Why do Chileans and Germans live longer than Americans?

Introduction

Visualizations
- Life Expectancy by Country
- Life Expectancy by Country (2000-2015)
- GDP by Country
- GDP vs Life Expectancy

Conclusion
- Further Questions to Investigate
- Data Limitations

Introduction

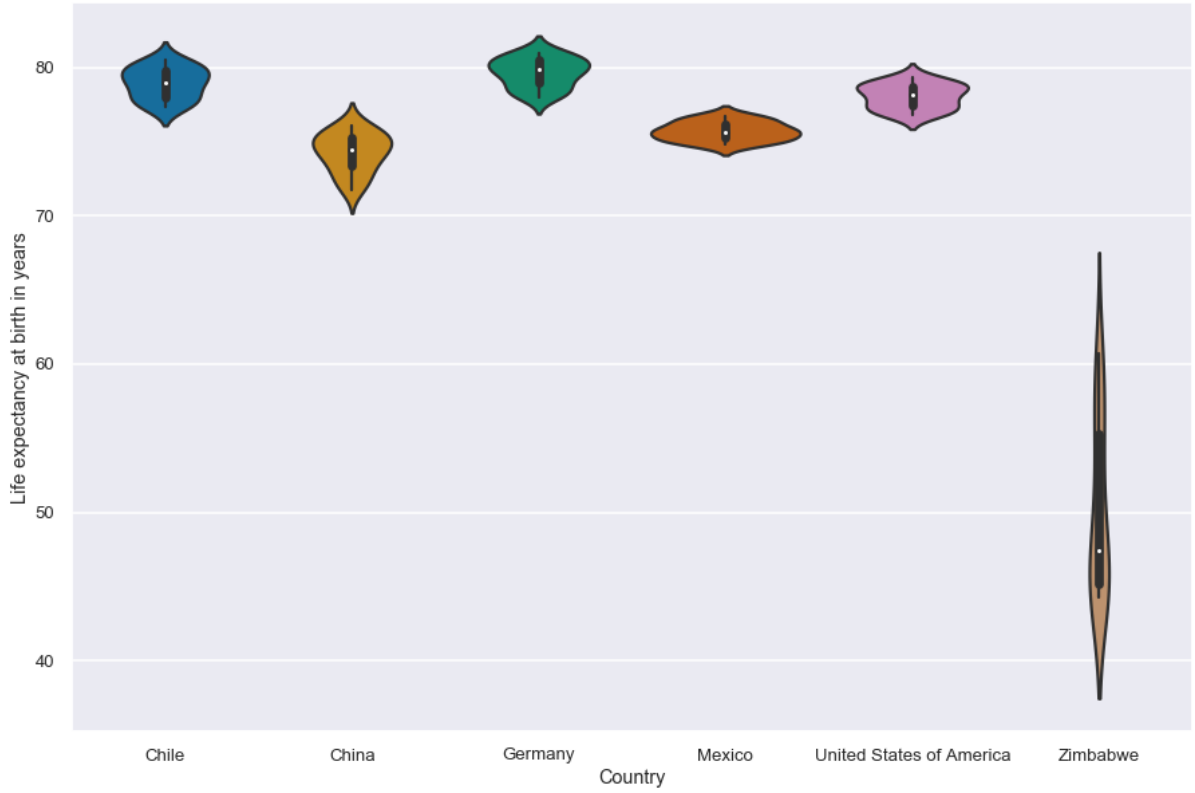
In this research, we tried to identify the relationship between Gross Domestic Product (GDP) and life expectancy for six countries from 2000 to 2015: Chile, China, Germany, Mexico, the United States, and Zimbabwe. GDP data came from the World Bank, and life expectancy data came from the World Health Organization.

You might be asking, why does the relationship between GDP and life expectancy matter?

The treatment and prevention of life-threatening illnesses is a vital part of any well-functioning society, and if a relationship between GDP and life expectancy does exist, that could allow economy-focused organizations like the World Bank and health-focused organizations like the World Health Organization to more easily collaborate towards a common goal (“Kill two birds with one stone”), as well as helping them better understand their overall impact on societies.

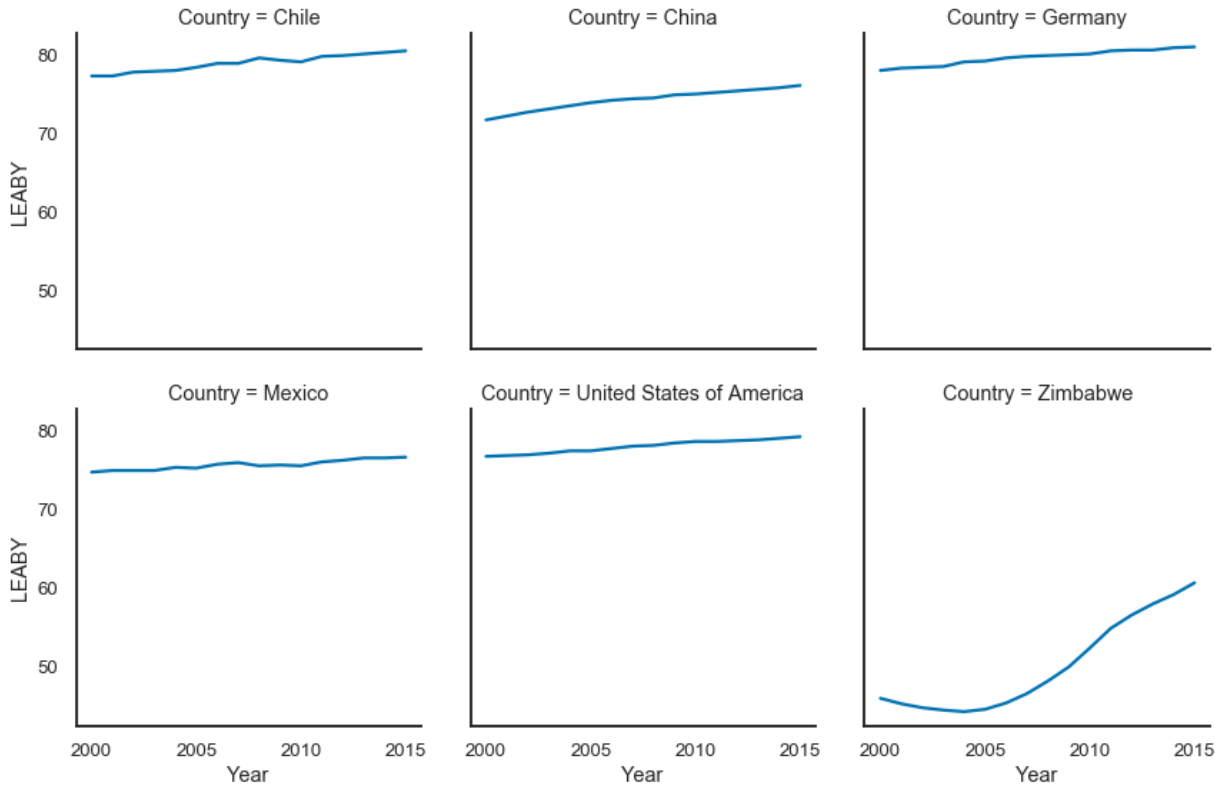
Visualizations

Life Expectancy by Country



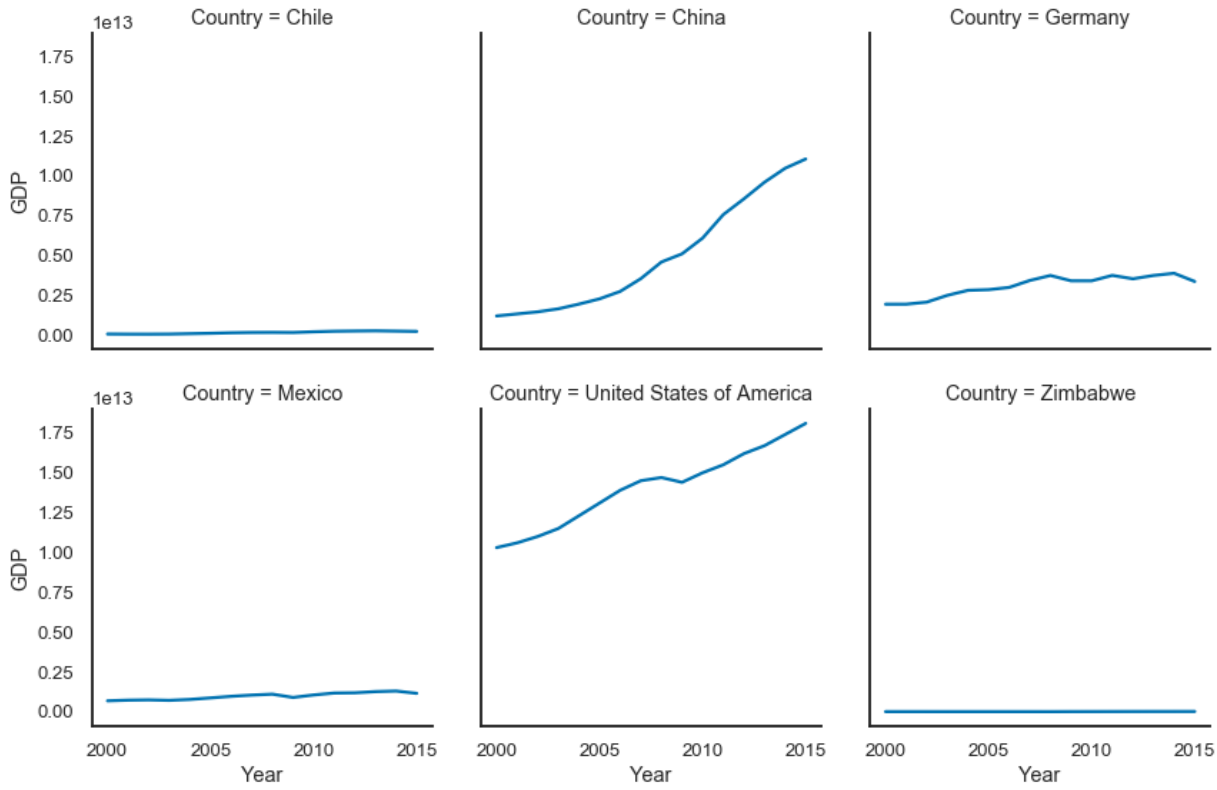
In this violin plot, we can see that when it comes to life expectancy from 2000 to 2015, Zimbabwe is clearly the outlier of the group — the life expectancy of Chile, China, Germany, Mexico, and the US range between 75 and 80, while the median for Zimbabwe was below 50.

Life Expectancy by Country (2000-2015)



This line graph shows the same data but over time. Chile, China, Germany, Mexico, and the US all have high (>70) life expectancies that have been steadily increasing over time. Meanwhile, Zimbabwe's life expectancy was decreasing and hit a low point of 44.3 in 2004, and then began a rapid ascent, reaching as high as 60.7 in 2015.

GDP by Country



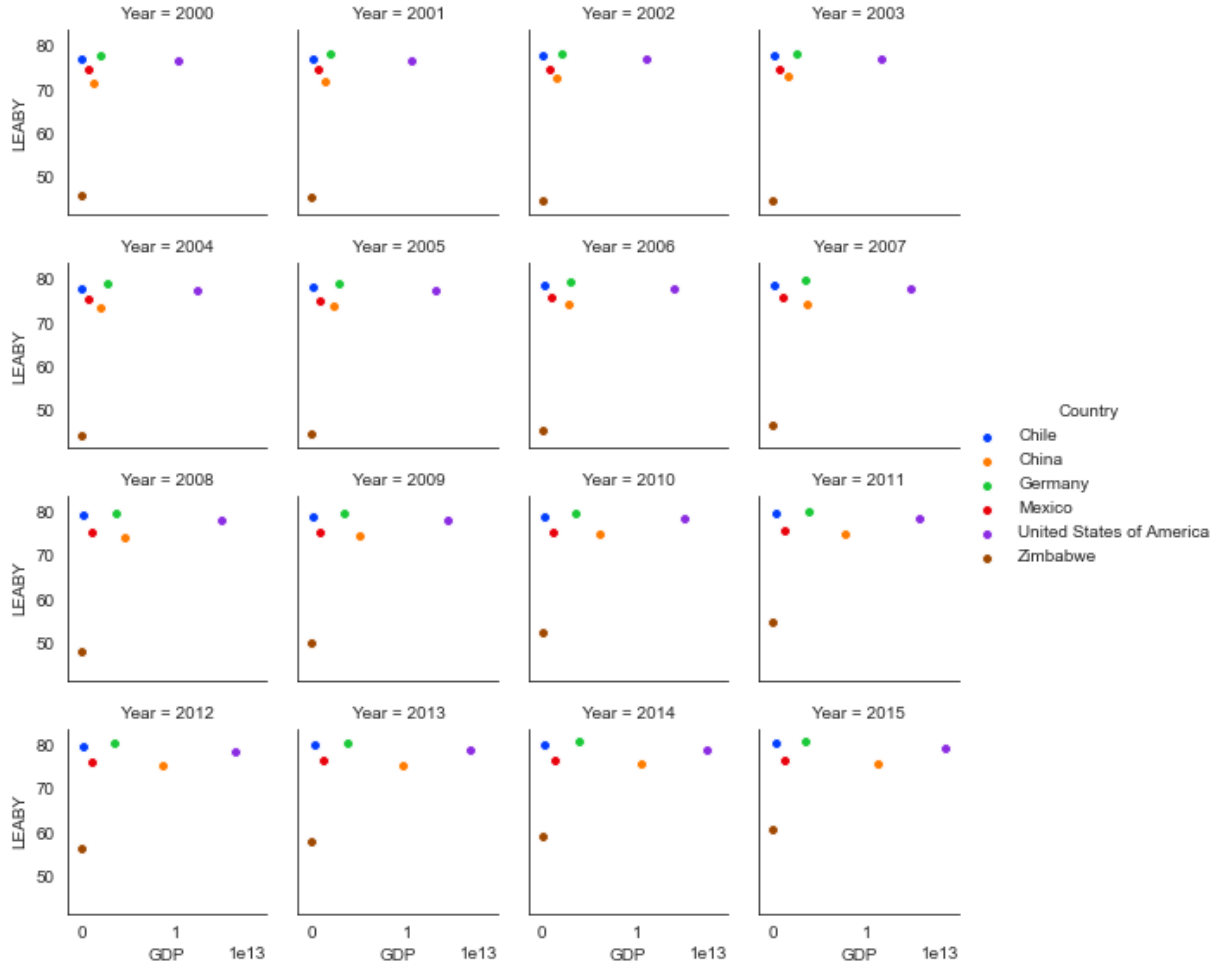
Comparing this line graph of GDP to the line graph of life expectancy immediately above it, we see some interesting and counterintuitive trends.

The GDPs of China and USA increased significantly between 2000-2015, and yet the increase in their life expectancy was essentially no different from that of countries like Chile, Germany, and Mexico which saw much less GDP growth.

As mentioned before, Zimbabwe's life expectancy increased 37% from its lowest point (44.3) in 2004 to its peak (60.7) in 2015. And yet, its GDP remained relatively flat during that time (on an absolute level, compared to the other countries).

Lastly, absolute GDP seems to have no relationship to life expectancy. The GDPs of Chile, Germany, and Mexico are much lower than that of China and the US, and yet their life expectancies are similar (or higher) than that of China and the US.

GDP vs Life Expectancy



Viewing GDP and life expectancy as a scatter plot shows that there seems to be little to no correlation between the two.

We can make the same observations mentioned earlier — for example, the GDP of the United States and China increased significantly (i.e. moved to the right in the graphs) between 2000 and 2015, but with little comparable change in life expectancy. Meanwhile, the life expectancy of Zimbabwe increased greatly (i.e. moved up on the graphs) between 2000 and 2015, but with no notable increase in GDP.

Conclusion

We've seen that life expectancy seems to have little to no relationship to absolute GDP levels, and yet we are left with more questions than answers.

Further Questions to Investigate

For example, what happened in Zimbabwe until 2004 to make its life expectancy decrease, and then what happened in the years after to cause life expectancy to increase so dramatically?

Some quick research shows that Zimbabwe was going through an HIV and AIDS epidemic in the 1990s and 2000s, and its economy started shrinking in 2000 due to political turmoil, corruption, and mismanagement. Further research and analysis should explore how the HIV and AIDs epidemics in other countries has affected their life expectancy, and how political instability affects both GDP and life expectancy.

A second question arising from this analysis is, how is Chile able to maintain such a high life expectancy, despite having the second lowest absolute GDP of the six countries we looked at? What is Chile doing right that other countries could learn from?

One possible hypothesis is the fact that despite its relatively lower GDP, Chile provides free and universal health care for its citizens. Further research could explore life expectancy and other health outcomes for all countries (like Chile, Germany, Mexico, and China) providing universal health care, versus all countries (like the US and Zimbabwe) that do not.

Data Limitations

It's important to note that the scope of this analysis was limited in several ways by the data at hand.

Use GDP per capita instead of absolute GDP

First, we used absolute GDP. This causes issues in visualizations because when graphing the GDPs of multiple countries in a single graph, the absolute GDP and GDP growth of large economies like China and the US dwarfs that of lower-GDP countries like Chile and Zimbabwe. As a result, even though Zimbabwe's GDP increased a whopping 143% between 2000-2015, this was not at all visible in our visualizations.

Using GDP per capita as a base metric would be much easier to visualize across economies of varying size, and would require historical population data for each country as well.

Use more historical data (pre-2000)

It's clear that average life expectancy currently has a global upper bound of around 80 to 85 years. According to data from the World Health Organization, the country with the highest life expectancy (as of 2015) is Japan at 83.7.

It's not hard to imagine that every country at some point goes through a "growth phase" where their life expectancy is lower (e.g. in the 50s or 60s) and grows rapidly, before eventually flattening out in the 70s. If we only look at data from 2000 and after, it's very likely we're omitting the "growth phase" of many countries, and only looking at their data once things have already flattened out, which could cause us to draw incorrect conclusions on the relationship between life expectancy and GDP.

Include more countries

This analysis looked at six countries: Chile, China, Germany, Mexico, the United States, and Zimbabwe. This was mostly arbitrary, and in order to make robust and reliable statements about the relationship between GDP and life expectancy, we would need to look at as many countries of the world as possible.

For example, a quick glance at this map of average life expectancies by country shows that Sub-Saharan Africa, the Middle East, and South(east) Asia have relatively lower life expectancies. Our analysis included only one country (Zimbabwe) from those areas. A more exhaustive analysis would also look at regional trends, which could then be tied to larger regional and/or cultural forces (e.g. war, disease, poverty) as possible causal factors.