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Life Expectancy vs. GDP

Introduction

The goal of this project was to measure the relationships between the GDP and life expectancies for six different countries. The countries in question were Chile, China, Germany, Mexico, Zimbabwe, and the United States. Each country's GDP and life expectancy had a positive correlation with time, meaning they tended to increase as the years went on. Additionally, the countries' life expectancy was positively correlated with its GDP at the time. As the GDP increased, the life expectancy of said country tended to increase. The distributions of life expectancy for the countries, as plotted on a histogram, were non-normal and non-unimodal for the most part. The same could be said about the life expectancies of all the countries plotted together. The data is originally from the World Health Organization and World Bank, but it was received directly from Codecademy for this analysis.

Body

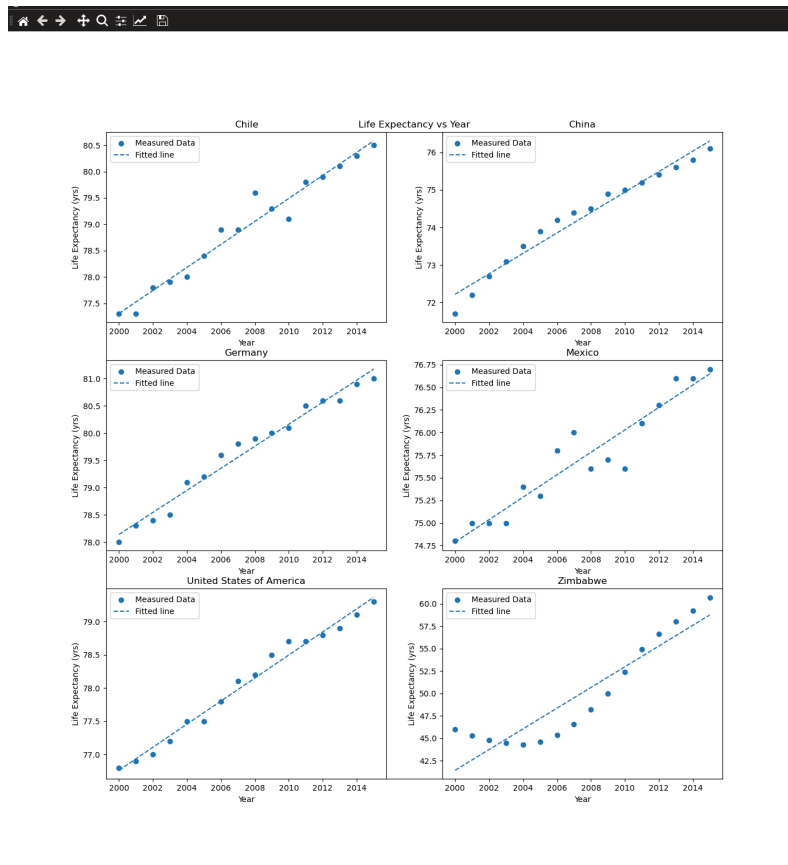


Figure 1: Life Expectancy vs. Year

Correlation Coefficients:

$$R_{\text{Chile}} \approx 0.981$$

$$R_{\text{China}} \approx 0.983$$

$$R_{\text{Germany}} \approx 0.987$$

$$R_{\text{Mexico}} \approx 0.950$$

$$R_{\text{US}} \approx 0.992$$

$$R_{\text{Zimbabwe}} \approx 0.924$$

For all of the countries, there was a strong, positive, linear correlation between life expectancy and the year it was measured. Although the data for Mexico looks somewhat scattered and Zimbabwe's data looks curved, their linear associations are strong according to their correlation coefficients. Zimbabwe had the most drastic increase in life expectancy over the time period of these measurements. Its life expectancy increased by approximately 12 years, which is much more than the life expectancy increases of all the other countries.

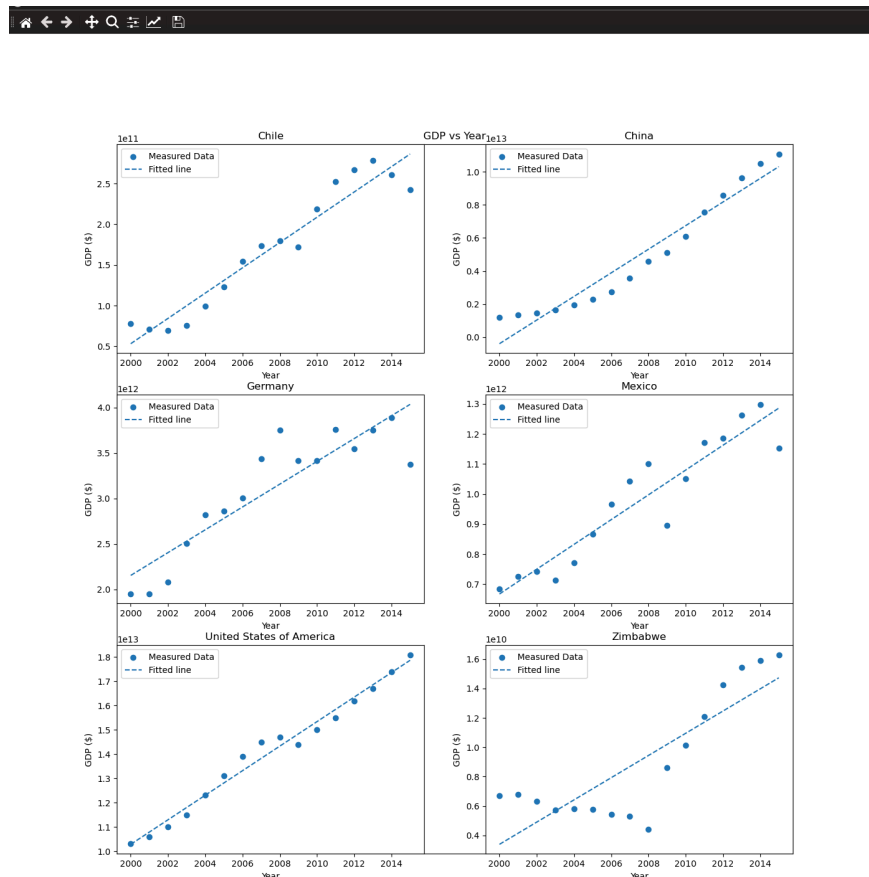


Figure 2: GDP vs. Year

Correlation Coefficients:

$$R_{\text{Chile}} \approx 0.962$$

$$R_{\text{China}} \approx 0.969$$

$$R_{\text{Germany}} \approx 0.894$$

$$R_{\text{Mexico}} \approx 0.937$$

$$R_{\text{US}} \approx 0.990$$

$$R_{\text{Zimbabwe}} \approx 0.838$$

Additionally, there was a strong, positive correlation between GDP and Year for all the countries according to their correlation coefficients. Although the data for Mexico, Zimbabwe, and Germany deviate noticeably from the line, they strongly follow an increasing, linear trend as the years increase. The GDP, for all the countries, measured tends to increase as the years the go on.

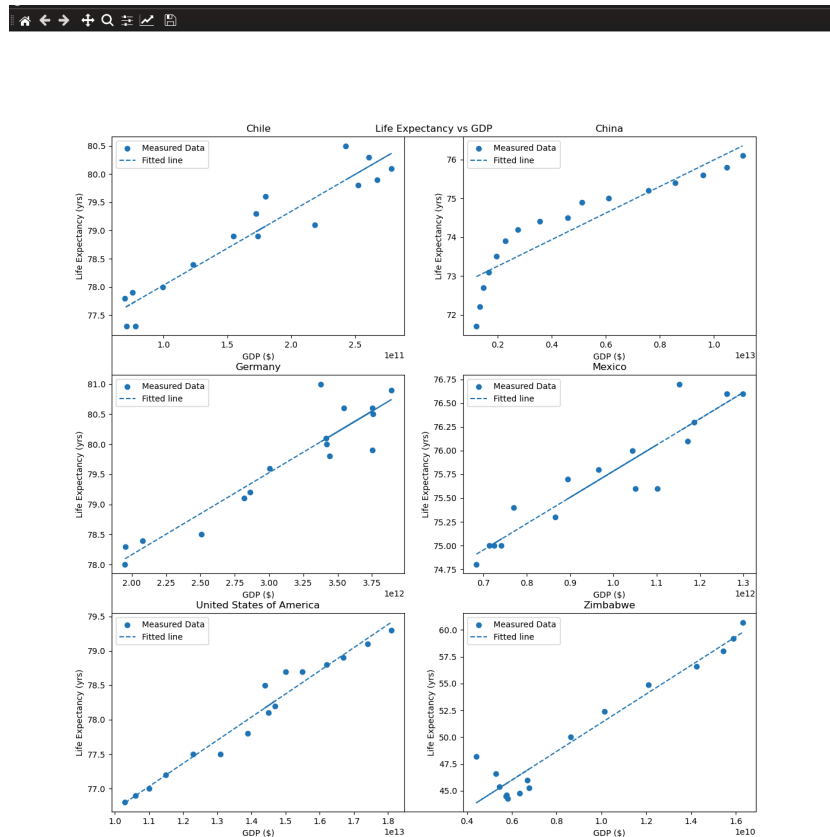


Figure 3: Life Expectancy vs. GDP

Correlation Coefficients:

$$R_{\text{Chile}} \approx 0.950$$

$$\begin{aligned}
R_{\text{China}} &\approx 0.909 \\
R_{\text{Germany}} &\approx 0.933 \\
R_{\text{Mexico}} &\approx 0.932 \\
R_{\text{US}} &\approx 0.982 \\
R_{\text{Zimbabwe}} &\approx 0.966
\end{aligned}$$

There is a strong, positive, linear correlation between the life expectancies and GDPs for each of the six countries. Although the data is scattered on the plots for Mexico, Chile, and Germany, they all follow an overall increasing, linear trend. The life expectancies tend to increase as the GDP increases.

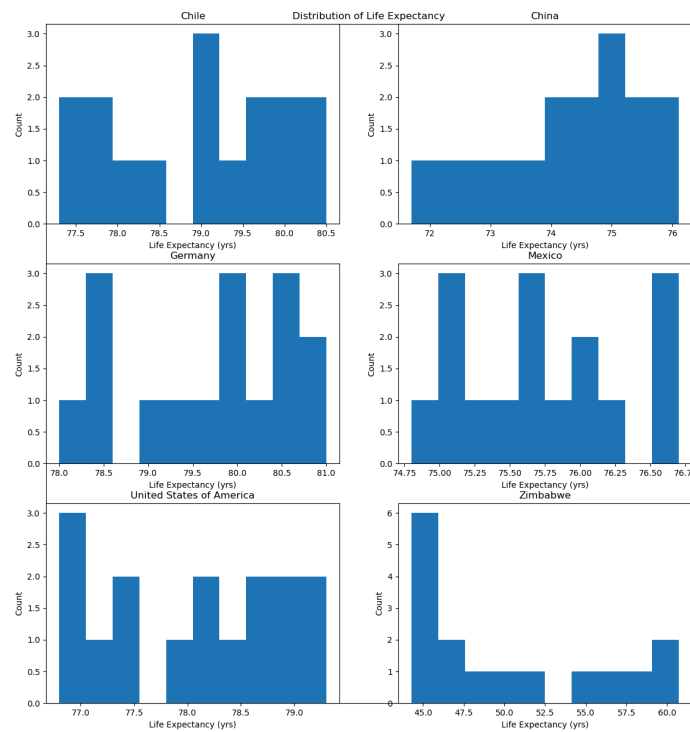


Figure 4: Distribution of Life Expectancies (for each country)

The distributions of life expectancy are, for the most part, not unimodal. Zimbabwe's, Germany's, and Mexico's data have multiple life expectancies that occur the most. Also, Zimbabwe's, Germany's and the U.S's data are split into two parts. This could be due to the overall deviation of the data from a pure, linear correlation in our previous Life Expectancy scatter plots. China's life expectancy distribution is skewed to the left, meaning that the majority of measured life expectancies were from 74 to 76 years for China. This could be due to China's high GDP. The Life expectancies of Germany, The U.S and Chile are significantly higher than

those of Zimbabwe. Although the GDPs of Chile and Germany are much higher than that of Zimbabwe, the U.S and Zimbabwe have similar GDPs. This could mean that Zimbabwe's low life-expectancy can be due to both GDP and other factors.

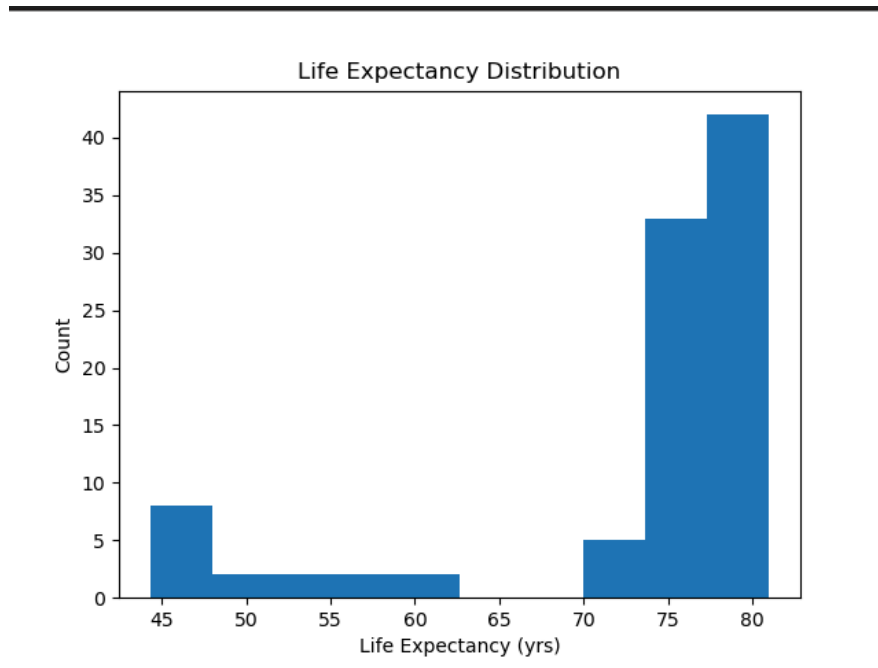


Figure 5: Distribution of all Life Expectancies

The aggregated distributions of life expectancy for all the countries are bimodal. The lower life expectancies (ranging from roughly 45 years to 63 years) corresponds to the life expectancy measurements of Chile. The other part of this distribution corresponds to the life expectancies of the other five countries. This could possibly mean that Zimbabwe could have systemic problems that increase the mortality of its citizens. For the five countries other than Zimbabwe, the most common life expectancy range is from 77.5 to 80 years.

Conclusion

As each country's GDP increased, their life expectancies increased in a linear fashion. Additionally, both GDP and life expectancy increased over time (from 2000 to 2015). As each country improved financially, their life expectancies also increased. Although Zimbabwe's life expectancy was much lower than those of the other countries, it had the biggest increase (approximately 12.5 years) of all the six countries. This could possibly mean that Zimbabwe's increasing GDP will allow its life expectancy to catch up with those of the other countries. In short, the life expectancies of these six countries had a strong, positive, linear correlation with their GDP. This supports the idea that a country's GDP strongly impacts its life expectancy.

Appendix

R - The correlation coefficient is a measure of the strength of the linear relationship between two variables. It ranges from -1 to 1.

Normal Distribution - A continuous distribution where the data is centered (or has the highest frequency at) the mean. It is shaped like a bell-curve.

Bimodal - A distribution that has two maximums. It has two points of roughly the highest frequency.

Linear Regression: The process of approximating a relationship between multiple variables with a line. This “line of best fit” is calculated by minimizing the total squared difference of the actual values and predicted values of the dependent variable.