Prices and Protocols in Public Health Care

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This article addresses the problem of how to determine the optimal allocation of public expenditure in the health sector. The first part poses the question: How should the set of services provided in the public health care system and the fees charged for them be chosen to maximize the health status of the population with a fixed budget? First, the findings show that policy reform should take into account the response of the private sector. Substituting for a reasonably well-functioning private sector is not as valuable as providing services the private sector cannot. Second, the assumptions needed to justify the cost-effectiveness of medical interventions as a criterion for setting priorities are so restrictive as to make this method usable in few, if any, circumstances. Third, prices for any one service should be set to balance the conflicting goals of encouraging its use and of conserving the budget for more effective services.

The second part broadens the objective of policy to cover the standard welfare economics concerns of utility and market failure, the latter being extensive in the health sector. It reexamines welfare maximization rules to show that only the market failure components of shadow prices are needed to calculate the welfare gains from public investments.

Providers of health care in public clinics in the developing world work with tight budgets, requiring difficult choices. This article examines a few ways to make these choices using standard tools of economic analysis. It does not pretend to be a comprehensive treatment but does raise some core issues concerning the best use of public funds in health care.

The standard method characterizes optimal allocations by posing the problem: how can the government maximize a given objective subject to constraints? The answer depends on the choice of objective and the characterization of the constraints. Economists generally like to use social welfare or the sum of peoples' utilities as defined by their own preferences as the objective in such a problem. Often, they weight this sum by peoples' income so as to give more influence to the well-being of the poor. In the context of the health sector, this objective is somewhat problematic because people may not be able to define their preferences due to lack of information about the nature of health under different diseases or the likelihood that a treatment will succeed. Using the standard approach requires making some monetary valuation of health, which may be difficult, especially if people's demand functions for care are not believed to give true valuations. Further, ministries of health are more likely to think in terms of

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improving the public’s health status. Therefore it is of interest to identify the best policies for achieving the goal of improved health.

Governments and their ministers of health face three sorts of constraints. The first is the state of the world that the government does not directly control. This includes available medical technology, of course, but also people’s behavior in pursuing or providing health care outside the government sector. The government, while typically a large supplier of health care, forms only one part of the overall medical market. The private sector, especially in developing countries, is also quite large, often larger than the public sector (World Bank 1993). If not controllable, the response to public policy of the entire private market for health care represents one of the constraints on the government’s ability to influence people’s use of goods and services, and, hence, their health. I do not presume that the private market does a good job, merely that it reacts to and therefore partly determines the ultimate effect of policies.

The second sort of constraint involves the budget. Analyses can focus on resources available to the public health care service, the ministry of health as a whole (which includes nonclinical interventions such as health education and vector—pest—control campaigns), the government as a whole (which includes sanitation, water supply, and female education), or the entire economy, including the private sector. For the economy, the range of policy instruments and regulatory powers must be quite extensive. Thus, the third kind of constraint is the range and flexibility of the policy instruments at the government’s disposal. Optimal policies must, above all, be feasible and take into account restrictions imposed by administrative capacity or political acceptability.

The first part of this article takes the particular view of a minister of health running a public health care system. I assume that the minister aims to maximize the health of the public. Decisions beyond the minister’s control fix the budget. The policy instruments are of two sorts. First, a set of rules, or protocols, ration the range of services available in the public sector. The types of services or treatments offered and excluded comprise the policy choice. Second, a schedule of fees, or prices, recovers some of the cost of services and thereby stretches the budget. Charging fees might deter people, particularly poor people, from using effective services. At the same time, public health care providers might face restrictions on setting fees. It is often not feasible, for example, to charge different rates for individual treatments or, sometimes, to charge at all. The basic model in section I focuses primarily on clinical care. Broader issues (and in the context of developing countries, very possibly the more important issues)—such as the provision of public health measures (safe water, sanitation, or vector control), the regulation of private providers, and public information campaigns—are extensions to the basic model.

The second part of the article is more consistent with standard public economics. The objective in this case is the overall welfare of the people. I argue that although health status as an objective can highlight certain principles of optimal resource allocation, this one dimension of health status fails to capture
many crucial policy decisions. Section I treats private markets as constraints on the effects of policy whether the markets work well or not. Section II follows standard public economics and goes one step further by examining the inconsistency between the behavior of markets and the maximization of social welfare. It searches for ways to correct these market failures or for policies that improve welfare given these imperfections in the market. Such policies include the location of facilities and the ability of the health care system to correct pervasive insurance market failures. The constraints include private markets with significant market failures. I treat relevant budget and policy constraints implicitly. I do not derive much of the standard results in the literature; however, I highlight their less obvious implications for the health sector.

I contrast the results of the formal model with the method of cost-effectiveness for dealing with the problem of allocation in health. “Cost-effectiveness” provides a decision rule suggesting that activities should be undertaken if they have the highest ratio of the amount of some unit of output (lives saved or, as in a recent World Bank study, disability-adjusted life years) per dollar spent on the intervention (Jamison and others 1993). This ratio can determine the elements of a policy of providing or financing a basic package of services (refer to World Bank 1993 or Jamison and others 1993). I call this allocation rule “medical intervention cost-effectiveness” and contrast it with the concept of “public sector cost-effectiveness.” (I am grateful to Lant Pritchett for coining these terms.) The latter is the net effect of public intervention compared with the case in which the government forgoes providing or financing the treatment (leaving it to other providers). In this article I show the conditions under which medical intervention cost-effectiveness provides an adequate guide to decisionmaking, demonstrating that the conditions are so restrictive as to make these calculations usable only in very special circumstances, which are unlikely to be fulfilled in any developing country. I also identify the types of information that the government needs to collect in order to make correct public health decisions.

A consistent theme running through the results is the insight that the government can best make use of its own resources by focusing on activities that most improve health or welfare beyond what would happen in the private market alone. The use of medical intervention cost-effectiveness is inadequate because it ignores the counterfactual of private sector activity and the scope of complementary instruments such as prices. Similarly, this method does not deal with the extent to which market failure varies across health activities. Such variation provides the basis of the welfare maximization approach.

I. HEALTH AS THE OBJECTIVE

This section presents the basic model for maximizing improvement in health for a given budget and discusses the solution with condition-specific charges for health care, simplifications needed to justify medical intervention cost-effectiveness, and further extensions of the model.
The Basic Model

The government wishes to run its public clinics in such a way as to improve health status as much as possible for a given amount of money. There are \( N \) possible disease conditions and interventions indexed by \( i \). The health centers do not actively seek cases, although they may perform outreach in the form of follow-up for certain disease conditions. Improvement in the health outcome depends on the number of people who show up for a given disease condition and the effectiveness of treatment currently available. Each of the treatments entails a known cost, and a given budget limits the level of services. Health centers can charge for services, thereby relaxing this constraint on the budget. The next section deals with the complication of whether the fees can be levied at different levels for different disease conditions. Health centers can decide not to treat a particular condition (if, for example, it is too expensive and will deplete the available budget too rapidly). The government is not necessarily the only provider of health care. The private sector, nongovernmental (usually nonprofit) organizations, traditional healers, and self-care by the afflicted person can all substitute for the provision of services in public facilities.

A formulation of the problem that reflects these considerations can be written:

\[
\text{max} \quad \mathcal{L} = \sum_{i}^{N} \left[ L_i^B \left( D_i^B \left( P_i^B, P_i^V \right) \right) I_i + L_i^V \left( D_i^V \left( P_i^B, P_i^V, I_i \right) \right) \right] \\
\text{subject to} \quad \sum \left[ \left( C_i^B - P_i^B \right) D_i^B \left( P_i^B, P_i^V \right) + F_i^B \right] I_i \leq R
\]

where \( L_i^j \) is health improvement in people visiting sector \( j \)—with \( j = B \) (public) or \( V \) (private)—with condition \( i \), \( D_i^j \) is the number of people visiting sector \( j \) with condition \( i \), \( P_i^j \) is the price charged for treating condition \( i \) in sector \( j \), \( I_i \) is a variable that indicates whether condition \( i \) is treated by the public clinic (1 if yes, 0 if no), \( C_i^B \) is the unit cost of treatment for service \( i \) by the public clinic, \( R \) is the total public budget for health care, and \( F_i^B \) are the fixed costs of including treatment \( i \) in the menu of public activities.

The first line in the expression sets out the main objective of the government, which in this case is to maximize the health status, \( \mathcal{L} \), of the population through policies related to the public health care system. Whether care is given by public or private practitioners is not a concern in and of itself.

The second line is the budget constraint for the public health system. Total subsidies (the difference between costs of provision and the price charged summed across all services provided) cannot exceed the total resources, \( R \), available for public health care. This is not the budget constraint for the whole government nor for society as a whole; its use can lead to unacceptable results. However, the minister of health may find it the most relevant budget constraint.
The demand for public health services $D^p(\cdot)$ depends on prices in both the public and private sector. Demand for a particular disease condition, $i$, needs to be interpreted with some care. I do not assume that the individual knows the cause of illness; demand is really a function of symptoms rather than of disease. However, an unexpressed relation linking disease conditions to demand for services underlies the demand relation. This is captured in full generality by having demand functions that are specific to disease $i$ and that can vary according to the usual severity of symptoms and the likelihood that individuals will seek help when the symptoms appear. The demand for services will bear a relationship to the incidence of the disease to the extent that specific symptoms are more or less likely to induce a search for care. For example, schistosomiasis may go undetected so that the gap between incidence and demand for treatment is large. Incidence and demand will be connected more closely in illnesses with more acute symptoms.

The model captures the degree of substitutability between the public and private sectors by the responsiveness of demand to their respective prices. High own- and cross-price elasticities reflect a great degree of substitution. Other determinants of demand, particularly income, are held constant for this analysis. The concluding comments explicitly recognize demand by different groups either for undertaking ethical valuation of outcomes or for describing the pattern of use of public and private sectors.

The health improvement function, $L^p(\cdot)$, in the public sector can represent lives saved or healthy life years saved conditional on someone with disease $i$ showing up for treatment. A substantial literature discusses the appropriate measure for health status. For example, World Bank (1993) and Murray and Lopez (1994) use the concept of disability-adjusted life years (see Anand and Hanson 1995 for a critique of this measure). For the purposes of this article the choice of measure does not matter. The same sort of function $L^v(\cdot)$ applies in the private sector, either the same function or one altered to reflect differences in clinical effectiveness between the two sectors. In a country with a well-functioning public sector with very little private modern care, treatment outside public clinics could include either mostly very poor care by traditional healers or self-care. In other settings, a sophisticated private sector may exist and offer more effective treatment than the public sector, $L^p(\cdot) > L^v(\cdot)$, for certain illnesses. For psychosomatic or culturally determined illnesses, even the traditional sector may exhibit this property. Sometimes health improvement due to treating a condition—the functions, $L^p(\cdot)$ and $L^v(\cdot)$—is simply proportional to the number of people being treated for the condition. That is, the marginal benefits to treating any given condition once someone has already presented with symptoms may not vary with the number of individuals seeking treatment. This assumption could fail to be true for a variety of reasons, for example if severely afflicted individuals are more prone to seek treatment at any level of prices and if the improvement in health that results from treatment varies with severity of the disease.
In the following I assume constant costs of treatment in the public sector, $C^B_\ell$, for each treatment. Treatment costs should include the costs of all diagnostic tests needed to identify an eligible disease and its treatment. To some extent, then, the analysis could attribute costs to diseases that are not covered by the health service if they take up diagnostic or other resources before the ineligibility is discovered. I assume that this effect is small. Similarly, I assume away other issues raised by the form of the cost function. In particular, I do not consider joint costs. This is a potentially serious limitation in practical application because some policy decisions involve packages of services whose complementarity may well determine the appropriate choices. Having a certain piece of equipment with multiple uses in place may make some treatments worthwhile that otherwise would not be justified and that alone would not justify the purchase of the equipment.

I cannot assume away the complication of the explicit treatment of fixed costs $F^B_\ell(\cdot)$. These could be interpreted as the cost of introducing an expensive piece of equipment that is likely to have excess capacity, but for a large enough country or catchment area, the amortized value of the machinery captures most of the costs. Instead, I justify fixed costs in terms of the costs of attention of policymakers or the perpetual increase in training of health care personnel who must learn a larger and more complex set of procedures. The analysis must include significant fixed costs to obtain results in which there is rationing by type of service, a principal feature of the design of basic packages. Without this assumption, the health care system needs no rationing other than by price.

The price in the public sector is determined within the problem as a matter of policy. I assume different degrees of specificity of this price. In the most general case, health care providers may charge a separate price for each condition. However, this degree of flexibility in the pricing structure may not be possible; therefore, I examine various constraints on the allowable price rules. The government does not exercise direct control of the price in the private sector. Two versions of private price determination are possible. In one the price in the private sector is given and is not affected by either the price charged or the inclusion of the disease in the protocols of the public sector. Strictly speaking, this version requires strong assumptions concerning the nature of production throughout the economy (not just in health). It can be justified, however, if the health sector is a small part of the economy and takes all its prices as given from outside. Because this includes the price of doctors' services, this is still not a great assumption.

In the other version of private price determination, private sector prices and inclusion of diseases can affect the price charged in the private sector and thus have a secondary effect on total demand. A careful analysis of the connection between the private sector price and performance as influenced by policies within public clinics is beyond the scope of this article; however, the analysis captures the basic point that private sector behavior may be influenced by competition in price and rationing rules in the public sector.
The policy parameter $I_i$ takes on the value 1 if the public clinic provides the service and 0 if it does not. For the simplest analysis in the article, people's demand for services is independent of the range of services offered by the public sector. However, if the public clinic does not provide certain services, this lack of comprehensiveness may discourage people from using the public sector even when they have conditions that the clinic would treat. People's demand is determined primarily by symptoms and not the actual disease condition. Thus, when individuals originally seek treatment, they do not know whether they will be turned away.

**Solution with Condition-Specific Charges**

The first-order condition for prices is:

$$\frac{\partial \mathcal{L}}{\partial p_i^B} = L_i^B \left( \frac{\partial D_i^B}{\partial p_i^B} + \frac{\partial D_i^B}{\partial p_i^V} \frac{\partial p_i^V}{\partial p_i^B} \right) + L_i^V \left( \frac{\partial D_i^V}{\partial p_i^B} + \frac{\partial D_i^V}{\partial p_i^V} \frac{\partial p_i^V}{\partial p_i^B} \right)$$

$$- \lambda \left[ (C_i^B - p_i^B) \left( \frac{\partial D_i^B}{\partial p_i^B} + \frac{\partial D_i^B}{\partial p_i^V} \frac{\partial p_i^V}{\partial p_i^B} \right) - D_i^B \right] L_i = 0$$

where $L_i^j$ is the marginal health improvement resulting from a visit for condition $i$ to sector $j$ ($B = \text{public}; V = \text{private}$), $\lambda$ is the Lagrange multiplier for the budget constraint of the ministry, and $\frac{\partial p_i^V}{\partial p_i^B}$ is the change in the private sector price for condition $i$ with respect to a change in the public sector price. Rearranging terms to solve for optimal prices,

$$p_i^B = \frac{1}{1 + \varepsilon_i^B} \left[ \varepsilon_i^B C_i - \frac{1}{\lambda} \left( L_i^B \varepsilon_i^B + L_i^V \varepsilon_i^V \frac{D_i^V}{D_i^B} \right) \right]$$

where $\varepsilon_i^B$ is the elasticity of demand for public service $i$ with private prices changing as a result of the change in the public price, and $\varepsilon_i^V$ is the cross-price elasticity of demand for private care, again with price changing in the new equilibrium.

The expression for the optimal price (equation 3) indicates, first of all, that the price charged for a service will be such that demand for the service is elastic ($\varepsilon_i^B < -1$) as is the case with all monopoly pricing models. Therefore, prices will be higher under the following conditions:

- The demand for the service is less elastic. The higher the elasticity of demand for a service (ignoring for the moment its health effects), the greater the sacrifice in earnings by the public's health care system (given high elasticities) from further raising the price. Therefore, relatively more elastic services have lower prices (higher subsidies) at the optimum.
• The health consequence of raising the price in the public sector is smaller. The second term in equation 3 reflects the health impact (evaluated in money terms by the multiplier \(\lambda\)) of a price rise. The term involving the \(B\) superscripts reflects the direct discouragement of treatment in the public sector, the term involving the \(V\) superscripts reflects the offset to this effect due to increases in demand in the private sector. The cross-price elasticity captures the extent of this offset. The greater the net reduction in the health status of the population due to a price increase for a particular service, the lower the price for that service.

• The budget constraint is more binding. That is, higher prices result with a higher \(\lambda\), the term that converts money into health gains. The \(\lambda\) term reflects the amount of health gain that an additional dollar of budget will buy if optimally deployed. As \(\lambda\) increases (which happens if the budget \(\mathcal{R}\) is cut), the second term in equation 3 decreases in absolute value. Because this term represents the amount by which prices are discounted in pursuit of better health, a decrease raises the price.

For the rationing rule, solving a problem having fixed costs within an optimization model would, as a practical matter, present a difficult combinatorial problem. However, characterizing the solution for the purposes of this article is straightforward. An additional procedure is included in the list of covered treatments only if offering the treatment brings a gain in health status larger than the loss of health from reducing the subsidy on all previously included treatments. The loss is the total cost of subsidizing the treatment, both its fixed component and the variable cost when optimal prices are charged. The gain in health status can be expressed as:

\[
\text{gain} = \left( L_i^B[D_i^B(P_i^B, P_i^V | l_i=1)] + L_i^V[D_i^V(P_i^V | l_i=1, P_i^B, 1)] - L_i^U[D_i^U(P_i^U | l_i=0, 0)] \right)
\]

where \(P_i^V l_i=1,0\) is the price charged by the private sector when a service is \((l_i = 1)\) or is not \((l_i = 0)\) offered by the public sector. The loss in terms of health forgone from restricting other services is the cost of treatment: \((C_i - P_i^B) D_i^B(P_i^{*B}, P_i^V | l_i=1)\) multiplied by the Lagrange multiplier, \(\lambda\), which converts money into health gains. These considerations lead to a rationing rule in which a treatment is included if the following is true:

\[
\frac{L_i^B[D_i^B(I_i = 1)] + L_i^V[D_i^V(I_i = 1)] - L_i^U[D_i^U(I_i = 0)]}{(C_i - P_i) D_i^B + F_i^B} \geq \lambda
\]

where to simplify the notation, I write demand as a function of the indicator variable, that is, with prices (not presented) allowed to reflect whether the service is provided in the public sector. The objective function (health status plus a term reflecting the budget constraint) increases with a new treatment if the improvement in health resulting from extra demand for services in the public sector net of any reduced demand in the private sector is greater than a term that reflects the extra cost to the system of providing the service.
The left-hand side of equation 5 is the net improvement in health due to offering a service per unit of subsidy to the public sector. The numerator is the health impact due to the direct provision of services, \( L_i^{B} \), net of the offset of (presumably) lower use of private services (the difference in use, \( L_i^{Y} \), with and without competition from the public sector). The denominator is the net cost of providing the service at prices \( P_{is} \), determined simultaneously in equation 3, or the per unit costs \((C_i - P_i)\) times the demand in the public sector. This ratio represents health improvement per unit subsidy and should be compared with \( \lambda \), the implicit value of health, or the amount of health status improvement that would result in a unit increase in the budget allocation, \( R \). The public health system should treat only conditions having ratios of benefit per unit subsidy higher than this.

Equation 5 shows the need for fixed costs to justify the policy of rationing. Without fixed costs, any procedure should be offered, regardless of its effectiveness, provided it has any net benefit at all. Increasing the price to nearly the cost would make the denominator of equation 5 arbitrarily close to 0 and the full benefit greater than any value of \( \lambda \). With fixed costs, total benefits would have a further hurdle to overcome even if the service covered its variable costs.

For both the pricing rule (equation 3) and the rationing rule (equation 5), the model handles private sector prices with a little sleight of hand. The elasticities in the price equation as well as the levels of demand in both sectors with and without public provision all depend on the prices determined by the private market equilibrium associated with the public price and rationing decisions. There is little information about these markets and their response to public policy. This indicates an important set of questions for research. In the current context, lowering a price in the public sector could induce a fall in the price in the private sector (especially if competitive cost considerations did not determine the original private price that, thus, included excess profits). The accompanying fall in price may limit both the number of people who leave the private sector and the number who come to the public sector. The lower cross-price elasticity of demand for private sector services would be reflected in both a lower optimal price and a higher likelihood of inclusion in the public sector.

The main results pertaining to the rationing rule are the following:

- The public sector should choose interventions that lead to the greatest improvement in health relative to what is being done for the same disease condition outside the public sector.
- This relative improvement must be assessed in comparison with the budget impact of the intervention when the price for the service is set correctly rather than relative to the resource cost of the service.
- The net health impact depends on the manner in which private markets respond to policy changes in the public sector: pricing and rationing rules depend on the degree of competition in the private sector.
• The public sector should set prices to balance two competing ends: limiting the adverse, net (of private sector response) health effect of a reduction in use of the particular service from higher prices and increasing revenue to allow provision of more services.

The point is to stretch the public budget as far as it can go in achieving health gains. If the private sector provides a service of comparable quality, the public sector should not provide it or, at least, the service should not absorb much public subsidy. Its price in the public sector should be closer to cost. For conditions for which high prices dissuade many people from getting effective treatment in either sector, the public sector should, sensibly, charge lower prices. On the revenue side, the less elastic is demand, the higher is the price that can be charged without affecting health status, providing revenue the public sector can use to extend services or to increase the subsidy to other ailments.

Some of these results are quite standard in optimal pricing theory. Besley (1988) and Barnum and Kutzin (1993) discuss them in greater detail. The innovation here is to link the problem with the rationing of services and to specialize the problem to the decision of the ministry of health rather than address the broader question of improving overall societal well-being. This perspective runs into a few very serious problems, as discussed below, but mirrors the particular interest of health decisionmakers. The main contribution is to underscore the central role of demand and other aspects of private behavior in the setting of priorities and prices within the public sector.

This formulation captures the private response in two ways. First, on the demand side, consumers can choose to switch between providers at given prices. This leads to measuring the appropriate health improvement by the difference between the medical outcomes in the public and private sector weighted by the change in use of each sector due to price changes or rationing rules. Second, on the supply side (or in market equilibrium, taking both supply and demand into account) possible endogenous change in the private sector price may result from the pricing and rationing rules within the public sector. If the public sector decides to provide a service at subsidized prices, it becomes harder for private providers to charge much higher rates. If the sector is competitive, this results in private doctors going out of business and is ambiguous in its social contribution. If the sector is not competitive and exhibits elements of monopoly or more complex equilibrium conditions, the reduced price (or even the full marginal cost) can lead to reductions in the private sector price (inclusive of market distortions) as well and may have a second-round effect of increasing service use in both the public and private spheres.

Pricing needs to balance competing needs. On the one hand, higher prices discourage users of health facilities. They could lead to substitution by an inadequate private sector (especially if dominated by self-care or ineffective traditional healers), and they may have the indirect effect of increasing prices and thus discouraging use in a modern private sector. On the other hand, higher
prices raise revenue that can help to relieve the ministry's budget constraint. Although this obviously does not expand the treatment of the disease whose price is being raised, it can help to expand services (or, more important in this most general case, to reduce prices) for other disease conditions. Jimenez (1987) illustrates this tradeoff for social sector spending in general.

Equation 3 allows for the possibility that certain services may actually make money for the ministry, that is, the appropriate fee could exceed the cost of provision. This is most likely to happen under two conditions. First, it is likely if demand for the service in the public sector is inelastic in the neighborhood of marginal cost. In this case, higher fees have little impact on health status but generate revenues until the point at which demand becomes elastic. Second, it is likely if cross-elasticities with the private sector are high and the private sector is at least as effective as the public sector.

The contrast of these results with often-suggested cost-effectiveness analysis is striking. Standard formulations compare the effectiveness of the technique with the resource cost and suggest that techniques with high ratios, \( L_i / C_i \), be the only ones offered. Although analysts sometimes suggest using this method to allocate resources in the public sector, it appears to bear little relation to the solution presented in equation 5. Unrelated to the choice of public or private provision or to price policy issues, the ratio \( L_i / C_i \) appears nowhere in the solution as such. The gain relevant in these calculations is the one net of private response \( (L_i^p - L_i^f) \). The relevant cost is the net subsidy and depends on the per unit subsidy \( (C_i - P_i) \), the change in use of public facilities (the number of units that must be subsidized), and fixed costs. Therefore, even within the very narrow objective of health status, the cost-effectiveness of medical interventions is not relevant to public decisions without further assumptions.

Simplifications Needed to Justify the Relevance of Medical Intervention Cost-Effectiveness

In this section I discuss the simplifications that are simultaneously required to make cost-effectiveness analysis a legitimate criterion for setting priorities for public spending: free public provision of health care, costs of curative care that are strictly proportional to cases seen, and absence of a private sector. The correct criterion for public provision is given in equation 5. When is this consistent with a high ratio of \( L_i / C_i \) alone?

FREE PUBLIC PROVISION. Rather than assuming that health care providers can charge any price or that they can distinguish prices by type of service, assume the opposite: that health care providers do not charge any fees at all. Instead, the ministry of health must fund its entire expenditure out of a fixed budget. This version of the model puts greater stress on the rationing rules because any activity in the public sector is a drain on government funds with nothing recouped in user charges. The assumption of no fees limits the total health package that the government can offer to the public. This scenario differs from the case in which
the public health sector can provide even frivolous (yielding little change in health status) activities by charging for them at full cost.

In this case, equation 1 is changed to remove all terms $P_i^b$ from the problem, and the budget constraint becomes:

$$\sum(C_i^b \cdot D_i^b(0, P_i^v) + F_i^b) I_i \leq R.$$  

Because there are no public prices in equation 6, the solution is only in terms of the decision whether to include a particular treatment of a disease condition in the set offered. Equation 5 becomes:

$$\frac{L_i^b[D_i^b(I_i = 1)] + L_i^v[D_i^v(I_i = 1)] - L_i^v[D_i^v(I_i = 0)]}{C_i D_i^b + F_i^b} \geq \lambda.$$  

Even with the constraint of free services, the logic of the optimal policy is the same. A treatment should be offered for free in the public sector if the ratio of the net gain in health status (net of substitution from the private sector) to costs exceeds a certain cutoff level. The substitution from the private sector should take into account any price changes that the existence of free public care induces in the private sector. Two differences mark the interpretation of the model in the case with no prices compared with the case with individual prices. First, the rationing rule in the case with no prices compares net health benefits with actual resource costs, $C_i$, rather than with subsidy costs, $(C_i - P_i)$. Second, the rationing rule has real bite, even without explicit fixed costs. Some services certainly will not be provided because their prices cannot be arbitrarily raised to match small health benefits with small subsidy costs; subsidy costs are technologically determined (given zero price) rather than determined as part of the solution.

**FORM OF TECHNOLOGY.** If, in addition to free care, the technology of curative care is such that costs are strictly proportional to cases seen, or if $L_i[D_i] = L_i \cdot D_i$ and $P_i^b = 0$ for all $i$, the rationing rule becomes:

$$\frac{L_i^b + L_i^v D_i^v(I_i = 1) - D_i^v(I_i = 0)}{C_i D_i^b(I_i = 1)} \geq \lambda.$$  

**ABSENCE OF A PRIVATE SECTOR.** In addition to free care and no scale effects of costs, let us assume one of three conditions is true. First, there is no private sector ($D_i^v = 0$ for all $i$), or, second, the private sector is useless; that is, it generates no improvement in health status ($L_i^v = 0$ for all $i$), or, third, there is no cross-price elasticity of demand at all between public and private sectors, in the sense that private demand for services is completely unaffected by whether or not services are offered in the public sector: $D_i^v(I_i = 1) = D_i^v(I_i = 0)$, for all $i$. If any of
these cases is combined with the assumptions of free care and proportional costs, the rationing rule for the public sector becomes:

\[
\frac{L_i^B}{C_i} \geq \lambda.
\]

Equation 9 denotes the rationing rule associated with standard cost-effectiveness analysis of curative care options. The health improvement associated with a technology is divided by its resource cost. This ratio is higher for any included procedure than for any excluded one. Note that within this fairly general model, this decision rule is appropriate only when all of these assumptions hold—free care, public monopoly of all health services, and proportional costs.

Even with all these assumptions a serious problem occurs in applying the cost-effectiveness ratios. This problem of the effectiveness per dollar of the least attractive procedure included involves society’s valuation of life (or health). People’s own evaluation of their own lives would likely differ from this number. Thus, if people’s valuation exceeds that implicit in the ministry’s budget and the ministry is doing the best it can with the budget \( R \), society could do much better in terms of health and welfare than the monopoly position of the government allows. People with higher valuations of their own health status would want to pay more for services not allowed by this allocation mechanism. Serious inefficiency can result because this allocation has no place for personal preferences.

Some Further Extensions of the Model

This section discusses two extensions of the model: uniform user fees and public health interventions.

Uniform User Fees. I again abandon the assumption that prices charged in the public sector can differ by disease. Rather than having free care, health care providers charge a common fee for all disease conditions (or certain classes of conditions). The common fee is then a matter of policy as well. Musgrove (1986) performs a similar analysis with more aggregate disease groups. The solution for the single optimal price becomes:

\[
P_B = \frac{-1}{\lambda} \left[ \text{cov}(L_i^B, \eta_i^B) + \text{cov}(L_i^V, \eta_i^V) + \bar{L}_i^B \bar{\eta}_i^B + \bar{L}_i^V \bar{\eta}_i^V \right] + \text{cov}(c_i^B, \eta_i^B) + c_i^B \bar{\eta}_i^B \\
\sum \epsilon_i^B \theta_i - 1
\]

where \( \theta_i = \frac{D_i^B I_i}{\sum D_i^B I_i} \) is the share of public visits accounted for by condition \( i \), \( \eta_i^B = \epsilon_i^B \theta_i \) is the elasticity of demand for public visits for condition \( i \) weighted by the fraction of visits accounted for by this condition (the sum of these terms is the elasticity of demand for all public visits), \( \eta_i^V = \epsilon_i^V \theta_i \frac{D_i^V}{D_i^B} \) is the cross-price
elasticity of demand for private care for condition $i$ with respect to the price of care in the public sector weighted by the ratio of private sector visits for this condition to total public sector visits, and $\bar{X}$ is the mean of $X$.

Start by solving the general problem for a single service (the average of all services). That solution will, as in the general case, have a higher price for the service the lower is the elasticity of demand, taking private supply into account. Because demand is for a group of services, the uniform price should depend on the type of illnesses for which higher prices discourage treatment. If effective treatments are available and significantly improve health for the kinds of illnesses that fail to be treated (in either the public or the private sectors) because of an increase in the common price, this argues for limiting those increases. If price increases happen to discourage treatment for ailments with ineffective treatments, raising those prices more extends treatments for ailments with more effective treatments. Similarly, if price increases happen to dissuade people from using particularly expensive treatments (holding their effectiveness constant), this too argues for higher prices (because it results in greater savings that can be used to extend services). The relevant piece of information is the covariance between the elasticity of demand for public service and the marginal effectiveness (or cost) across treatments.

All of these considerations depend on the degree to which the private sector picks up treatments. The common (public sector) price can be higher, the higher is the covariance between the cross-price elasticity of demand for private services and the effectiveness of those services. The public sector should charge a higher price if doing so disproportionately pushes people into the private sector for treatments that the private sector is capable of providing. The public sector should not charge a higher price if doing so pushes people with eminently treatable conditions (in the public sector) into the hands of unqualified private practitioners (traditional healers or self-care). If patients happen to sort themselves out in ways helpful to the public service (that is, they know the illnesses for which the public sector is most useful, or, by luck, they stop using the most expensive services), the public sector can charge a higher price. For the most part, this entirely empirical question depends on the knowledge of the general public or on cultural patterns. To some extent, though, the term $\text{cov}(c_i^p, \eta^p)$ would usually argue against higher prices. A larger gap between private and public prices would likely occur for expensive treatments (private practitioners charge closer to costs) than for cheap treatments. Therefore, the change in demand in the public sector would likely be greater for cheaper services than for expensive ones.

The emphasis on covariances between elasticities and costs or effects parallels results in the optimal tax literature. When government assesses taxes on commodities taking into account the effects on different income groups, it modifies the tax rates on each commodity according to the covariance of income shares of that commodity by different income groups and the marginal social valuation of income going to that group (presumably higher for the poor). This results in lower taxes on items disproportionately consumed by the poor (see Feldstein
The objective function examined here is not sensitive to distributional concerns because it is hard, ethically, to distinguish between health outcomes per se by income group. If it were, however, those treatments that disproportionately go to the poor would have lower prices. In the case with uniform fees, the common price would be lower if diseases afflicting poor people were disproportionately included in the package of provided services.

The rationing rule that corresponds to the uniform price case is not different in form from those given in the previous sections. With a single price, the rationing rule does have real consequences even without fixed costs as in the case of free care because prices cannot be raised on individual services to cover less effective or more expensive treatments. The higher the price charged, the more services can be provided. Improved sorting of people (that is, lower covariances between service reduction and relative effectiveness in public facilities) can stretch the public health subsidy further.

The appropriate price, and simultaneously the appropriate choice of treatments to offer, depends on the behavior of people and varies by area. Some studies have examined the pattern of service use before and after price increases. There appears to be a wide variety in this pattern with demand for quite essential services falling in some areas (see Bennett 1989 on Lesotho) while more appropriate selectivity (that is, less use of less effective services) occurs in others (see Gertler and Melnick 1993 on Indonesia). In deciding the type of price increase and the types of services offered, the government should consider the following features of the demand (and supply) structure of the medical services market:

- Own- and cross-price elasticities of demand for public and private services
- The private sector response to public sector price and rationing policies
- Covariances between elasticities of demand and the costs and effectiveness (again relative to the private sector) of treatments.

**Public Health Interventions.** This framework can be modified to handle public health initiatives that do not rely on a clinic-based delivery system. Such initiatives include vector control (killing disease-bearing pests); information, education, and communications activities; and provision of public goods such as safe water or sanitation services. These can be incorporated into the analysis by modifying equation 1 in the following way:

\[
\max_{P^B, I_i, K} \mathcal{L} = \sum [L_i^B(D_i^B(P_i^B, P_i^V, K))] I_i + L_i^V(D_i^V(P_i^B, P_i^V, I_i, K), K) + L_i^*(K)
\]

subject to \( \sum (C_i^B - P_i^B) [D_i^B(P_i^B, P_i^V) I_i] + C(K) \leq R. \)

The direct investment, \( K \), enters the equation in at least four possible places. First, it enters through the direct improvement in health from the intervention. The number of cases of malaria avoided by killing mosquitoes, for example, translates into a direct health benefit through the function \( L'(K) \). Second, the number of cases of a disease avoided translates into the demand for health ser-
vices in both the public and private sectors. This translation need not be one for one, that is, some people may suffer (and possibly die) from a disease without ever seeking help, and so the number of cases avoided need not be the same as the reduction in the number of people seeking help. Certain kinds of interventions may have no direct effect on disease but may increase the demand for services. For example, public information campaigns that make mothers more aware of symptoms of disease and more prone to seek help for them have no direct impact on health but increase the demand for services (public or private). Stimulating demand for preventive care such as immunization is another example. Third, information campaigns directed toward private providers can improve treatment currently given in the private sector (for an example of this in the context of improving the accuracy of drug prescriptions, see Hammer 1992). Fourth, the intervention entails a cost $C(K)$. For many of the clinical interventions, the costs attached to the provision of service can be assumed to be constant without much problem. However, when direct, population-based interventions are considered, the cost structure can be very important. Large fixed start-up costs for pest-control operations or information campaigns can generate decreasing costs. On the other hand, costs of successfully providing services such as health information or water networks to more and more remote and sparsely settled groups within a population can lead to increasing costs.

Equation 11 implies an additional first-order condition to determine the appropriate level of public health interventions:

$$C'(K) = \frac{1}{\lambda} \left[ \sum \left( \frac{\partial L_i^B}{\partial D_i^B} \frac{\partial D_i^B}{\partial K} + \frac{\partial L_i^V}{\partial D_i^V} \frac{\partial D_i^V}{\partial K} + D_i^V \frac{\partial L_i^V}{\partial K} + \frac{\partial L_i^*}{\partial K} \right) - \sum (C_i - p_i) \frac{\partial D_i^B}{\partial K} \right].$$

The marginal cost of provision should be set equal to the benefit due to improved health (represented by the term multiplied by the conversion factor $1/\lambda$) plus that due to budget savings. Two types of effects compose the health benefits. The expression $\frac{\partial L_i^*}{\partial K}$ captures direct health benefits from the investment itself. The expression $D_i^V \frac{\partial L_i^V}{\partial K}$ reflects any improvement in the effectiveness of the private sector as a result of the investment, such as information, education, and communications activities directed at private providers. Against these direct improvements in health status must be counted the health improvement of cases that could be handled by the curative care system if people become ill and seek treatment. The terms involving $\frac{\partial L_i^B}{\partial D_i^B} \frac{\partial D_i^B}{\partial K}$ and their equivalent for the private sector are negative because the effect of prevention, say, on demand for services should be negative. Prevention of diseases in which effective curative care is
being used is less important than prevention of diseases with no cure. However, the existence of curative care is irrelevant if people are not using it, and therefore, the offset to the health effects of the prevention activity only comes from that part of the reduced incidence that is reflected in the reduced demand for care. Those who never seek care to begin with still reap the benefits. The budgetary benefits for the ministry are captured in the last term in equation 12. Prevention is beneficial to the extent that it saves the ministry its subsidy to services.

The existence of public health interventions can change the optimal pattern of subsidies and services provided, although there is no general rule concerning what these changes will be. Direct investments may lead to a disease condition either appearing or disappearing from the list of treated illnesses because the budget constraint binds more tightly and the cutoff level of effectiveness, $\lambda$, rises. The disease would disappear from the list, of course, if the investment leads to eradication of the disease. Alternatively, reducing the demand for a particular type of treatment to a low level may make it worthwhile to offer that treatment because the budgetary impact will be much less (the denominator in equations 6 or 11 will be lower). In the case of disease-specific charges, a reduction in demand will show up as a possibly higher subsidy rate on treating the residual cases of the disease. Public health interventions can also affect the pattern of own- and cross-price elasticities if the people (say, remote rural dwellers) who are most affected by the public health interventions vary systematically from other people in the sector in which they seek treatment or in their response to prices. For example, if the demand for public services in remote areas is less elastic (because fees are a smaller fraction of the total cost of seeking treatment due to transport and time costs), market demand elasticity will rise in response to reduced incidence of disease. The control activities can change the market-level elasticities of demand for treatment and therefore the appropriate price and rationing rule for those treatments.

Four propositions summarize the basic results of including direct interventions in the analysis of a health care system.

- Preventing health problems for which there is effective care is less valuable than preventing problems with no solution. Conversely, the existence of effective primary prevention methods can influence the degree of subsidy and the decision to treat an illness. The direction of this effect is not obvious, however. The use of funds for primary prevention makes the budget constraint bind more tightly and knocks some diseases off the treatable list. At the same time, effective prevention may make treating any remaining cases less burdensome when prices are not fully controllable.
- Preventive activities are more valuable when care for the conditions they prevent is heavily subsidized.
- Public health investments can change the appropriate pricing and rationing rules for health care delivery. Improving the quality of private care may obviate the need to provide free public care for the same condition.
Improvement in the sorting of patients by disease conditions (in the case of uniform user fees) may allow a higher fee and a greater range of services to be provided.

- Information campaigns that increase the demand for effective services in the private sector (relative to subsidized services in the public sector) are better than those that increase demand for public sector services.

The last proposition is particularly sensitive to the initial statement of the problem in which only overall health outcomes and the public budget concern the relevant policymaker (the minister of health). In the following section, in which I consider welfare, other, less appealing aspects of the private market may modify this result.

II. WELFARE AS THE OBJECTIVE

Up to this point I have based my argument on the assumption that only health outcomes and only the budget of the ministry of health matter in public decisionmaking. This position is not tenable. Consider the following proposed investment in the context of a network of public health facilities (and no private sector). Everyone goes to a clinic when they are ill. However, some people who live far from the closest clinic have to expend much money and forgone earnings to get there. The ministry is considering adding one clinic in a particularly remote area that would decrease the travel time significantly for many people (travel time is worth much more than the cost of the facility) but would not improve health at all (everyone already gets needed treatment). Should the ministry build the facility? The decision rule implicit in the analysis above answers unequivocally no because the investment obtains no extra health from the scarce public health budget. From society’s point of view, however, the answer is certainly yes because, as assumed, the savings from reduced travel time and money outweigh the cost of the facility. Maximizing health status alone does not answer a large set of questions a policymaker must address.

Rather than press the health maximization model too far by adding more complications, I reinterpret standard formulations of welfare economics. An essential feature of the health sector is the pervasiveness of market failures. Some of these market failures compromise health, but some manifest themselves in financial or utility losses not captured by health status. The different versions of the preceding model establish the theme that governments should focus on activities that make the greatest improvement relative to the status quo of private markets. I extend this argument to the more general case of utility maximization by correcting market failures characteristic of the health sector or making investments that most improve welfare given uncorrected market failures.

The literature on the welfare economics of policy reform and project evaluation identifies conditions in which welfare improves either as a result of policy reform (changes in prices essentially, although other reforms can be interpreted
in this way) or as a result of a direct investment (see Boadway 1975, Drèze and Stern 1987, Squire 1989, and Kanbur 1991). In the evaluation of investments, the method through which welfare is improved determines the appropriate prices (or the shadow prices) used to value the outputs and inputs of the investment. If the investment makes a profit at these prices, it increases social welfare and should be made.

Here I use the notation in Kanbur (1991) and write a change in welfare as:

$$ dW = \left( -t \frac{\partial x}{\partial q} E^{-1} \frac{\partial y}{\partial p} \right) dt + \left( p + t \frac{\partial x}{\partial q} E^{-1} \right) dz $$

where $W$ is a measure of welfare, $q$ is a vector of consumer prices (marginal benefit) for a commodity, $p$ is a vector of producer prices (marginal private cost) for a commodity, $t$ is $q - p$ or the distortion of prices in the economy, $x$ is a vector of levels of consumption for each commodity, $y$ is a vector of production levels for each commodity, $E$ is the matrix of elasticities of net demands, and $z$ is the vector of net inputs and outputs associated with a project.

Based on the existence of the distortions, $t$, the government justifies both policy reform, $dt$, and direct project investment, $dz$. The first term in equation 13 indicates that there will be no improvement in welfare from any change in $t$ if all distortions were originally 0. On the project evaluation side, it is less obvious because the term describing the change in welfare due to projects ($dz$) is composed of two parts. The second term in the shadow price calculation is the distortion-correcting component of the valuation. Investments receive a premium in the calculation if they lead to an expansion of consumption of goods with higher social than private valuation. The first term, $p$, is the actual private resource cost. If there are no distortions in the system, the value of a project is $p \cdot dz$.

This argument seems to indicate that an increase in welfare results from a public project if it turns a profit at private prices. However, the private profit criterion raises some questions as to the source of projects for evaluation. The usual, zero-profit condition for competitive equilibrium is (in the current notation) $p \cdot dz = 0$. In the absence of any distortions (induced by policy or private market failure), the condition that government must turn a profit is sufficient to justify an investment; however, such an investment is not likely to be found in a zero-profit equilibrium. We may agree with Hammond (1988) who says, "[Those], with more open minds, will at least wish to consider the possibility of there being some desirable projects which private sector corporations and entrepreneurs have overlooked." However, even if it can identify such a project, the government may not want to implement projects that are viable at private prices. Instead, it may simply inform potential investors about profit-making opportunities. Lack of private investors taking advantage of the information may point to distortions in the capital markets or to lack of confidence in the calculations. In the presence of distortions, the public sector has a clear role, and the lack of private investors in the project is less mysterious.
In the welfare literature, distortions usually result from policy-induced taxes (hence the mnemonic $t$) that drive a wedge between producer and consumer prices. In the case of the health sector, however, distortions are more likely to be caused by market imperfections in the private sector.

For some health-related items, such as treatment of communicable diseases, the social value of consuming the good is greater than the private value. When evaluating the need for treatment, people do not consider the risk of infecting others. Therefore increases in the consumption of such goods, whether by policy changes (say, by subsidizing treatment) or by direct investment (by providing subsidized treatment or, in some cases, vaccination) should be evaluated at a premium over the private price of the service. In the case of pure public goods, or cases in which no private market can exist due to the inability to exclude a nonpaying user (vector control, some water supply problems), the whole value of the investment is attributable to the public intervention.

Other market failures commonly associated with the health sector revolve around the problem of imperfect information. Here some difficult conceptual issues could arise, but the main problem is that people may not perceive the true value of the commodity because they lack knowledge of the effectiveness of treatment or the consequences of going without it. The health care literature frequently assumes that people undervalue the benefits of preventive activities (immunizations and lifestyle changes including cessation of smoking). These activities yield a social value greater than the perceived private value. How this value is determined is a major question, both in principle and in actual measurement. As far as the principle goes, the value needs to capture the effect of providing the consumer with more complete information. The value is the marginal benefit under this better set of information. Medical professionals know certain kinds of information, such as the change in the probable incidence of disease with and without vaccination or the kinds and degrees of health improvements from alternative treatments. The patient knows other kinds of information, such as tolerance for pain, tolerance of uncertainty of outcome, or burdens put on family members due to disability, death, or financial cost. The appropriate information set for the model with welfare as the objective combines personal situations and preferences with professional knowledge.

Practically speaking, there could be two ways to identify and measure relevant information. One is to approximate the social value of a service under the augmented information set by (a) guessing (or researching) how many more people would use a given service if they were fully informed of the consequences of using it, (b) determining the elasticity of demand for the service (either using demand studies for the service under the status quo or using studies from better-educated populations or subpopulations within the same area), and (c) inferring how much higher the price under the new demand curve would be at the old, status quo, level of demand. Alternatively, the analyst could make an explicit valuation of the service using more than one dimension of valuation, thus giving the decisionmaker the freedom to use different weighting systems. Monetary
changes (or changes that may be easily converted into monetary values) could be added up in one dimension with various sorts of health outcomes left in a separate account.

Social and private prices may diverge indirectly due to the lack of information on the part of consumers as a result of having to rely on medical professionals to suggest treatment. This principal-agent problem occurs because the incentives of the medical professionals differ from the incentives of a perfectly informed consumer. The principal-agent problem, identified 30 years ago by Arrow (1963), is at the core of attempts to model behavior in markets for medical care. Several researchers have advanced models of this phenomenon (Ellis and McGuire 1986, 1990; Selden 1990; and Pauly 1988). However, there is little consensus as to the most salient features to include or how these models might best be adapted to conditions in developing countries. In terms of the supplier-induced demand problem, an increase in the supply of doctors may not reduce the price of medical services as the providers induce more, and more expensive, procedures in order to maintain income (Evans 1974). The providers can get away with this because consumers cannot second-guess the professional. Here, again, the true value of a service to the consumer differs from the supply price due to the decisionmaking of an agent, probably with different values and motives than satisfying the consumer.

Imperfect information in the health sector has its greatest effect on insurance markets. One characteristic of health problems is that very expensive problems are relatively rare. This is why there should be great demand for insurance against catastrophic losses. However, most of the developing world has no market for health insurance except in small niche areas. The combined problems of adverse selection and moral hazard, which make health reform so difficult in industrial countries, prevent the very emergence of such markets in developing countries. A complete treatment of the insurance market and its effect on public health priorities is beyond the scope of this article (see Hammer and Berman 1995 for further discussion). However, the absence of insurance markets can impose a large gap between private and social benefits for different types of health care, particularly for expensive, catastrophic illnesses.

Health services are almost always nontraded goods, that is, they are provided and used in the same place as opposed to ordinary commodities that can be sent. This distinction is important because the proper ratio of output to value is the net addition to consumption of an item, that is, net of adjustments in the market for the service that already exists. As in the analysis of health outcomes discussed above, policymakers should value only net additions above what the market will supply. In evaluating public investment in the health sector, essential information comes from changes in demand, supply, and the market equilibrium in the private sector that results from the investment. This would be true even if all medical markets were competitive simply due to the nature of nontraded goods. When combined with the argument of the preceding paragraph, that the markets have noncompetitive characteristics (in ways that go beyond the stan-
standard noncompetitive models of markets), the need for convincing models of behavior takes on central importance.

III. CONCLUSIONS

This article attempted to derive price and rationing rules for public health facilities. It discussed the effect on these rules of different assumptions concerning the objectives of government (health versus welfare), the limitations on available policy instruments, and the market environment in which the public system operates.

The article highlights the need for analysts to assess policy reform in relation to the changes it induces relative to the status quo before reform. An obvious point, this finding identifies a distinct gap in the literature on resource allocation in health. In order to assess changes, analysts need to know the behavior of the private sector both in terms of the type of care that it provides and in terms of how this care will change as a response to policy reform. Substituting for a reasonably well-functioning private sector is not as valuable as providing services that the private sector cannot sustain. Research is needed into the characterization of market equilibrium for medical care and its response to policy measures. Among the issues not examined here, the most important relate to uncertainty and insurance. In further research, these issues will have to figure prominently as major determinants of the demand for care. Originally identified by Arrow (1963), this line of research requires much more work.

I have not focused my analysis here in terms of preventive or curative care. Instead I argue for the assessment of interventions on the basis of changes in the stated objectives of a public system. However, my analysis could connect with the preventive/curative dichotomy if there were reason to believe that preventive care would systematically lose out to curative care in a market setting. On the basis of people's generally acknowledged undervaluation of preventive services, this may well be the case. Various prevention activities also have many public good features with few private alternatives. Such activities will look good when analysts examine all interventions for improvements over the status quo. However, analysts should evaluate all activities in terms of their improvement over market provision and not prejudge each case for certain types of intervention.

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