

# Analyzing and Visualizing Life Expectancy and its Factors

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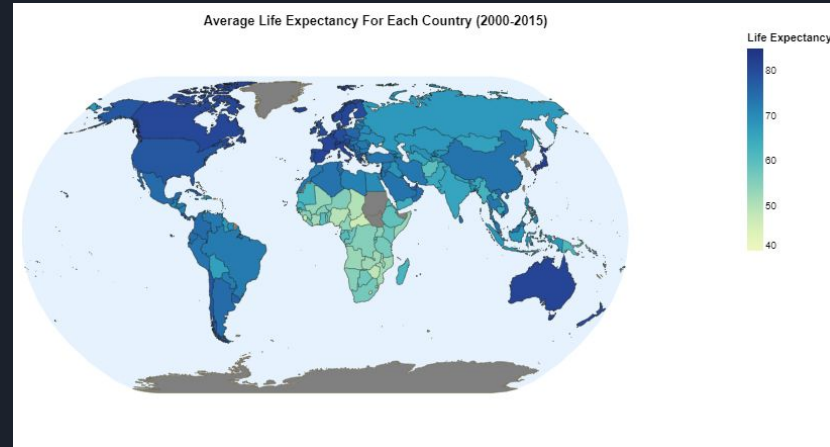
# Project Goal

## Topic:

- Life expectancy is the average number of years that a newly born child can expect to live.
- Assumes that they will be exposed to the current sex and age specific death rates, for a specific year, in a given country for their entire life.
- [Definition](#) from the World Health Organization.

## Project Goal:

- The goal of this project is to confirm previous findings and create new insights through the use of interactive data visualizations.
- We will explore the data and look for factors possibly correlated with life expectancy.
- Create visualizations to better show relationships between life expectancy and relevant factors.





# Project Motivation

Why is this project **important**?

- Life expectancy is arguably the most important topic to the human race, as without life itself no other problems are relevant.
- The overall life expectancy of a specific community can be used as a way to gauge the overall health of said community.

How does it relate to **social and/or scientific importance**?

- Finding the causes of trends in life expectancy can lead to better quality of life, reduced mortality rates, and socio-economic benefits such as higher work productivity for a longer period of time, as well as increased innovation.



# Overall Approach and Audience

## Overall Approach:

- As mentioned before, we created an interactive notebook in Observable.
- Made all of our visualizations interactive to allow the readers to be more engaged.
- Used a variety of visualization types in order to show off our learning, and to view the data from different perspectives.

## Audience/Readers:

- The intended audience of this article is any individual who is eager to learn about a new topic.
- Or individuals eager to gain new insights and confirm old insights on a topic they are already familiar with.
- We hope that these individuals are interested in the topic of life expectancy and are motivated to take the information presented in this article and extend the research for more practical uses.
- We assume that readers understand the basics of visualizations, the ability to interpret results, and familiarity with diseases and viruses such as Measles, Hepatitis B, HIV.

# Workbook and Dataset References

- The original data set we referenced for our project was called [“Life Expectancy \(WHO\)”](#) (Kaggle).
- We needed to reference a fixed version of the data (included missing values & details) called [“Life Expectancy \(WHO\) Fixed”](#) (Kaggle).
- The data set contained information on 179 countries over 15 years (2000-2015), including factors such as life expectancy, mortality rates, vaccine immunization rates, GDP per capita, population, etc.
- Our workbook contains both datasets, as well as articles we referenced during our creation and research process (Observable).

Link to the Observable Notebook: <https://observablehq.com/d/85b3bf36845addab>

## Life Expectancy (WHO) Fixed

Life Expectancy data is fixed and missing values filled.

[Data Card](#) [Code \(11\)](#) [Discussion \(4\)](#) [Suggestions \(0\)](#)

### About Dataset

Data contains life expectancy, health, immunization, and economic and demographic information. The adjusted dataset has **21 variables** and **2,864 rows**.

Data were initially collected from [Kaggle Source](#).

The dataset had inaccurate data and a lot of values were missing.

The dataset is completely updated.

## Analyzing and Visualizing Life Expectancy and its Factors

By: Jaiden Atterbury, Abel Mitiku, Bethany Quevedo, Megan Yam

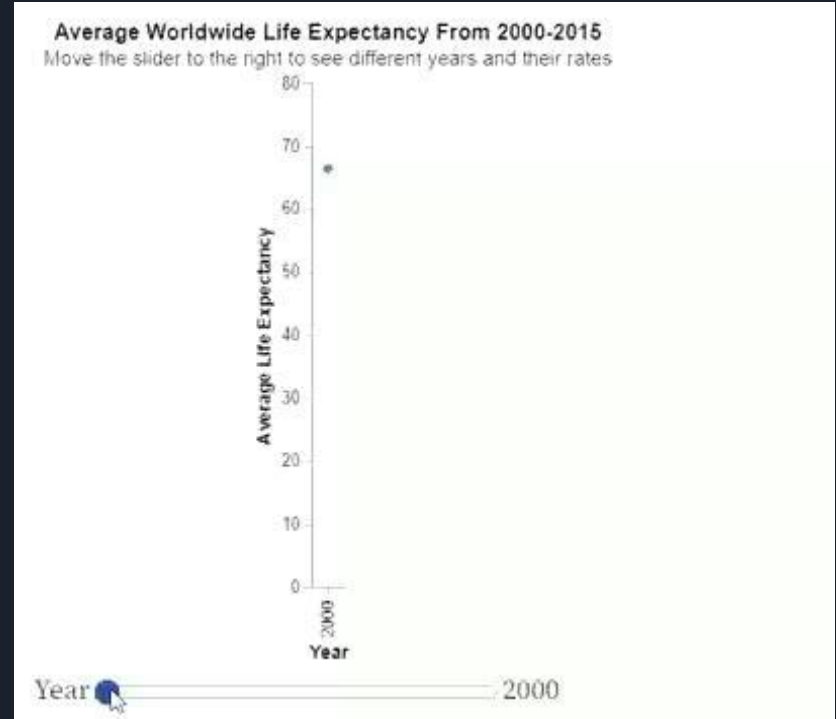
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# Initial Investigations (Exploratory Data Analysis)

- Medical, technological, and cultural influence greatly impacted the rise of average life expectancy worldwide
- Global events heavily influenced worldwide life expectancy; regions were impacted unproportionally.
- 2000-2015 saw the average life expectancy be 66-72 years; 1900s saw average life expectancy was only 47 years in most countries.





# Key Questions

- Research Question 1: How Does Life Expectancy Vary Around the Globe and How Has Life Expectancy Changed Over Time?
- Research Question 2: What Factors are Related to Life Expectancy?
- Research Question 3: How Important is Developmental Status For a Country's Quality of Life? How does Developmental Status Relate to Life Expectancy?

Due to the fact that we had 16+ visualizations in total, we will only highlight a subset of these during our approach and takeaways.



# Notebook/Visualization Descriptions

**How** do your **visualizations** address said questions?

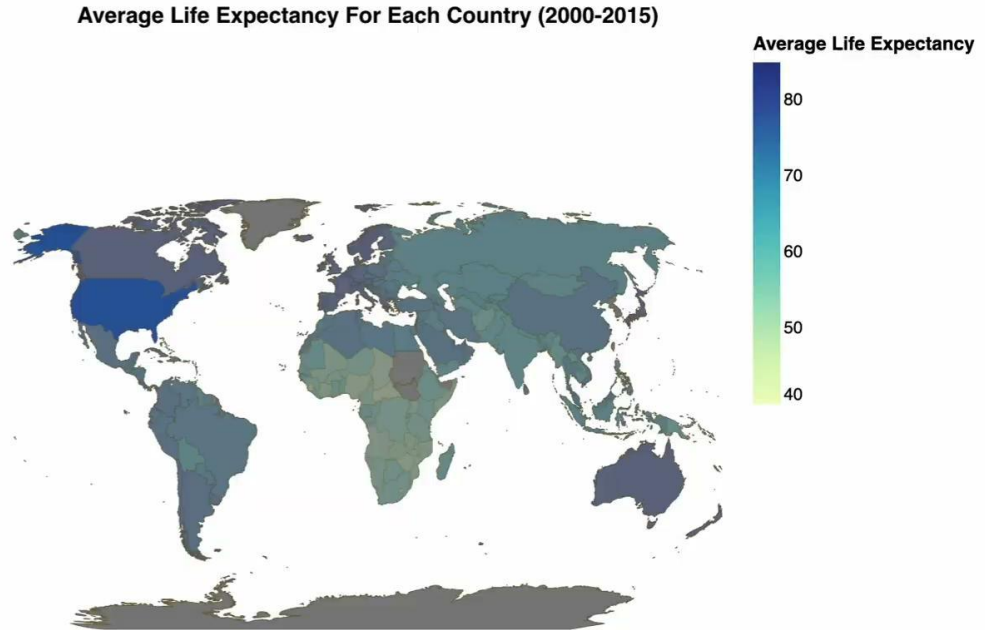
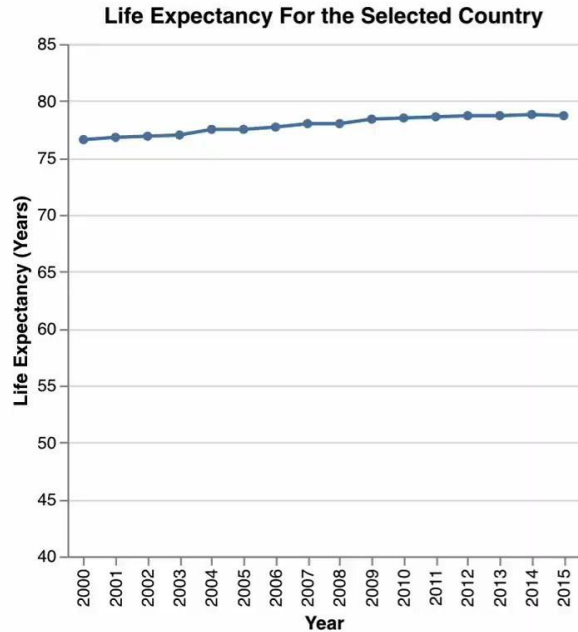
- Our visualizations address the aforementioned questions by viewing the data through different perspectives, while keeping the project goals and question goals in mind.
- Keeping these goals in mind allowed us to make sure that our visualizations were answering the questions, and not going off on needless tangents.

**Why** are these **visualizations** designed effectively to address those questions?

- These visualizations are designed effectively to address those questions because they are sequentially designed in order to complement each other for a more complete answer.
- For example, a single map of average life expectancy was created, and then a dual visualization of the same map and line chart was shown after to extend the results.



# Research Question 1: How Does Life Expectancy Vary Around the Globe and How Has Life Expectancy Changed Over Time?





# Approach and Takeaways

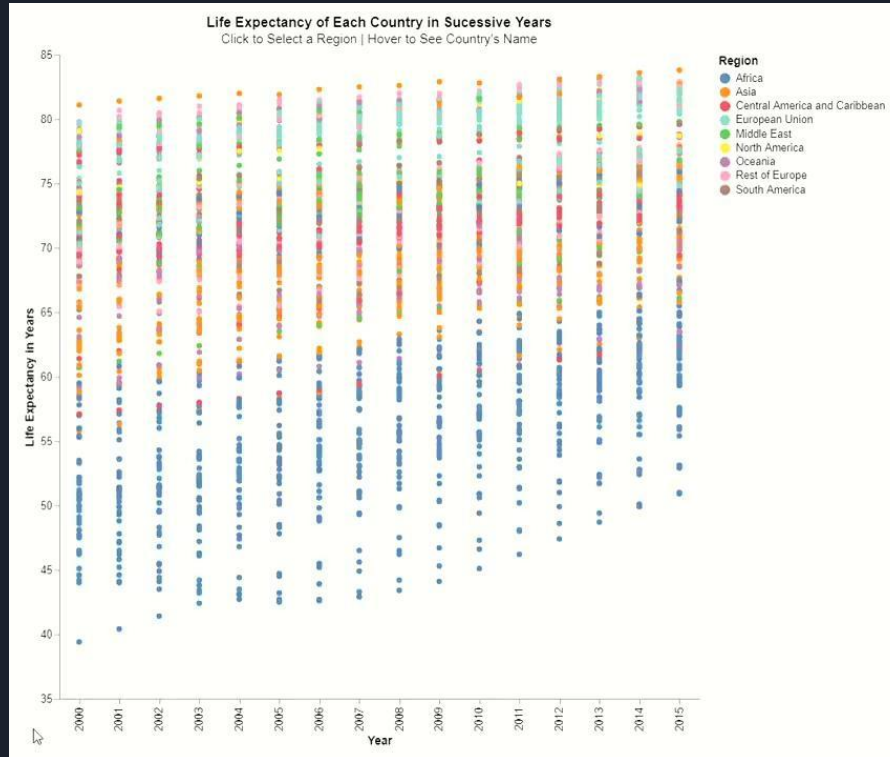
## Approach:

- This visualization combines a line chart and the choropleth map from the project goal slide.
- Users can click a country on the map (on the right) and plot a line chart of the life expectancy of that country from 2000-2015 (on the left).
- If a country is grayed out, no information is present for that country (in the data set).

## Takeaways:

- Countries that have higher average life expectancies see steady growth from 2000-2015, while countries with lower average life expectancies see growth at higher rates.
- This visualization validates the sentiment that developed countries see higher life expectancies than developing countries, but this gap is narrowing over time.

# Research Question 1: How Does Life Expectancy Vary Around the Globe and How Has Life Expectancy Changed Over Time?





# Approach and Takeaways

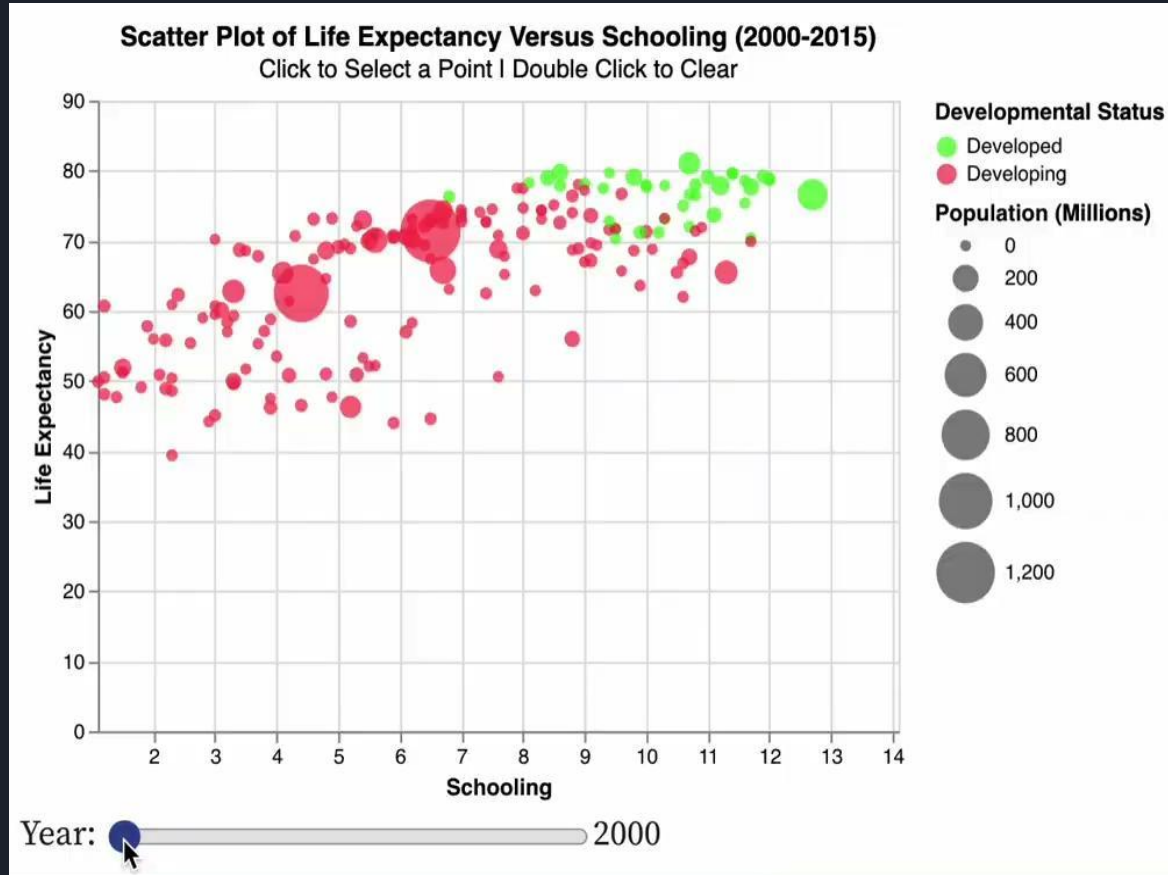
## Approach:

- Wanted a way to see the distribution of life expectancy across WHO regions.
- Decided on a chart type, thought that a scatter/dot plot was the most efficient way to see the spread of life expectancies.
- Just the plot was difficult to interpret. Added interaction to allow the viewer to choose particular regions to highlight.
- Selecting a region either by clicking with the mouse on the legend of the graph, causes a region's data points to be highlighted. Hovering the mouse over points creates a pop-up containing information about the datapoint.

## Takeaways:

- Even within regions there was a widespread of life expectancies.
- As a next step, we could look within regions to see what factors make the countries with higher life expectancy within their region different from their neighbors.

## Research Question 2: What Factors are Related to Life Expectancy?





# Approach and Takeaways

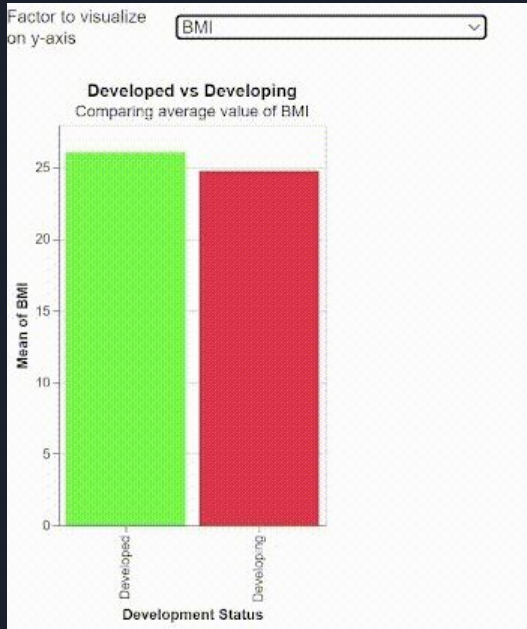
## Approach:

- [Previous research](#) showed that demographic changes and changes in health factors are more likely to increase life expectancy, such as lower disease prevalence.
- Thus, to see the relationship between the factors in our data set and life expectancy, we focused on three types of factors: **economic**, **health**, and **social**.
- For each factor type, life expectancy versus all of the relevant factors were plotted, sized by population, and colored by developmental status.

## Takeaways:

- The total population of a country wasn't a factor that told us much, but developmental status was (Research Question 3).
- Factors such as mortality rates, immunization coverage rates, and schooling all had a noticeable linear relationship with life expectancy.

# Research Question 3: How Important is Developmental Status For a Country's Quality of Life? How does Developmental Status Relate to Life Expectancy?



HIV Incidents

- BMI
- Schooling
- Alcohol Consumption
- Adult Mortality
- Infant Deaths
- Polio
- Diphtheria
- Hepatitis B
- Measles
- HIV Incidents

*List of variables in drop down menu*

## Visualization Description:

- Bar chart with a drop down menu that changes the y-axis based on user selection.
- Developed and developing countries are represented on the x-axis; developed on the left and developing on the right
- User can hover over the bars to see exact values for the given y-axis.
- Note: Illnesses (excluding HIV) listed represents the immunization rates against that illness.



# Approach and Takeaways

## Approach:

- To see what factors could contribute to the difference in life expectancy between developed and developing countries, we made an interactive bar graph for the user to see the average values of certain factors between developed and developing countries.
- We allowed the y-axis to be changed based on user input to make the graph more readable and to be able to focus on factors one at a time, rather than all at once.

## Takeaways:

- Immunization rates in developing countries were lower on average than those in developed countries; developing countries tend to have [less health services available than developed countries.](#)
- The number of HIV incidents were higher for developing countries, reaffirming the statement that developing countries tend to have less health services available.





# Conclusion

## Limitations:

- Heavy emphasis was placed on few variables, this leaves many relationships to be discovered/delved into deeper.
- Our research was limited by the factors that the WHO included in their report.

## Future Works:

- Efforts should be geared towards increasing life expectancy in low income countries through the elimination of factors like HIV prevalence and overall illiteracy/schooling.
- Get more data from the WHO in order to answer new questions/better answer the questions that we had.

## One Line Summary:

- Overall, we created an interactive webpage on Observable that used prior research and visualizations to gain and confirm insights on life expectancy.



# Works Cited

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