

Human Capital 2: Health

What is the relationship between health and development?

Like education, both a means and an ends.

As reflected in the HDI, improved health care is an objective in and of itself for development.

Good health means people lead fuller, happier lives.

Good health allows people to improve their education, improve their incomes.

Again, we can return to the Millennium Development Goals to evaluate past progress.

Health outcomes as development objective:

Target 5.

Reduce by two thirds, between 1990 and 2015, the under-five mortality rate

Indicators

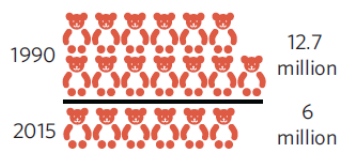
13. Under-five mortality rate (UNICEF-WHO)

14. Infant mortality rate (UNICEF-WHO)

15. Proportion of 1 year-old children immunized against measles (UNICEF-WHO)

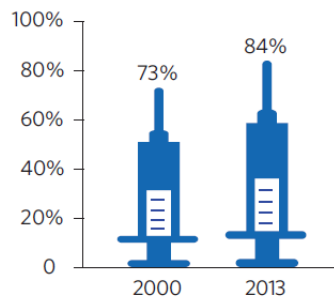
GOAL 4: REDUCE CHILD MORTALITY

Global number of deaths of children under five



- The global under-five mortality rate has declined by more than half, dropping from 90 to 43 deaths per 1,000 live births between 1990 and 2015.
- Despite population growth in the developing regions, the number of deaths of children under five has declined from 12.7 million in 1990 to almost 6 million in 2015 globally.
- Since the early 1990s, the rate of reduction of under-five mortality has more than tripled globally.
- In sub-Saharan Africa, the annual rate of reduction of under-five mortality was over five times faster during 2005–2013 than it was during 1990–1995.
- Measles vaccination helped prevent nearly 15.6 million deaths between 2000 and 2013. The number of globally reported measles cases declined by 67 per cent for the same period.
- About 84 per cent of children worldwide received at least one dose of measles-containing vaccine in 2013, up from 73 per cent in 2000.

Global measles vaccine coverage



Goal 5. Improve maternal health

Target 6. Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio

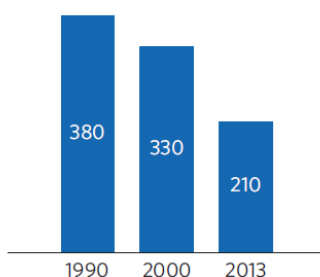
Indicators

16. Maternal mortality ratio (UNICEF-WHO)

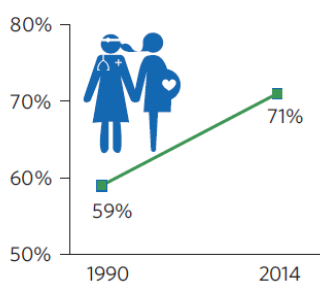
17. Proportion of births attended by skilled health personnel (UNICEF-WHO)

GOAL 5: IMPROVE MATERNAL HEALTH

Global maternal mortality ratio (deaths per 100,000 live births)



Global births attended by skilled health personnel



- Since 1990, the maternal mortality ratio has declined by 45 per cent worldwide, and most of the reduction has occurred since 2000.
- In Southern Asia, the maternal mortality ratio declined by 64 per cent between 1990 and 2013, and in sub-Saharan Africa it fell by 49 per cent.
- More than 71 per cent of births were assisted by skilled health personnel globally in 2014, an increase from 59 per cent in 1990.
- In Northern Africa, the proportion of pregnant women who received four or more antenatal visits increased from 50 per cent to 89 per cent between 1990 and 2014.
- Contraceptive prevalence among women aged 15 to 49, married or in a union, increased from 55 per cent in 1990 worldwide to 64 per cent in 2015.

Goal 6. Combat HIV/AIDS, malaria and other diseases

Target 7

Have halted by 2015 and begun to reverse the spread of HIV/AIDS

Indicators

18. HIV prevalence among pregnant women aged 15-24 years (UNAIDS-WHO-UNICEF)

19. Condom use rate of the contraceptive prevalence rate (UN Population Division)^c

20. Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years (UNICEF-UNAIDS-WHO)

Target 8.

Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Indicators

21. Prevalence and death rates associated with malaria (WHO)

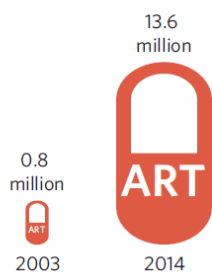
22. Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures (UNICEF-WHO)^e

23. Prevalence and death rates associated with tuberculosis (WHO)

24. Proportion of tuberculosis cases detected and cured under DOTS (internationally recommended TB control strategy) (WHO)

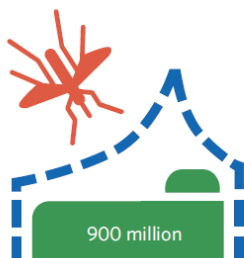
GOAL 6: COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES

Global antiretroviral therapy treatment



- New HIV infections fell by approximately 40 per cent between 2000 and 2013, from an estimated 3.5 million cases to 2.1 million.
- By June 2014, 13.6 million people living with HIV were receiving antiretroviral therapy (ART) globally, an immense increase from just 800,000 in 2003. ART averted 7.6 million deaths from AIDS between 1995 and 2013.
- Over 6.2 million malaria deaths have been averted between 2000 and 2015, primarily of children under five years of age in sub-Saharan Africa. The global malaria incidence rate has fallen by an estimated 37 per cent and the mortality rate by 58 per cent.

Number of insecticide-treated mosquito nets delivered in sub-Saharan Africa, 2004-2014



- More than 900 million insecticide-treated mosquito nets were delivered to malaria-endemic countries in sub-Saharan Africa between 2004 and 2014.
- Between 2000 and 2013, tuberculosis prevention, diagnosis and treatment interventions saved an estimated 37 million lives. The tuberculosis mortality rate fell by 45 per cent and the prevalence rate by 41 per cent between 1990 and 2013.

And current progress is reported for the Sustainable Development Goals:

Direct for Health (goal 3)

<https://www.undp.org/sustainable-development-goals/good-health>

Indirect water and sanitation (goal 6)

<https://www.undp.org/sustainable-development-goals/clean-water-and-sanitation>

Indirect hunger and malnutrition (goal 2)

<https://www.undp.org/sustainable-development-goals/zero-hunger>

Mortality rates:

<https://data.unicef.org/topic/child-survival/under-five-mortality/>

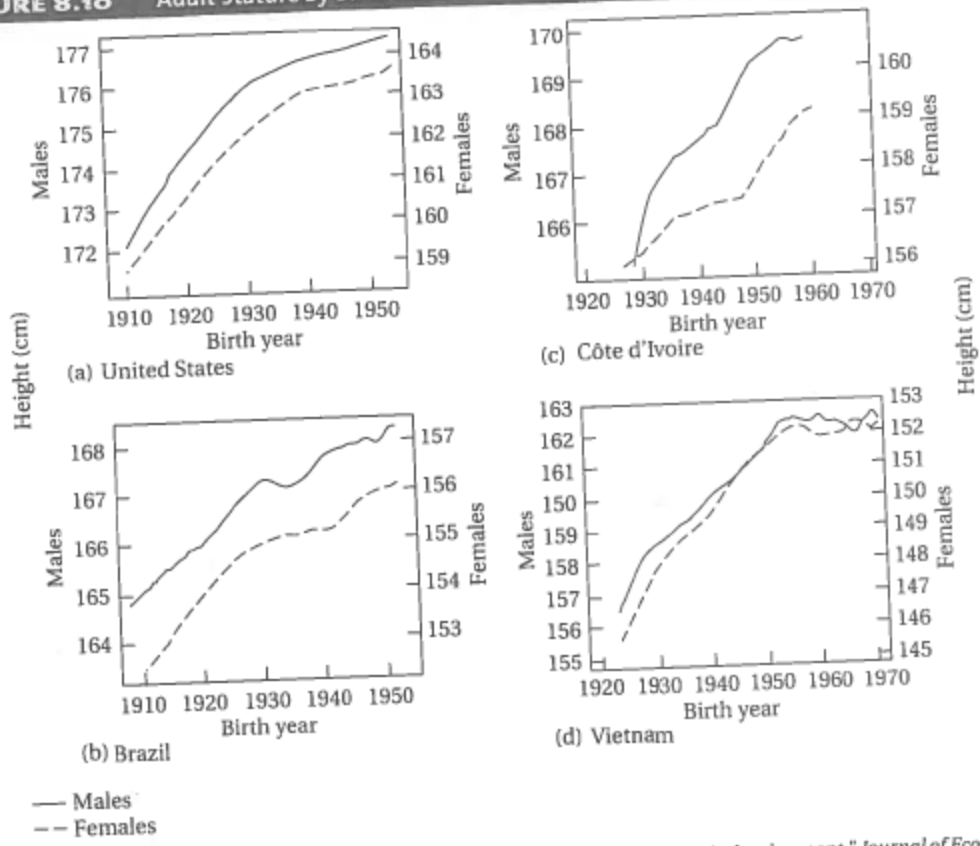
What is the impact of improved health on economic growth?

One study (Bhargava et al., 2001) identifies a positive impact on economic growth brought about by increased health as reflected in the adult survival rate. This is after attempting to control for reverse causality.

Impact is rather small quantitatively.

In general, results suggest that health impacts productivity. Better health leads to higher wages. Early childhood health leads to later higher productivity, and thus higher wages (people born later in the development process are taller, and taller people earn more).

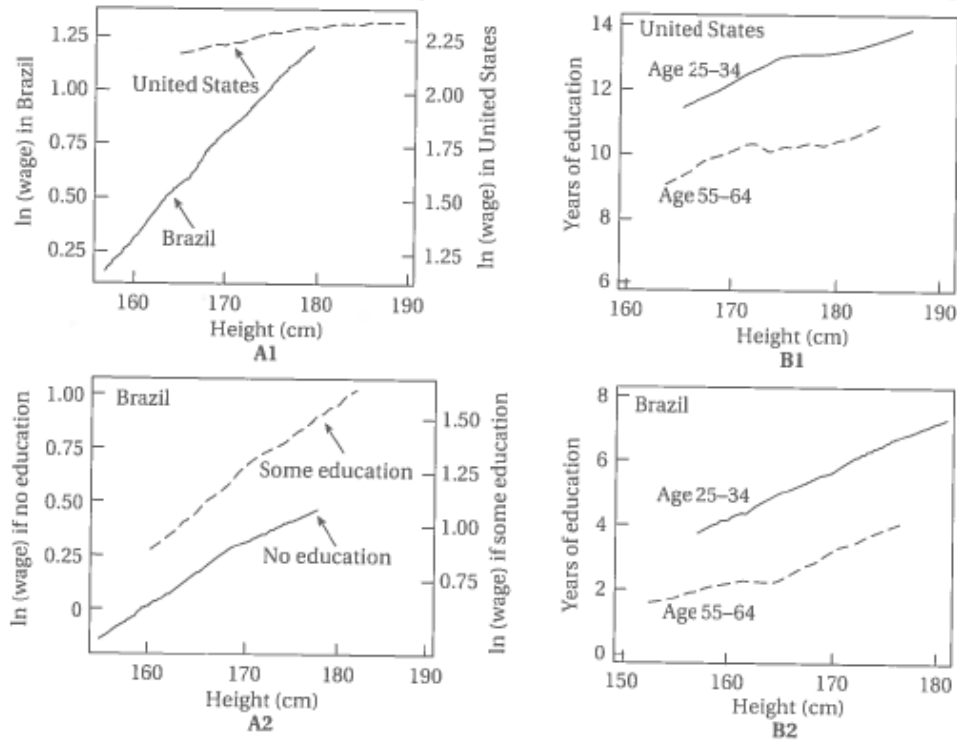
FIGURE 8.10 Adult Stature by Birth Cohort



Source: John Strauss and Duncan Thomas, "Health, nutrition, and economic development," *Journal of Economic Literature* 36 (1998): 766-817; see also Strauss and Thomas, "Health and wages: Evidence on men and women in urban Brazil," *Journal of Econometrics* 77 (1997): 159-185. Reprinted with the permission of the American Economic Association.

Early childhood health also leads to increased education and increased adult height.

FIGURE 8.11 Wages, Education, and Height of Males in Brazil and the United States



Source: John Strauss and Duncan Thomas, "Health, nutrition, and economic development," *Journal of Economic Literature* 36 (1998): 766-817; see also Strauss and Thomas, "Health and wages: Evidence on men and women in urban Brazil," *Journal of Econometrics* 77 (1997): 159-185. Reprinted with the permission of the American Economic Association.

A different perspective on this issue of from the disability adjusted life year (WHO).

The DALY is a health gap measure, which combines information on the impact of premature death and the disability and other non-fatal health outcomes.

One lost year of a healthy life (rather than death as used in the survival rate studies).

One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for incident cases of the health condition:

Calculation

$$\text{DALY} = \text{YLL} + \text{YLD}$$

The YLL basically corresponds to the number of deaths multiplied by the standard life expectancy at the age at which death occurs. The basic formula for YLL (without yet including other social preferences discussed below), is the following for a given cause, age and sex:

$$\text{YLL} = \text{N} \times \text{L}$$

where:

- N = number of deaths
- L = standard life expectancy at age of death in years

Because YLL measure the incident stream of lost years of life due to deaths, an incidence perspective is also taken for the calculation of YLD. To estimate

YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the average duration of the disease and a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead). The basic formula for YLD is the following:

$$YLD = I \times DW \times L$$

where:

- I = number of incident cases
- DW = disability weight
- L = average duration of the case until remission or death (years)

Issues such as mental illness and depression show up in DALY rankings that are not on the usual list of health challenges.

<https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-dalys>



Almost 90% of disease burden as measured by DALY occurs in developing regions, where only 10% of health care dollars are spent.

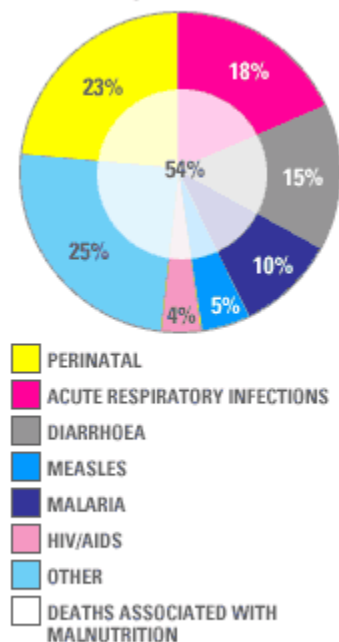
What types of diseases are on the usual list of health challenges?

AIDS, TB, Malaria, Hepatitis B (A and C as well), Cholera, Typhoid, Parasitic diseases, Acute Respiratory infections, diarrhea, measles...

Let us consider one aspect of poor health that combines issues of poverty, vulnerability, and disease: malnutrition.

Malnutrition is often a contributing factor in death that is attributed to other causes.

Under-five deaths in developing countries by cause, 2002



Source:
World Health Organization

If people are not getting what they need from food, they can be malnourished.

Mother's nutrition has an impact on child's cognitive and physical development, both while the mother is pregnant and while the child is breastfeeding.

Malnutrition leads to problems in intellectual development and physical dexterity.

Malnutrition makes people more susceptible to diseases.

SDG information on hunger and malnutrition

<https://www.undp.org/sustainable-development-goals/zero-hunger>

Types of malnutrition:

- 1) Overnutrition
- 2) Secondary malnutrition (unable to absorb)
- 3) Dietary deficiency or micronutrient malnutrition (iodine, zinc missing)
- 4) Protein-calorie malnutrition

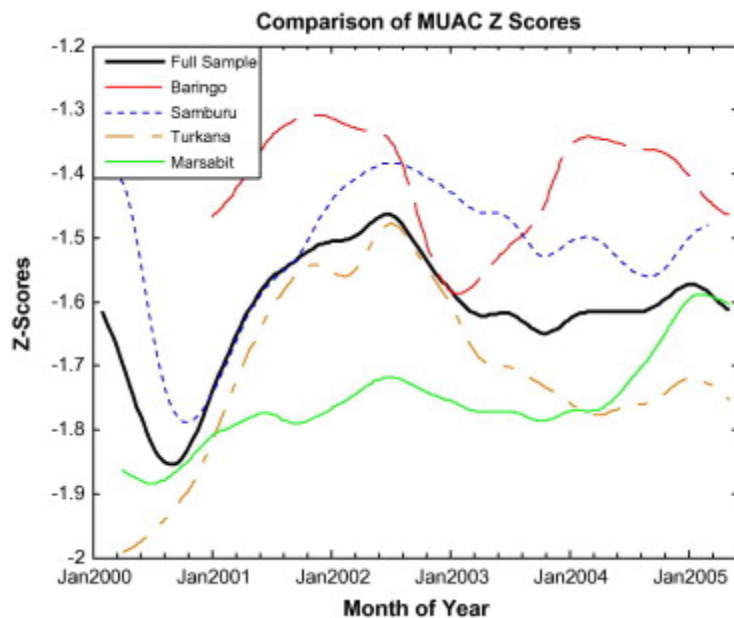
Measures of undernutrition:

- 1) Clinical assessment. Look for physical symptoms (such as reddish hair and swollen belly for Kwashiorkor).
- 2) Biochemical assessment. Draw blood and look for anemia.
- 3) Dietary assessment. Look at what people are eating and in what quantities and identify gaps in the diet. Use either recall or record.
- 4) Anthropometric assessment. Weight for age, height for age, arm circumference. Wasted (current undernutrition); stunted (past undernutrition).

MUAC case (Mude et al., 2009):

As MUAC was collected for children aged 6–59 months residing within sample households or in close proximity (for a maximum of five children per household), we transformed our MUAC data into standardized Z-scores. We used the internationally recognized 1978 CDC/WHO growth chart whose reference population is American children sampled in the 1977 National Center for Health Statistics survey.

The trend of one of our dependent variables, village-level mean child MUAC Z-score, across our sample districts.



Note that this would suggest even in good times, kids are having lower MUAC scores than the reference population. Z-score is the observation value in terms of the population mean and relative to the standard deviation (zero is at the mean, -1 is one standard deviation below, -2 is two standard deviations below,...)

Famine: 20% or more with MUAC scores under -2

Severe famine: 40% or more with MUAC scores below -2.

Goal is to see how well we can predict future declines in MUAC scores, how well and how far out we can predict it.

Model performance in generating correct decision for famine response.

Mean is the mean predicted MUAC. Predictions are one and three months out.

Mean below -1.8 triggers a warning.

Proportions is the predicted share of the children that will be at -2 s.d. or below. Share 20% or greater triggers a warning.

Fraction of correct decisions by confidence threshold.

Model type	Forecast horizon	Confidence threshold		
		75%	66%	50%
<i>Fraction of correct decisions</i>				
Proportions	1 Month	0.779	0.784	0.786
	3 Month	0.757	0.759	0.761
Means	1 Month	0.622	0.628	0.630
	3 Month	0.596	0.605	0.604
<i>Fraction of errors that are Type 1</i>				
Proportions	1 Month	0.315	0.266	0.205
	3 Month	0.318	0.276	0.189
Means	1 Month	0.206	0.170	0.121
	3 Month	0.214	0.182	0.139

Confidence threshold is how sure do you have to be in your prediction before you raise the alert (50% is 50% sure, 75% is 75% sure)

Fraction of Type 1 errors by confidence threshold, type one is failed to predict a famine that happened (type two is predicted one that did not happen)

Will income growth alone lead to improved health?

Level of income is an imperfect predictor of health care system performance. WHO (2000) study. At any given income level, there is wide variation in health system performance.

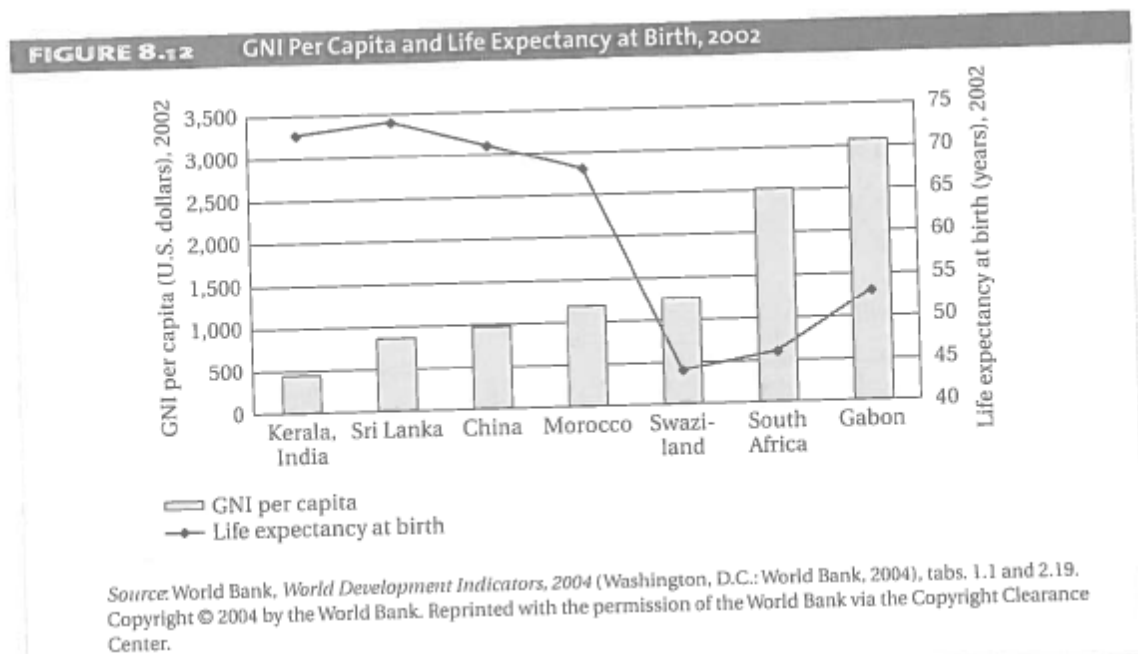
However, the overall correlation is positive and relatively high: GNP rank and Health system rank = 0.80.

Another issue: income elasticities of demand for calories are often quite low.

Increased income does not necessarily lead to improved nutrition. Income elasticities of not so good for you food (soda, candy) is often higher than unity. Income growth may lead to a shift towards foods that lead to other nutritional problems (recall overnutrition issue)

Micronutrient problems are also increasingly recognized as an issue.

This graph suggests the link between income per capita and life expectancy at birth is not direct.



Overall, GNP rank and life expectancy (female) are correlated at 0.81, so again we have a reasonable positive correlation, but some variation.

Sorted by income quartile:

	Health System score (standard deviation within group)	Female life expectancy (standard deviation within group)
Lowest	0.42 (.16)	52 (8)
Second	0.59 (.15)	66 (10)
Third	0.69 (.14)	72 (9)
Highest	0.86 (.12)	78 (5)

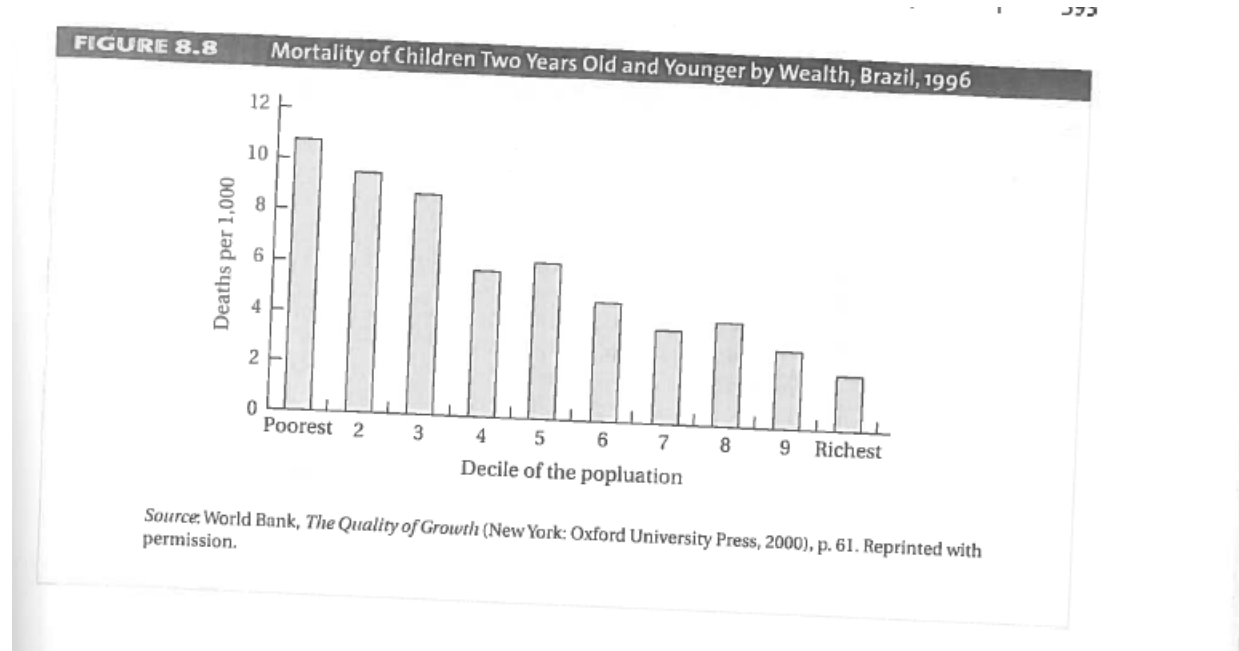
Broad pattern is that income and health indicators are positively correlated, but there is a great deal of variation within groups as well.

Many of the allocative questions such as we thought about with education are issues here – clinics or national hospitals...

Also may have different health issues associated with affluence.

Inequality at a given average level of income may be an issue.

This figure indicates that the death rate of children is influenced by household income class. The death rate for the poorest 40% is triple that of the wealthiest 30%.



Within household inequality can also be an issue, where age and gender specific distribution of resources influences access.

Will income growth lead to better education, thus better health? Education can also play a critical conditioning factor here. Better educated parents make better decisions and have healthier children.