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 at http://millenniumindicators.un.org

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 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 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)

And current progress is reported for the Sustainable Development Goals:
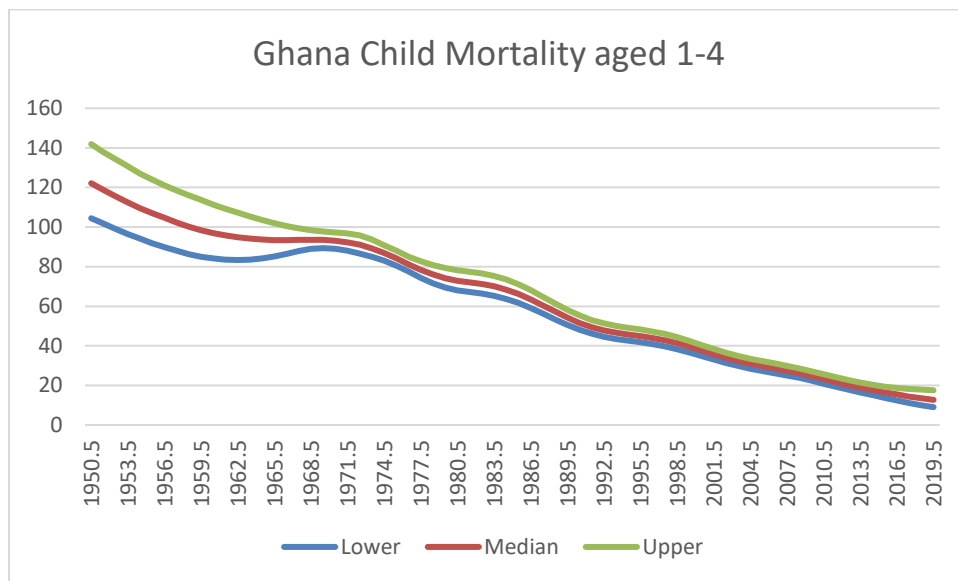Direct for Health (goal 3)
http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-3-good-health-and-well-being.html

Indirect water and sanitation (goal 6)
http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-6-clean-water-and-sanitation.html

Indirect hunger and malnutrition (goal 2)
http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-2-zero-hunger/targets/

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

Some good visualizations are available here.

World Health Statistics 2020 visual summary (who.int)

And this provides some interesting indicators
Indicators (who.int)

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.
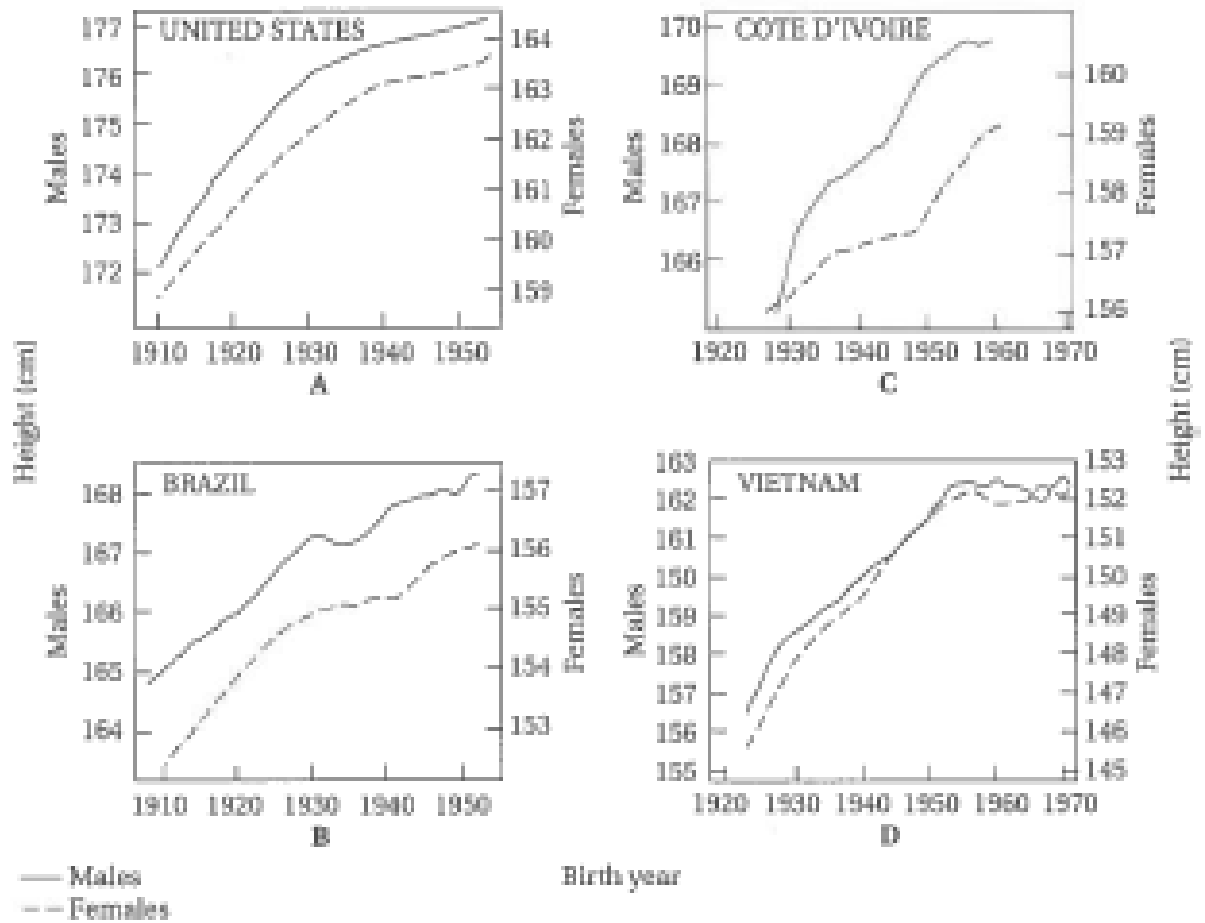
Impact is rather small quantitatively.

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).

From the book, a distribution of height based on different cohorts, with economic growth in the background as the reason.

Figure 9.10   Adult Stature by Birth Cohort

Height (cm)

A — UNITED STATES (Males 172–177, Females 159–164), Birth year 1910–1950

C — COTE D'IVOIRE (Males 166–170, Females 156–160), Birth year 1920–1970

B — BRAZIL (Males 164–168, Females 153–157), Birth year 1910–1950

D — VIETNAM (Males 155–163, Females 145–153), Birth year 1920–1970

——— Males
– – Females

Birth year

Wages, Education, Nutrition, Wages have linkages in some contexts.

Figure 9.11 Wages, Education, and Height of Males in Brazil and the United States
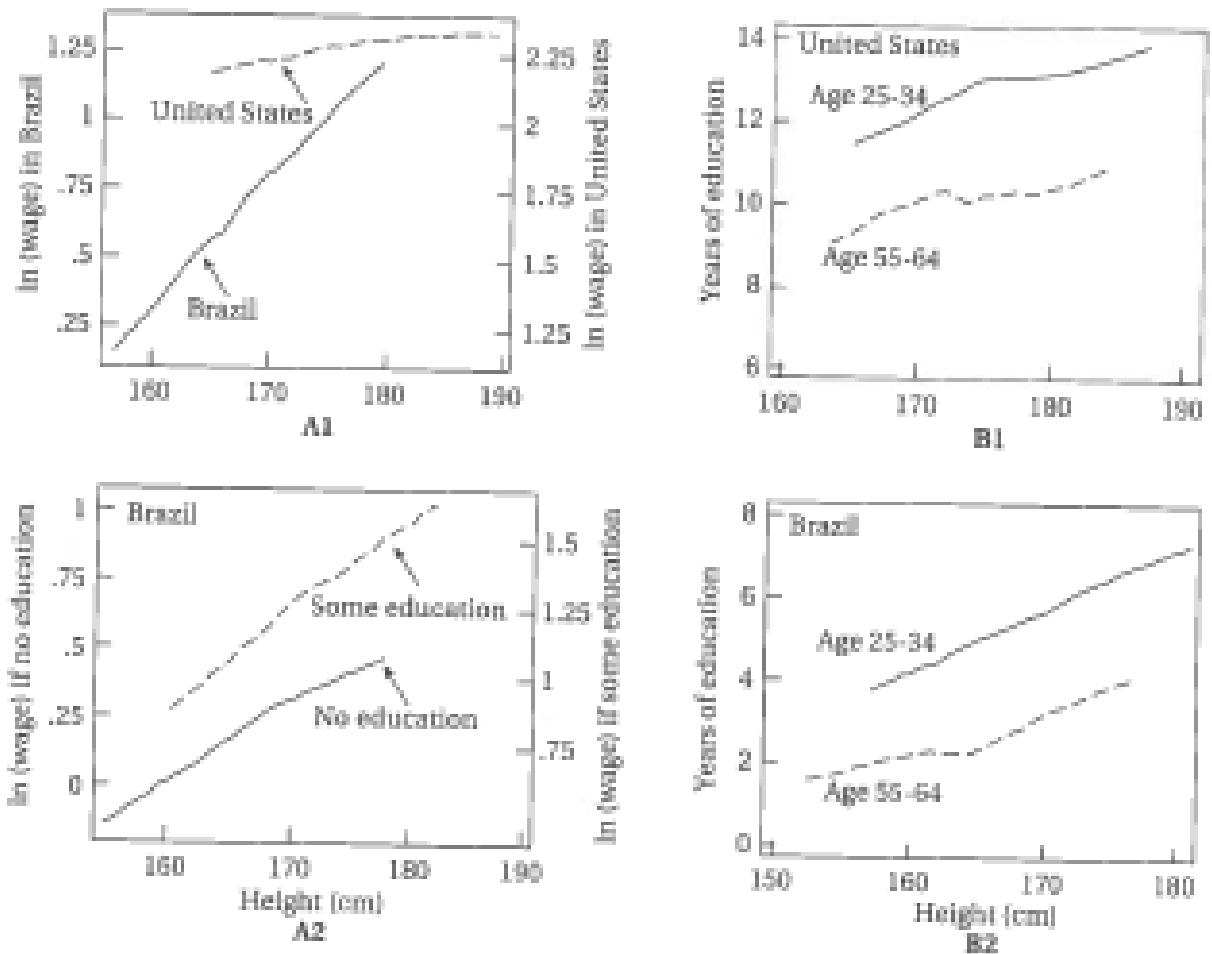
A different perspective on this issue of from the disability adjusted life year (WHO).

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

$$DALY = YLL + YLD$$

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:

$$YLL = N \times L$$

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.

Top 5 causes of death and DALY, 1990. Worldwide.

	DALY	Death
1	Lower respiratory infections	Heart Disease
2	Diarrheal diseases	Cerebrovascular disease
3	Perinatal conditions	Lower Respiratory infections
4	Depression	Diarrheal diseases
5	Heart disease	Perinatal conditions

Almost 90% of disease burden as measured by DALY occurs in developing regions, where only 10% of health care dollars are spent.
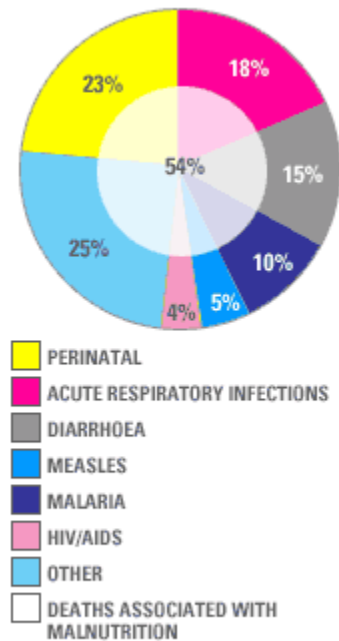
Mortality and global health estimates (who.int)

Global Health Estimates 2015: 20 Leading Causes of DALY globally, 2015 and 2000

2019				2000				
Rank	Cause	DALYs (000s)	% DALYs	DALYs per 100,000 population	Rank	Cause	DALYs (000s)	% DALYs	DALYs per 100,000 population
0	**All Causes**	**2,531,710**	**100.0**	**32,844**	0	**All Causes**	**2,682,555**	**100.0**	**43,695**
1	Neonatal conditions	201,821	8.0	2,618	1	Neonatal conditions	297,160	11.1	4,840
2	Ischaemic heart disease	180,847	7.1	2,346	2	Lower respiratory infections	183,011	6.8	2,981
3	Stroke	139,429	5.5	1,809	3	Diarrhoeal diseases	161,009	6.0	2,623
4	Lower respiratory infections	105,652	4.2	1,371	4	Ischaemic heart disease	144,055	5.4	2,346
5	Diarrhoeal diseases	79,311	3.1	1,029	5	Stroke	125,790	4.7	2,049
6	Road injury	79,116	3.1	1,026	6	Tuberculosis	92,632	3.5	1,509
7	Chronic obstructive pulmonary disease	73,981	2.9	960	7	HIV/AIDS	83,652	3.1	1,363
8	Diabetes mellitus	70,411	2.8	913	8	Road injury	74,574	2.8	1,215
9	Tuberculosis	66,024	2.6	857	9	Chronic obstructive pulmonary disease	68,134	2.5	1,110
10	Congenital anomalies	51,797	2.0	672	10	Malaria	62,194	2.3	1,013
11	Back and neck pain	46,532	1.8	604	11	Congenital anomalies	61,815	2.3	1,007
12	Depressive disorders	46,359	1.8	601	12	Measles	47,676	1.8	777
13	Cirrhosis of the liver	42,798	1.7	555	13	Cirrhosis of the liver	38,653	1.4	630
14	Trachea, bronchus, lung cancers	41,378	1.6	537	14	Diabetes mellitus	38,482	1.4	627
15	Kidney diseases	40,571	1.6	526	15	Self-harm	38,415	1.4	626
16	HIV/AIDS	40,147	1.6	521	16	Depressive disorders	36,075	1.3	588
17	Other hearing loss	39,477	1.6	512	17	Meningitis	35,135	1.3	572
18	Falls	38,216	1.5	496	18	Back and neck pain	34,189	1.3	557
19	Malaria	33,398	1.3	433	19	Interpersonal violence	30,812	1.1	502
20	Uncorrected refractive errors	31,981	1.3	415	20	Trachea, bronchus, lung cancers	30,392	1.1	495

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

- PERINATAL
- ACUTE RESPIRATORY INFECTIONS
- DIARRHOEA
- MEASLES
- MALARIA
- HIV/AIDS
- OTHER
- DEATHS ASSOCIATED WITH MALNUTRITION

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/content/undp/en/home/sustainable-development-goals/goal-2-zero-hunger/targets/

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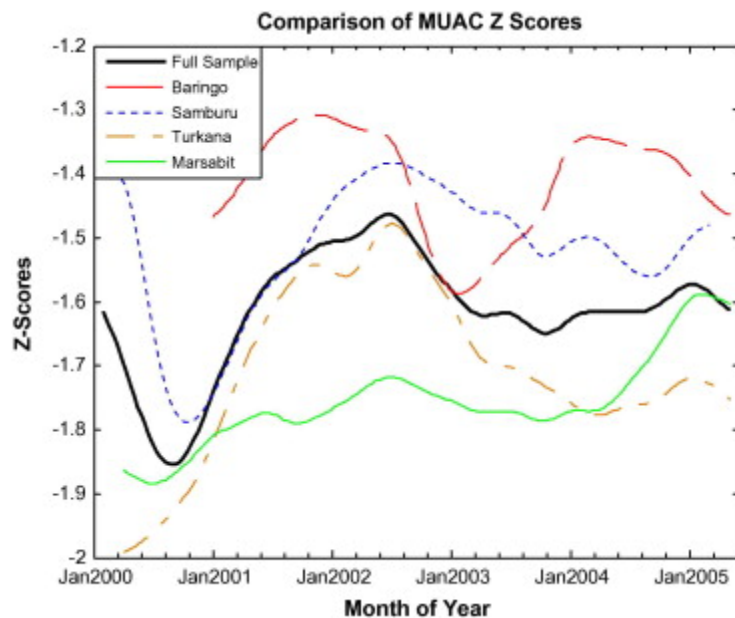
Note that this would suggest even in good times, kids are having lower MUAC scores than the reference population. Z-score is the observation value in terms of the population mean and relative to the standard deviation (zero is at the mean, -1 is one standard deviation below, -2 is two standard deviations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

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.

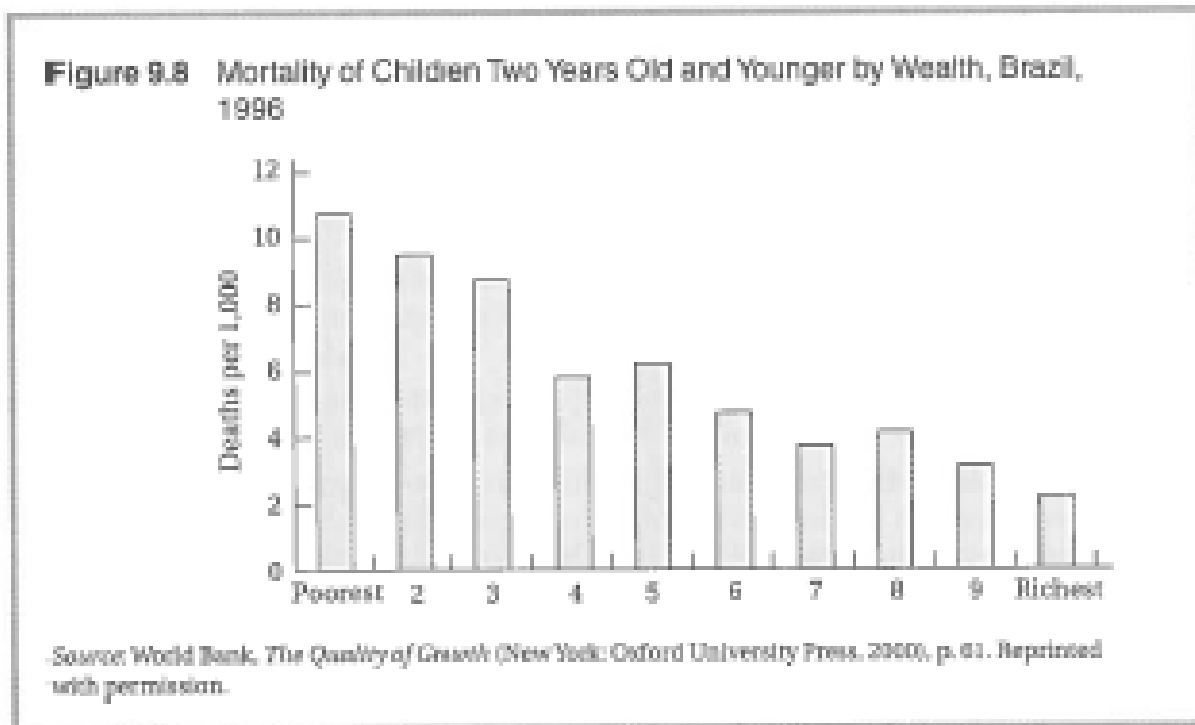The death rate of children is influenced by household income class.

Figure 9.8 Mortality of Children Two Years Old and Younger by Wealth, Brazil, 1996

Source: World Bank, *The Quality of Growth* (New York: Oxford University Press, 2000), p. 81. Reprinted with permission.

Table 8 Human and animal disease incidence

	Seasons with human health events in drought	Seasons with human health events in recovery	Share of all livestock mortality due to disease shock
1) Left behind	27.0%	11.0%	31%
2) Combining	38.3%	15.8%	40%
3) Staying with	15.6%	11.5%	21%
4) Combining	23.8%	13.0%	27%
	t12**, t13***, t14, t23***, t24***, t34**	t12, t13, t14, t23, t24, t34	t12, t13*, t14, t23***, t24**, t34

***Significant difference at 1%, **significant difference at 5%, *significant difference at 10%

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.