Coverage for Catastrophic Illness

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COVERAGE FOR CATASTROPHIC ILLNESS

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Introduction

To protect themselves against the ill effects of uncertain, unfortunate events, individuals commonly band together to participate in transfer schemes designed to shift resources from the group as a whole to the unlucky ones, those who need them most. This transfer mechanism is what economists typically call a contingent claims market. An individual who is a victim of an unfavorable contingency, say theft of his car or destruction of his house, makes a claim in accordance with a prearranged compensation scheme.

It might seem that the greater the magnitude of the potential misfortune the more desirable it would be to institute a scheme that transfers resources to the unlucky ones. Within the healthcare area, this compensate-for-the-extreme-disaster point of view helped prompt recent policy discussions of coverage for catastrophic illness. In the fall of 1972, Congress enacted legislation that provides federal payment for renal dialysis, an extraordinarily costly procedure. Other monumentally expensive medical treatments are candidates for future federal support. Indeed, there is strong speculation that initial national health-insurance legislation will be directed in part toward a general package of coverage for catastrophic illness.¹

If such a coverage scheme could function as a perfect market for contingent claims, as the simple model that follows demonstrates, it would be clearly desirable. But before extrapolating this conclusion to the real world with its imperfections, three sets of qualifications must be considered: first, if the potential suf-

¹Senator Russell Long, whose chairmanship of the Senate Finance Committee makes him a key legislator on this issue, is known to favor a program of this sort.
For as dictionary definitions make evident, an understanding of catastrophic includes the concept of suddenness. This concept is interpreted here as an indication of nonpredictability, of the occurrence of a low-probability event.

Thus this discussion focuses attention on potentially severe illnesses with sudden onset for which medical treatment is extraordinarily expensive.

**The Economist's Approach**

The key question of this paper, then, is how should a group of individuals contract on a policy to protect themselves from the dangers of the extraordinarily high medical expenses associated with catastrophic illness? 4 This is of course a more specific version of a general policy question: How should a group of individuals who face low-probability likelihoods of very bad outcomes organize and allocate their resources? For the economist, that is the nutshell question. And it comes, in this context, in two parts: First, how much coverage should an individual want or select as optimal for himself? And second, what kind of mechanism (market or market substitute) can we devise that will give him the desired amount of coverage?

**Selection of the Optimal Extent of Coverage.** The first question is difficult to answer since it implies that the individual can funds for the retarded. The difficulty for efficiency is that the catastrophic coverage contract is not drawn up until we know who the sufferers will be.

4 The voluntary contract emphasis of this analysis leaves as a matter for later consideration the purely distributional arguments in favor of the social provision of particular services. Medical care, in particular, is thought by many analysts to fall into a priority consumption category that could be alternately labeled citizenship right or necessity. If medical services consumption does merit priority, this would be an argument for provision of "adequate" care for those who cannot (or would not choose to) provide it for themselves. Included in these ranks would be many victims of catastrophic illness.

In evaluating catastrophic illness coverage, as with any other social program, we must ask what and who pays. Given that individuals' incomes differ, that they do not have equal access to medical services, and that they have different expected incidences for catastrophic illness, it is highly unlikely that any coverage plan will have a neutral influence on the income distribution. This would imply that interpersonal equity considerations will play a substantial role in the design of a program of this sort. See E. J. Mishan (1972).

5 T. C. Schelling (1969) employed this prior contracting approach with significant success in addressing the question: What value should we place on lives saved through various policy measures?

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2 The concept of expense can be interpreted broadly to include scarce resources that are not competitively priced on the market. Organs for transplantation are a good example. Conventionally they are provided free of charge. If sold on the open market their prices might be extraordinary.

3 If our position vis-à-vis retardation were like our position vis-à-vis, say, cancer, that is, if no one knew whether he would contract it, we would provide far more
make some quantitative assumptions relating to the value of his life—surely an elusive concept. We can easily acknowledge that the value of life is an unknowable, metaphysical riddle—what indeed is the value of the life of a tennis-playing mother of three? and that no generally acceptable procedures exist for calculating such figures. But if life expectancy is used as a measure of the gain achieved with increased catastrophic coverage, as some analysts suggest, then we may be able to draw some conclusions about optimal coverage. Then the individual, in deciding how much catastrophic coverage he would want, would be making a trade-off between period consumption and life expectancy. He would attempt to maximize a utility function of the form \( U(C, E) \), where \( E \) gives average length of life and \( C \) the vector of period consumptions. In essence he would look over the available combinations of his two valued variables (this might be called the production-possibility frontier) and select the pair he liked best.

This approach produces a variety of problems. First, life expectancy is not a satisfactory summary variable of the total welfare received from good health: There are intermediate stages between total health and death; they should not be valued at either extreme. Second, the distribution pattern of life expectancy may matter. Suppose a person has a choice between raising the probability that he will survive his forties or the probability that he will survive his sixties, a choice such that his life expectancy for either option is the same. Which one would he take? Most people would probably select an increase in the forties probability. Finally, the way people feel about their own life expectancy may depend very much on the life expectancy of other people in the society. If most people are living to be seventy-five, you may be almost indifferent to a change that will extend your expected life by, say, one hundred. You may even value the change negatively. But if everyone else had a good chance of becoming a centenarian,

6. Pessimism in this regard can be carried one step further. Figures traditionally treated as upper and lower bounds often make little sense. Outstanding for its nonsensical basis is the discounted future earnings benchmark.

7. There is a significant probability that feelings about this extension may vary very much over an individual's life span, that he will give different values and answers at 71 than he will at 45. This raises a more complex set of problems relating to such issues as the efficiency implications of having an individual when he is young take actions that affect his welfare as he grows older. Perhaps the young man and the old should be viewed as two separate individuals in a closely entwined situation of externality and altruism.

you might like to get in with the crowd. There is more than envy and conformity associated with this keeping-up-with-the-Joneses phenomenon. Society changes according to the life expectancy of its citizens, and it may be painful to be out of step.

A potentially more promising approach is to ask, "What coverage for catastrophic illness should we like to provide ourselves?" If we can answer this more applied question, we can duck the enigmatic one, "What is the value of a human life?"

Contingent Claims Markets as Guides for Resource Allocation in the Treatment of Catastrophic Illness—A Simple Model. First, it must be recognized that ordinary static markets cannot meet the needs of victims of catastrophic illness. When the strobe lights flash to permit a round of transactions, the camera will record a situation where some traders are caught in a state of catastrophic illness. These sufferers will have little to offer in trade for highly desired medical resources. A dynamic approach is needed. At time frame 1, a collection of healthy individuals must contract together and specify that whoever gets sick in the next period will collect from the others. Time frame 2 reveals the paying off of bets: The sick get compensated. We refer to this system of betting on the future as trading on a contingent claims market. The claim is contingent in that it is paid off only: if some pre-specified event (in this case, some illness for which medical treatment is very expensive) should occur. The introduction of contingent claims as tradeable commodities restores Pareto optimality to the market outcome in a world of uncertainty.

A simple model illustrates how medical treatment, the "commodity" transferred by the market, affects health status. Under-
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lying health status, s, can take on either of two values: healthy, h, or catastrophically ill, i. This variable as well as medical expenditure, m, serve as inputs for the production function for after-treatment health status, S. The variable S is normalized to take the value 0 if the individual is ill and has no medical expenditure and to take the value 1 if he is healthy regardless of his medical expenditure. These values define the range of the production function

\[ S = f(s,m) \]

If we create an agreement where all members of society share in the medical expenditures of those who are sick, we produce a scheme that brings about some redistribution of S. Equal after-treatment health status is unlikely to be achieved. For example, no amount of medical expenditure can make a cancer victim as healthy as a nonaffected individual.

Our next step is to take this health status-to-treatment relationship and incorporate it into a model that shows how individuals choose their optimal medical expenditure patterns. We shall assume a world without market imperfections that extends for two periods. Interest rates and discount rates are cast aside, for they are all assumed to be equal.\(^{12}\) The individual decision maker is healthy in period 1. For period 2 there is a probability p that \(s = i\), and a probability \(1 - p\) that \(s = h\).

This individual knows his incomes in the two periods to be \(y_1\) and \(y_2\), respectively. These incomes are devoted to period consumption and medical expenditures. In this ideal world, the individual can transfer funds forward and backward in time on perfect capital markets. He can insure himself against ill health on actuarially fair contingent claims markets.

If his consumption in a period is \(c\), and his after-treatment health status in that period is \(S\), the individual will receive a utility for that period \(U(c,S)\). His objective is to allocate his consumption and medical expenditures to maximize the sum of his discounted (at rate 0) utilities for the two periods.

He is healthy in period 1. He will have no medical expenditure

\(a\) a transferable commodity such as payment for medical expenses that can provide compensation for unfortunate outcomes in the lottery on underlying health status.

\(^{12}\) For the formal model these rates are assigned the value of 0. The reader with a mind for calculation can work out that this model is completely equivalent to one with different income parameters but positive discount and interest rates.

in that period; neither will he expend in period 2 should he be healthy then. His problem is to decide what level of medical expenditure to make if he turns out to be catastrophically ill in period 2, and what level of consumption to have in each of three situations, period 1, period 2 if \(s = h\), and period 2 if \(s = i\). The ordered subscripts to the variables c and m in the following equations indicate the period of expenditure (1 or 2) and medical condition (h or i). Given that the individual is dealing on zero interest-rate capital markets and actuarially fair contingent claims markets, he faces a most streamlined conservation equation.

\[ y_1 + y_2 = c_{ih} + (1-p)c_{2h} + p(c_{2i} + m_{2i}) \]

The second term on the right-hand side gives the contribution to the expected expenditure of his \(h\) condition in period 2; the third term gives the contribution of his \(i\) condition.

The individual's objective then is to find the

\[ \text{MAX} \quad U(c_{1h},1) + (1-p)U(c_{2h},1) + pU(c_{2i},f(i,m_{2i})) \]

subject to the conservation equation (2). Fortunately this problem can be substantially simplified. For example (unless the individual is a risk taker with respect to gambles on consumption), it is clearly optimal to have \(c_{1h} = c_{2h}\). Furthermore, any one of the other parameters of maximization can be suppressed by means of the conservation equation. The individual confronts a two-variable maximization.

The linear relationship between \(c_{1h}\) and \(m_{2i}\) simplifies the optimization procedure. Differentiating the constrained objective function with respect to \(m_{2i}\) and setting the result equal to 0 yields the efficiency condition

\[ f_2(i,m_{2i})U_2(c_{2i},f(i,m_{2i})) = U_1(c_{1h},1) \]

where a subscript on \(f\) or \(U\) indicates the partial derivative with respect to the named variable.

The optimal value of \(m_{2i}\) sets the product of the when-ill marginal productivity of medical expenditure times the marginal utility of improved health status equal to the marginal utility of consumption when healthy (or ill). This is what might be expected. The rule comes down to spending your money where it does the most good. It should be noted that the marginal utility
of consumption is the same for the three different circumstances.\textsuperscript{13}

Two Numerical Examples. Some examples show how this condition works out numerically. If \( p = .02, y_1 \) + \( y_2 = 20,000 \) (dollars), then with the separable period utility function \( U(c,S) = \log(c) + 20S \), and the when-ill production function \( S = f(i,m) = m/(m + 5000) \), the optimal consumption level is 9,737 for both illness and health and the optimal medical expenditure when ill is 26,300. Deriving the same result on a pure contingent claims basis, the individual would choose to trade a claim of 263 if healthy in return for the actuarially equivalent 26,037 if ill.

With the nonseparable period utility function \( U(c,S) = S^{3/8} \\log(c) \), the consumption level will be higher when the individual is healthy. In this instance the optimizing values are \( c_1 = 8500, c_2 = 9916, \) and \( m = 9788 \). The examples and the efficiency conditions reveal the structures of optimal schemes. Expected utility is maximized when a particular level of medical expenditure is prescribed for the individual who is catastrophically ill. This principle extends immediately to situations where there are many possible illnesses; each illness will be associated with a particular optimal expenditure. Consumption levels will also vary among states of health, unless consumption is a separable argument of the utility function.

Some Reservations and Reflections

The foregoing mechanism for catastrophic coverage raises a number of theoretical issues and presents some difficulties.

Insurance as a Tool to Equalize the Marginal Utility of Money. The model described shows how insurance works to secure efficiency. Insurance is a mechanism for transferring money between states of the world to maximize expected utility. Assuming that the marginal utility of money is decreasing in each state of the world, the maximizing outcome will equate the marginal utility of money in all states where it is spent.

\textsuperscript{13}In one-variable models or two-variable models in which all goods are tradeable, equalizing marginal utilities across states will equalize total utilities as well. Given that health is not tradeable, it is not optimal to have dollar transfers that equalize utilities. (If the marginal rate of substitution of money for health becomes infinite, equalization may not even be possible.)

\textsuperscript{14}This observation implies that optimal coverage for catastrophic illness will relate not only to medical expenditures but also to medical-event-related indemnity schemes.

\textsuperscript{15}Further examples abound outside the medical area. If you have inherited a priceless painting you never intend to hock or sell, and if painting enjoyment were a separable additive item in your utility function, then there would be no reason to insure it at actuarially fair rates. (Indeed, even if you got better than fair actuarial rates, you might choose not to insure. The policy would increase the variance of your "usable" assets.) Similarly, given the present direction of flow in health care, it is not optimal to equalize the marginal utility of health and income.

\textsuperscript{16}The model assumes, as is usual, that we insure against bad outcomes; that is, that we transfer funds from situations with high utility to those with low utility. But this procedure is desirable only if the marginal utility of money is higher in the low-utility situation.

If medical situations are our concern, losses incurred through high medical expenditure alone would certainly have this property. Charging premiums and compensating expenditures would shift resources toward states where their marginal utility is higher. For example, if a short but expensive hospital stay is required to cure an illness or correct a condition, the loss is primarily financial. It will be desirable to have a transfer scheme that shifts resources into the sick state.

But medical expenditure is not the only variable that shifts the marginal utility of money; hence it cannot be the sole argument of an efficient transfer scheme. If a righty loses his left arm but no earning capacity, it is not clear what happens to his marginal utility of income.\textsuperscript{14} His expenditures required to achieve his past level of social success may go up, thus raising that critical variable. Alternatively, he may find that he now can no longer participate in expensive hobbies such as skiing and golf, implying that before he faced the lottery on the arm loss, he would have shifted funds to his two-armed state.\textsuperscript{15}

In the case of the most extreme loss, that of life, funds are often transferred into the purchase of anti-life insurance, what is called an annuity. An old-folks commune might agree to an insurance policy where all who survive contribute to the high recreational expenses of those who remain healthy.\textsuperscript{16}
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Perhaps the reason some of these anti-insurance prescriptions seem counterintuitive is that we are accustomed to dealing with tradable goods and convex preferences (at times to the extent that we use monetary expenditure as a sufficient statistic for the arguments of the period utility function). In these accustomed circumstances, efficient claims markets will lead an individual to arrange identical consumption bundles and utility levels under each state of the world. But once some goods (lives, arms, health, and so on) cannot be traded, contingent trades that lead to equal utilities for all states of the world are hardly desirable. Our intuition trained for other circumstances may fail us.\footnote{My earlier example that Howard Raiffa has popularized involves a bachelor who must play Russian roulette with two of six barrels loaded. How much would he give up to have one bullet removed? Ask the same question again, this time starting with but one bullet. He should pay more in the two-bullet instance. There is a \( \frac{1}{6} \) probability of death even after he buys the bullet, and money matters little if at all when he is dead.}

Difficulties with the Economist’s Pure Model. An economist can stride most confidently where markets are perfect. Asked to make policy recommendations for a highly imperfect area of the real world, he is likely to seek guidance by asking himself, “What would have been the result if a perfect free market could have been made to function?” In the catastrophic illness area, the answer would be the outcome of the hypothetical contingent claims market described above.

But this intellectually comforting pursuit of the counterfactual may not provide robust insights. The market apparatus may be in such a state of collapse that no firm inferences can be drawn as to what it would have produced had it been working smoothly. Even if our conjectural skills were unlimited and our inferences precise, the perfect market analogy would provide minimal guidance if its outcome is not achievable.

In these circumstances it is sometimes proposed that we institute the closest viable relative of the perfect market. Here that would be an insurance version of the economist’s pure model. To evaluate such a proposal, we must identify and understand the explanations for the rather limited success of markets to spread risks.

There are a variety of explanations for the rather limited success of markets to spread risks. (1) Certain goods, such as intelligence of intergenerational transfers, it hardly makes sense to take out life insurance on one’s children.

and health, are not redistributable. (2) Under the best of circumstances, contingent claims markets are difficult to establish and run. (3) Risk-spreading contracts are drawn up after some lotteries have been conducted. (4) It is difficult or impossible to monitor the information required for the efficient functioning of contingent claims markets.\footnote{See R. J. Zeckhauser (1973) for a further discussion of these points.}

If catastrophic illness is the specific concern, the first category of explanation applies with a vengeance.\footnote{This statement may not say much about efficiency. What it says, in effect, is that outcomes would be much improved in a hypothetical world where all non-marketable goods were made marketable.} The existence of the second set of difficulties may provide the justification for numerous proposals for socially provided insurance: imperfections are such that the private market will not provide efficient and desirable insurance structures. Further, it encompasses some thorny intergenerational problems. There is no way for our descendants to compensate us for lowering radiation levels and thus reducing their incidence of catastrophic illness. The third set of explanations shows that even infancy is too late for contracting. By the time a child is born, his catastrophic health needs are determined to a substantial extent in the statistical sense. He may be born with a mental or physical congenital defect, or he just may be poor and live in unhealthy surroundings. The fourth set of explanations involves such matters as adverse selection and adverse incentives. If a health-insurance policy is offered to the general public, the purchasers will be the sick and the lame. Once they have the policy, the purchasers will have greater expenditures than their paired control-group counterparts. This could be avoided if the insurer could monitor in advance the information the potential insureds possessed about their future health lotteries, and if the insurer could determine, while the policies were in effect, the insureds’ exact medical conditions and not merely the signals, such as medical expenditures, that indicated what they were.

Some Reservations and Reflections: the Social Impact

The imperfections associated with contingent claims markets (and other types of markets as well) are complemented with difficulties
particular to the medical area. The implication of the economist's pure model is that there may be a contractual reason to provide catastrophic illness coverage. If the required contingent claims markets could be established, we might all trade to a position where each individual's catastrophic medical costs were covered by the general society. But there are many problems involved with establishing such schemes. In this highly imperfect world, there could hardly be the present policy interest in catastrophic illness coverage if there were not additional arguments beyond this one of contractual self interest.

Is there a sense in which medical care in our society is a special type of commodity? Is it not a commodity in which each of us has an interest in seeing his fellow citizens' consumptions increase?

Medical Care in General. Such a positive externality reflects the obvious fact that if your fellow citizens are healthier you are less likely to contract their contagious diseases. Similarly, you may earn more because your co-workers are healthier. The familiarity of these traditional classes of positive externalities is perhaps more compelling than their import. If they were the sole deviation from the neoclassical model in this area, efficient levels of medical expenditure would probably not be much above the privately secured levels.

But there is a second, potentially more significant class of externalities that is usually emphasized by social critics, policy analysts, and health care specialists, rather than by economic theorists. It revolves around the philosophy of health care as a right. Thus we are more concerned that another individual have good health than that he have a color television set, even if he should prefer the latter.

Many factors get tangled up in this belief. A significant one, no doubt, stems from observation of the effects of a substantially unequal income distribution. Most individuals in policymaking and policy analysis positions are drawn from the middle and upper classes. For them, medical care is not viewed as a discretionary commodity whose consumption is traded off against furniture, vacations, and other goods that contribute to over-all utility. They purchase all of the medical care that their physicians tell them that they need. It seems quite natural to extend this mode of reasoning to individuals less wealthy than themselves. With discretionary commodities, poor people, like rich, should choose for themselves. But with necessities like medical care no one should be denied the required (prescribed) amount on the basis of income.

A question that would seem to merit investigation is whether this same attitude toward medical care would persist if we had a substantially more equal income distribution. The most likely answer is "yes, but less strongly." The income distribution factor is frequently overemphasized when analysts propose right off to adopt other than a market solution. They may be taking refuge in complexity by refusing to face up to the question of what they would propose if all incomes were equal. If there is no clear prescription in that situation, there can be little justification in stating that the unequal income distribution sent matters astray.

Medical services do seem to be unlike other commodities. They restore the integrity of the body and seem to confirm the notion that something other than traditional economic processes endows us with life and health. We do not at present allow individuals to sell parts of their bodies, commit suicide, or make contracts guaranteeing their own euthanasia. In some mystical sense, health is a sacred matter. Its sacredness makes it very much less an object for barter.

Catastrophic Illness in Particular. These arguments would be reinforced if attention were focused on catastrophic illness. Most catastrophic illnesses are grave. If inadequate medical treatment is given, death or at least serious impairment of function will be the result. With catastrophic illness we immediately raise the issue of the sacredness of life.

The special nature of catastrophic illness produces some interesting efficiency arguments. Any transfer in kind, such as payment for medical expenses, runs the risk of being inefficient in terms of the recipient's preferences. But an individual who is having the direct treatment of his catastrophic illness paid for is hardly likely to prefer some significantly different pattern of transfer.

Specific transfers also run into difficulties when the transferrer's imperfect knowledge of the production function means that less than maximum output is being achieved. If the health level of
the poor is the variable to be fostered, it may be more important to improve their food or housing than to improve their access to medical services. But this may be hard for the transferring agency to recognize. If government organizations or other bureaucracies are involved, opportunities for learning what is efficient may be limited. Given natural organizational inertia, less than totally productive programs may be difficult to scale down or redirect to more fertile territory. With catastrophic illness, the danger of this type of inefficient production seems minimal. For the most part, physicians, not the transferring agency, decide how resources are to be spent. The recipient certainly could not be expected to have superior knowledge of productive possibilities. If transfers for the treatment of catastrophic illness are found to be inefficient, it will have to be for reasons other than these traditional ones.29

Potential Sources of Inefficiency of Transfers for Catastrophic Illness Coverage. Explanations of the possible inefficiency of catastrophic coverage payments may be classed under three headings: actuarial, ceremonial, and nonessential. The actuarial argument cautions us against judging the efficiency of contingent claims payments solely in the context of the states in which they are paid. Rather, we should step back and see what pattern of payments an individual would have requested before his condition became known. For example, a cancer patient might spend every penny of an unrestricted $50,000 transfer on medical treatment. But before his 1-in-20 shot of contracting the illness came in, he might have preferred an arrangement whereby he would receive $2,500 independent of the outcome.21 Providing him with contingent medical coverage of $50,000 should he contract cancer would thus be inefficient.

Along ceremonial lines, money is frequently spent on medical coverage because it would be too painful to admit we would prefer not to. It is difficult to allow a family member to die a little sooner just because total family welfare would be better served by conserving the resources spent on extending his life.22 Potential guilt is not the only source of excessive ceremonial expense. We might like to restrict medical expenditures on ourselves if that provided us with a way to transmit the saved resources to our close friends and relatives. But custom and tradition may bind us as securely as the provisions of coverage policies.23

Many resources expended in close connection to the treatment of catastrophic illness fall in the class of nonessentials. Some of these consist of frills in room, board, and comfort. Of perhaps greater significance are direct medical expenditures that are made only because complete or near-complete coverage is provided. Nonrequired tests, extra hospital days, even unneeded operations all may find their way into this category.

None of these three categories of inefficiencies would come into play if catastrophic coverage provisions could be fully specified at the outset.24 Individuals could pay reduced premiums by agreeing to forego frills and unnecessary or ceremonial expenses. But it would be most difficult and expensive for an insurer to monitor the information required to enforce a bare-bones policy of this sort. These informational difficulties would include the adverse selection problem that always arises when varieties of coverage are offered.

On-off Variables and Catastrophic Illness. Problems relating to catastrophic illness bring to mind a special category of externalities that is not much discussed in the economic literature. These externalities are generated by variables that can take on only two statuses: present or absent, on or off. For example, either we let

22 Carl Stevens observes that the utility derived from relief of guilt, anxiety, and so on may be one of the major outputs of the medical-care sector.

23 Extraordinarily difficult problems get bound up with committing ourselves in advance in these types of situations. In this regard, T. Schelling suggests we might want to implant a device in our brain that would automatically lead to our demise were we to suffer a severely disabling stroke. This would protect us from later chickening out when our mental capabilities might be somewhat impaired, would enable others to avoid the onus of euthanasia, and would permit us to participate in a contract that would provide us with more extensive medical resources were we not to suffer such a stroke.

24 Carl Stevens pointed out a useful distinction between initial macroprospective level decisions and micro-immediate level decisions. "Decisions which seem economically necessary and ethically appropriate at the first level force choices at the second level which seem ethically unacceptable (and vice versa — aggregating up from the micro-immediate level in response to ethical imperatives seems to result in a requirement at the macroprospective level which is economically unacceptable)."
individuals die for lack of medical treatment because they are poor, or we do not. Starting with the survive-independent-of-wealth variable in the off position, say that we change matters so that 90 percent of dying-because-poor people are saved. The survive-independent-of-wealth variable is still off. It would still be off if 99 percent were saved. If an on-off variable is to achieve on status, everyone must be treated the same; even minor transgressions mean that all is lost.

The Myth That Life is not Given up When the Price Gets too High. A most significant on-off variable relating to the catastrophic illness area is that life is sacred: it is not bought at a price. If medical expenditures can save a man's life, we will spare no expense to do so. An effort to maintain this variable in an on status may be the source of much support for public policies to pay for catastrophic illness.

It is important to recognize that there are ample opportunities for self-deception and recategorization where on-off variables are concerned. Society can be well equipped to interpret the evidence as though a variable is on, even though an impartial outside observer might see that it is off. Every physician, every student of medical care, for example, could tell us that we frequently expend savable lives in order to conserve resources. But rarely are resources-over-life decisions made in full public view. For the most part they are concealed behind phrases and psyche-salving concepts such as: We were following the requirements of good medical practice. Where no such concealment would be possible, extraordinary levels of resources might be expended to preserve not only a life, but a valuable myth.

A variety of subterfuges can be tried to attempt to preserve this myth. If we get another kidney machine, we can save some more patients suffering from renal failure. If we believe it uneconomic to save everyone, the best we can do to maintain the notion that inadequate funds are never a barrier to the saving of life is to restrict the supply of machines from the start. This confronts us with the difficult problem of allocating people to machines. But we have managed to change the problem. The shortage is not one of funds, but rather of life-saving machinery.

25 For a fascinating survey on doctors' differing intentions on saving the lives of members of different economic classes, see D. Crane (1971).
26 In a more macro context, some medical resources are not fungible, and rigid supply barriers may play a role. Physicians' services can now be purchased at a price. Some proposed national health insurance schemes will greatly expand demand for them. If price is controlled, the physical supply of physicians' services will have to be rationed. In a less intricate manner, the supply of donor organs has an absolute physical limitation. Fortunately, there is significant slack at present in the organ-donation system. If a successful coordination effort could be undertaken, our transplantation operations could expand manifold before running into these absolute supply limitations.
27 For a variety of other reasons the myth may be difficult to maintain much longer. Medical care is becoming increasingly expensive and sophisticated. New, heroic, potentially successful, and extraordinarily expensive procedures are being developed all the time. Each such procedure throws up another challenge akin to the one produced by the dialysis machine. Unrational use is too costly; rationed use threatens the myth. Bone-marrow transplants and a variety of cardiac surgery procedures are frequently mentioned as promising life-saving procedures that are extraordinarily expensive.
28 A more finely tuned measure than lives saved for the moment would reflect an even greater disparity in treatment. The driver saved by the guardrail could lead a complete and wholesome life, whereas the individual who receives the opera-
In the terminology of the on-off variables, we can draw a very useful distinction between failing to allocate resources to save a man for sure, and failing to allocate resources that might save someone in the future. If this argument is correct, then we should expect that at present there persists a technically inefficient, but perhaps highly desirable situation. At the margin, we are spending substantially more to save identifiable lives than we are to save statistical lives. And the more generally evident it is that the identifiable life can be saved, the more we will be willing to spend to save it. This is all an effort to preserve an on-off variable in on status. But we should recognize that we could save more lives at less cost if we allocated our funds in a somewhat different fashion.

The Two-Armed Bandit Problem. There is another important analytic construct related to catastrophic illness that leads us to make sacrifices in expected lives. The two-armed bandit paradigm confronts a player with two different slot machines. The pay-off structure for the first is known. For the second, it is an uncertain quantity, whose present expected value is somewhat lower. The game is to be played a large number of times. What is the appropriate strategy? Merely to play the machine that has the highest present expected pay-off would not be optimal. Machine B may turn out to have a very high average pay-off, despite the fact that at present it looks somewhat worse than machine A. Playing machine B offers valuable learning. If the final play is far away, it may be worthwhile to play it for the present.

The catastrophic illness analogue to this problem involves a string of patients who, over time, all suffer from the same ailment. Starting with the first patient, the decision must be made whether to give him the standard treatment or a relatively untired new one, which though believed to be somewhat inferior may test out to be superior. The distinction between this two-armed bandit problem and the traditional one is that here the beneficiaries differ from trial to trial. The knowledge gained in the treatment of a particular individual cannot help him but only his successors.

Though expected lives saved may increase if we give the first man the relatively untested treatment, the probability that his life is saved will diminish.

Here another on-off variable comes into play. We have a belief that makes us feel much more comfortable about our society: we will always give an individual the best possible medical treatment. There is no convenient way to relax that code so that we can give some people worse care (on an expected value basis) so as to benefit other individuals in the future. To keep this variable in an on status, we run up smack against the two-armed bandit problem.

Some analysts might prescribe a solution to the two-armed bandit type situations. Why not pay people to take chances with experimental treatments? Payment can be in dollars, or in time off from prison, or in the receipt of better medical care than one otherwise would have received. Unfortunately the very fact that we have an on-off variable in the area means that we do not believe it should be violated, that it is not capable of being traded for other valued goods. If these trades were allowed, our variable would be compromised.

Another medical example illustrates the difficulty more emphatically. Consider a situation in which certain individuals were potential carriers of a disease, but unlikely victims. Vaccination of carriers, let us assume, is a slightly risky procedure. Following the give each-the-best-treatment ethic, such vaccination, no matter how beneficial, would be proscribed.

There is a contractual way to get around this problem that relies on a conception of an original position due to J. Rawls (1971). Standing behind a "veil of ignorance" we are each as likely as not to be the first treated. Therefore, in formulating our policies we will maximize for all individuals now and forever. We will choose to play as if a single individual were confronting a giant lottery in which he was equally likely to receive a pay-off from any individual trial. The objective then will be to maximize total expected pay-off, and early trials may be devoted to relatively untested, lower expected pay-off procedures.

In the real world we are far from an original position of equal ignorance. Youngsters know that they are unlikely to need a new-fangled coronary treatment procedure as soon as they elders. This argument applies more forcefully to people living in many societies hence.

This would seem to be an argument against allowing a small fraction of individuals to get out of the draft for occupational deferments, or because they were willing to buy replacements. If the draft is universal, then we have an instrument that we can regard as egalitarian on a particular dimension. Once broken, even by a little bit, its equal-treatment aspect vanishes. Understanding this, it would be quite consistent to argue that so long as we are going to allow occupational deferments we may as well have a volunteer army. However, in preference to either we might prefer a draft lottery. If the lottery were fair and if all were subject to its outcome, then we would be creating one significant area in our society where all citizens started on an equal footing.
System Response to Catastrophic Coverage

When conducting a policy evaluation, we must take a dynamic view of the outcome that would result if we provided citizens with certain levels of catastrophic coverage. The medical system would respond significantly to such coverage. If medical care were an ordinary commodity, introductory economic theory would tell us to direct attention to long-run supply curves to determine how the demand increase from catastrophic coverage would affect matters. If these curves were reasonably elastic, this increased load on the system might not produce undue inflationary forces. If one had to find a textbook example of an area where this type of unit-cost analysis could be misleading, medical care would serve admirably. (Being forced to abandon our most valuable predictive tool, we know that extensive research should be conducted before we attempt confident predictions or undertake sticky policy commitments in this area.) Given the overwhelming market imperfections within the medical-care sector, factor and service prices are only the flimsiest guide to efficient resource allocation decisions. (Reflect on the wisdom of the hospital director who assigns interns to head-nurse duties after observing that interns receive lower salaries.) Inflation in costs may primarily reflect a transfer from society at large to those individuals who are fortunate enough to reap the benefits of working in a restricted entry sector. Alternatively, if entry to the medical-care field were relatively free, but if few were qualified, these increases could signify a situation where an increase in demand has made already highly valued resources even more so.

Physicians and Quality Medical Practice. The medical-care industry has other structural aspects that weaken the usefulness of traditional economic yardsticks. Its producers, the physicians (in

33 If expanded loan programs were made available to medical students so that they could better spread their lifetime income patterns, more individuals would be able to afford medical school. This in itself would do no good unless increased medical-school places were made available. The trouble on the second score relates to certification and licensing; a problem that crops up elsewhere in the medical-care system. Medicine is like plumbing and teaching; you cannot practice without a license, and the profession controls the licensing procedure. In the medical-care field, the most economically significant licensing efforts may not be related to the limitation of physicians but rather to restricting present physician duties to physicians only. See R. J. Zeckhauser and M. Eliastam (1973).

34 Admittedly in some non-life-and-death instances they may take into account the patient's financial position, and any economic hardship that might ensue were he to receive a particular mode of treatment.

35 A more cynical assessment would point out that doctors may earn less than their average return when treating catastrophic illness. Insurance moneys may run out, making further fee-collecting tardy, difficult, or impossible. If the patient or his family is paying everything, these problems may also arise. Matters may be particularly difficult if the patient does not survive.

In considering the impact of plans to provide coverage for catastrophic illness, it is essential to assess the ways in which the requirements of quality medical practice will be shifted. If such coverage were universal, it would seem likely that it would become standard practice to undertake more costly and heroic procedures to deal with catastrophic conditions. These procedures are not undertaken at present, because they are viewed as being uneconomic, and quality medical practice reflects this perception. Our present failure to devote resources for these treatments does not produce difficulties with the life-over-resources myth, because the sacrifice of life does not appear obvious so long as the dictates of quality practice are being followed.

Universal catastrophic coverage would in effect be shifting out the margin of what we believe is called for. It would make it more expensive for us to preserve the myth; we might decide to scrap it. In a second area, catastrophic coverage will encourage the development of new, expensive modes of treatment. This too can be viewed as a margin-shifting procedure. It may have the effect of putting us much more frequently in situations where there is a clear choice between survival and the saving of an extraordinary expenditure of resources.

Hospitals. The possible response of hospitals to catastrophic coverage must be considered as well. At present many hospitals find the treatment of catastrophic illness an uneconomic proposi-
tion. The catastrophically ill require more than their fair share of attention and treatment, yet their excess expenses are spread to some extent among all patients. Furthermore, a higher proportion of their assessed charges may never get paid.

There is a tendency, then, for hospitals to discourage the treatment of the catastrophically ill. Given the preponderance of non-profit institutions in the hospital field and the important role of factors such as prestige in motivating physicians and hospital administrators, this discouragement does not eliminate the ministration of catastrophic care. However, it does introduce a factor for downward bias.\(^{36}\) Change the structure so that catastrophic illness is fully covered, and the bias might go in the other direction. Hospitals might come to support their other services by catering extensively to the catastrophically ill.

Implications of System Response for Welfare. The present system which cunningly conceals its decisions to sacrifice lives in order to conserve resources may be just what we want. Quality medical practice serves as a protective shield for our highly valued myth. Provide universal catastrophic coverage and the costs of preservation may skyrocket, although the number of additional lives saved may be minimal. When weighed against the lives saved for the same resources devoted elsewhere, the net loss in life could be significant.

Perhaps of greater consequence, any equity or morality considerations relating to our present noncoverage of catastrophic illness might be compounded, not simplified. With the frontiers of knowledge pushed back, and quality medical practice requiring more extensive resource expenditures, we might take more actions that would weaken our own moral stance.

As medical science advances and the dictates of quality medical practice evolve, key policy questions will surely be, “Can the myth be preserved? How much will it cost? Is it worth it?” In making policy assessments on the provision of catastrophic coverage, it will be important to determine how this would affect these answers.\(^{37}\)

\(^{36}\) See J. P. Newhouse (1970) for a discussion of the influence of objective functions on the behavior of hospitals.

\(^{37}\) G. Calabresi (1972) presents the compelling argument that it is not possible to determine at present how best to allocate scarce medical resources in the future. He argues for an evolutionary approach where a mix of procedures, lotteries,


Stevens, Carl, Reed College, Portland, Oregon. Private communication.
