Income Inequality and Population Health Outcomes in Developing Countries: A Cause for Concern?

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Context

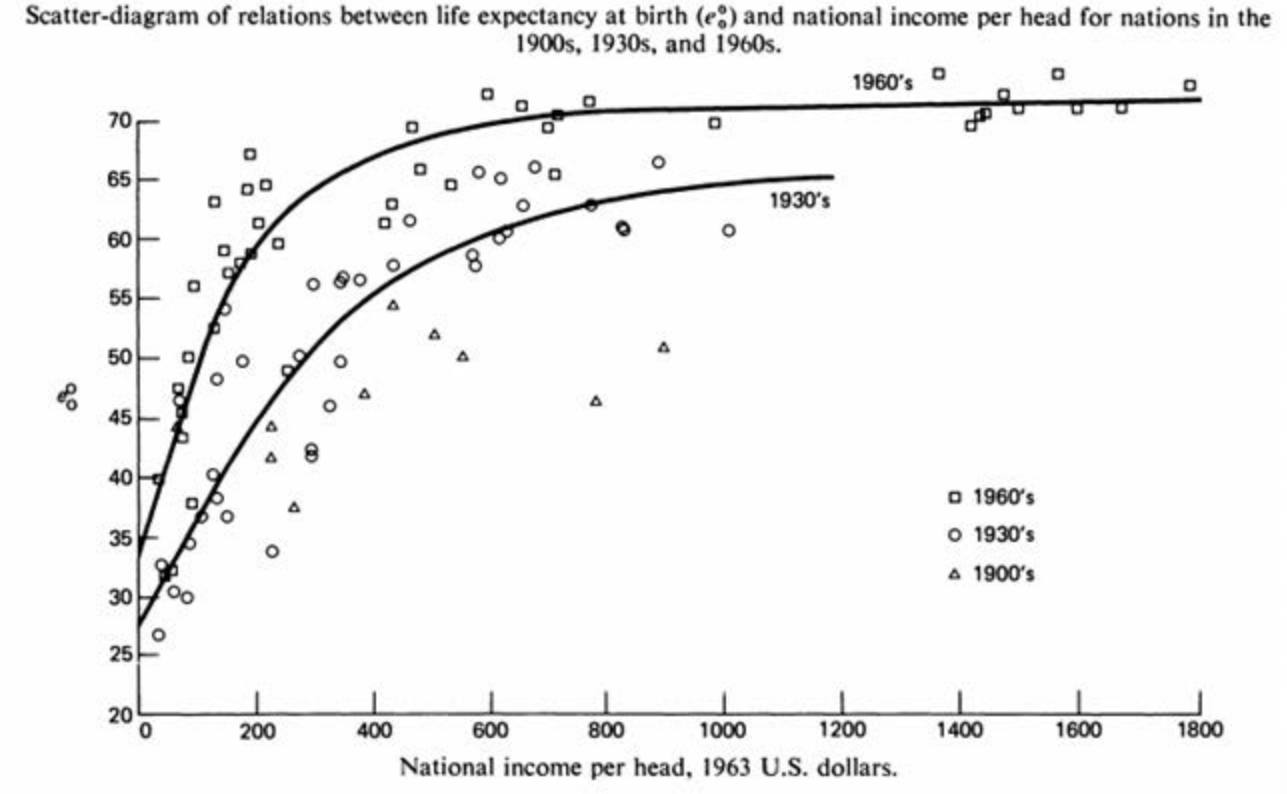
- Aim: To estimate the relationship between income inequality and population health outcomes in developing countries
- Improving population health is a public health and development goal
- Understanding the determinants of population health will help developing countries achieve population health targets
- Income inequality has been proposed as a determinant of population health outcomes.
- Previous developing country studies suffer limitations, limiting the reliability of their findings.
- Cross-sectional data, omitted variables
- Unanswered: the relationship between income inequality and population health in developing countries.

Theoretical Explanations

Absolute Income Hypothesis (AIH)

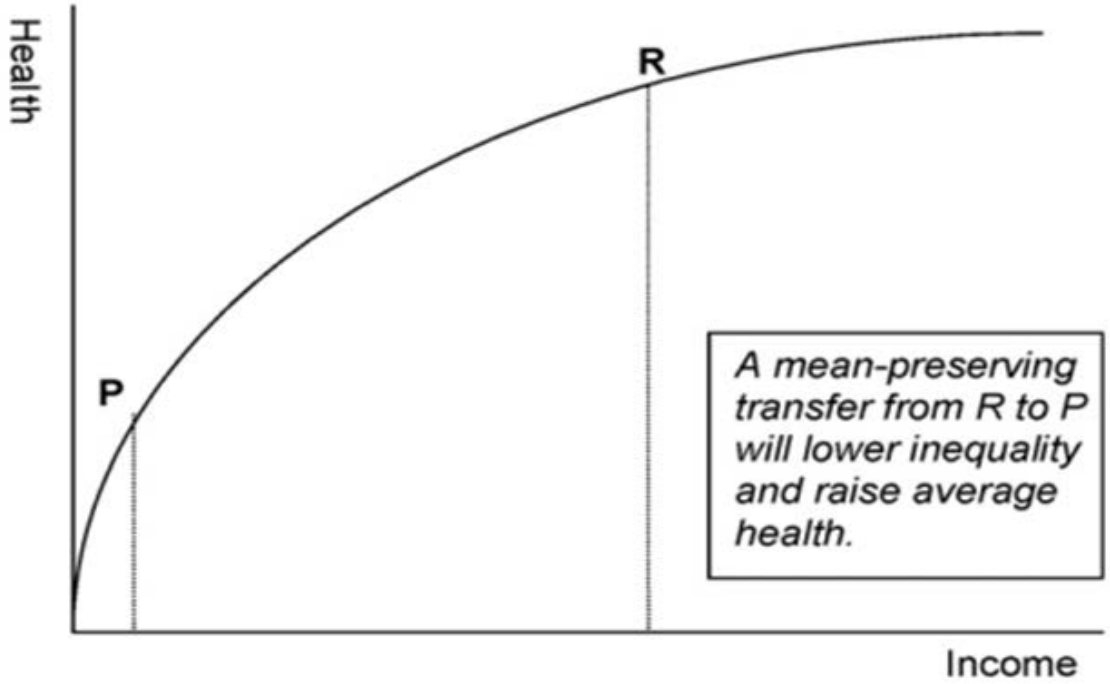
- Individual health is a concave function of individual income.
- Diminishing returns
- Population health is a function of average income and income distribution.
- First proposed in Preston (1975)

Preston Curve



(Source: Preston 1975)

Absolute Income Hypothesis



(Source: Leigh and Jencks 2007)

Theoretical Explanations

Relative Income Hypothesis (RIH)

- Individual health is partly a function of income inequality
- Psychosocial stress, deterioration of social capital and trust
- Less support compared to AIH
    - Wagstaff and Van Doorslaer (2000)

Challenges to Theoretical Explanations

- Causal framework of AIH (Income → Health) does not take into account out reverse causality (potential endogeneity)
- Other confounding variables, may affect perceived non-linear relationship
  - Education, Health Spending, Status of Women, Healthcare access
- "Other inequalities," not income inequality, are correlated with population health (Deaton 2003)
  - Racial and Political Inequality
  - Deaton and Lubotsky (2003)
- Assumptions of AIH framework not been thoroughly established
  - Individual health is caused by individual income
  - This relationship is non-linear
  - Relationship is same across all individuals
  - Studies using AIH framework "not fully worked out theoretically nor convincingly demonstrated empirically." (Deaton 2003, 115)

Previous Studies

- Most developing country studies are cross-sectional
  - Rodgers (1979), Flegg (1982), Waldmann (1992), Schell et al. (2007)
  - Most have found significant negative correlation
  - Limitations with cross-sectional data
- Better approach: Longitudinal Panel Data, including Country Fixed Effects
  - Country Fixed Effects likely correlated with health and income inequality
  - Significant effect in several developed country studies
  - Avendano (2012), Beckfield (2004), Babones (2008), Leigh and Jencks (2007), Hu et al. (2015)
  - Almost all developed country studies find insignificant results
  - Very few developing country panel data studies

Developing Country Panel Data Studies

- Significant results, different directions

Study	Panel Data	Sample	Control Variables	Direction of Significance
Pulok (2012)	FE	Low and Lower Middle	GDP per cap, Gross secondary school enrollment rate	+
Pop et al. (2013)	FE	Low Income	GDP per cap	+
Asafu-Adjaye (2002)	RE	Low and Middle Income	GDP per cap, primary school enrollment rate, savings rate	-*
Herzer and Nunnenkamp (2015)	FE	Low and Middle Income	GDP per cap*	-

- No study uses Fixed Effects and a Holistic Set of Control Variables

My Study

- Includes Country and Time Fixed Effects

- Controls for Income Levels, Female Education, and Public Health Spending
- Large sample and sub-samples. Identify 2 samples as “developing” country samples.

$$(1) HealthOutcome_{it} = \beta_0 + \boldsymbol{\beta_1 Gini_{it}} + \beta_2 lnGDP_{it} + \beta_3 FemaleEdu_{it} + \beta_4 PublicHealthExp_{it} + X_i + \lambda_t + \varepsilon_{it}$$

$$(2) HealthOutcome_{it} = \beta_0 + \boldsymbol{\beta_1 Gini_{it} * Developing_{it}} + \boldsymbol{\beta_2 Gini_{it} * Developed_{it}} + \beta_3 lnGDP_{it} + \beta_4 FemaleEdu_{it} + \beta_5 PublicHealthExp_{it} + X_i + \lambda_t + \varepsilon_{it}$$

Samples (1996-2007)

Sample	Countries	Observations
Full (Pooled Sample)	102	1224
Low Income (LI)	28	336
Middle Income (MI)	46	552
Low and Lower-middle income (LLM)	56	672
Low and Middle Income (LandM)	74	888

Data

Variable	Source
Life expectancy at birth, total (years)	World Development Indicators, 2015 October Version
Mortality rate, infant (per 1,000 live births)	World Development Indicators, 2015 October Version
Standardized adult-equivalent net-income Gini coefficients	Standardized World Income Inequality Database, version 4.1
GDP per capita (constant 2005 US$)	World Development Indicators, 2015 October Version
Average years of total schooling for the female population aged 15 and over	Barro-Lee Educational Attainment Dataset
Health expenditure, public (% of GDP)	World Development Indicators, 2015 October Version

Results: Full Sample

	Model 1		Model 2		Model 3	
Dependent Variable	LEB	lnIMR	LEB	lnIMR	LEB	lnIMR
Gini	0.049 (0.067)	-0.000 (0.009)				
Gini*Developing			0.078 (0.082)	-0.001 (0.003)	0.055 (0.076)	0.000 (0.003)
Gini*Developed			-0.071 (0.074)	0.004 (0.007)	-0.002 (0.092)	-0.004 (0.011)
lnGDP	2.017** (0.982)	-0.325*** (0.062)	1.967** (0.955)	-0.323*** (0.061)	1.978** (0.988)	-0.328*** (0.063)
FemEdu	0.714 (0.545)	-0.046* (0.028)	0.651 (0.550)	-0.044 (0.027)	0.697 (0.556)	-0.048* (0.027)
PubHealthExp	0.335 (0.230)	-0.014 (0.011)	0.343 (0.232)	-0.014 (0.010)	0.337 (0.231)	-0.014 (0.010)
Constant	43.211*** (10.601)	6.124*** (0.526)	45.151*** (10.007)	6.050*** (0.518)	43.864*** 10.530	6.172*** 0.545
Fixed or Random Effects	FE	FE	FE	FE	FE	FE
R-sq (within)	0.507	0.839	0.511	0.839	0.508	0.839
N (Countries)	102	102	102	102	102	102
N (Obs)	1224	1224	1224	1224	1224	1224

*p<0.10; **p<0.05; ***p<0.01

Table 1. Full sample regressions for life expectancy at birth and infant mortality rate. Robust standard errors in parentheses.

Results: Sub-Samples

	Model 4 (LI)			Model 5 (MI)				Model 6 (LLM)				Model 7 (LandM)		
Dependent Variable	LEB	IMR		LEB		IMR		LEB		IMR		LEB	IMR	
Gini	0.081 (0.132)	0.000 (0.004)	0.001 (0.004)	0.051 (0.074)	0.043 (0.070)	0.000 (0.004)	0.002 (0.004)	0.092 (0.085)	0.069 (0.083)	-0.001 (0.003)	-0.000 (0.003)	0.058 (0.080)	0.001 (0.003)	0.001 (0.003)
lnGDP	3.770* (2.130)	-0.354*** (0.100)	-0.354*** (0.089)	0.136 (1.183)	0.272 (0.917)	-0.295*** (0.091)	-0.309*** (0.082)	1.406 (1.314)	2.142** (1.014)	-0.306*** (0.061)	-0.312*** (0.053	1.716 (1.126)	-0.322*** (0.063)	-0.342*** (0.050)
FemEdu	0.905 (0.976)	-0.080 (0.049)	-0.087*** (0.029)	1.357* (0.743)	1.265* (0.721)	-0.102*** (0.027)	-0.106*** (0.025)	1.079 (0.878)	1.242* (0.641)	-0.095*** (0.025)	-0.098*** (0.021)	0.970 (0.764)	-0.096*** (0.024)	-0.103*** (0.019)
PubHealth Exp	0.596 (0.504)	-0.032** (0.015)	-0.033** (0.015)	0.081 (0.198)	0.068 (0.201)	-0.016 (0.012)	-0.018 (0.012)	0.530 (0.370)	0.520 (0.365)	-0.031*** (0.011)	-0.031 (0.053)	0.431 (0.307)	-0.026** (0.010)	-0.027*** (0.010)
Constant	24.338 (18.379)	6.872 (0.655)	6.894*** (0.576)	55.685*** (9.129)	55.664 (7.223)	6.379*** (0.664)	6.465*** (0.589)	41.044*** (11.544)	36.174*** (8.472)	6.619*** (0.445)	6.658*** (0.379)	41.967*** (10.634)	6.629*** (0.458)	6.780*** (0.344)
Fixed or Random Effects	FE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	FE	RE
R-sq (within)	0.608	0.879	0.879	0.447	0.446	0.887	0.886	0.512	0.510	0.888	0.888	0.463	0.882	0.881
N (Countries)	28	28	28	46	46	46	46	56	56	56	56	74	74	74
N (Obs)	336	336	336	552	552	552	552	672	672	672	672	888	888	888

*p<0.10; **p<0.05; ***p<0.01

Table 2. Sub-sample regressions for life expectancy at birth and infant mortality rate. Robust standard errors in parentheses.

Results: Summary

- Full sample and all sub-sample models: no significant correlation
- Robust across different definitions of “developing”
- Inconsistent with AIH and previous developing country studies.
  - Difference may be due to:
    - Difference in samples (country-years)
    - Different operationalization of variables
    - Different Gini data
    - Omitted Variables
  - Preliminary analysis shows that omitted variables may cause different directions of significance in previous studies
- Insignificant result implies no endogeneity bias from reverse causation

Limitations and Future Research

- Did not exactly replicate other studies, cannot tell what caused different results
- Gini data smoothing (SWIID) allows for limited year-by-year within-country variation
- Test robustness of results using different and longer time periods and different Gini datasets

Or In Another Direction...

- Current study still improves upon previous developing country studies
- Questions the validity of AIH assumptions (Deaton 2003)
- Suggests moving away from income inequality as a determinant of population health
- Instead focus attention on other variables that are more clearly correlated
    - Explore how “country fixed effects” or “other inequalities” impact health

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