Curve Fitting with Education, Income Inequality, and Life Expectancy

Amina Ospan, Ethan Trepka, Mien Nguyen, Sloane Sambuco

Background / Motivation

- A child who has a mother who can read is 50% more likely to live past the age of five, 50% more likely to be immunized, and twice as likely to attend school.
- Education can greatly affect human health and well-being.
- Income inequality also affects human health and well-being.

Objectives

- We wanted to investigate how education and income inequality predict human health and well-being (specifically life expectancy).
  - First, we looked at top 20 countries with the highest GDP per capita, and 20 countries with the lowest GDP per capita;
  - Then looked at whole world;
- Solve with curve fitting!

Methods

- Used datasets from The World Bank and UN Data
- UN HDR:

Data sources

- Life expectancy at birth: UNDESA (2015).
- Mean years of schooling: Barro and Lee (2014), UNESCO Institute for Statistics (2015) and Human Development Report Office updates based on UNESCO Institute for Statistics (2015).
- Expected years of schooling: UNESCO (2015).
- GNI per capita: World Bank (2015), IMF (2015) and UNSD (2015).

- Fed data into R Studio for curve fitting
- Looked at different variables' correlations and finalized our analysis

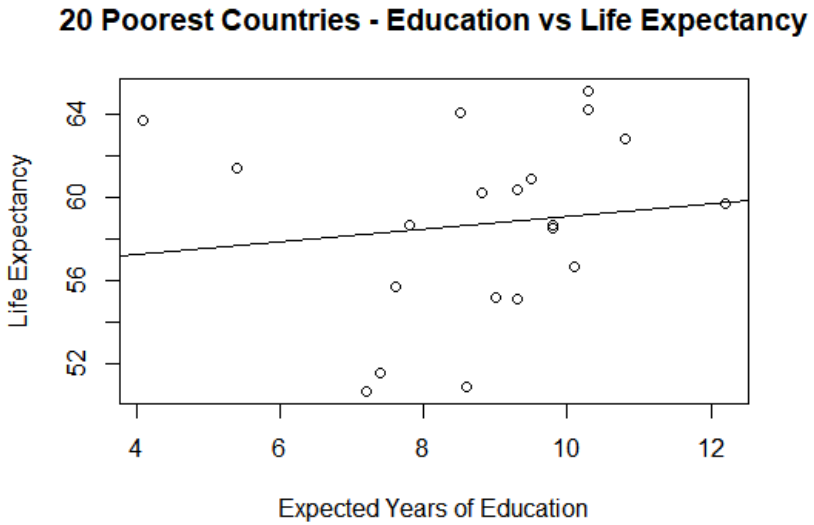
Question 1

How do years of education predict life expectancy?
Is education a better predictor of life
expectancy in countries with high GDP per capita or in
countries with low GDP per capita? (I.e. where does the curve fit
better?)

GDP

- **Gross domestic product (GDP)** is the sum of the market values, or prices, of all final goods and services produced in an economy during a period of time (basically a country's income)
- Measure of economic activity
- GDP per capita = GDP per person (divide by population)

Education vs Life Expectancy

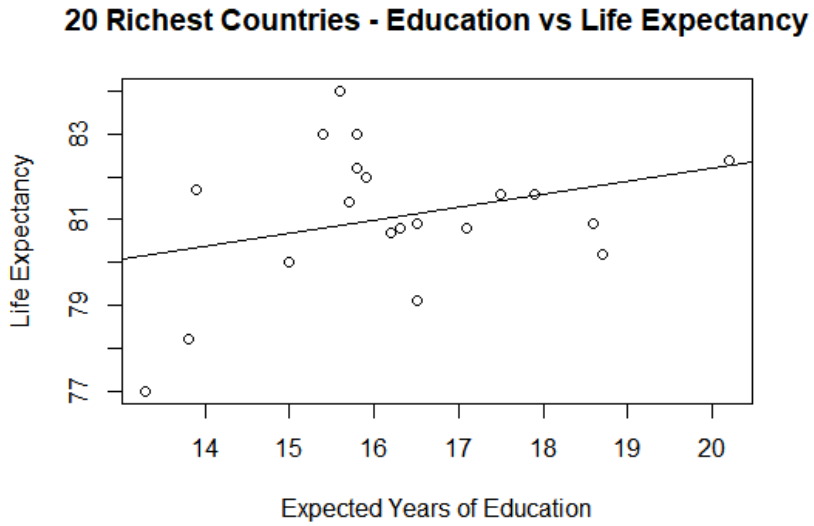


y=0.3074x+56.0126
t(18) = .55, p=.59
R^2 = -.04

- The correlation appears to be stronger (data points closer to the best fitted curve) with 20 richest countries
- But there isn't a huge difference between them, *so we zoomed out…*

- Both show positive correlation:

Higher # years of education correlates with higher life expectancy

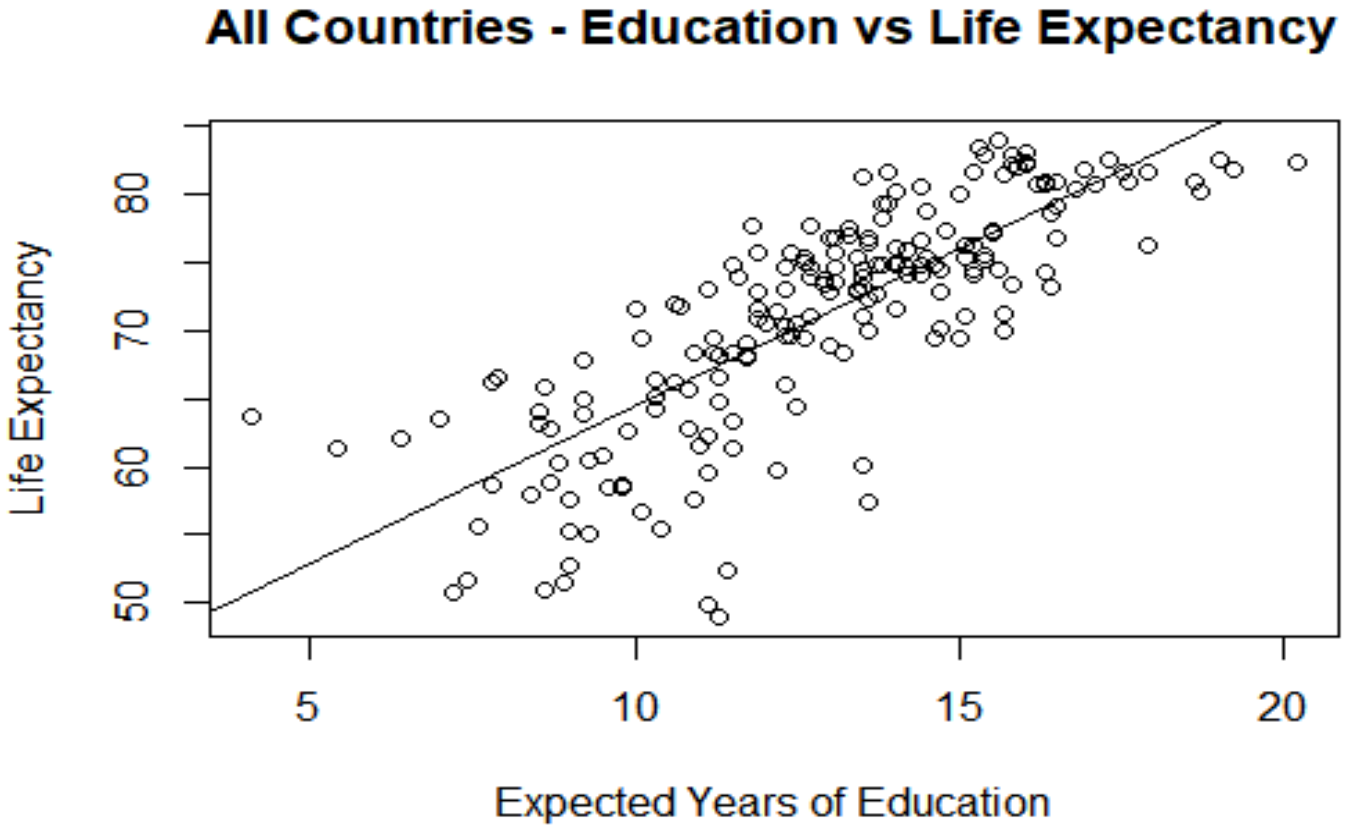


y=0.3029x+76.1427
t(18) = 1.4, p=.77
R^2 = .05

Question 2

How does years of education predict life expectancy in the whole word?

Education vs Life Expectancy



Life Expectancy = 2.3079*Years of Education + 41.38
R^2 = 0.6192
Linear fit: t = 17.79, p<.001

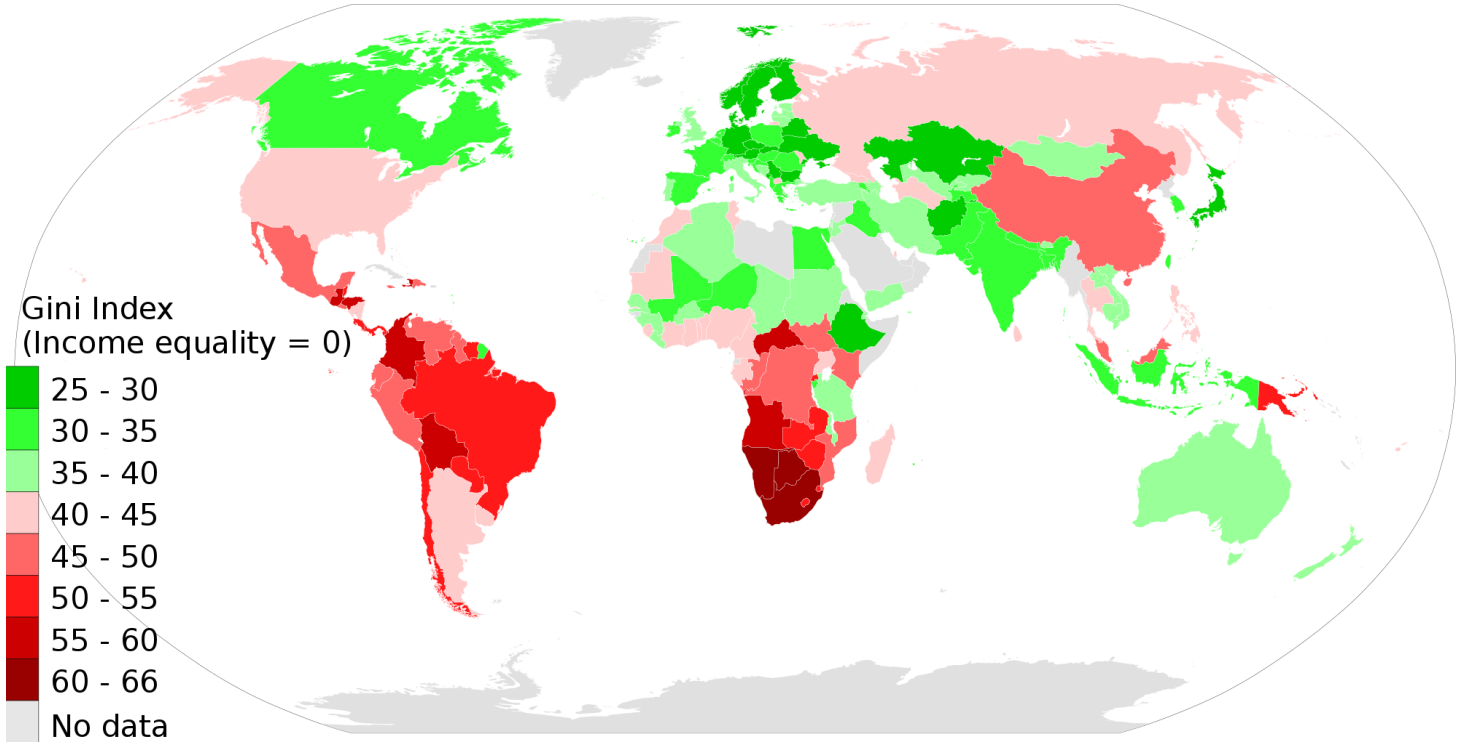
- Further exploring how other inequalities affect life expectancy…

Question 3

How does income inequality predict life expectancy in the whole world?

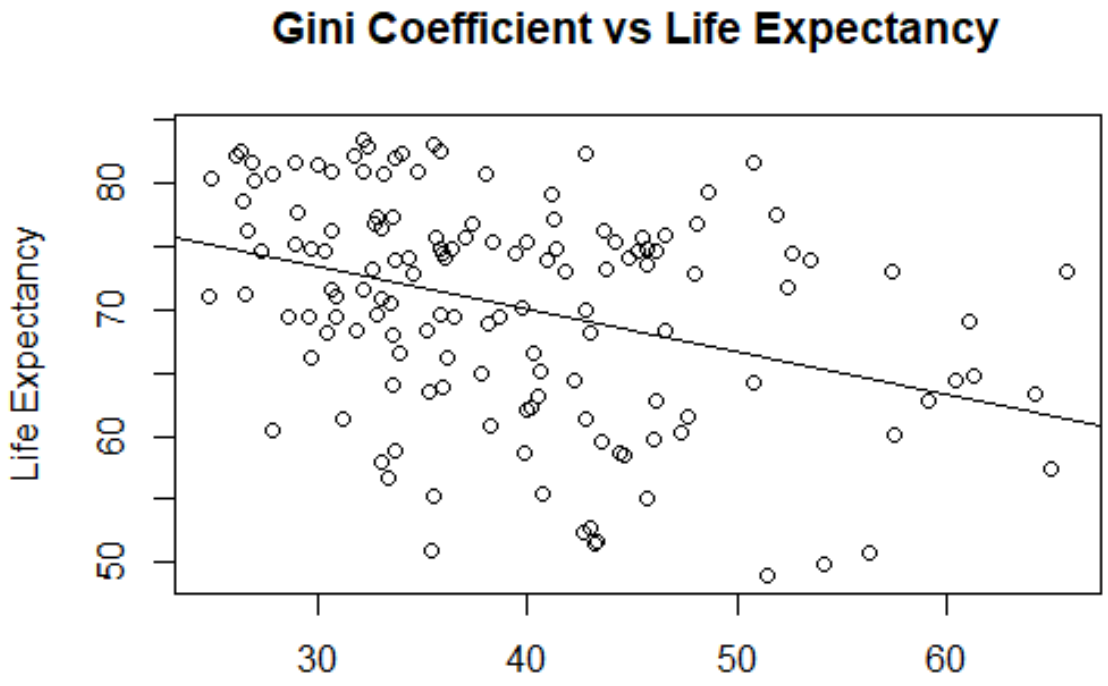
Gini Coefficient

- The **Gini Coefficient** is a statistical measure used as a way of comparing how ***income*** is distributed across a population. (not education)
- A society that scores 0.0 on the Gini scale has perfect equality in income distribution. 1 = all the country's income is earned by a single person.
- ***A higher Gini index indicates greater income inequality,*** with high income individuals receiving much larger percentages of the total income of the population.



Gini coefficient

Gini Coefficient vs Life Expectancy



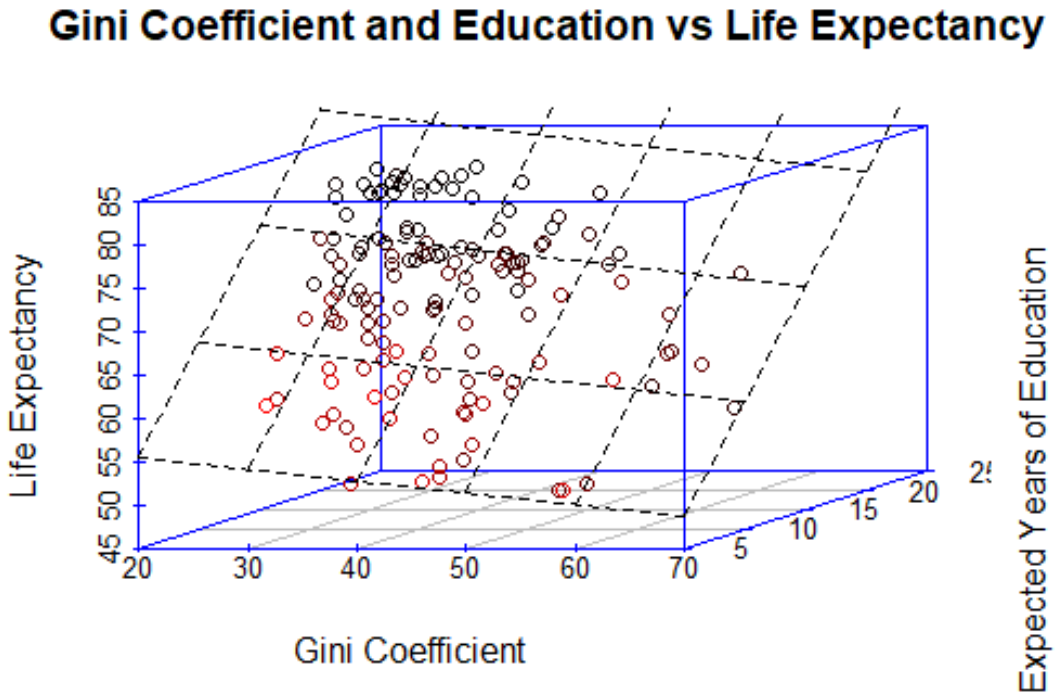
Life Expectancy = -0.33575*Gini + 83.42963
R^2 = 0.12
Linear fit: t = -4.496, p<.001

- Income inequality/Gini coefficient seems to predict life expectancy
  - Combining our graphs…

Question 4

How do income inequality, years of education, and life expectancy relate looking at them all together?

Combined Graph



- Final verdict: expected years of education & income were significant predictors of life expectancy
- R^2 = .65 which indicates that expected years of education and Gini coefficient explain 65% of the variance in life expectancy
- F(2,139) = 130, p<.001 which suggests this model has predictive utility

Key Takeaways

- Question 1: **Higher # years of education correlates with higher life expectancy in both top 20 richest and bottom 20 poorest countries, however, the differences in correlations is not very strong.**
- Question 2: **Years of education is a strong predictor of life expectancy in the whole word.**
- Question 3: **The more income inequality, the lower the expected length of life.**
- Question 4: **Both years of education & income inequality were significant predictors of life expectancy**

Thank you for listening!

Amina Ospan, Ethan Trepka, Mien Nguyen, Sloane Sambuco