Equity–efficiency trade-offs in health technology assessment

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Health technology assessment (HTA) currently focuses on efficiency, rather than equity, on the basis that its primary objective is to maximize population health. Yet a strict cost-effectiveness approach sometimes conflicts with important equity concerns, such as the reduction of socioeconomic health inequalities. Managing such equity–efficiency trade-offs on the basis of intuition is unsatisfactory in a democracy, as it arouses suspicions of special pleading and favoritism toward vested interests. Over the next few decades, therefore, decision making may progress through up to three further stages of development observed historically in other areas of resource allocation. Stage two involves case law, limited to principles distilled from precedent. Stage three involves codification, seeking to generalize these principles without specifying their relative weights. Finally, at stage four, quantitative trade-offs are incorporated into a formula. At stage four, deliberation centers on adjustments to the formula, which would then be applied impartially, transparently, and fair-mindedly to all future decisions. Methods already exist for valuing equity–efficiency trade-offs, based on established methodological principles for valuing trade-offs between different dimensions of health. Early findings indicate that the general public thinks that social class inequalities are more inequitable than those by smoking status, with inequalities between the sexes somewhere in between. Relative weights can be calculated from these data, although the data are not yet comprehensive enough to do this credibly for current policy purposes. In the mean time, the equity–efficiency trade-offs suggested by current decisions can be estimated using standard cost-effectiveness analysis. This is because every departure from a strict cost-effectiveness approach has an opportunity cost. The size of that opportunity cost is a test of how much weight a particular equity concern is deemed to merit.

Keywords: Cost-effectiveness, Social justice, Technology assessment, Quality-adjusted life years

Health economics has had an enormous impact on health technology assessment (HTA). No HTA report is complete without a section on cost-effectiveness; cost-effectiveness

studies are being produced across the globe at a rapid and increasing rate. Several countries have now formally institutionalized the use of economic data to support coverage decisions about pharmaceuticals and other health technologies, and both the quality and influence of economic evidence are increasing. To date, however, economic evidence has related almost exclusively to efficiency, or cost-effectiveness, rather than equity.

Health economists simply followed the precedent set by the clinical trials on which they drew, and assumed that the principal objective of HTA is health maximization. They focused on the problem of allocating scarce resources so as to
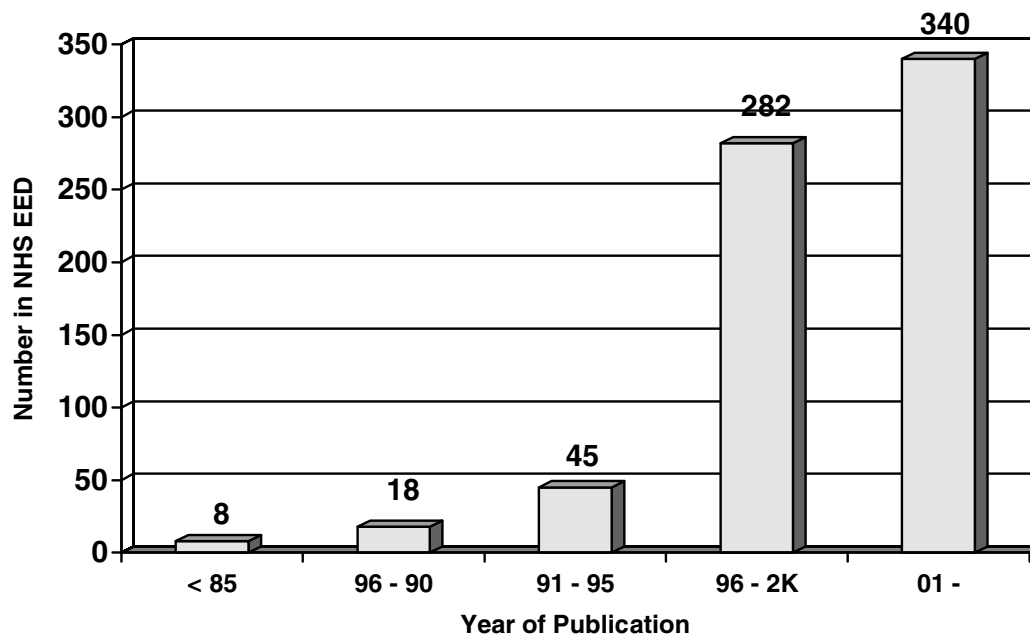
Figure 1. Use of quality-adjusted life years (QALYs) as a measure of benefit. These figures only include studies that meet the National Health Service Economic Evaluation Database (NHS EED) inclusion criteria for "full" economic evaluations and that have been reviewed and incorporated into the database, and mainly comprise publications in peer-reviewed journals rather than "gray" literature. The figure for the 5-year period from 2001 (the final column) is a projection and, likely, an underestimate. Source: NHS EED.

maximize the health of the whole population—and not just the health of a particular patient—and developed a sophisticated array of tools with this over-arching purpose in mind. Their contribution has been twofold. First, broadening the outcome measures used to match the broader priority-setting context. Second, insisting that health sacrifices (i.e., opportunity costs) be compared systematically and quantitatively with health gains.

Of particular importance has been the economist's concept of the quality-adjusted life year (QALY). The QALY accounts for both length and quality of life in a single index, and its great virtue is that it enables decision makers to make health gain comparisons between different disease areas. Over the past three decades, the QALY concept has been developed into a practical and quantifiable tool that is now used throughout the world to inform health technology purchasing decisions. To illustrate this development, consider Figure 1, which shows growth over time in use of the QALY as a measure of benefit in economic evaluation studies.

The QALY is also relevant to the economist's concept of cost as "opportunity cost." If resources are scarce, then increased spending on one technology, which brings QALY benefits to one group of patients, means diverting money away from other technologies that would have brought QALY benefits to other groups of patients. Conceptually, therefore, economists think of costs and QALYs as being interchangeable. There is an ethical dimension to this, as there was once a tendency among health professionals to see costs as

being morally unimportant—a matter for the uncaring professions: the bean counters and the bureaucrats. In this sense, economists see themselves as standing up for the "silent majority": the diffuse and unidentifiable groups of patients whose care is delayed, diluted, deterred, or denied whenever decisions are made to fund a costly new technology that will be loudly supported by the relevant industry and professional and patient groups.

COST-EFFECTIVENESS IS NO LONGER ENOUGH: DISTRIBUTIVE JUSTICE ALSO MATTERS

The ethical dimension that economists have so far ignored is equity—or what philosophers sometimes call "distributive justice." Economists are not alone in neglecting this aspect. Clinical trials do not look at distributive justice, either regarding the distribution of benefits or the distribution of costs. If cost per QALY analysis is to be criticized for ignoring equity, then using the results of clinical trials for decision making cannot be exempt from the same criticism (14).

In this study, our focus is on equitable outcomes and specifically the desire to reduce inequalities in health. Nevertheless, the ideas and methods we describe can be applied to *any* kind of equity concern—including concerns for equitable procedures—that may have an opportunity cost.

Some equity concerns focus on the right formal procedures for making decisions, rather than the right substantive

decisions to make (3). For example, one common "procedural justice" concern is that affected parties should have appropriate opportunities to challenge and potentially reverse the decision through an appeals process. Moreover, even substantive principles of justice may be process-oriented (or "deontological"), at least up to a point. Two examples are:

- Anti-discrimination principles (e.g., the concern that, if two patients both need the same treatment, no official should give priority to one over the other on grounds of age, sex, ethnicity, or socioeconomic status)
- Rules of rescue (e.g., the concern that patients at the end-of-life should always be given access to effective life-saving technology)

Equitable processes (whether formal or substantive) are often seen as ethical absolutes and not the sorts of things that can be traded-off against efficiency, at least not in any straightforward way. Rather, they are seen as ethical constraints on the pursuit of efficient and equitable outcomes. Even with rules, rights, and duties, however, there may come a point at which trade-offs arise. For instance, few people would argue that end-of-life patients have a right to life-saving technology *regardless of cost*. At some point, once the costs become so great that life-saving technologies are being denied to people at the beginning and middle of their lives, then equity–efficiency trade-offs (or, at least, equity–equity trade-offs) must surely come into play.

Let us now turn to our primary concern: health inequalities. The reduction of health inequalities is a major public policy issue. But there are hundreds of these inequalities. Inequalities by sex, income, ethnicity, geography, sexual orientation, smoking status, and genetic inheritance are to name but a few. Human beings differ from one another in all sorts of ways that impact on their health, some of which matter more than others from the perspective of social justice. We thus face the question, Equality between whom? Then, there is the even more vexed question, Equality of what? For instance, are we concerned with access to health services or with health outcomes and, if the latter, with current health outcomes or lifetime health outcomes? Then there is the more technical question, Equality measured how? The simplest measures are "range measures," i.e., the difference between selected groups. But which groups? Selecting more "extreme" groups at opposite ends of a spectrum will yield larger estimates. And should we look at ratios or gaps? Gaps may be small even though ratios are large—it all depends on the size of the denominator. An alternative is to use more complex summary measures such as the concentration index (based on the Gini coefficient). But this strategy is no panacea, as summary measures have a "black box" feel and can give "quirky" results.

So, given all these different inequalities, where should we start? We need to find out which inequalities (a factual matter) are regarded as the more serious inequities (a moral matter).

Political philosophy cannot resolve this problem. There are many schools of thought about justice—for example, utilitarianism, egalitarian–liberalism, libertarianism, republicanism—and numerous variants within each. Each can give rise to different views about which health inequalities matter most. In view of this controversy, it is perhaps not surprising that so little progress has been made on equity–efficiency trade-offs in HTA. It proved relatively easy to agree on a single over-arching efficiency objective for HTA—health maximization—even though working out the details turns out to be highly complex. With equity, by contrast, the HTA community cannot seem to get off the starting block: practitioners cannot even agree at a conceptual level on a single over-arching equity objective, let alone start to flesh it out by specifying quantitative weights and trade-offs (13). Several different and often conflicting principles of equity in health and health care have been proposed (15). However, none commands universal assent—not even, we are sorry to report, the "fair innings" argument advocated by one of the authors (9; see also 5;6;10;11).

WHERE COULD A DECISION MAKER START (AND WHERE SHOULD HE/SHE FINISH)?

In view of this fundamental disagreement about first principles of equity, what can decision makers do to manage the equity–efficiency trade-offs they routinely face? In this section, we outline a general historical framework for thinking about this problem, which is intended to apply to any setting in which public policy makers are charged with making routine resource allocation decisions in an impartial and fair-minded way. The framework involves a process of four historical stages of development that decision making may or may not go through. It is anybody's guess what principles will result from this process.

Stage one is where decisions are made on the basis of intuition. Stage two involves case law, limited to principles distilled from the precedents set by previous decisions. Stage three involves codification, which seeks to generalize these principles but without specifying the relative weights to be used when conflicting principles have to be weighed up against one other. Finally, at stage four, the weights are specified and quantitative trade-offs are incorporated into a formula. At stage four, further argument centers on adjustments to the terms of the formula, which would then be applied impartially, transparently, and fair-mindedly to all future decisions.

The framework is based on the accumulated experience and observation of one of the authors (A.W.) of the history of public resource allocation decisions in a variety of policy settings, including the financing of local public services, the water industry, and, of course, health care. The primary context

we have in mind is that of routine decisions about the public funding of health technologies, of the kind made by The English National Institute for Health and Clinical Excellence (NICE) and comparable bodies elsewhere in the world. However, the framework is also intended to apply to logically prior decisions about the selection and scoping of technologies for evaluation and in decisions about the prioritization of future research. Both of these kinds of decision have important implications for equity as well as efficiency, and both merit (although rarely get) the same degree of evidence-based scrutiny. Furthermore, our framework also extends to the context of geographical resource allocation—for example, the allocation of central government funding to local governments or to local public services (e.g., hospitals, schools, policing). And it potentially also includes problems of routine public sector resource allocation in other areas of policy—such as transport policy, environmental policy, food policy, and so on.

The problem with decision making based on intuition—that is, stage one—is that it may give rise to suspicions of special pleading and favoritism. Public sector decisions are supposed to be made in an impartial and fair-minded way. However, all such decisions take place against a backdrop of political lobbying by vested interests. The "losers" from any decision will naturally be suspicious that the "winners" have exerted undue influence—and will challenge the policy maker to justify the decision. One justification is simply that the correct process was followed. But that is unsatisfactory in modern democracies, where increasingly well-educated citizens expect to be told why decisions were made—and on the basis of what information and evidence—rather than simply being asked to trust the wisdom of the decision maker or the collective wisdom of the decision-making process. Under these pressures, policy makers may seek to take decision making on to the next stage: case law.

Under case law, decisions are made and justified on the basis of principles distilled from precedents set by previous decisions. The decision maker's discretion is restricted: decisions that are clearly inconsistent with precedent are ruled out unless extremely good reasons can be deployed to justify an exception. Again, however, suspicions of favoritism may arise in particular cases. Precedent may force the decision-maker to take account of a particular principle or consideration but may allow considerable leeway to determine how much weight it should be given in particular cases. There may be no relevant precedent for a particular case. Or, more likely, several apparently inconsistent precedents from which the decision maker is free to pick and choose. If so, pressures may arise that move us to stage three: codification, where principles are generalized to cover all foreseeable cases.

At stage three, one problem is that general principles may leave specific value trade-offs unspecified. For example, the general principle of health maximization cannot be applied without making trade-offs between numerous more specific values—including length of life and different dimensions of quality of life. Another is that general principles may

conflict. Some will take absolute precedence over others—for instance, protecting human rights may take precedence over any other considerations. In other cases, however, trade-offs will arise between different principles. So the decision maker will have to use discretion in determining what weight to give to different principles in different cases. Here again, suspicions of favoritism may arise. So, finally, we move to stage four: a formula that specifies what weight to attach to different general principles, and to the different specific values invoked by those principles, in the case of trade-offs.

In health care, a classic example of stage four is the English Resource Allocation Working Party formula, introduced back in 1976, for allocating funding between Regional Health Authorities (2). At the time of its introduction, there were large regional inequalities—in particular, the big teaching hospitals in London received the lions share of funding. Figure 2, copied from the original 1976 report, illustrates those inequalities. The formula specifies a "fair share" of funding, based on population size, weighted by age, sex, mortality rates, and a few other need variables. The target allocation line is indexed at 100. Regional authorities above the line had more than their fair share of funding—these were the ones in London and the South East. Over time, the formula gradually reduced those inequalities, as unfair historical allocations were gradually shifted toward fair target allocations. For the authorities on the left, the dotted line is the 1976–77 allocation; the black line represents the 1977–78 allocation—closer to target "fair share." A revised version of this formula is still used today, nearly 30 years later. This shows how successful and stable stage four can be in achieving equality objectives through a transparent and fair-minded process that all parties can sign up to. (Although we are not of course claiming that stage four is always either politically popular or stable, witness current political wrangles over another important geographical resource allocation formula: the European Union budget.)

The potential problem with stage four, of course, is that rigid application of a formula may give rise to patently harsh outcomes. However, this danger may be overplayed. When people criticize "mechanistic" solutions, what they are often really criticizing is solutions that are explicit, systematic, and evidence-based, and consequently leave little room for those in charge to exercise their own individual discretion about social value judgments. However, a strong argument can be made that publicly accountable decisions should be subjected to precisely this kind of discipline.

The "formulaic approach" of stage four is sometimes contrasted with the "deliberative approach" of stages one to three. But this distinction can be misleading. In comparing the four stages, the question is not *whether* deliberation, nor yet *how much* deliberation, but rather *at what stage* and *within what parameters* deliberation takes place. Deliberation about both scientific and social value judgments always takes place through the normal democratic channels, within the decision-making body and within society at large. As we
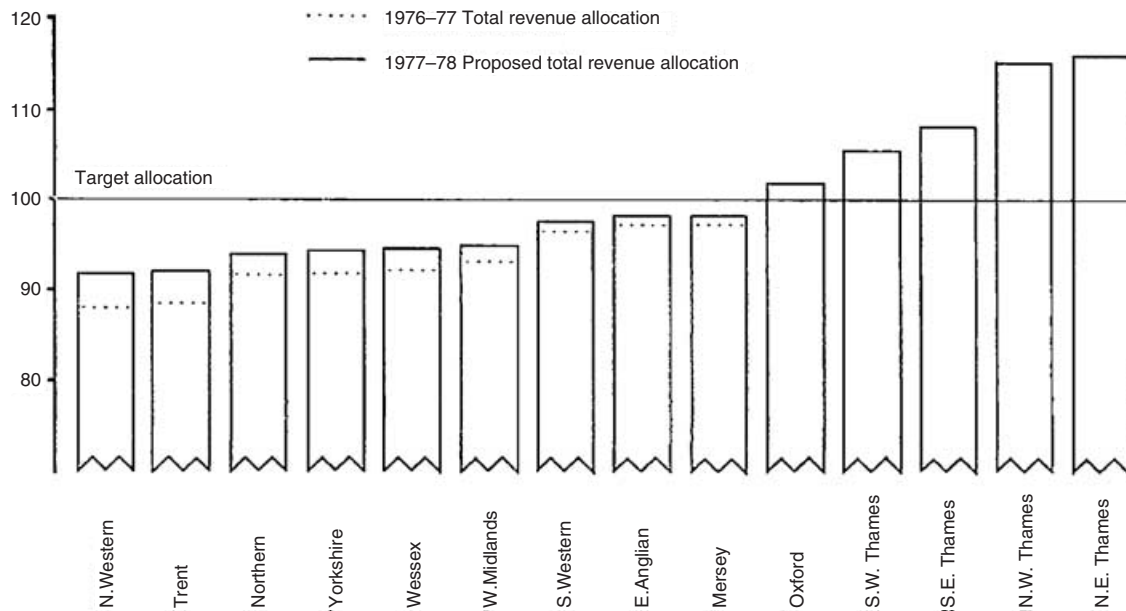
Figure 2. Fair shares of resources for health care in England according to the 1976 Resource Allocation Working Party Formula.

progress through the four stages, however, more of the deliberation about social value judgments takes place outside the context of the particular decision in hand. The move toward a formula can be embedded within a democratic process and is consistent with highly democratic procedures of representative democracy. It is not consistent with direct democracy, where all political decisions are taken by local community groups. But then nor is the existence of a national HTA decision-making body in the first place. And, as George Bernard Shaw might have said: the trouble with direct democracy is that it takes too many evenings!

WHAT STAGE HAVE WE REACHED IN HTA?

It may be instructive to view the current HTA situation from the perspective of this historical framework. In relation to efficiency, considerable progress has been made. Since the 1990s, several HTA decision-making bodies around the world have moved to stage three (codification) by endorsing the general principle of cost-effectiveness and making formal use of cost-effectiveness evidence. The first to do this were the Pharmaceutical Benefits Advisory Committee in Australia and the Drug Quality and Therapeutics Committee in Ontario.

However, many still rely on cost-effectiveness data involving disease-specific outcomes without specifying the relative weight to be attached to different outcomes. Thus, the decision maker is left to judge the relative value of outcomes as diverse as a life saved, a hip fracture prevented, and a one-point increase on a gastrointestinal symptom score. Such judgments are inescapable for any decision maker

charged with a service-wide remit, who cannot assume that all resource implications are contained within a ring-fenced disease-specific budget.

Some of the "new kids on the block"—including the English NICE, launched in 1999, and the Pharmaceutical Benefits Board in Sweden, launched in 2002—have moved to stage four in efficiency evaluation by specifying a specific formula for making such value judgments, namely, cost per QALY. In relation to equity, by contrast, most HTA decision-making bodies remain at stage one (intuition). Decision makers seem happy to over-ride cost-effectiveness on the basis of intuition, for a variety of reasons—such as budget impact, rule of rescue, and more overtly political reasons such as rewarding manufacturers for inward investment, or preventing a political outcry from clinicians and patients. These reasons are rarely stated, let alone set out in a principled and quantitative form that would allow one to detect what weight has been given to different principles of equity in different cases—that is, how much sacrifice to population health has been deemed worthwhile to pursue each principle of equity. At the same time, academics are busy working out the formula for stage four—and getting frustrated when their efforts are ignored!

At least one HTA body—NICE—is moving toward stage two (case law) in relation to equity, by publication of a consultation document on its Social Value Judgments (4). This document focuses on equitable processes—in particular, processes of consultation and appeals, and antidiscrimination principles. However, it says nothing about health inequalities. In fact, interpreted literally, its stance against discrimination prohibits the tackling of important health inequalities. For instance, income-related health inequalities cannot be tackled without positively discriminating (at least in some sense)

in favor of people with lower income. This may be seen as disappointing for economists interested in health inequality, because, perhaps more closely than any other institution in the world, NICE approximates the economist's dream of how priority-setting in health care should be conducted (12).

So is a formula for managing equity–efficiency trade-offs in HTA an unattainable dream? No! Because every departure from a strict cost-effectiveness approach has an opportunity cost. The size of that opportunity cost is a test of how inequitable a particular inequality is held to be. Moreover, this opportunity cost can be measured using standard cost-effectiveness methods. The central ethical question then becomes, How much sacrifice to efficiency (e.g., in terms of sum total population QALYs foregone) is it worth making to achieve a particular improvement in equity? This central question can be asked in relation to *any* reduction in *any* kind of health inequality, however defined. It can also be asked in relation to equitable procedures. In short, it can be asked (and answered) in relation to any equity concern deemed to warrant a departure from a strict cost-effectiveness approach.

HOW CAN EQUITY–EFFICIENCY TRADE-OFFS BE VALUED?

Experimental methods already exist for valuing equity–efficiency trade-offs. Early findings indicate that people think that social class inequalities are more inequitable than those by smoking status, with inequalities between the sexes somewhere in between (16). Moreover relative weights can be calculated from these data, although at present, the database is not comprehensive enough to do this credibly for current policy purposes.

The basic methodological principles for valuing equity–efficiency trade-offs are the same as those already used in HTA to value trade-offs between different dimensions of health in the process of constructing QALYs. That is, members of the general public are surveyed using carefully designed hypothetical questions that force people to make "hard choices" involving quantitative trade-offs between competing values, and from which the magnitude of those trade-offs can be inferred.

Figure 3 is an example of one such question. It shows part of a questionnaire instrument developed as part of an ongoing program of empirical research on this topic based at the UK Universities of York and Sheffield (e.g., 1;7;16). It presents a choice between two programs, A and B, which cost the same and which affect the life expectancy of two equally sized population groups: social class 1 and social class 5. Class 1 starts with a life expectancy of 78, whereas class 5 starts with a life expectancy of 73—roughly the current situation in the United Kingdom. Program A gives an extra 2 years to both groups, so that the 5-year heath gap remains
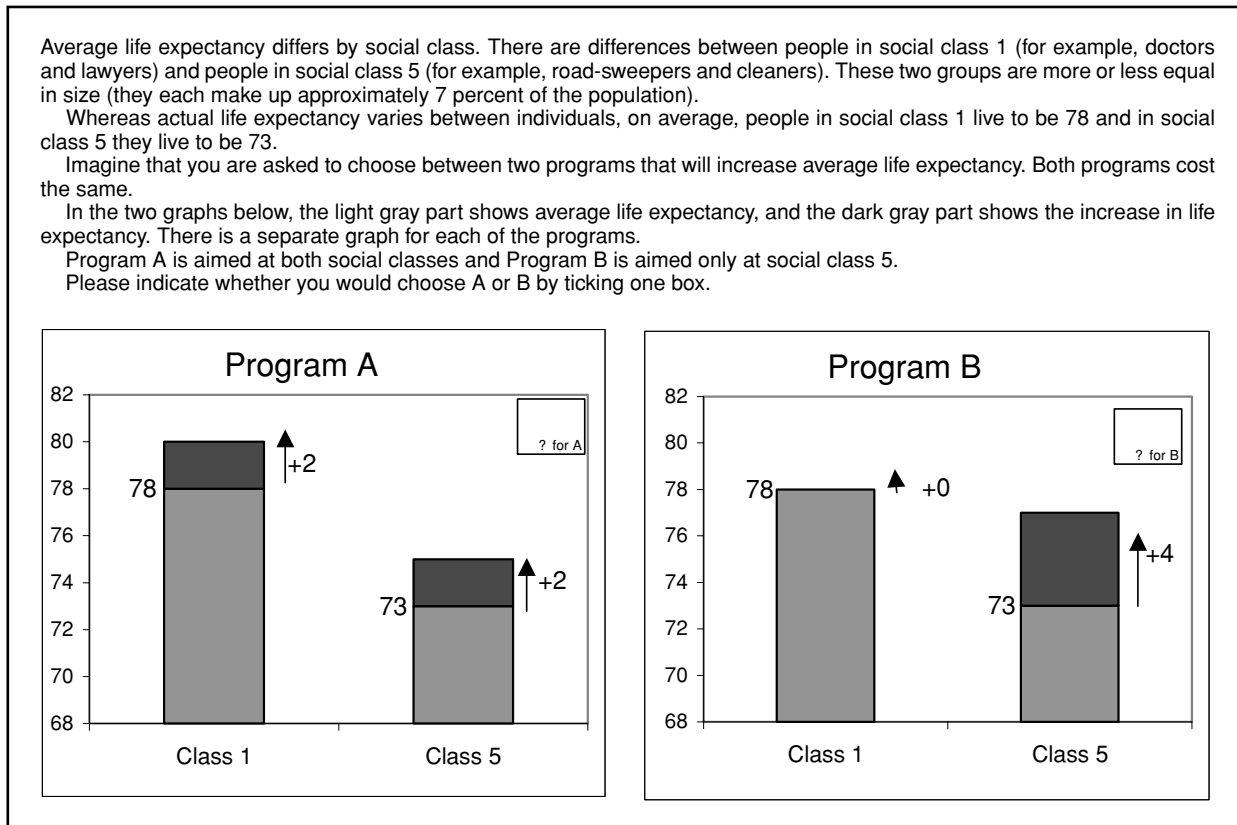

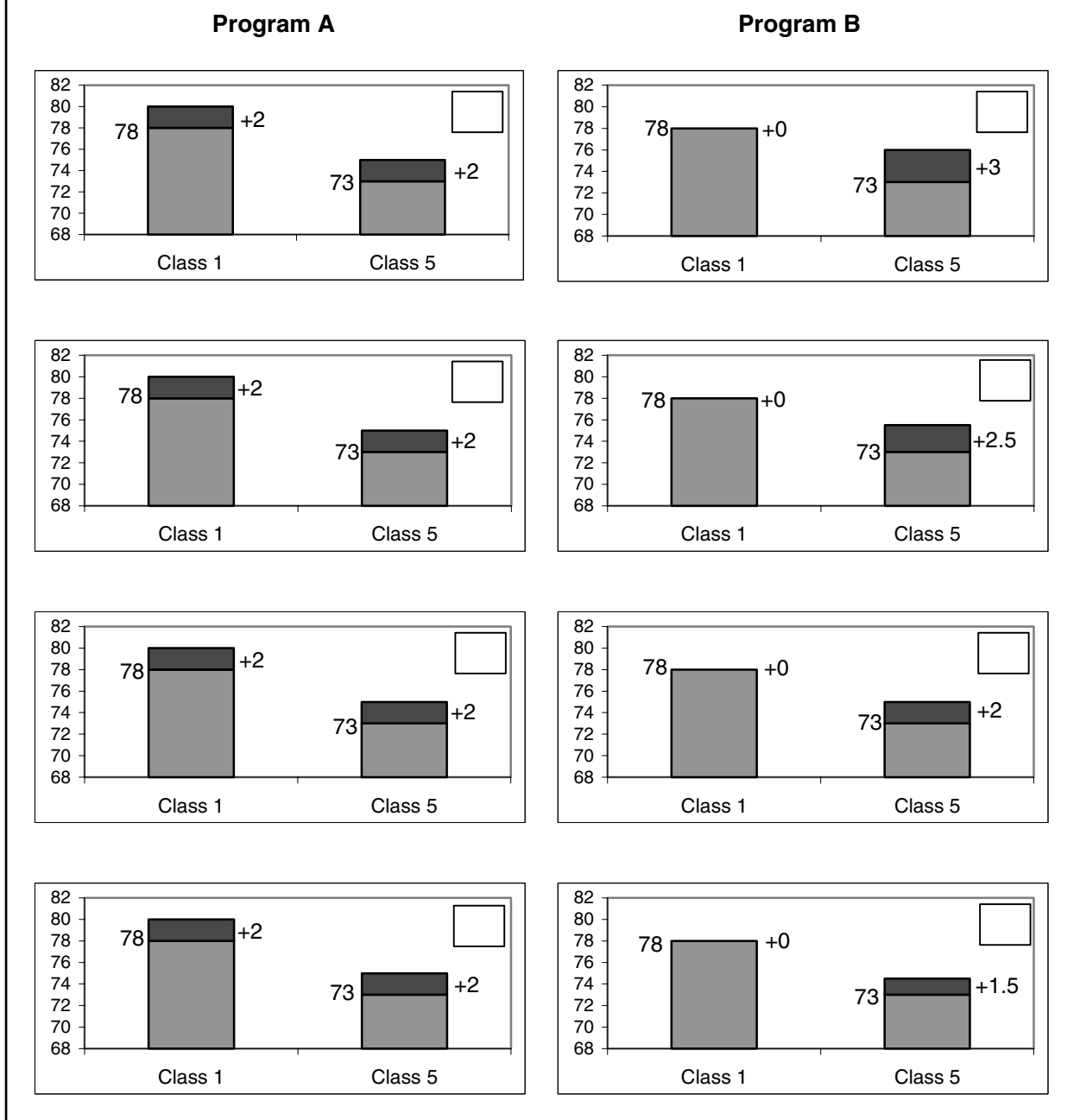**Figure 3.** Example value elicitation question.

Figure 4. Follow-up sequence of questions.

the same. Program B gives 4 extra years to class 5, and nothing to class 1, thus reducing the health inequality gap to only 1 year. People concerned with socioeconomic inequality in life expectancy, thus, will presumably choose program B.

Note that both programs are the same from an efficiency perspective: both yield a total of 4 years of health gain. So choosing Program B involves no sacrifice of efficiency:

it only tells us that the respondent has *some* concern for equality. To quantify the equity–efficiency trade-off, we require a follow-up question for those who choose B.

The follow-up question, in Figure 4, holds Program A constant but changes Program B by sequentially reducing the benefit to class 5. For example, question 1 asks whether you would still choose B if the benefit to class A were only

3 years, rather than 4. This sequence of questions forces the respondent to quantify *how much* efficiency they are prepared to sacrifice for the sake of reducing health inequality. A respondent who sticks with Program B in question 1, for example, is willing to sacrifice at least 1 year's worth of sum total life expectancy to reduce inequality in life expectancy. This questionnaire instrument—and variants involving trade-offs between different social groups—has been administered to a variety of different samples of people in different settings including the United Kingdom, Spain, and the United States.

CONCLUSION

The HTA community currently adopts a "Pontius Pilate" approach to health inequalities: it "washes its hands" of them. There are two traditional justifications for this. First, that most policy-relevant health inequalities are mainly determined outside the health care system (e.g., by income, education, and other "social" determinants of health) or by system-level decisions about health care financing that fall well outside the remit of any HTA agency (such as, whether or not to maintain a policy of universal social health insurance). Second, that it is not acceptable for health care professionals to engage in "positive discrimination" (by income, ethnicity, or whatever) when making coverage decisions about which patients may access a particular technology for a particular condition.

Both justifications are questionable. First, decisions about health technology do have *some* impact on health inequalities. The rich tend to adopt effective new technologies more rapidly than the poor, which impacts on inequalities of access and outcome. And "positive discrimination" may seem less objectionable if applied *between* rather than *within* conditions. That is, if two technologies for different conditions are equally cost-effective, but one tends to benefit poorer patients, then it may be acceptable to apply a less stringent cost-effectiveness threshold to the latter.

The "Pontius Pilate" approach to health inequalities, thus, feels uncomfortable. And, whatever its merits in relation to traditional medical technologies, it is unsustainable in relation to wider public health interventions, which often have explicit health inequality reduction objectives. As HTA becomes increasingly influential, it may start to play a role beyond medicines and devices in evaluating wider "technologies" such as public health interventions—for example, NICE has taken on a public health role since April 2005. Wise HTA leaders, who wish to stay ahead of the game, therefore, would be well advised to start investing now in developing better methodologies for managing equity–efficiency trade-offs! This work requires progress on two main fronts: (i) using standard methods of economic analysis to estimate the equity–efficiency trade-offs suggested by current decisions and (ii) eliciting valuations of equity–efficiency trade-offs from the general public. On this latter front, two paral-lel research projects currently are under way in the United Kingdom, funded by the National Co-ordinating Centre for HTA, under the rubric of, What Is the Value of a QALY to Society?

How long will it take for such effort to bear fruit? The QALY concept was developed in the 1970s and applied to important practical decisions—albeit using crude data and methods—by the 1980s (8). The 1990s saw the publication of generic health state descriptive systems and scoring systems suitable for generating QALY estimates across the full spectrum of disease areas (e.g., EQ-5D and HUI). And today, three decades after its discovery, the QALY is in widespread use by Government decision-making bodies, not only in health but also in transport, the environment, crime, and even pensions policy (in assessing the effect of changes to the retirement age on length and quality of life). So the QALY took a decade from discovery to development of a crude working prototype, another decade to develop a robust product suitable for mass production, and then another decade to achieve widespread diffusion. That is pretty good going for any new technology, especially one developed by academics! So far, work on equity–efficiency trade-offs remains at an experimental stage. But if the track record of the HTA community in developing measures of efficiency is anything to go by, one might expect that, within three decades, quantitative measures of equity–efficiency trade-offs in HTA will have widespread policy impact.

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