

# Issues and Methods in Evaluating Costs, Benefits, and Cost-Effectiveness of Drug Abuse Prevention Programs for High-Risk Youth

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## ISSUES

The abuse of licit and illicit drugs [“drugs” throughout this chapter refers to tobacco, alcohol, and other drugs] has placed an extraordinary burden on the Nation’s health, human service, and criminal justice systems (Rice 1991; National Institute of Justice 1993). Alcohol, a licit drug, is misused by more Americans than any other drug. A smaller number of Americans use illicit drugs, but the consequences of this use are far reaching because, in part, of the violence associated with the illicit drug trade. When considering the high rates of human immunodeficiency virus (HIV) infection and the burden of lost productivity among drug users, the social and economic costs of drug abuse to the individual and to society are staggering.

To reduce the misuse of licit and illicit drugs, the Department of Health and Human Services (DHHS) has increased funding for drug abuse prevention demonstration projects fourfold, from \$56 million in FY 1989 to \$251 million in FY 1992 (DHHS 1993). Research on the effectiveness of drug abuse preventive policies (e.g., setting a legal age for the purchase of alcohol) and program interventions (e.g., the Midwestern Prevention Project) is limited but growing. However, with evidence that adolescent drug use has been rising in recent years, questions about the value of prevention programs are once again prominent in the public debate. Moreover, questions about program effectiveness are being increasingly linked with questions about costs.

This chapter examines some of the issues and methods used in the economic evaluation of drug abuse preventive interventions. Policymakers make programmatic decisions after evaluation of a variety of factors, many of which are unrelated to economic issues. Often considered are factors such as whether the initiative is technically or administratively feasible, whether it is culturally competent, and how many individuals will be served. An assessment is generally made also as to whether an initiative is politically feasible in terms of existing laws and/or supporters and opponents of the initiative. For many policymakers, these criteria can at times weigh more heavily than economic concerns. As such, economic evaluation is usually just one of several evaluation tools used in deciding whether an intervention should be implemented or continued.

#### Why Apply Economic Evaluation Criteria to Drug Abuse Prevention Programs?

Policymakers in governmental bodies, schools, community-based organizations, and funding agencies are increasingly being asked to justify expenditures on complementary, but competing, programmatic efforts. They also are being asked to choose between alternative programs that seek to achieve similar goals. While issues of costs are generally important to policymakers, they are particularly important in an era of fiscal constraints and declining resources. Drummond and colleagues (1987) define economic evaluation as “the comparative analysis of alternative courses of action in terms of both their costs and consequences.” The heart of this process is the concept of opportunity cost, in which the true cost of a drug abuse preventive intervention is essentially the forgone benefits that could have been achieved had the resources been used for the next best alternative (Drummond et al. 1987). For example, the cost of a drug abuse prevention program that prevents 1,000 children from using drugs may be a year of life for an elderly person, whose life could have been prolonged if the resources had been allocated toward an experimental therapy. When policymakers allocate funds toward a particular program, they are essentially deciding that society will give up the benefits of some other program. Economic evaluation can help decisionmakers make these choices, while also attempting to ensure that limited funds are used efficiently.

This notion of an opportunity cost is particularly important when a health program is the focus of the analysis. Unlike other parts of the economy, many goods produced in the health sector are not explicitly bought and sold in markets. Normally, market prices reflect how

much society is willing to pay for certain goods or services. According to economic theory, teachers' salaries indicate how much society values the education of its children. However, the amount society is willing to pay to prevent one child from using drugs is yet to be defined. It is difficult to answer this question because prevention cannot be bought and sold in a market. This problem makes it particularly important that the opportunity costs of health interventions be made explicit—otherwise, the lack of prices to guide decisionmakers impedes efficient resource allocation.

### Current Knowledge About the Economic Evaluation of Prevention Programs

Although many believe that prevention and early intervention programs are cost-effective, evidence of their financial costs and benefits is limited (Banta and Luce 1983). In a 1979-1990 review of the health literature, Elixhauser and colleagues cite 3,206 studies that used either cost-benefit or cost-effectiveness analysis to evaluate mostly clinical procedures (Elixhauser et al. 1993). The authors classified 88 of the 3,206 articles as studies that focus on topics related to prevention. Of these, none deals specifically with an evaluation of a drug abuse prevention program.

In fact, only a few of these prevention articles actually involve an evaluation of a prevention program. Malcolm and associates (1988), Stein and associates (1984), and Tager and Sondik (1985) analyzed the costs and benefits of stroke prevention through drug therapy, Channel One programming, and a cancer prevention project, respectively. Most of the 88 studies classified as prevention related, however, do not involve systematic economic evaluations of particular programs. Instead, these authors have addressed more general, conceptual issues in prevention.

Since 1990, it appears that more articles have been published that involve cost-benefit and cost-effectiveness analyses of prevention programs. Buescher and colleagues (1993) conducted a cost-benefit analysis of WIC participation in North Carolina and found that WIC participation leads to benefit-cost ratios of 1.92 and 3.75 for white and African-American women, respectively. In other words, the benefits of WIC participation are about 2 to 4 times the costs of the program. Ginsberg and Silverberg (1994) studied the net benefits of bicycle safety helmet legislation in Israel and estimated benefit-cost ratios that range from 2 to 3, depending on the assumptions made. Articles by Shi (1993), Scheffler and colleagues (1992), and Byers and

colleagues (1995) are other recent examples of economic evaluations of prevention programs.

Recently, some researchers have used existing data and literature to estimate costs, benefits, and cost-effectiveness of proposed prevention programs and policies. In this spirit, Hueston and associates (1994) used decision trees and sensitivity analysis to evaluate the cost-effectiveness of several possible methods of helping pregnant women quit smoking. Phillips and colleagues (1994) provide another example of this type of study, in which they assessed the cost-effectiveness of different HIV testing policies aimed at physicians and dentists.

In sum, the literature on the economic evaluation of prevention programs and policies is relatively new and limited in scope. There were no published studies identified in the literature that applied cost-effectiveness analysis or cost-benefit analysis to a drug abuse prevention program. Moreover, the quality of economic evaluations varies widely—a problem not limited to economic evaluation research on prevention programs. Elixhauser and colleagues (1993) note that researchers in many studies do not follow the basic tenets of cost-benefit and cost-effectiveness analysis. Occasionally there is still confusion over terminology, or terminology is used imprecisely. Although more recent articles are of better technical quality, methods and measurement issues should be considered when reviewing this literature.

## METHODS FOR ECONOMIC EVALUATION OF DRUG ABUSE PREVENTION PROGRAMS

An assessment of the costs and benefits of drug abuse prevention initiatives requires the use of analytic tools that permit a comparison of financial outlays as well as short- and long-term benefits. The most frequently used analytic tools—cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA)—have limitations, but they can provide useful information in decisions regarding the allocation of resources. The two analytic tools are similar in many respects, but they have one major distinction. In CBA, monetary terms are used to express an initiative's benefits as well as costs. In contrast, CEA generally, although not exclusively, expresses outcomes in nonmonetary terms (such as an increase in a health benefit or a reduction in an undesirable health outcome).

Whether a researcher chooses to conduct CEA or CBA, there are a number of methodologic issues to be considered, such as whether the

costs and benefits are tangible, whether they can be expressed in monetary terms, and whether they are direct or indirect.

### Cost-Effectiveness Analysis

CEA is used to compare alternative policy or program interventions in an effort to assess which alternative achieves the desired goal at the lowest overall cost. The analysis may compare two drug abuse prevention programs. Or the analysis could compare a defined drug abuse prevention program with a church's usual efforts to improve the life chances of at-risk youth. As previously noted, the analysis may value the intervention outcomes in monetary or nonmonetary terms. The results of the analysis are generally summarized using measures such as average cost-per-unit of effectiveness, marginal cost-per-unit of effectiveness, or net savings.

A community seeking ways to reduce marijuana use among its youth may compare two programs that were found to reduce marijuana use by 10 percent. The average cost of program A is \$2,000 per youth served; the average cost of program B is \$4,000 per youth served. Although the cost of a program is an important factor, it is not the only factor to consider in choosing such a program. Program B may be better suited to the target population, or it may have longer term effects. The cost of program A may be linked to the use of facilities that do not exist in program B's jurisdiction, or it may depend on support from a hospital or university, which was available to one site but not to another (the comparison community). Using an analytic tool that compares these and other factors helps those who design and implement programs obtain information needed to make better decisions about efficient use of available resources.

### Cost-Benefit Analysis

CBA typically is used to assess whether a program or policy intervention is a worthwhile investment in and of itself, without comparison to other programs. Traditionally, program benefits as well as costs are valued in monetary terms. The analysis is used to determine if the benefits outweigh the costs of a program and thus justify the allocation of resources to that program. The most common indices in CBA are cost-benefit ratio and net benefits.

The choice of approach in CBA reflects the assumptions and values of the researcher. The willingness-to-pay approach attempts to capture what individuals would be willing to pay for reducing the

probability of illness or death. Willingness to pay for health outcomes is difficult to measure accurately for a number of reasons. For example, individuals' willingness to pay for a health improvement is heavily affected by income level (i.e., upper income families are able to pay more than poor families), and individuals are not accustomed to placing an explicit value on the probability of illness or death.

The human capital approach appears more appropriate for an assessment of the costs and benefits of drug abuse prevention because of current limitations in accurately measuring willingness to pay for improved health outcomes. Under this approach, human worth is measured by the discounted value of an individual's stream of output over time, as measured by wages. The human capital approach assumes a societal perspective, and, moreover, it uses data that are more readily available and reliable. The human capital approach is appropriate for determining the economic cost of a disease or condition over a defined time period or for determining the cost-savings of a specific procedure or intervention. This approach, however, is limited when evaluating programs involving children or socially or economically disadvantaged individuals, since society tends to value its members for reasons unrelated to their productive capacity. The approach can undervalue productive potential if current wages do not reflect future value or true abilities. Also, because of its focus on market earnings, the human capital approach tends to ignore less tangible factors such as pain and suffering (Rice et al. 1991).

Under the human capital approach, researchers may choose to estimate incidence or prevalence of an outcome. Prevalence estimates are used as the basis for evaluating the direct and indirect costs of an illness incurred during a defined time period such as a year. Incidence estimates are used to assess the lifetime direct and indirect costs of an illness (Rice et al. 1991).

### Critical Issues in Economic Evaluation of Drug Abuse Prevention Programs

When applying CEA and CBA to an assessment of drug abuse prevention programs, a number of definition and measurement issues warrant special attention. Some of these issues are generic to evaluation of prevention intervention programs; others are particular to CEA and CBA. Among the most important of these are issues related to measurement of program benefits (e.g.,

outcome/effectiveness measures and timeframe of study) and those issues related to measurement of costs (e.g., hidden costs and units of analysis).

## Measurement of Program Benefits

In an assessment of the costs and benefits of a program or policy, an attempt is made to quantify the allocation of resources and expected benefits. The more tangible the costs and benefits, the easier the task. Benefits that might be included in an analysis of a drug abuse prevention program include increased school productivity (e.g., better grades, improved attendance); increased self-esteem and social competence; reduced morbidity and mortality (e.g., from auto accidents or suicide attempts); and reduced family pain and agony over the loss of a child or diminishment of a child's lifespan or quality of life.

In an economic evaluation of a drug abuse prevention program, many of the main outcomes of interest may be intangible. This is especially true for short-term outcomes such as school productivity and self-competence. It is difficult to avoid valuation of intangible outcomes when these outcomes are the focus of the study. This problem is exacerbated by the fact that research on the effectiveness of drug abuse prevention programs, irrespective of their costs, is limited.

Although valuing the benefits is often the biggest challenge in any CBA, it may be especially difficult in an evaluation of a drug abuse prevention program aimed at children. Some of the costs and benefits listed above are easily quantifiable, but others are not. Since monetary value is generally derived from market values, it is problematic to give a monetary quantification to important but intangible factors such as pain, worry, and relief about a child's future. In many cases, however, these outcomes are only a small part of the analysis. Drummond and colleagues (1987) suggest that before attempting to put a price on intangible outcomes, researchers should consider the possibility that this valuation may not lead to more informed decisionmaking. Furthermore, Drummond and associates (1987) point out that, in some cases, valuation of intangible outcomes may mislead users of the information who might be unfamiliar with the assumptions on which value estimates are based.

Other professions, however, have developed methods for valuing intangible factors that perhaps offer useful lessons for researchers studying the costs and benefits of drug abuse prevention. The legal

profession has developed means of quantifying pain and suffering for the purpose of making monetary settlements to clients. Insurance companies have methods of quantifying the cost of malfeasance in monetary terms, methods that may prove useful in the evaluation and comparison of drug abuse prevention programs. Although these valuation methods are controversial, they are a place to start in efforts to develop new ways of assessing the outcomes of drug abuse prevention programs.

If intangible outcomes are of secondary importance relative to the main outcomes of interest, researchers often choose to avoid valuation of these items given the difficulties of this task. Ginsberg and Silverberg (1994), in their CBA of bicycle safety helmets, mention that although the benefits of helmet use undoubtedly include the reduction of pain and suffering, these factors are not included in their analysis. They note that this omission may result in benefit-cost ratios that are biased downward.

Research on the costs and benefits of drug abuse prevention is complicated by the complexity of measuring the outcomes and by the lack of consensus on acceptable outcome measures. In research on the effects of drug treatment, there is substantial consensus that program benefits include not only measures of drug use but measures of illegal activity, and of social or occupational functioning. In research on drug abuse prevention, many policymakers and funding sources principally define “drug use” as the outcome of interest despite difficulties in securing funding to assess drug use over an extended period of years. Outcomes such as enhanced well-being or increased school productivity are acceptable as intermediate outcomes; however, their empirical relationship to the likelihood of drug use has not been sufficiently established to develop models quantifying their relationship to drug use. As such, researchers evaluating the costs and benefits of drug abuse prevention must use secondary data sources to project the long-term benefits of prevention programs.

**Timeframe of Study.** Another problem facing drug abuse prevention researchers is that knowledge about the risk (i.e., the occurrence of new cases) of alcohol and other drug use is limited. It is difficult to measure the nonoccurrence of an adverse outcome, especially if that outcome continues to be a possibility throughout the life of the individual. The impact of an intervention may take years to realize, but the average study is limited to 4 years or less; this may not be sufficient time to assess the impact of the program. Interventions

with children, intended to influence behavior in the adolescent or adult years, are therefore problematic for impact evaluations.

This issue further complicates benefits valuation. Many of the long-term benefits of drug abuse prevention may occur in the use of health/mental health services or in the labor market. These outcomes can be measured and, in some cases, valued. But very few projects last long enough to follow youth into their young adult years when differences in service use and labor market outcomes would occur. This practical difficulty can make it impossible to accurately account for the range of benefits that is attributable to drug abuse prevention.

Related to the timeframe for measurement of outcomes is the timeframe for measuring durability of effects. In addition to measuring an effect, it is important to make an assumption about how long an effect will last. If a prevention program is designed to raise self-esteem in children in an effort to keep them off drugs, two important questions about the outcome are: How much time is required to raise a child's self-esteem to a level that is defined as success? Will the effects of the increase in self-esteem last into adolescence, or into adulthood? These issues have implications for benefits valuation. In order to link short-term, intangible outcomes such as improved self-esteem to long-term, measurable outcomes such as adult wage, it may be necessary to make assumptions about the durability of prevention program effects.

**Use of Multiple Outcome Measures.** Using multiple outcome measures generally strengthens the potential to learn about the impact of a preventive intervention (Leukefeld and Bukoski 1991). Of course, consistent findings within and across studies give added confidence to a study's results. Inconsistencies among study findings, often based on different choices of outcome measures, make drawing conclusions about program effects more complex. When multiple outcome measures produce inconsistent results, particularly in a single study, it is important to explore conceivable explanations for the findings. Some findings can be explained by the relationship of personal or social factors to the outcome under study. Identifying these factors helps to direct future investigations of the impact of prevention programs.

**Types of Forgone Costs or Benefits.** Using the Rice and colleagues (1991) methodology, it is useful to classify the benefits of drug abuse prevention as direct, indirect, and related benefits. In their work on the cost of drug abuse and mental illness, Rice and associates (1991) use this classification system for costs. Since the costs of drug abuse

are avoided when abuse is prevented, these costs are actually the benefits of a drug abuse prevention program.

Direct and indirect benefits are classified under the more general category of core benefits. Core benefits are typically those resulting directly from the illness or condition itself. Other related costs are secondary to the condition under study, pertaining instead to the nonhealth effects of the illness. In addition, both core benefits and other related benefits include direct costs, for which monetary payments are actually made, and indirect costs, which represent lost resources. Core benefits include direct costs such as dollar expenditures on health, mental health, and social services related to drug misuse, and indirect costs such as value of lost/reduced productivity. Other related benefits include direct costs such as dollar expenditures on drug abuse-related services, and indirect costs such as the value of delinquency or criminal activity.

### Measurement of Costs

Although outcomes are an important focal point in CEA, they must still be reviewed in light of program costs to form a complete picture of the intervention's value. Documenting program costs is generally straightforward in drug abuse prevention initiatives, although accounting records are not generally kept for billing purposes and tend to be of poorer quality than drug abuse treatment records. Also, since many drug abuse prevention programs are relatively new, they lack experience in cost accounting or they may not use an accounting system that sufficiently disaggregates costs as needed for CEA/CBA. Requests for cost information, therefore, present an added burden for small programs with little or no institutional support or accounting infrastructure. Moreover, when young people with multiple needs use multiple services, the problem of linking the service to one presenting problem versus another generally requires detailed information on the nature of the service use.

Greater effort is generally required to document the costs of prevention services for youth in a comparison program or for youth engaged in efforts that could be considered the usual and customary efforts (i.e., the status quo). Of course, the first challenge is to find an appropriate comparison program or group of youths who are similar to those engaged in the intervention. In most prevention programs, random assignment is not a realistic option for the evaluation design. Thus, differences in outcomes between an intervention and a comparison group may be due to differences in the

youth served. Once an appropriate comparison program or group of youths is identified, convincing them to participate in the evaluation process may require special efforts since their participation will burden them with additional costs but no immediate benefits. To entice their participation, it may become necessary to financially compensate staff or offer staff support for data collection efforts needed in the evaluation.

**Hidden Costs.** Decisions must be made about handling hidden or one-time costs, and overhead and capital costs must be taken into account, especially when comparing established programs with new programs and their attendant capital costs. Drummond and colleagues (1987) suggest many methods of overhead cost allocation including direct allocation, stepdown allocation, and simultaneous allocation. The authors point out that the choice of method used should depend on the importance of overhead costs in the analysis. Capital costs can also be measured in a variety of ways. Drummond and associates (1987) recommend use of the equivalent annual cost method, which annuitizes the initial expenditure of the asset over its lifetime. Regardless of which method is used, researchers should state how overhead costs were allocated and how capital costs were measured, since the choice of method may affect results.

Volunteer contributions and other types of donations are common in drug abuse prevention programs. Donated goods and time represent a benefit to the program, but they can also be hidden costs since volunteers often require training, facilities, office supplies and equipment (such as telephones and photocopies), and other support to perform their jobs effectively. Any assumption in the calculation and comparison must be made clear to decisionmakers in order to present a complete picture of the costs of a program. If the study is being conducted from a societal perspective, it is very important to include volunteer labor and donated goods and services as program costs. Even though the program itself does not pay for these goods and services, they are essential to the functioning of the program and represent resources that could have been used elsewhere. That is, the analysis should account for the opportunity costs of these donated inputs.

**Units of Analysis.** Standard units of analysis must be agreed upon in order to develop summary measures useful to policymakers. The major units of analysis capture what is normally thought of as program costs (e.g., total costs and costs per youth served), but other units of analysis that focus on specific cost elements (e.g., costs per youth per service component) convey a different type of information

that may say as much about a program's functioning as it does about the expenditure of dollars.

**Other Practical Problems.** Developing cost indicators for prevention programs presents many challenges. While most drug abuse treatment involves adults, most prevention programs target children for whom there is far less research on service use and costs. Table 1 presents direct and indirect core cost indicators, timeframes, and data sources as applied to drug abuse treatment and prevention services.

Many of the treatment cost indicators are applicable to prevention initiatives; however, the timeframes for collecting information and the data sources differ. Table 1 identifies services for youth with co-occurring conditions (e.g., drug use and antisocial behavior) as a core cost indicator. In drug abuse treatment, the service cost information will be defined as for a drug problem and thus more easily recognized as a cost of drug abuse. Table 1 also shows the timeframe for collecting information for persons in treatment as including measures of service use before, during, and after treatment. In prevention research, the period of observation is generally during and after the intervention.

Although some prevention programs systematically collect information on participants' behavior and service use prior to their involvement in an intervention, most programs have little uniformly collected information on participants' behavior or performance for this time period. Table 1 also identifies data sources used in drug abuse treatment and prevention services. While service use records are noted as an information source for both, drug treatment services often maintain client-specific billing records that are seldom available for prevention services.

In sum, table 1 identifies a number of possible indicators and data sources for assessing the costs of adolescent drug use; however, the collection of that data for children and for prevention services is less precise and less routine than for adults and for treatment services.

**TABLE 1.** *Comparing core costs of drug abuse treatment versus drug abuse prevention.*

Core costs	Treatment			Prevention		
	Indicator	Timeframe	Data sources	Indicator	Timeframe	Data sources
Direct	Diagnosed drug problem	During treatment	Treatment provider records	Co-occurring conditions	Before drug use starts	Prevention program records
	Use of health and human services	Before, during and after treatment	Survey data utilization records	Use of health and human services	During and after intervention	Follow-up survey data
Indirect	Illness, injury, mortality	Before, during and after treatment	Survey data utilization records	Illness, injury, mortality	During and after intervention	Survey data utilization records
	Employment performance		Employer	School, community		School records

Additionally, issues of data confidentiality make access to information more difficult for children than adults.

## Moving to the Next Stage of Economic Evaluations of Drug Prevention Programs

Although many contend that drug prevention programs are more cost-effective than treatment, there is little evidence of their financial costs and benefits. The lack of research in this area reflects the complexity of quantifying the value of intangible benefits (e.g., increased school productivity) and problems in measuring outcomes that do not generally occur until many years after a program's completion.

The costs and benefits of drug treatment services have been the focus of several studies and scientific meetings (Cartwright and Kaple 1991*b*; IOM 1990). However, there are no comparable efforts under way to assess the economic costs and benefits of drug prevention programs. Researchers need to rigorously evaluate the outcomes of drug prevention programs, to document the costs of achieving the outcomes, and to assess whether the benefits of programs exceed the costs.

The ALPHA Program, an early intervention program for Florida at-risk youth, provided an excellent opportunity to undertake such an assessment. Since 1979, the Pinellas County ALPHA Program has been jointly sponsored by the Pinellas County School Board and Operation PAR (parental awareness and responsibility). In 1993, the Johns Hopkins University, with NIDA funding, became a sponsoring partner with primary responsibility for evaluating the program's effectiveness.

The NIDA-funded evaluation research effort, called the ALPHA Prevention Project, is investigating whether an elementary school program for at-risk children has impact on early adolescent drug use. The research addresses this issue by linking an existing drug prevention program for at-risk children (the ALPHA Program) with an existing annual survey (the Omnibus Survey). The ALPHA Program is a school-based drug prevention program that targets fourth and fifth graders with aggressive behavior, social withdrawal, learning problems, and low self-competence. The program is operated by Operation PAR in cooperation with the Pinellas County

School Board. The semester-long “pullout” program intervenes with the targeted risk behaviors through behavior management strategies, social skills strategies, and curricular and instructional strategies. Prevention research with children who are at higher-than-average risk for later drug use serves two needs. It contributes to a continuum of drug use interventions by filling the gap between the prevention efforts directed at all children in a population and the interventions directed at children who may have frequent or problem drug use. It also presents an opportunity to advance researchers’ knowledge about the etiology of drug use by using the prevention program to test hypothesized causal factors, specifically aggressive behavior, social withdrawal, learning problems, and low self-competence. This assessment’s specific aims include investigating the impact of the ALPHA Program on age of initiation of use, frequency of use, and problem use; developing and implementing a protocol to assess the costs and benefits of the ALPHA Program and producing a technical assistance manual for drug prevention costs and benefits research; and investigating the effectiveness of screening procedures, identifying perceived barriers to program participation, and characterizing the process of transition out of the program. These last three issues are critically important to the design of drug prevention programs for at-risk children.

Central to all three aims is collaboration with two major ongoing activities. The authors’ linking of a drug prevention program for at-risk children (the ALPHA Program) with an annual survey (the Omnibus Survey) produces a collaboration that allows for testing of the effect of a drug prevention program for at-risk children without bearing the costs of developing, refining, and implementing the program. The Pinellas County School System Omnibus Project is an annual survey of the cohort of children in Pinellas County who entered kindergarten in 1989. They became eligible for the ALPHA Program in the fall of 1993. The Omnibus cohort will be assessed annually using teachers and parents to report on a wide range of child and family characteristics from spring 1990 through spring 2002. Collaboration with Omnibus includes access to data on the Omnibus cohort, additional assessments added to the annual surveys from spring 1993 through spring 1997, and an agreement to work together to trace and assess mobile children and families. The authors have also negotiated access to all school data concerning grades, achievement test scores, attendance, special education services, disciplinary removals, suspensions, expulsions, and dropout prevention services. Collaboration with Omnibus allows for substantially reduced data collection costs by adding research assessments to the Omnibus assessments. In addition, it is expected

that collaboration with Omnibus will increase response rates because of the extra resources available to Omnibus for tracing the cohort. Another advantage is access to prospectively gathered data from kindergarten through second grade, which enhances baseline information.

## Conceptual Model and Design

The conceptual model of drug use under investigation is built upon social learning theory (Bandura 1986), which hypothesizes that behavior is learned through observation and reinforcement. This theoretical framework concentrates attention on the behaviors that children observe and how others respond to their behavior. The social learning model is a conceptual framework used in earlier school-based prevention research (Werthamer-Larsson et al. 1991) and connects the authors' research with existing literature on effective drug prevention programs. Using general principles of social learning theory, the authors hypothesize that child social behavior problems (aggressive behavior and social withdrawal) are reinforced by ineffective behavior management practices (i.e., teachers and parents paying attention to social behavior problems and ignoring prosocial behavior). As social behavior problems continue over time, children are rejected by nondeviant peers and accepted by deviant peers, some of whom may be drug users. These affiliations may lead to a child's drug use through observational learning. Using recent elaborations of social learning theory concerning incompetence (Langer and Park 1990), the authors additionally hypothesize that children with learning problems or low self-competence have a greater propensity for modeling deviant peer behavior. Parent drug use may influence the child's drug use through observational learning (modeling drug use) or through ineffective behavior management practices that reinforce social behavior problems. Family conflict may influence the child's drug use through observational learning (modeling aggressive behavior) or through ineffective behavior management practices that reinforce social behavior problems. Availability and use of drugs by role models within a child's neighborhood may influence drug use through observational learning. Once drug use is initiated, reinforcement contingencies in a child's environment maintain the use. The ALPHA Program seeks to modify individual characteristics that are hypothesized causal factors of adolescent drug use, allowing researchers to test the relationship between changing levels of personal risk and drug use outcome across different social environments.

The authors' design is a field experiment with internal and external controls. At-risk children at four elementary schools feeding into the ALPHA Program are randomly assigned to the ALPHA Program or the internal comparison group, and at-risk children attending two similar schools become the external comparison group. The children in the internal comparison group at the four ALPHA feeder schools provide an important comparison for children receiving the ALPHA Program because they are within the same school context. However, since children participating in the ALPHA Program will return to classrooms and could potentially share information and skills learned in ALPHA with comparison children, a group of children in two other schools who are not likely to learn information and skills from returning ALPHA students are also needed.

The authors pretested all children at the end of third grade to obtain preintervention baseline data for a check on the success of randomization, for modeling developmental trajectories, and for identifying subgroups that might respond differently to the intervention. Screenings were conducted at the end of third grade, beginning of fourth grade, end of fourth grade, and beginning of fifth grade to identify at-risk children. The screening consists of an interview with the teacher, during which the teacher rates every child in the class; recent grades; and a group-administered child interview about self-esteem. Screening instruments are on op-scan forms, allowing for rapid scale scores review.

Children classified as at risk (mild, moderate, or severe aggression; social withdrawal; learning problems; or perceived incompetence) at the ALPHA schools were randomly assigned using blocking with fixed allocation to intervention (ALPHA) or control (internal control) conditions. Ten children from each school (block) were randomly assigned (with a 1:1 allocation ratio) each semester during fourth and fifth grades. Children at each school were randomly assigned after excluding those with severe learning disabilities, attention deficit disorder, or severe emotional disturbance. The excluded children are served by special education services. In addition, assignments were made after consent was obtained to make the groups as comparable as possible.

The intervention group, internal control group, and external control group will be assessed at the end of fifth grade, end of sixth grade, end of seventh grade, and end of eighth grade (spring 1995 through spring 1998). Four posttests allow the authors to examine the pattern of drug use as the child makes the transition to middle school.

## The Influence of a Diversity Perspective on Developing a Common Set of Methods for Program Impact and Cost-Analyses

The authors' approach to developing a common set of methods for both program impact and cost-analyses stems from a perspective that acknowledges the diversity among participants, program services, and program impacts. Children and families in the population base for a prevention program have widely varying needs, highlighting the importance of methods that adequately represent type and level of need in the sample of participants selected for investigating program impacts. Similarly, programs may address diversity of participant need by altering the pattern of services delivered to participants, highlighting the importance of methods that measure a range of program services that vary in intensity, frequency, and duration. Garnering support for prevention programs is easier when information is available about diverse conceptions of drug use, highlighting the importance of measuring a broad range of drugs and drug-related outcomes.

To promote research and service programs that consider the range of participant characteristics and intensity of service needs, the authors developed four methods that simultaneously enhanced an assessment of program impact and cost research.

**Methods To Represent Diverse Participants.** Consent strategies were divided into three stages, with the first stage including all parents in the study group and succeeding stages involving only parents who had not responded to the preceding stage. The standard procedure consisted of an article placed in each school's newsletter as a brief introduction to the project, a brochure sent to each parent/guardian of a child, a letter inviting parents to the dinner meeting, and a dinner meeting held at each school. The second stage targeted parents who had not responded in the first stage and consisted of phone calls to parents to remind them about the project and to discuss any questions or concerns they had, sending a consent form home with the student, and sending an additional consent form through the mail with a self-addressed, stamped return envelope. The third stage targeted those parents not responding to the second stage, and involved home visits and principals calling parents. In preliminary analyses of the consent strategies data (using consent process data for fall 1993 only), it was found that 63 percent of everyone enrolling in the project consented with the first stage standard procedure, while 16 percent needed the second stage and 21 percent needed the third stage. It was found that

the risk levels of children vary across the families consenting to each stage, suggesting the importance of using targeted consent strategies to ensure that samples represent a wide range of risk for impact and cost research.

**Methods To Measure Diversity in Participants.** Information from children, teachers, and the Pinellas County School System was used to create risk scores for children in three areas: (1) low self-esteem, (2) learning problems, and (3) conduct problems. An empirically derived cutpoint was used to divide the continuum of scores into risk versus nonrisk. Generally, if a child has risk in a specific area, that child is in the bottom third of the distribution for the sample (i.e., two-thirds of the children are feeling better about themselves than the at-risk child, or two-thirds of the children are learning better than the at-risk child, or two-thirds of the children are behaving better than the at-risk child). Risk in any one of the three areas was used to select children for the ALPHA Program. All at-risk children in the four ALPHA feeder schools were ranked by risk, and children were assigned to intervention and internal comparison conditions successively, in order to represent a range of risk severity in the intervention and control groups. The majority of at-risk children identified over the late elementary school period were experiencing conduct problems alone (38 percent) or in combination with learning problems (15 percent). Children experiencing self-esteem problems alone (13 percent) or learning problems alone (12 percent) accounted for one-fourth of children at risk, while children experiencing risk in all three areas (learning, conduct, and self-esteem problems) were relatively rare (2 percent).

**Methods To Represent Program Diversity.** During year 1, the ALPHA research team collaborated with the ALPHA Program staff to develop a service plan for documenting the student's specific problems, services planned to address each problem, services delivered to address each problem, and the student's monthly outcome for each problem. This general procedure has been used during all four semesters of intervention (fall 1993 through spring 1995). During the first year of intervention (fall 1993 through spring 1994), counselors completed the service plan by writing in the student's problems and the planned services. This information was later coded and transferred to a form for data entry. During the second year of intervention (fall 1994 through spring 1995), codes were revised to correspond with assessment items from the teacher, family, and child interviews, allowing direct comparisons with project assessments conducted before and after intervention. In addition, the form was revised so that problems and services were entered as codes by the

counselors, eliminating the step of transferring information to a separate form for data entry.

A direct observation procedure was also developed in order to have another method for documenting the services delivered to individual students. Project staff observed children in intervention classrooms biweekly during two semesters of intervention (fall 1994 through spring 1995). Both the day of the week for observation and the observer varied over the course of the semester. Observations were conducted whenever students were with ALPHA Program staff (observers did not follow the students to their classes of art, PE, or lunch and did not observe on ALPHA field trips). The observation form includes identifying information for children observed, the classroom location, the date of observation, and the staff person completing the observation form. Observations about the type of classroom activity, the start time and end time of the activity, staff involved in the activity, and children involved in the activity are entered on the direct observation form using the same codes that were developed for the service plan. Preliminary analyses of these data indicate that elements of the intervention are occurring on a frequent basis including curricular elements such as individual help from the teacher; math in a small group; and behavioral elements such as praise, proximity control, specific feedback, and cuing.

Methods for Measuring Diverse Outcomes. Primary impact variables are whether drug use has started, age at first use, and frequency of use for specific drugs used by youths (alcohol, tobacco, inhalants, and possibly marijuana and cocaine). Information also will be obtained on indicators of problem drug use. Empirical work suggests that the age of initiation of use is an important outcome in drug prevention research (Newcomb et al. 1986; Robins and Pryzbeck 1985). In addition, a number of researchers have suggested the importance of distinguishing frequency of use from problem use (White and Labouvie 1989; Newcomb and Bentler 1989). Problem use augments data about frequency and quantity of drug use with contextual characteristics of the drug use. Hughes and colleagues (1992) identified patterns of drinking in adolescence by assessing frequency, quantity, and context of use (where, when, with whom, and how alcohol was obtained). The pattern of problem drinking that emerged from this enriched data was characterized by binge drinking, problems with the law or accidents, problems with friend or relatives, and problems in school.

## The ALPHA Prevention Project: Applying Economic Methods and Issues to Drug Prevention Programs for High-Risk Youth

One of the distinguishing features of this study is its focus on costs associated with adolescent drug abuse. This emphasis may lessen the financial costs, but it should make the comparison more useful to policymakers accustomed to operating within a budgetary framework that is generally service- and age-group specific. Potential savings, therefore, will be a more tangible concept. Also, given the current state of knowledge about the long-term effects of drug abuse prevention, this approach may more accurately reflect the benefits of the program.

This study will conduct several parallel but separate assessments of the costs and benefits of the ALPHA Program. These assessments take advantage of the project field experiment in which fourth and fifth grade at-risk youth are randomly assigned to one of four groups: the ALPHA Program, the internal control group, and two external control groups. The project will document the core costs of the services (health, mental health, social, and academic) provided to at-risk youth in all four groups.

The specific aims of this component of the evaluation are to: (1) assess whether the ALPHA Program is a worthwhile investment of resources; (2) evaluate the extent to which ALPHA Program resources are deployed in an efficient manner to achieve its goals; and (3) document the approach that can be used for an assessment such as this conducted at the State, county, or local level.

With the first aim, the evaluation team seeks to determine whether the benefits of the program outweigh the costs, thus justifying an investment in a program of this type. The second aim of this project is based on an assumption that the program goal is desirable but should be pursued using the most cost-effective strategy. The final aim is to provide evaluators with the technical assistance needed to undertake similar analyses. To assure that thoughtful consideration is given to the methodologic issues involved in this analysis, the Costs and Benefits Workgroup includes a multidisciplinary team consisting of two economists, a biostatistician, an accountant, a health services researcher, and a drug abuse prevention researcher.

To assess whether the benefits of the ALPHA Program outweigh the costs, the project will compare the monetary costs of the

intervention efforts with their benefits expressed in monetary terms. Expenditures will be documented for the cost of services (health and nonhealth), and estimates for valuing outcomes associated with less problem drug use (e.g., increased school productivity) will be developed. The outcomes will be compared to those of other at-risk youth assigned randomly to one of the three control groups. Since the youths are randomly assigned, differences in cost can be attributed to the program.

The major unit of analysis for the assessment of costs will be annual costs per person. For the purpose of deriving this measure, total annual costs will be assessed for each group of youth. Other possible analytic program cost indicators (e.g., costs per program days, costs per FTE staff) that will be compared are noted in table 2. Also presented in table 2 are the data required to develop each measure.

Table 3 identifies the measures of costs and effectiveness that will be examined in this assessment. Information on ALPHA Program costs and the Pinellas County School System's usual efforts with youth in the control groups are obtained using a data collection instrument. The costs and benefits of the the ALPHA Program will be compared with those of the internal control group as well as the two external control groups. Issues of concern in performing this analysis include the following.

- *Use versus abuse:* As noted above, the cost of illness methodology is well developed for estimating the economic consequences of drug abuse and dependence. However, procedures are less well defined regarding the consequences of drug use, rather than abuse. Data on health and nonhealth services provided to youth engaged in alcohol or other drug use will be collected and an assessment made of the extent to which services use should be attributed to drug use rather than academic or behavior problems unrelated to drug use. Similarly, estimating other related costs will be problematic. Data will be collected on school truancy, and an effort will be made to assess how much of the truancy is drug use-related or symptomatic of other problems in the child's life.
- *Care in making assumptions:* The approach to making assumptions in the economic valuation of outcomes (e.g., increased school productivity) will be carefully reviewed prior to making any recommendations. Assumptions will be made separately regarding the impact of using particular drugs (tobacco, alcohol, inhalants, and other drugs).

**TABLE 2.** *Intervention program cost units of analysis.*

	Program cost indicators	Data requirement
Major unit of analysis	Total costs per semester	Total annual costs: Year 1, Year 2, Year 3
	Cost per youth served	Annual number of youth served, cost per semester: Year 1, Year 2, Year 3
Other units of analysis	Change in program cost from Year 1 to Year 2 to Year 3	Total annual costs: Year 1, Year 2, Year 3
	Cost per semester or program days	Number of semesters or operating days: Year 1, Year 2, Year 3
	Cost per FTE staff	Number of FTE staff: Year 1, Year 2, Year 3
	Cost per youth per service component	Total costs of particular service components
	FTE staff per youth served	Number of FTE staff Number of youth served
	Share of operating expenses devoted to program administration	Specific operating expenses for administration staff, overhead (e.g., building, lights)

- *Identifying an appropriate timeframe:* The timeframe for projecting expected benefits will require thoughtful consideration. For some, the benefits of the intervention programs may last long after the intervention program has ended; for others, the benefits may be less durable. Funding will permit collecting outcome data for only a 3-year followup period, so outcome findings for the project for years 1 and 2,

**TABLE 3.** *Alpha program assessment: types of costs and benefits.*

Costs
Alpha Program intervention costs
School system intervention costs
Tangible benefits*
Core costs
Direct costs
Health and human services use related to drug use
School service use (visits to counselors, teachers, mental health specialists)
Nonschool service use (visits to medical providers, counselors, etc.)
Indirect costs
Productivity (affected by absenteeism, illness, injury, mortality)
Earnings
Other related costs
Direct costs
Juvenile justice system
School truancy
Indirect costs
Family burden
Juvenile crime
Class setting
Intangible benefits*
Outcome variables
Drug use
Age of initiation of use
Frequency of use for specific types of drugs
Problem use of drugs
Mediators of outcome
Aggressive behavior
Academic competence
Self-competence/self-esteem

**KEY:** \* = Because the costs of drug abuse are avoided when drug abuse is prevented, these costs are actually the benefits of a drug abuse prevention program.

as well as findings from other studies, will be used to develop a recommendation for a time period to project program benefits.

## Secondary Data Analysis

To explore the potential long-term benefits of drug abuse prevention, a secondary data set called the National Longitudinal Survey of Youth (NLSY) will be used. This data set is unique in that it offers data on alcohol and other drug use, labor market outcomes, and socioeconomic and demographic characteristics of 12,686 individuals who were 14 to 22 years of age in 1979. This cohort has been surveyed every year, with a very low rate of attrition and missing data.

The ALPHA Program timeframe limits the study to 5 years. Many of the benefits of the program, however, are likely to become apparent long after the period of analysis has ended. These long-term benefits may be easier to measure than the short-term benefits because the former can manifest themselves in the labor market. Children's school productivity and self-esteem are important outcomes; their worth, however, is difficult to quantify in monetary terms that cost-benefit analysis requires. The long-term outcome of adult wages is different. As an example, assume that multivariate regression analysis shows that adolescent drug users earn lower wages as adults compared with people who were not adolescent drug users. Prevention of adolescent drug use, then, is associated with higher earnings or greater productivity as an adult. This increased productivity can be measured easily through the wage rate—the present discounted value of the wage difference between adolescent users and nonusers represents one benefit of drug abuse prevention.

The wage rate is just one adult labor market outcome that may be affected by adolescent drug use. Labor supply, job mobility, occupational choice, and unemployment are other adult outcomes that are interesting and can be measured. Previous researchers in the field of drug abuse and labor market outcomes have suggested that drug abuse may affect labor market outcomes indirectly rather than directly. Adolescent drug and alcohol use, for example, might have a negative impact on schooling, and this negative schooling outcome might depress adult earnings. Adolescent drug use, then, has affected adult labor market performance indirectly through its impact on schooling.

Using the NLSY data set, it is possible to explore the direct and indirect relationships between youthful drug use and subsequent adult labor market outcomes. If it is found that adolescent drug use has a negative impact on

these outcomes, the loss attributable to drug use can be quantified. These results may be useful in a CBA or in another application.

## CONCLUSION—THE CHALLENGE

CEA and CBA are important analytic tools that have the ability to help communities make better decisions about the use of prevention programs or services. The tools are not value neutral, and those who request such analyses, who use them, and who perform the analyses all bring their biases to the choices and the decisions made. The findings can be used appropriately or misused in the decisionmaking process. Indeed, the decision to include economic analysis in the evaluation of programs is itself value laden.

While drug abuse prevention and treatment programs must defend their existence through the use of sophisticated CEA/CBA techniques, many other medical treatments, such as coronary artery bypass grafts or efforts to control high blood pressure, are seldom subject to the same level of scrutiny. Reasons for this are only speculative. However, the perception of the “typical” drug user as someone who lacks personal will and is unworthy of public or private dollars is one likely contributing factor. As such, efforts to apply and use the results of CEA/CBA in the decisionmaking process should critically consider the purpose, the assumptions, and the limitations of these methodologic techniques for evaluating drug abuse prevention programs. As noted by Weisbrod (1985), these techniques are not a “substitute for our own judgment but an aid in using judgment.” They are a tool that can help decisionmakers better understand the opportunity costs involved in the implementation or continuation of particular policies or programs, allowing them to utilize limited funds most efficiently.

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