcohol consumption
(in litres)"
##  - attr(*, "class")= chr [1:2] "theme" "gg"
```

```
##  - attr(*, "complete")= logi FALSE
##  - attr(*, "validate")= logi TRUE
```

Analyzing the above Plots :

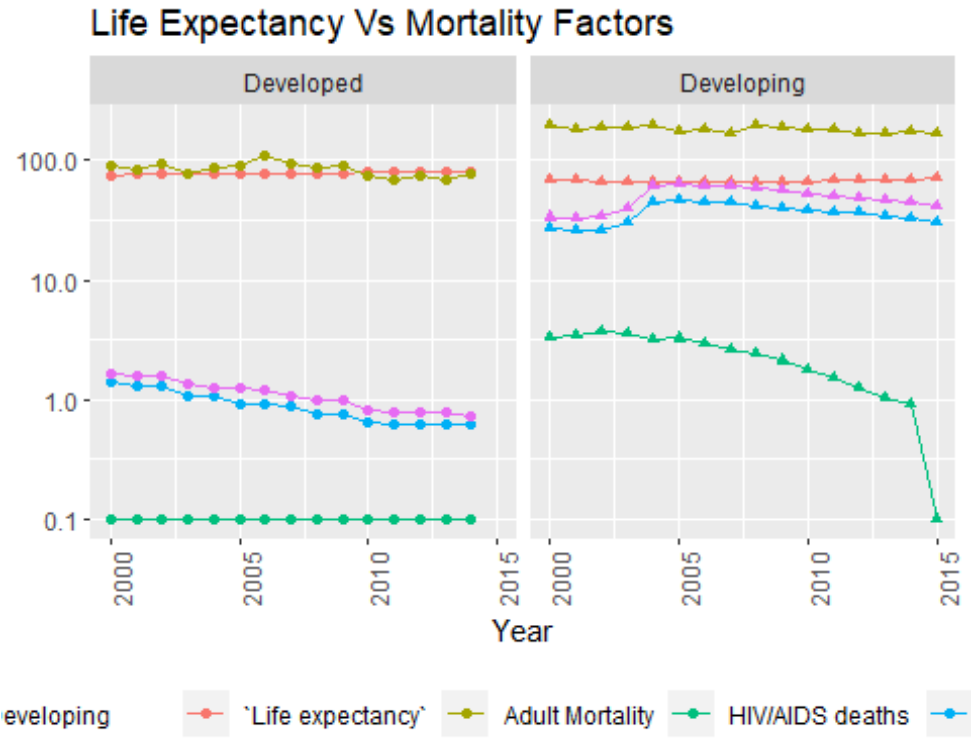
The plots depict the trend of Life Expectancy against lifestyle factors of BMI and alcohol consumption. As per the Plots, - Developed countries have a more unhealthy Lifestyle as indicated by higher BMI and Higher per capita alcohol consumption.This may be partially true because of higher per capita income of developed countries thus more expenditure on drinks and food. But, Despite leading a more unhealthy lifestyle, Developed countries have a higher Life Expectancy as compared to developing countries. This suggest that lifestyle factors like alcohol consumption , BMI are not playing a major role in influencing the Life Expectancy. This is a little counter-intuitive and needs more detailed analysis from diverse datasets. - Another good observation is that with decrease in per capital alcohol consumption, there seems to be a general increase in the Avg. Life Expectancy for both developed and developing clusters. - The BMI data is very haphazard and any direct correlation with Life Expectancy seems to be a haste.

Life Expectancy Vs Mortality Factors : Adult Mortality, Infant deaths, under 5 deaths and deaths due to HIV/AIDS

Plotting the required visualization.

```
global %>%
  ggplot(aes(x = Year, y =`Life expectancy` )) +
  geom_line(aes(color = "`Life expectancy`" )) +
  geom_point(aes(color = "`Life expectancy`", shape = global$Status)) +
  geom_line(aes(y = `Adult Mortality`, color = "Adult Mortality")) +
  geom_point(aes(y = `Adult Mortality`, color = "Adult Mortality", shape=
global$Status)) +
  geom_line(aes(y = `infant deaths`, color = "infant deaths")) +
  geom_point(aes(y = `infant deaths`, color = "infant deaths", shape =
global$Status)) +
  geom_line(aes(y = `under-five deaths`, color = "under-five deaths")) +
  geom_point(aes(y = `under-five deaths`, color = "under-five deaths", shape
= global$Status)) +
  geom_line(aes(y = `HIV/AIDS`, color = "HIV/AIDS deaths")) +
  geom_point(aes(y = `HIV/AIDS`, color = "HIV/AIDS deaths", shape =
global$Status)) +
  scale_y_log10() +
  facet_wrap(~Status) +
  labs(shape = "Type", color = NULL) +
  theme(legend.position="bottom",
        axis.text.x = element_text(angle = 90)) +
  labs(title = "Life Expectancy Vs Mortality Factors", y= NULL)

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.
```

```
## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.
```



Analysing the above Plots

-As can be seen from the plots, Developing nations have much higher mortality rates as compared to developed countries. Hence, all three mortality rates(Adult, infant and under-five) have a negative correlation with Life Expectancy. - The infant mortality rates and under-5-mortality rates are almost parallel curves suggesting similar factors like poor nutrition,level of vaccination, neonatal care etc. are at play. -The deaths due to HIV/AIDS are also significantly higher in developing countries resulting into higher overall mortality rates in them. But the Deaths due to HIV/AIDS are showing a decreasing trend with timein developing nations which can be one of the reasons for increasing Life expectancy with time.

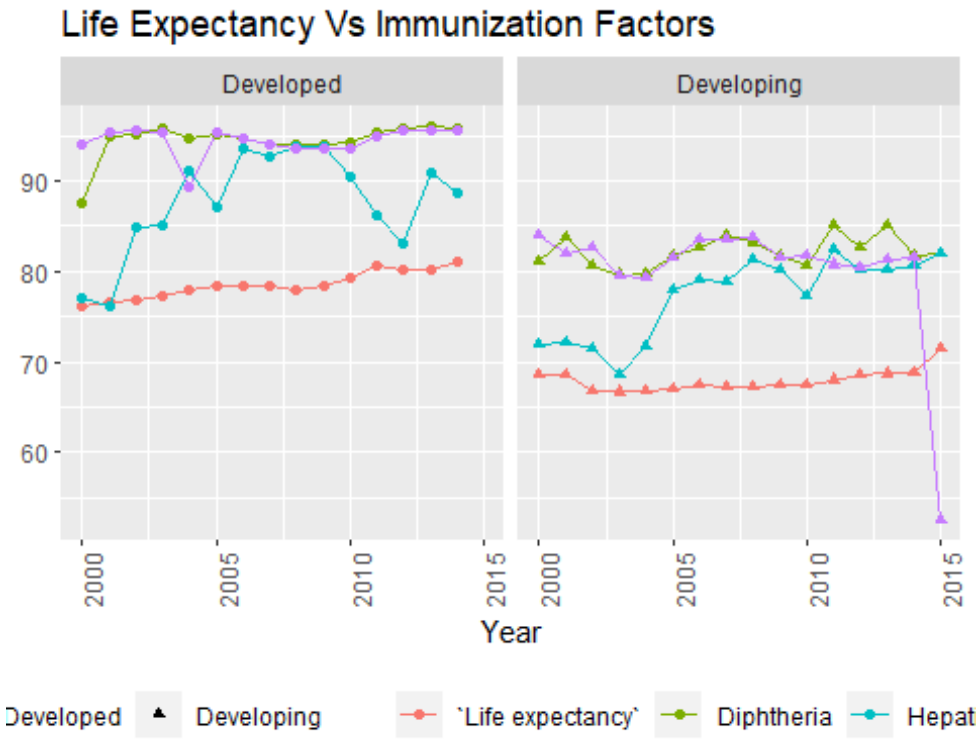
Average Life Expectancy Vs Immunization Factors.

Considering immunization of 1year old child as the benchmark and vaccinations of Hepatitis B, Polio and Diphtheria as index.

Plotting the required visualization.

```
global %>%
  ggplot(aes(x = Year, y =`Life expectancy` )) +
  geom_line(aes(color = "`Life expectancy`" )) +
  geom_point(aes(color = "`Life expectancy`", shape = global$Status)) +
  geom_line(aes(y = `Diphtheria`, color = "Diphtheria")) +
  geom_point(aes(y = `Diphtheria`, color = "Diphtheria", shape=
global$Status)) +
  geom_line(aes(y = `Hepatitis B`, color = "Hepatitis B")) +
  geom_point(aes(y = `Hepatitis B`, color = "Hepatitis B", shape =
global$Status)) +
  geom_line(aes(y = `Polio`, color = "Polio")) +
  geom_point(aes(y = `Polio`, color = "Polio", shape = global$Status)) +
  facet_wrap(~Status) +
  labs(shape = "Type", color = NULL) +
  theme(legend.position="bottom",
        axis.text.x = element_text(angle = 90)) +
  labs(title = "Life Expectancy Vs Immunization Factors", y= NULL)
```

```
## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.
```



Analysis of the above plots .

- The above curve does not show any definite trend, specially in the data of Hepatitis-B vaccination. Hence no direct corelation with the LIfe expectancy is clear.
- But one good observation is that overall there is higher level of immunization in the developed countries as compared to developing one, which can be a factor for higher Life expectancy of developed world.

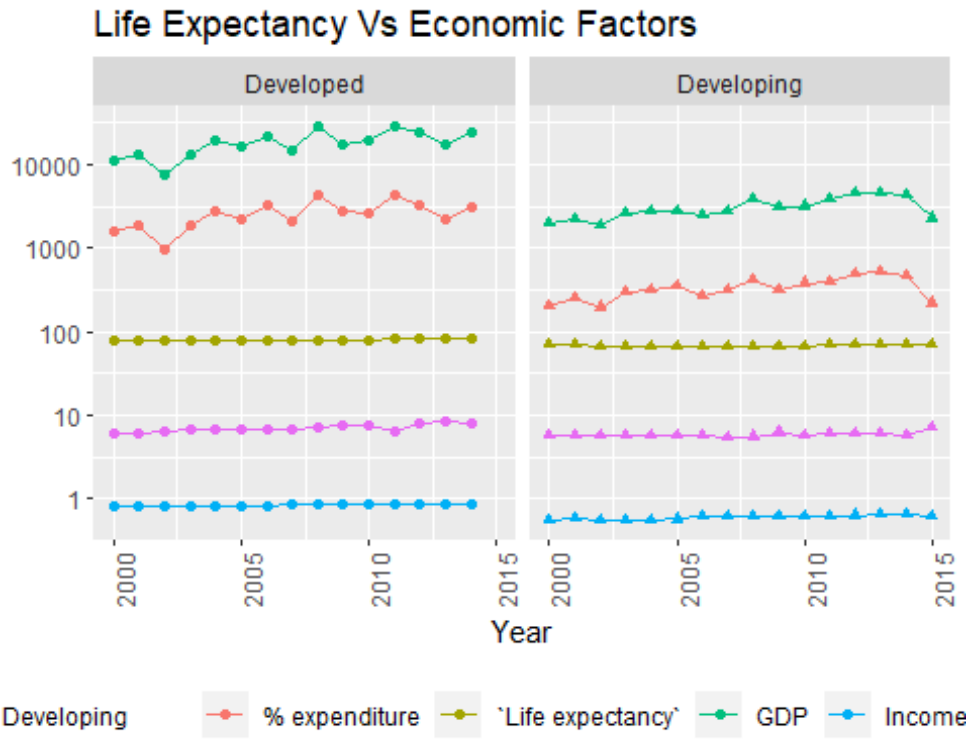
Average Life Expectancy Vs Economic Factors.

Looking at the various economic factors like % expenditure, Total Expenditure, GDP of the nation and income composition

```
global %>%
  ggplot(aes(x = Year, y =`Life expectancy` )) +
  geom_line(aes(color = "`Life expectancy`" )) +
  geom_point(aes(color = "`Life expectancy`", shape = global$Status)) +
  geom_line(aes(y = `percentage expenditure`, color = "% expenditure")) +
  geom_point(aes(y = `percentage expenditure`, color = "% expenditure",
shape= global$Status)) +
  geom_line(aes(y = `Total expenditure`, color = "Total expenditure")) +
  geom_point(aes(y = `Total expenditure`, color = "Total expenditure", shape
= global$Status)) +
  geom_line(aes(y = `Income composition of resources`, color = "Income
composition")) +
  geom_point(aes(y = `Income composition of resources`, color = "Income
```

```
composition", shape = global$Status)) +
  geom_line(aes(y = GDP, color = "GDP")) +
  geom_point(aes(y = GDP, color = "GDP", shape= global$Status)) +
  facet_wrap(~Status) +
  scale_y_log10() +
  labs(shape = "Type", color = NULL) +
  theme(legend.position="bottom",
        axis.text.x = element_text(angle = 90)) +
  labs(title = "Life Expectancy Vs Economic Factors", y= NULL)
```

```
## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.

## Warning: Use of `global$Status` is discouraged. Use `Status` instead.
```



Analysing the above Plots.

As can be seen from the graphs :

- All the economic factors have a positive correlation with the Life expectancy. This suggests better the fiscal health of the nation –> better is the expenditure on health infrastructure and services –> better is the Life expectancy.
- Also, as expected developed nations have stronger fiscal health as compared to developing nations.

Global Life Expectancy Analysis : Country Wise

Preparing copies of data in relevant format. - data_countries : country-wise avg statistics over the period of 2000 to 2015 - d2 : a copy of data_countries with a shorter name.

```
data_countries <- data_clean %>%group_by(Country,Status)%>%
select(-c(Year))%>% summarise_each(funs( mean(.,na.rm = TRUE)))%>%ungroup()
ungroup(data_clean)
```

```
## # A tibble: 1,649 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2015 Developing             65                263
62
##  2 Afghanistan  2014 Developing             59.9              271
64
##  3 Afghanistan  2013 Developing             59.9              268
66
##  4 Afghanistan  2012 Developing             59.5              272
69
##  5 Afghanistan  2011 Developing             59.2              275
71
##  6 Afghanistan  2010 Developing             58.8              279
74
##  7 Afghanistan  2009 Developing             58.6              281
77
##  8 Afghanistan  2008 Developing             58.1              287
80
##  9 Afghanistan  2007 Developing             57.5              295
82
## 10 Afghanistan  2006 Developing             57.3              295
84
## # ... with 1,639 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

```
print(data_countries)
```

```
## # A tibble: 133 x 21
##    Country     Status  `Life expectanc~ `Adult Mortalit~ `infant deaths`
Alcohol
##    <chr>       <chr>              <dbl>            <dbl>           <dbl>
<dbl>
##  1 Afghanistan Develo~             58.2             269.            78.2
0.0144
##  2 Albania     Develo~             75.2              45.1            0.688
4.85
##  3 Algeria     Develo~             74.2             103.            20.3
0.447
##  4 Angola      Develo~             50.7             363.            76.6
7.62
##  5 Argentina   Develo~             75.2             100.            10
8.00
##  6 Armenia     Develo~             73.3             117.             1
3.70
##  7 Australia   Develo~             81.9              62.4            1
10.2
##  8 Austria     Develo~             81.5              65.8            0
12.2
##  9 Azerbaijan  Develo~             71.1             120.             5.77
1.06
## 10 Bangladesh  Develo~             70.0             136.           142.
0.01
## # ... with 123 more rows, and 15 more variables: percentage expenditure
<dbl>,
## #   Hepatitis B <dbl>, Measles <dbl>, BMI <dbl>, under-five deaths <dbl>,
## #   Polio <dbl>, Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS
<dbl>,
## #   GDP <dbl>, Population <dbl>, thinness  1-19 years <dbl>,
## #   thinness 5-9 years <dbl>, Income composition of resources <dbl>,
## #   Schooling <dbl>
```

Global Average Life Expectancy.

Finding the mean life expectancy for all the people across globe, averaged over the period of 2000-2015

The finding is : 68.62 years

```
d2<- data_countries
global_avg_LE = mean(d2$`Life expectancy`)
print(global_avg_LE)
```

```
## [1] 68.62162
```

*Top 10 countries with **highest Life expectancy** across globe, averaged over the period of 2000-2015*

```
d2%>% slice_max(`Life expectancy`, n = 10)
```

```
## # A tibble: 10 x 21
##    Country     Status  `Life expectanc~ `Adult Mortalit~ `infant deaths`
Alcohol
##    <chr>       <chr>              <dbl>            <dbl>           <dbl>
<dbl>
##  1 Ireland     Develo~             83.4             55.4               0
11.3
##  2 Canada      Develo~             82.2             66.8               2
8.16
##  3 France      Develo~             82.2             72.8               3
12.4
##  4 Italy       Develo~             82.2             54.1               2.07
8.27
##  5 Spain       Develo~             82.0             64.1               1.67
10.0
##  6 Australia   Develo~             81.9             62.4               1
10.2
##  7 Sweden      Develo~             81.9             56.5               0
7.35
##  8 Austria     Develo~             81.5             65.8               0
12.2
##  9 Netherlands Develo~             81.3             47.2               1
6.68
## 10 Greece      Develo~             81.2             73.7               0.2
8.80
## # ... with 15 more variables: percentage expenditure <dbl>, Hepatitis B
<dbl>,
## #   Measles <dbl>, BMI <dbl>, under-five deaths <dbl>, Polio <dbl>,
## #   Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>,
## #   Population <dbl>, thinness  1-19 years <dbl>, thinness 5-9 years
<dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

As can be seen from the above table of Highest Life expectancy, Ireland tops the chart with avg. Life expectancy of about 83 years.Moreover, all the 10 nations in the list are from the first world nations which are either already well developed or just about to enter the status of being developed. Apart from this , all 10 nations have Avg. Life expectancy over 80yrs, which is way more higher than the global avg. of 68.62 avy across globe over the same time period of 2000 -2015

*Top 10 countries with the **least Life expectancy** across globe, averaged over the period of 2000-2015*

```
d2%>% slice_min(`Life expectancy`, n = 10)
```

```
## # A tibble: 10 x 21
##    Country     Status  `Life expectanc~ `Adult Mortalit~ `infant deaths`
Alcohol
##    <chr>       <chr>              <dbl>            <dbl>           <dbl>
<dbl>
##  1 Sierra Leo~ Develo~             48.4             335.            26.2
2.42
##  2 Lesotho     Develo~             48.6             547.             4.42
1.87
##  3 Zimbabwe    Develo~             49.4             471.            26.9
4.48
##  4 Malawi      Develo~             50.3             403             36.1
0.882
##  5 Angola      Develo~             50.7             363.            76.6
7.62
##  6 Swaziland   Develo~             50.8             337.             2.67
4.46
##  7 Central Af~ Develo~             51.4             445.            16.2
0.82
##  8 Chad        Develo~             52.3             322.            46
0.464
##  9 Nigeria     Develo~             52.8             340.           524.
8.18
## 10 Mozambique  Develo~             53.4             230.            74.3
1.27
## # ... with 15 more variables: percentage expenditure <dbl>, Hepatitis B
<dbl>,
## #   Measles <dbl>, BMI <dbl>, under-five deaths <dbl>, Polio <dbl>,
## #   Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>,
## #   Population <dbl>, thinness  1-19 years <dbl>, thinness 5-9 years
<dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

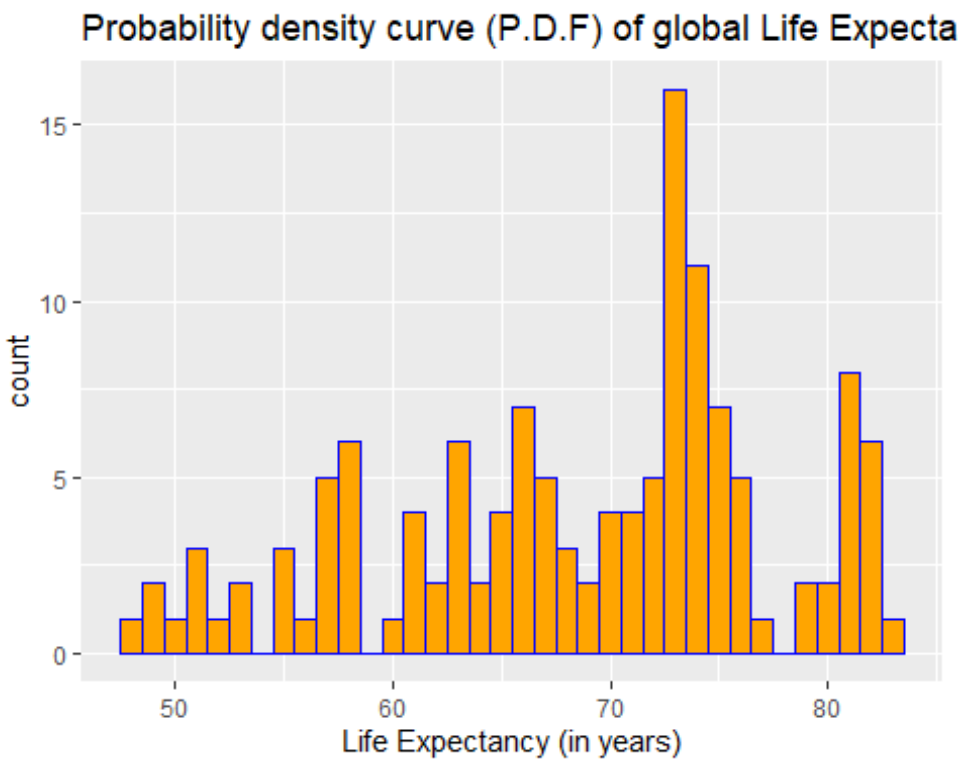
As can be seen from the table above :-

- Sierra Leone tops the chart with Life Expectancy as low as 48yrs, which is almost 20yrs lower than the global avg of 68 yrs.
- All the 10 countries are developing nations and all belong to the continent of Africa.

Probability density function *of global Avg. Life Expectancies :*

Ploting the pdf curve :

```
p<-ggplot(d2, aes(x=`Life expectancy`)) +
  geom_histogram(binwidth=1, color="Blue", fill="orange") +
  labs( title = "Probability density curve (P.D.F) of global Life Expectancy"
, x = "Life Expectancy (in years)")
print(p)
```



According to the Probability density function (pdf) of Avg Life expectancy of different countries over the period of 2000-2015, one can conclude that the most likely average global expected Life expectancy is about **73 year**. Also, the highest Life expectancy across globe is 83yrs which is about 10 years more than the modal value of 73ys.

Country-wise comparison of top performers : in terms of LIfe Expectancy

Preparing copies of data in relevant format. - d3 : a copy of data_clean with a shorter name. - d3_2005 : country wise data for the year 2005 - d3_2014 : country wise data for the year 2014

```
d3<-data_clean
d3_2005<-d3 %>% filter(Year == 2005 )
d3_2014<-d3 %>% filter(Year == 2014 )

print(d3)
```

```
## # A tibble: 1,649 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2015 Developing            65                263
62
##  2 Afghanistan  2014 Developing            59.9              271
64
```

```
##  3 Afghanistan  2013 Developing             59.9              268
66
##  4 Afghanistan  2012 Developing             59.5              272
69
##  5 Afghanistan  2011 Developing             59.2              275
71
##  6 Afghanistan  2010 Developing             58.8              279
74
##  7 Afghanistan  2009 Developing             58.6              281
77
##  8 Afghanistan  2008 Developing             58.1              287
80
##  9 Afghanistan  2007 Developing             57.5              295
82
## 10 Afghanistan  2006 Developing             57.3              295
84
## # ... with 1,639 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>

print(d3_2005)

## # A tibble: 110 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2005 Developing             57.3              291
85
##  2 Albania      2005 Developing             73.5               15
1
##  3 Algeria      2005 Developing             72.9              136
19
##  4 Argentina    2005 Developing             74.9              127
11
##  5 Armenia      2005 Developing             73                137
1
##  6 Australia    2005 Developed              81                 67
1
##  7 Austria      2005 Developed              79.4               85
0
##  8 Azerbaijan   2005 Developing             68.4              162
6
##  9 Bangladesh   2005 Developing             67.8              155
```

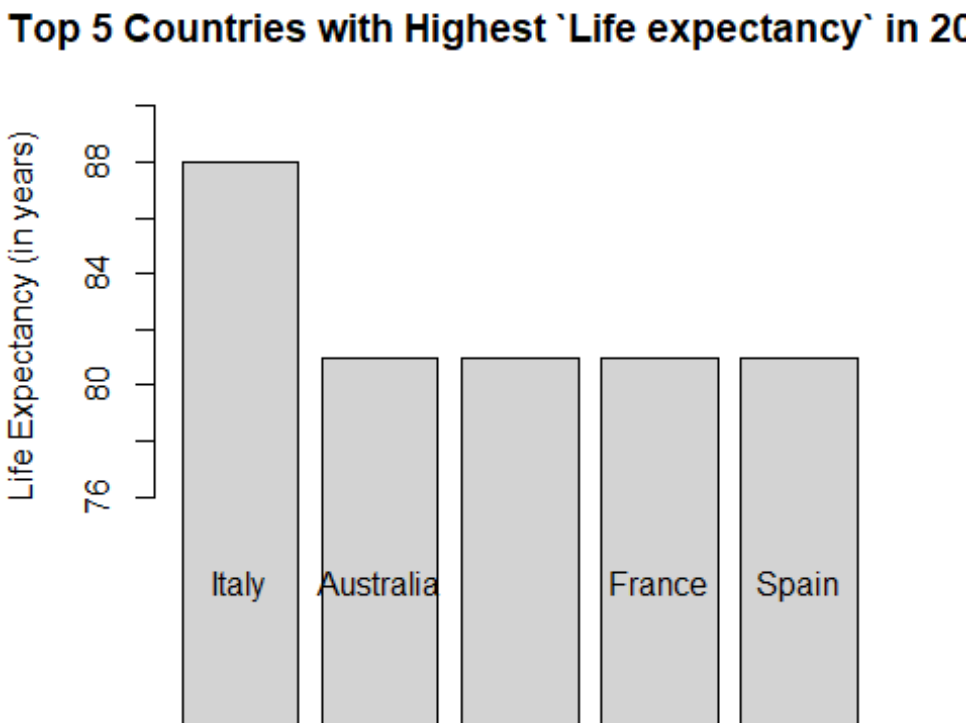
```
174
## 10 Belarus      2005 Developing             68.1              252
1
## # ... with 100 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>

print(d3_2014)

## # A tibble: 131 x 22
##    Country      Year Status     `Life expectanc~ `Adult Mortalit~ `infant
deaths`
##    <chr>       <dbl> <chr>                 <dbl>            <dbl>
<dbl>
##  1 Afghanistan  2014 Developing             59.9              271
64
##  2 Albania      2014 Developing             77.5                8
0
##  3 Algeria      2014 Developing             75.4               11
21
##  4 Angola       2014 Developing             51.7              348
67
##  5 Argentina    2014 Developing             76.2              118
8
##  6 Armenia      2014 Developing             74.6               12
1
##  7 Australia    2014 Developed              82.7                6
1
##  8 Austria      2014 Developed              81.4               66
0
##  9 Azerbaijan   2014 Developing             72.5              119
5
## 10 Bangladesh   2014 Developing             71.4              132
98
## # ... with 121 more rows, and 16 more variables: Alcohol <dbl>,
## #   percentage expenditure <dbl>, Hepatitis B <dbl>, Measles <dbl>, BMI
<dbl>,
## #   under-five deaths <dbl>, Polio <dbl>, Total expenditure <dbl>,
## #   Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>, Population <dbl>,
## #   thinness  1-19 years <dbl>, thinness 5-9 years <dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

Plotting the best 5 performers of the year 2005

```
Best_2005<- d3_2005 %>% slice_max(`Life expectancy`, n = 5)
print(Best_2005)
```

```
## # A tibble: 5 x 22
##   Country    Year Status `Life expectanc~ `Adult Mortalit~ `infant deaths`
Alcohol
##   <chr>     <dbl> <chr>             <dbl>            <dbl>           <dbl>
<dbl>
## 1 Italy      2005 Devel~               88               66               2
8.65
## 2 Australia  2005 Devel~               81               67               1
10.3
## 3 Canada     2005 Devel~               81               76               2
8
## 4 France     2005 Devel~               81               93               3
12.2
## 5 Spain      2005 Devel~               81               77               2
11.9
## # ... with 15 more variables: percentage expenditure <dbl>, Hepatitis B
<dbl>,
## #   Measles <dbl>, BMI <dbl>, under-five deaths <dbl>, Polio <dbl>,
## #   Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>,
## #   Population <dbl>, thinness  1-19 years <dbl>, thinness 5-9 years
<dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>
```

```
barplot(Best_2005$`Life expectancy`,
main = "Top 5 Countries with Highest `Life expectancy` in 2005)",
ylab = "Life Expectancy (in years)",
ylim = c(75,90),
names.arg = c("Italy","Australia","Canada","France","Spain"),
col = "Light Grey",

horiz = F )
```

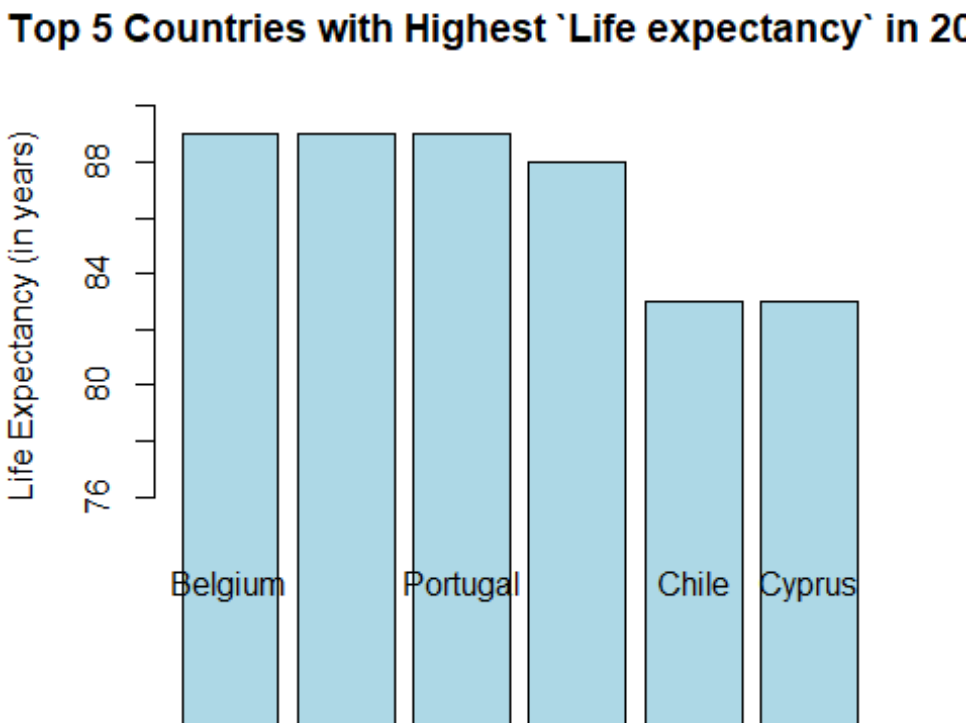


Plotting the best 5 performers of the year 2014

```
Best_2014<- d3_2014 %>% slice_max(`Life expectancy`, n = 5)
print(Best_2014)
```

```
## # A tibble: 6 x 22
##   Country   Year Status `Life expectanc~ `Adult Mortalit~ `infant deaths`
Alcohol
##   <chr>    <dbl> <chr>             <dbl>            <dbl>           <dbl>
<dbl>
## 1 Belgium   2014 Devel~               89               76               0
12.6
## 2 Germany   2014 Devel~               89               69               2
11.0
## 3 Portugal  2014 Devel~               89               78               0
9.88
## 4 Greece    2014 Devel~               88               73               0
7.53
## 5 Chile     2014 Devel~               83               83               2
7.16
## 6 Cyprus    2014 Devel~               83               53               0
0.01
## # ... with 15 more variables: percentage expenditure <dbl>, Hepatitis B
<dbl>,
## #   Measles <dbl>, BMI <dbl>, under-five deaths <dbl>, Polio <dbl>,
## #   Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS <dbl>, GDP <dbl>,
```

```
## #   Population <dbl>, thinness  1-19 years <dbl>, thinness 5-9 years
<dbl>,
## #   Income composition of resources <dbl>, Schooling <dbl>

barplot(Best_2014$`Life expectancy`,
main = "Top 5 Countries with Highest `Life expectancy` in 2014)",
ylab = "Life Expectancy (in years)",
ylim = c(75,90),
names.arg = c("Belgium","Germany","Portugal","Greece","Chile", "Cyprus"),
col = "Light Blue",

horiz = F )
```



- As can be seen from both the plots, the top performers are still from the first world nations , though the toppers of the past have failed to retain their positions in the chart.
- Also, as can be seen from the graphs, the Life expectancy value for the top performers is higher in 2014 as compared to 2005, which suggest that world as a whole is moving towards longevity of life.

Linear Model to predict Life expectancy against the parameter of schooling.

```
mod <- lm(`Life expectancy` ~ Schooling, data = global)
summary(mod)
```

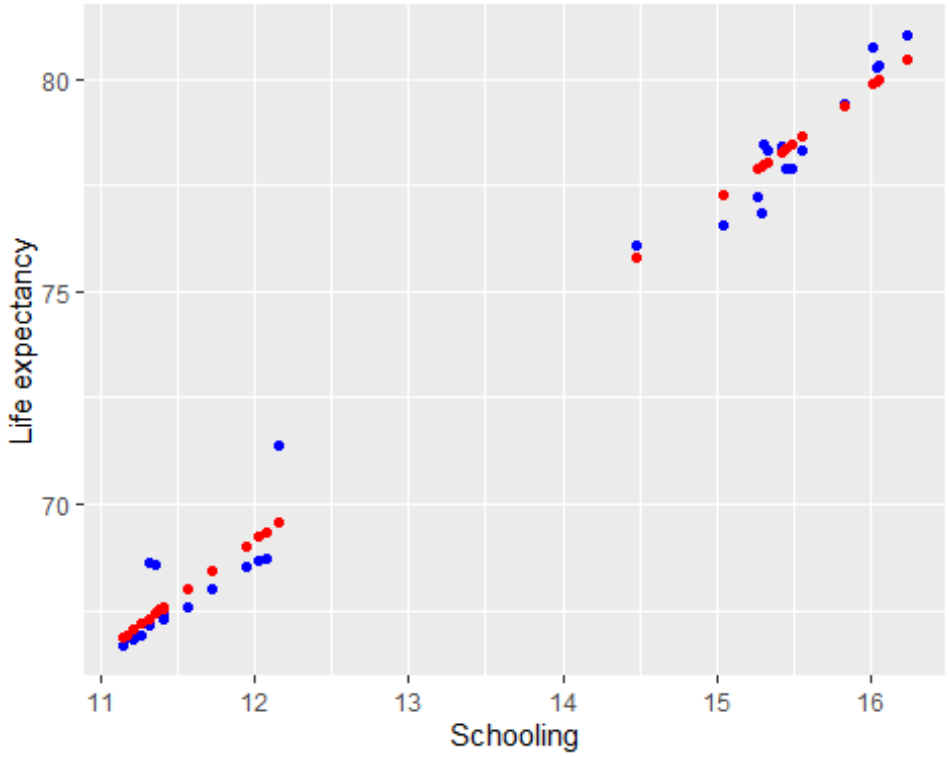
```
##
## Call:
## lm(formula = `Life expectancy` ~ Schooling, data = global)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.0657 -0.4495 -0.1901  0.3199  1.8481
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 37.16285    0.78237   47.50   <2e-16 ***
## Schooling    2.66577    0.05747   46.38   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6511 on 29 degrees of freedom
## Multiple R-squared:  0.9867, Adjusted R-squared:  0.9862
## F-statistic:  2152 on 1 and 29 DF,  p-value: < 2.2e-16
```

```
x_grid <- seq(1, 151)
new_df <- tibble(Schooling = x_grid)
global %>% mutate(pred = predict(mod))
```

```
## # A tibble: 31 x 22
##     Year Status     `Life expectancy` `Adult Mortality` `infant deaths`
Alcohol
##    <dbl> <chr>                  <dbl>             <dbl>           <dbl>
<dbl>
##  1  2000 Developed               76.1              91.7            1.38
10.6
##  2  2000 Developing              68.6             197.            26.7
3.76
##  3  2001 Developed               76.6              84.9            1.29
10.4
##  4  2001 Developing              68.6             181.            25.8
3.85
##  5  2002 Developed               76.9              94.9            1.29
10.7
##  6  2002 Developing              66.9             188.            25.7
3.81
##  7  2003 Developed               77.2              78.9            1.07
10.6
##  8  2003 Developing              66.7             191.            30.2
3.59
##  9  2004 Developed               77.9              87.8            1.07
10.9
## 10  2004 Developing              66.8             201.            45.7
3.67
```

```
## # ... with 21 more rows, and 16 more variables: percentage expenditure
<dbl>,
## #   Hepatitis B <dbl>, Measles <dbl>, BMI <dbl>, under-five deaths <dbl>,
## #   Polio <dbl>, Total expenditure <dbl>, Diphtheria <dbl>, HIV/AIDS
<dbl>,
## #   GDP <dbl>, Population <dbl>, thinness  1-19 years <dbl>,
## #   thinness 5-9 years <dbl>, Income composition of resources <dbl>,
## #   Schooling <dbl>, pred <dbl>
```

```
LE_pred <- global %>% mutate(pred = predict(mod))
LE_pred %>% ggplot() +
geom_point(aes(x = Schooling, y = `Life expectancy`), color = "blue") +
geom_point(aes(x = Schooling, y = pred), color = "red")
```



As can be seen from the above graph : - the schooling has a positive correlation with LIfe Expectancy as the curve has a positive slope. - As both red and blue dots are majorly close, it suggests that linear model to find the correlation and prediction of Life expectancy is quite good.

CONCLUSION

Avg. Life Expectancy of humans is not a naturally fixed constant but a variable being shaped by various anthropogenic factors too such as Lifestyle habits, spending on Health infrastructure and services, better immunization drives as well as other socio-economic

and political factors. Hence, in order to lead a better and more longer life, humans need to define their public policy keeping various factors in mind as analysed above. Hence, with better policy and practices on the line of developed world , Humanity can lead a better, healthier and longer life.