Relationship between income inequality and child mortality by World Health Organization region

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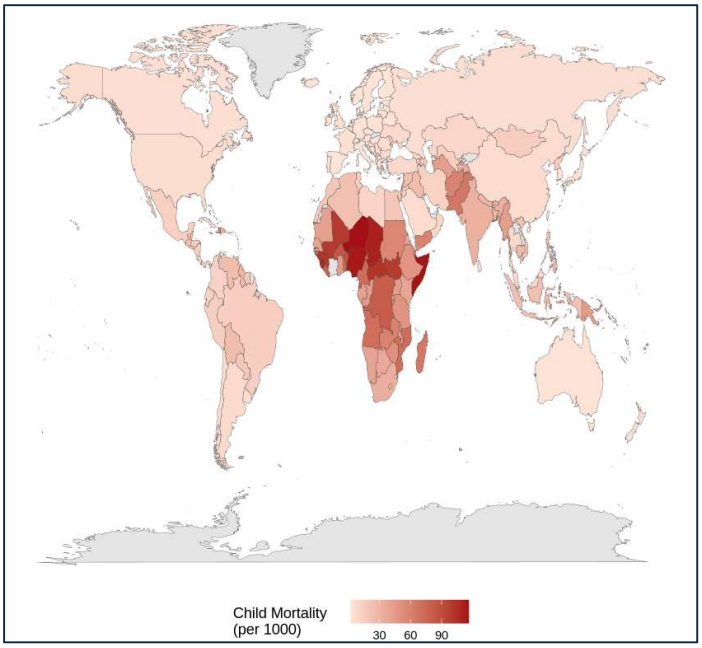
Introduction

Income inequality is a measure of the extent to which resources are equitably distributed among a country's population. Countries where resources are concentrated among a small proportion of the population may lag in development indicators. Additionally, countries with high income inequality often face challenges achieving universal health coverage and promoting the health of their population. Child mortality is an important indicator of economic development and health equity. The purpose of this report is to investigate the association between income inequality and child mortality across different regions.

Child mortality around the world

Child mortality is measured as the number of deaths in children less than five years old per 1000 live births. The highest rates of child mortality are found in sub-Saharan Africa where several countries had rates exceeding 90 child deaths per 1000 live births in 2020 (Figure 1Figure 1.

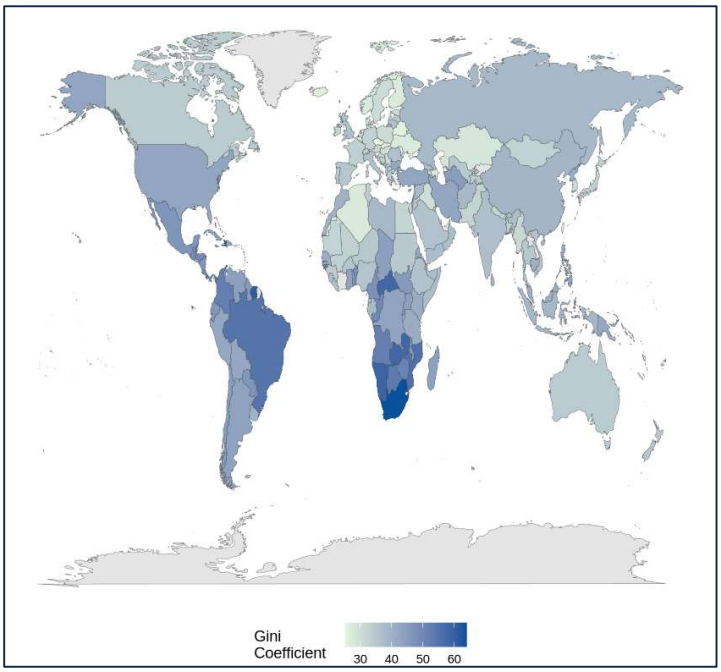
Figure 1. Child mortality rates in 2020



Income inequality around the world

The Gini coefficient is a measure of income equality where 0 indicates perfect equality and 1 is maximal inequality. Income inequality is highest in southern Africa and South America and lowest in Europe (Figure 3).

Figure 2. Gini coefficient in 2020



Correlation between income inequality and child mortality

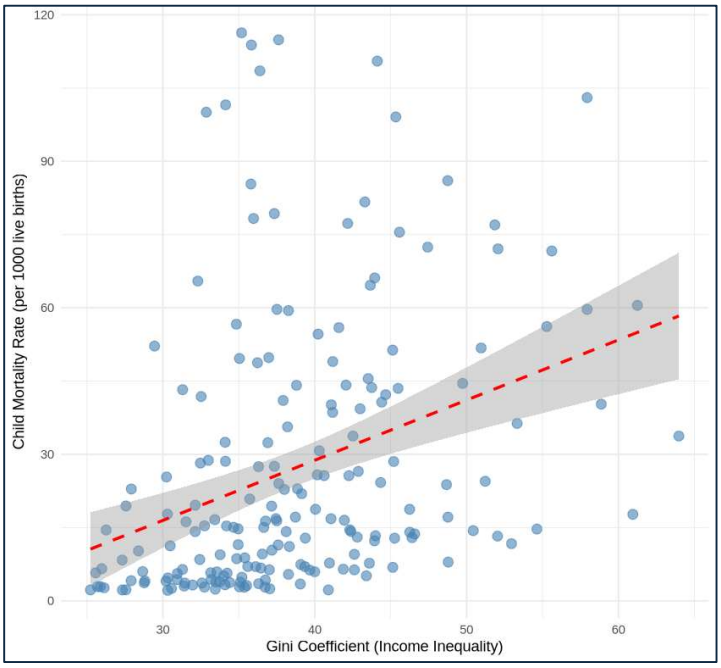
Key Findings:

- There is a moderate positive relationship ($r = 0.339$) between income inequality and child mortality (Figure 3)
- The relationship is statistically significant ($p < 0.001$), meaning it's unlikely to be due to chance
- For every 1-point increase in the Gini coefficient, child mortality increases by approximately 1.23 deaths per 1000 births
- However, the Gini coefficient only explains about 11.5% of the variation in child mortality ($R^2 = 0.115$)

Interpretation: While higher income inequality is associated with higher child mortality rates, the relationship is moderate. This suggests that inequality is one of many factors affecting child mortality. Other important factors likely include healthcare infrastructure,

education, sanitation, nutrition, and overall economic development. The wide scatter of points indicates substantial variation - some countries with similar inequality levels have very different child mortality outcomes, highlighting the importance of these other factors.

Figure 3. Scatter plot of the relationship between income inequality and child mortality in 2020



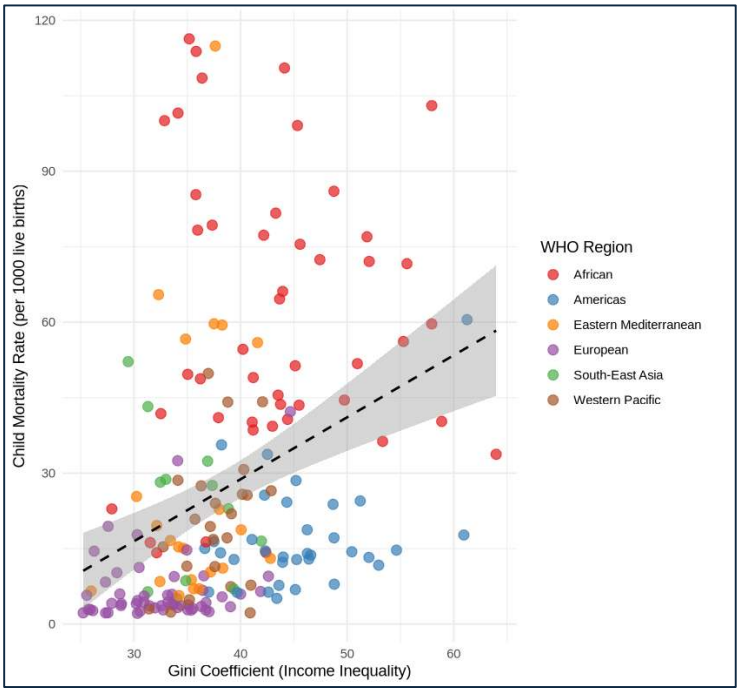
Key Observations by Region

The visualization below reveals some interesting regional patterns (Figure 4:

- **African countries** (red) tend to cluster in the upper portion of the graph, showing higher child mortality rates across varying levels of inequality
- **European countries** (purple) are concentrated in the lower-left, with low inequality and low child mortality
- **Americas** (blue) show considerable variation in both inequality and mortality rates
- **South-East Asia** (green) and **Western Pacific** (brown) countries show moderate to high inequality but varying mortality rates
- **Eastern Mediterranean** (orange) countries are spread across the middle range

The black dashed line shows the overall trend across all regions, confirming the positive relationship between inequality and child mortality.

Figure 4. Scatter plot of the relationship between income inequality and child mortality by WHO region, 2020

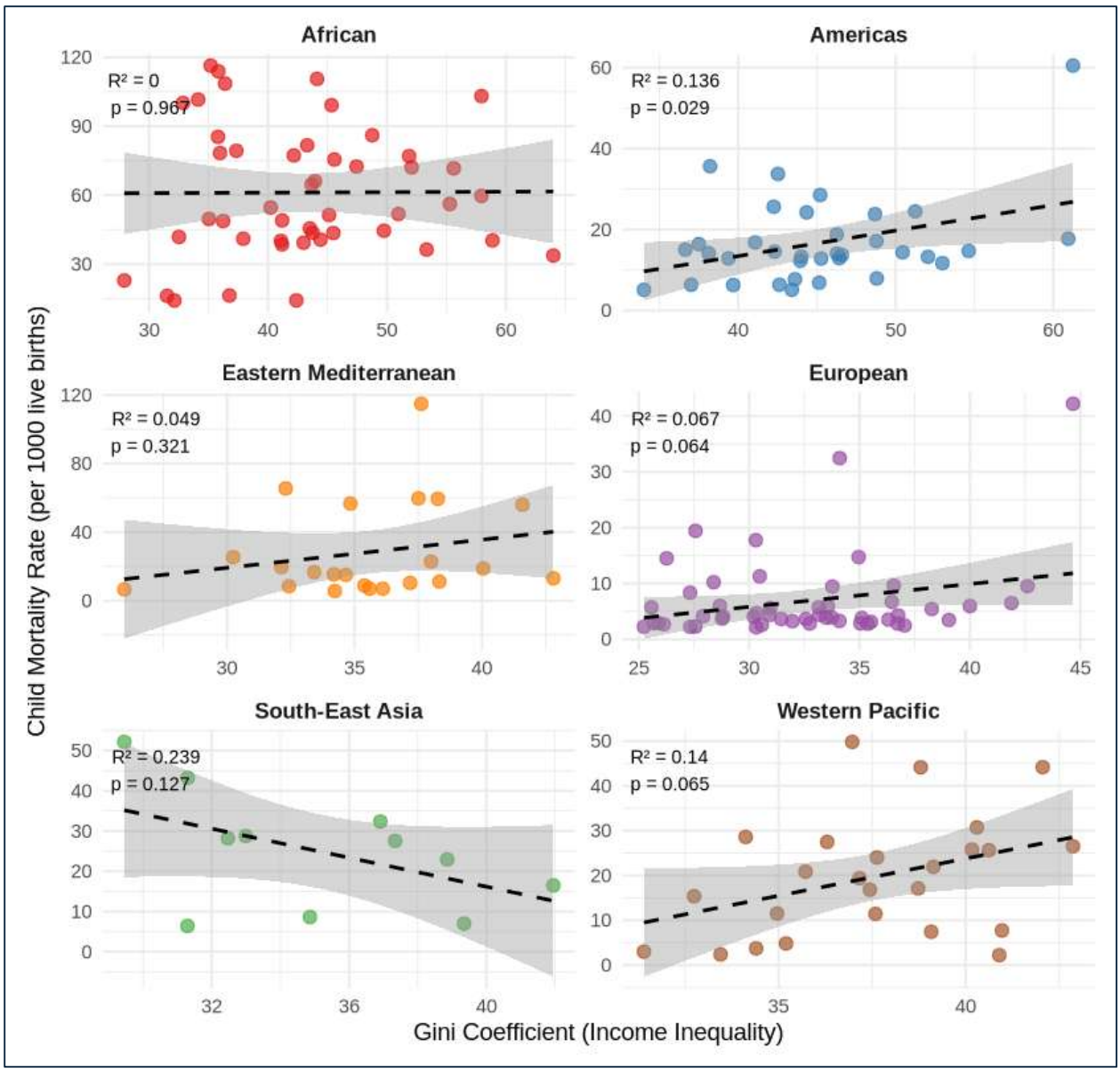


Correlation between income inequality and child mortality by WHO region

Key Findings:

- Only the Americas shows a statistically significant relationship ($p < 0.05$)
- South-East Asia has the highest R^2 but lacks significance due to small sample size
- African region shows virtually no linear relationship, suggesting other factors (disease burden, healthcare infrastructure, conflict) are more important
- European and Western Pacific regions are borderline significant ($p \approx 0.06$)

Figure 5. Scatter plots of the relationship between income inequality and child mortality within different WHO regions



Reflection

Over the past year, I have been using ChatGPT to learn how to code in R and I found that the iterative process of generating code, trying it, submitting errors to ChatGPT to identify and fix coding problems has helped me to understand the R coding environment and even to write and debug code when ChatGPT was unable to figure it out. While I was unable to make Cursor work given a persistent error message around my internet connection, I think both Cursor and Julius would be useful for quick and dirty exploration of data, particularly during the early phases of understanding the limitations of a dataset.