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Departures from Cost-Effectiveness Recommendations: The Impact of Health System Constraints on Priority Setting

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CONTENTS

Abstract—The methods and application of cost-effectiveness analysis have reached an advanced stage of development. Many decision makers consider cost-effectiveness analysis (CEA) to be a valid and feasible approach toward setting health priorities, and it has been extensively applied in evaluating interventions and developing evidence-based clinical guidelines. However, the recommendations arising from cost-effectiveness analysis are often not implemented as intended. A fundamental reason for the failure to implement is that CEA assumes a single constraint, in the form of the budget constraint, whereas in reality decision makers may be faced with numerous other constraints. The objective of this article is to develop a typology of constraints that may act as barriers to implementation of cost-effectiveness recommendations. Six categories of constraints are considered: the design of the health system; costs of implementing change; system interactions between interventions; uncertainty in estimates of costs and benefits; weak governance; and political constraints. Where possible—and if applicable—for each class of constraint, the article discusses ways in which these constraints can be taken into account by a decision maker wishing to pursue the principles of cost-effectiveness.

INTRODUCTION

Cost-effectiveness analysis (CEA) of health services has been extensively applied to evaluate interventions and is a key input in developing evidence-based clinical guidelines and care quality standards. These guidelines and standards offer systematic guidance on how health care professionals should care for individuals with specific conditions. The principle underlying conventional CEA is that it seeks to identify the set of health interventions that maximizes some social objective (usually improvements in aggregate health) subject to a single publicly funded budget constraint. Although there

are still many methodological challenges that remain unresolved, great strides have been made in resolving key issues.[1] CEA is becoming an important mechanism for strategic priority setting in health systems, and many countries have put in place agencies to advise on health system cost-effectiveness issues. International organizations are increasingly appealing to CEA as a basis for advising countries on priority setting, in particular to determine benefit packages included in universal health coverage in resource-constrained settings.[2]

However, it remains the case that often the recommendations arising from CEA are not fully implemented, even when decision makers agree with the underlying principle of CEA—of obtaining maximum value from a limited health service budget.[a] The failure to secure implementation of CEA recommendations does not necessarily indicate a weakness in the principles underlying the analytic approach or the institutional arrangements employed by the health system. It may be often the case that decision makers invoke perfectly legitimate criteria that are not considered in the CEA methodology when coming to priority-setting decisions. Failure to implement in these circumstances may not negate the usefulness of the CEA, which has at the very least demonstrated what is sacrificed (often in the form of lost health improvement) by failing to implement. Nevertheless, the frequent widespread reports of CEA recommendations being ignored or modified does highlight the importance of understanding the motivations of decision makers and raises the issue of whether CEA ignores important elements of the priority-setting process.

One class of practical factors that may have a major influence on priority setting is the potentially large set of constraints that inhibit change in the health system, in addition to the global budget constraint. For example, all systems have an existing configuration of institutions such as hospitals that cannot be altered in the short term; the present pool of skilled human resources may be strictly limited; many changes impose short-term costs (such as training) that detract from direct patient care; governance and information infrastructure may be inadequate to ensure that new services are delivered effectively; and powerful political forces of various sorts may inhibit change throughout the health system. The constraints that we discuss in this article are the design of the health system; costs of implementing change; system interactions between interventions; uncertainty in estimates of costs and benefits; weak governance; and political constraints. Not all priority-setting decisions face these constraints. For example, replacing therapeutic drugs may face hardly any barriers, whereas the implementation of complex public health interventions is faced with multiple constraints.

This narrative review assumes that decision makers wish to maximize the societal value secured from their health services budget and are considering the use of CEA to guide that process. It then explores the role that constraints play in influencing priority-setting decisions and assesses whether and how they can be accommodated within the CEA methodology. The review is inspired by various group discussions conducted as part of the International Decision Support Initiative. The objective of the article is to develop a typology of constraints that may act as barriers to implementation of cost-effectiveness recommendations. Where possible and applicable, it sets out ways in which these constraints can be accommodated in CEA models.

THE CONSTRAINTS

The cost-effectiveness model generally used for the evaluation of health technologies—and health care and public health interventions more widely—has become a central tool for public-sector policy makers in many health care systems.[3] It was developed to help decision makers with fixed public resources to compare (1) different interventions for the same health problem and (2) programs in different disease areas. For a particular level of health care resources, the goal is to choose from among all possible combination of programs the set that maximizes total health benefits produced. See Drummond et al.[1] for an introduction to CEA.[b] The traditional CEA methods presume the existence of only one salient constraint—the public finance budget constraint. Yet all of the evidence suggests that many other constraints impinge on decision makers, at least in the short run. These limitations to traditional CEA gives rise to difficulties in interpreting CEA findings for implementation by local decision makers. We consider six broad categories of constraints that are most commonly encountered in practical policy making, although we acknowledge that there are additional ones that are not discussed here.[c] They may explain why strategic decision makers depart from national or international guidance.

Design of the Health System

System design constraints preclude certain flexibilities and relate to the institutions of the health system (purchasers and providers), the financing mechanism, regulatory arrangements, and the role of external agencies such as donors. Important practical system constraints are the short-run availability of capital or labor. For example, a

highly cost-effective new intervention may require substantial additional staffing, but if the existing workforce is already working at full capacity and existing interventions cannot be abandoned, implementation may be infeasible. With respect to financing mechanism constraints, CEA implicitly embraces an assumption that payment of providers is solely by a single national funder, who is able to specify which interventions are funded. In practice, however, private payments such as user charges make it difficult to ensure that designated services are always provided to the intended recipients.[4] Constraints imposed by finance donors can often take the form of "vertical" organization of services for specific programs such as HIV/AIDS services.[5] Though this may optimize delivery for the chosen program, it can also create serious rigidities in how resources are deployed and prevent systems from realizing the economies of scope[d] available by integrating services "horizontally" for a wide range of conditions.

Provider reimbursement through capitation payments or global budgets can constitute another important financial constraint, because it may provide weak incentives for providers to deliver a recommended intervention as intended. Augmenting conventional provider payment methods with various forms of pay-for-performance may address this constraint, and there is some evidence that pay-for-performance is leading to improved discipline in strategic purchasing of health services, including adherence to benefits packages.[6] Regulatory constraints can arise from the way relations between the different institutions of a health system—such as hospitals, primary care organizations, local governments, and insurers—are organized via legal arrangements and professional regulations.[7] This implies that the autonomy of the institutions is usually limited by regulatory statutes that may preclude adoption of certain innovations. For example, efforts to move certain interventions out of a hospital setting may be frustrated by the organizational boundaries and funding mechanisms in place.

Many health system constraints can be eased in the medium to long term. However, in the short-term, decisions usually have to be taken subject to prevailing constraints. Recommendations from CEA could allow for the type of health system in place. System design constraints can be addressed technically by more careful analysis of supply side and demand side responses to the introduction of an intervention and—where necessary—by extension of the optimization model to include multiple resource constraints.[8,9] In addition to yielding evidence that is more immediately relevant to priority setters than crude CEA, such analysis offers a great deal of valuable additional information; for example, on the effect of short-run constraints in reducing the potential longer-run achievements of the health system. It can therefore help point to the most urgent priorities for health system redesign.

Costs of Implementing Change

In its purest form, the rational cost-effectiveness model assumes that change is instantaneous. This often does not reflect realities of implementation. Any significant change to the health system is likely to require irreversible investment; for example, in the form of capital (new clinics), personnel (training or redeployment), information resources (data capture), implementation (new guidelines), or administrative complexity. Such irreversible investments are transition costs. They can often act as a major decision-making barrier to implementation of programs with long-term benefits, and even if the priority-setting process is functioning properly, it may take considerable managerial effort to ensure that the technology is implemented.[10] Therefore, an important consideration for any priority-setting endeavor is the transition costs of implementing a new intervention.

A more gradual reform may reduce transition costs substantially. It may not only be infeasible but also inefficient for a government to reappraise continually the entire health system. Rather, a more realistic aspiration is that a government should progressively remove cost-ineffective programs and replace them with more cost-effective actions. This suggests that an incremental threshold formulation of CEA may be closer to political reality than a comprehensive zero-based formulation. The zero-based approach requires a ranking of the cost-effectiveness of *all* potential interventions, with only the most cost-effective being selected for inclusion in the publicly funded benefits package, as attempted in the famous Oregon experiment.[11] The zero-based approach is likely to be especially important when fundamental reform of a system is needed, such as the introduction of universal coverage. As well as defining the package, CEA can be used to inform health system reforms necessary to maximize returns from expenditure.

The incremental model implies that governments may set priorities for action on the basis of criteria that are not considered in conventional cost-effectiveness models. These might include the following:

- The magnitude of the program involved: greatest potential gains may be secured by first reconsidering programs consuming a large part of health care expenditure.
- The existence of large differences between competing technologies such as in outcomes, externalities, or equity considerations.
- Practical considerations: programs may have priority according to how feasible it is to change delivery patterns and how high the transition costs are.

There are a number of approaches that have been developed to deal with the constraints imposed by transition costs, of which program budgeting and marginal analysis (PBMA) is one of the most prominent. PBMA can be interpreted as an attempt to systemize the incremental budgeting approach. A practical focus on the evaluation of relatively modest and manageable changes, as opposed to adherence to historical patterns, is the key contribution made by the PBMA approach.[12] The PBMA approach can be interpreted as a complement to CEA because cost-effectiveness often remains an important criterion for prioritizing.[13] The cost effectiveness and strategic planning project of the World Health Organization (WHO-CHOICE) has addressed the inclusion of implementation costs by proposing to assess mutual exclusive scenarios across a variety of disease areas, including noncommunicable diseases, HIV/AIDS, malaria, and tuberculosis in various low- and middle-income settings.[14]

In summary, it is important that a recommended intervention should be implemented as intended, and substantial transition costs can often be an important requirement to ensure that is the case. Such costs should in principle be incorporated into the CEA and written off over the expected lifetime of the program. Costs could be disaggregated as far as possible to highlight major cost components that may arise. However, in practice, short-term transition costs can act as an important decision-making barrier to implementation of programs with long-term benefits. Certain aspects of system design can mitigate the rigidities caused by transition costs; for example, the use of separate public-sector budgets for covering such costs or the use of donor funds. However, it may also be necessary to adapt CEA methodology to accommodate transition costs, either by explicitly including such costs in the optimization model or by embedding CEA in a broader decision-making process.

System Interdependencies Between Interventions

Most interventions rely on the existence of certain aspects of health system infrastructure without which delivery would be infeasible. This infrastructure might include physical capital, the workforce, various supply chains, and information technology. With a few exceptions, such resources are shared with many other interventions, often yielding the manifest economies of scope that can be observed in all health systems. From an accounting perspective, the costs of providing these resources should be shared across the interventions that use them. Changes to the mix of services using the infrastructure may alter the costs and effectiveness of all interventions that rely on it.[e] And the absence of certain types of infrastructure may preclude—or at least seriously increase the costs—of adopting a new technology. Thus, decisions cannot be made only on comparisons of average costs of individual services but must take into account bundles of the services being provided and the implications of shifting resources and redefining packages and the corresponding losses or gains due to changes in scale and scope of the packages. For example, a new intervention to be delivered by community-based nurses may only be highly cost-effective if a network of such nurses is already in place but not if major investments into such a network are required. Furthermore, the adoption (or absence) of certain interventions may have implications for other programs of care. The most obvious example of this is the joint supply of a bundle of early-child interventions.

System interdependencies illustrate the limitation of examining interventions in isolation. Any significant reform of the health system design may affect not only the long-run average costs of the intervention under immediate scrutiny but also those of many other interventions. System reform may require the comparison of two entirely different configurations of service delivery, with profound implications for different patient groups and system costs. It is possible that such zero-based reforms can never be fully adopted as a basis for decision making but can still be used to indicate where the scope for improved performance lies and determine policy on more incremental changes to the system. The presence of system-wide effects, and the complexities they introduce, may explain why the greatest impact of CEA has been in the realm of pharmaceutical treatments. New drugs can often be adopted without major changes to the configuration and mix of human and physical resources. Proper modeling of system interdependencies is feasible in principle within a CEA framework[15] but may be challenging in practice. The interactions between interventions must be modeled explicitly, perhaps by modeling an

intervention under two mutually exclusive scenarios—with and without its complement. At the very least, where feasible, there may be an argument in CEA for presenting a range of cost-effectiveness ratios for interventions where costs (and benefits) are dependent on the prevailing system configuration.

Uncertainty in Estimates of Costs and Benefits

Uncertainty is inherent to all priority setting. It can take numerous forms, including uncertainty in model parameters (costs and benefits of interventions, especially in the longer term; see Meltzer[16]), uncertainty about the nature and performance of competing interventions (either now or in the future; see Fenwick et al.[17]), uncertainty about patient behavioral responses (such as uptake and compliance), and uncertainty about provider responses. The importance of uncertainty has long been recognized in cost-effectiveness analysis, and there has been lively academic debate about how to incorporate uncertainty into analytic models.[18,19] The role of uncertainty in constraining decisions is that—other things being equal—greater levels of uncertainty inhibit decision makers from implementing change. This may be due to natural risk aversion, especially when political or managerial futures are at stake. However, uncertainty also puts at risk any irreversible investment costs associated with change.

Uncertainty can therefore act as a powerful barrier to any change. In some circumstances the conservatism it causes may be warranted, because a delayed decision may avoid unnecessary investments and keep options open for the future. However, a vague appeal to uncertainty may, on the other hand, inhibit timely adoption of cost-effective programs. The key requirement then is to inform decision makers about the true level and nature of uncertainty, so that they can make balanced judgements. Cost-effectiveness analysis can act as a powerful device for assessing and communicating uncertainty. A range of analytic methods have been developed to address and communicate parameter uncertainty. These should be adopted wherever feasible. Accounting for parameter uncertainty by probabilistic sensitivity analysis, and the presentation of its result via cost-effectiveness acceptability curves, is well established and required for submission of CEAs to the English National Institute for Health and Care Excellence.[20,21]

However, there is also a broader issue of structural uncertainty that reflects potential limitations in modeling, such as the inclusion/exclusion of relevant comparators, inclusion/exclusion of relevant events, the statistical models to estimate specific parameters, and clinical uncertainty or lack of clinical evidence.[22] This structural uncertainty is the main source of concern in priority setting, because its magnitude is difficult to quantify, and risk-averse decision makers will naturally be reluctant to act when there are concerns about the relevance and quality of the analytic evidence base. Sensitivity analysis is of course then an important instrument for assessing the robustness of estimates to alternative model specifications. Novel approaches such as model averaging are becoming more widely used to address problems related to model uncertainty; that is, uncertainty related to the choice of explanatory variables.[23]

The most obvious way to reduce any form of uncertainty is to commission relevant research, seek out high-quality data, undertake relevant meta-analyses, improve the quality of modeling, and carry out value of information analysis to identify priorities for generating new evidence.[24] This will allow uncertainty to be incorporated in a systematic manner into the evidence base. Of course, these endeavors are both costly and time-consuming and will in themselves create new delays. Robustness analysis can be used as a practical means of handling uncertainty in decision making.[25] It assesses the flexibility achieved or denied by particular acts of commitments, provided that they can or must be staged sequentially. In the same vein, option pricing theory has been applied to economic evaluation by Palmer and Smith[26] as a means of assessing the value of deferring decisions pending the arrival of better information. Despite these methodological advances, uncertainty will always remain intrinsic to strategic priority setting. The key requirement is to inform decision makers about the true level and nature of uncertainty, so that they can make balanced judgements. A failure to convey uncertainty properly may give rise to "uncertainty about the level of uncertainty" underlying a decision and therefore inhibit warranted change. Therefore, for decision makers with little technical expertise, innovative ways of communicating uncertainty may be needed.

Weak Governance

Whatever type of health system is under consideration, most tools of health policy assume the existence and effectiveness of certain instruments of good governance. In choosing to include a treatment in the benefits package on the basis of CEA, policy makers are presuming that it will be delivered in line with the CEA modeling assumptions. The governance requirements to underpin any priority setting task are likely to include the following:

- Clear mechanisms for promulgating guidelines and financing the required activity, possibly extending to contractual arrangements.
- Effective data collection mechanisms designed to audit delivery of care and adherence to quality standards.
- Functioning accountability mechanisms that enable providers and other relevant parties to be held to account for the performance they have secured.[27]

The level of detail at which priorities can be set may be determined by the administrative capacity of the health system. At one extreme, the benefits package might be explicitly defined in terms of detailed interventions and eligibility criteria. International bodies such as the World Health Organization and the Global Fund could help in this task by providing generic resources that may be suitable for assessing the cost-effectiveness of specific interventions. At the other extreme, priorities might be set in very broad terms, such as emphasizing a larger role for primary care relative to secondary and tertiary care. Of course, the risk of adopting a broad definition of priorities is that the prioritized sector may provide some services that are not cost-effective.

In many health systems, the limited capacity for audit and performance reporting inhibits the ability to set and monitor detailed priorities.[28] The most poorly developed aspects of governance are the mechanisms to hold to account providers and other relevant agents for the levels of performance they have achieved, via mechanisms that include consumer markets, administrative procurement arrangements, democratic elections, or professional regulation. The prime purpose of an accountability mechanism is to allow stakeholders to check on adherence to standards and give them a means of offering rewards or sanctions depending on results.

An absence of good governance in any of these three key areas—priority setting, performance measurement, or accountability mechanisms—seriously undermines the capacity for change and may render the adoption of certain services infeasible or ineffective. It is difficult to offer generic guidance on how to confront or sidestep the constraints caused by weak governance. CEA may consider these realities by constraining the number of decisions that can be made in a given time period. In all health systems, there is likely to be a trade-off between the health gains secured by detailed priority setting and the governance costs of specifying and monitoring adherence to the package. Whatever approach is taken, it is important to note that CEA can play an important accountability role, by demonstrating the costs to the health system of continued shortcomings in governance capacity and indicating where the priorities for improvement may lie.

Political Constraints

The process of priority setting takes place in a profoundly political context, in which numerous influential political interest groups seek to participate.[29] Hauck and Smith[30] presented several models of political economy that describe how decision makers react to political realities and how priority-setting decisions may be influenced by them. Such models try to explain why the political decision-making process fails to generate apparently welfare-improving policy changes. Goddard et al.[31] argued that there may be substantial benefits to seeking to understand the processes of priority setting using models based on political concepts. We consider five classes of political forces and the influence they exert on decision makers: The median voter model, interest groups, bureaucratic decision making, decentralization, and equity.

The median voter model[32] asserts that political decision makers will seek to develop policies that attract the median voter, in an effort to maximize political support. The implication of this insight for priority setting is that the size and contents of a public benefits package may be skewed toward the preferences of key voting groups. Gaining taxpayer support for health policies has high importance for policy makers, in particular in many low-income countries with high levels of informal employment where tax contributions are concentrated among a relatively small, urban elite. Models of competing interest groups are based on the assumption that powerful interest groups may seek to skew decisions in their own favor at the expense of less organized stakeholders.[33] Within health care, small groups with a clearly defined common objective—for example, providers of health services, the pharmaceutical industry, or patients with a specific disease—have low costs in organizing themselves, securing cohesion, and effectively lobbying decision makers to their advantage, compared to the broader population, whose interests may be more diffuse and who experience higher costs of organizing.

The institutional theories of Tullock[34] and Niskanen[35] focus on the interests of bureaucrats in maximizing their influence and the effect of their behavior on the level and nature of government output. The essence of this approach is the belief that such bureaucrats receive power and remuneration in proportion to the size of their enterprise, with the implication that bloated and inefficient public services emerge if there is a lack of effective control on the growth of government. Many health care systems make extensive use of subsidiary levels of government, and such decentralization adds further complexities that affect variations in spending and benefits packages,[36] although the direction and magnitude of effects are likely to depend on specific institutional arrangements for such policies.

Constraint	Solution
Health system design constraint	• Requires institutional adjustments, but can be incorporated into CEA analytically via: • Analyse supply- and demand side responses • Incorporate multiple resource constraints into the mathematical modelling
Implementation costs	• Incorporate transition costs into the mathematical modelling • Disaggregate costs to highlight major cost components
System interactions	• Model interactions between interventions by incorporating economies of scope • Model intervention under alternative scenarios (with and without complementary intervention) • Present range of CE ratios dependant on prevailing system configuration
Uncertainty	• Conduct probabilistic sensitivity analysis • Present extent of uncertainty via cost-effectiveness acceptability curves • Address structural uncertainty with sensitivity analyses • Commission additional research • Evaluate robustness of decisions under alternative future scenarios
Governance constraints	• Requires institutional adjustments, and difficult to incorporate into CEA analytically, but possibly: • Constrain the number of decisions that can be made in a given time period
Political constraints	• Requires institutional adjustments, possibly: • Devolve process of priority setting to agencies with politically determined terms of reference • Public involvement in decision making

TABLE 1. Six Constraints and Proposed Solutions to Incorporate Them into Cost Effectiveness Analysis

Decentralization may be associated with improved performance resulting from increased horizontal competition between different levels of governments, although empirical evidence is mixed, and the outcomes are likely to depend upon the institutional structure at each level. The promotion of equity in health and health care can in some respects be viewed as a political constraint. Equity concepts can readily be incorporated into conventional CEA; for example, by placing greater weight on health gains for disadvantaged population groups. However, the nature of equity criteria adopted in health policy is likely to vary between health systems, so it will be difficult to develop universal equity-weighted measures of cost-effectiveness.[37]

Public involvement in decision making has been advocated as one approach to ameliorate potentially unwarranted impacts of political constraints. However, a scoping review found it difficult to assess the extent to which public involvement is more or less vulnerable to capture by interest groups because formal evaluations of public engagement efforts are rare.[38] Priority setting is ultimately a political undertaking. To some extent, the health technology assessment agencies now being put in place across the world are an indication that politicians feel it is helpful and expedient to devolve some aspects of that process to agencies with politically legislated terms of reference. At its best, this approach can lead to better informed rankings of interventions, made on a consistent basis, aligned with social preferences. However, the technical recommendations of those agencies must almost always be viewed from a broader perspective than that of narrowly defined CEA. In some cases

that broader scrutiny may be undertaken within the agency (as in the National Institute for Health and Care Excellence); in others it must be left to those who are ultimately accountable for choosing priorities. In either case, a key consideration will be the political context within which the decision is being made.

DISCUSSION AND CONCLUSION

This article has assumed that a decision maker accepts the general principles underlying CEA. It then considered six types of constraint under which such decision makers must operate when considering the implementation of CEA recommendations. See **Table 1** for an overview of constraints and potential approaches to addressing them, either by incorporating them into CEA or by introducing adjustments to institutional arrangements. There are frequently links between the classes of constraint, and none can be considered in isolation. For example, many of the constraints caused by uncertainty arise because of the irreversible costs of implementing a change. Health system design constraints may arise in part because of weaknesses in governance. The difficulty of assessing interdependencies within the health system may reflect limited analytic and decision-making capacity. This may change in future, as efforts are made to increase analytical capacity and international collaborations among modelers.

Where feasible, the article has outlined possible ways of addressing the strategic constraints under consideration. A fundamental choice is often whether to accept and

accommodate the constraint or to seek to relax the constraint itself. It is important to recognize that some constraints may be in place for good regulatory reasons (such as a concern with equity) and that relaxation of other constraints may in any case not be feasible in the short run. For some of the constraints, in particular the ones related to costs of change, we make the implicit assumption that a new intervention is compared against current standard of care. We acknowledge that the discussion may need to be slightly more nuanced if two or more new interventions are compared.

Many of the constraints described can in principle be modeled by augmenting the simple CEA mathematical programming model to include additional considerations. For example, additional resource constraints, say, in the form of workforce numbers, can be added; interdependencies between interventions can be modeled by incorporating constraints that reflect economies of scope and considering portfolios of interventions using integer programming; nonlinearities—for example, in the form of variable returns to scale— can be reflected in the model; limited decision-making capacity can be modeled by constraining the number of decisions that can be made in a given time period; the model can be formulated as an incremental priority-setting model, which assesses potential change from the current situation; and uncertainty can be incorporated by adding variability to parameters and (for example) reformulating as a stochastic mathematical program.

Though offering more realistic modeling of the decision setting, such innovations introduce serious drawbacks. First, the analytic complexity and information demands are increased considerably, and in many circumstances parameterization of the augmented model would be infeasible. Second, the model would have to be tailored to each individual setting, leading to a vast increase in the need for analytic capacity. And third, the simple transferability and clarity of the conventional CEA would be lost. In short, further tailored refinements of the mathematical decision model will be helpful in individual settings but is less likely to be appropriate when seeking to offer generic advice to a wide range of countries. There are some classes of constraint, related to governance and politics, that cannot be managed analytically. Rather than trying to model the constraints, the role of CEA under such circumstances is to indicate the opportunity costs of not being able to adopt certain optimal courses of action. Thus, although it can be argued that the world is rarely as simple as that represented in the theory of CEA, undertaking such analysis can nevertheless still yield

powerful benefits by identifying the key bottlenecks to reform and indicating the priority areas for action. It may also help overseas aid organizations identify where their funds are best directed.

To conclude, we can put forward a number of principles for disseminating CEA that can be drawn out from the discussion of constraints. For example, cost could be explained and disaggregated in more detail, so that decision makers can see more clearly the assumptions underlying the analysis and where the major sources of costs arise. In this way, they can make adjustments if they feel that the original setting or costs were inappropriate to their situation. The CEA could be accompanied by a narrative that sets out the significant interactions of the intervention under scrutiny with other interventions in the health system and the circumstances in which they may be important. The strength of CEA recommendations could be varied depending on the robustness of the cost-effectiveness evidence. However, this must be accompanied by clear guidance on what is considered robust evidence. Uncertainty could be treated more systematically. Though great strides have been made in modeling certain types of uncertainty, further improvements could be made in helping decision makers understand the implications for their system. Subgroup analysis could be encouraged in order to help decision makers understand the implications for equity objectives and the implications of heterogeneity in costs and benefits of an intervention across the population.

Progress has been made in some of these areas, and the main thrust of future work should be to consolidate and formalize existing methods. In other areas, there is a need for preliminary ground-clearing work before significant progress can be made. The complications introduced by system constraints in no way undermine the central role that can be played by CEA in the process of strategic priority setting in health services. Rather, the existence of such constraints underlines the importance of ensuring that the modeling process underlying CEA—as far as feasible—takes account of the constraints. Where it is not feasible, results should be presented so that decision makers can properly understand the simplifying assumptions that have been made. Failure to implement the recommendations of CEA should offer an important indication of the opportunity costs (measured in terms of lost health) arising from system constraints and other considerations that may have affected the decision. Where necessary, by quantifying the opportunity cost of failing to implement, the CEA can then act as a powerful driver for health system reform designed to address particularly serious constraints to improvement. CEA methods can

therefore help decision makers to tailor recommendations to local circumstances, to understand the most important constraints inhibiting adoption or abandonment of technologies, and to assess whether and how to address those constraints.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

No potential conflicts of interest were disclosed.

NOTES

[a]   For the purpose of this article, we sidestep the issue of what precisely should be considered value or welfare. There is considerable discussion in the literature on this issue. For example, the extensive literature on equity weighting of health or recent research on happiness suggests that measuring welfare in terms of health in CEA is too narrow a focus.[39]

[b]   Conversely CEA can be formulated as seeking to minimize the costs needed to achieve a certain level of health benefit. The two formulations are mathematically equivalent.

[c]   Additional constraints are for example the capacity of countries to produce high-quality CEAs or governance arrangements that may affect the relation between the agency producing CEAs and decision makers. There are further important demand-side responses to the introduction of an intervention. Uptake and acceptance of an intervention by individuals are important behavioral responses that may greatly impact on the feasibility of implementing interventions. They may explain why strategic decision makers depart from national or international guidance.

[d]   Economies of scope are a proportionate saving gained by producing two or more distinct goods, when the cost of doing so is less than that of producing each separately.

[e]   It is important to note that existing infrastructure may sometimes reduce costs (at least in the short run) relative to those assumed in the CEA, thus potentially making the service under scrutiny more cost-effective than indicated by the CEA. Economies of scope are a proportionate saving gained by producing two or more distinct goods, when the cost of doing so is less than that of producing each separately.

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