GDP and Life expectancy. Related?

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GDP and Life Expectancy. Further Investigation required.

In this post we examine data from six countries to find potential relationship between GDP and life expectancy at birth. Our sample suggests that countries with very low GDP tend to have significantly lower life expectancy than those with better economies. Yet, our data fails to establish strong correlation between these factors and provide little evidence of causation.

What is GDP?

GDP (or Gross Domestic Product) is a monetary measure used in economics to estimate a value of all final goods and services produced in particular country over a period of time. GDP can be useful to compare economic performance of different countries and its influence on various aspects of society. In our case, we examined GDP with focus on life expectancy at birth.

Our Sample

Our sample consists of six countries (USA, Germany, China, Chile, Mexico and Zimbabwe) over a period between 2000 and 2015. GDP data was taken from World Bank and OECD National Accounts data files. Life Expectancy data comes from World Health Organisation.
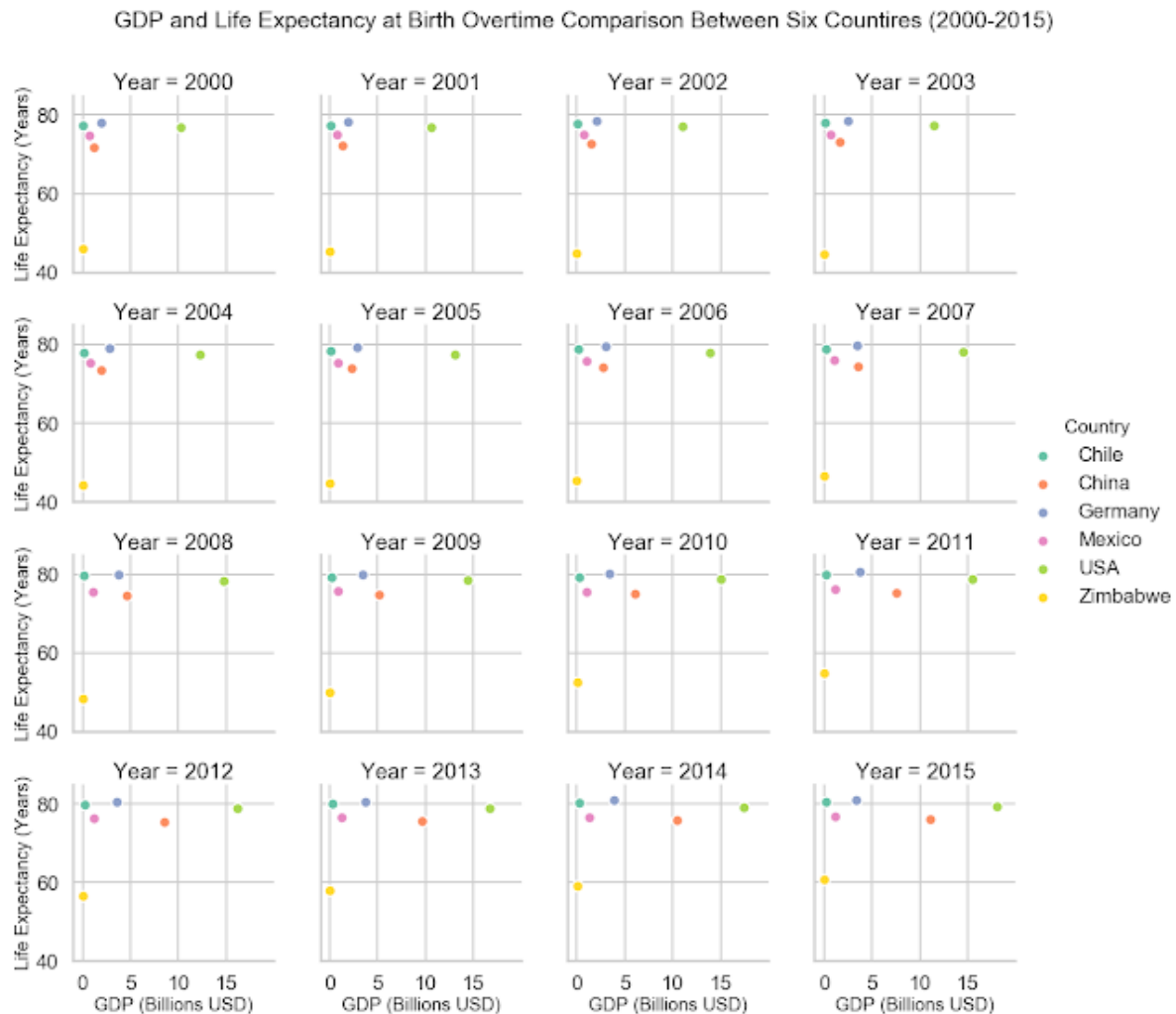
Life Expectancy. What Changed?

Life Expectancy Comparison Between Six Countires (2000-2015 Data)
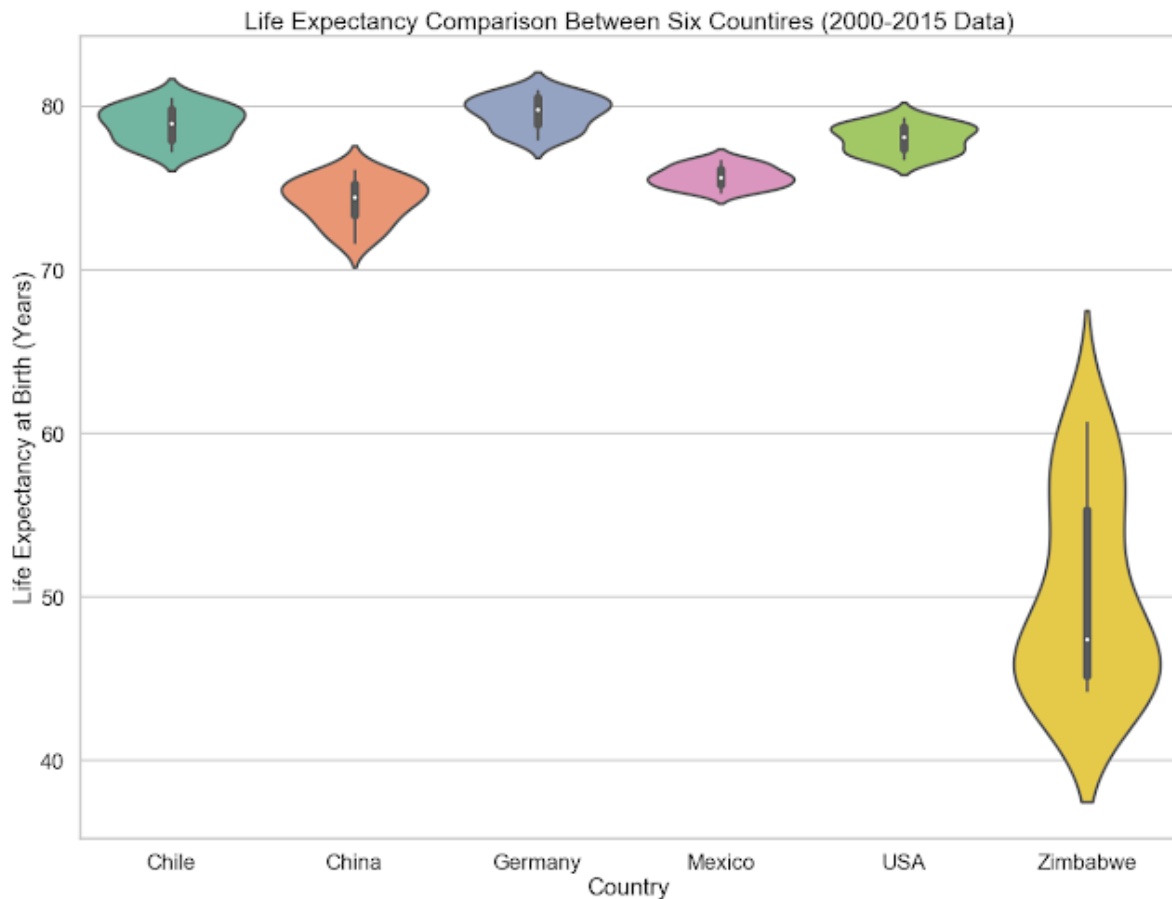
A violin chart above summarizes the distribution of life expectancy data for each country over the timespan of 2000-2015. From the graph we see a huge disparity between life expectancy in Zimbabwe and other countries. We will see the similar pattern in GDP data further in the text. Yet, Zimbabwe is also the country which increased its life expectancy the most from around 45 in 2000 to over 60 year old in 2015. The second largest increase in life expectancy is demonstrated by China.

More importantly however, we can see that leaders in life expectancy in our sample are Germany and Chile reaching over 80 years old life expectancy at the end of 2015. This result is surprising as the latter data will show a huge economic disparity between these two countries and even greater gap between them and economic superpowers such as China and USA.

GDP and Life Expectancy. What is the story?

GDP and Life Expectancy at Birth Overtime Comparison Between Six Countires (2000-2015)


A sequence of scatter plots above shows how GDP and Life Expectancy changed in six countries from our sample over the period of 15 years. Colored dots represent countries in our sample. Movement along x-axis to the right signifies increase in level of GDP, while upwards movement along y-axis shows change in life expectancy.

From these scatter plots we can see that USA (green dot) has been an absolute GDP leader in 2000 and remained so in 2015. A significant increase in GDP is also demonstrated by China (red dot). Yet, despite economic differences and even absolute leadership (in case of USA) or unprecedented leap (in China), differences between life expectancy in these countries and that in Germany, Chile and Mexico are significantly less pronounce along the whole 15 year period. Significant change in life expectancy is only seen in Zimbabwe (yellow dot). However, the scale of scatter plots fail to show the actual significant GDP gap between Zimbabwe (16 billion USD in 2015) and Chile (240 billion USD in 2015).

These scatter plots suggest the relationship, if any, between GDP and life expectancy might be more complicated than we anticipated. In order to investigate it further, we plot GDP and Life Expectancy data overtime, separately for each country.

GDP. Life Expectancy. Going own ways?
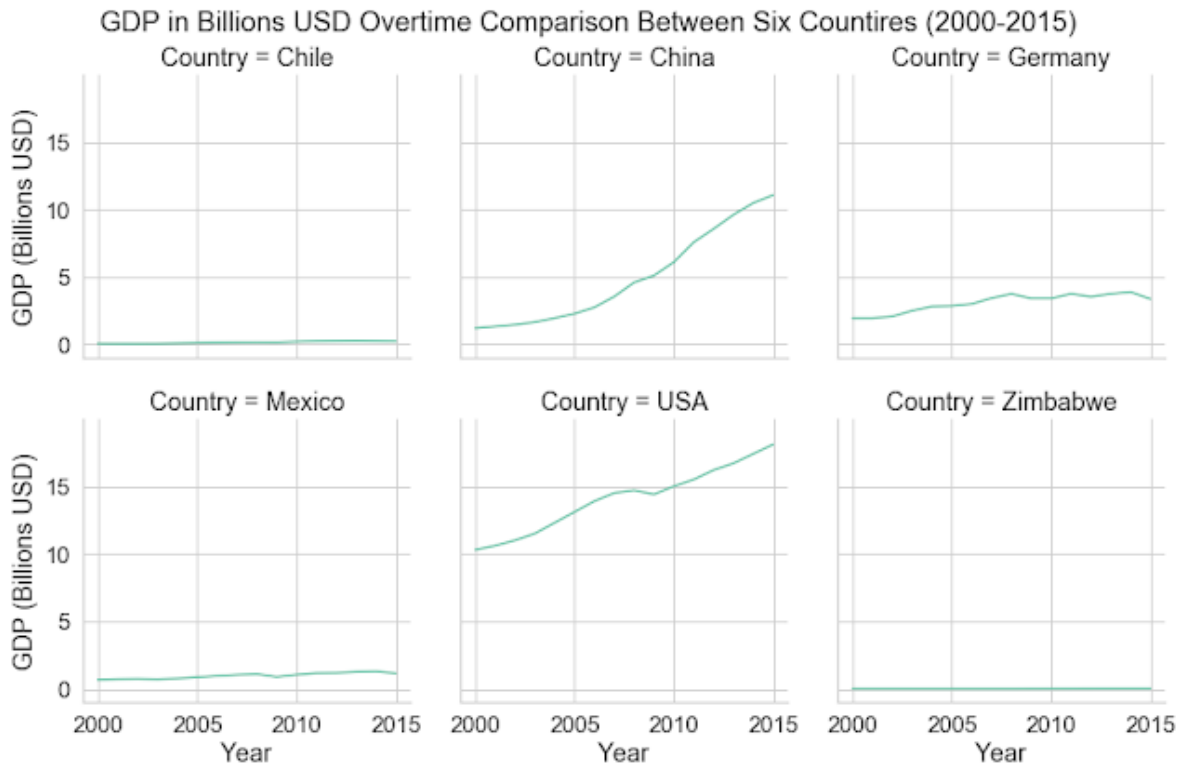
Line plots above show GDP change (along y-axis) in each country individually over the period of 15 years. This type of data visualizations clearly demonstrated the USA and China economic powerhouses and the economic gap between different countries in the sample. The gap so wide that the scale fails to meaningfully show economic performance of Zimbabwe and to lesser extent - Chile. However, we can clearly see the effect of world economic crisis of 2008 on at least 4 out of 6 countries. Thus, USA was heavily impacted as the origin of economic disaster, yet recovered in 2010 and continued its growth. Germany was also affected and continued fluctuation with no meaningful economic increase since 2008. Similar story is observed in Mexico as a country is heavily dependent on USA market. Interestingly, China also experienced world economic crisis, yet it only slowed down its economic expansion for a period of 2 years to skyrocket again after 2010.

Has world economic crisis impacted life expectancy as well in those countries as well?
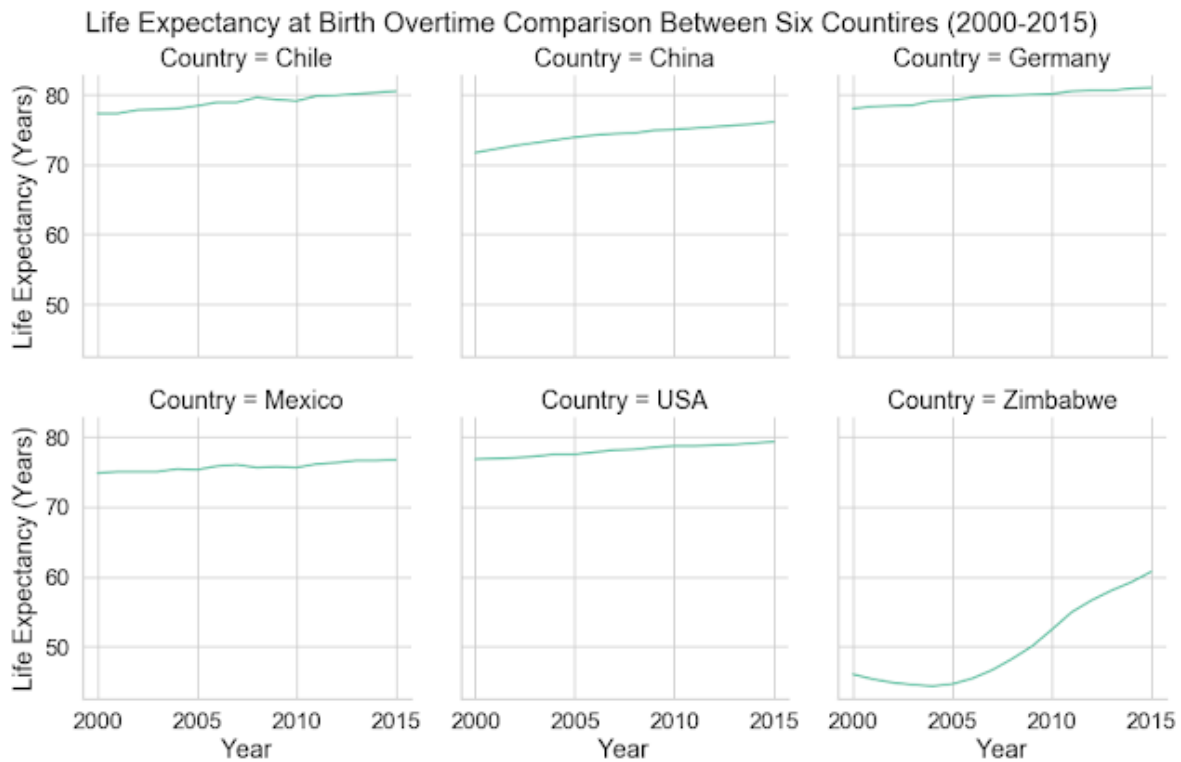
Line charts above with life expectancy data show no meaningful effect of economic hardships of world economic crisis of 2008 on life expectancies. USA as well as Germany demonstrate minor growth along the whole period of 15 years. Similar pattern is in China, although the rate of increase is higher. Life expectancy in Zimbabwe starts soaring from the 2006. Only two countries who seem to have a minor decrease in life expectancy in the aftermaths of world economic crisis are Chile and Mexico. Yet, the data provided is not enough to establish a real causal link between the two.

GDP. Life Expectancy. Is there a story?

In order to answer this question let's examine the case of Zimbabwe from our sample. Two bar charts below show its life expectancy and GDP change over time.

Zimbabwe Life Expectancy at Birth in 2000-2015

Zimbabwe GDP Growth in 2000-2015 in USD
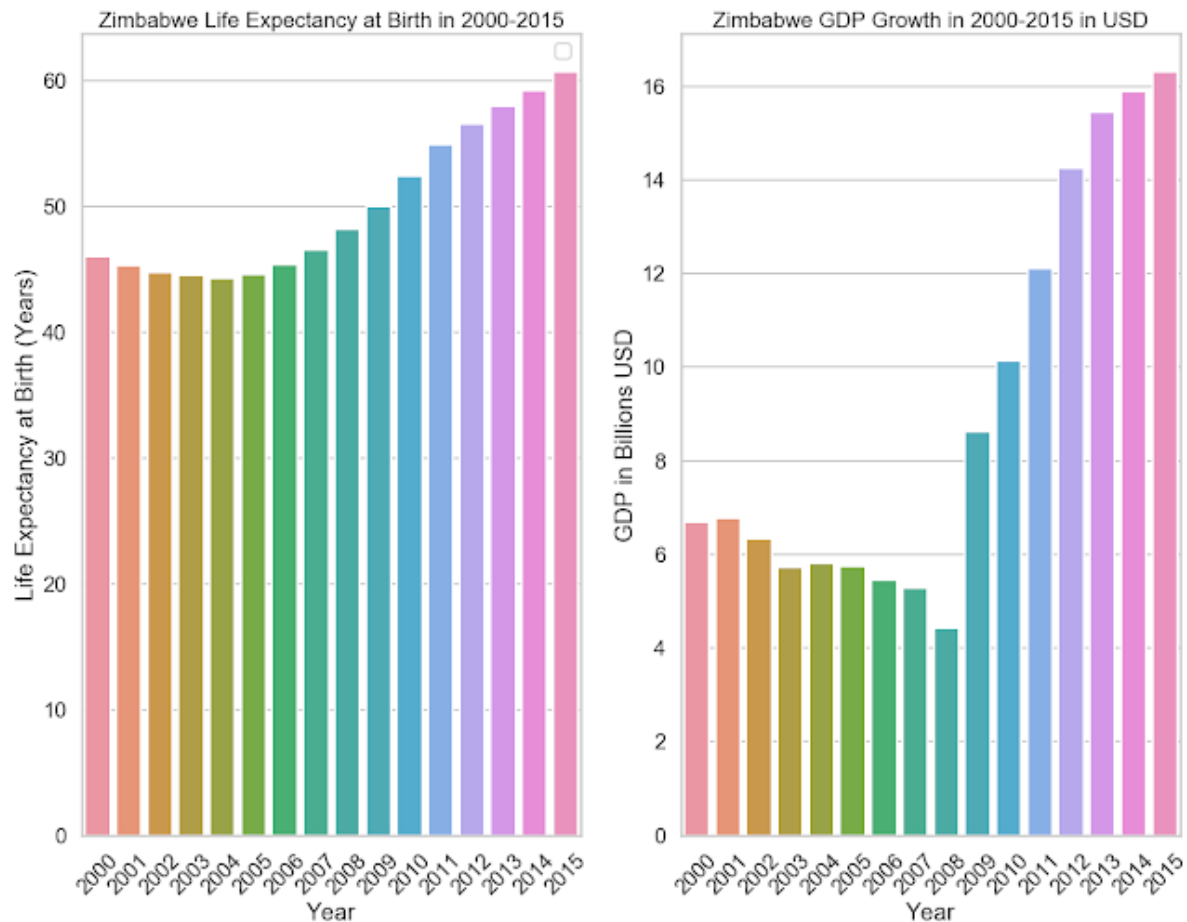
From the charts we can clearly see that upwards trend in life expectancy started as early as 2004. This is particularly surprising as at that point country was at a decade-long period of hyperinflation, reflected in its GDP figures plummeting between 2000 and 2008. Yet, we see a significant life expectancy increase even in 2007 when inflation reached 24,411% according to World Bank and 2008 when it peaked at 231 million % according to countries own central bank (Rodgers, 2018). Therefore, it is hard to tell how much of the subsequent increase in life expectancy at birth can be attributed to the following economic recovery as national currency was abolished in favor of USD.

One explanation for such contradiction may be in contributions of international humanitarian organizations to local healthcare. Thus, Unicef is heavily involved in Zimbabwe, focusing on children mortality rate in particular as well as combating spread of malaria and HIV and supplying local hospitals and schools with drinkable water. Thus, between 1999 and 2010/11 child mortality at birth decreased from 65 to 57 deaths per 1000 life births in the country, which could significantly impact our data (zn.one.un.org, 2018).

Overall, this example shows multiple limitations of our data sample. The relationships between raw GDP and life expectancy seems to be correlational at best. It also clearly doest not take into account potential influences of climate and diseases, nutrition habits and difference in healthcare systems, not to mention humanitarian aid. The latter can be particularly influential in the context of small poor developing countries.

Can we do better?

There are several things we can do to improve our performance during future studies of links between economic performance and life expectancy. Thirst thing we need to substitute raw GDP data by healthcare spendings per capita which would include states' budget spendings as well as related humanitarian aid. This will ensure we only count funds related to healthcare and not money which otherwise end up in a military budget or education. We also want to extend number of countries in our sample to incorporate more data from respective geographical regions. This will make it possible to control our data for climate and disease as well as smooth economic imbalance, remove outliers and improve quality of our data.

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Links:

Rodgers, L. (2018). *10 numbers that tell the story of Zimbabwe*. [online] BBC News. Available at: https://www.bbc.com/news/world-africa-42013720 [Accessed 11 Feb. 2019].

Zw.one.un.org. (2019). *Reduce Child Mortality | UN in Zimbabwe*. [online] Available at: http://www.zw.one.un.org/togetherwedeliver/millennium-development-goals/4-reduce-child-mortality [Accessed 11 Feb. 2019].