

Life Expectancy Visualization

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Project description

In our information visualization project, we will be plotting multiple small line-graphs for each country in the world. The main goal of the project is to visualize the life expectancy of each country versus five different factors such as GDP, BMI, government expenditure on health care, schooling, number of diseases reported between the year 2000-2015.

We will see how and why the life expectancy has changed over the years. The correlation between the life expectancy and other factors for each country between the year 2000-2015 will be communicated to the user through multiple small line graphs.

Dataset:

Dataset we are using a dataset which is a csv file. The dataset related to life expectancy, health factors for 193 countries has been collected from the same WHO data repository website and its corresponding economic data was collected from United Nation website. The Global Health Observatory (GHO) data repository under World Health Organization (WHO) keeps track of the health status as well as many other related factors for all countries. It has been observed that in the past 15 years, 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 file(dataset) consists of 22 columns and 2938 rows which meant 20 predicting variables. All predicting variables was then divided into several broad categories: Immunization related factors, Mortality factors, Economical factors and Social factors.

Link: <https://www.kaggle.com/kumarajarshi/life-expectancy-who>

These are the main attributes that will be used:

1. **Country Name** – Categorical, Spatial (193 country names)
2. **Year** – Quantitative, Temporal (2000 to 2015)
3. **Life Expectancy** – Quantitative (36.3 to 89 in age)
4. **Percentage expenditure** – Quantitative (0 to 19479.91, Expenditure on health as a percentage of GDP)
5. **GDP** – Quantitative (1.68 to 119172.7 in USD)
6. **Population** – Quantitative (34 to 1.29E+09)
7. **BMI** – Quantitative (1 to 87.3)
8. **Schooling** – Quantitative (0 to 20.7)

Analytical Questions and Proxy tasks

1. How much govt spending on healthcare change the years people live?

Proxy Tasks:

Does the amount of money spent on healthcare change the life expectancy?

Proxy values:

Government spending on healthcare → Percentage expenditure

No of people live → life expectancy.

2. Is there any correlation between countries production on change in how long people live?

Proxy Task:

Is there correlation between GDP and life expectancy?

Proxy value:

How long people live → life expectancy.

3. Does education has a correlation on how long people live?

Proxy Task:

Does number of years in schooling increase life expectancy?

Proxy value:

No of people live → life expectancy.

Education → Schooling

4. Is there a correlation between major diseases and how long a person lives ?

Proxy task:

Does diseases which are highly reported have correlation on life expectancy?

Proxy value:

How long a person lives → life expectancy

Major disease → Number of cases reported for different diseases

5. Do countries with healthy individual also have people who live longer?

Proxy task:

Does BMI have a correlation on life expectancy?

Proxy Value:

Healthy Individual → BMI

People who live longer → Life expectancy

Story Design

Data Analysis

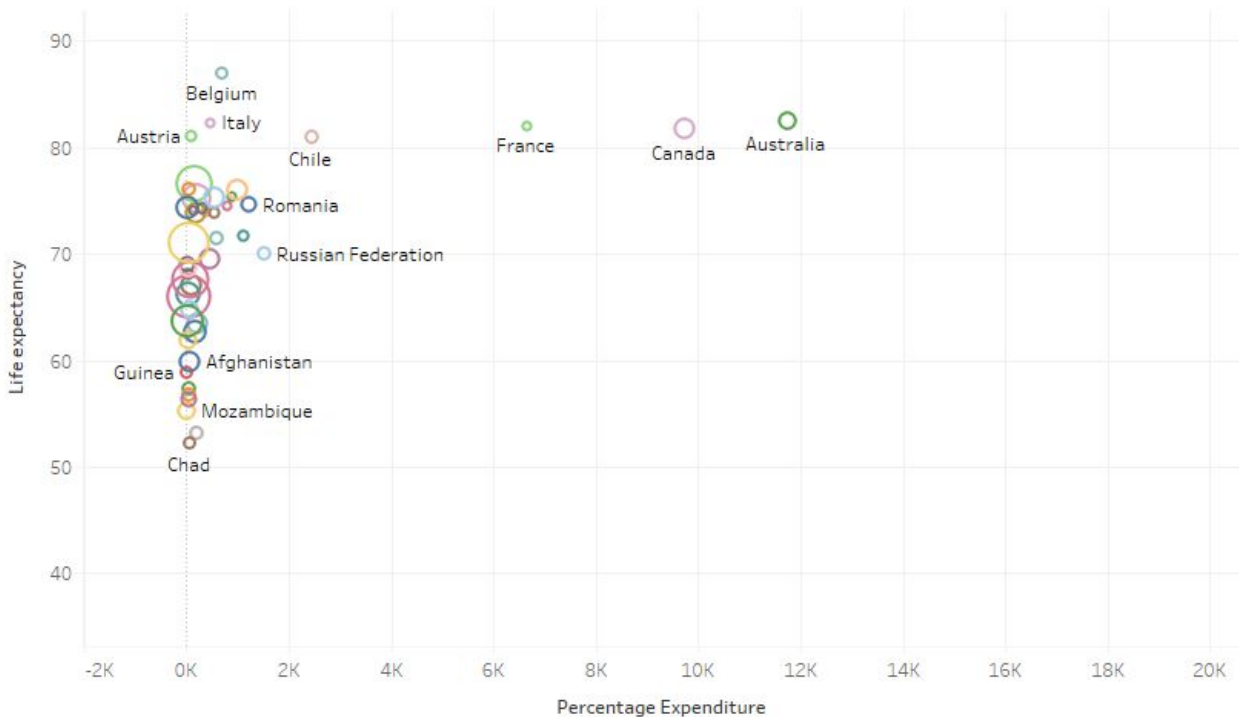
The visualizations shown below are actually animations and we have taken a part out of it to show here.

1. How much govt spending on healthcare change the years people live?

While few countries had high life expectancy after spending much on health care, but there were also countries which had the same high life expectancy with low spending on health care. While majority of the countries in the world spent low amount of their GDP

on health, countries like Switzerland have spent a lot on health sector. Looking at the visualization we can say that most of countries have achieved high life expectancy with minimal spending on health care. In future instead of taking the overall expenditure on healthcare, we plan to use expenditure on healthcare per person, as a small country who has less population would obviously be spending less than the huge countries.

<Percentage Expenditure on Health Care> - 2013

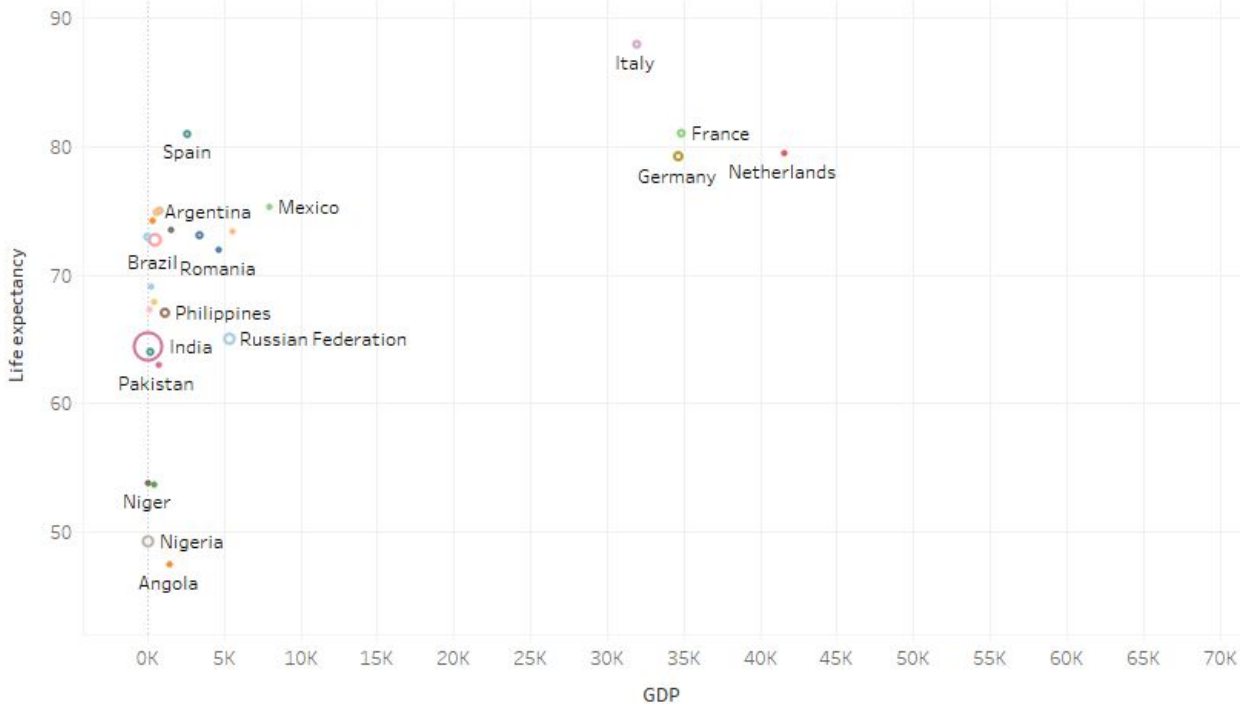


Percentage Expenditure vs. Life expectancy. Color shows details about Country. Size shows details about Population. The marks are labeled by Country. The view is filtered on Population, which includes values greater than or equal to 5935168.

2. Is there any correlation between countries production on change in how long people live?

Though this visualization we observe a large number of countries in the world which have the low GDP still have high life expectancy. We can notice a trend that all those countries which have high GDP has high life expectancy. But at the same time there are many countries in the world which have low GDP and same level of life expectancy as those. So, we can say that GDP not necessarily account for the life expectancy of a given country. But again here we need to take these values proportional to the size of the country(population).

<GDP of each country> - 2005

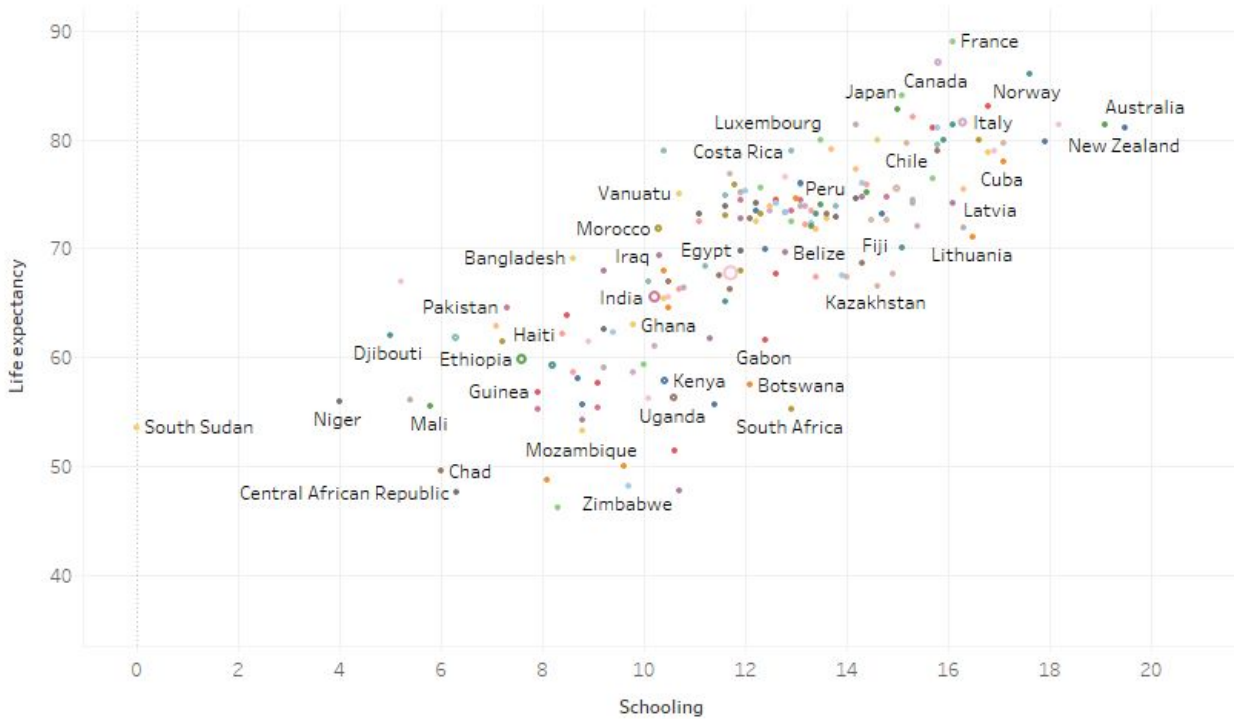


GDP vs. Life expectancy. Color shows details about Country. Size shows details about Population. The marks are labeled by Country. The view is filtered on Population and GDP. The Population filter includes values greater than or equal to 11870302. The GDP filter ranges from 4 to 67792.

3. Does education has a correlation on how long people live?

After looking at this animation one can see an increase in the life expectancy with increase of schooling at the end of 15th year. There is a slow increasing trend in life expectancy every year with increase in number of years people spend in school. Thus, we can say that education has a positive effect over the life expectancy of the people. We may conclude from this the apart from spending on healthcare, spending on education could also have a positive impact on life expectancy.

<Education rate of each country> - 2008

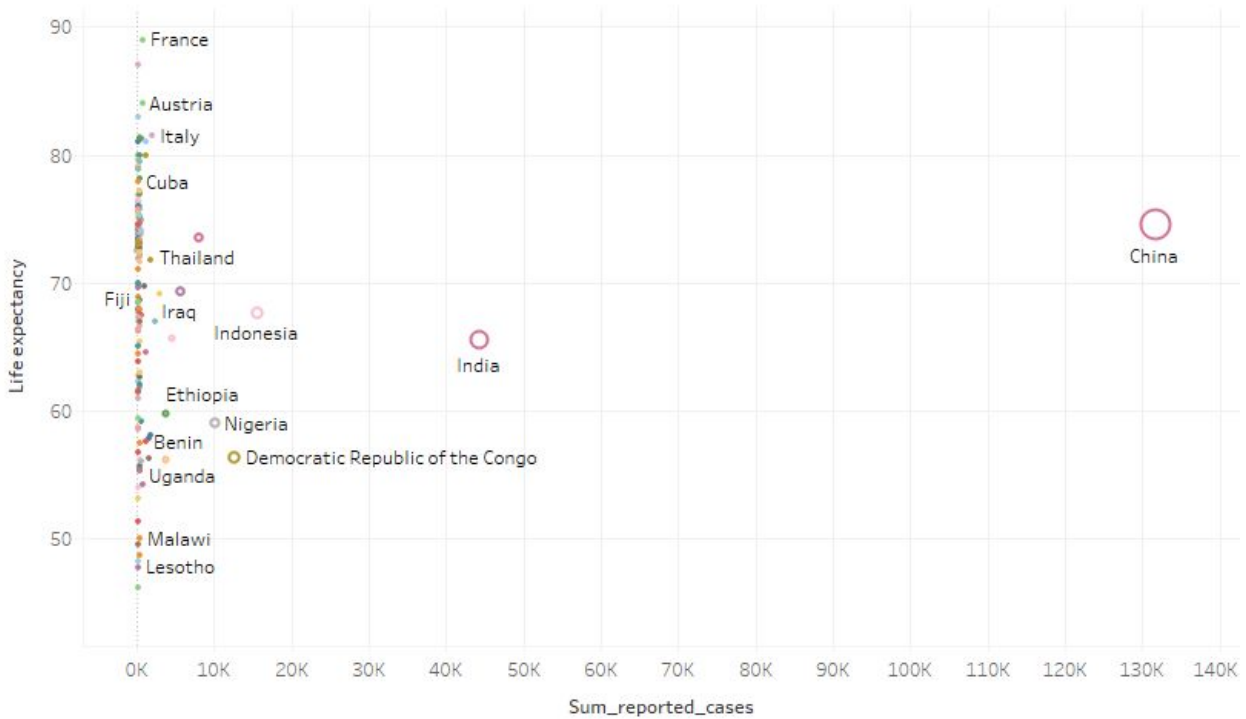


Schooling vs. Life expectancy. Color shows details about Country. Size shows details about Population. The marks are labeled by Country. The view is filtered on Schooling and Life expectancy. The Schooling filter keeps non-Null values only. The Life expectancy filter keeps non-Null values only.

4. Is there a correlation between major diseases and how long a person lives?

It can be seen from the visualization that increase in the number of diseases reported hardly increased the life expectancy of the people. For example, China and India had an increase in number of diseases reported over years but there was not much decrease in their life expectancy. There could be other reason such as over-population of these two countries which might have increased the number of diseases reported. But at the same time majority of the countries in the world which had low reports of diseases still had high life expectancy.

<Number of different diseases reported> - 2008

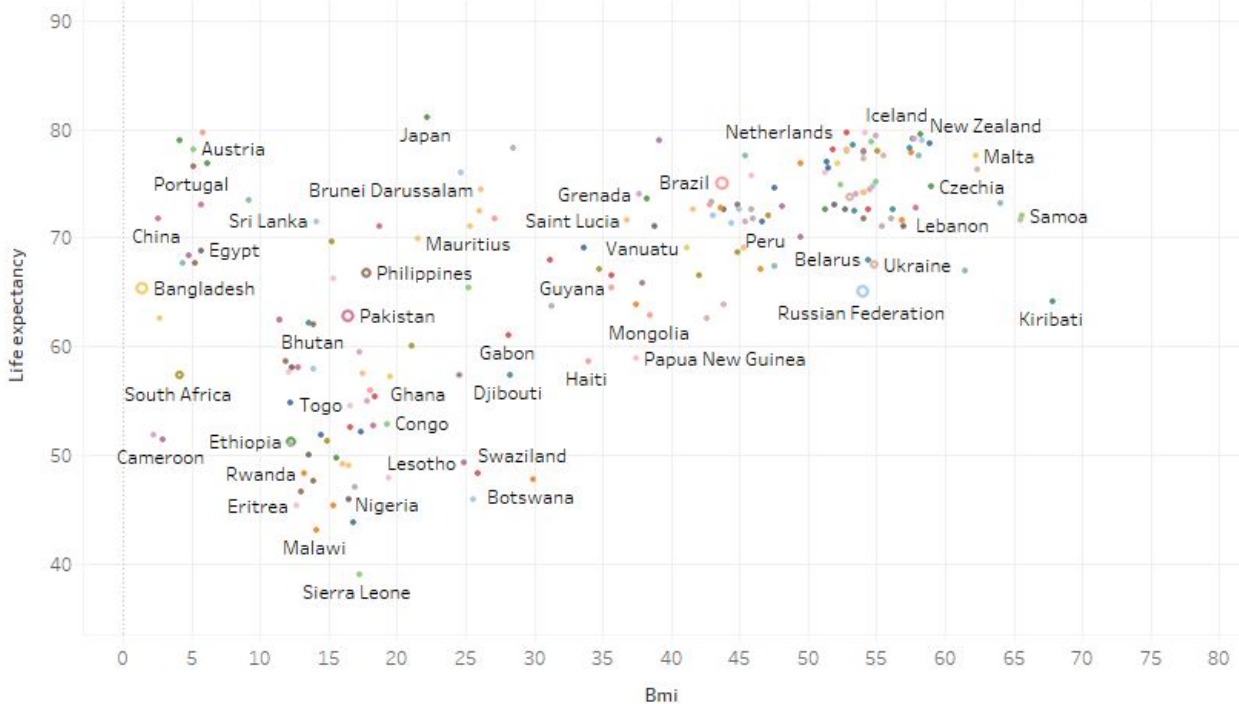


Sum_reported_cases vs. Life expectancy. Color shows details about Country. Size shows details about Sum_reported_cases. The marks are labeled by Country. The view is filtered on Life expectancy and Sum_reported_cases. The Life expectancy filter keeps non-Null values only. The Sum_reported_cases filter keeps non-Null values only.

5. Do countries with healthy individual also have people who live longer?

We did data analysis on whether BMI has any effect over the life expectancy of the people. BMI is height to weight ratio for any individual. In order to visualize this we created an animation consisting of BMI, life expectancy over time. Many countries with very high and very low BMI which is considered as unhealthy have the high life expectancy. While some countries like Pakistan, Afghanistan, South Africa increased their life expectancy with increase in BMI but there are also countries like Somalia which even after increasing its BMI from 17 to 24.30 still had the life expectancy of 55.

<Health condition of people of each country> - 2000



Bmi vs. Life expectancy. Color shows details about Country. Size shows details about Population. The marks are labeled by Country. The view is filtered on Bmi and Life expectancy. The Bmi filter keeps non-Null values only. The Life expectancy filter keeps non-Null values only.

The dataset we are using is unfortunately not accurate. While making these visualizations we found that there are many missing data points, erroneous values. For example, the population of the countries is not accurate. For the final project we will try to make the dataset more accurate by merging it with other datasets.

Storyboard

What all factors affect how long you will live?

Life expectancy at birth is an estimate of how long a person born today would live, on average. Life expectancy is affected by many factors such as: socio economic status, including employment, income, education and economic well-being; the quality of the health system and the ability of people to access it; health behavior such as tobacco and excessive alcohol consumption, poor nutrition and lack of exercise; social factors; genetic factors; and

environmental factors including overcrowded housing, lack of clean drinking water and adequate sanitation.

Some of these reasons may seem obvious and others not so much. In fact, some factors could affect your life in the opposite way you expect. Through these visualizations we try to find and understand what factors affect the life expectancy the most and why they do so.

Before we get into it, we should know why is this important. Life expectancy is widely viewed as a key measure of the health of populations. Different countries have different life expectancies. The reason for these can be the policies they implement, diseases spread in that area and many others. By understanding the trends and patterns of the countries that have higher life expectancies we can improve it in countries where it is needed the most, where life expectancies are very less.

In our visualization we are focusing on 5 main factors that affect the life expectancy. These are

- How much does the government spend on health care
- GDP of the country
- Number of years on average a person spends in school
- Number of different diseases reported
- Average BMI of the person

Why are we considering these factors?

How much does the government spend on healthcare -> It may sound obvious that spending more money on health care would improve the life expectancy, but it is not always true. Apart from how much the government spends on health care, on how it spends these money may also play a determining role in the life expectancy.

GDP of country -> The gross domestic product (GDP) is one of the primary indicators used to gauge the health of a country's economy. It represents the total dollar value of all goods and services produced over a specific time period, often referred to as the size of the economy. As one can imagine, economic production and growth – which GDP represents – have a large impact on nearly everyone within that economy. For example, when the economy is healthy, you will typically see low unemployment and wage increases as businesses demand labor to meet the growing economy.

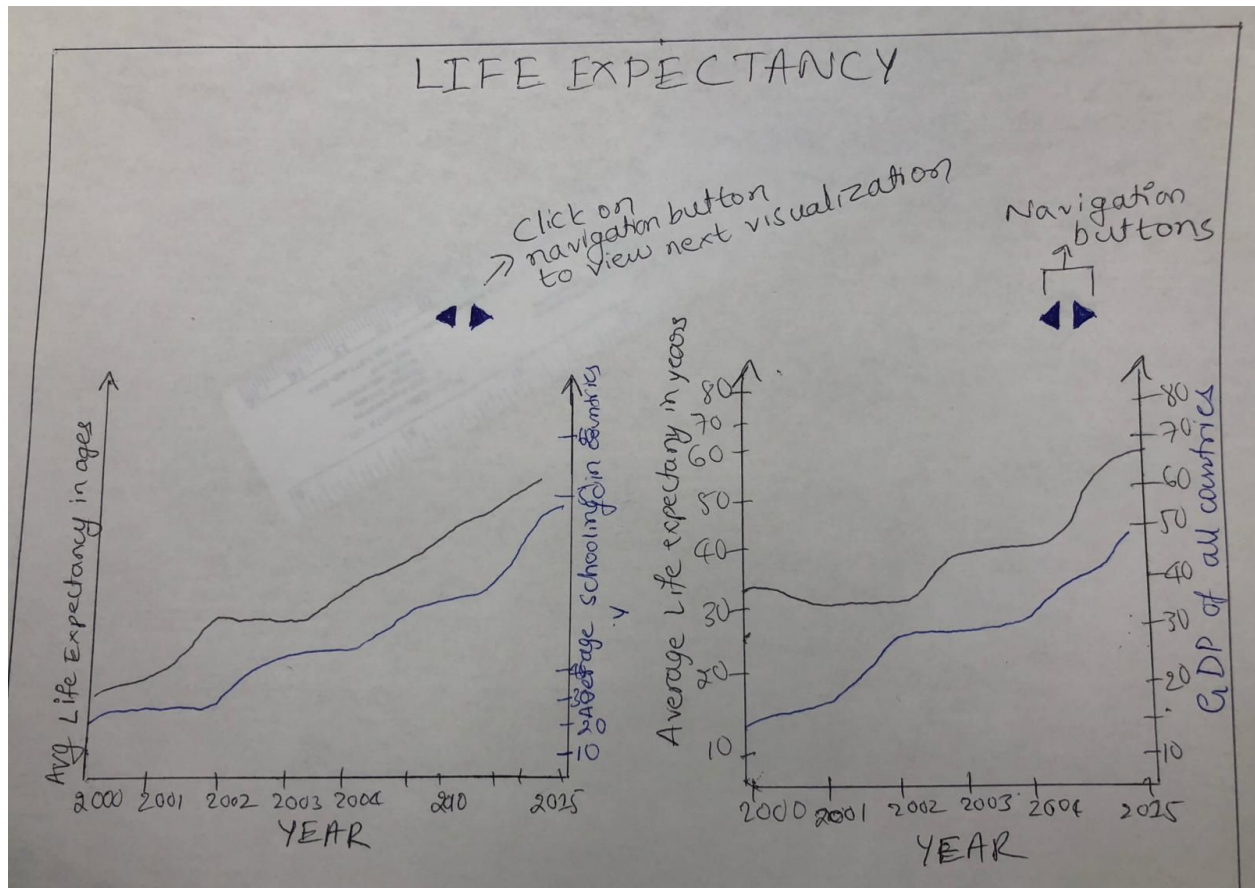
Number of years on average a person spends in school -> This tells us what is the impact of education on the lives of individual.

Number of different diseases reported -> Diseases spread could have a huge affect on the life expectancy. A sudden outbreak of a disease can lower the life expectancy of that area by a significant amount. We need to see how the spread of diseases affect the life expectancy of the people. Also, we would see what were the policies used by different countries in these situation to find out which has been the most effective.

Average BMI of the person -> Doctors often use BMI as an objective indicator of whether a person is overweight, underweight, or at a healthy weight. BMI helps determine someone's

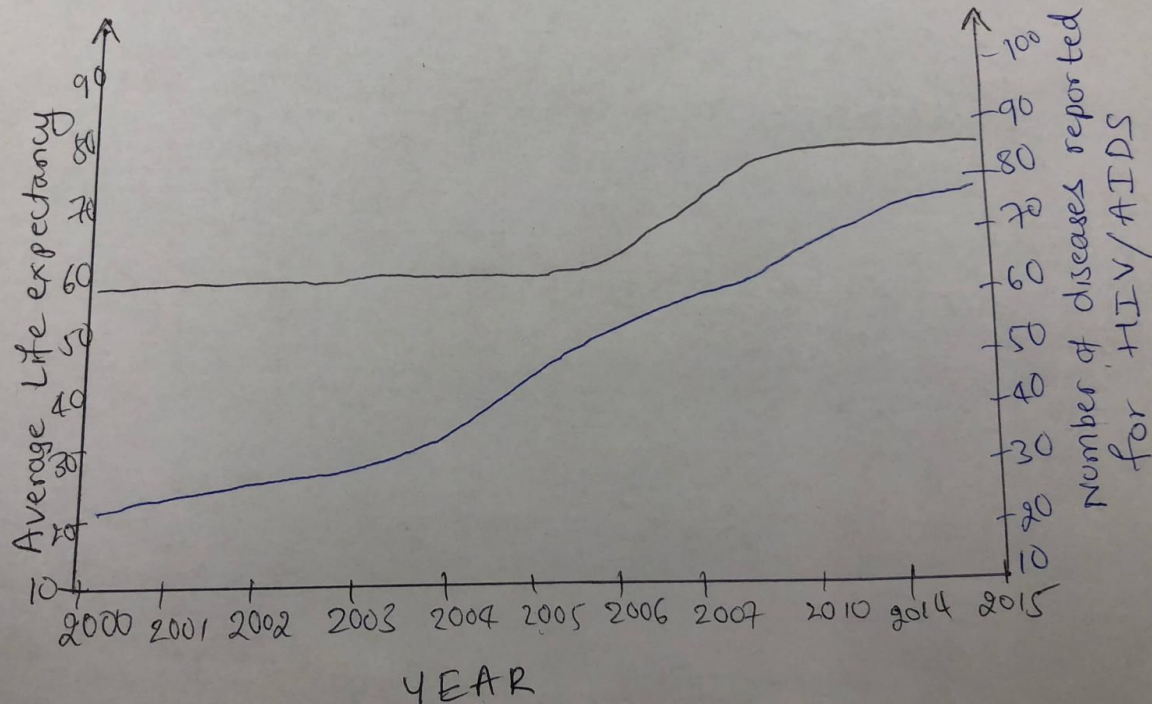
overall health risk. As we should see here is that people with BMI in normal range should have higher life expectancy.

We will be showing the line graph. Here one line represents the Average life expectancy of all the countries in the world. The another blue line shows the average schooling of all the countries in the world. We can look at the correlation between the average life expectancy and the average schooling of the countries between the years 2000 to 2015. As we click on the navigation buttons we can correlate the life expectancy with other factors such as GDP, BMI, expenditure on health care



In this visualization we will select top 3 countries in the world based on number of diseases reported. Here one line represents the Average life expectancy of these top 3 countries. The another blue line shows the average number of cases reported on HIV/AIDS from these top 3 countries. We can look at the correlation between the average life expectancy and the average number of cases reported on HIV/AIDS for these 3 countries between the years 2000 to 2015.

→ based on no. of diseases reported.
 Life expectancy of top 3 countries and correlation
 with the number of diseases reported



A list of items already implemented

1. Dual y axis multiple line chart implemented using D3. The y axis multiple line chart provides us an insightful visualization on whether average life expectancy of the world had any correlation with the average schooling of the world between the years 2000 to 2015.
2. Dual y axis multiple line chart implemented using D3. This chart helps us to visualize the correlation between average major diseases of the world and average life expectancy of the world over the years between 2000 to 2015
3. Static website containing two graphical visualizations implemented using D3.
4. We performed some operations over the dataset to retrieve the average of the required columns. The average of the attributes of all the countries in the world has been calculated for each year between 2000 to 2015

A list of items yet to be implemented:

1. The line charts with dual y axis showing the visualizations for:
 - A. Average BMI of the world with the average life expectancy over the years 2000 to 2015
 - B. Average GDP of the world with the average life expectancy of the world over the years 2000 to 2015
 - C. Average of all the countries expenditure on healthcare with the average life expectancy of the world over the years 2000 to 2015
2. Build and host a dynamic website with navigation buttons to show the interactions between the visualizations

A link to the current version of the page on GitHub

<https://github.com/NYU-VIS-FALL2018/storytelling-group-1>

Link to Demo Page

The feedback we received in the first week is to take average of all the countries in the world instead of plotting for each 193 countries as it would populate the graph with 386 lines which would be difficult to see the trend. But after implementing the changes we received on first feedback, it didn't seem meaningful to take average of all countries. Hence, in the second feedback we were told by the Professor to plot multiple small line graphs. This would be very easy to see the trends of each country and how its life expectancy had correlation with different factors such as BMI, schooling etc. We have finally implemented multiple small line graphs for 50 different countries. We have plotted it against two different factors BMI and schooling.