

## SPECIAL ARTICLE

## COST-EFFECTIVENESS ANALYSIS IN A SETTING OF BUDGET CONSTRAINTS

## Is It Equitable?

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**Abstract Background.** One of the promises of cost-effectiveness analysis is that it can demonstrate how to maximize health benefits attainable within a specific limited budget. Many people argue, however, that when there are budget limitations, the use of cost-effectiveness analysis leads to health care policies that are inequitable.

**Methods.** We asked prospective jurors, medical ethicists, and experts in medical decision making to choose between two screening tests for a population at low risk for colon cancer. One test was more cost effective than the other but because of budget constraints was too expensive to be given to everyone in the population. With the use of the more effective test for only half the population, 1100 lives could be saved at the same cost as that of saving 1000 lives with the use of the less effective test for the entire population.

**Results.** Fifty-six percent of the prospective jurors, 53 percent of the medical ethicists, and 41 percent of the experts in medical decision making recommended offering the less effective screening test to everyone, even

though 100 more lives would have been saved by offering the more expensive test to only a portion of the population. Most of the study participants justified this recommendation on the basis of equity. A smaller number stated either that it was not politically feasible to offer a test to only half the population or that the additional benefit of the more expensive test (100 more lives saved) was too small to justify offering it to only a portion of the public.

**Conclusions.** People place greater importance on equity than is reflected by cost-effectiveness analysis. Even many experts in medical decision making — those often responsible for conducting cost-effectiveness analyses — expressed discomfort with some of its implications. Basing health care priorities on cost effectiveness may not be possible without incorporating explicit considerations of equity into cost-effectiveness analyses or the process used to develop health care policies on the basis of such analyses. (N Engl J Med 1996;334:1174-7.)

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**B**UDGET constraints increasingly determine the provision of health care services. One of the promises of cost-effectiveness analysis is that it can demonstrate how to maximize the health care benefits attainable within a specific budget.<sup>1,2</sup> Despite this promise, cost-effectiveness analysis has been criticized for setting health care priorities in a way that violates people's values.<sup>3-5</sup> For example, many people value equity in the distribution of health care resources, yet equity is not accounted for in cost-effectiveness analyses.<sup>6-13</sup>

A basic assumption of cost-effectiveness analysis is that one should always prefer a health care intervention that provides a population with more benefit per dollar than another intervention. However, sometimes budget constraints make it impossible to offer the most cost-effective intervention to everyone in the population, raising issues of equity.<sup>14</sup> For example, suppose one has a fixed budget of \$200,000 with which to screen a specific population for colon cancer. Test 1 costs \$200,000

to offer to everyone in the population and prevents 1000 deaths from colon cancer. Test 2 costs \$400,000 to offer to everyone and prevents 2200 deaths from colon cancer. Because of the budget, it is impossible to offer test 2 to everyone. However, it is possible to offer it to half the population, thereby exhausting the \$200,000 budget and preventing 1100 deaths from colon cancer. Test 2 is more cost effective than test 1, because for the same number of dollars, it brings more benefit.

In this study, we surveyed three groups of people — members of the general public, medical ethicists, and experts in medical decision making — to determine whether, given a specific budget constraint, they would set health care priorities in ways that are consistent with cost-effectiveness analysis. We surveyed members of the general public because many people think community values should play an important part in setting health care priorities.<sup>15-17</sup> We included medical ethicists because of their expertise in recognizing and addressing moral dilemmas in health care. We included experts in medical decision making because they are most knowledgeable about (and presumably supportive of) the methods involved in cost-effectiveness analyses.

## METHODS

## Subjects

The participants in the study were prospective jurors in Philadelphia, members of the American Association of Bioethics, and members of the Society for Medical Decision Making. The prospective

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jurors were surveyed at the Philadelphia County Courthouse, in Philadelphia. In this county, potential jurors are selected from voter-registration records. We recruited potential jurors to participate in the study by announcing that those who completed a survey would receive a candy bar. Members of the American Association of Bioethics and the Society for Medical Decision Making were surveyed by mail. One hundred members from each group were randomly selected from membership lists. Each selected member received two mailings separated by four weeks, without any financial incentive.

### Survey Instrument

All the survey participants were given the following scenario:

The federal government has set up a program to test for colon cancer in people enrolled in Medicaid, a government program that offers health insurance to low-income people and their families. The test allows doctors to find colon cancer at an early stage. So far, the federal government has offered the test to people at high risk for colon cancer and has prevented many of them from dying of colon cancer. Now the government wants to offer the test to the rest of the people receiving Medicaid, all of whom are at equally low risk for colon cancer.

A group of doctors was formed to help the government decide which of two tests to offer the low-risk people. Test 1 is inexpensive but does not always detect cancers in their early stages. Test 2 is more expensive but is better at detecting early cancers. The decision is complicated by budget limitations: the government has only a certain amount of money available to pay for the screening tests. After evaluating the costs and benefits of each test, the doctors have reached the following conclusions. The budget is just large enough to offer test 1 to all the low-risk people. With this approach, everyone can receive the test, and 1000 deaths from colon cancer will be prevented. The budget is just large enough to offer test 2 to half the low-risk people. With this approach, half the people can receive the test and half cannot, and 1100 deaths from colon cancer will be prevented.

All the participants in the survey were asked to indicate which of the screening tests the physicians should recommend and why.

By random allocation, the prospective jurors received one of two versions of the survey. The two versions differed in how they described who would be eligible to receive test 2. In the first version, the persons eligible for screening would be selected randomly according to their social security numbers. In the second version, it had already been decided, on the basis of a coin flip, that the screening test would be offered to everyone with an even-numbered social security number. We hypothesized on the basis of earlier research that the respondents would be less inclined to offer test 2 to half the people if those who were to receive the test had already been identified.<sup>16</sup> All the medical ethicists and experts in medical decision making received the first version of the survey.

### Statistical Analysis

Differences between the proportion of respondents choosing test 1 and the proportion choosing test 2 were evaluated with Fisher's exact test (two-tailed). Because the prospective jurors were a more heterogeneous group, we evaluated the influence of demographic features on their responses with the use of logistic regression. The participants' written explanations of their responses were coded independently by two research assistants. Discrepancies were resolved by one of us.

## RESULTS

A total of 568 prospective jurors completed the survey. Seventy-four of the 100 members of the American Association of Bioethics and 73 of the 100 members of the Society for Medical Decision Making responded to the mailed questionnaire. The respondents' demographic characteristics are shown in Table 1. There

Table 1. Demographic Characteristics of the Survey Respondents.

CHARACTERISTIC	PROSPECTIVE JURORS (N = 568)	MEDICAL ETHICISTS (N = 74)	DECISION-MAKING EXPERTS (N = 73)
Mean age (yr)	41.7	48.3	46.1
Male sex (%)	36	50	78
Race (%)			
White	55	92	90
Black	34	0	1
Other	11	8	9
Mean education (yr)	13.8	>16	>16

were no differences between the responses of the prospective jurors who received the first version of the survey and the responses of those who received the second version ( $P=0.88$ ). These two groups of responses were therefore pooled.

Table 2 shows the policy recommendations made by the survey participants. Fifty-six percent of the jurors, 53 percent of the medical ethicists, and 41 percent of the experts in medical decision making favored test 1. The responses of the decision-making experts differed significantly from those of the prospective jurors ( $P=0.02$ ) and differed marginally from those of the medical ethicists ( $P=0.08$ ). The responses of the prospective jurors and medical ethicists did not differ significantly ( $P=0.80$ ). The recommendations of the prospective jurors were not related to their age, race, or sex ( $P>0.4$  for all comparisons) but were related to their level of education: the respondents with more years of education were more likely to recommend using test 2 than were those with fewer years of education ( $\chi^2=10.0$ ,  $P=0.002$ ).

Table 3 shows the respondents' explanations for their recommendations. The respondents who recommended test 1, which would save only 1000 lives, most often justified this decision on the basis of fairness. For example, one person wrote, "It would be unfair to offer the test only to half the people"; another wrote, "Equity is more important than efficiency"; and a third stated, "It is not fair to randomly distribute health care." Some respondents recommended test 1 not because they thought it was more fair but because they were concerned about political appearances. For example, one person wrote, "Politics. Test 2 would be perceived as rationing, and thus unfair. People think in ways that are not always correct." Another person wrote, "The indigent have been discriminated against for so long that a test that was only available to half of them would be likely to be viewed as unfair." A smaller number of respondents recommended test 1 because they thought the difference in survival associated with the two tests was too small to justify offering a test to only half the population. As one person wrote, "The difference of 100 lives is not significant enough to use random selection."

Among the respondents who recommended test 2, the most common explanation was the desire to improve

overall survival. A typical example of this reasoning is the statement, "The aim of a public program should be to maximize health benefit across a population — that aim should outweigh equal but less effective care." Some of the respondents who wanted to maximize survival also noted that random selection in itself is fair. Thus, they did not see the decision as one involving a trade-off between equity and efficiency. As one person wrote, "With the same dollars, more lives are saved, and since those selected are randomly chosen, there is distributive justice." Another person wrote, "Behind a 'veil of ignorance,' I don't know whose life would be saved, but we all have a better chance using test 2." Finally, a few respondents favored offering test 2 to half the people because they thought the unfairness of doing this would highlight the need for more health care funds. As one person wrote, "Offering a test to only half the people is unfair, but at least it will show everyone that the system needs more money."

### DISCUSSION

The findings of this study add to the accumulating evidence that the methods and ethical assumptions of cost-effectiveness analysis are not necessarily acceptable to many people when limitations are placed on health care budgets. Cost-effectiveness analysis operates under the assumption that it is best to maximize the total benefit per dollar spent, even if this is achieved by offering a health care intervention to only a portion of a population that might benefit from it. A large number of the people we surveyed, representing three diverse populations, rejected this assumption, even though everyone would have an equal chance of receiving the health care intervention and even though the alternative approach would result in 100 additional deaths from colon cancer. In fact, almost half the experts in medical decision making, whom we expected to accept this assumption, rejected it.

Given the political, economic, and philosophical reasons for offering the more effective test to half the population — that it would save more lives and would be distributed randomly — it is tempting to interpret the respondents' rejection of the more effective test as a mis-

Table 3. Survey Participants' Explanations for Their Policy Recommendations.

EXPLANATION*	THOSE WHO	THOSE WHO	TOTAL
	RECOMMENDED TEST 1 (N = 388)	RECOMMENDED TEST 2 (N = 313)	
Fairness	256	49	305
Improved survival	13	229	242
Political appearance	18	0	18
Small difference in survival	12	0	12
Highlighting need for funding	0	5	5
Other	64	48	112

\*Some participants provided more than one explanation for their recommendation.

take in judgment. Indeed, a number of studies have shown that people are often influenced by irrational notions of equity.<sup>18,19</sup> Therefore, it makes sense to consider the reasons the participants gave for rejecting the more effective test.

A number of people rejected the more effective test on the grounds that it would appear to be unfair to offer it to only half the population. Were this the only reason for rejecting the test, a perverse situation would result, in which everyone thought it would be better to offer test 2 to half the population but recommended offering test 1 to the entire population because of what they thought other people would prefer. However, the respondents had other reasons for rejecting the more effective test. Some thought random assignment would be unfair. This opinion is consistent with research showing that people are less inclined to ration health care according to random distribution than according to a first-come, first-served method.<sup>20</sup> This position may seem irrational. After all, what is the moral difference between a lottery and a first-come, first-served method? If anything, a lottery should be preferable, because a first-come, first-served approach is subject to inequities in access to information and medical care. Whether or not the aversion to random selection is defensible, it represents a political obstacle to health care policies that distribute scarce resources by lottery.

Other respondents rejected the more effective test because of what they perceived as a small difference in survival. For these respondents, a larger difference might have been enough to justify offering the test to only a portion of the population. Thus, some people are not completely averse to random allocation of scarce resources but believe that this approach should be used only when a substantial benefit will be gained.

Most important, a large number of respondents rejected the more effective test because they thought it would be inequitable to offer it to half the people when a less effective test could be offered to everyone. In effect, the respondents thought that cost-effectiveness analysis did not pay enough attention to equity. Cost-effectiveness analysis operates on the assumption that the primary

Table 2. Policy Recommendations Made by the Survey Participants.

RECOMMENDATION	PROSPECTIVE JURORS (N = 568)	MEDICAL ETHICISTS (N = 74)	DECISION-MAKING EXPERTS (N = 73)
	no. of respondents (%)		
Test 1 (saves 1000 lives)	319 (56)	39 (53)	30 (41)
Test 2 (saves 1100 lives)	240 (42)	32 (43)	41 (56)
Refused to make a recommendation*	9 (2)	3 (4)	2 (3)

\*These participants provided written explanations for their refusal to make a policy recommendation.

goal of health care spending should be to maximize health care benefits across a population rather than to distribute those benefits equally. Many of the respondents who rejected the more effective test did not accept this assumption. The rejection of this assumption may pose the greatest obstacle to the widespread use of cost-effectiveness analysis in setting health care priorities.

In view of these results, what is the proper role of cost-effectiveness analysis in setting health care priorities? First, we might try mathematically to incorporate concern about equity into cost-effectiveness analyses or, more practically, into the process used to develop health care policies that are based on the results of such analyses. This approach has difficulties: it leads to inconsistent judgments, is subject to framing effects (in which the presentation of information affects judgment),<sup>21</sup> and goes against the desires of the many people who do favor maximization of benefits. If the reason for taking equity into account is that the majority of people favor it, then we need to be concerned about the views of the minority who do not favor it. In other situations, those who advocate the maximization of benefits are in the majority.<sup>18</sup>

Second, advocates of cost-effectiveness analysis as the basis for setting health care priorities might try to convince others of the value of this approach, either in general or in specific cases. It is not clear how deeply rooted the opposition to cost-effectiveness analysis is. The extent of the opposition may depend on the circumstances.<sup>22</sup> In the present case, calling attention to the fairness of random selection might be sufficient to persuade people that offering the second test to a portion of the population would be equitable.

With restrictions placed on budgets, it is often impossible to offer the most cost-effective intervention to all the people who might benefit from it. Basing health care policies on cost effectiveness alone can lead to inequities or the appearance of inequities. Our study shows that many people think these issues are important enough for them to be willing to allow more people to die than to introduce possible inequities. Given the increasing frequency with which health care decisions are influenced by budget constraints, it is important to recognize people's discomfort with policies based on cost effectiveness. If cost-effectiveness analysis is to have a larger role in health care policy, an attempt must be made ei-

ther to convince the public of its merits or to balance a consideration of its merits with a greater concern for equity.

We are indebted to Christine Weeks for research assistance, to the many people who participated in the study, and to Jon Merz, J.D., Ph.D., for comments on an earlier draft of this paper.

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