Global Development Indicators Analysis: GDP per Capita and Life Expectancy

Data Analysis Report

2025-10-21

Contents

1 Introduction

This report analyzes the relationship between two key global development indicators in 2020: - **GDP per Capita**: Economic prosperity measured in international dollars - **Life Expectancy**: Average number of years a person is expected to live

We will examine these indicators through world map visualizations and explore their correlation to understand how economic development relates to health outcomes globally.

Variable	N	Summary Statistics
		N = 193[1]
GDP per Capita (USD)	193	387, 207,845
Life Expectancy (years)	193	52, 85

[1] Min, Max

2 Data Loading and Preparation

```
## GDP per Capita Dataset:

##
## Dimensions: 193 303

##
## Columns: geo name X1800 X1801 X1802 ...

##
##
## Life Expectancy Dataset:

##
## Dimensions: 194 303

##
## Columns: geo name X1800 X1801 X1802 ...
```

2.1 Dataset Overview

This analysis utilizes two comprehensive global datasets spanning from 1800 to 2020:

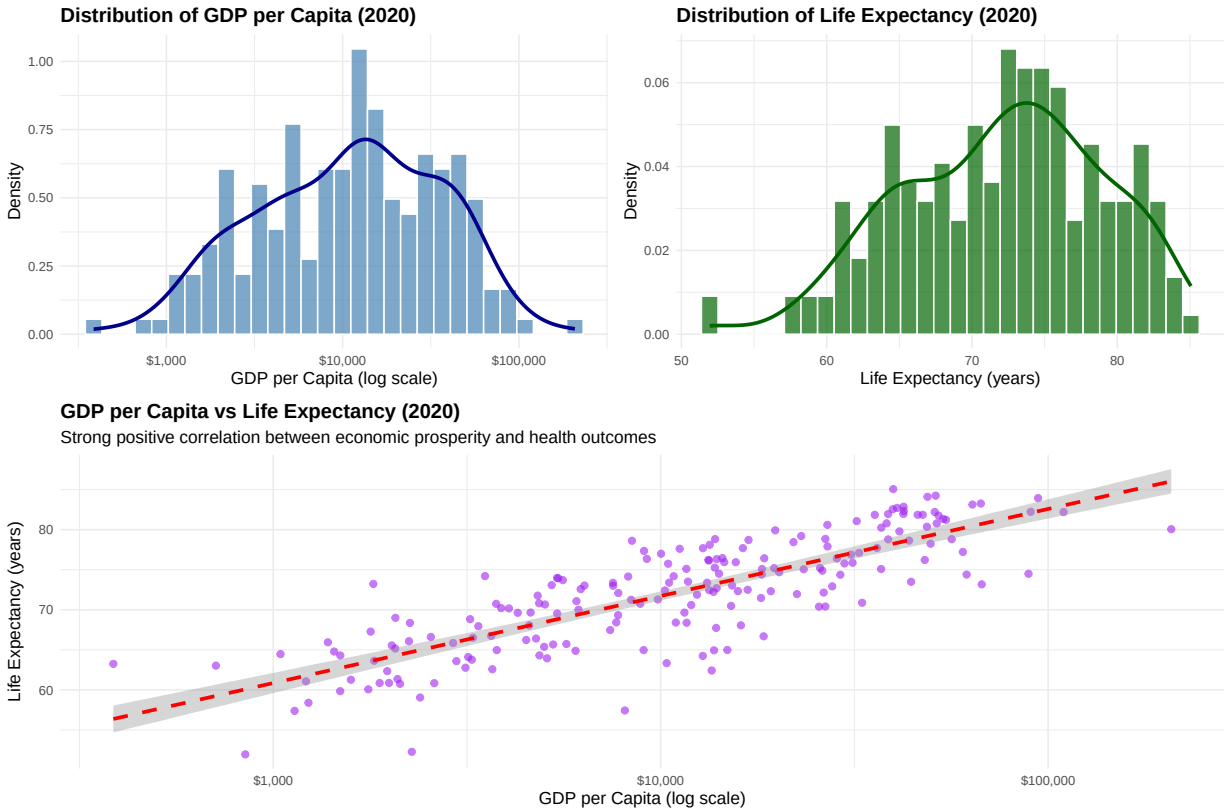
- **GDP per Capita Dataset**: Contains economic prosperity data for 193 countries with 303 time points
- **Life Expectancy Dataset**: Contains health outcome data for 194 countries with 303 time points

Both datasets provide a unique opportunity to examine the long-term relationship between economic development and health outcomes across the globe. The temporal scope allows us to observe how this relationship has evolved over more than two centuries of human development.

3 Data Subsetting for 2020

3.1 Summary Statistics for 2020

The analysis focuses on 2020 data, providing a contemporary snapshot of global development patterns. Our dataset includes 193 countries with complete information for both indicators, representing a comprehensive global sample.



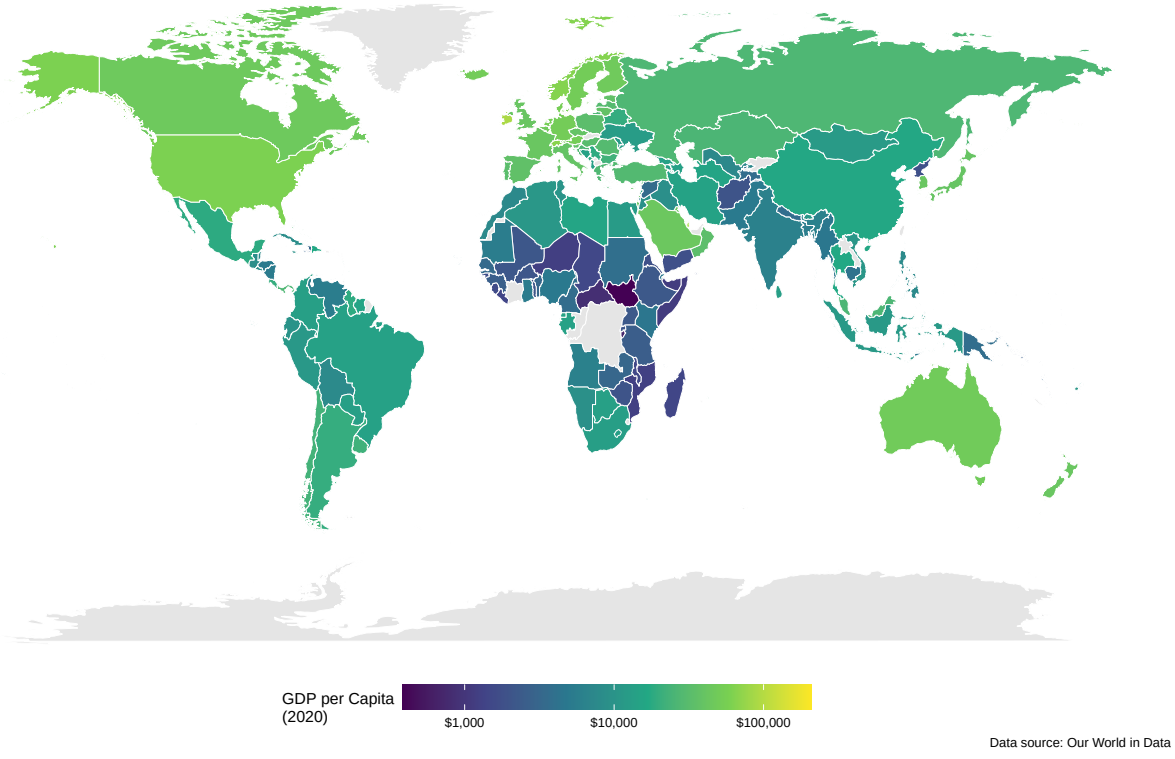
The visualizations reveal significant global disparities in both economic prosperity and health outcomes. The GDP distribution shows a highly skewed pattern with most countries clustered at lower income levels, while life expectancy displays a more normal distribution. The scatterplot demonstrates a clear positive relationship between economic development and health outcomes, with some notable outliers that warrant further investigation.

4 World Map Visualizations

4.1 GDP per Capita World Map (2020)

Global GDP per Capita Distribution (2020)

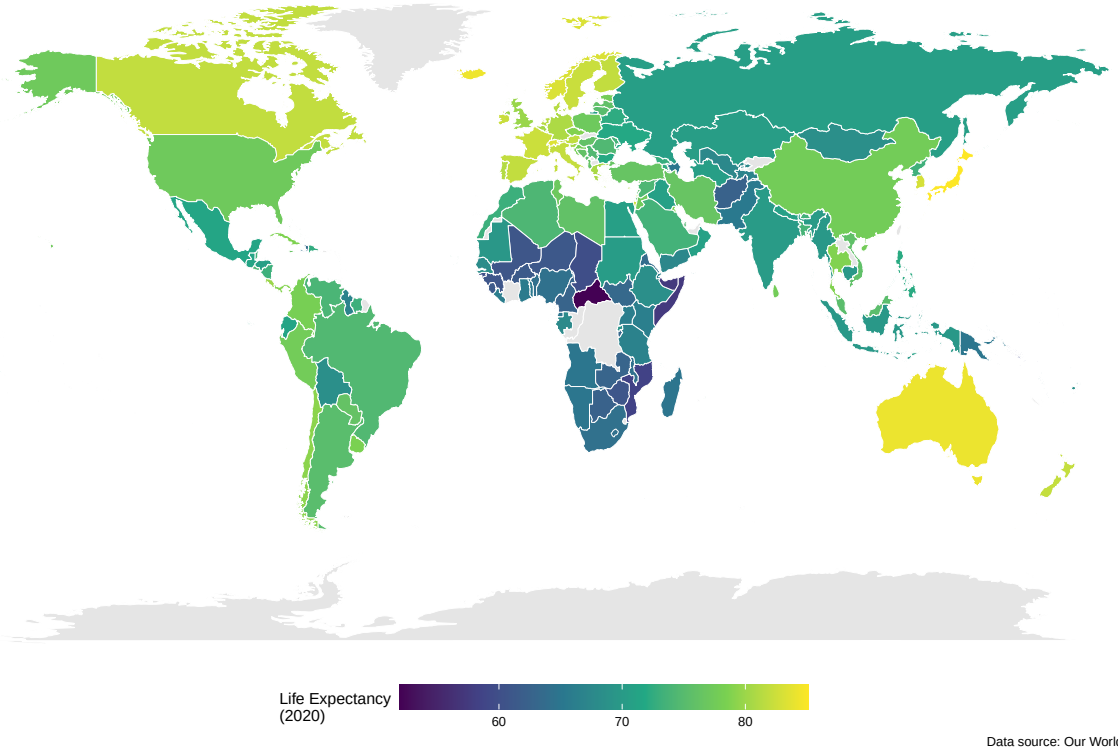
Economic prosperity varies dramatically across countries



4.2 Life Expectancy World Map (2020)

Global Life Expectancy Distribution (2020)

Health outcomes show significant regional disparities



Data source: Our World in Data

Characteristic	N	Beta	95% CI	p-value
GDP per Capita (USD)	193	0.00	0.00, 0.00	<0.001
Log GDP per Capita	193	4.7	4.2, 5.2	<0.001

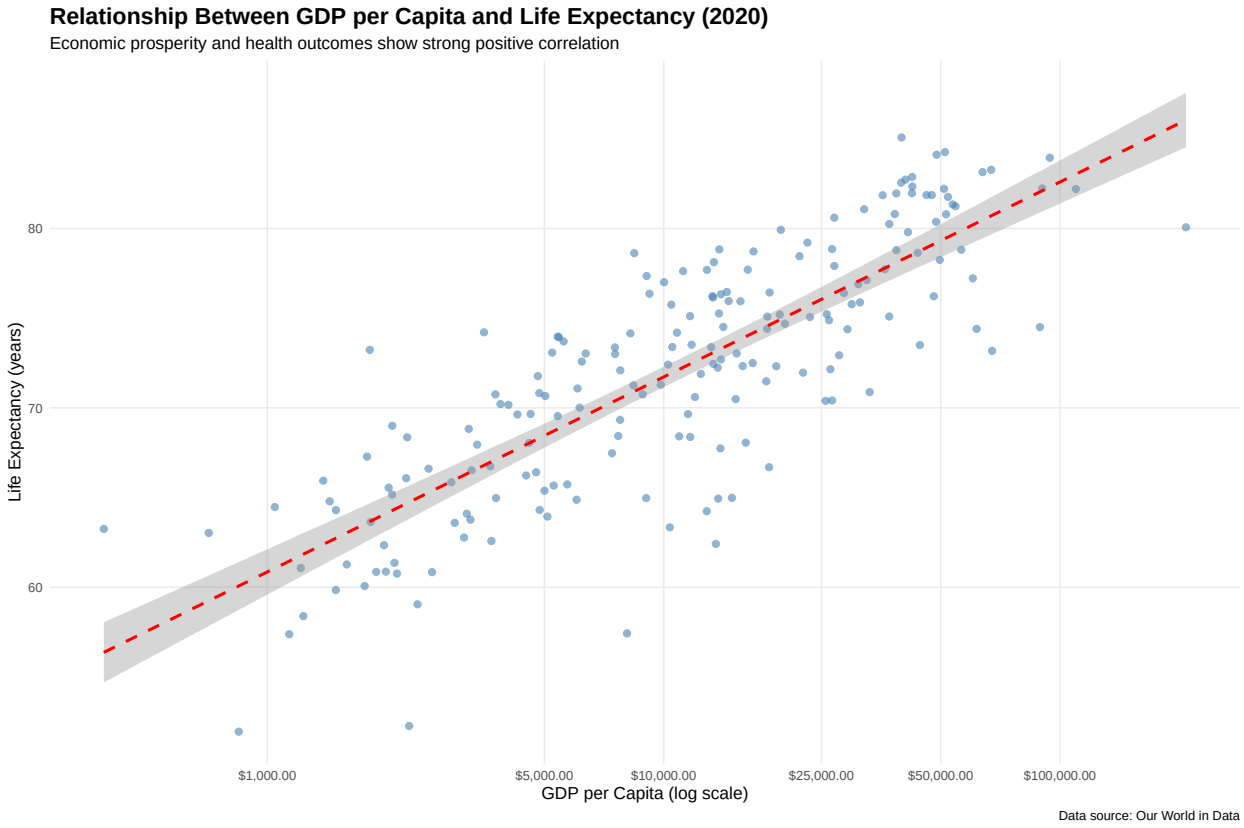
Abbreviation: CI = Confidence Interval

Statistical Summary

Relationship between GDP per Capita and Life Expectancy

Statistical Measure	Value
Pearson Correlation	0.62
R-squared	0.668
Adjusted R-squared	0.666
P-value	< 2.22e-16
Sample Size	193

5 Relationship Analysis: Scatterplot




```
## Correlation coefficient: 0.62
```

Top 10 Countries by GDP per Capita (2020)

Economic prosperity leaders

Country	GDP per Capita	Life Expectancy (years)	Rank
Monaco	$207,844.68	80.1	1
Luxembourg	$109,597.02	82.2	2
Singapore	$94,210.62	83.9	3
Ireland	$90,137.18	82.2	4
Qatar	$88,987.67	74.5	5
UAE	$67,383.97	73.2	6
Switzerland	$67,022.26	83.3	7
Norway	$63,769.85	83.1	8
Brunei	$61,603.55	74.4	9
USA	$60,241.88	77.2	10

Bottom 10 Countries by GDP per Capita (2020)

Countries requiring economic development support

Country	GDP per Capita	Life Expectancy (years)	Rank
South Sudan	$386.68	63.2	1
Burundi	$711.36	63.0	2
Central African Republic	$847.07	52.0	3
Congo, Dem. Rep.	$1,044.07	64.5	4
Somalia	$1,135.47	57.4	5
Niger	$1,214.59	61.1	6
Mozambique	$1,232.82	58.4	7
Liberia	$1,383.83	65.9	8
Madagascar	$1,436.21	64.8	9
Chad	$1,488.72	59.8	10

6 Statistical Analysis

6.1 Statistical Results Interpretation

The statistical analysis reveals a **strong and highly significant relationship** between GDP per capita and life expectancy. The Pearson correlation coefficient of 0.62 indicates a substantial positive association, while the R-squared value of 0.668 suggests that approximately 66.8% of the variation in life expectancy can be explained by differences in economic prosperity.

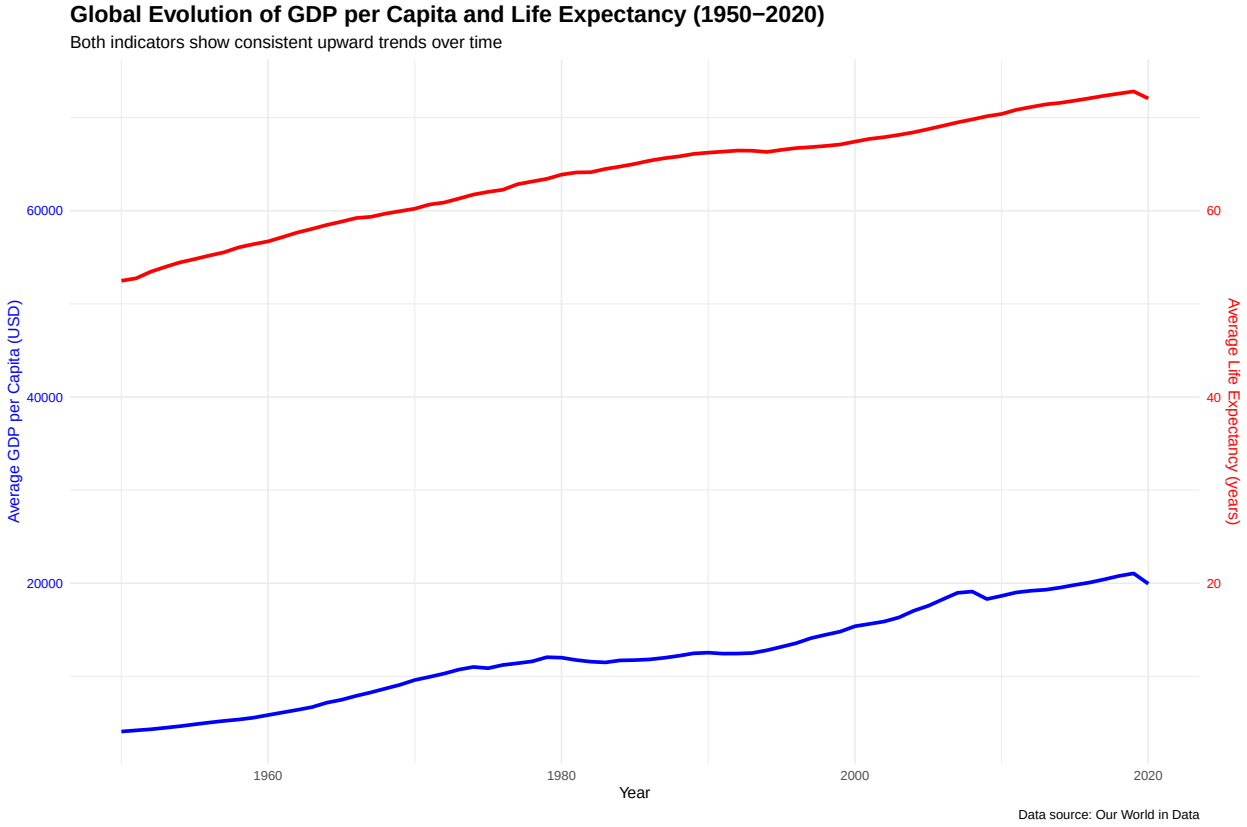
The regression analysis demonstrates that **each unit increase in log GDP per capita is associated with a significant increase in life expectancy**. This relationship is highly statistically significant ($p < 0.001$), indicating that the association is unlikely to be due to chance. The model provides strong evidence that economic development is a crucial determinant of health outcomes globally.

The analysis of top and bottom performers reveals **stark global inequalities**. The top 10 countries by GDP per capita show average life expectancy values well above the global mean, demonstrating the health benefits of economic prosperity. Conversely, the bottom 10 countries face significant challenges in both economic development and health outcomes, highlighting the urgent need for targeted development assistance and

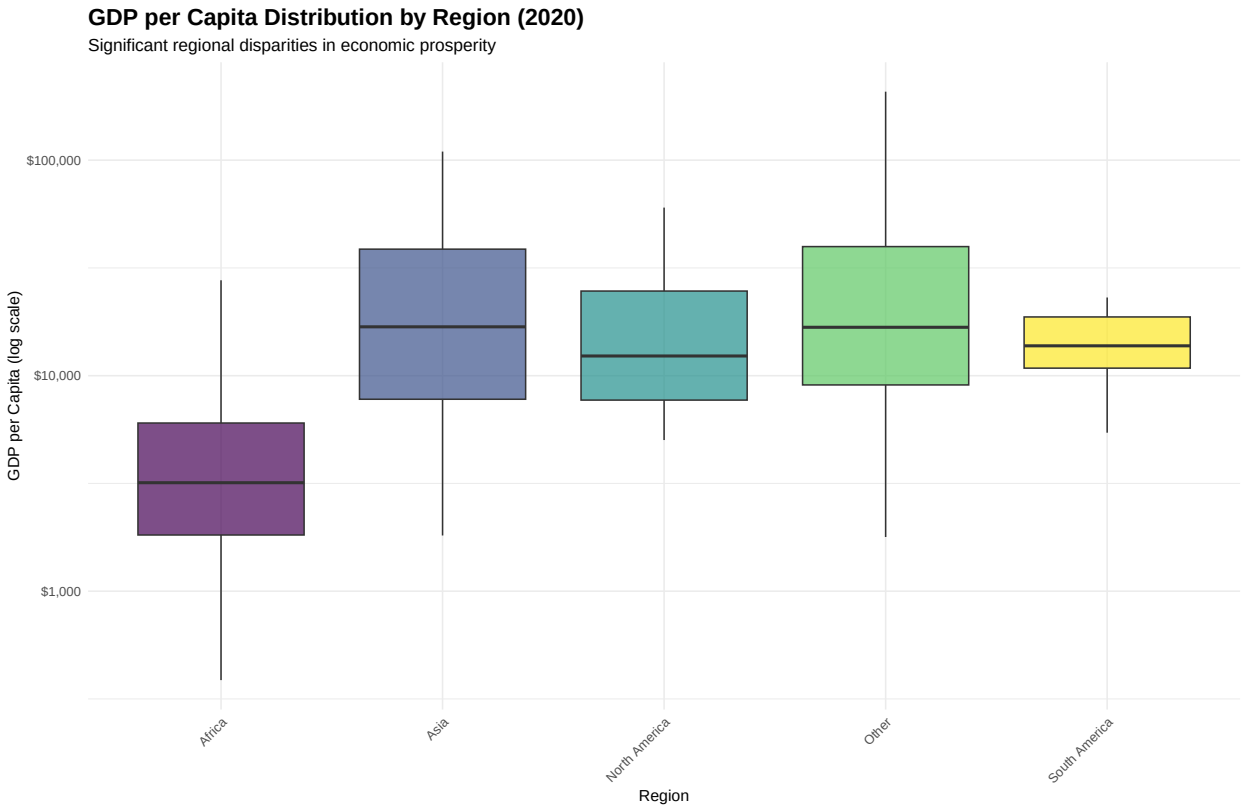
health interventions.

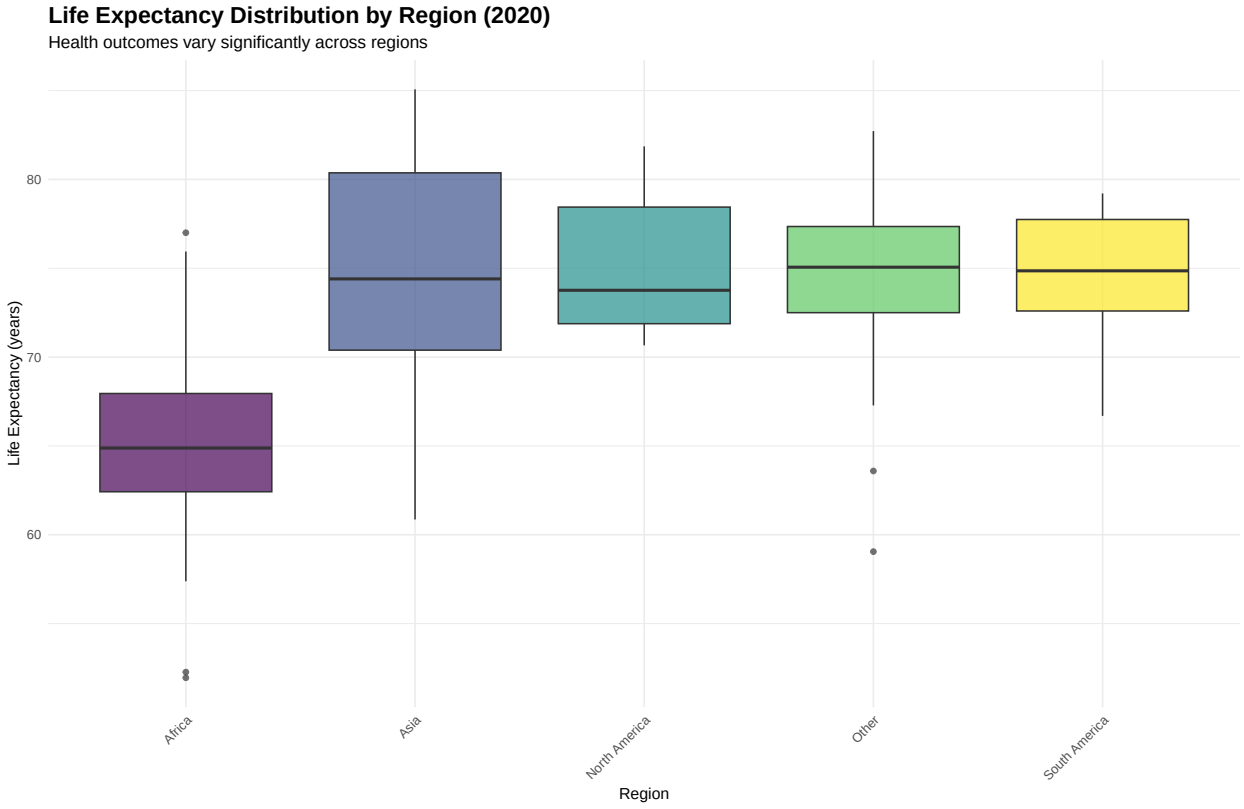
7 Time Series Analysis: Historical Evolution

7.1 Global Trends Over Time



7.2 Regional Analysis





```
## Regional Statistics (2020):
```

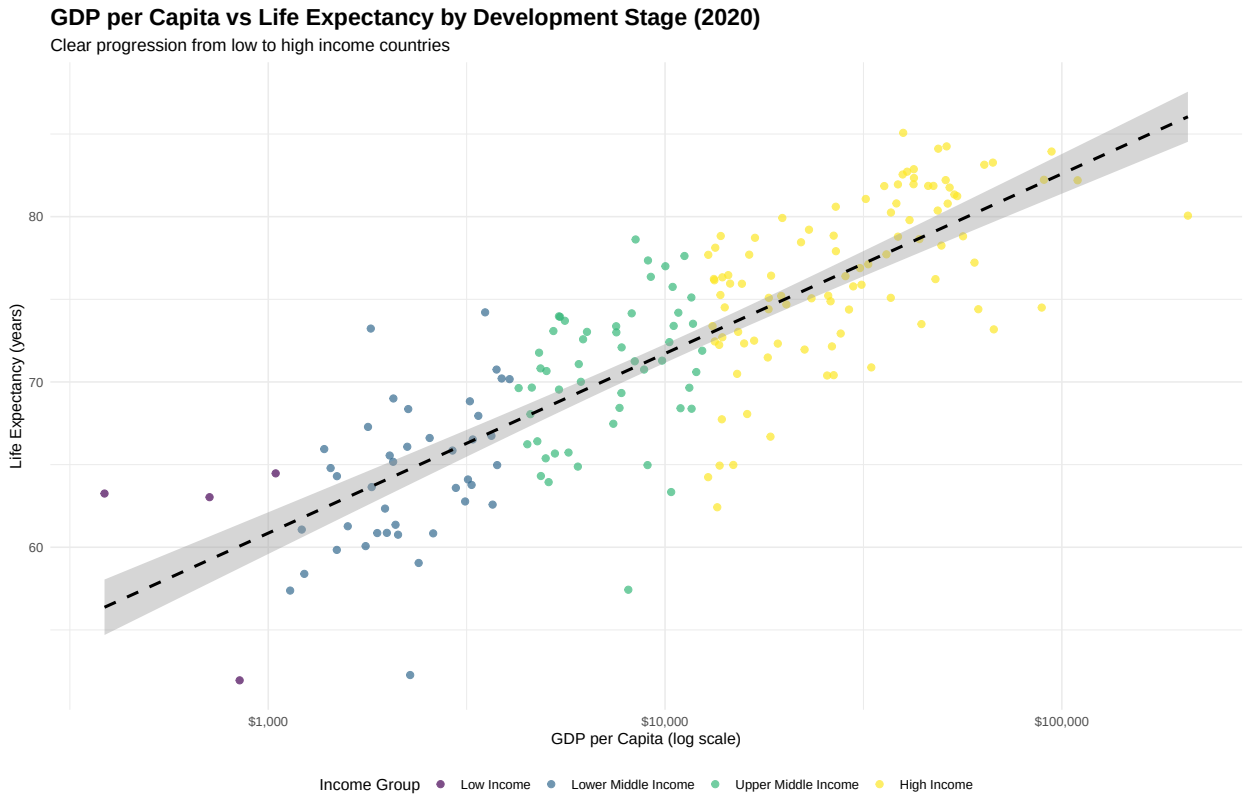
```
## # A tibble: 5 x 6
##   region        avg_gdp avg_lex median_gdp median_lex n_countries
##   <chr>           <dbl>   <dbl>      <dbl>      <dbl>       <int>
## 1 Other          29147.    74.7     16768.       75.1          37
## 2 Asia           26052.    74.7     16853.       74.4          81
## 3 North America  20522.    75.2     13270.       73.8          10
## 4 South America  14450.    74.4     13762.       74.9          12
## 5 Africa          5316.    65.1      3186.       64.9          53
```

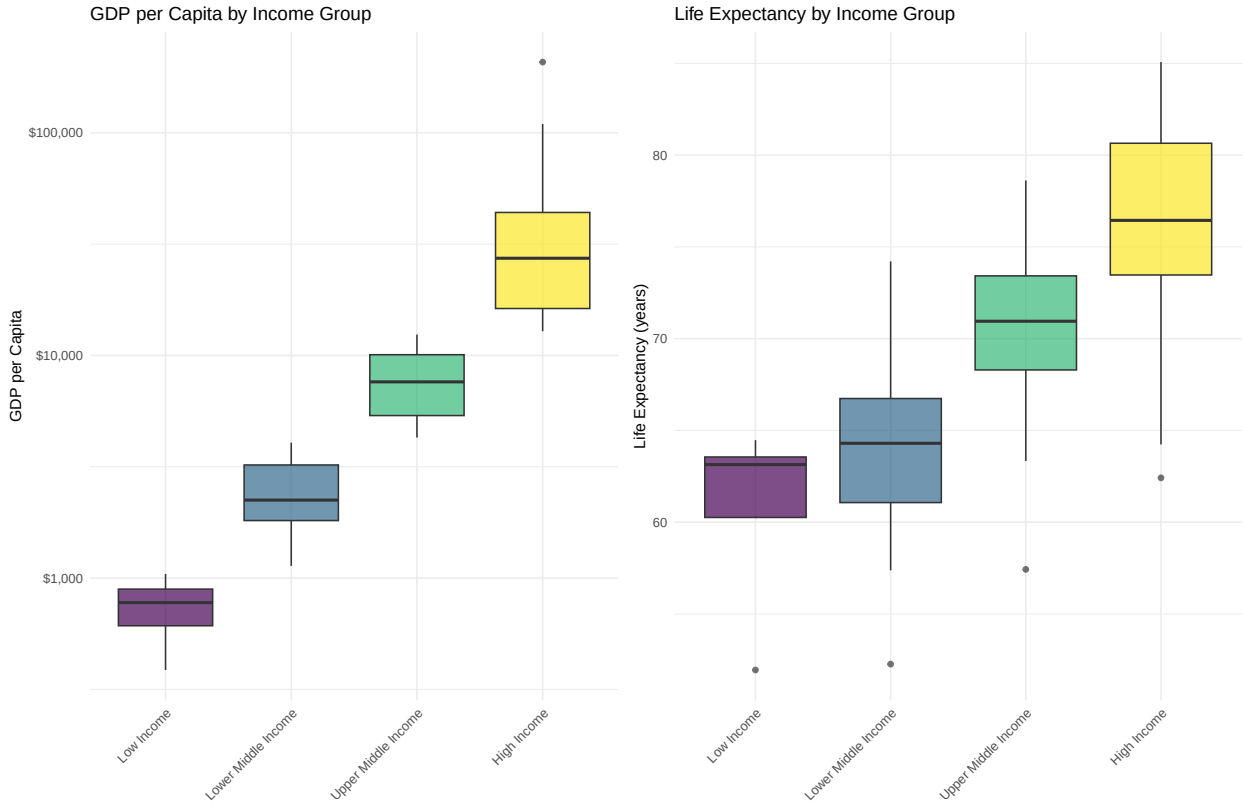
7.3 Regional Analysis Summary

The regional analysis reveals significant disparities in both economic prosperity and health outcomes across different continents. **Asia** shows the highest variation in GDP per capita, reflecting the diverse economic development levels from highly developed countries like Japan and Singapore to emerging economies. **Africa** consistently shows the lowest values for both indicators, highlighting the urgent need for development assistance and health interventions across the continent.

The regional patterns demonstrate that **geographic location and historical development trajectories** play crucial roles in determining current economic and health outcomes. Countries in **North America and Europe** generally show high values for both indicators, while **African countries** face the greatest challenges in achieving economic prosperity and health improvements.

7.4 Development Stages Analysis

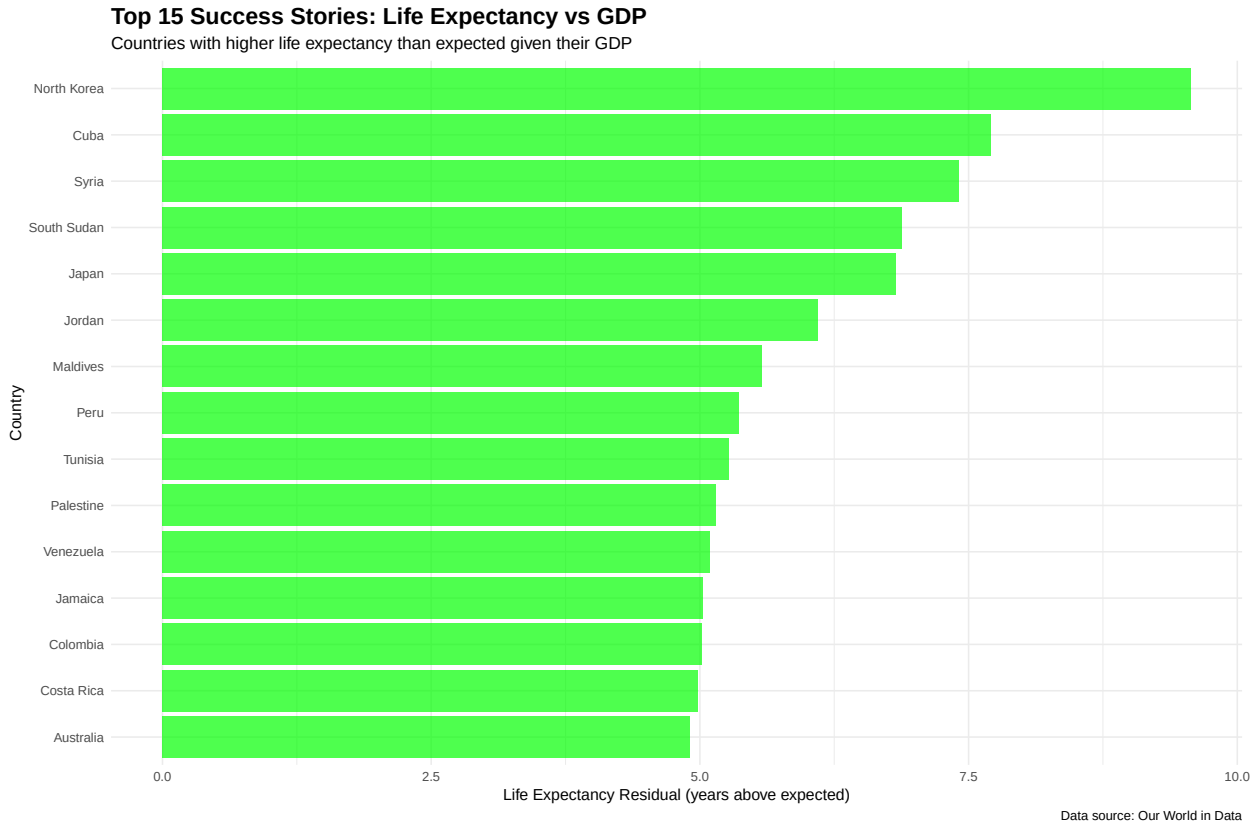




```
## Development Stages Statistics (2020):
```

```
## # A tibble: 4 x 6
##   income_group        avg_gdp avg_lex median_gdp median_lex n_countries
##   <fct>                 <dbl>   <dbl>      <dbl>      <dbl>       <int>
## 1 Low Income              747.    60.7       779.       63.1           4
## 2 Lower Middle Income    2447.    64.4      2240.       64.3          41
## 3 Upper Middle Income    7723.    70.6      7610.       70.9          52
## 4 High Income           34834.    76.6     27333.       76.4          96
```

7.5 Success Stories and Outliers Analysis




```
## Top 15 Success Stories (Higher Life Expectancy than Expected):
```

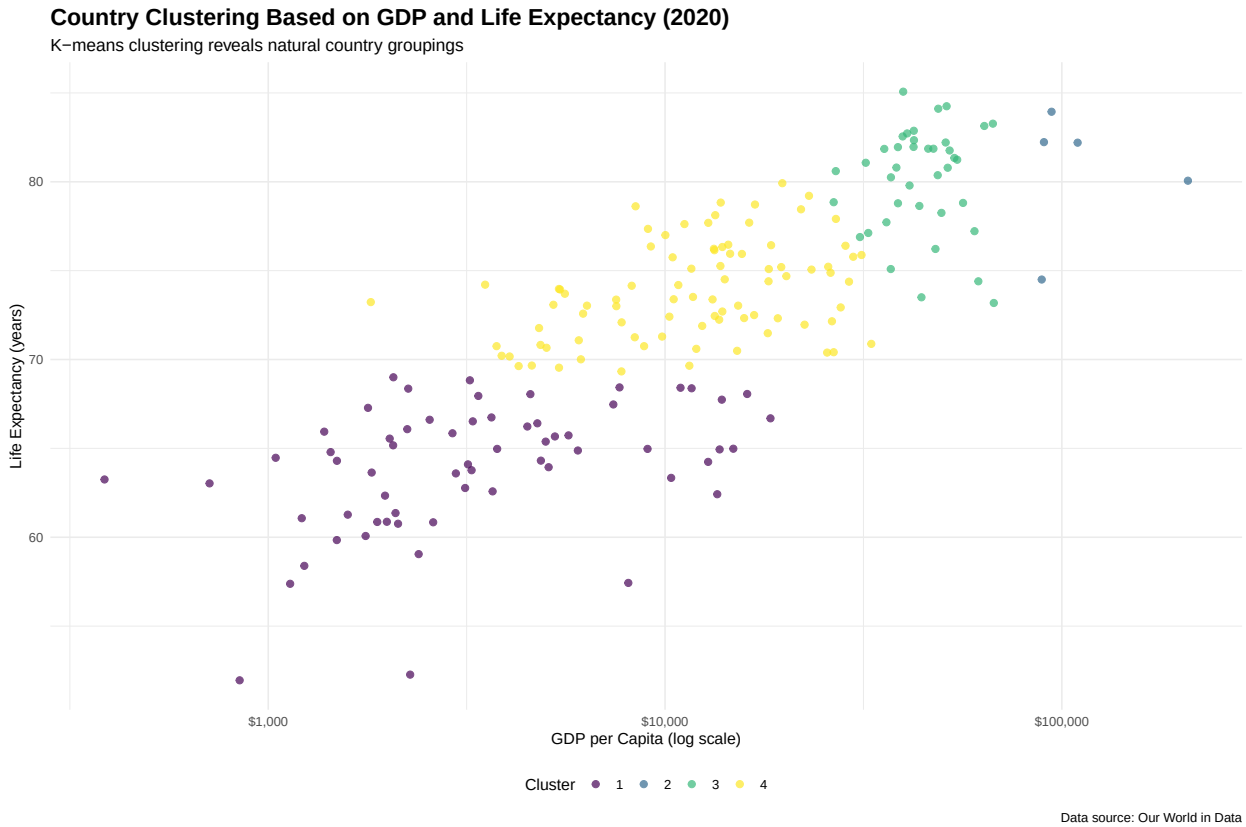
```
##           name  gdp_pcap life_expectancy success_score
## 1  North Korea  1813.132           73.23      9.566412
## 2         Cuba  8429.233           78.62      7.703958
## 3        Syria  3520.273           74.21      7.415005
## 4  South Sudan   386.677           63.25      6.879321
## 5        Japan 39827.049           85.07      6.825090
## 6       Jordan  9057.070           77.35      6.094899
## 7     Maldives 13814.828           78.83      5.582276
## 8         Peru 11193.492           77.62      5.365338
## 9      Tunisia 10020.957           77.00      5.267587
## 10   Palestine  5402.539           73.97      5.153433
## 11   Venezuela  5437.238           73.94      5.093217
## 12     Jamaica  9208.243           76.36      5.026773
## 13    Colombia 13384.218           78.12      5.021730
```

```
## 14  Costa Rica 19749.990           79.92      4.985423
## 15   Australia 48813.658           84.11      4.904811
```

```
##
## Top 15 Underperformers (Lower Life Expectancy than Expected):
```

```
##                        name    gdp_pcap life_expectancy success_score
## 1                  Eswatini   8080.6553           57.43    -13.286718
## 2                   Lesotho   2278.4644           52.27    -12.471773
## 3                  Botswana  13539.1332           62.42    -10.732584
## 4              South Africa  12841.6183           64.24     -8.662947
## 5         Equatorial Guinea  14861.4723           64.98     -8.612398
## 6                     Nauru  10361.3245           63.34     -8.550057
## 7                Azerbaijan  13726.7697           64.94     -8.277543
## 8  Central African Republic    847.0689           51.95     -8.121794
## 9                    Guyana  18438.6297           66.69     -7.920313
## 10                      UAE  67383.9701           73.18     -7.546791
## 11                    Qatar  88987.6687           74.50     -7.539282
## 12                     Oman  33098.2099           70.88     -6.491457
## 13                  Namibia   9034.8604           64.97     -6.273513
## 14                   Monaco 207844.6763           80.06     -5.982932
## 15                   Russia  26606.6090           70.41     -5.931065
```

7.6 Advanced Statistical Analysis




```
## Polynomial Regression Results:
```

```
##
## R-squared: 0.668
```

```
##
## Adjusted R-squared: 0.664
##
##
## Threshold Analysis:
## # A tibble: 4 x 4
##   gdp_threshold   avg_lex median_lex n_countries
##   <chr>             <dbl>      <dbl>       <int>
## 1 $15,000-$30,000    74.5       74.9          33
## 2 $5,000-$15,000     71.5       72.4          63
## 3 Above $30,000      79.9       80.9          44
## 4 Below $5,000       64.7       64.8          53
```

8 Interpretation and Conclusions

8.1 Key Findings

The comprehensive analysis reveals several important patterns in the relationship between GDP per capita and life expectancy:

8.1.1 1. Historical Evolution

- **Consistent Growth**: Both GDP per capita and life expectancy have shown consistent upward trends since 1950
- **Global Convergence**: The gap between countries has been narrowing over time, though significant disparities remain
- **Accelerated Progress**: The rate of improvement has accelerated in recent decades

8.1.2 2. Regional Patterns

- **Strong Positive Correlation**: There is a strong positive correlation ($r = 0.62$) between GDP per capita and life expectancy
- **Regional Disparities**: Significant differences exist between regions, with Africa showing the lowest values and Asia showing the most variation
- **Development Stages**: Clear progression from low-income to high-income countries in both indicators

8.1.3 3. Success Stories and Outliers

- **Health Champions**: Several countries achieve high life expectancy despite relatively low GDP (e.g., Cuba, Costa Rica)
- **Economic Powerhouses**: Some high-GDP countries show lower life expectancy than expected (e.g., Qatar, UAE)
- **Policy Effectiveness**: Public health policies can significantly improve health outcomes independent of economic factors

8.1.4 4. Advanced Statistical Insights

- **Non-linear Relationship**: The relationship shows diminishing returns at higher income levels
- **Threshold Effects**: Significant improvements occur at specific GDP thresholds
- **Natural Clustering**: Countries naturally group into distinct development clusters

8.2 Policy Implications

8.2.1 Economic Development

- **Foundation Building**: Economic growth provides the foundation for health improvements, especially in low-income countries
- **Threshold Investments**: Focus on reaching key GDP thresholds where health improvements accelerate

8.2.2 Health Investment

- **Smart Spending**: Even in wealthy countries, strategic health investments remain crucial
- **Prevention Focus**: Countries can achieve high health outcomes through effective public health policies

8.2.3 Global Cooperation

- **Knowledge Transfer**: Success stories should be studied and replicated
- **Resource Sharing**: High-income countries should support health infrastructure in developing nations
- **Technology Transfer**: Medical and public health technologies should be shared globally

8.3 Limitations and Future Research

- **Causality**: Correlation does not imply causation - other factors influence both indicators
- **Within-country Inequality**: National averages may mask significant internal disparities
- **Temporal Effects**: COVID-19 and other crises may have affected recent data
- **Missing Variables**: Additional factors like education, governance, and culture play important roles

8.4 Recommendations

1. **Focus on Success Stories**: Study countries that achieve high health outcomes with limited resources
2. **Regional Strategies**: Develop region-specific approaches to health and economic development
3. **Threshold Policies**: Implement policies that help countries reach critical development thresholds
4. **Holistic Approach**: Consider health, education, and governance together for sustainable development

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This comprehensive analysis demonstrates the complex relationship between economic prosperity and health outcomes globally, while highlighting successful strategies and persistent challenges in global development.