

Investigating the Relationship Between GDP and Life Expectancy for 6 Different Countries

By Megan Barstead

Gross domestic product or GDP is defined as the market value of all final goods and services produced within a country in a given period of time. It is often used to represent the size of a country's economy or the economic growth over a certain period of time. [Studies](#) have shown that life expectancy at birth increases at a decreasing rate with GDP per capita. This nonlinear increase is because once people reach a certain level of wealth, they spend the excess on "wants" and not "needs." Additionally, the link between GDP and life expectancy is complicated, and periods of high economic growth can also lead to [higher mortality rates](#). The following blog post will compare the GDP of six countries with the life expectancy at birth in those countries, for the years 2000-2015.

Violin plots are a combination of a bar plot and a rotated distribution density plot. The below violin plot (Figure 1) shows that Zimbabwe has the lowest life expectancy as well as the widest distribution of life expectancy over the time frame (2000-2015). This is likely due to political turmoil and food insecurity in the country, as well as a devastating AIDs pandemic in the late 1990s and early 2000s. As the country stabilized and more affordable AIDs treatments became available, the life expectancy increased. The distribution of the other countries appear to follow relatively narrow normal distributions. However, this plot is somewhat hard to interpret, and does not do a good job of showing how life expectancy has changed over time, so it is important to examine the data further.

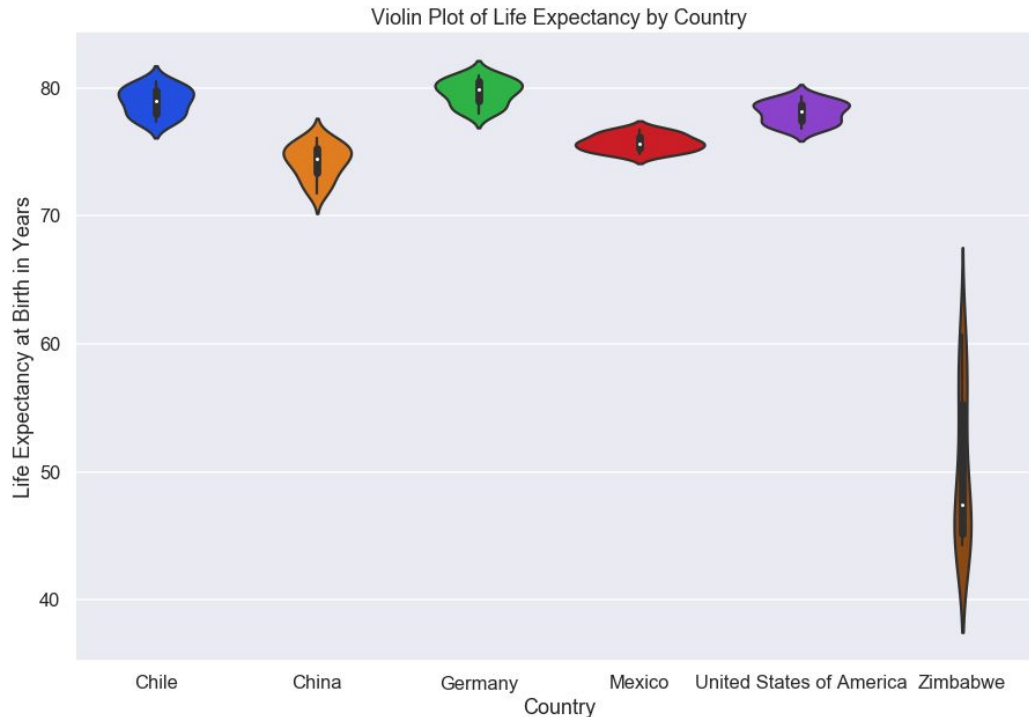


Figure 1: Violin plot of Life Expectancy at Birth (Years) for six Countries.

The facet plot below (fig 2) is a group of scatter plots showing how the average life expectancy vs avg GDP and how they changed every year for each country. In this plot, “LEABY” on the Y axis stands for “Life Expectancy at Birth in Years” and GDP is in billions of US dollars. This plot does a better job of illustrating just how much Zimbabwe’s life expectancy has increased since the year 2000, indicated by the brown dot moving up the Y axis. On these plot it appears the other countries’ life expectancies have remained relatively stable. This indicates that over this time period Zimbabwe either experienced major changes in the health of their population or changed the way they reported their data. It is possible that over this period the increased level of foreign aid led to increased health infrastructure in the country, thus leading to healthier citizens and longer lives. Additionally, more affordable and accessible AIDs treatment started to slow the AIDs pandemic in Africa over this period. However, because of the drastic change it would be important to further investigate how the data was obtained to ensure as much bias was eliminated as possible.

This plot also shows that China has had the largest increase in GDP, indicated by the orange dot’s move to the right along the x-axis. Scatter plots are not the best way to

visualize trends in increasing/decreasing data, which is why we've included the line plots below.

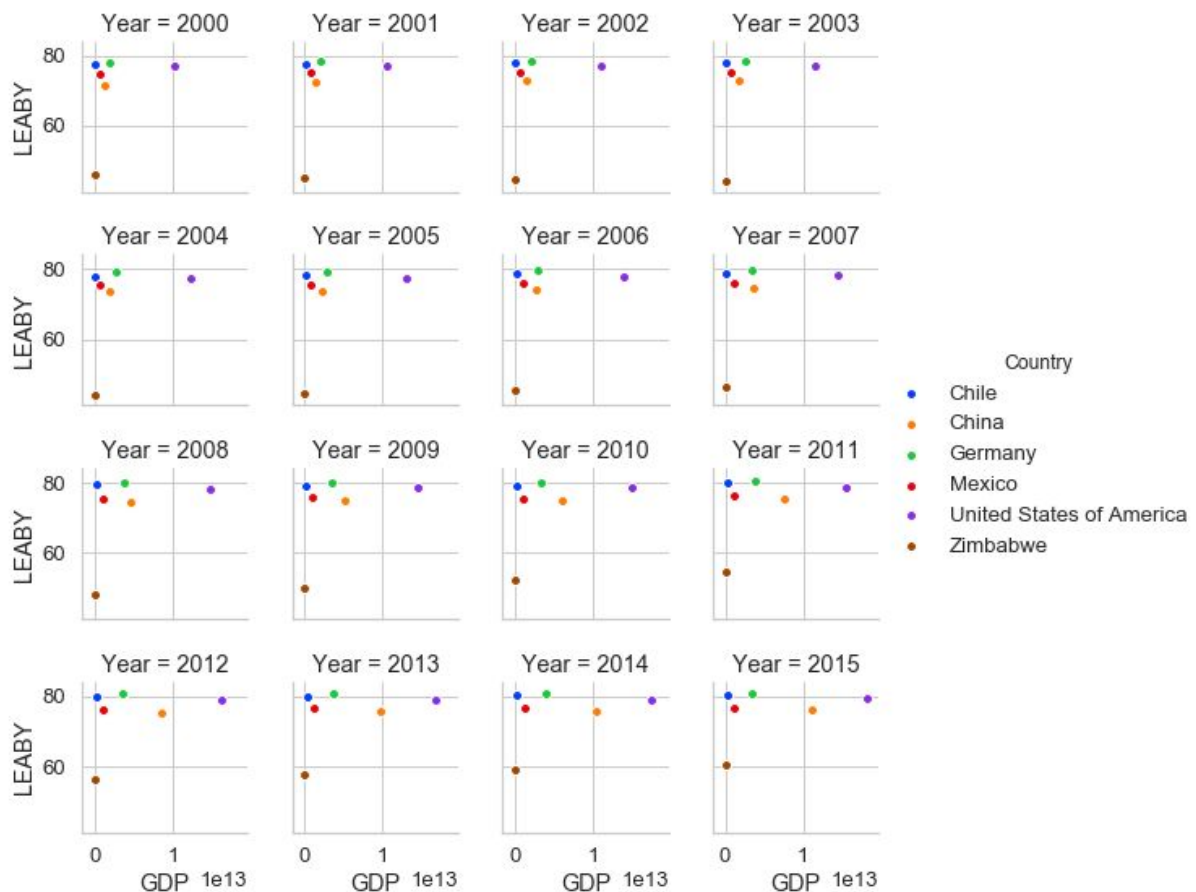


Figure 2: Series of Scatter plots showing life expectancy vs GDP for each country.

In the following group of line plots (fig 3) life expectancy at birth (“LEABY”) is plotted for each country over the 15 year time frame (from 2000-2015). These charts more clearly indicate that Zimbabwe has undergone the largest change in life expectancy.

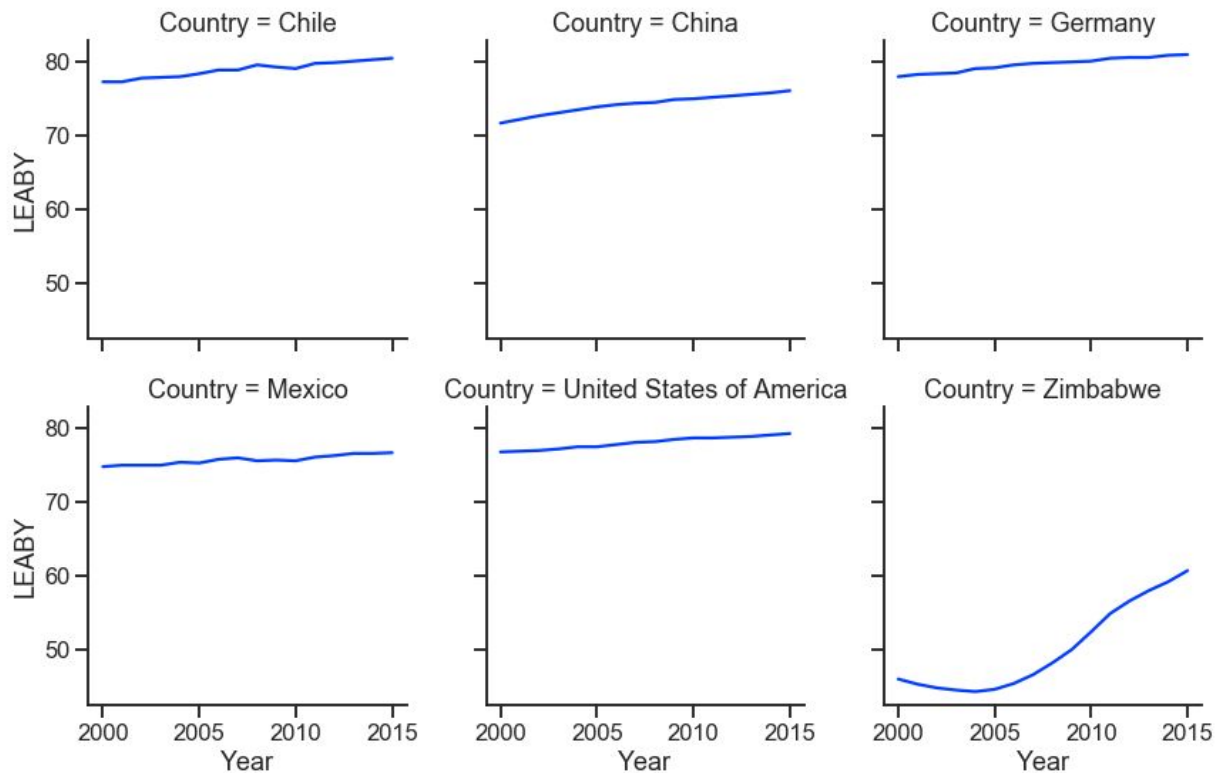


Figure 3: Line plots of Life Expectancy from 2000-2015 for six countries.

Figure 4 is also a group of line plots, but this group shows GDP for each country. GDP is in billions of US dollars. These charts are helpful when compared to the plots above in Figure 3, because you can easily see how GDP changed over the same period of time. As you can see from this chart, Zimbabwe's GDP has remained stable over this time period, so their increase in life expectancy must be explained by another factor. Similarly, the US experienced a large increase in GDP while life expectancy remained relatively stable. This may be because life expectancy in the US was already high and we have not had significant increases in healthcare quality since the year 2000. China has also experienced a rapid increase in GDP over this time period, likely due to massive industrialization.

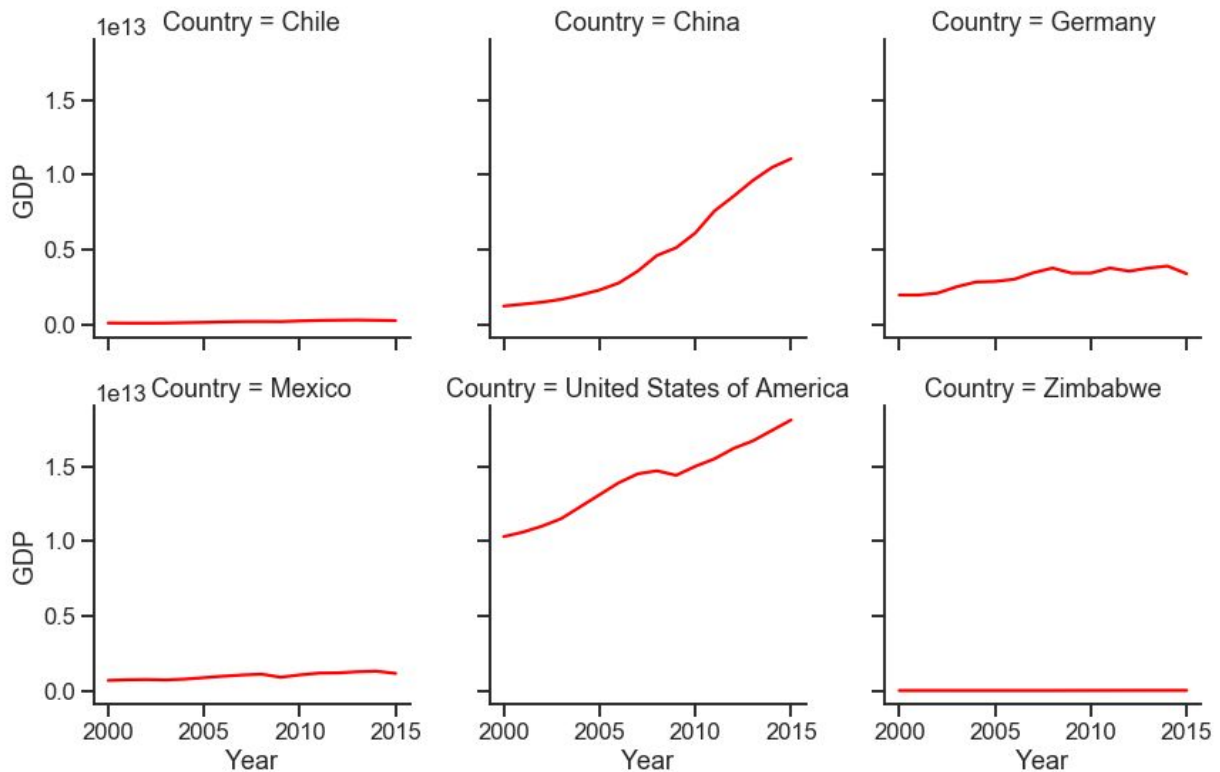


Figure 4: Line plots of GDP in billions of US dollars for six countries.

While studies indicate that there is indeed a correlation between GDP and life expectancy, it is not readily apparent from these charts. There are some limitations to this data set and further information may help draw more conclusions about the relationship between national wealth and life expectancy. Because GDP is not averaged by population, it's hard to compare the GDPs of extremely large countries like China with small countries like Zimbabwe. Shown below are the populations of each country, according to Google. A more helpful comparison might be GDP per capita vs life expectancy. In conclusion, while charts are very helpful to visualize data sets, it is important to critically analyze if you have enough data to make broad assumptions about a country's health, welfare, and culture.

Table 1: Population of each country

China	Chile	Germany	Mexico	USA	Zimbabwe
1.386 billion	18.05 million	82.79 million	129.2 million	325.7 million	16.53 million

