

Valuing Health—A “Priceless” Commodity

By VICTOR R. FUCHS AND RICHARD ZECKHAUSER*

Price is a fundamental variable in economics. What role, then, can economics play in the analysis of a commodity, like health, that is said to be priceless? A central concern of health economics research has been whether health is a commodity like any other. Our answer to this question is an unwavering “yes and no.” Health *is* a commodity: it enters into utility; its supply is not unlimited, but can be increased through the use of scarce resources (broadly defined); the amount that people demand varies inversely with its price. If societal arrangements for protecting, producing, and enhancing health (including the provision of medical care) ignore this aspect of health—if it is assumed to be a truly “priceless” commodity—these arrangements are likely to be inefficient and unsatisfactory.

In many respects, however, health is *unlike* other commodities. These differences have profoundly shaped our institutional arrangements—regulatory, financial, organizational—in both the positive and the normative sense. Health is difficult to trade interpersonally. Initial endowments are extremely important. Whereas most commodities are produced by specialists and then sold to the general public, an individual's health status is largely self-produced, being strongly affected by his or her consumption of other commodities. Together, these conditions imply that individuals will not all value health equally at the margin.

Significant externalities of the conventional sort (for example, communicable diseases) afflict health; significant interdependent utilities affect its valuation. The symbolic

aspects of health are important. Many people believe health should not be allocated like other commodities (i.e., on the basis of ability to pay). This sentiment may be expressed more often than it is acted on, but even its ability to command lip service is revealing. For example, Joseph Califano—a recent and enthusiastic convert to the competitive market approach in *America's Health Care Revolution* (1986)—tries to soften his message by saying no one should be denied “needed” care.

In this paper we comment on health in relation to such standard economic topics as wealth, time preference, risk aversion, and utility.

I. Health and Wealth

Except in extreme cases it is difficult to sort out the precise nature of the relationship between health and wealth. If wealth is very low, health suffers, sometimes to the point of death. Likewise, a person in very poor health may have no capacity to create wealth. Random shocks to health and wealth are usually positively correlated. Within the characteristic range of health and wealth in developed countries, however, the direction and strength of causal connections are more difficult to ascertain.

Initial endowments of health and wealth are probably positively correlated. Children inherit genes that affect health and mental ability, and they also inherit wealth. Parental efforts during childhood are probably also positively correlated. For example, children who receive above-average investment in health probably also receive more investment in education.

Health and wealth also depend on the choices individuals make as adolescents and adults. Some factors, such as rate of time preference, will lead to a positive correlation, but others, such as a tradeoff between hazardous work and wages, will lead to a negative relationship.

*Stanford University, Stanford, CA 94305, and Harvard University Kennedy School of Government, Cambridge, MA 02138, respectively. We gratefully acknowledge financial support during this work to Fuchs from the Robert Wood Johnson Foundation and to Zeckhauser from the Business and Government Center at Harvard University.

Health seems to be a normal good in the sense that an increase in wealth leads to an increase in the demand for health. However, the wealth elasticity of demand for health may be less than that of some other commodities, some of which (for example, mountain climbing) may have negative effects on health. In poor countries (unlike the United States), cigarette smoking has a fairly high positive wealth elasticity.

Empirical studies, both cross-section and time-series, suggest that the elasticity of mortality with respect to income (a weighted average of the cause-specific elasticities) approaches zero as income rises. This is to be expected because an increase in income tends to reduce the weight of those causes of death that have large elasticities. Consider infant death rates from congenital anomalies (small elasticity) versus deaths from infectious diseases (large elasticity). In poor societies most infant deaths are the result of infectious diseases, and the overall elasticity is large. As societies become wealthier, a much smaller proportion of infant deaths is due to infectious diseases, and the overall elasticity is small.

When health and wealth are distributed unequally, the question of redistribution poses many complex problems. Suppose that health and wealth depend only on initial endowments, so that incentive effects can be ignored. In this hypothetical situation, many economists would argue for redistribution of wealth toward greater equality—but is there a comparable case for redistributing health? If so, how should it be done? In the real world the choice of appropriate redistributive policies is even more complex; inequality in health is partly the result of initial endowments and partly the result of individual behavior and random shocks.

II. Time Preference

Health valuation discussions should focus on outputs rather than inputs—for example, days without morbidity as opposed to physician visits—and should take consumer preferences as the building block for welfare evaluation. Thus, not just lives lost but some variant of quality-adjusted life years

(QALYs) seems appropriate in assessing health outputs. Should QALYs be discounted the way cash flows are discounted in investment analyses? Many ethically concerned observers have said no, lest we mistreat the future, and they have been joined by others who oppose technologies that impose long-lived threats to human survival. Economists have tended to support discounting, prescribing that some account be taken of life cycle income patterns, the changing cost of QALY increments over the lifetime, and the higher expected wealth of future generations.

The appropriate principle is quite simple; individuals and policy planners should discount the *value of life years*. Changes in quality due to income or age are counted, as are changes in life expectancy or the costs of health production. If we fail to discount, or do not take account of changing valuations, we will be taking Pareto-dominated actions. With life years, unlike most commodities, there is virtually no exchange among individuals, which implies that individuals will value life years differently. Policy planners thus cannot merely add up discounted life years for different individuals. Rather they should add up the individuals' valuations. (If distribution is a concern, planners should weight a dollar to a rich and a poor person for life years in the same way as if they were deciding on sponsoring operas or repaving streets. The weighting could be one for one if a tax-transfer system is available. Symbolic effects—discussed below—would be added separately.)

Choices that affect the health of future generations (for example, disposal of nuclear waste, biomedical research) are qualitatively different from redistributing health from our present to our future selves. Should the distinctive nature of health affect our intergenerational bequests? Should we be any more or less generous in leaving an intact ozone layer, thus diminishing the risk of future skin cancers, than in leaving up-to-date factories? If we assume no altruism, then we will always benefit by pushing health risks off to future generations. In a world that is generationally selfish, there will be too little *R&D* and too much long-lived pollution. Capital,

by contrast, will not be “selfishly” consumed, leaving nothing for the future, since as time rolls forward it can always be sold to the younger generation.

Suppose altruism induces us to leave something to those who follow. Surely we should leave them the mix of health and other endowments that they most prefer among those that cost us the same amount. Allocations to the future then will represent a Pareto-efficient mix, though we will almost certainly fail to make bequests that the future would like to pay for if it could. (With good-specific paternalism, the principle still applies; the net dollar cost of providing different goods to the future will differ, however.)

Most policy planning discussions assume full altruism—future citizens are given equal weight with present citizens—and discount solely for the time value of money. Given this ethical premise, the value of life years to future generations should be discounted at the time-value-of-money rate. If our descendants will be much wealthier than we, our incentive to transfer wealth to them is diminished. But their greater wealth will confer additional value on a life saved in their generation, increasing our incentive to allocate resources so as to improve our descendants’ probability of survival. Similarly, just as we tend to value a life saved at age 30 more than one saved at age 80, we should transfer more life-saving resources from current to future generations the greater is their life expectancy relative to ours.

Assessing the present value of life years is just one area where our thinking about discounting has been confused by intergenerational considerations. Economists’ discussion of the social rate of discount often founders on the same issue. If it turns out that we collectively value the future more than we express in private actions—for example, I care more about your child’s welfare than about yours, but you have no way to charge me for the externalities of your intergenerational transfers—we should adjust our valuations of future benefits upward, not our discount rate downward. Self-respecting economists should not adjust discount rates for externalities stretching to the future or

use different rates because it is health that is being valued.

III. Risk and Risk Aversion

Even physicians and epidemiologists have a hard time specifying the production function for health. The commodity is produced probabilistically, substantially through the lifestyle choices of individuals. The relevant probabilities are often small and hard to judge. If *A* is inefficient in the production of health—say, eating too much meat relative to fish though he has no strong preference between the two—*B* cannot poach on his market; this suggests the potential for X-inefficiency. The costs of producing additional life years vary significantly, between old and young, as well as between exercise freaks and sedentary types. Moreover, individuals value life years differently because of differences in income, attitudes, and age. In sum, even if there were no income inequalities, individuals would have dramatically different values for the same health output.

Some health valuations merely revolve around probabilities of health loss. From von Neumann-Morgenstern utility, we learn we should be linear with gains in survival probability at any particular time (assuming there is no endowment to be spread across our survival states). In a two-period model, a 1 percent increment in survival probability in the first year is worth a 2 percent gain for the second year, leaving aside time preference and age-related changes in the quality of life. Experiments with hypothetical questions about health suggest that individuals are risk averse with respect to gains but risk preferring with respect to losses, much as Daniel Kahnemann and Amos Tversky have shown for wealth in their work on prospect theory. This suggests how much behavior can depend on mental frame of reference. The point from which an individual perceives gains and losses to occur can influence his choices.

Though life may be priceless—in the sense that there is no monetary amount that an individual would accept to give up his life and (even if there were) society would prohibit its sale—probabilistic risks to life in

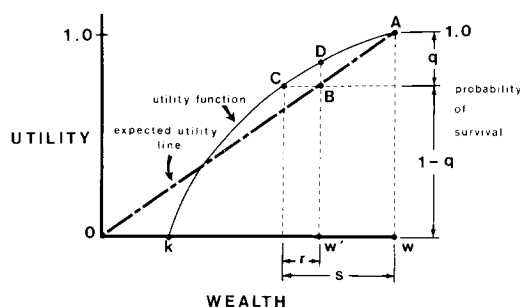


FIGURE 1

exchange for dollars (or other benefits) may be acceptable. Economists have presented this argument in a variety of regulatory arenas, notably those relating to the environment and workplace. In common parlance, an individual who will not take health risks for money is called risk averse. How does this risk aversion relate to the economist's risk aversion, a hesitancy to take gambles on money (i.e., along a single dimension)? The more risk averse a person is with respect to wealth, the more he will pay to boost his probability of survival.

Consider an individual who will either die immediately with probability q , or survive for a single period with probability $1 - q$. He will have wealth w should he survive, whereupon he receives utility $u(w)$ at A , whose height is scaled to be 1.0 (Figure 1). Death is assigned a utility of 0. Notice that a wealth of k , perhaps the subsistence wage, is no better than death. The individual's expected utility, as indicated along the heavy dashed line for possible probabilities of survival, is $u(w, q) = (1 - q)U(w) + qU(\text{death}) = (1 - q)U(w)$, as indicated by the height at point B .

What amount of money would the individual sacrifice to avoid the q risk of death? Assume first that his wealth is independent of his survival probability. Then he will sacrifice up to s , where $u(w - s, 0) = u(w, q)$, as shown on the diagram by the equal heights for B and C .

On the other hand, if the individual's wealth is an endowment that must be spread in an actuarially fair manner over his survival states, then his income would fall to w' ,

where $(1)w' = (1 - q)w$, if he purchased survival probability q , placing him at D . He would then sacrifice wealth of only r to rid himself of death probability q . (The value of r could be negative if he were relatively risk neutral.)

In either case, the amount that an individual would sacrifice to reduce risks to life relates positively to the height of the utility function at current wealth relative to its slope at that point. Holding constant the zero utility wealth, k , greater risk aversion (at all wealths) leads to greater valuation, which accords with anecdotal experience.

To see this intuitively, consider the fixed-wealth case, where willingness to pay to avoid a risk is proportional to height/slope. Scale the utility functions of two individuals with different risk aversion to reach height 1.0 at w . A q risk of death cuts the expected utility of each by the vertical distance q . Willingness to pay to eliminate this risk is the amount of money taken from present wealth that entails the same q reduction in utility. This amount will be greater for the more risk-averse individual, whose utility function is flatter near present wealth.

IV. Policy Issues

The government's role in health is pervasive. Government tells consumers what goods and services they can and cannot buy; it tells workers what jobs and working conditions they can and cannot accept; it spends hundreds of billions of dollars each year subsidizing the demand for health care and regulates every aspect of its delivery. Some of these interventions can undoubtedly be explained by economies of scale in the provision of information or a desire to reduce transaction costs, but most cannot. The demand for extraordinarily expensive health care is highly unpredictable, not unlike the demand for firefighting services. To achieve efficient risk spreading, we can collectivize health care and provide it for free (as Britain has done) or employ insurance, possibly government subsidized (the approach of the United States).

Quite often we are dealing with a situation where A thinks that B is not choosing an optimal level of health and therefore favors

legislation that will raise *B*'s health level, even at some cost to *A*. Why does *A* feel this way? One possibility is pure paternalism. *A* thinks he is a better judge of what maximizes *B*'s utility than *B* is, and *B*'s utility matters to *A*. Alternatively, *A* may feel a responsibility to ensure that *B* acts rationally, regardless of any effects on *A*, or to protect *B*-future who is being inadequately considered by *B*-present. Or, sensing that he may find himself in *B*'s shoes some day, *A* may vote for some intervention, say mandatory health insurance, as a form of self-control. Finally, it may not be *B*'s utility in general that matters to *A*, but specifically *B*'s health. *A* is more troubled by *B*'s poor health than by his empty wallet. This could be an atavistic reaction left over from a time when most health problems were communicable. Or perhaps *A* wants to cover up the "raw edges" of inequality in wealth. Thus he is unwilling to let poor people work at hazardous jobs, sell their organs, or otherwise barter health for income.

One popular explanation for the attempts to regulate health behaviors is that *A* does not want to bear the expense of *B*'s health-damaging behavior through collectively financed third-party payments for health care. But *A* also shares in the costs of providing *B*'s retirement income, and thus stands to benefit financially from *B*'s lower life expectancy. On balance, the externalized financial consequences of *B*'s cigarette smoking, including the excise taxes he pays and his lower-than-average expected Social Security benefits received, may more than offset his higher-than-average expected medical costs. If eliminating financial externalities were the key, perhaps society would take more aggressive actions for seatbelts, which disproportionately confer health benefits on individuals entering prime earning years, and less on cigarettes and their mostly older victims. In any case, many ardent "interventionists" seem completely unaware of the financial externalities argument, so we must look elsewhere for an explanation of their preferences.

The symbolic role of health and health care may play a role. Many of the most fundamental beliefs of our society are wrapped up in the valuation of lives and

health. Although society cannot avoid making choices that trade health for other resources, the implicit or shadow prices are rarely mentioned; the legitimacy and popular acceptance of the choice process is often as important as the outcome it generates. Because of the special nature of health production, economists cannot make their customary contribution of pointing out how fewer resources would be required to produce the same commodity elsewhere. Better guardrails for *B* in no way compensate for dirtier air or less health care for *A*, however great the net gain in health, and *A* himself is not saving any resources.

That life is priceless need not imply that we will spare no expense to save a life or cure a disease. Yet that myth persists and gives us comfort. When the myth confronts us head on, as in a decision to support renal dialysis for all who need it, we are likely to flinch and provide. Given our need for myths, many mechanisms of cost containment must work in the shadows. If hospital beds or new technologies that are unlikely to be cost effective are put in place, myth maintenance tends to overpower cost containment. Distributional equity also plays a significant role. If a poor man lacks a VCR or even a radio, we are not overcome by guilt. But let him suffer from a lack of health, and all the injustices of our society come into stark relief. It is no surprise that government expenditures on health care for the poor exceed cash transfers to them.

V. Conclusion

We cannot produce life years directly or buy them on any market. Goods that cannot be produced or sold often become priceless through a natural process that leads to interdependent utility considerations, great concerns for equity, probing discussions of obligations to the future, and assertions that these goods shall not be allocated through the market. Many priceless commodities are collectively owned, or at least we act as though we have a collective interest in them. Thus, for example, governments rarely sell their natural wonders or peddle outlying territories to other countries; they prevent the export of rare antiques (the national heri-

tage) and strictly regulate the use of unique parcels of land, say the greensward near the town center.

Even if we never sell these priceless commodities, we may need to know their value, so as to decide whether to defend the Falkland Islands, build a school on the greensward, or devote more resources to health care. Economics must grapple with the price-

less commodity health with one axis tied behind its back. Nevertheless, as we hope we have shown, core economic concepts such as discounting, efficient transfers, and risk aversion provide useful guides through perilous intellectual minefields. At the same time, we believe that economics itself is enriched by its ventures into the treacherous domain of health production and valuation.