

Module 1: What Is Poverty?

Williams College ECON 204:

Global Poverty and Economic Development

Professor: Pamela Jakiela

photo: Per Gunvall / World Bank

Measuring Living Standards: GDP per Capita

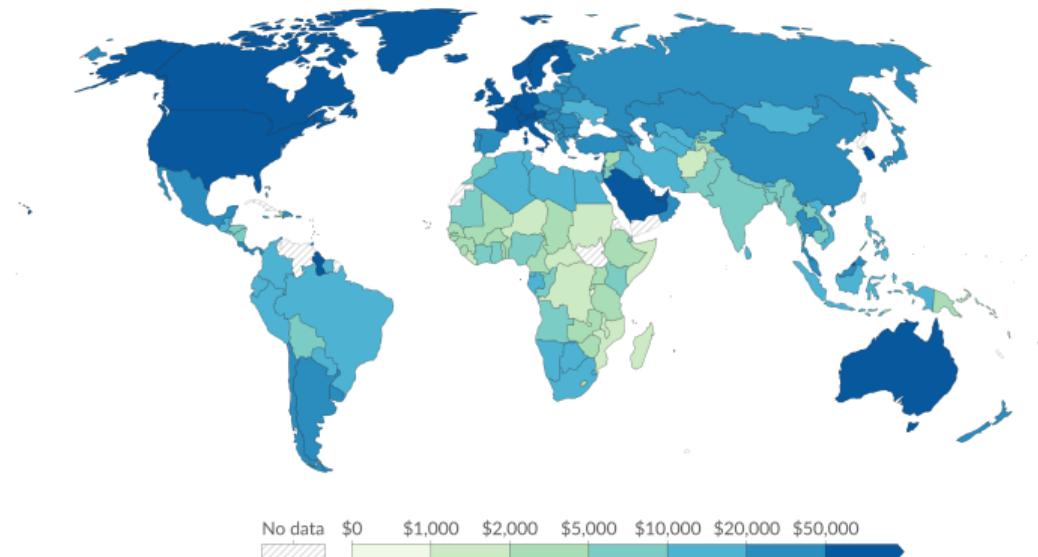
- **Gross Domestic Product (GDP)** is a measure of all the final goods and services produced and sold in an economy, i.e. the monetary value of total market output
 - ▶ Gross Domestic Product vs. Gross National Income
- **GDP per capita** is total GDP divided by population, how much is produced per person
- GDP per capita is adjusted for **purchasing power parity (PPP)** to reflect the fact that goods and services, particularly non-tradables, are often cheaper in low-income countries
- GDP per capita is expressed in real rather than nominal terms (e.g. “2011 dollars”)
- PPP-adjusted GDP per capita varies by more than a factor of 10 across countries:
 - ▶ Burundi: \$836 in 2024
 - ▶ Singapore: \$132,570 in 2024

PPP-Adjusted GDP per Capita Around the World

GDP per capita, 2024

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GDP per capita is a country's gross domestic product¹ divided by its population. This data is adjusted for inflation and differences in living costs between countries.



Data source: Eurostat, OECD, IMF, and World Bank (2025)

Note: This data is expressed in international-\$² at 2021 prices.

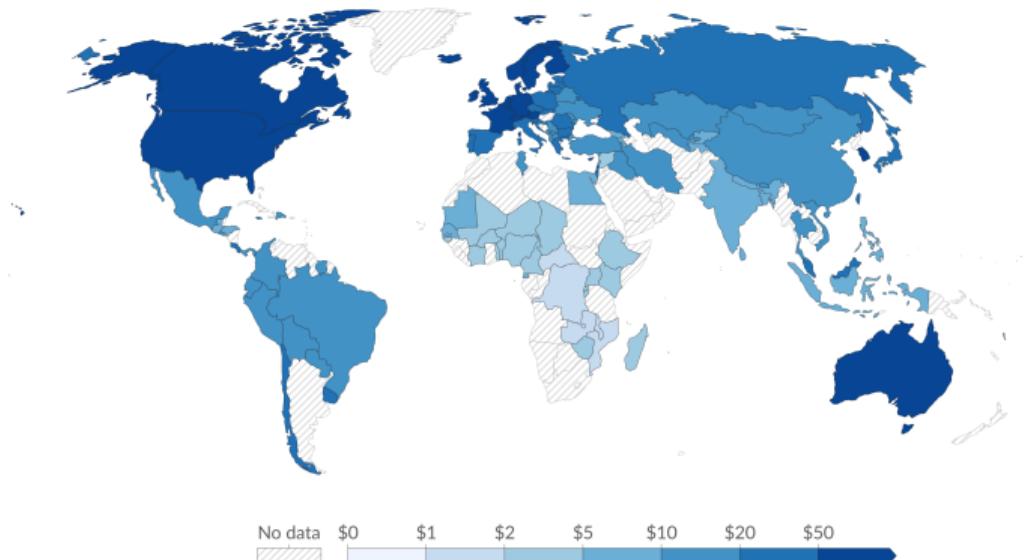
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Median Income

Median income or consumption per day, 2024

This data is adjusted for inflation and differences in living costs between countries.

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Data source: World Bank Poverty and Inequality Platform (2025)

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Note: This data is expressed in international-\$¹ at 2021 prices. Depending on the country and year, it relates to income (measured after taxes and benefits) or to consumption, per capita².

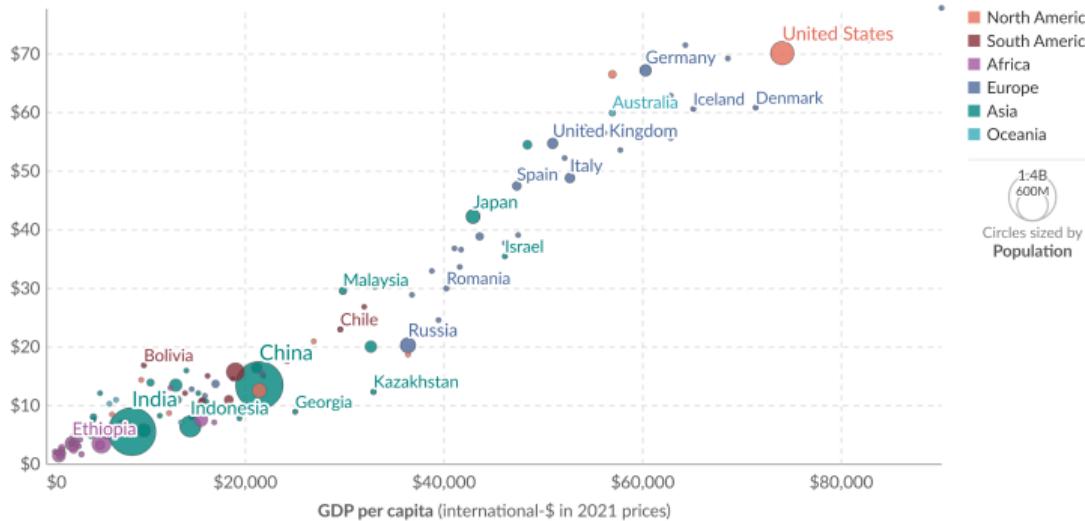
Median Income and GDP per Capita Are Highly Correlated

Median income or consumption per day vs. GDP per capita, 2024

This data is adjusted for inflation and differences in living costs between countries.

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Median income or consumption per day (international-\$ in 2021 prices)



Data source: World Bank Poverty and Inequality Platform (2025); Eurostat, OECD, IMF, and World Bank (2025)

Note: This data is expressed in international-\$ at 2021 prices. Depending on the country and year, median data relates to income (measured after taxes and benefits) or to consumption, per capita.

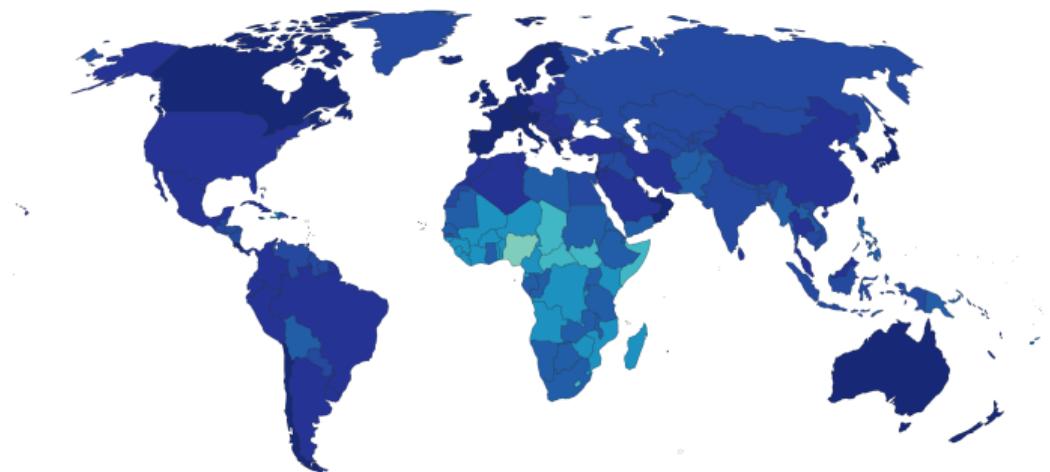
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Life Expectancy

Life expectancy, 2023

The period life expectancy at birth, in a given year.

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40 years 45 years 50 years 55 years 60 years 65 years 70 years 75 years 80 years 85 years

Data source: Human Mortality Database (2025); UN, World Population Prospects (2024)

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Life Expectancy and GDP per Capita Are Highly Correlated

Life expectancy vs. GDP per capita, 2023

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The period life expectancy at birth, in a given year. GDP per capita is adjusted for inflation and differences in living costs between countries.

Life expectancy

85 years

80 years

75 years

70 years

65 years

60 years

55 years

\$20,000

\$40,000

\$60,000

\$80,000

\$100,000

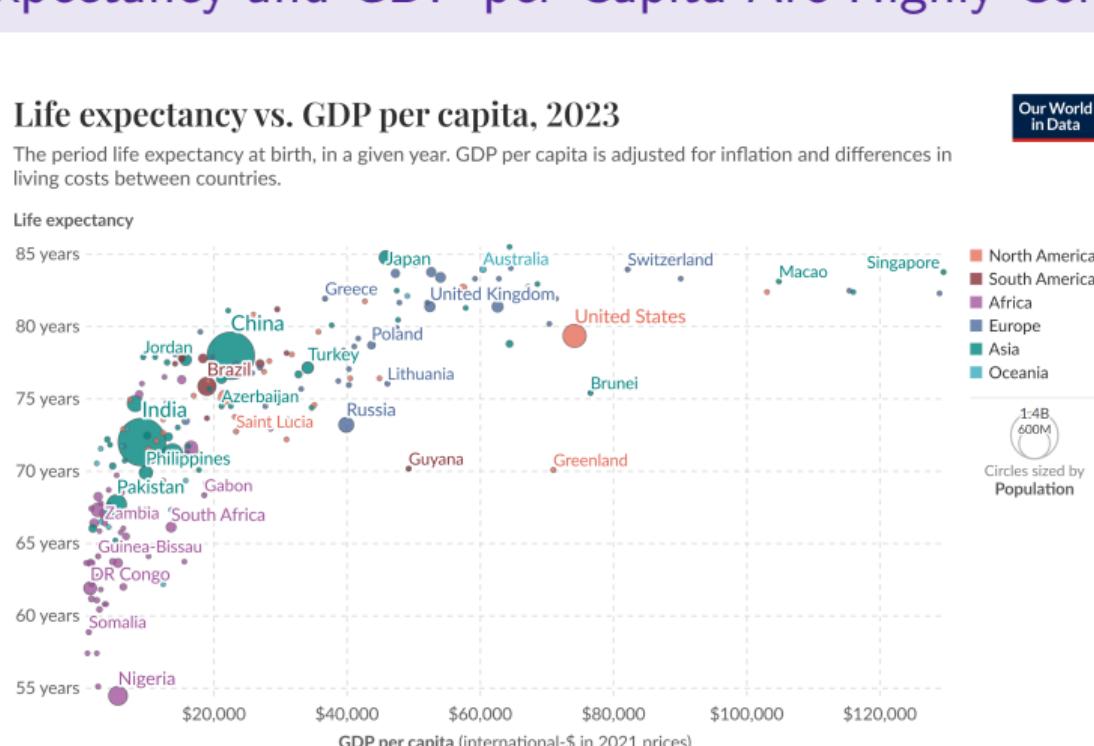
\$120,000

GDP per capita (international-\$ in 2021 prices)

- North America
- South America
- Africa
- Europe
- Asia
- Oceania

1.4B
600M

Circles sized by
Population



Data source: UN, World Population Prospects (2024); Eurostat, OECD, IMF, and World Bank (2025)

Note: GDP per capita is expressed in international-\$ at 2021 prices.

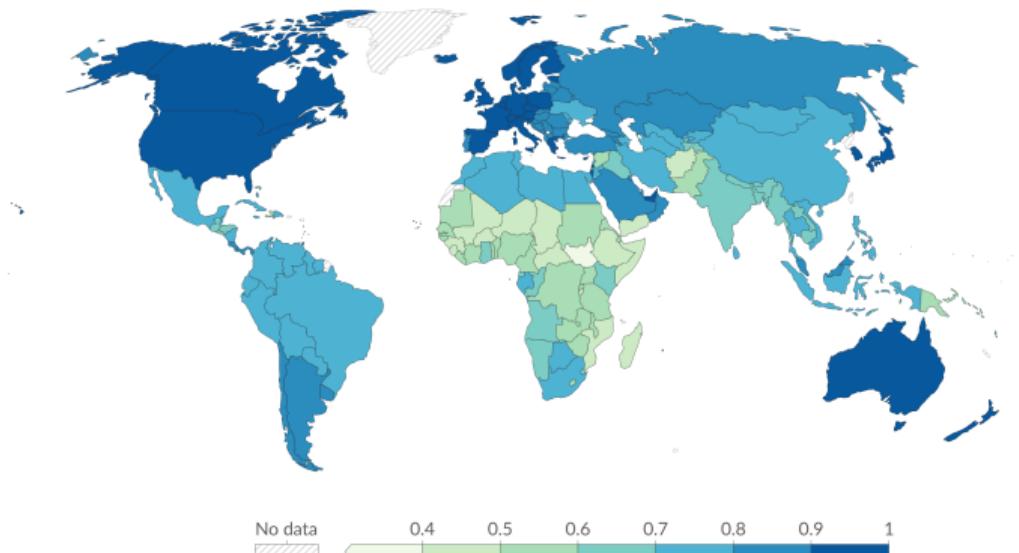
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Human Development Index

Human Development Index, 2023

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The Human Development Index (HDI) is a summary measure of key dimensions of human development: a long and healthy life, a good education, and a decent standard of living. Higher values indicate higher human development.



Data source: UNDP, Human Development Report (2025)

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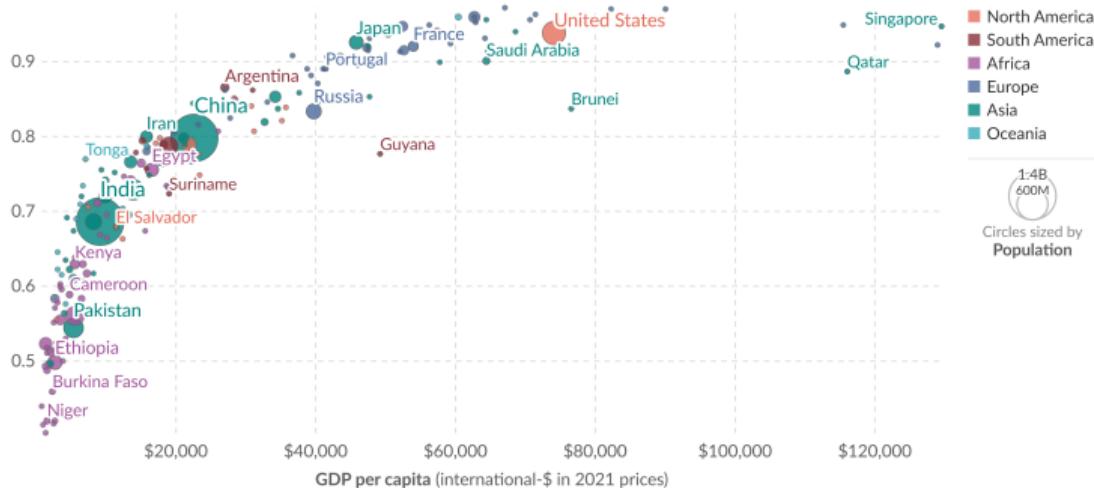
Human Development and GDP per Capita Are Highly Correlated

Human Development Index vs. GDP per capita, 2023

Our World
in Data

The Human Development Index (HDI) is a summary measure of key dimensions of human development: a long and healthy life, a good education, and a decent standard of living. GDP per capita is adjusted for inflation and differences in living costs between countries.

Human Development Index



Data source: UNDP, Human Development Report (2025); Eurostat, OECD, IMF, and World Bank (2025)

Note: GDP per capita is expressed in international-\$ at 2021 prices.

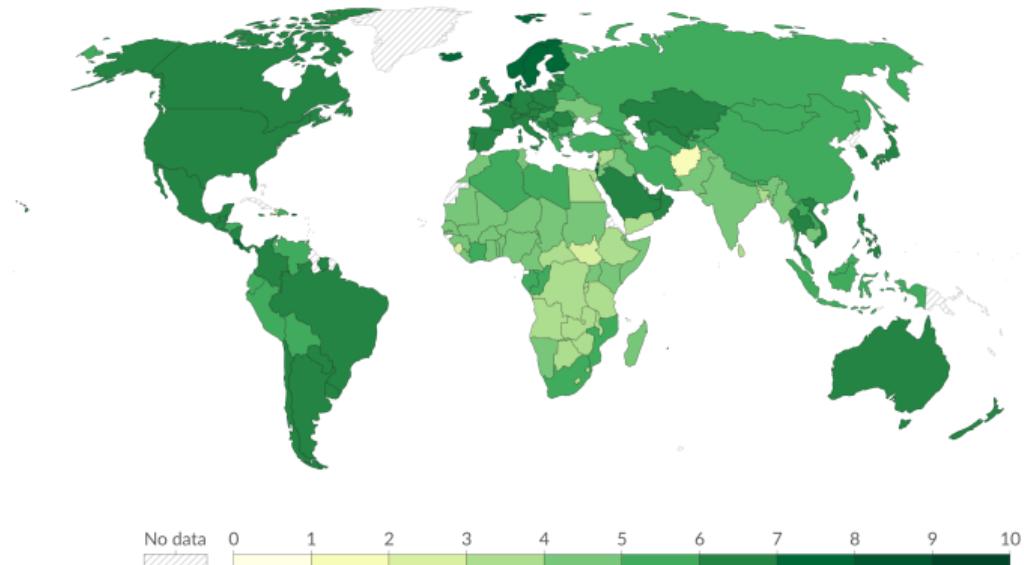
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Life Satisfaction: Measuring Happiness and Subjective Wellbeing

Self-reported life satisfaction, 2024

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Average of survey responses. The survey question asks respondents their current position on a hypothetical ladder, where the best possible life for them is a 10, and the worst possible life is a 0.



Data source: Wellbeing Research Centre (2025)

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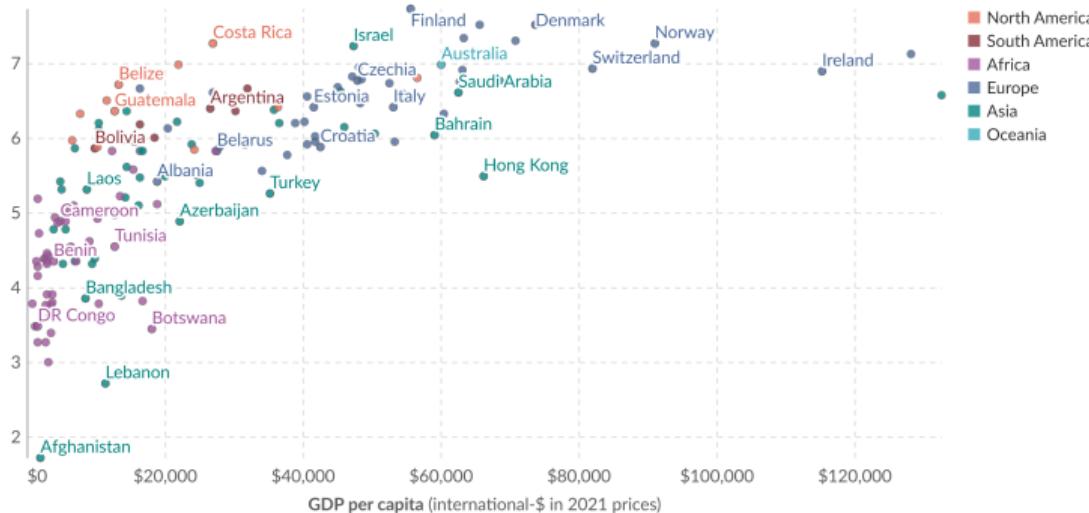
Life Satisfaction and GDP per Capita Are Highly Correlated

Self-reported life satisfaction vs. GDP per capita, 2024

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Self-reported life satisfaction is measured on a scale ranging from 0-10, where 10 is the highest possible life satisfaction. GDP per capita is adjusted for inflation and differences in living costs between countries.

Life satisfaction (0-10)



Data source: Wellbeing Research Centre (2025); Eurostat, OECD, IMF, and World Bank (2025)

Note: GDP per capita is expressed in international-\$ at 2021 prices.

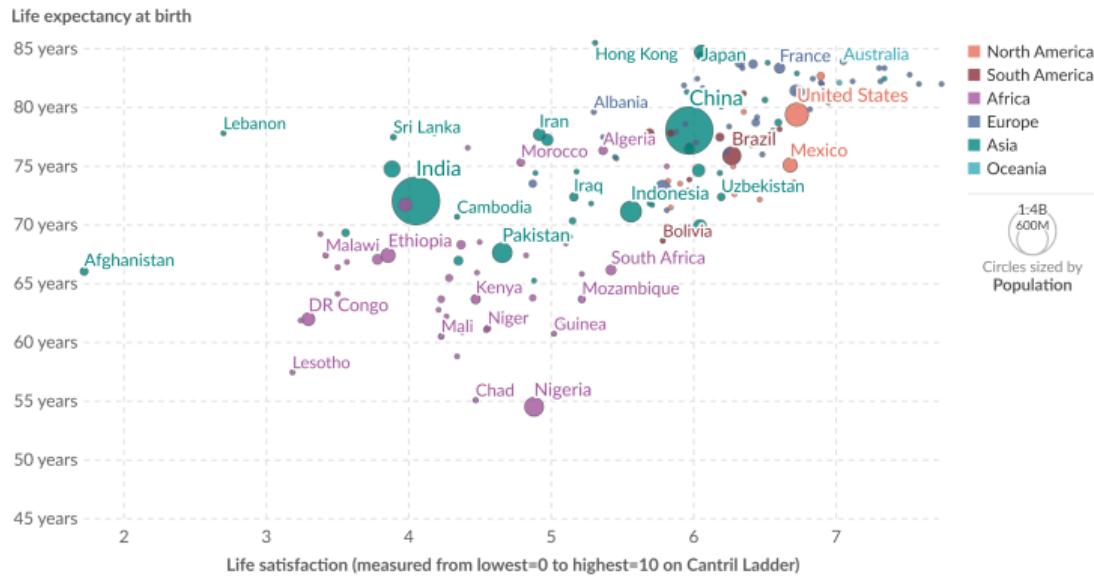
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Life Satisfaction and Life Expectancy Are Highly Correlated

Life satisfaction vs. life expectancy, 2023

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The vertical axis shows life expectancy at birth. The horizontal axis shows self-reported life satisfaction in the Cantril Ladder (0-10 point scale with higher values representing higher life satisfaction).



Data source: UN, World Population Prospects (2024); Wellbeing Research Centre (2025)

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Summary: Alternative Measures of Living Standards

- **Median income/consumption** constructed from household and/or labor force surveys
 - ▶ Less subject to outliers than GDP per capita
 - ▶ Data is missing for many countries
- **Life expectancy** at birth is the expected lifespan of a child born today if current age-specific mortality rates were to remain constant throughout the child's life
 - ▶ Major drivers: infant mortality and maternal mortality
- The UN's **Human Development Index (HDI)** aggregates life expectancy at birth, current and expected educational attainment, and income (GNI) per capita
- Cantril's Ladder of Life captures **life satisfaction**, happiness, and subjective wellbeing

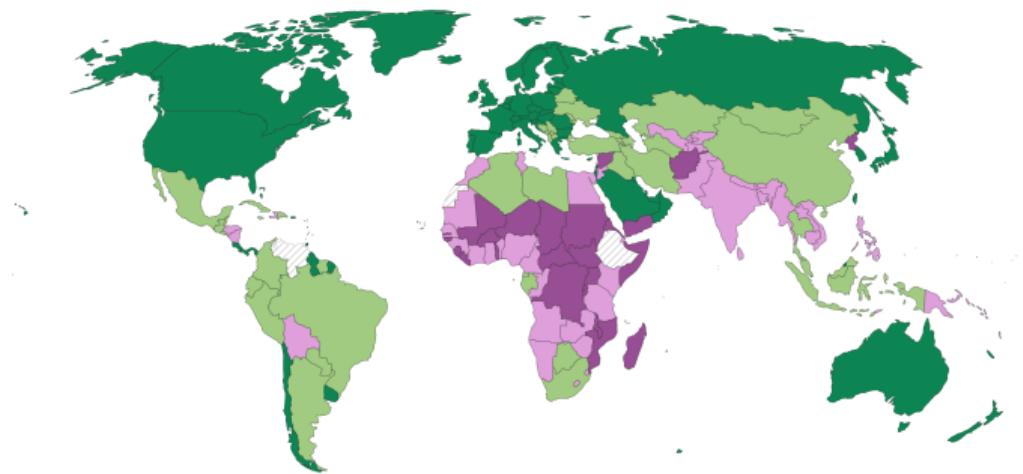
Country-Level Measures of Living Standards Are Correlated

		Maximum		Minimum		Ratio
GDP per capita	Singapore	\$132,570	Burundi	\$836	158	
Median income/consumption	Luxembourg	\$89.49	DRC	\$1.32	67.8	
Life expectancy	Monaco	86.4	Nigeria	54.5	1.6	
Human Development Index	Iceland	0.972	South Sudan	0.388	2.5	
Life satisfaction	Finland	7.74	Afghanistan	1.36	5.7	

Low-Income, Middle-Income, and High-Income Countries

World Bank income groups, 2024

The World Bank's income classification divides countries into four categories based on their gross national income (GNI) per capita. Thresholds between income groups have changed over time.



■ Low income ■ Lower-middle income ■ Upper-middle income ■ High income ■ No data

Data source: World Bank (2025)

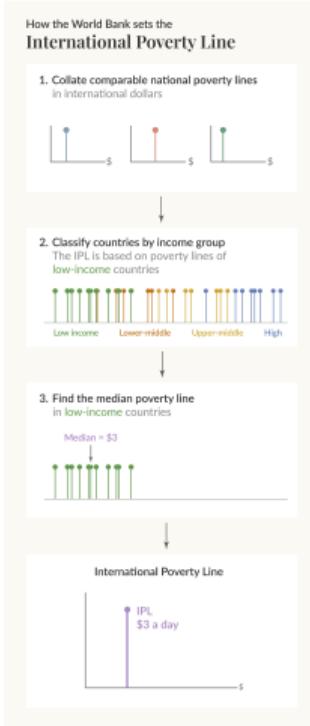
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Note: Countries are grouped based on the income classification for each respective year. This means that group membership can change over time. Venezuela and Ethiopia are currently unclassified.

How the World Bank Measures Extreme Poverty

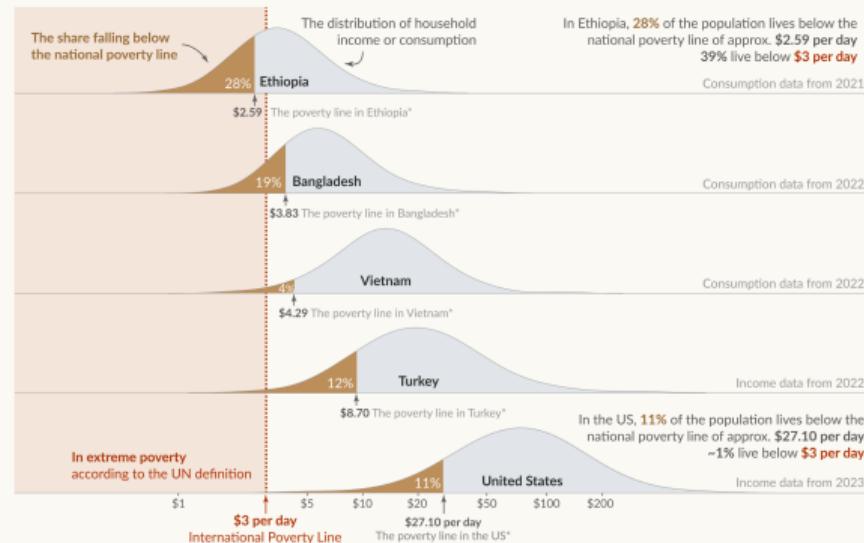
- Poverty lines were originally constructed in the UK and US to reflect the minimum income needed to obtain basic necessities, either calories or calories plus shelter, heat, etc.
- They are used to classify individuals and households, and to compare across regions
- Countries define their own poverty lines (e.g. \$15,650 for a single person in the US), reflecting prevailing views of how much income is needed to meet (perceived) basic needs
 - ▶ Even after adjusting for purchasing power parity, **relative poverty** lines are higher in high-income countries (HICs) than in low- and middle-income countries (LMICs)
- Martin Ravallion introduced the idea of an international measure of **extreme poverty**
 - ▶ \$1 per day, then \$1.08 per day, then \$1.90 per day, then \$2.15 per day, now \$3.00 per day
 - ▶ Adjustments reflect both inflation and changes in living standards in low-income countries
 - ▶ Reflects the fact that most of the world is poor by US (or Luxembourg) standards
 - ▶ Those in extreme poverty often lack calories, shelter, water, power, schools, healthcare, etc.

Relative Poverty vs. Absolute Poverty vs. Extreme Poverty



National poverty lines, poverty rates and incomes in five countries

This data is adjusted for inflation and for differences in living costs between countries.



Note: This data is expressed in international-\$ at 2021 prices. It relates to income (measured after taxes and benefits) or to consumption, per capita.

* Poverty lines are approximations of national definitions, harmonized to allow comparisons across countries. All poverty lines are from Lakner et al. (2025), except for the US — which we calculate from the value that in the World Bank's poverty data yields the same rate as the official US Census Bureau rate in 2023.

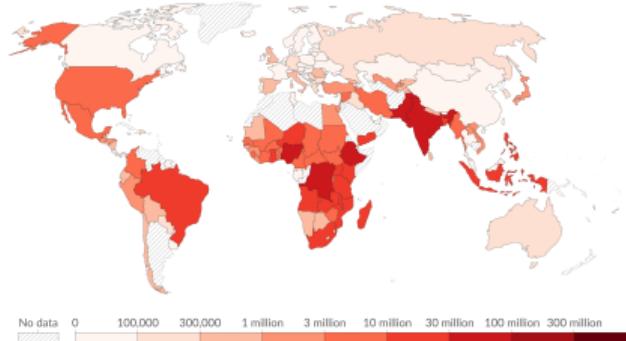
Data source: World Bank Poverty and Inequality Platform (2025); Lakner et al. (2025); US Census Bureau (2024)

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The Changing Distribution of Extreme Poverty

Number of people living in extreme poverty, 2019

Extreme poverty is defined as living below the International Poverty Line of \$3 per day. This data is adjusted for inflation and for differences in living costs between countries.



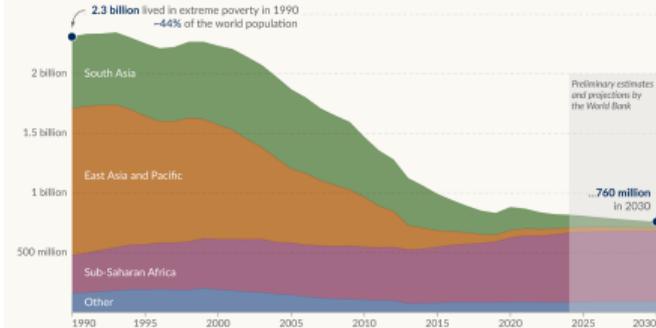
Data source: World Bank Poverty and Inequality Platform (2025)

Note: This data is expressed in International-\$ at 2021 prices. Depending on the country and year, it relates to income (measured after taxes and benefits) or to consumption, per capita.

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The number of people in extreme poverty – including projections to 2030

Extreme poverty is defined as living below the International Poverty Line of \$3 per day. This data is adjusted for inflation and for differences in living costs between countries.



Note: This data is expressed in International-\$ at 2021 prices. It relates to income (measured after taxes and benefits) or to consumption, per capita.

From 2024 onwards, the data refers to newcasts and projections based on growth estimates and forecasts from the World Bank and IMF.

Data source: Laiher et al. (2025)

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The Changing Distribution of Extreme Poverty

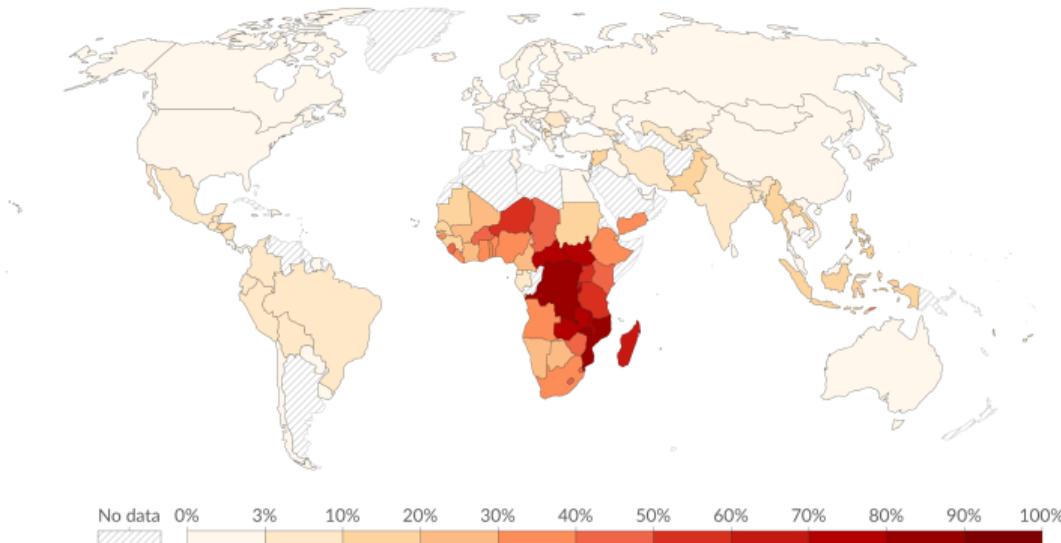
- No high-income country except the US has millions of people in extreme poverty
- Roser (2021): “The poorest people today live in countries which have achieved no growth”
- Page and Pande (2018) dispute this, pointing out that eight middle-income countries (China, India, Indonesia, Nigeria, Pakistan, the Philippines, South Africa, and Zambia) each account for more than one percent of the world’s (less than \$1.90 per day) poor
 - ▶ Many “countries which have achieved no growth” are fragile/conflict-affected states (FCS)
 - ▶ Binyavanga Wainaina: “Never have a picture of a well-adjusted African on the cover of your book, or in it, unless that African has won the Nobel Prize. An AK-47, prominent ribs... If you must include an African, make sure you get one in Masai or Zulu or Dogon dress.”

Poverty Headcount Ratio

Share of population living in extreme poverty, 2019

Our World
in Data

Extreme poverty is defined as living below the International Poverty Line of \$3 per day. This data is adjusted for inflation and for differences in living costs between countries.

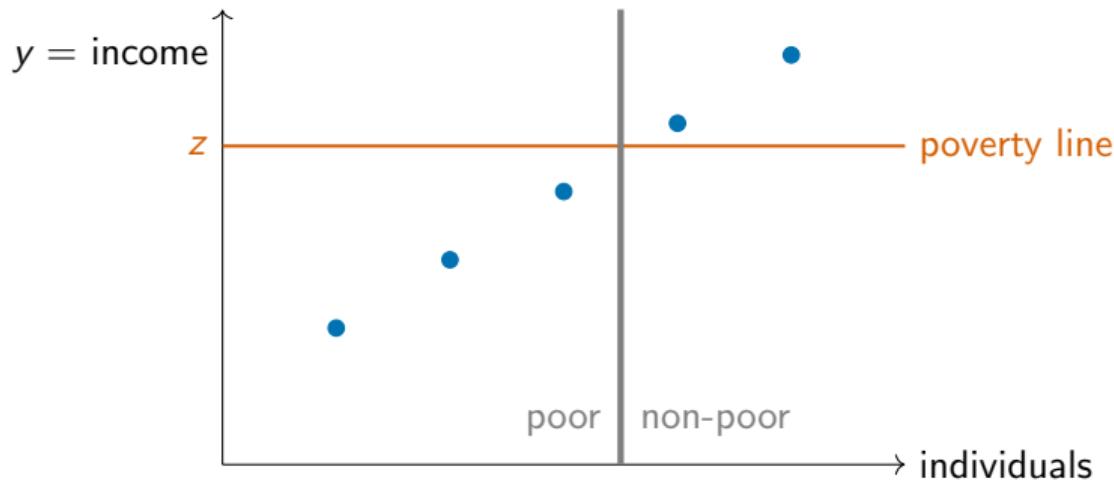


Data source: World Bank Poverty and Inequality Platform (2025)

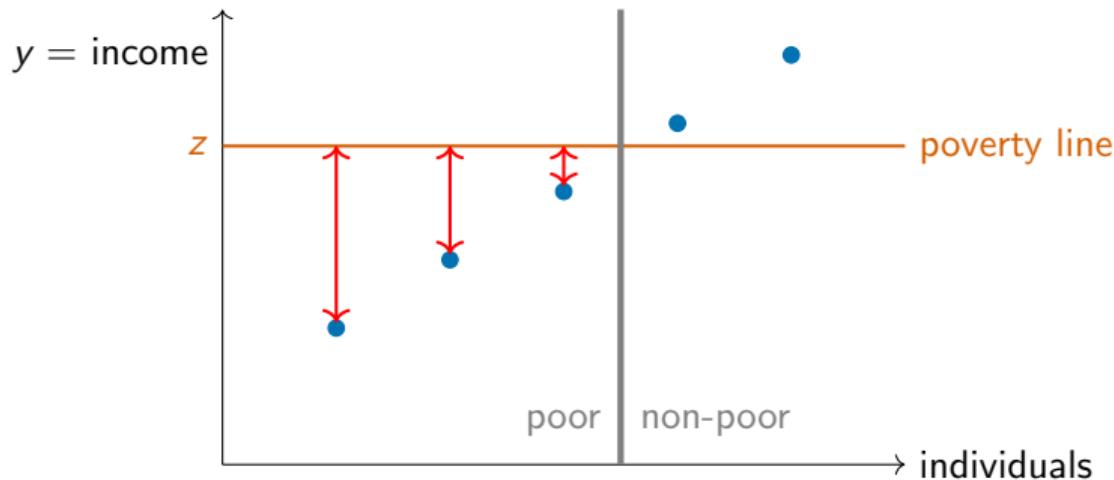
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Note: This data is expressed in international-\$ at 2021 prices. Depending on the country and year, it relates to income (measured after taxes and benefits) or to consumption, per capita.

Measuring Poverty: The Headcount Ratio



Measuring Poverty: The Poverty Gap Index



Measuring Poverty

- The **poverty headcount ratio** is the percentage of a population below the poverty line:

$$HC = \frac{N_{poor}}{N} = \frac{1}{N} \sum_{i=1}^{N_{poor}} 1$$

- The **poverty gap index** is a measure of the depth of poverty:

$$PG = \frac{1}{N} \sum_{i=1}^{N_{poor}} \left(\frac{z - y_i}{z} \right)$$

where z is the poverty line and y_i is individual i 's income or consumption level

- Both can be expressed as either a percentage (0 to 100) or a proportion (0 to 1)

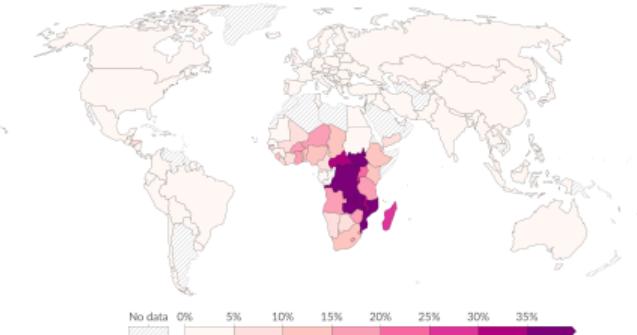
Measuring Poverty: Comparing Approaches

- When would the headcount ratio be equal to 0?
- When would the poverty gap index be equal to 0?
- When would the headcount ratio be equal to the poverty gap index?
- If you had one million dollars to spend reducing poverty by making direct transfers (of \$) to poor individuals, what should you do to reduce the headcount ratio as much as possible?

Measuring Poverty: Comparing Approaches

Poverty gap index at \$3 a day, 2019

The poverty gap index is a poverty measure that reflects both the prevalence and the depth of poverty. It is calculated as the share of population in poverty multiplied by the average shortfall from the poverty line (expressed as a % of the poverty line).



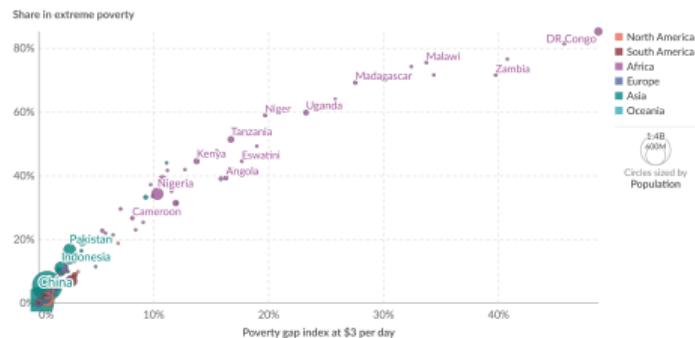
Data source: World Bank Poverty and Inequality Platform (2025)

Note: This data is measured in International-\$ at 2021 prices to adjust for inflation and differences in living costs between countries. Depending on the country and year, it relates to income (measured after taxes and benefits) or to consumption, per capita.

Our World in Data

Share in extreme poverty vs. poverty gap index, 2019

Extreme poverty is defined as living below the International Poverty Line of \$3 per day. The poverty gap index is a poverty measure that reflects both the prevalence and the depth of poverty. It is the share of population in poverty multiplied by the average shortfall from the poverty line (expressed as a % of the poverty line).



Data source: World Bank Poverty and Inequality Platform (2025)

Note: This data is measured in International-\$ at 2021 prices to account for inflation and differences in living costs between countries. Depending on the country and year, it relates to income (measured after taxes and benefits) or to consumption, per capita.

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Summary: Extreme Poverty in 2026

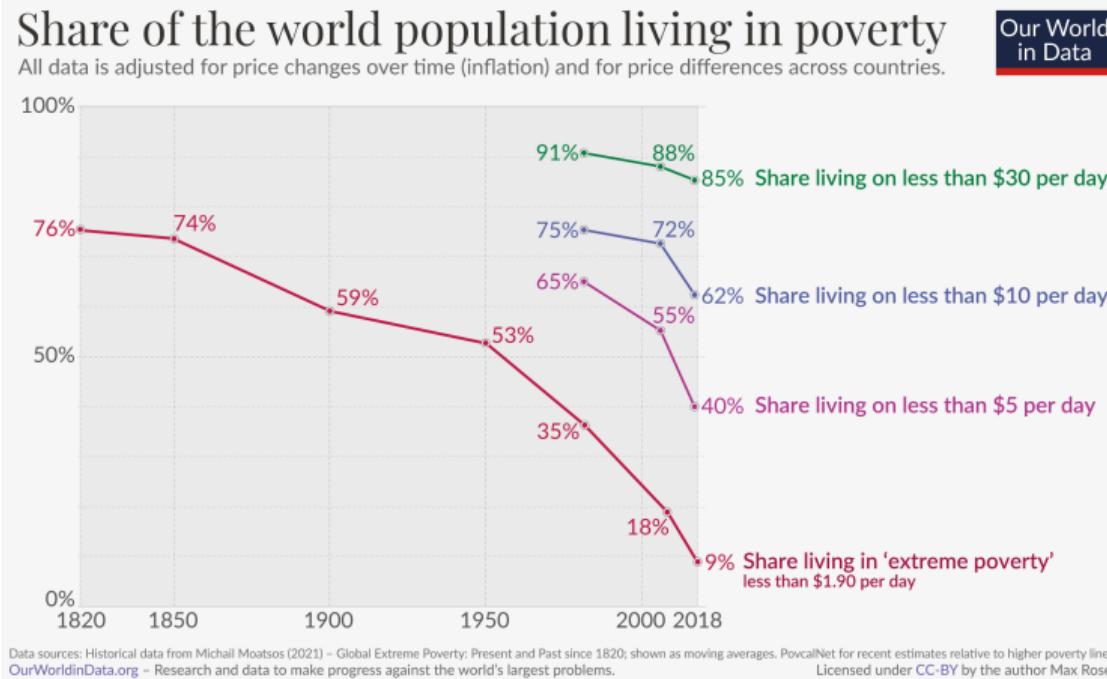
Over 800 million people around the world are living on less than \$3 per day

- Two thirds of the world's extremely poor people live in Sub-Saharan Africa, and African countries tend to have the highest poverty headcounts and the largest poverty gaps
 - ▶ Exceptions include Haiti, East Timor, Papua New Guinea, Yemen, Afghanistan
- India, Pakistan, Indonesia, and the Philippines also contain large numbers of extreme poor

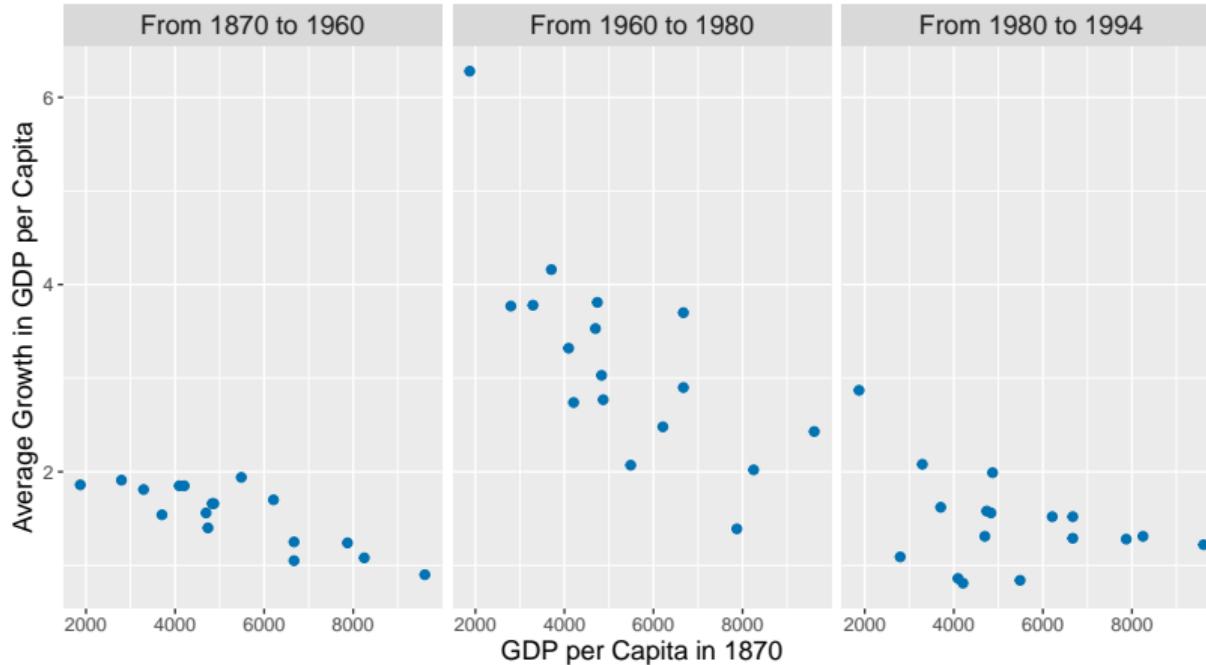
The number of people in extreme poverty declined by more than 50% between 2000 and 2015

- There were over 2.2 billion extreme poor in 2000, down to only about 1 billion by 2015
- The largest gains were in the East Asia and Pacific and South Asia regions, where the number of people living in extreme poverty declined by almost 75% over those 15 years
- Progress against extreme poverty has slowed since then

Poverty Reduction in Historical Perspective



GDP Growth in Historical Perspective: Pritchett (1997)



Sample: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, UK, USA

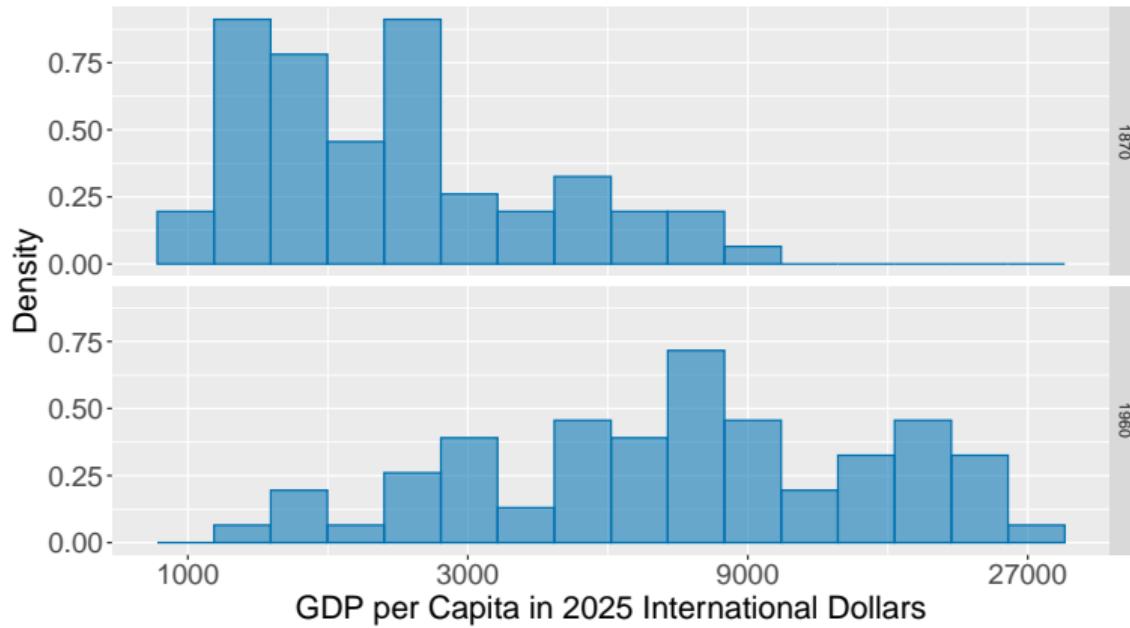
Convergence

Pritchett (1997) shows evidence of convergence among rich countries between 1870 and 1960

- Currently rich countries that were initially poorer...
- Many economic theories as to why this might be the case (Solow, Gershenkron)
- In what sense is convergence among (currently) high-income countries tautological?

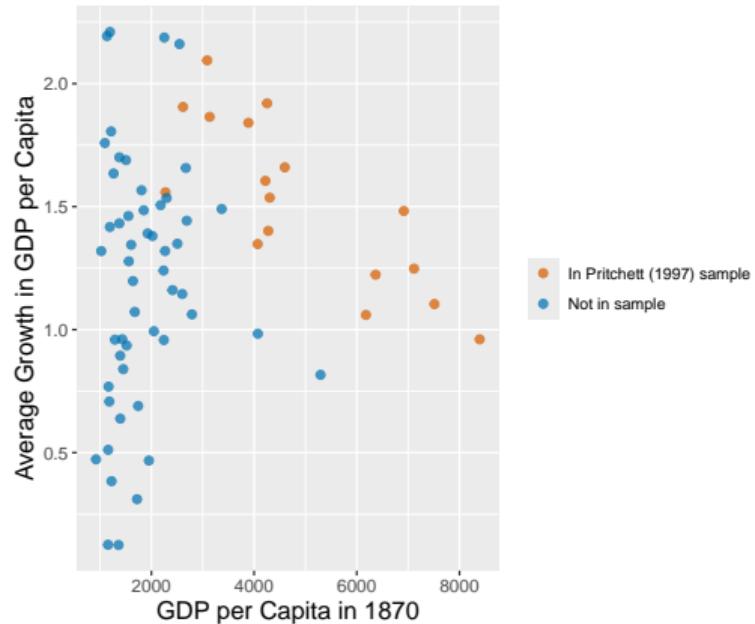
How do we know that poor countries (today) were not growing as fast as wealthy countries?

Substantial Growth in GDP per Capita Between 1870 and 1960

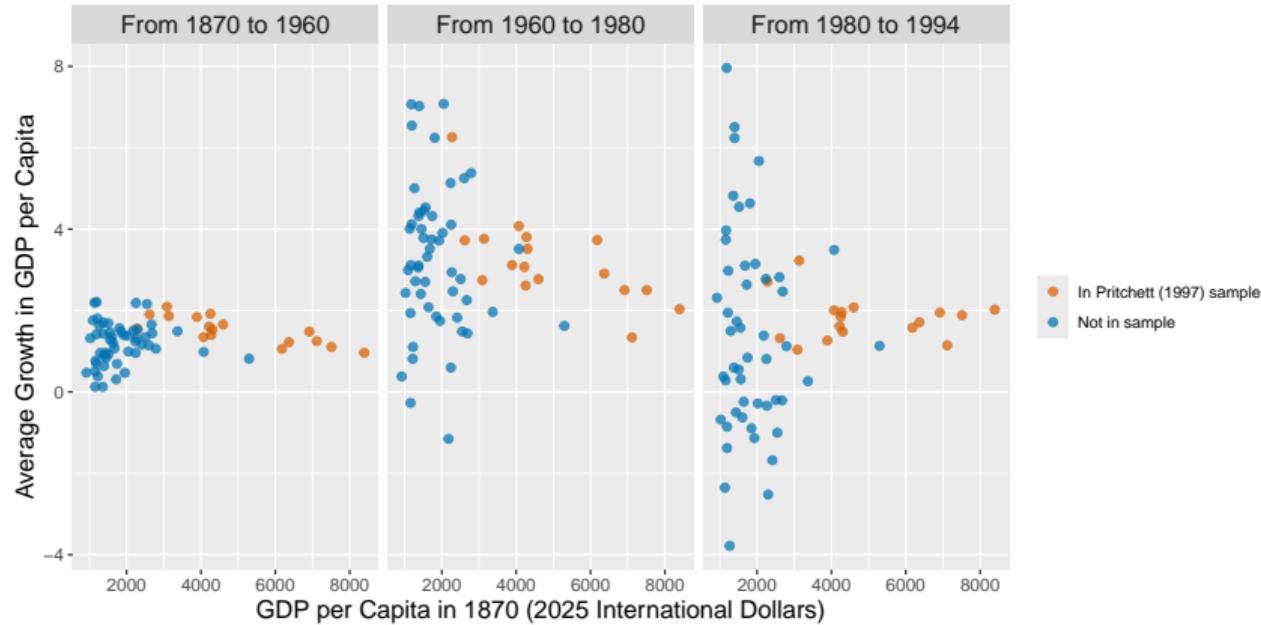


Data from Bolt and Van Zanden (2024), sample includes $N = 69$ countries

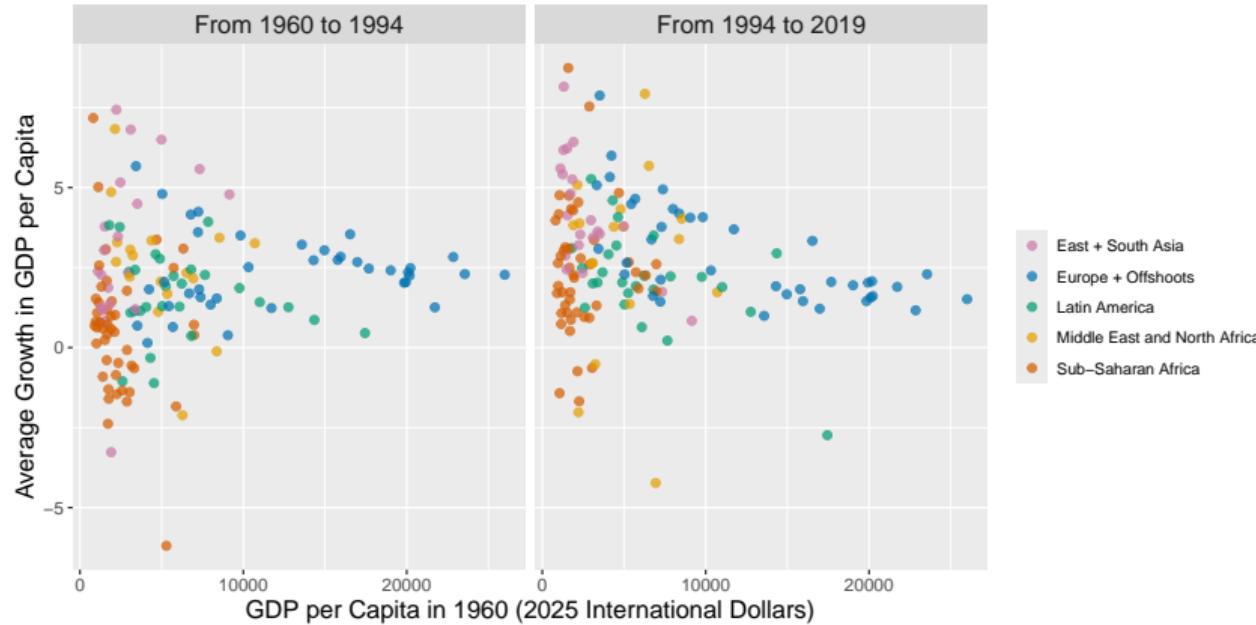
No Overall Pattern of Convergence Between 1870 and 1960



No Overall Pattern of Convergence Between 1870 and 1994



Convergence Between 1960 and 2019?



How Much Would It Cost to End Extreme Poverty?

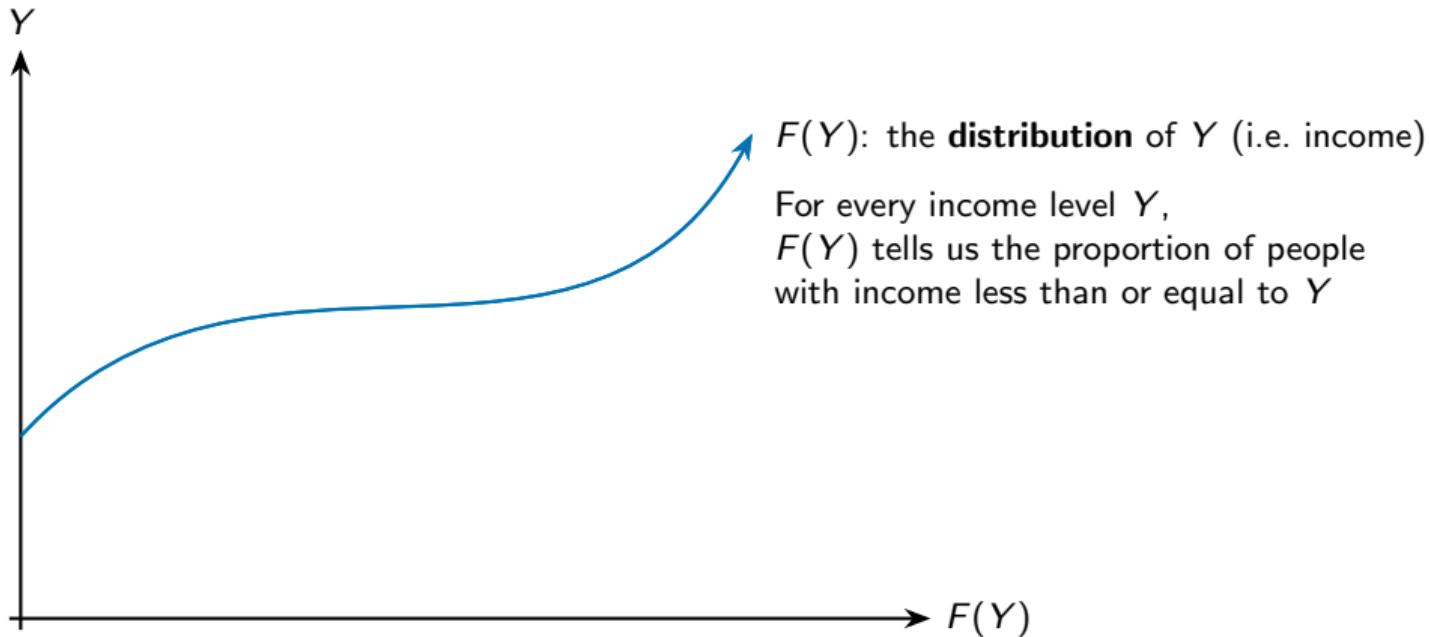
Giving every poor person \$1,095 would end extreme poverty (mechanically, for this year)

- In practice, we (and poor country governments) don't know who is poor
- Transfers are often made based on **proxy means testing**
 - ▶ Do your (obvious, measurable) durable assets suggest that you are poor?
 - ▶ Targeting based on proxy means testing leads to errors of inclusion and exclusion

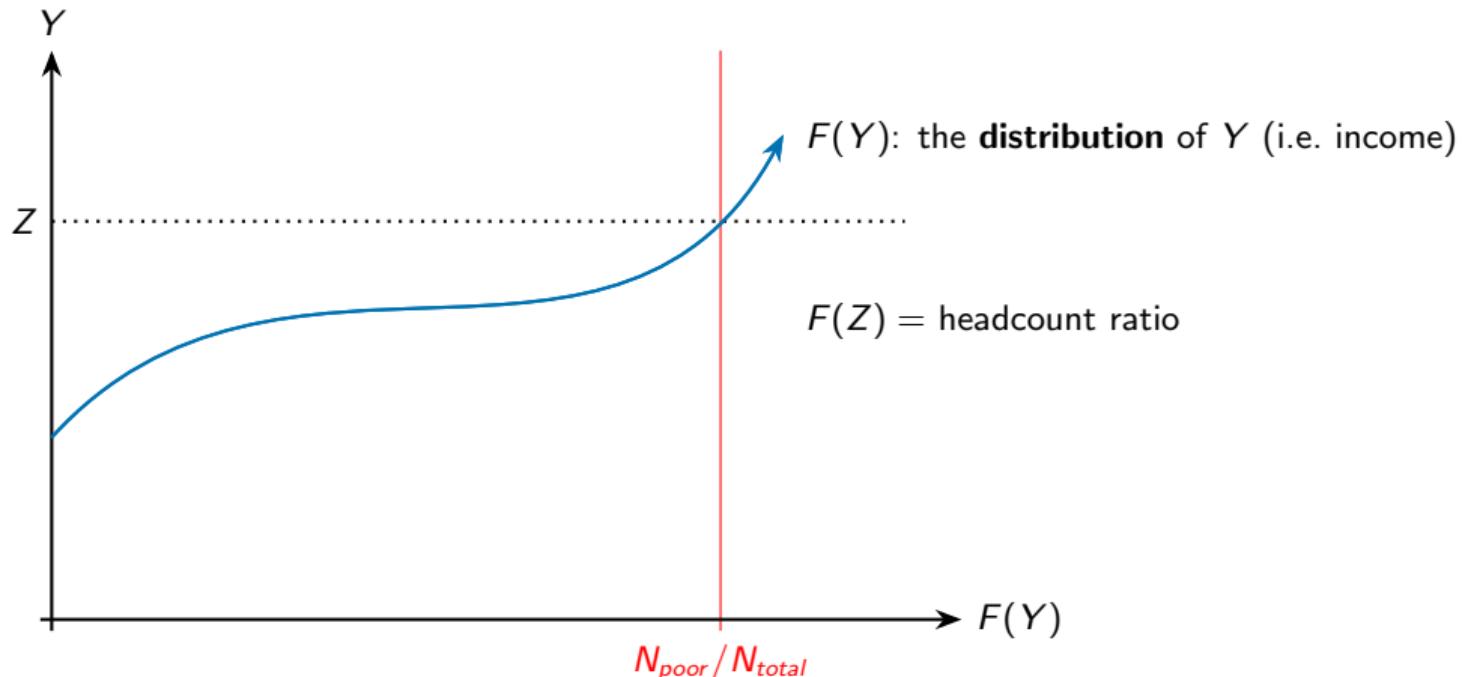
Paul Neihaus and colleagues frame this as a big data problem: how much would it cost to end extreme poverty if you used widely available (e.g. census) data to predict who is poor

- Use nationally-representative income/consumption surveys to see how well targeting works
- Define a mapping from observable assets to government transfers

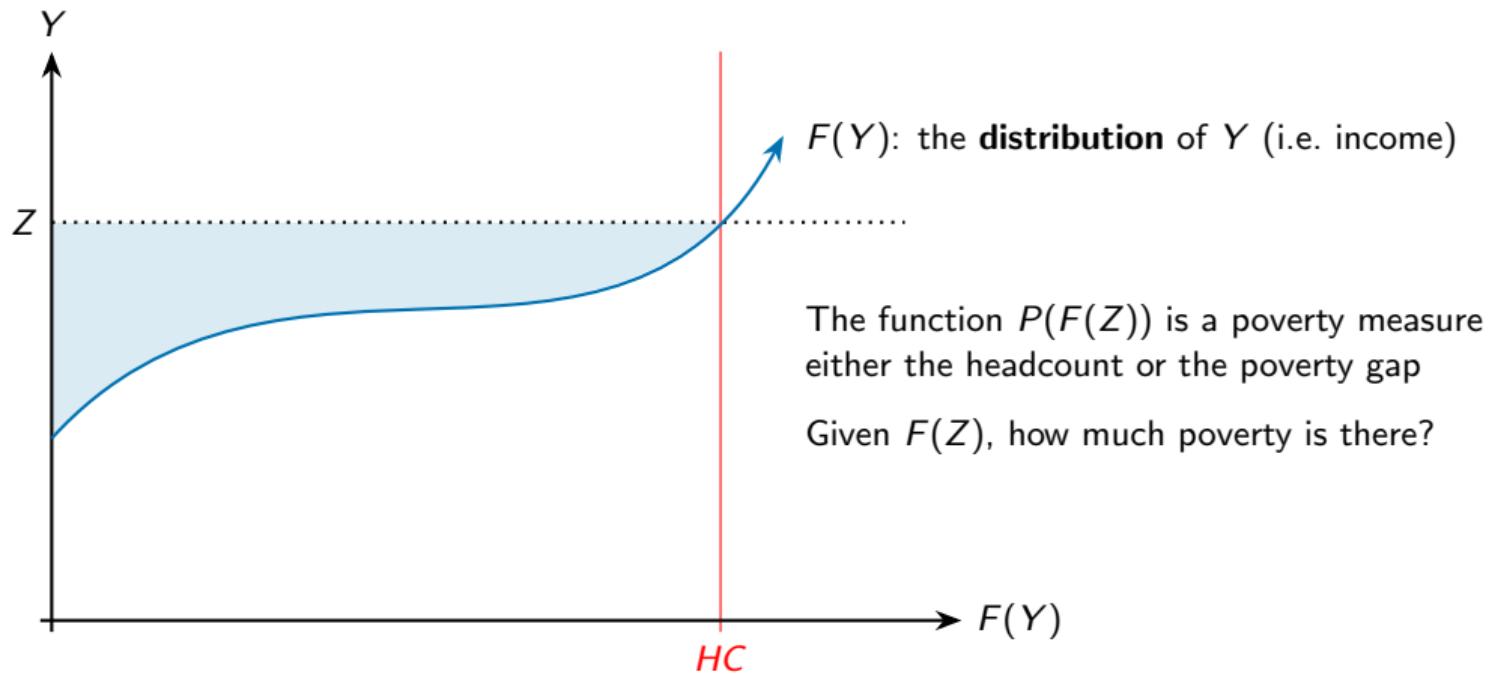
The Distribution of Income



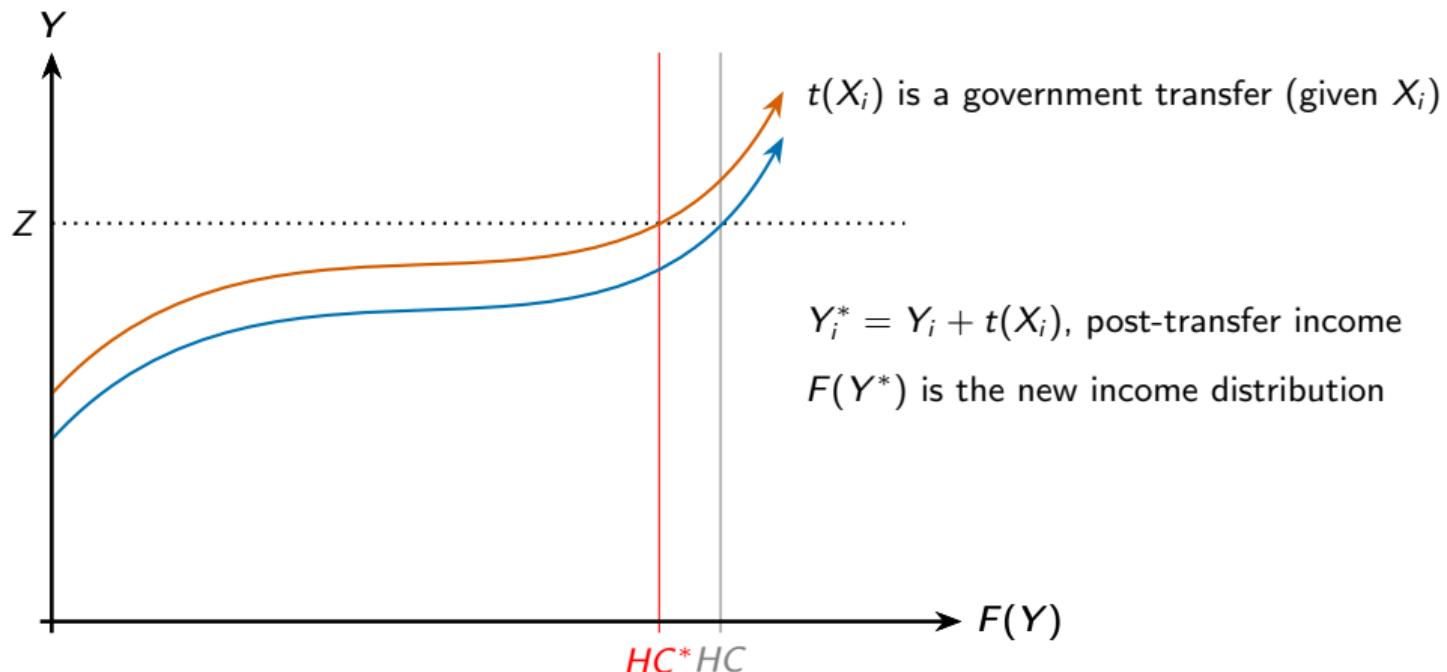
Poverty Measures



Poverty Measures



Government Transfers Shift the Income Distribution



The Social Planner's Problem

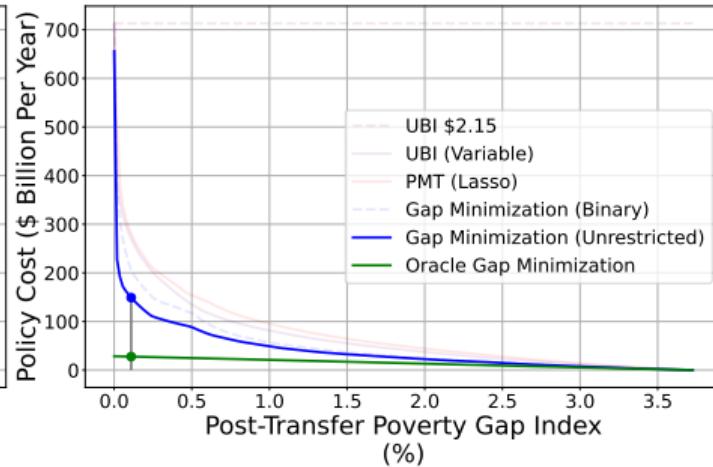
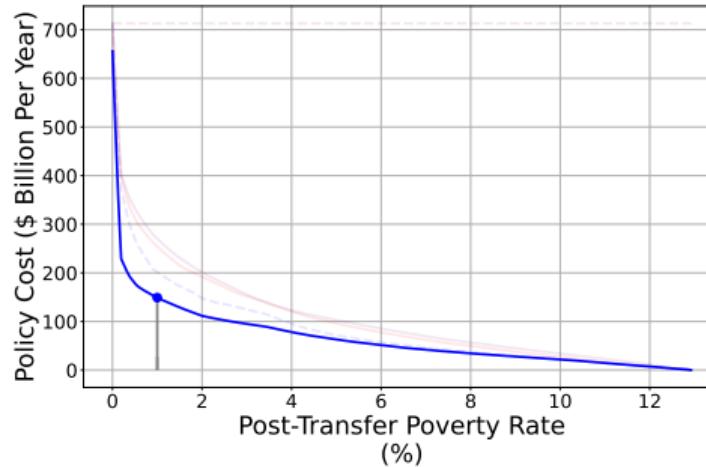
The social planner wants to minimize poverty, i.e. they want to solve

$$\min P(F(Y^*)) \text{ subject to } \sum_i t(X_i) \leq B \text{ and } t(X_i) > 0 \text{ for all } i$$

where:

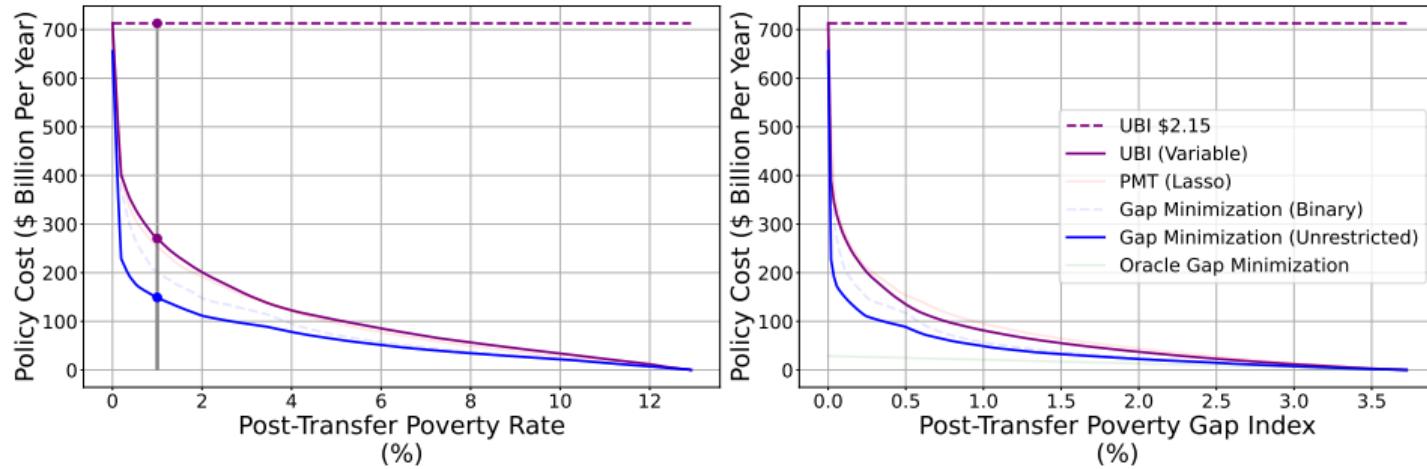
- $F(Y)$ is the distribution of income before government transfers
- X_i is the data we have about individual or household i (e.g. assets)
- $t(X_i)$ is a transfer function that tells us how much to transfer to i given X_i
- $Y_i^* = Y_i + t(X_i)$ is post-transfer income, and $F(Y^*)$ is the new income distribution
- $B > 0$ is the budget for all transfers

How Much Would It Cost to End Extreme Poverty?



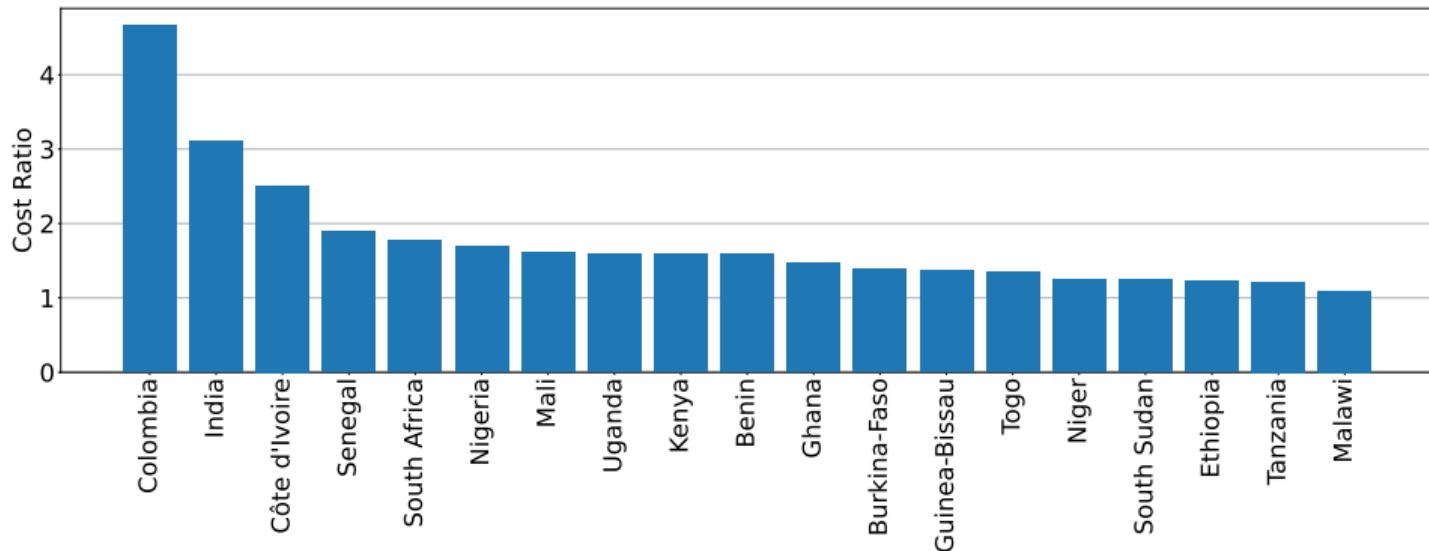
Source: Sahoo, Blumenstock, Selker, Neihaus, and Wager (2025)

How Much Would It Cost to End Extreme Poverty?



Source: Sahoo, Blumenstock, Selker, Neihaus, and Wager (2025)

Cost Relative to Universal Basic Income



Source: Sahoo, Blumenstock, Selker, Neihaus, and Wager (2025)

Is This Feasible?

Estimating (via extrapolation) the cost of achieving a *global* poverty rate of 1%,

0.30% **cost / GDP**

0.21% **ODA / GDP**

Source: Sahoo, Blumenstock, Selker, Neihaus, and Wager (2025)