

# *Do people in richer countries live longer?*

## Comparing GDP with Life expectancy at birth.

### Introduction:

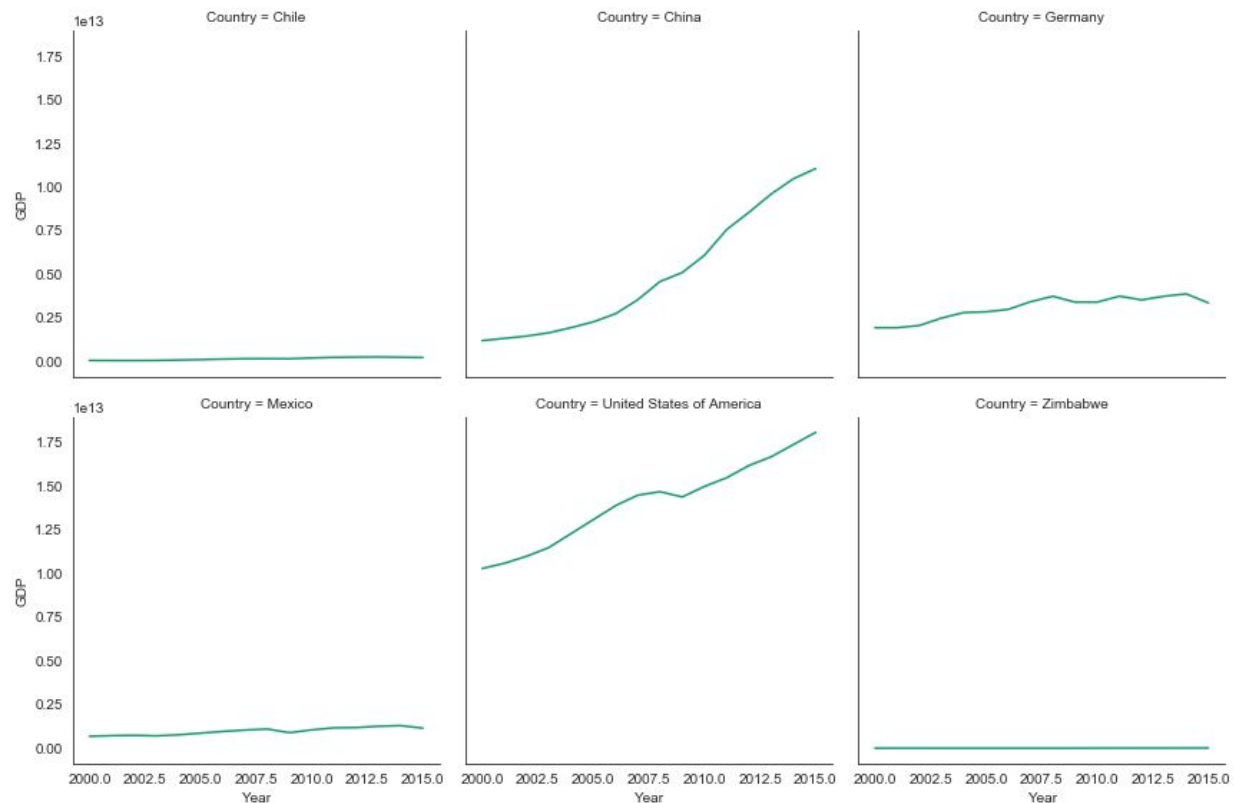
**Objective:** The purpose of this article is to compare Gross Domestic Product (GDP) data with life expectancy at birth (LEAB) between a sample of six different countries in order to better understand if there is a correlation between the two. The article assesses GDP growth and LEAB over time in turn using line graphs, then uses violin plots and scatter charts to better analyse if there is a correlation.

**Definitions:** GDP is defined as *'the total monetary value of all finished goods and services produced within a country within a given year'*. LEAB is defined as the mean number of years citizens of a country live from the year they are born.

**Sources:** The GDP data used for this article is taken from World Bank and OECD data, and life expectancy data is taken from the World Health Organisation.

### Analysis

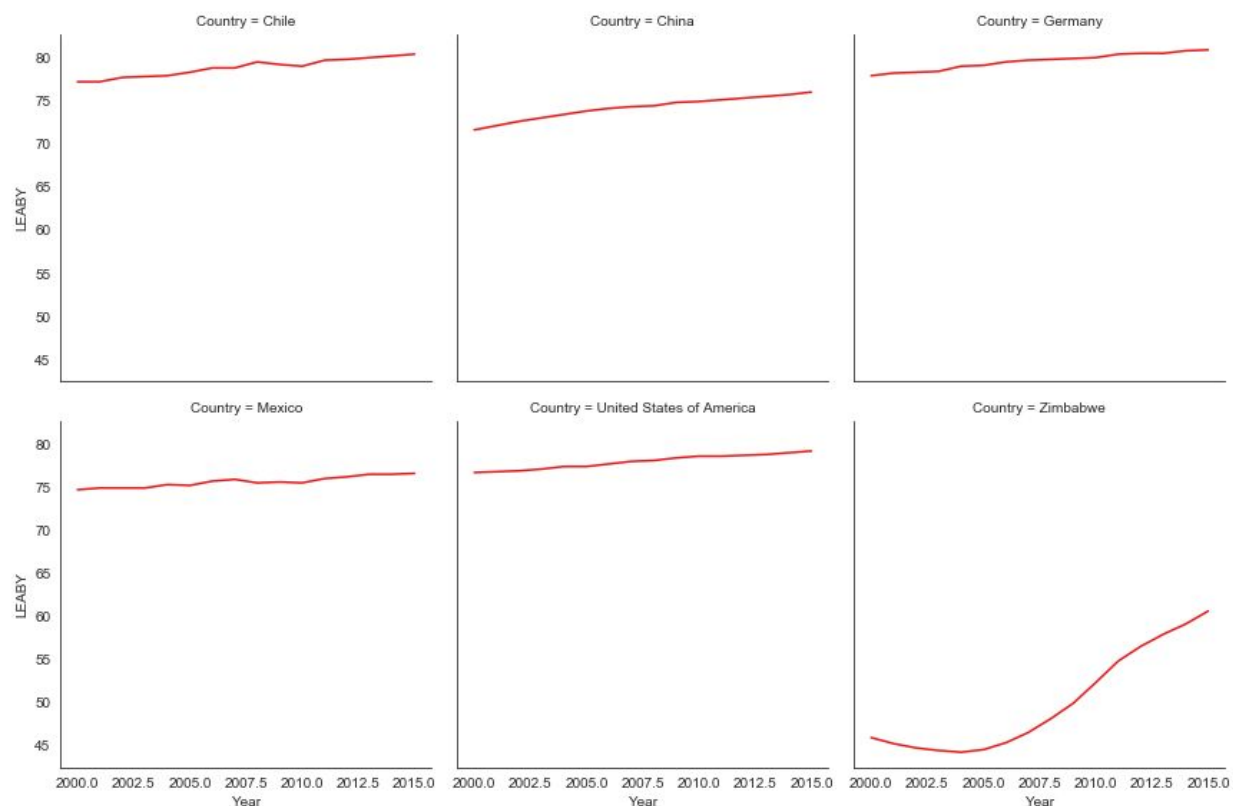
Figure 1: GDP (in USD Trillions) over time:



Of the six countries in the sample, China has clearly seen the most rapid economic growth - a result of numerous factors such as the reform of the economy into a free market system and major public sector investment in education and infrastructure. The United States experienced the second highest level of GDP growth, followed by Germany which grew at a slower rate. Mexico, Chile and Zimbabwe show the lowest GDP growth over the time period.

All countries saw a brief economic slowdown after 2007, the year of the global financial crisis, but China was the only country that did not have negative economic growth (i.e a recession) in that year.

*Figure 2: LEAB over time*



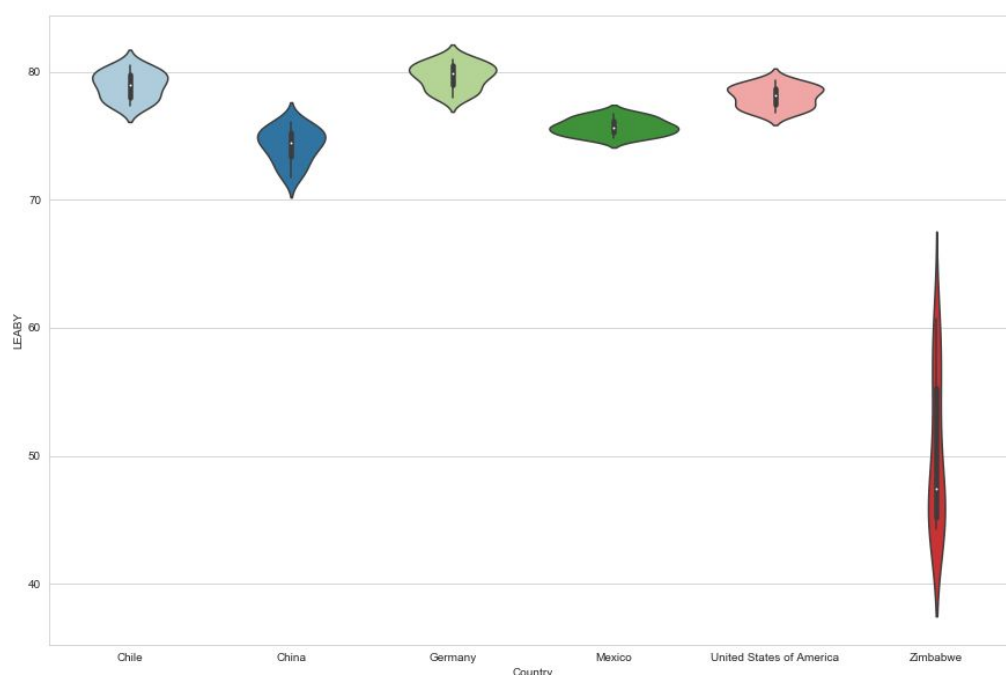
All six countries in the sample saw a rise in LEAB over the 15 years in the time frame, with all countries except Zimbabwe showing a gradual increase over time with minimal fluctuation. Zimbabwe was the clear exception here, with LEAB declining for the first five years (the only country where such a long decline took place), followed by a sharp increase until 2015.

Having a larger total GDP does not directly correlate to having a longer LEAB. This is most clearly indicated by Chile and Mexico having greater LEAB rates than China in every year, despite having significantly lower GDPs. However, this is a result of taking net GDP figures rather than GDP per capita, which accounts for population. For example, Chile's GDP per capita in 2015 was more than 50% higher than China's (\$13,736 compared to China's \$8069) (World

Bank), which is one likely explanation for Chile's higher LEAB than China despite lower net GDP.

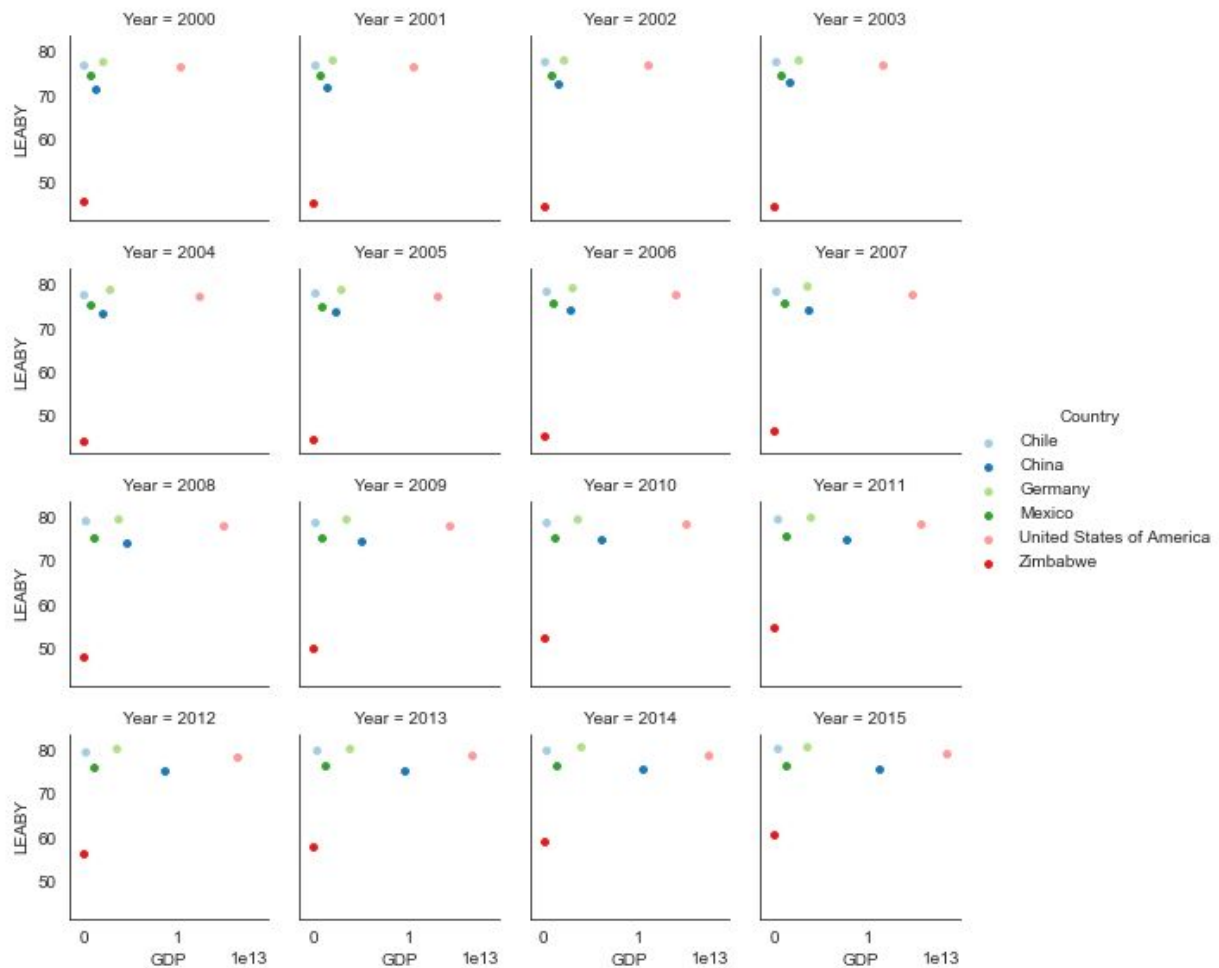
While having a larger net GDP does not directly correlate to having a higher LEAB, comparing Figure 1 and Figure indicates that changes in GDP clearly correlate to changes in LEAB. China's constant year-on-year growth is matched by constant year-on-year LEAB rises, while Zimbabwe's initial GDP decline from 2000 to 2005 and subsequent economic expansion until 2015 is matched by near identical trends in LEAB rates. The trendlines for GDP and LEAB are similar for all countries, even if the gradient of these lines may differ due to the large number of factors affecting LEAB. While it is likely that increasing or falling GDP is a major contributor to changes in LEAB due to the ability to invest in health infrastructure, services and better nutrition, we cannot assume it is the only causation as other factors may also be at play.

*Figure 3: Violinplot of LEAB*



The violinplot above comparing LEAB by country allows analysis of probability density and data distribution. Like the linecharts above, it clearly shows that Zimbabwe has experienced the most significant changes in LEAB, while Mexico has seen only minimal change over time (reflected in the short and wide shape of the density plot).

Figure 4: Scatter Chart comparing GDP with LEAB



The scatter chart above also illustrates the correlation between rising GDP and rising LEAB, with China's rising position on both the X and Y axis the best example of this trend. The scatter graph also indicates that Chile, China Germany and Mexico all had relatively similar GDP in the early 2000s, and that despite China's rapid increase in GDP growth over 15 years this has not resulted in a higher LEAB ranking than in 2000 (likely a result of significant population disparities within the sample). Despite all the GDP shifts over the period, the LEAB rankings for the six countries remained the same. This suggests that while increasing GDP does correlate to rising LEAB, the proportionality of change is not relative and thus a 10% increase in GDP does not result in a 10% rise in LEAB.

## Conclusion

Ultimately comparing GDP with LEAB does indicate that there is a correlation between rising GDP and a corresponding rise in LEAB, and that having a larger economy does not necessarily result in citizens living longer. However, the use of net GDP rather than GDP per capita is misleading since it does not account for the population size of the different countries, which

varies dramatically. Comparing GDP per capita with LEAB would provide a clearer indication of whether being better off economically as a citizen means that you are likely to live longer. Likewise, the use of absolute figures for both GDP and LEAB makes it difficult to analyse to what extent growing GDP results in a higher LEAB. Using GDP per capita and LEAB annual percentage increase figures would provide a more accurate depiction of what impact economic growth has on LEAB, and the extent to which they correlate.

*Ed Knight, 24th February, 2019*