

Applications of Cost-Effectiveness Methodologies in Behavioral Medicine

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In 1996, the Panel on Cost-Effectiveness in Health and Medicine developed standards for cost-effectiveness analysis. The standards include the use of a societal perspective, that treatments be evaluated in comparison with the best available alternative (rather than with no care at all), and that health benefits be expressed in standardized units. Guidelines for cost accounting were also offered. Among 24,562 references on cost-effectiveness in Medline between 1995 and 2000, only a handful were relevant to behavioral medicine. Only 19 studies published between 1983 and 2000 met criteria for further evaluation. Among analyses that were reported, only 2 studies were found consistent with the Panel's criteria for high-quality analyses, although more recent studies were more likely to meet methodological standards. There are substantial opportunities to advance behavioral medicine by performing standardized cost-effectiveness analyses.

Health care costs in the United States have grown dramatically since 1940. Although there was a temporary slowdown in the early 1990s, the rate of increase began to accelerate again by the turn of the century. Health care in the United States now consumes about 14.5% of the gross domestic product, whereas no other country in the world spends more than 10.0%, and it has become increasingly difficult to pay for public programs such as Medicare (Patashnik & Zelizer, 2001). Although the rate of growth has slowed, the Institute for the Future estimates that health care expenditures will increase at a rate of 6.4% annually and will account for 15.6% of the gross domestic product by 2010 (Institute for the Future, 2000). Despite high expenditures, the United States system may not be producing exceptional health outcomes. In one recent comparison, the United States ranked 12th among 13 countries when compared on 16 health indicators (Starfield, 2000). Clearly, we are spending more, but how do we know whether we are getting more in return?

Opportunity Cost Problem

Health care resources (dollars for spending) are limited, and there is constant pressure to spend more on attractive new treatments or diagnostic procedures. Without containment, it is likely that the health care bill will dominate the economy and limit the opportunity to develop other sectors, such as education, energy, or national defense. Although most provider groups understand that health care costs must be contained, few acknowledge that their own expenditures should be subject to evaluation. Successful lobbying to obtain reimbursement for a specific service may nec-

essarily mean that another service is excluded. Suppose, for example, that the amount that can be spent on health care is fixed, and \$3 of each \$100 (3%) is devoted to behavioral services. If psychologists are able to get \$10 of each \$100 spent on behavioral services, there will be less to spend on other non-behavioral health services. This is called the opportunity cost problem. Opportunity costs are the foregone opportunities that are surrendered when resources are used to support a particular decision. If we spend a lot of money on surgical services, for example, we necessarily have to spend less money on other services such as preventive or behavioral services. How do we decide which services should get more and which should get fewer resources?

When confronted with the choice between two good programs, it is always tempting to support both. The difficulty is that it costs more to offer multiple programs. The cost of programs is represented in the fees for health insurance or the cost of health care to taxpayers. A society can choose to offer as many health programs as it wants. However, more programs require more funding. Employees do not want the fees for their health insurance to rise, and taxpayers do not want tax increases. The goal of formal decision models is to get higher quality health care at a lower cost. Yet no public policy has ever been shown to effectively control costs in the American health care system (Blumenthal, 1999). This article focuses on the cost-effectiveness of behavioral medicine. However, it is important to recognize the larger context. Behavioral medicine programs compete for limited resources with many different health care services. Thus, consideration of funding behavioral programs must be taken in the context of all programs. This requires the application of generic methods for assessing cost-effectiveness and cost-utility. These terms are often misunderstood, so we will briefly introduce them.

Cost-Effectiveness, Cost-Utility, Cost-Offset, and Cost-Benefit

The terms *cost-utility*, *cost-effectiveness*, and *cost-benefit* are used inconsistently in the medical literature (Doubilet, Weinstein, & McNeil, 1986). The key concepts are summarized in Table 1. Some economists favor the assessment reached with cost-benefit.

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Preparation of this article was supported by Agency for Research and Quality Grant R01 HS 09170, National Institutes of Health Grant P60 AR 40770, and American Cancer Society Grant TPRH-98-119-01.

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Table 1
Comparison of Cost-Effectiveness, Cost-Utility, Cost-Benefit, and Cost-Offset Analysis

Type of Analysis	Compares	With	Comment
Cost-effectiveness	Monetary value of resources used	Health effects: clinically based (death rate, blood pressure, test performance)	Not comprehensive; not based on consumer preference for health states
Cost-utility	Monetary value of resources used	Health effects: preference based (health-related quality of life)	Comprehensive; based on consumer preference for health states
Cost-benefit	Monetary value of resources used	Monetary value: resources saved or created, including health	Places monetary value on lives and the quality of life
Cost-offset	Monetary value of resources used	Monetary value: costs (i.e., health care) reduced by the intervention	Can shift focus away from health improvement

This approach measures both program costs and treatment outcomes in dollar units. For example, treatment outcomes are evaluated in relation to changes in use of medical services or in the economic productivity of patients. Treatments are cost-beneficial if the economic return exceeds treatment costs. Patients with cancer who are aggressively treated with surgery, for example, may need fewer emergency medical services. The savings associated with decreased services might exceed treatment costs. Sometimes investment in a service can save money. For example, investment in a psychotherapy program may reduce overall use of health services (Spiegel, 1999). The bottom line for those paying for health services is improved because the costs of mental health care are less than the costs of the medical services that are averted. Although there are many reports of cost-offsets, few have been replicated or are well documented when standardized accounting principles are used. Typically, health services produce a health benefit and resources are used to obtain desired health outcomes. However, a requirement of a good cost-benefit analysis is that all outcomes have a dollar value attached. Therefore, side effects of a drug or functional limitations from a surgery must have a dollar value placed on them. This poses a variety of problems because many people are uncomfortable placing monetary values on human life.

Cost-offset is a term used to describe interventions that save money independently of their health benefits. Most often, this savings is related to reduced health care utilization and health care costs. Cost-offset may be present within cost-benefit or cost-effectiveness analyses, but it often shifts the focus away from whether the intervention improves health. Therefore, cost-offset is not recommended as the primary goal of intervention development.

The requirement that health care treatments reduce costs may be unrealistic (Russell, 1986, 1987). Patients are willing to pay for improvements in health status just as they are willing to pay for other desirable goods and services. We do not treat cancer to save money. Allowing patients to die would certainly be less expensive. Treatments are given to achieve better health outcomes. In other words, treatments should be evaluated in terms of their effectiveness, not just their financial benefit. Cost-effectiveness (and cost-utility analysis) are the methodologies used to accomplish this evaluation.

In recent years, cost-effectiveness analysis has gained considerable attention. Some approaches emphasize simple, treatment-

specific outcomes. For example, one interesting study evaluated the effects of different types of insurance coverage on smoking cessation rates in a health maintenance organization (HMO; Curry, Grothaus, McAfee, & Pabiniak, 1998). They found that people were more likely to use the smoking cessation services if there was no copayment. Even though programs with copayments may be more effective in getting participants to quit smoking, the programs with full coverage have attracted more people and resulted in the best rate of smoking cessation in the population. However, the program's main health outcome was smoking cessation. The major difficulty with older cost-effectiveness methodologies is that they did not measure health outcomes in a comprehensive manner and in common units, which does not allow for comparisons across different treatment interventions. For example, health care administrators often need to choose between investments in very different alternatives. Should the limited amount of money be used to support tobacco cessation programs for all enrollees or should it be devoted to supporting organ transplantation for a few patients? For the same cost, they may achieve a large effect for a few people or a small effect for a large number of people. The treatment-specific outcomes used in cost-effectiveness studies do not permit these comparisons across different health conditions.

Therefore, the purpose of cost-effectiveness analysis is to evaluate the comparative potential of expenditures on different health-care interventions. Typically, the analysis starts with the assumption that some resources are available to spend on health care. The purpose of the analysis is to identify decisions that will maximize the amount of total health gained for the expenditure of these resources. For example, an administrator may need to decide between supporting a program on smoking cessation and a program to screen for prostate cancer. The question is whether using the resources to support smoking cessation will produce more or less total health benefit than would spending the same money on a prostate cancer screening project. There is not enough money to support both programs, and a decision between the alternatives must be made. A proper comparison between the smoking cessation program and the prostate cancer screening program can only be made if the health benefits are stated in a common unit of measurement. Otherwise, an administrator may have to decide on using resources to save one life versus using the same resources to get many people to stop smoking for 6 months.

Another important limitation of reporting cost-effectiveness results in dollars/treatment-specific outcome is that side effects, both

positive and negative, are not expressed in the equation. When comparing a behavioral treatment program for depression with an antidepressant medication, the results could be easily expressed in a common measurement such as the score on a depression scale. However, there may be numerous side effects that are not picked up by the questionnaire. The medication may have sexual side effects, and the behavioral program may increase muscle pain. Out of this dilemma arose the concept of measuring health-related quality of life and cost-utility approaches. Cost-utility analysis is a special case of cost-effectiveness analysis that uses the expressed preference or utility of a health state or treatment effect as the unit of outcome. It still expresses cost per health benefit, as do all cost-effectiveness analyses, but expresses those health benefits in a comprehensive manner and in units that reflect the health preferences of the population. Therefore, cost-effectiveness is a broader term that encompasses cost-utility analysis, and it is used in that context later in this article. The main feature of cost-utility analysis is that it uses quality-adjusted life years (QALYs) as the unit of analysis. We discuss this further in the Cost-Effectiveness Analysis in Behavioral Medicine section.

In recent years, cost-utility approaches have gained increasing acceptance as methods for comparing many diverse options in health care (Russell et al., 1996; Weinstein et al., 1996). The goals of health care are designed both to make people live longer (decrease mortality) and to help people have a higher quality of life (decrease morbidity; Kaplan, 1997). Cost-utility studies use outcome measures that combine mortality outcomes with quality of life measurements. The utilities are the quality of life ratings or preferences for observable health states on a continuum bounded by 0.0 for *death* to 1.0 for *asymptomatic optimum function* (Kaplan, 1997; Kaplan, Schmidt, & Cronan, 2000; Russell, 1999; Russell et al., 1996; Siegel et al., 1997; Weinstein et al., 1996). A state rated as .70, for example, is judged to be 70.0% of the way between death and perfect health. A year in that state is scored as .70 QALYs. We return to the discussion of QALYs later in the article. The exact methods used to obtain a population's health preferences or utilities are based on economic theory and are beyond the scope of this article. The topic is explained in more detail in many sources including Drummond (1997) and Gold (1996).

Standards for Cost-Effectiveness Analysis

Contrary to the portrayal of cost-effectiveness analysis in the popular media, the purpose of the analysis is not to cut costs but rather to identify which interventions produce the greatest amount of health using the resources that are available. Because of the confusion about cost-effectiveness analysis, the Office of Disease Prevention and Health Promotion in the Public Health Service developed standards for cost-effectiveness analysis. In 1993, they appointed a 13-member panel cosponsored by a variety of agencies including the Agency for Health Care Policy and Research (now known as the Agency for Healthcare Research and Quality), the National Institutes of Health, the Healthcare Financing Administration, the Centers for Disease Control, and several others. The charge of the panel was to develop recommendations for consistent practice of cost-effectiveness analysis in preventive medicine, medical therapy, rehabilitation, and public health. Ultimately, the goal was to create common standards. The work of the panel was

published as a book (Gold, Siegel, Russell, & Weinstein, 1996) and as a series of articles published in the *Journal of the American Medical Association* (Russell et al., 1996; Siegel et al., 1996; Weinstein et al., 1996). In the following sections, we review some of the major elements of cost-effectiveness analysis as defined by this panel.

Perspective

The results of cost-effectiveness analysis may depend on perspective. From the *societal* perspective, all health care benefits and costs are considered, regardless of who experiences them or pays for them. The *administrative* perspective evaluates the problem through the eyes of a specific agency. *Individual* perspectives consider costs and benefits from the viewpoint of an individual citizen or patient. There may be occasions in which results differ dramatically as a function of perspective. An HMO, for example, may save money by denying a particular mental health service. So, from an administrative perspective, costs may be reduced; however, from a societal perspective, costs may increase because other agencies may be required to pay for this service or for the consequences of conditions being left untreated. After much consideration, the panel decided to take a societal perspective. They concluded that fair decisions must take all parties into consideration. Decision makers must wrestle with who gains and who loses, and they must consider the broad consequences of decisions. Hence, the societal perspective is one that simply attempts to measure all possible impacts of an intervention, both positive and negative. This could be extended to include changes experienced by people who live with or care for a patient being treated, but there are obvious limits to how far out the indirect impact can be measured.

It might be argued that taking the societal perspective is unrealistic. In most circumstances, resources are controlled by administrators who are focused on the programs that will make their institutions appear to be producing the most services at the lowest cost. When the Panel on Cost-Effectiveness in Health and Medicine reviewed this issue, they argued that the analysis should consider everyone affected by the intervention and that all significant health outcomes and costs for all people affected by the program must be tabulated, regardless of who experiences the costs or outcomes. An analysis done from the perspective of an employer might consider only the costs that affect the employer directly. These might be the effects on work productivity or on medical bills that the employer is responsible for. This approach is problematic because it ignores important components of the costs, such as the bills paid directly by the employee or the consequences of the health outcome for other individuals.

The argument for the societal perspective uses a philosophical exercise known as the "veil of ignorance." The exercise asks us to imagine that we are making health resource allocation decisions without any information about what will happen in the future. For example, we might imagine that we are looking at the world before we are born or before we have contracted any illnesses. From this perspective, we would want all possible treatments available because they might be needed to treat a condition that will eventually affect us (Daniels, Crawford, & Sabin, 1997; Russell et al., 1996). It is argued that this position is most fair because people making the decisions do not stand to gain or lose by favoring a condition that they already have. Decisions are made based on the serious-

ness of the problem and the ability of the intervention to remedy it. The perspectives of specific individuals with a defined medical problem and the special interests are de-emphasized. In reality, administrators may base their decision on what is best for their company's profit margin, but the main point is that scientific studies should remain objective and provide decision makers with as much information as possible.

Comparators

It makes little sense to say that a program is cost-effective. Cost-effective in comparison with what? Virtually all decisions involve evaluating in comparison with some alternative. A "comparator" is the alternative to which a new treatment is compared. For example, behavioral management of back pain could be compared with no treatment at all, surgery, or medical management. The choice of the comparator is of critical importance in the analysis. Evaluations of innovative new therapies should compare the new approach with care that was usual before the new intervention was available. The Panel on Cost-Effectiveness in Health and Medicine (Gold, 1996) recommended that new approaches should be compared with the best alternative that would realistically be used if the new treatment was not available. Often, the best available treatment is what is currently being done. In addition, other comparators might be the low-cost alternative, different intensities of treatment, or care provided by alternative providers.

Many studies compare a treatment group with a control group and report the difference in outcomes. Next, cost-effectiveness for the treatment is evaluated considering only the costs of the treatment versus the results of the control group. The problem is that if a new treatment was not available, patients would use another treatment or seek an alternative remedy. Therefore, a no-treatment control group is usually not the most realistic comparator. The standards for cost-effectiveness analysis suggest that costs and effects be evaluated for both the treatment and the comparator and the difference in cost-effectiveness be reported.

Measure of Effectiveness

The purpose of health care is to improve health, yet as explained above, many studies never measure health outcomes. Instead, they focus on dollars saved by the decreased usage of health services. Next, researchers might ask: "What health outcomes should we measure, and how do we measure them?"

Behavioral outcomes have become common in the evaluation of biomedical interventions. More than 35 years ago, Sullivan (1966) published a key government document that argued that behavioral indicators such as absenteeism, disability days, and institutional confinement were the key indicators of disease and disability. Health outcome measures began to emphasize the ability to perform activities of daily living and the restriction in usual activities. The key indicators of illness are largely behavioral (Kaplan, 1990). Diseases and disabilities are important for two reasons. First, illness may cause life expectancy to be shorter, and second, illness may make quality of life less desirable (Kaplan, 2000). Diseases, disabilities, environmental exposures, or risky behaviors are important because they may shorten life expectancy or lead to reductions in quality of life. Treatments or preventive interventions are valuable because they might make life longer or improve quality of

life by curing or preventing disease. We want to be well to function and enjoy life (Kaplan, 1994). Outcome measures have been developed to quantify these behavioral indicators of wellness. These measures are now commonly used in clinical research (Spilker, 1996).

Outcome measurement models are refinements of generic survival analysis. In traditional survival analysis, the living are statistically coded as 1.0, whereas the dead are statistically coded as 0. Mortality can result from any disease, and survival analysis allows comparisons between different diseases. For example, the life expectancies for those who will die of heart disease can be compared with the life expectancies of those who will die as a result of alcohol abuse. The advantage of these generic measures over disease-specific measures of heart or liver function is that general comparisons of life expectancy can be considered. The disadvantage is that all individuals who are alive are considered to be equal. A person confined to home because of severe depression is scored the same as someone active and participating in many areas. Utility assessment allows the quantification of levels of wellness on the continuum anchored by death and wellness (Lenert & Kaplan, 2000). A variety of studies have demonstrated that generic measures accurately reflect the impact of mental health conditions (Patterson et al., 1996; Pyne, Patterson, Kaplan, Gillin, et al., 1997). In addition, several studies have demonstrated that mental health interventions produce significant benefits when they are assessed using generic health outcomes (Pyne, Patterson, Kaplan, Ho, et al., 1997).

The Panel on Cost-Effectiveness in Health and Medicine suggested that outcomes be measured using QALYs, which are measures of life expectancy with adjustments for quality of life (Gold et al., 1996; Kaplan, 1997). QALYs integrate mortality and morbidity to express health status in terms of equivalents of well-years of life. If a woman dies of breast cancer at age 50 and one would have expected her to live to age 75, the disease was associated with 25 lost life years. If 100 women died at age 50 (having life expectancies of 75 years), 2,500 (100 × 25 years) life years would be lost.

Death is not the only outcome of concern in cancer. Many adults continue to suffer from the disease, which leaves them somewhat disabled over long periods of time. Although they are still alive, the quality of their lives has diminished. QALYs take into consideration the quality of life consequences of these illnesses. For example, a disease that reduces quality of life by one half will take away .5 QALYs over the course of 1 year. If it affects two people, it will take away 1 QALY (2 × .5) over a 1-year period. A pharmaceutical treatment that improves quality of life by .2 for each of five individuals will result in the equivalent of 1 QALY if the benefit is maintained over a 1-year period. The basic assumption is that life years can be adjusted for quality of life by multiplying the time in each health state by its quality of life preference weight to estimate QALYs. QALYs can be added together and estimated over multiple patients and multiple years. This system has the advantage of considering both benefits and side effects of treatment programs in terms of the common QALY units.

Another strength of using QALYs is that they incorporate changes in symptoms and functioning that traditionally have been components of behavioral measurements. The behavioral medicine field has been a leader in demonstrating the connection between

mind and body. However, many behavioral intervention studies have not measured health outcomes or the effect of treatment on psychological well-being. By measuring a wide spectrum of symptoms and concentrating on function, researchers' proper assessment of QALYs includes global well-being, including psychological aspects.

Although sometimes initially daunting to researchers, using cost-utility analysis and measuring QALYs offers an excellent opportunity for promoting behavioral medicine and psychological interventions in general. A recent example considered two pathways to enhance the population health status (Kaplan, 2000). One pathway requires the early diagnosis and treatment of diseases such as cancer. The second pathway promotes health through changes in lifestyle. The unusual aspect of the second pathway is that it completely disregards the requirement that a condition be diagnosed before intervention is recommended. Using cost-utility analysis, it was suggested that behavioral programs that promote physical activity or reduce tobacco use result in significantly more QALYs per dollar investment than do many widely accepted prevention programs that require diagnosis through the early detection of breast or prostate cancer. It was argued that the objectives of improved population health might be better served by devoting more resources to behavioral prevention programs.

In summary, QALYs combine measures of morbidity and mortality and do not require medical diagnoses. The measures include time or prognosis and incorporate preferences for health outcomes. A consensus conference with the Department of Health and Human Services recommended the use of QALYs to evaluate health programs (Gold et al., 1996). A recent Institute of Medicine report on the measurement of population health came to similar conclusions (Field & Gold, 1998).

Clinical Significance

Systematic randomized clinical trials can be used to establish whether the outcomes for an experimental treatment are significantly distinguishable from those attributable to control or placebo interventions. However, clinicians are not always convinced that statistically significant results are clinically meaningful. Clinical significance describes the meaningfulness or convincingness that a treatment produces benefits from the perspective of the clinician or the patient (Kendall & Sheldrick, 2000). Kendall and associates (Kendall & Flannery-Schroeder, 1998; Kendall, Marrs-Garcia, Nath, & Sheldrick, 1999) have argued that clinically meaningful change brings a person to within normal limits in relation to a normative population. Kazdin (1999), noting ambiguities in several measures of clinical significance, suggested that outcomes should be evaluated in relation to clinical goals. Cutoff scores for meaningful clinical change should be set and treatments should be considered in relation to their impact on society. Social validity evaluates the impact of treatments on society (Foster & Mash, 1999).

QALYs provide an alternative approach to these problems. One of the advantages of QALYs is that they describe outcomes in a unit that has intuitive meaning. All treatments are considered in relation to the number of years of life (adjusted for quality) that they produce. As all treatments are measured in a common unit, the benefits can be directly compared, and there is a substantial normative database that shows the amount of gain achieved with

different interventions. A second advantage of QALYs is that they are scaled in relation to perceived benefit. For example, the meaning of the change from .6 to a score of .7, is defined by judgments of people in the community. A change of .1 means that peers see the change as about one tenth of the distance between death and perfect health. The numbers have meaning independent of reference to normative data bases. A third advantage of QALYs is that they have social significance. Cost/QALY allows the estimation of the relative benefit of investing in alternative programs. Ultimately, the goal of cost-utility analysis is to find the best use of community resources. In other words, the goal is to use the available resources to produce the most health for society.

Accounting for Costs

Costs are an important component of cost-effectiveness analysis. From the societal perspective, the cost analyst considers all resources required for the intervention and for the comparator. An evaluator of a preventive intervention, for example, must consider all costs required to deliver the intervention or the comparison program. These include all costs for all people exposed to the program whether or not they eventually developed a health problem. From an administrative perspective, direct cost estimates include all costs of treatment and any costs associated with caring for side effects of treatment. Direct costs may be the only ones recognized by the administrative perspective. However, from the perspective of the patient or from a societal perspective, several indirect costs must be realized. Indirect costs include patient time required for therapy, income lost because a family member offers home care, and morbidity and mortality costs associated with reduced productivity due to disability or premature death. A thorough analysis must also include the intangible costs associated with pain and suffering. Although some researchers have argued over what should be considered as direct or indirect costs, guidelines have been developed to ensure thoroughness and consistency across studies (Gold et al., 1996).

In cost-benefit analysis, the cost savings in reduced health care are subtracted from the cost of an intervention. For example, a behavioral intervention to manage anxiety may reduce the number of visits to health care providers. If the resources saved by reduced visits exceed the costs of the programs, a cost-offset has been achieved. However, some authors question the common belief that behavioral intervention programs actually save money (e.g., Russell, 1986). Often, after a more thorough analysis, the cost-offsets have been difficult to document. For example, some have argued that treatment often results in productivity gains (Pelletier, 1993). These gains in productivity may occur because healthy people who live longer are able to contribute more to the economy through work and to pay more taxes. These approaches have been seriously criticized because they value only the portion of life used for paid work (Lehman et al., 1999). The models exclude or devalue activity such as child care, schoolwork, or volunteer efforts. Further, these methods place greater weight on wealthy individuals and may favor programs that care for the rich (Lave, Frank, Schulberg, & Kamlet, 1998).

Discounting Costs and Outcomes

It is commonly acknowledged in economic theory that future gains (or losses), should be discounted because most people prefer

positive events or rewards sooner and negative events or punishments later in time (Berwick, Cretin, & Keeler, 1981; Udry & Morris, 1971). For example, even if inflation were held constant, most people would choose to receive \$100 today versus \$100 a year from today. Why? Because they have an extra year to either invest that money or spend it on things they can enjoy sooner.

Theoretically, health is expected to be valued and preferred earlier in life in the same manner as money and should therefore be discounted in a similar manner (Weinstein & Stason, 1977). However, there is still considerable debate about whether this is correct (Parsonage & Neuburger, 1992). The Panel on Cost-Effectiveness in Health and Medicine reviewed the issue and found it to be very complex (Gold, 1996). They concluded that, until a different consensus is reached, for the purposes of standardization, health outcomes should be discounted at the same rate as monetary costs. They recommended a discount rate of 3.0% per year.

Time Horizon and Modeling

The time horizon concept simply refers to how long after the intervention costs and outcomes are evaluated. Preventive interventions may change outcomes over a lifetime or longer, if subsequent generations are impacted by the intervention. Obviously, the longer the follow-up period the better, as there is always the potential for unintended side effects or benefits in the distant future. However, it is not possible to accurately measure health outcome data or costs indefinitely.

An increasingly popular technique for extending the time horizon of a cost-effectiveness analysis is the modeling of future outcomes. Modeling uses estimates of the probability of each possible health outcome to calculate future costs and health consequences of the intervention by computer. Probability estimates for some health problems have been fairly well established through epidemiological research. However, there are also concerns about how much of the future probability should be estimated from past data. Sensitivity analysis, which will be briefly discussed in the next section, is one way to address some of this uncertainty, but it is not a complete remedy for these concerns.

Sensitivity Analysis

Sensitivity analysis is a statistical technique that is not specific to cost-effectiveness analysis but is usually included in higher quality cost-effectiveness evaluations. Almost every study on cost-effectiveness uses estimates of costs or rates of outcome. For example, actual health care costs are often hard to identify, because these costs vary widely and often contain sensitive or confidential information. Health care utilization rates are easier to obtain, but they require an estimate of the cost per type of utilization. Likewise, effect sizes from multiple studies of a very similar intervention may vary widely, so an estimate of the average effect size is used. Sensitivity analysis examines how the results of the cost-effectiveness analysis would change if these estimated values were allowed to vary between a realistic upper and lower bound. In other words, researchers examine and report how sensitive their results are to the estimates contained in their analysis.

Cost-Effectiveness Analysis in Behavioral Medicine

It appears that cost-effectiveness has been somewhat ignored by the behavioral medicine field. For example, a recent Medline

search identified 24,562 references on costs or cost-effectiveness in medicine between 1995 and 2000. For the same interval, the search identified only nine articles on costs or cost-effectiveness in behavioral medicine. In addition, not a single presentation at the 2000 or 2001 annual meetings of the Society of Behavioral Medicine listed "cost-effectiveness" or "cost-utility" as a key word (*Annals of Behavioral Medicine*, 2000, 2001). Although the review example above pertained to only a limited time frame and to only one database, it is clear that cost-effectiveness remains under-used in behavioral medicine.

Many researchers have proclaimed that there is plenty of evidence that behavioral interventions are cost-effective (e.g., Pelletier, 1993). However, behavioral medicine interventions are rarely cited in reviews of the health care cost-effectiveness literature. In part, this happens because some behavioral interventions are not considered to be medical. The more obvious reason, however, is that many analyses of cost-effectiveness do not meet many of the current standards for cost-effectiveness (Gold, 1996). Among the nine articles identified in the Medline search, none was an original study. Eight of the nine articles discussed basic issues without presentation of data. The ninth article is an important piece by Friedman et al. (Friedman, Sobel, Myers, Caudill, & Benson, 1995) that systematically reviews evidence of cost-offset in behavioral medicine. Because the Friedman article is so widely cited, we decided to look carefully at the data reviewed for their analysis and the supporting evidence for related claims of cost-offset.

In reviewing the literature cited in the Friedman et al. (1995) article, we found several articles arguing that behavioral interventions are valuable because they reduce overall health care costs. However, improved overall health, not cost reduction, is the most important criterion for justifying any health service. For example, health costs can be reduced by making access to care difficult. As the great majority of health care utilization is for self-limiting problems, simply denying access reduces costs, with arguably little affect on health outcome. In several of the studies cited, a cost-offset occurs because a less expensive service is substituted. In one study (Vickery et al., 1983), patients were randomly assigned to receive a self-care book, a telephone information service, individual counseling by a trained nurse, or the usual care. The self-care guide offered instructions on more than 100 common symptoms. Those who received the book and had access to the telephone services used health care services for minor self-limiting problems 35.0% less often. Each \$1.00 spent on the program resulted in \$2.50 saved in medical care costs.

As attractive as these findings are, they do not show that patients experience health benefits as a function of participation in these programs. The intervention has a benefit, and cost-offset occurs because patients use services less often. An intervention's cost-effectiveness ratio might be improved because cost has changed, and it is presumed that the patients are no worse off. Yet, we do not know that because health status was not measured. Might patients who were using this system less have had some aspects of their illness overlooked? We simply do not know. Studies that show both cost savings and improvements in patient outcomes are needed. For example, Lorig et al. (Lorig, Mazonson, & Holman, 1993) demonstrated that an arthritis self-help course can result in both significant reductions in the use of health services and better patient functioning.

Several articles have reviewed the literature on cost-effectiveness in behavioral medicine, yet these reviews came to different conclusions. One review performed a meta-analysis of 191 studies of psychological or educational care for adult surgical patients. The review suggested that there are small but consistent effects of psychological and educational interventions for outcome measures such as postoperative pain, psychological distress, and recovery from surgery (Devine, 1992). However, the review did not formally consider the cost-effectiveness of these interventions. Klaus, Kennell, Berkowitz, and Klaus (1992) reviewed 5 studies on maternal assistance and support during childbirth. Again, none of the studies considered economic impact.

Two reviews specifically evaluated the economic impact of behavioral or psychological interventions (Gabbard, Lazar, Hornberger, & Spiegel, 1997; Pelletier, 1993). One review (Gabbard et al., 1997) considered 686 articles published between 1984 and 1994. Articles were excluded from further consideration if they did not have a control group, if they focused on a medical disorder instead of a psychiatric illness, or if the outcomes did not include cost data. Among the 686 articles, 41 articles describing 35 studies were considered further and 18 of the studies were judged of sufficient quality to be included for final consideration. Studies were classified as to whether patients were assigned to the treatment or control group using randomization. Most of the clinical trials using randomization and all of those without randomization suggested that psychotherapy reduces total health care costs. Most cost savings occur because of reduced in-patient treatment and increased capacity to work (Gabbard et al., 1997) instead of because overall health status was improved (Gabbard et al., 1997).

Pelletier (1993) reviewed studies on the cost-effectiveness of comprehensive health promotion programs at the work site. The article was an update of an article he published in 1991. Pelletier noted that he received 6,500 requests for reprints for his original article and suggested that anyone challenging the evidence for the cost-effectiveness of behavioral interventions at the work site is "simply ignorant of more than 13 years of increasingly sophisticated research with documentation of both health and cost outcomes" (Pelletier, 1993, p. 51). The article summarizes 48 studies. However, careful consideration of the 48 studies reveals that few of them comply with standards outlined by Gold and colleagues (Gold et al., 1996). It is true that the current standard of methodology has changed considerably since 1991, but many of the studies used intermediate outcome variables such as blood pressure and cholesterol levels without considering quality of life outcomes or the impact of the intervention on other areas of health. Indeed, since the publication of the Pelletier (1991) review about the benefits of community intervention programs, several studies have challenged the efficacy of major community intervention efforts (Luepker et al., 1996).

Our conclusion is not that behavioral medicine, preventive, or community interventions are not cost-effective or should not be implemented. Instead, the purpose was to critically examine the methodologies used to arrive at the results that have been disseminated and to suggest that there is lots of room for improvement. Sound and credible improvements in cost-effectiveness methodologies should not be ignored because they have been developed by economists or biostatisticians.

Review of Cost-Effectiveness Literature and Cost-Offset Literature

In this section, we provide a more detailed review of some of the studies that reported that behavioral medicine services are cost-effective or produced a cost-offset. We restricted the review to recent studies because cost-utility methodologies for estimating cost/QALY were not well known and were rarely used before 1988. As mentioned earlier, our focus is on the application of contemporary methodologies rather than on the provision of a comprehensive review of the literature.

To evaluate studies, we considered the following criteria.

1. What perspective was used to evaluate the study (i.e. consumer, clinician, administrative, societal)?
2. Was a systematic experimental design used to evaluate the treatment? Was it a randomized clinical trial, an observational study, or some other design?
3. What was the comparator for the analysis?
4. Were all costs of treatment accounted for?
5. Did the analysis consider costs of treatment for patients who did not get the disease?
6. What was the unit of outcome? Was it cost? Health? QALYs? Was mental health considered?
7. Were future outcomes discounted to current value?

Table 2 summarizes the review of some commonly cited studies on cost-effectiveness in behavioral medicine. The studies involved a variety of different patient populations including nondiagnosed adults, adults with high blood pressure, adults with somatization disorders, adults with acute myocardial infarctions, women giving childbirth, individuals with hip fractures, individuals with chronic arthritis, individuals with HIV, and individuals with other serious chronic problems. When considered in methodological context, few of the studies used measures of health outcome that allow cost-utility comparisons. In fact, studies published before 1995 rarely considered the effects of interventions on measures of overall health. This trend was reversed with more recent studies, which have become more likely to consider cost-effectiveness or cost-utility (Cronan, Durkin, Groessl, & Tomita, 1997; Pinkerton, Holtgrave, & Valdiserri, 1997; Salkeld et al., 1997; Smith, Rost, & Kashner, 1995). Nearly all of the studies performed calculations from the administrative perspective, but a few did acknowledge the value of the societal perspective.

For the great majority of the studies, the time horizon was relatively short, almost always fewer than 5 years. The behavioral interventions in the studies varied widely. In some studies, behavioral intervention was simply providing educational information, whereas in others it was intensive and long-term intervention. In reviewing these studies, we discovered that several articles, commonly cited as supporting the cost-effectiveness of interventions, never actually considered or reported measuring the cost of the intervention (Fahrion, Norris, Green, Green, & Snarr, 1986). An important study by Ornish et al. (1990) is commonly cited as supporting the cost-effectiveness of intensive behavioral interventions (e.g., Friedman et al., 1995). However, cost-effectiveness data were not presented in the Ornish article cited by Friedman et al. (1995). Kennell, Klaus, McGrath, Robertson, and Hinkley (1991) demonstrated the reduced use of services and cesarean sections for women who received emotional support during labor.

Although the article is commonly cited as demonstrating the cost-effectiveness of intervention (Friedman et al., 1995), there is no formal cost analysis. Instead, there is a speculative paragraph in the discussion arguing that costs would be reduced if the intervention was used. One commonly cited article (Pallak, 1995) suggested that managed mental health care reduces medical care costs and produces a cost-offset. However, the article did not include formal accounting of program costs. Similarly, a study by Robinson, Schwartz, Magwene, Kregel, and Tamburello (1989) is cited as showing cost-offset, but it also presented no formal cost accounting. The study suggested that there was a cumulative effect of an educational intervention. However, inspection of the data in the article suggests that most of the benefit occurred within the first 30 days.

Many of the studies are difficult to evaluate in relation to current medical care. Length of stay for most surgeries and medical illnesses has decreased substantially in the past few years. Strain et al. (1991) were able to demonstrate that psychiatric consultation reduces hospitalization for hip fracture by about 2 days. However, after the consultation, the length of stay was 18.5 days at one hospital they studied and 13.8 days at another hospital. The problem is that the length of stay for hip fracture has decreased quite significantly in the past few years because of a variety of factors. Currently, the total length of stay is estimated to be about 3 to 4 days in California. Managed care has reduced length of stay so dramatically that it is unclear how much remains to be improved through psychiatric consultation.

There are two studies in Table 2 in which the researchers adhered to many of the standards proposed by the Panel on Cost-Effectiveness in Health and Medicine (Pinkerton et al., 1997; Salkeld et al., 1997). Although both of these studies involved the computer modeling of future outcomes, the authors took a societal perspective and calculated the cost-effectiveness of both the intervention group and the comparator. They measured (or estimated) health outcomes in QALYs (which includes mental health concerns) and did a good job of attempting to account for all possible costs. In addition, both studies conducted sensitivity analyses.

In general, the studies have improved steadily over time, and it should be noted that many of these studies were designed long before the current methodology and guidelines were established. There are also practical limitations with respect to strictly following the cost-effectiveness guidelines in every study. Therefore, these studies should be viewed as valuable building blocks in the transition toward better use of existing methodology in cost-effectiveness analysis.

Conclusion

It is commonly argued that behavioral medicine services are cost-effective; yet the evidence appears to be based mostly on incomplete, inconsistently applied, or outdated methodologies. Our review identified few systematic evaluations of behavioral medicine services, which is in contrast to other areas of health care where cost-effectiveness evaluations are becoming refined and commonplace. Among the few published reports, there is considerable confusion between terms such as cost-effectiveness, cost-utility, cost-benefit, and cost-offset. A panel on cost-effectiveness representing several U.S. federal agencies has set guidelines for cost-effectiveness evalu-

ations (Gold, 1996). These guidelines addressed many limitations of earlier analyses and provide guidance for the design and analysis of studies. Therefore, it is important for outcome studies in behavioral medicine to make use of these standards.

Our review of the current literature suggests several conclusions. First, the literature consistently shows that behavioral and psychological interventions do reduce utilization of health care services. These findings are consistent across a wide range of studies. Further, the literature suggests that there is a cost-offset associated with these services.

However, despite the appearance of benefit, few studies meet the criteria for high-quality cost-effectiveness evaluations. According to current standards, studies should consider a societal perspective rather than simply the perspective of the administrative unit paying the bills. A second concern is that full-cost accounting has rarely been used. Behavioral services, like other services, cost money. The cost accounting must include not only the fees of service provided but also the overhead costs associated with providing the care and possibly the indirect costs. A third concern is that few studies have adequately measured health outcomes. It is not sufficient to say that a service reduces costs. An inexpensive service that harms patients or places them at risk cannot be advocated. Studies need to show that behavioral services either produce equivalent benefit at a lower cost or produce greater benefit at an equal cost to competing services to be considered cost-effective.

The guidelines for cost-effectiveness in health and medicine offer several suggestions for the design of studies (Gold et al., 1996). Some of these issues are summarized in Table 3. Authors should report the perspective of their study and clearly describe comparators. They should also discuss uncertainty and include sensitivity analysis where appropriate.

The best opportunities to provide cost-effectiveness data are to include measurements of cost and health-related quality of life in randomized clinical trials. Ideally, the health-related quality of life measure would be one that can be used to estimate QALYs. There are a number of such measures currently available. They include the Health Utilities Index (Feeny, Furlong, Boyle, & Torrance, 1995; see also <http://www.fhs.mcmaster.ca/hug>), the Quality of Well-Being Scale (Kaplan, Ganiats, Sieber, & Anderson, 1998; see also <http://orpheus.ucsd.edu/famed/hoap/MEASURE.html>), and the Euro Qol Five Dimension Scale (Gudex, Dolan, Kind, & Williams, 1996; see also <http://www.euroqol.org>)

Cost information should include all direct and indirect costs of the intervention and the alternative with which the treatment is being compared. Costs should also include secondary costs, such as loss of income to family members or support persons who take time off from paid work to care for a patient. Longer time horizons, especially for preventive interventions are also an important goal. Finally, sensitivity analyses are needed to evaluate the variability of estimated values. These recommendations should be considered at the earliest phase of research design; they become much more difficult to achieve when attempted retrospectively.

This article is not meant to be a comprehensive review of all studies of cost-effectiveness in behavioral medicine but should serve as an assessment of the progress the field has made in this area and as an indication of the remaining areas in need of improvement. Behavioral medicine has long claimed to be cost-effective, but it has not produced enough evidence that is well-accepted by colleagues. Using the current standardized methods is a challenging task, but users will offer

Table 2
Behavioral Medicine Research on Important Elements of Cost-Effectiveness

Study	Health condition or population	Behavioral medicine pathway	Design	Time horizon	Types of outcome measured	Mental health
Vickery et al. (1983)	Normal adults—HMO members	Info-edu	Prospective (P), Randomized (R), Controlled (C)	6–12 months	Estimated costs of medical visits	No
Fahrion et al. (1986)	Hypertensive	Psychophysiological	P, consecutive patients	33-month average	Blood pressure, medication index	No
Smith, Monson, & Ray (1986)	Somatization disorder	Psychiatric consultation	P, R, C	18 months	Rand Health Status Measures, health care costs	Yes
Shellenberger et al. (1986)	Normal adults	Psychophysiological	Retrospective, C	2 years	Physician visits, physical health, mental health	Yes
Robinson et al. (1989)	Families with child with acute symptoms	Info-edu	P, R, C	2–12 months	Patient visits (fever and total acute)	No
Ornish et al. (1990)	Coronary artery disease	Behavior change	P, R, C	1 year	Heart symptoms, lesion size	No
Frasure-Smith (1991)	Acute myocardial infarction (MI)	Social support	P, R, C	5 years	Cardiac mortality, acute MIs	No
Kennell et al. (1991)	Nulliparous women	Social support	P, R (partial), C	< 1 week	Delivery type, pain relief, baby and mother health	No
Strain et al. (1991)	Hip fracture surgeries	Psychiatric consultation	P, consecutive admissions, C	1 year	Hospital costs, mood, cognition	Yes
Fries et al. (1993)	Elderly adults	Behavior change	P, R, C	2 years	Health risk scores, health care costs	Some
Lorig, Mazonson, & Holman (1993)	Chronic arthritis (Osteoarthritis, rheumatoid arthritis)	Info-edu	P, R, C, wait-list control	4 years	Physician visits (money saved), symptoms	Yes
Pallak (1995)	Medicaid	Psychiatric	P, R, C	6–18 months	Medical costs	No
Smith, Rost, & Kashner (1995)	Somatizing patients	Psychiatric consultation	P, R, C, one-way crossover	2 years	Rand HSM, health care costs	Yes
Meyers et al. (1996)	Overweight adults	Behavior change	P, R, C	15 months	Weight, exercise, diet, self-concept	No
Cronan et al. (1997)	Osteoarthritis	Social support, info-edu	P, R, C	3 years	QALYs, (Estimated health care costs, QWB)	Yes
Pinkerton et al. (1997)	Men with HIV	Skills training	Retrospective	Life (estimated)	Estimated QALYs	Yes
Salkeld et al. (1997)	Adults with ≥ 1 CVD risk factors	Info-edu, self-help, beh change	P, R, C	1 year (data)	CHD events, QALYs, health care costs	Yes
Curry et al. (1998)	Smoking cessation	Health care services	P, C	6 months	Smoking cessation	No
Sevick et al. (2000)	Sedentary adults	Beh change, skills training	P, R, C	2 years	Weight, blood pressure, health behaviors	No

Note. HMO = health management organization; dash indicates the category is not applicable; tx = treatment; HSM = health status measures; QALYs = beh = behavior.

data that are more persuasive. We believe the opportunities for cost-effectiveness analyses in behavioral medicine are excellent. The literature suggests that behavioral services will produce health care benefits and compete favorably with other health services. However,

systematic documentation is inadequate at this time. This should provide ample opportunity for investigators to conduct and report high-quality cost-effectiveness evaluations.

There are many aspects of cost-effectiveness and cost-utility anal-

Cost accounting issue	Perspective	Comparator	Discounting	Sensitivity analysis	Data vs. modeling	Notable method
No recruitment, indirect costs, travel costs	Administrative	Standard and tx and control	— (<1 year)	No	Data	
None	Not specified	Baseline	No	—	Data	
No indirect costs, home visit, interview, recruitment costs	Administrative		Yes	No	Data	Asked about alternative providers or care
None	Not specified	Control	No	—	Data	Self-report after 2 years, 35% response rate
None	Not specified	Standard tx and control	—	—	Data	
None	Not specified	Baseline	—	—	Data	
None	Not specified		No	—	Data	
None	Not specified		—	—	Data	
No indirect costs, recruiting costs	Administrative		—	No	Data	Followed after discharge
No recruitment, indirect, travel costs	Administrative	Control	No	No	Data	2 control groups
No indirect costs	Not specified	Standard tx	Yes	No	Data	
None	Administrative	Control	No	—	Data	
No indirect cost, recruitment, mailing costs	Administrative	Control	Yes	No	Data	2.5-year baseline alternative care
No indirect, recruitment costs	Not specified	Wait-list control, other	—	No	Data	
No indirect, travel costs	Administrative	Control	Yes	Yes	Data	
Sufficient	Societal	Yes	Yes	Yes	Data + modeling	
Sufficient	Societal and administrative	Yes	Yes	Yes	Data + modeling	
No indirect, implementation, recruiting costs	Administrative and consumer	Standard and others	Estimated	No	Data	Costs not fully explained
No indirect, recruiting costs	Clinician and administrative	Structured intervention	Yes	Yes	Data	

quality-adjusted life years; QWB = Quality of Well-Being Scale; CVD = cardiovascular disease; Info = information; edu = education; CHD = childhood;

ysis that we have not been able to cover in this article. The interested reader should consult more comprehensive references (Drummond, 1997; Gold, 1996). We recognize that economic methods for making important health policy decisions may seem detached or insensitive.

Placing dollars and QALYs on human lives may seem ethically inappropriate. In concert with other authors, we oppose cost-effectiveness utility as the sole source of information used to make these major health decisions (Drummond, 1997; Gold, 1996). Instead,

Table 3
Components of a Cost-Utility Analysis

Component	Suggested analysis
Perspective	Societal: All health care benefits and costs are considered regardless of who experiences them or pays for them.
Comparator	Analyses should be reported in relation to specific alternatives.
Accounting for cost	Cost should include all direct and indirect costs of intervention and comparator. Secondary costs, such as loss of family income, should also be included.
Reference case	Results should be reported in relation to a well-defined reference case. The reference case describes the treatment and the characteristics of the subject population to which it was applied.
Components of report	Total cost, total effectiveness (in QALYs), incremental costs, incremental effectiveness, incremental cost-effectiveness, and discount rate should be included.
Discounting	Costs and effects should be discounted to their present value. (Typically, this is 3%, but other alternatives are possible.)
Sensitivity	Uncertainty should be formally evaluated through sensitivity analysis.

Note. QALYs = quality-adjusted life years.

the analyses offer additional information to decision makers. It is, however, one of the most useful, accurate, and objective ways to evaluate health interventions and to maximize the overall health of a population. When used appropriately, cost-utility analysis might offer a highly ethical utilitarian approach to achieve the best health status for a defined population (Gold, 1996).

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Received January 29, 2001

Revision received June 19, 2001

Accepted August 10, 2001 ■