Analytic Issues for Estimating the Benefits and Costs of Substance Abuse Prevention

Gary A. Zarkin and Robert L. Hubbard

INTRODUCTION

The benefits of averting drug use and abuse may outweigh the costs of prevention. Economic evaluation studies can help assess whether current prevention expenses are justified by future cost savings and health improvements. These studies can assist policymakers in judging whether particular prevention programs should be implemented at all.

In addition, economic analysis helps policymakers determine which of several alternative intervention programs provides the most benefits per dollar spent. For example, policymakers may assess the cost-effectiveness of prevention versus treatment programs or broad-based versus targeted prevention programs. Focusing on this latter policy issue, suppose that policymakers wish to reduce the number of drug-exposed infants. Prevention efforts could be directed at all women of childbearing age, the broadest possible population. Although such a program will likely increase the awareness of the problem among all women of childbearing age, individuals who are most at risk for maternal substance abuse may not be reached, or if they become aware of the issue, the program may not be intensive enough to change their behavior significantly. Thus, the program may not be as cost-effective as other prevention programs that focus on more narrow targets. These more narrow targets include substance-abusing women or those at high risk for substance abuse, women of childbearing age who abuse substances or are at high risk for substance abuse, and pregnant women who abuse substances or are at high risk for substance abuse.

These different target groups can be found in schools, social service agencies, family planning agencies, the criminal justice system, the healthcare system, and in treatment settings. The likelihood of reaching each of these groups varies across different locations. For example, virtually all pregnant women will access the healthcare system, but the prevalence of substance-abusing women in this location is relatively low, and they are difficult to identify. However, in treatment settings, reaching large numbers of substance-abusing women of childbearing age is easier.

Choosing a particular target group and prevention strategy requires careful consideration of three elements of program effectiveness and cost:

The probability that a targeted individual will become aware of the program and participate.

The effectiveness of a program for a given individual (i.e., the probability that the individual will change behavior because of the program).

The cost of the program.

In this chapter, a conceptual framework for the economic evaluation of prevention programs that includes all three of these elements is presented. The conceptual framework also accounts for another major issue in the evaluation of prevention programs—namely, that individuals may be exposed to multiple interventions at the same time and over their lifetimes. A careful research design should identify and assess the marginal benefit of contemporaneous and sequential prevention interventions.

The remainder of the chapter is organized as follows. Section 2 describes the conceptual framework that is based on a decision tree model. Four economic evaluation methods—cost-minimization, cost-effectiveness, benefit-cost, and cost-utility analyses—are briefly described in section 3, and the types of economic cost and outcome data that must be collected to perform these analyses are highlighted. A hypothetical cost-effectiveness and benefit-cost analysis of a community- based prevention program is discussed in section 4. Finally, section 5 provides a summary of the chapter.

CONCEPTUAL FRAMEWORK

The conceptual framework for the economic evaluation of prevention programs is based on a decision tree model commonly used in the economic evaluation of new drug therapies and recently described in the context of substance abuse treatment by Zarkin and colleagues (1994). The decision tree model, like any model, presents a stylized view of the prevention intervention dynamics. Because decision tree models only approximate reality, they focus on the key aspects of the dynamic process and ignore the less important details. However, decision trees are a convenient structure for organizing and performing outcome and economic evaluations because they identify the important therapeutic and economic endpoints (i.e., points at which key outcomes occur or at which economic data should be collected), and they summarize the data that researchers and policymakers require to make better informed economic policy decisions (Haddix et al. 1996; Zarkin et al. 1994).

The decision tree approach considers the natural history of substance abuse and the outcomes of prevention and treatment interventions as part of a stochastic process. Thus, outcomes are not deterministic but occur with a given probability. For example, in the natural history of substance abuse, it is probable that substance-abusing individuals may "age out" of substance abuse even without a prevention or treatment intervention. Similarly, prevention and treatment interventions are not always effective but are successful with some (usually unknown) probability.

Figure 1 presents an example of the dynamics of individuals' exposure and response to two prevention interventions at two points in their lives: when they are preadolescents and when they are adolescents. Although individuals may also be exposed to two prevention programs simulta-neously, the figure highlights how an earlier prevention effort may change the effectiveness of later interventions. Even though it is widely accepted that exposure to previous prevention activities may increase the effectiveness of subsequent prevention efforts, typically researchers do not collect information on previous prevention interventions. But because previous prevention programs may have a cumulative effect on individuals, researchers should measure these earlier exposures. Otherwise, all measured changes in behavior may be incorrectly attributed to the current prevention program. In discussing the idealized experiment below, it is assumed that researchers are able to collect information on previous prevention exposures.

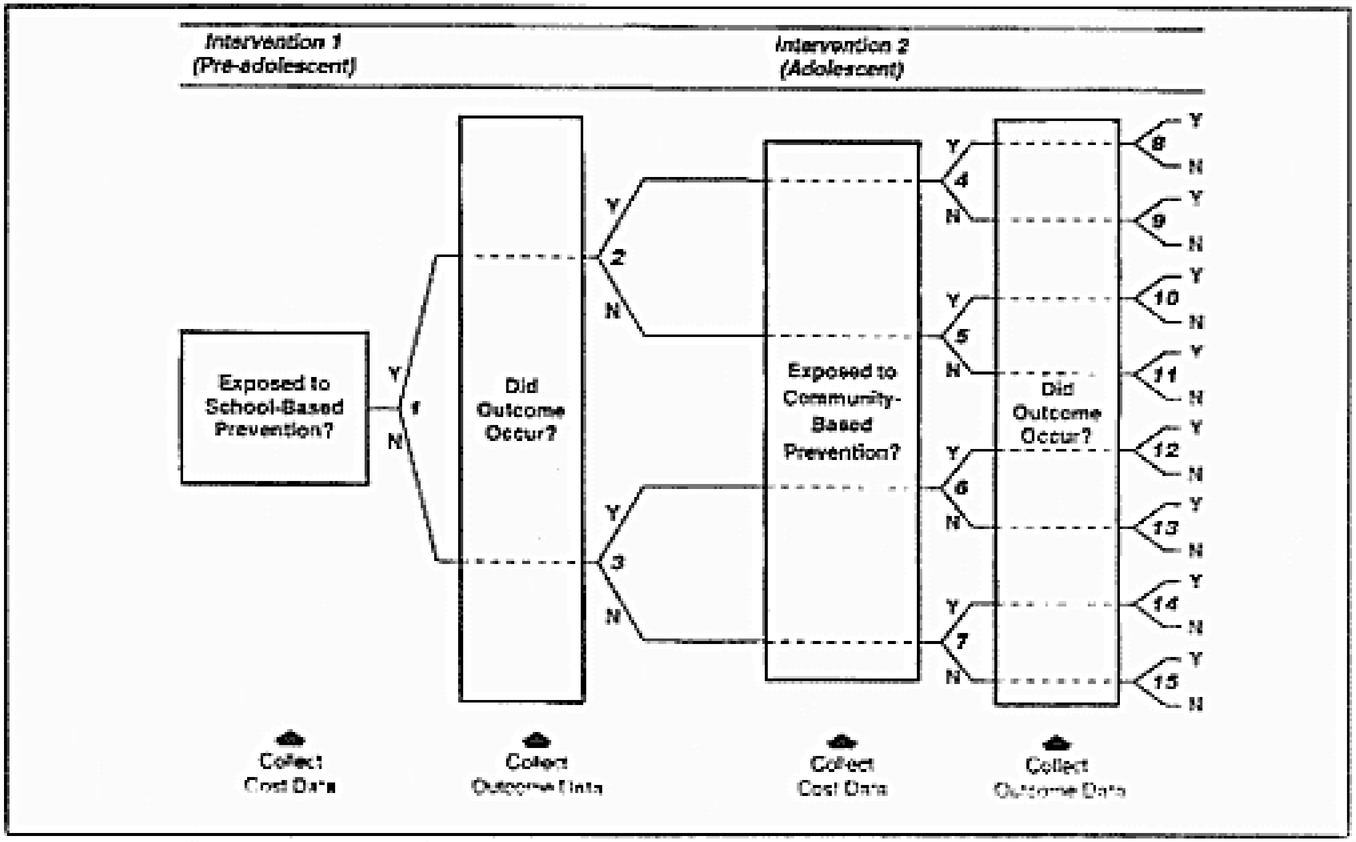

FIGURE 1. *Example of a decision tree model—simplified dynamics of substance abuse prevention interventions.*

The simplified dynamics shown in figure 1 indicate that preadolescents may or may not have been exposed to a school-based prevention program (node 1). An outcome (or outcomes) of interest will occur with some probability (e.g., node 2), and the same outcome will occur with some probability even without exposure (e.g., node 3). Individuals may also be exposed to a community-based intervention as adolescents. To capture the possibility that the probability of being exposed to a community-based intervention may depend on previous exposure and response to prevention programs, four nodes are shown (nodes 4, 5, 6, and 7) that depend on individuals' prior history with prevention programs. In general, the probability of individuals being exposed to a community-based program differs for nodes 4, 5, 6, and 7. For example, individuals who are at high risk for initiating substance abuse may have been exposed to a school-based prevention program as preadolescents and may be more likely to be exposed to a community-based prevention program as adolescents. Finally, the probability that the community-based intervention affects subsequent outcomes (nodes 8, 9, 10, 11, 12, 13, 14, and 15) depends on the entire history of previous prevention exposure. The figure also highlights that the effectiveness of an inter-vention is equal to the difference in the probabilities of the outcome occurring between the group that was exposed to the prevention inter-vention (e.g., node 2) and the group that was not exposed (e.g., node 3).

Figure 1 demonstrates the bias that may occur in the estimated behavioral change parameters attributable to a community-based intervention if researchers fail to control for previous prevention interventions.[1] For example, if researchers implement a community-based intervention and do not account for a previous school-based intervention, the estimated probability that an outcome occurs after exposure is an average of nodes 8, 10, 12, and 14. But these nodes represent distinctly different prevention histories; individuals at node 8 previously experienced the outcome of interest (i.e., node 2 is a "yes"), while individuals at node 10 did not (i.e., node 2 is a "no"). Individuals at nodes 12 and 14 were not previously exposed to a school-based intervention, and their behavior may be used to estimate the response to a community-based intervention.

Figure 1 highlights the various stages in the prevention intervention dynamics at which cost and outcome data must be collected to perform a cost-outcome evaluation of the interventions. Cost data should be collected prospectively for each prevention intervention. Cost data have typically not been collected in prevention studies, and there are few estimates of the cost of prevention interventions. The next section discusses some of the methodological issues in collecting these cost data. Collection of outcome data is the focus of recent prevention studies (e.g., Botvin et al. 1990; Pentz et al. 1989), and the results of this work can be viewed as estimating the outcome probabilities in figure 1.

COST-OUTCOME EVALUATION METHODS

This section provides an overview of cost-estimation issues. In addition, the authors describe how cost-estimates are combined with estimates of the intervention outcomes to perform economic (or cost-outcome) evaluations.

Cost-Estimation. Prevention interventions entail a range of activities such as:

- Identifying the target population.
- Recruiting participants.
- Screening participants.
- Delivering prevention services.
- Conducting evaluation activities.

To provide these activities, prevention programs use various proportions of the following inputs:

- Personnel—direct labor costs of providing prevention activities.
- Building/facility—rental payments or annual cost of capital (if owned).
- Equipment—rental payments or annual cost of capital (if owned).
- Supplies—costs of drug tests, pamphlets, etc.
- Value of volunteer labor—opportunity cost of volunteer labor.

- Value of donated space and equipment—opportunity cost of donated buildings and equipment.

The purpose of the cost-analysis is to identify and estimate all of these cost-components. Research Triangle Institute has developed a specialized data collection form for use with drug abuse treatment programs, Drug Abuse Treatment Cost Analysis Program (DATCAP), which can be modified to collect cost data for prevention programs and has been modified to collect the cost of employee assistance programs (Bray et al. 1996). The cost-analysis is a necessary step in any of the cost-outcome methods described below.

Typically, personnel costs represent the largest proportion of total costs; the relative magnitude of the other cost-components (e.g., building versus supplies) depends on the type of prevention activities and the location of the prevention program (e.g., is the program located on valuable real estate?). The value of volunteer labor and donated space also have been listed as inputs into the supply of prevention activities. For programs that use volunteers and receive donations, donated labor, space, and equipment are available at no charge; however, these resources have an opportunity cost, which is defined as the value of the activity that is forgone when the resources are donated. For example, if employed individuals donate their time to a prevention activity rather than going to work, the opportunity cost of that time would be equal to their forgone salary. Even if the donors were not employed or if they donated their time on the weekends, the value of this "leisure" time is not zero.

One measure of the opportunity cost of buildings and equipment is their current market rental value. If the equipment or buildings are being rented, then the amount of the rental payments directly reflects the opportunity cost of these components. But if equipment or buildings are owned outright, then analysts must impute their annual (opportunity) costs. To estimate this value for buildings, information on the size of the building space devoted to prevention activities (in square footage) can be combined with the current rental value of similar space in the surrounding area.

A similar procedure can be followed for equipment, but the equipment rental market is not as well defined as the real estate market. In addition, because the annualized cost of equipment is relatively small, it may not be worth the effort of collecting the current market value for several types of equipment. Instead, the authors recommend collecting information on the original purchase price of equipment and amortizing the initial purchase price over its useful economic life (Drummond 1991).

The discussion of opportunity cost raises an important issue that applies to both the cost and outcome estimation: in performing economic evaluations of prevention programs, the perspectives of the analysis must be identified at the outset (Drummond et al. 1987). Is the analysis performed from the program perspective or the social perspective? From the societal perspective, the value of donated services would be included in the economic evaluation, but these resources would not be included in an analysis from the program perspective. Alternatively, the analysis may be performed from the client's perspective, in which case the time spent traveling to a prevention intervention or waiting for services would be included in the cost-estimation. Another important perspective, especially in this time of managed care, is the payer's perspective. Payers would focus on direct costs that are incurred by providers and would ignore opportunity costs of donated resources and clients' time.

Economic Evaluation Methods

After costs are estimated, the next step is to combine cost-estimates with the outcomes of the intervention and perform an economic evaluation.[2] Examples of outcomes for prevention interventions include but are not limited to:

- Change in attitudes toward substance abuse.
- Development of peer-refusal skills.
- Prevention of substance abuse initiation.
- Postponement of the initiation of substance abuse.
- Reduction in the number of people who abuse substances.

A change in these measures is likely to lead to a reduction in other social indicators such as:

- Fewer drug-exposed infants.
- Reduction in medical and other social service costs.
- Decreased drug-related crime.

- Improvement in education and labor market outcomes.

The types of economic evaluation methods include cost-minimization, cost-effectiveness, benefit-cost, and cost-utility analyses (Drummond et al. 1987; Haddix et al. 1996; Plotnick 1994). Cost-effectiveness analysis, which includes cost-minimization analysis as a special case, is the dominant form of health-related economic evaluation. Benefit-cost analysis requires substantially more data but has the advantage of measuring the extent of the social gain (i.e., net benefits) directly for each prevention program. Cost-utility analysis, which evaluates changes in the quality of life of program recipients, is used in the medical literature but is probably less relevant for evaluating prevention interventions. Each of these types of analysis is briefly described below.

The simplest and most straightforward type of economic evaluation is cost-minimization analysis. If two or more prevention programs have the same effectiveness for the outcome of interest (e.g., two programs reduce drug use by the same extent among young women), then, by the principle of cost minimization, the cheaper prevention program is preferred.

Typically, the cost and effectiveness of alternative prevention interventions are not equal. In cost-effectiveness analysis, the ratio of the difference in costs between two or more programs relative to the difference in effectiveness is computed. This computation yields ratios such as the incremental cost-per-case of drug use prevented or the incremental cost-per-averted, drug-exposed infant. In comparing alternative prevention programs, the program with the smallest cost-effectiveness ratio can achieve the given outcome at the lowest cost-per-unit change in effectiveness.

To perform a cost-effectiveness analysis, it is best to have one unambiguous objective of the intervention yielding a single outcome by which effectiveness can be measured and compared across programs (Drummond et al. 1987). If an evaluation collects data on several alternative outcomes, cost-effectiveness ratios may be computed for each of the outcomes (Drummond et al. 1987). But if one of the alternative prevention programs being studied does not lead to the lowest cost-effectiveness ratio for each of the outcomes, policymakers are left in a quandary as to the most cost-effective program.

In cost-effectiveness analysis, a policy option is said to be dominated if at least one other option is both less expensive and more effective. In selecting the optimal policy, all dominated options should be removed from further consideration. However, for the remaining policy options, cost-effectiveness analysis does not provide an explicit decision criterion for choosing the optimal policy.

Benefit-cost-analysis addresses two shortcomings of cost-effectiveness analysis: its weaknesses evaluating policies with multiple outcomes and its lack of an explicit decision criterion for choosing among competing policies. Benefit-cost-analysis translates all benefits of an intervention into a common unit—dollars—and thus is a convenient method for evaluating interventions with multiple outcomes. To make decisions about the economic viability of alternative policies, the net benefit of an intervention is derived by taking the difference between the benefits and costs of the intervention. If the benefits exceed the costs, the prevention policy is justified on economic grounds; if the costs exceed the benefits, the policy cannot be justified and should not be implemented. The optimal policy is the policy with the largest net benefits.

Economic theory suggests that the best measure of the benefits of reducing substance abuse is society's willingness to pay (WTP) for a given level of substance abuse reduction (Anderson et al. 1994; Zarkin et al. 1996). The WTP for a prevention intervention may exceed the amount spent by society to reduce drug use in the same way that consumers' WTP for a typical product such as bread exceeds the dollars they spend to buy bread.

There are two methods for estimating society's WTP for commodities: revealed preference methods that use data on the actual purchase decisions of individuals and expressed preference methods that rely on survey responses to hypothetical purchase decisions. Although private markets exist for drug treatment and prevention in which clients pay for services out of their own pockets, the vast majority of clients have private or public (e.g., medicaid) insurance which affects their decisions to seek treatment. In addition, unlike the consumption of most commodities such as food, housing, or transportation, the individual choice to reduce substance abuse is likely to make other people, such as family members and victims of averted future crimes, better off. Both of these factors suggest that it may be misleading to estimate society's WTP for substance abuse reduction from the private decisions of people seeking substance abuse treatment or people participating in prevention programs.

In contrast to market-based methods, expressed preference methods of benefit estimation rely on contingent valuation (CV) techniques. CV uses a series of survey questions to elicit preferences for public goods (Mitchell and Carson 1989). First, the survey presents the person with a detailed description of the item being valued. Next, questions are presented to elicit the respondent's WTP for the item. These questions are not open-ended but are typically of the form: "Would you pay $X more in taxes per year to reduce the number of substance abusers from A0 to A1?" The respondent answers "yes" or "no"; if the answer is "yes" the amount of $X is increased, and the question is asked again with the higher dollar amount. If the respondent answers "no," the amount of $X is reduced. Finally, the survey obtains information on the respondent's characteristics (i.e., wage, age, or gender) which are used in regression equations to estimate a valuation function for the good (Mitchell and Carson 1989). Although the technique has only recently been applied to substance abuse (Zarkin et al. 1996), it has been successfully applied to assess WTP for environmental interventions and has also been used in health economics to assess WTP for in vitro fertilization (Neumann and Johannesson 1994), lipid lowering (Johannesson 1992), and pain reduction (Bala et al. 1997). A limitation of the CV approach is that the responses are based on hypothetical situations and not on responses to actual behavior.

Instead of using WTP models, analysts typically measure the benefits of drug abuse treatment as the sum of avoided costs from continued drug abuse plus the dollar value of quality of life improvements (Plotnick 1994; Tabbush 1986). French and colleagues (1991) described the data and methods necessary to estimate the full range of avoided costs from antidrug-abuse policies and programs. This method calculates the dollar cost of drug abuse as the sum of medical resources to diagnose and treat the disorder, criminal justice costs, costs of other social services, and the dollar value of lost productivity due to morbidity and mortality. The benefit of drug treatment is then calculated as the reductions in these medical and other social costs.[3]

Benefit-cost analysis potentially provides the broadest method of estimating the total value to society attributable to prevention. In practice, however, measuring and quantifying all the costs and benefits—especially the dollar value of quality of life changes and other intangible benefits associated with policy interventions—are extremely difficult and often controversial. Some analysts have raised concerns about assigning dollar values to improvements in labor market productivity (Drummond 1991), and others are uncomfortable assigning dollar values to changes in people's well-being (Feeny et al. 1990).

Because of these concerns, some analysts turn to cost-utility analysis. Cost-utility analysis is similar to cost-effectiveness analysis in that it compares differences in cost and effectiveness between alternative prevention programs, but cost-utility analysis also accounts for changes in the quality of life outcomes. In cost-utility analysis, the entire array of health improvements is converted to a single common unit, typically quality-adjusted life years gained, which makes comparing alternative programs easier. Although common in the medical literature, the authors are unaware of any cost-utility analyses used in the evaluation of substance abuse prevention programs.

EXAMPLE: COST-EFFECTIVENESS AND BENEFIT-COST ANALYSIS OF ALTERNATIVE COMMUNITY-BASED PREVENTION PROGRAMS

Community-based prevention starts from the recognition that many environmental factors affect people's decision to use drugs and alcohol. In this approach, schools, parents and families, government agencies, churches, businesses, and civic organizations work together to prevent drug and alcohol use.

Drawing on the example described in figure 1, cost-effectiveness and benefit-cost analyses of alternative community-based prevention programs are demonstrated. To keep it simple, suppose policymakers are considering augmenting an existing community-based prevention program in a city without prior school-based prevention programs. Thus, as noted in table 1, the probability that an individual in that community has been previously exposed to a school-based prevention intervention is zero at node 1. Furthermore, assume that no one in the community has initiated substance use as a preadolescent (i.e., the

TABLE. 1. *Illustrated probabilities at baseline and for two policy alternatives.*

	Node 1 Exposed to school-based prevention?		Node 7 Exposed to community-based prevention?		Node 14 Initiate substance use (exposed to prevention)?		Node 15 Initiate substance use (not exposed to prevention)?	
	Yes	No	Yes	No	Yes	No	Yes	No
Baseline	0%	100 %	10%	90%	80%	20%	96%	4%
Outreach program	—	—	20%	80%	—	—	—	—
Program effectiveness enhancement	—	—	—	—	60%	40%	—	—

NOTE: (—) Denotes the value is the same as at baseline.

probability of "no" at node 3 is 1). The following additional baseline assumptions are also made:

- The city has a population of 100,000 people and 10 percent of the population consists of adolescents who are at high risk of initiating use of a substance such as illicit drugs or cigarettes.

- A baseline community-based intervention is targeted at these high- risk individuals, but only 10 percent of them are exposed to the prevention program (node 5).

- Of the 1,000 high-risk individuals exposed to the existing program (0.10 x 10,000), 80 percent initiate substance use (node 14).

- However, of the 9,000 high-risk individuals who are not exposed to the program (0.96 x 10,000), 96 percent initiate substance use (node 15).

- The baseline program costs $200,000.

The effectiveness of the baseline intervention program—as measured by the reduction in the probability of initiating substance use between those exposed to the intervention and those not exposed—is equal to 16 percent (96 percent - 80 percent).

Table 2 illustrates how the baseline probabilities translate into numbers of individuals. The first column notes that 1,000 high-risk individuals are exposed to the intervention at baseline, and the second column notes that 160 fewer individuals initiate substance use in response to the intervention (equal to [0.96 - 0.80] x 1,000).

Starting with an existing community-based program, policymakers are considering two alternative prevention approaches. The first is a broad-based program designed to attract more high-risk individuals to the prevention program and increase the total number of people exposed to the intervention (outreach program). The second is a targeted, intensive program designed to change the behavior of those who are exposed to the prevention program and increase the probability that the program changes their behavior (program effectiveness enhancement).

As noted in table 1, the outreach program increases the proportion of the city's high-risk population exposed to the community-based prevention from 10 percent to 20 percent (node 7). This change translates into an increase in the number exposed from 1,000 to 2,000 (table 2). Applying the unchanged baseline effectiveness rate of 16 percent to the 2,000 exposed individuals yields a value of 320 individuals who will change their behavior because of the intervention, an increase of 160 people from the baseline level (table 2, column 3).

The program effectiveness enhancement is an alternative prevention program that continues to reach 10 percent of the city's 10,000 high-risk adolescents (i.e., node 7 reverts to its baseline value of 10 percent). But this prevention program decreases the probability from 80 percent to 60 percent that exposed individuals will initiate substance use (node 14). Thus, program effectiveness increases from 16 percent to 36 percent (96 percent - 60 percent). This percentage translates into 360 fewer individuals who will initiate substance use in response to the intervention (table 2, column 2), an increase of 200 people from the baseline level (column 3).

Table 2 also indicates the costs of the baseline program ($200,000) and the costs of each of the alternative programs, as well as the incremental

TABLE 2. *Illustrated cost-effectiveness and benefit-cost analysis of two policy options.*

	Number of high-risk individuals exposed to the intervention	Reduction in substance use initiators due to the intervention (E)	Increase in the number of individuals who changed behavior relative to baseline (ΔE)	Costs (C)	Incremental costs of new program relative to baseline (ΔC)	Cost-effectiveness of new program relative to baseline (ΔC/ΔE)	Total benefits (B)	Net benefits (B-C)
Baseline	1,000	160	—	$200,000	—	—	$640,000	$440,000
Outreach program	2,000	320	160	$300,000	$100,000	$625	$1,280,000	$980,000
Program effectiveness enhancement	1,000	360	200	$450,000	$250,000	$1,250	$1,440,000	$990,000

or additional costs (relative to the baseline) of implementing the two alternative programs. At $450,000, the program effectiveness enhancement is the most expensive program, but with 360 people changing their behavior, it is also the most effective. Dividing the incremental costs of implementing each program relative to baseline (C) by the increase in the number of individuals changing their behavior relative to baseline (E) yields a cost-effectiveness ratio (C/ E) of $625 for the outreach program and $1,250 for the program effectiveness enhancement. The cost-effectiveness numbers represent the additional cost spent per incremental reduction in the number of substance use initiators. Because this cost is smaller for the outreach program, it is the most cost-effective of the two alternatives to the baseline program. Alternatively, its greater cost-effectiveness means that the outreach program yields a greater increase in the number of individuals who change their behavior per dollar spent than does the program effectiveness enhancement. However, as the authors show below in the benefit-cost example, the outreach program is not necessarily the most beneficial program to implement.

The last two columns of table 2 illustrate a benefit-cost analysis. The total benefits (B) are calculated as the product of the total reduction in substance use initiators attributable to the intervention (E) and the estimated dollar value society places on reducing substance use initiation. For the purposes of illustration, assume that this dollar value is $4,000 per individual. The program with the largest number of individuals who change their behavior in response to the intervention—the program effectiveness enhancement—has the largest total benefit (B). The net benefits of the intervention are determined by subtracting the total costs of the intervention (C) from the total benefits (B); the program effectiveness enhancement also has the largest net benefit of $990,000. Because the goal of policy evaluation is to choose the program that maximizes the net benefits to society, the project with the largest net benefit is the project that should be chosen, if sufficient funds are available to pay for it. The program effectiveness enhancement has the largest net benefit and is the preferred program from society's perspective, assuming that the dollar value of the benefit is $4,000 per person and $450,000 is available.

Note that as long as the dollar value of the benefits exceeds $3,750 per individual, the program effectiveness enhancement generates more net benefits than the outreach program. If only $300,000 is available and the program effectiveness enhancement can be partially funded, yielding only 240 individuals who change their behavior (equal to 360 x [$300,000/$450,000]), then the outreach program generates more net benefits ($980,000 versus $660,000) and is the preferred program from society's perspective. Thus, in this case of equal spending for each alternative, both the cost-effectiveness analysis and the benefit-cost analysis yield the same optimal policy.

SUMMARY

Policymakers are often faced with the choice among several alternative programs of how to spend their scarce prevention dollars. They might ask, "Should we increase funding of prevention program A at the expense of program B?" or "Should more dollars be put into broad-based or targeted prevention programs?" These questions, which are fundamental to the policymakers' decision process, essentially ask, "What policies should be adopted to help the most people, given the limited budget?" In a world without scarce resources, society could pursue all prevention efforts simultaneously, even those that are only marginally effective. Obviously, resources are limited and a subset of prevention activities must be selected from the universe of all possible prevention activities. Cost-outcome evaluation methods provide policymakers with the tools to help them decide which prevention programs to fund.

In this chapter, the authors discussed how benefit-cost analysis indicates whether a particular policy is justified on economic efficiency grounds and noted that the optimal policy is the one that maximizes the difference between benefits and costs. However, many policymakers are uneasy placing a dollar value on all benefits such as intangible, nonmonetary benefits. To avoid this concern, many analysts turn to cost-effectiveness analysis that compares incremental costs to incremental changes in an outcome of interest (e.g., the changes in the number of individuals who initiate substance use). However, the authors' illustration also demonstrated the care that must be exercised in using cost-effectiveness analysis to make budget allocation decisions.

To aid in the economic evaluation, a conceptual framework that draws on a decision tree model has been described. This decision tree model captures the risk behavior and prevention intervention dynamics and highlights the impact of previous prevention interventions on these transitions. These dynamics can be very complicated, and the authors have presented a very simple version of the type of model that can be developed. It is hoped that even the simple version presented here will aid prevention researchers in identifying key behavioral and economic endpoints and in highlighting the points in the intervention where economic data need to be collected.

In addition to the usual behavioral endpoints collected as part of prevention interventions (e.g., attitude changes and substance abuse initiation), researchers should also collect data on economic endpoints such as:

- The costs of the intervention.

- Measures that can be used in benefit estimation (e.g., healthcare expenses, criminal activity, and labor market outcomes).

- The concurrent and lifespan exposure to other prevention activities.

Both program evaluation and prevention research efforts should include these elements in their protocol. If prevention researchers collected prospectively a basic standard set of economic data across all prevention efforts, comparison and analysis across a wide range and large number of programs and types of intervention would be possible.

NOTES

This bias will exist even if individuals are randomly assigned to the intervention. Thus, even with an experimental design, failure to control for previous exposure will not yield an externally valid estimate of the effect of a current prevention intervention.

Because the purpose here is to focus on the economic aspects of prevention intervention evaluation, the authors do not discuss methods for estimating outcome changes. See Zarkin et al. 1994 for a discussion of outcomes analysis for drug treatment interventions in the context of a decision tree model; see Haddix et al. 1996 for a more general discussion.

See Plotnick 1994 for a description of nonmonetary benefits of substance abuse reductions.

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AUTHORS

Gary A. Zarkin, Ph.D.
Program Director
Health and Human Resource Economics
Center for Economic Research
Research Triangle Institute
PO Box 12194
Research Triangle Park, NC 27709-2194

Robert L. Hubbard, Ph.D., M.B.A.
Director
National Development and Research Institutes
PO Box 10248
Raleigh, NC 27605

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