

CHAPTER 5 The Production of Health

1. How to think about health care, What is the good?

- Dentist drilling out tooth
- Physical exam
- Eating our vegetables

What gives us Utility is what we derive from the action.

We all have some reservoir of health that we want to make as big as possible, all else equal.

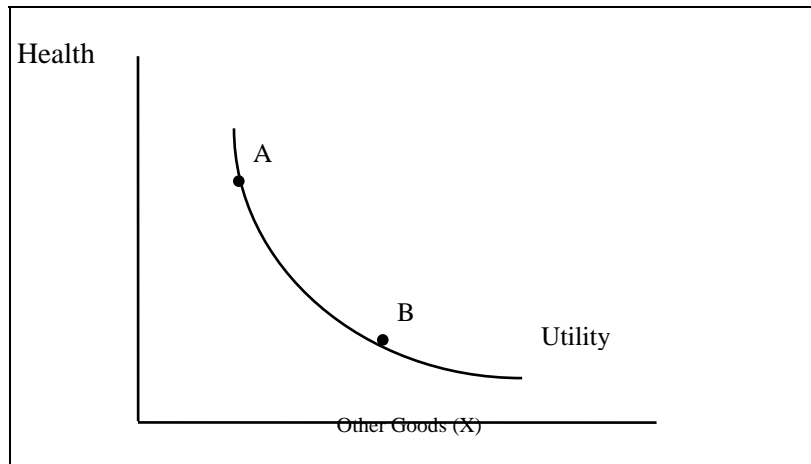
Health is a durable good (like a car, house, refrigerator, etc.) We are endowed at birth with a stock of health and the rest of our lives we make choices that affect that stock.

As consumers our ultimate goal is to maximize our utility

$$U = f(X, H) \text{ where } X \text{ is other things and } H \text{ is our stock of health}$$

Note the interdependence of X and H: if H increases MU_X increases, if X increases MU_H increases

We can think of health care as things that increase our stock of health



Note the IC goes asymptotically toward infinity: all the X in the world is not good unless you have some health and vice versa.

We will come back to this in deriving the demand for health care, but note that it is not bad to consume French fries or cigarettes as long as we understand the costs involved!

Almost 40% of deaths for those aged 15-24 due to vehicle crash - raise driving age to 25?
Smoking increases the risk of heart attack by 2.5 times, high cholesterol by 2.4 shouldn't we ban these as well?

2. The Production of Health

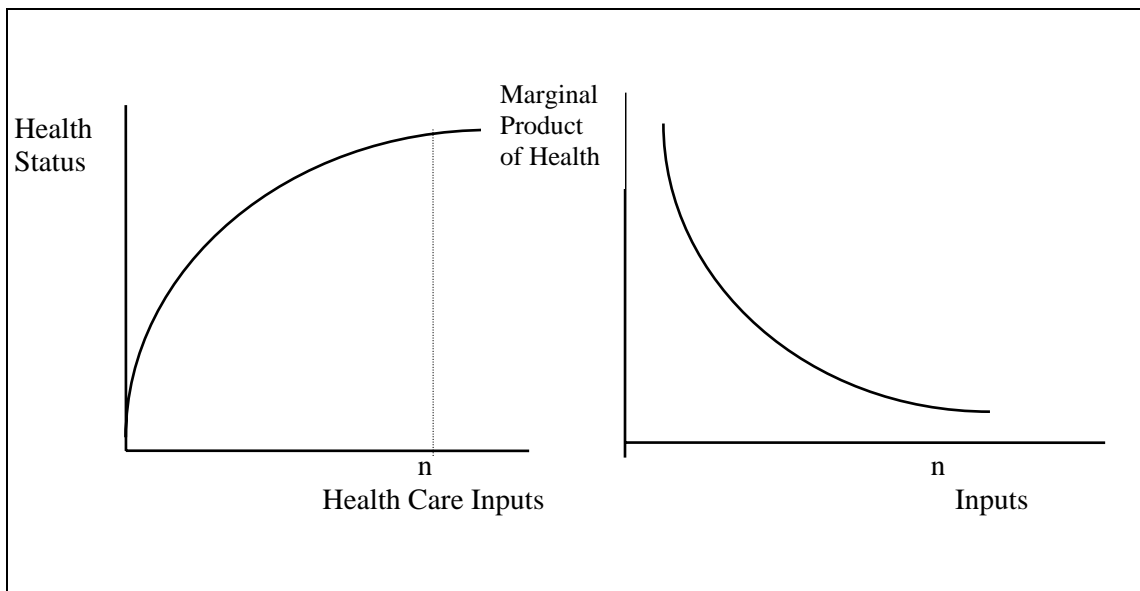
A. Why look at the production function?

1. Understand the relationship between the amount of health care used and the resultant change in health - how much of downward trend in mortality rate and increased life expectancy is due to practitioner provided health care?
2. Ask questions about the efficiency of current production process - can we re-allocate our resources and increase efficiency? - or what is the marginal product of health care?

B. How to think about the production function

Our stock of health is a function of lots of things:

$$HS = F(\text{health care, life style, environment, } X)$$



Health care is some aggregate measure, maybe total expenditures. Note we are holding constant all the other inputs to the production function. If any of them increased, the curve would shift upward.

Distinguish between the marginal product and total product.

The marginal product of HC is the increment in HS from a 1 unit increase in HC.

Note the *Law of diminishing marginal product*

If we were currently at n - HC has made a large total contribution to HS - AP is high, but the marginal product will be quite low. Additional expenditures on HC will not impact health

The MP is probably the most relevant for policy!!

Curve could eventually reach a point where MP negative - over use of medical care - lots of unneeded surgery etc.

Historical Role of Medicine and Health Care.

Most agree that medicine has played a relatively minor role historically in the rise in the population over the past few hundred years. If you look at major causes of death (Measles, scarlet fever, TB, typhoid, etc.) it turns out that the vaccine/drug came out after the death rate had already declined substantially suggesting that something other than the drug itself increased health. Reduction in exposure and better knowledge of the disease seem to have played huge roles. Public health is important here, but note that much of this information came from the medical research into finding the vaccines. So Medicine's role is probably understated by simply looking at the effect of the drug on death rates.

Measuring the Production of Health

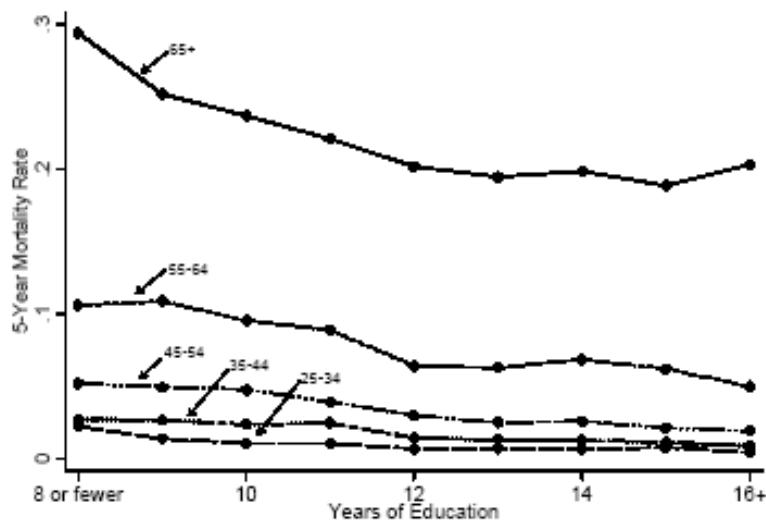
Note that before we can measure the production, we first have to figure how to measure health. Mortality vs morbidity

Difficulties of non-experimental data.

Conclusions from empirical studies.

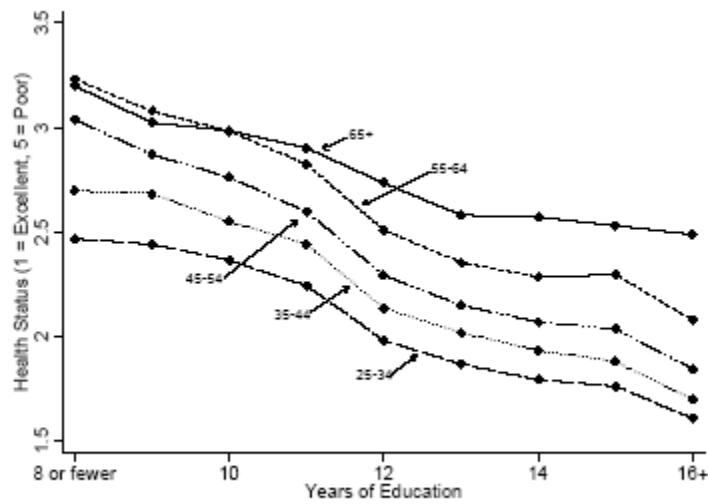
The following figures are taken from Cutler, Lleras-Murney, and Vogl, "Socioeconomic Status and Health: Dimensions and Mechanisms" NBER working paper 14333, September 2008.

Figure 2a: Education and Mortality, U.S. Adults over 25, NHIS 1986-1995



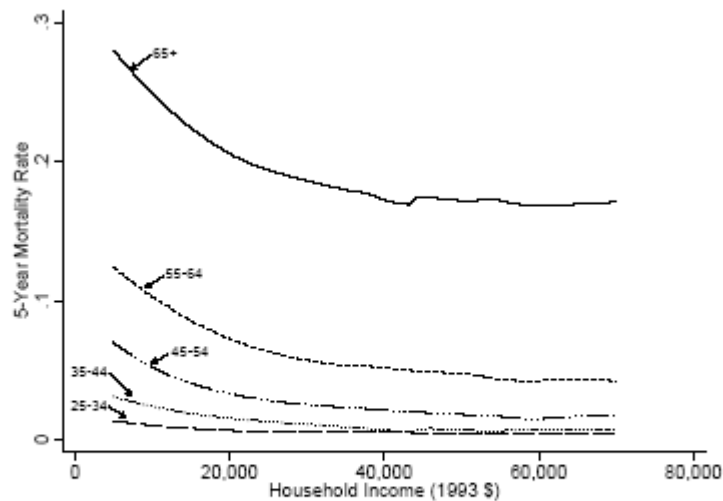
Notes: The estimated mortality rates are weighted using the survey weights provided by the NHIS. 5-year mortality is defined as death before the start of the sixth year following the survey year.

Figure 2b: Education and Self-Reported Health, U.S. Adults over 25, NHIS 1986-1995



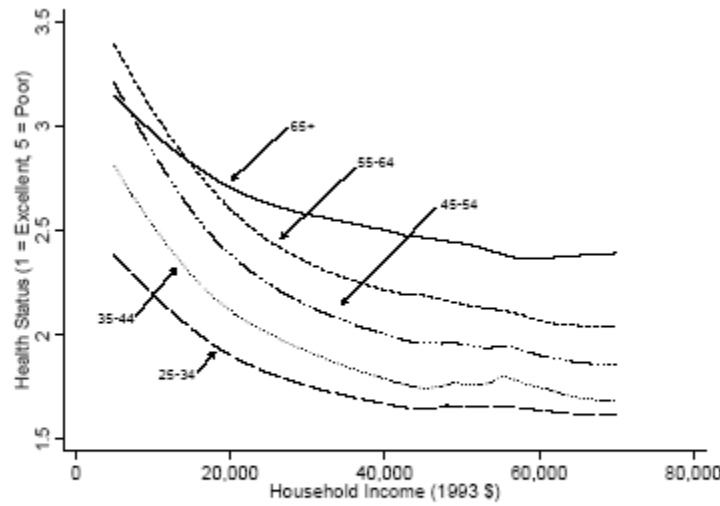
Notes: The means are weighted using the survey weights provided by the NHIS.

Figure 3a: Income and Mortality, U.S. Adults over 25, NHIS 1986-1995



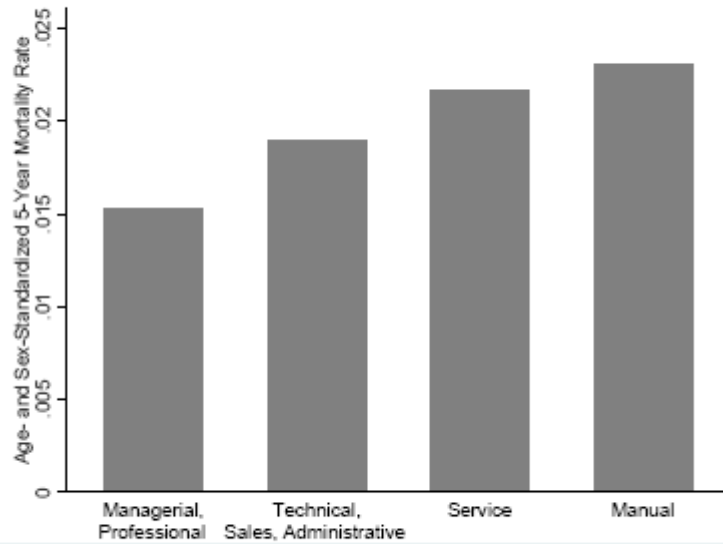
Notes: The curves are local logistic regression estimates. The regressions are weighted using the survey weights provided by the NHIS. Household income is reported in income brackets in the NHIS; it is imputed here from the March CPS of the same year as the mean income in the income bracket and education cell of the household head.

Figure 3b: Income and Self-Reported Health, U.S. Adults over 25, NHIS 1986-1995



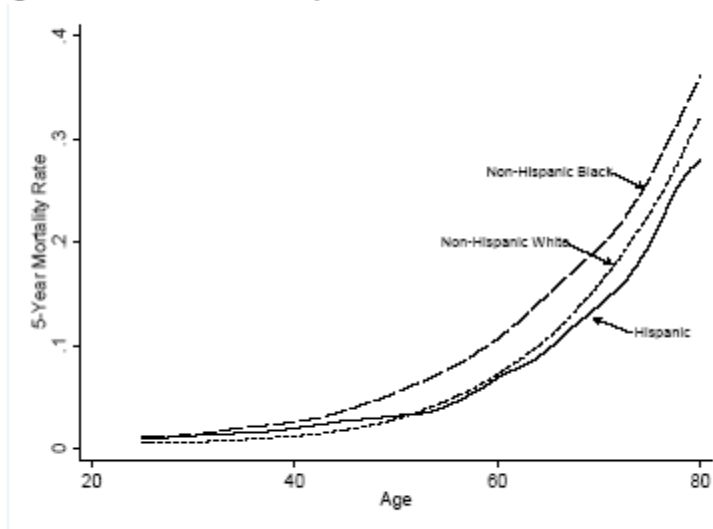
Notes: The curves are local linear regression estimates. The regressions are weighted using the survey weights provided by the NHIS. Household income is reported in income brackets in the NHIS; it is imputed here from the March CPS of the same year as the mean income in the income bracket and education cell of the household head.

Figure 4: Occupation and Mortality, U.S. Adults Ages 25-65, NHIS 1986-1995



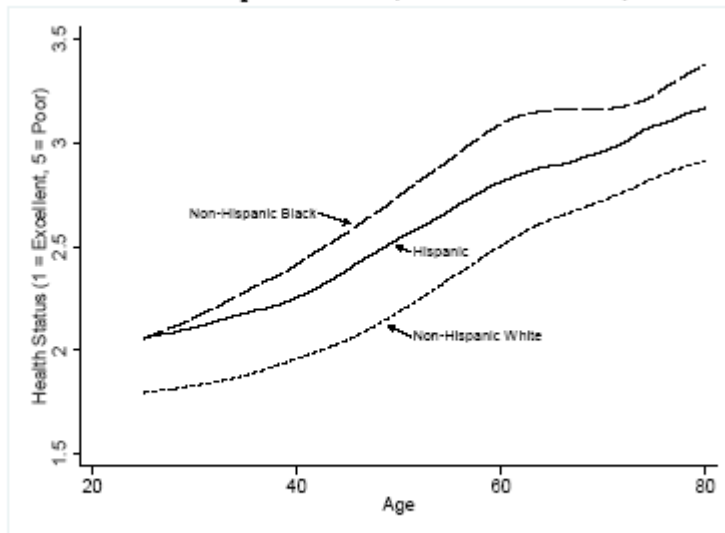
Notes: The mortality rates are age- and sex- standardized using the 2000 population structure of the United States. See text for a description of the occupations in each category.

Figure 5a: Race and Mortality, U.S. Adults over 25, NHIS 1986-1995



Notes: The curves are local logistic regression estimates. The regressions are weighted using the survey weights provided by the NHIS.

Figure 5b: Race and Self-Reported Health, U.S. Adults over 25, NHIS 1986-1995



Notes: The curves are local linear regression estimates. The regressions are weighted using the survey weights provided by the NHIS.

Table 1: Socioeconomic Status and Health, NHIS 1990, Ages 25-64

	10-Year Mortality					Fair/Poor Self-Reported Health				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Education</i>										
Years of Education	-0.33 [0.03]**	-0.18 [0.04]**	-0.11 [0.04]**	-0.17 [0.04]**	-0.18 [0.04]**	-1.45 [0.06]**	-0.82 [0.06]**	-0.66 [0.05]**	-0.82 [0.06]**	-0.77 [0.05]**
<i>Household Income (Ref. < \$15,000)</i>										
\$15,000 - \$24,999	-0.95 [0.27]**	-0.48 [0.26]	-0.31 [0.25]	-0.46 [0.27]	-0.45 [0.26]	-2.58 [0.40]**	-1.31 [0.36]**	-1.1 [0.34]**	-1.31 [0.36]**	-1.04 [0.33]**
\$25,000 - \$49,999	-2.17 [0.25]**	-1.25 [0.26]**	-0.89 [0.24]**	-1.22 [0.26]**	-1.21 [0.26]**	-7.18 [0.39]**	-3.82 [0.37]**	-3.2 [0.35]**	-3.82 [0.37]**	-3.32 [0.34]**
≥ \$50,000	-2.96 [0.32]**	-1.66 [0.33]**	-1.17 [0.31]**	-1.64 [0.33]**	-1.63 [0.33]**	-11.94 [0.54]**	-6.15 [0.54]**	-5.2 [0.52]**	-6.15 [0.53]**	-5.56 [0.50]**
<i>Occupation (Ref. Managerial & Professional)</i>										
Tech., Sales, Admin. Support	-0.01 [0.35]	-0.53 [0.35]	-0.65 [0.33]*	-0.54 [0.35]	-0.49 [0.35]	3.02 [0.63]**	0.67 [0.57]	0.5 [0.54]	0.67 [0.57]	0.86 [0.53]
Service	0.77 [0.32]**	-0.29 [0.34]	-0.51 [0.31]	-0.32 [0.34]	-0.22 [0.33]	6.16 [0.56]**	1.36 [0.55]*	0.93 [0.51]	1.36 [0.55]*	1.71 [0.50]**
Operators, Fabricators, Laborers	1.18 [0.38]**	0.02 [0.40]	-0.38 [0.37]	-0.02 [0.40]	-0.10 [0.20]	6.82 [0.64]**	1.6 [0.62]*	0.99 [0.58]	1.6 [0.62]*	2.01 [0.58]**
Out of labor force	3.26 [0.31]**	2.01 [0.32]**	1.55 [0.29]**	2.00 [0.32]**	2.03 [0.31]**	12.93 [0.52]**	7.29 [0.52]**	6.5 [0.49]**	7.29 [0.52]**	7.11 [0.48]**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Race/ethnicity (Ref. Non-Hispanic White)</i>										
Non-Hispanic Black	1.47 [0.29]**	0.67 [0.29]*	0.95 [0.27]**	0.66 [0.29]**	0.71 [0.29]*	5.5 [0.47]**	2.28 [0.39]**	2.34 [0.38]**	2.28 [0.40]**	2.53 [0.37]**
Hispanic	0.88 [0.42]*	-0.06 [0.42]	0.40 [0.39]	-0.06 [0.41]	-0.01 [0.41]	4.29 [0.64]**	-0.58 [0.57]	0.08 [0.53]	-0.57 [0.57]	0.06 [0.52]
<i>Controls for:</i>										
Demographic Variables	X	X	X	X	X	X	X	X	X	X
Other SES Variables		X	X	X	X		X	X	X	X
Behavioral Variables			X					X		
Knowledge Variables				X					X	
Stress Variables					X					X
Observations	25,752	25,752	25,752	25,752	25,752	25,894	25,894	25,894	25,894	25,894

Notes: The estimates represent marginal effects from logit estimations, evaluated at the means of the independent variables. All estimates are multiplied by 100, in order to reflect marginal effects in percentage points. Brackets contain robust standard errors. * p < 0.05, ** p < 0.01. Mean 10-year mortality is 5.59%, and mean fair/poor health is 9.22%. Demographic variables include age, sex, region, size of metropolitan area, marital status, and family size. Behavioral variables include current smoker, ever smoker, number of cigarettes per day, obesity, regular exercise, and use of a seat-belt always. Knowledge variables include the number of correct responses to health questions about smoking, drinking, and heart disease, with one tally for each of these three domains. Stress variables include self-reports of "a lot of stress" over the past week and over the past year. The race specifications also include a dummy for "other" race.

Conclusions from research:

- Education has a strong relationship at all age levels, but it is smaller for older adults
- Income has a strong effect for low income but tapers off as income increases. The effect becomes steeper with age
- At all ages nonhispanic blacks have higher mortality/SRHS than nonhispanic white. The gap widens with age
- Hispanics have higher mortality rates than nonshipanics at low age, but higher at older ages. SRHS shows Hispanics worse than whites at all ages (this goes away when controlling for income and education)
- Some of the income and education effects go away when control for demographic characteristics (age, sex, region, city size, marital status, family size). Even more when behavioral variables are added (smoker, obesity, exercise, seat belt use)
- Reverse causation with both Education and Wealth?

1. Grossman

better educated people understand the technology or know-how needed to stay healthy. If this were true then a transfer of funds out of medical care into education would greatly improve health. That is expenditures on health would yield the MP from production fcn studies.

2. Fuchs

Self selection problem. People who choose higher education also more healthy people with low discount rates tend to have higher education since they are patient. Similar thing is happening with their stock of health. May be willing to give up unhealthy activities today in return for an increased life span. Likewise those who do not obtain a lot of education are impatient - they want it now. Thus, they are less likely to choose a healthy lifestyle - more likely to drink, smoke, eat onion rings, etc. The implication is that increased expenditure into education will not improve health much.

Income effect could go both ways as well.
Evidence of short run vs. long run differences.

Short run shocks to wealth – recessions tend to increase health, expansions tend to decrease health. Longer run effect tends to be slight positive.

For children income has a strong causal effect – even controlling for insurance, education and everything else you can think of.