

Cost-Benefit/Cost-Effectiveness  
Research of Drug Abuse  
Prevention: Implications for  
Programming and Policy

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# Introduction

*William J. Bukoski*

In an era of managed care, downsizing of Government services and budgets, the advent of a science of drug abuse prevention, and confronted with increases in adolescent drug abuse, the practice of drug abuse prevention finds it necessary to address a number of interrelated critical questions in order to guide future program development and policy: What scientific evidence supports the efficacy and effectiveness of drug abuse prevention programs and policy currently in effect in schools, the workplace, and communities across the country? What are the costs associated with those programs and are those programs and policies beneficial to those receiving them? How can the practice of prevention be improved by the emerging science of drug abuse prevention? And, what prevention programs and services have demonstrated their cost-effectiveness or cost benefit and can be implemented in the evolving healthcare system under the pressures of managed care?

Agency administrators of drug abuse prevention programs are seeking science-based answers to these questions in order to plan and implement drug abuse prevention programs that reach the populations most at risk of drug abuse with high-quality, proven, and cost-efficient approaches to counter the increased pressures to use illicit drugs that youth, young adults, and adults are experiencing in our society. Health administrators for managed-care, fee-for-service, and public and private healthcare plans are exploring a wide array of health benefits to provide in their healthcare plans to include the introduction of drug abuse prevention services.

However, to make wise decisions concerning the use of limited resources, drug abuse prevention program administrators, healthcare providers, and insurers are asking tough questions concerning the efficacy, cost, and benefits to be derived for their clients by providing drug abuse prevention programs and services under the auspices of their agencies' healthcare programs and plans. While the adage that "an ounce of prevention is worth a pound of cure" still has currency in the current debate, empirical data gathered through rigorous scientific methods are being demanded by the field so that policy making can be improved by the adoption and implementation of

science-based drug abuse prevention programs that actually work in the real world.

In response, the emerging science of drug abuse prevention is beginning to provide practical answers for these types of questions. For example, over the past 5 years, the science of drug abuse prevention (Bukoski 1997; Mrazek and Haggerty 1994; Sloboda and David 1997) has yielded a number of important findings and emerging prevention principles that indicate adolescent drug abuse prevention can be prevented by theory-based approaches that focus on social skill development; drug resistance techniques; family monitoring and communication skills; strengthening antidrug abuse norms and perceptions of social disapproval; promoting increased awareness and salience of the perception of harmful effects resulting from drug use; creating positive social networks; promulgation of preventive health policies; and community mobilization for prevention. This research also suggests the importance of the variety of implementation actions that are essential to promote high fidelity and quality of program delivery leading to positive program outcomes. These implementation techniques include the employment of interactive teaching methods; staged learning through behavioral analysis to include coaching, role modeling, practice, reinforcement, and training for generalization; and use of multiple developmentally appropriate booster sessions.

However, hard data on the cost-effectiveness or cost-benefit of specific drug abuse prevention programs have proven to be elusive. Only a handful of studies have been conducted over the past 20 years, providing suggestive evidence that exposure to drug abuse prevention programs could be justified based on data derived from cost-effectiveness and cost-benefit studies. As a result of this desperate need for additional research to be focused on this topic, the National Institute on Drug Abuse (NIDA) convened a group of experts in the fields of drug abuse prevention research and economic evaluation studies (cost-effectiveness and cost-benefit) to assess the current scientific knowledge base of the efficacy of drug abuse prevention programs, to explore state-of-the-art economic evaluation methodologies and their application in the future to analysis of the cost-effectiveness and cost-benefit of drug abuse prevention, and to identify possible research directions for these types of studies that are needed by the field of drug abuse prevention. Scientific papers from this meeting were then reviewed, revised, and assembled to form this publication.

This NIDA monograph attempts to place in perspective a number of salient scientific and practical issues by providing a timely and

relevant review of scientific evidence that supports drug abuse prevention programs and policy, by discussing methodological and analytic developments in conducting cost-benefit and cost-effectiveness studies in the area of drug abuse prevention, and by assessing the implications of these research studies for the development in the future of evidence-based drug abuse prevention that would meet the highest scientific standards of excellence. This research could lead to high-quality, accessible, effective, and cost-efficient drug abuse prevention services offered in a variety of venues to include schools, communities, the workplace, and the healthcare system.

In the first chapter, Merrill and Fox discuss in detail the cost impact of drug abuse on Federal entitlement spending. This chapter provides a unique perspective on the multimillion-dollar drain annually on the Federal entitlement budget to pay for the health consequences of drug abuse in our society. These costs are hidden in the budgetary process, and this chapter provides interesting data concerning actual dollar savings that could be realized through more effective drug abuse prevention services. The next four chapters by Evans; Botvin and colleagues; Catalano and colleagues; and Pentz provide a solid review of the scientific literature concerning the efficacy of drug abuse prevention programs implemented in schools and for high-risk youth. Scientific evidence presented in these chapters suggests that drug abuse prevention programs that have been tested under rigorous controlled conditions have demonstrated impact in reducing the prevalence and incidence of adolescent drug abuse. Preliminary evidence provided in these chapters suggests that exploratory analysis of empirical data is beginning to yield rudimentary scientific evidence of the cost-effectiveness of drug abuse prevention programming.

In the remaining chapters, a technical discussion of the quality and applicability of cost evaluation methodologies for the analysis of drug abuse prevention is presented. For example, Woodward provides a definitional overview of the methods of cost-effectiveness, cost-benefit, and cost-offset methodologies. Zarkin and Hubbard provide an insightful and technically sound econometric cost evaluation methodology and framework for assessing the cost-effectiveness and cost-benefit of drug abuse prevention programs. In their chapter, Plotnick and colleagues report on applying cost-effectiveness and cost-benefit methods to the assessment of a family-focused drug abuse prevention and treatment program for high-risk youth and families involved in methadone maintenance therapy. Then, Lillie-Blanton and colleagues discuss salient issues for applying cost-evaluation techniques to drug abuse prevention programs, citing advantages of

various approaches and methodological barriers that still exist hindering program development and cost evaluations. Finally, DuPont provides a concluding chapter that begins to assess the implications of cost-effectiveness and cost-benefit analyses for drug abuse prevention policy.

Obviously, this NIDA monograph only begins the scientific conversation on the relevance, appropriateness, and practical value of conducting scientifically valid economic evaluations of drug abuse prevention programs that are implemented in schools, communities, places of work, and healthcare settings across the country. This monograph suggests that science has an important role in the discussion currently enjoined by drug prevention practitioners, policymakers, and health funding entities across the country and that the scientific community stands as a ready partner with prevention practitioners in the development of scientifically sound economic evaluation data to guide future drug abuse prevention programs and policy.

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# The Impact of Substance Abuse on Federal Spending

*Jeffrey Merrill and Kimberley Fox*

## THE USE OF EPIDEMIOLOGY IN PUBLIC POLICY FORMULATION

The purpose of this chapter is to demonstrate how epidemiologic research can be a powerful tool in estimating the costs of substance abuse to society.

Traditionally, epidemiologic studies have provided information on how to develop and target interventions aimed at preventing and curtailing the spread of a specific disease. But epidemiology may be used to examine a risk factor in terms of more than simply the etiology of a disease. For example, by studying the effects of a single risk factor on multiple diseases, the impact of that factor on overall healthcare costs or government spending may also be quantified.

This notion is extremely applicable with respect to estimating the full impact of substance abuse on society. Much epidemiologic evidence already exists on the relationship between smoking, drinking, the use of drugs, and adverse health outcomes. Already, this research has led to changes in public policy, from bans on smoking in public places due to mounting evidence of the impact of passive smoke, to greater enforcement of drunk driving laws resulting from the evidence linking drinking to traffic accidents.

By combining studies looking at each of these substances as risk factors for a variety of diseases, a more complete picture of the heavy toll that substance abuse takes on society can be seen. Doing this will help provide evidence of why, ironically, greater investment in substance abuse prevention and treatment is even more necessary as efforts are intensified in other areas to cut government spending.

## PAST RESEARCH HAS LAID THE FOUNDATION

Considerable research already exists, particularly as it relates to the impact of cigarette and alcohol use on the cost of healthcare.

### Costs of Smoking

Quantifying the costs of smoking has been a major public health issue since the 1960s. Annually, the Surgeon General issues a report on smoking and health that summarizes all current epidemiologic evidence on the relationship between smoking, disease, and death. The most noteworthy of these was *Reducing Health Consequences of Smoking: 25 Years of Progress* (U.S. Department of Health and Human Services [DHHS] 1989), issued in 1989, which reported smoking attributable fractions (SAFs) for 10 selected causes of death using data collected in a 4-year, 50-State study conducted by the National Cancer Society. These SAFs represent the proportion of deaths for a given disease that could have been avoided if cigarette smoking were eliminated.

Many economic cost studies have relied on these estimates to calculate the number of smoking-attributable deaths for specific regions and the number of years of potential life lost as a result of smoking. Some have also employed these mortality statistics to estimate hospital utilization and costs. However, mortality SAFs, which measure smokers' risk of dying of a disease, are different than morbidity SAFs, or smokers' risk of contracting a disease. Thus, mortality SAFs cannot be used reliably for estimating morbidity or hospital costs.

Recognizing the shortcomings of using mortality SAFs in estimating healthcare costs, Rice and colleagues (1990) developed a different methodology for identifying smokers' attributable risk of utilizing health services using National Health Interview Survey (NHIS) data. For people who had neoplastic, circulatory, and respiratory diseases, Rice analyzed the use of hospital days and physician visits by smokers compared to nonsmokers by age and sex. From these comparisons, Rice was able to calculate morbidity-attributable risks, which were then applied to hospital and outpatient expenditures for these diseases to estimate annual smoking-related healthcare costs. While not as disease-specific as the mortality-based studies, Rice's methodology set a standard for estimating annual healthcare costs associated with smoking.

In addition to these point-in-time estimates, others have studied the lifetime costs of smoking. For example, Manning concluded that the cumulative impact of excess medical care required by smokers at all ages outweighs the savings to these programs resulting from the shorter life expectancy of smokers (Manning et al. 1991). Using survey data from the National Medical Expenditures Survey (NMES) and NHIS, Hodgson broke down the differences in expenditures between smokers and nonsmokers revealing that, over the long term, payers that cover the younger age groups (i.e., private insurers and medicaid) bear a greater burden of smokers' costs than does medicare, for example. These studies have current relevance in countering the arguments that measures designed to reduce smoking (e.g., increased cigarette tax) will, in fact, increase healthcare costs.

Other studies have estimated the costs of specific diseases (Harwood et al. 1984), specific subpopulations (Phibbs et al. 1991; Rivo et al. 1989), distinct hospital departments (Hauswald 1989), State health expenditures (Rice and Max 1992; Spiegel and Cole 1990) associated with one or more substances, or for specific payers (Adams et al. 1993). Most of these studies employed some version of the Rice or Harwood (see below) methodology. The study by the National Center on Addiction and Substance Abuse (CASA) also starts with Rice's and Harwood's previous work, incorporating both the concept of disease-specific risks attributable to substance abuse and the marginal effects of substance abuse as a secondary diagnosis.

### Alcohol and Other Drugs

At present, the most comprehensive studies on the economic costs of alcohol and other drug use are those commissioned by the Alcohol, Drug Abuse, and Mental Health Administration in the 1980s. Cruze and colleagues (1981) and Harwood and colleagues (1984) studied the combined cost impact of alcohol and drug abuse and mental illness to society. Both studies, conducted by the Research Triangle Institute (RTI), estimated the total economic impact of alcohol and drug abuse and mental illness (ADM) disorders, including the direct costs of diagnoses and treatment of patients suffering from these illnesses, indirect costs associated with loss of earnings due to reduced or lost productivity, premature death, and other related costs.

In their estimates of treatment and costs, the RTI studies refined previous estimates by "identifying specific diseases and illnesses that are related to alcohol, drug abuse, and mental illness (ADM) and

allocating costs based on the proportions of the illnesses or diseases that are attributable to ADM” (Cruze et al. 1984). However, these attributable proportions were almost solely alcohol related: no drug-related illnesses were included. Furthermore, for some diseases, estimates ranged from 0.2 percent to 70 percent. Nevertheless, this work did provide an analysis of the alcohol literature and established a clear link between epidemiologic research and cost analysis.

In 1988, Rice and colleagues updated Harwood’s cost analysis (Office of Technology Assessment 1985). Like Harwood, Rice attempted to estimate the total societal costs of alcohol, drug abuse, and mental illness (direct healthcare costs only accounted for 24 percent of these total costs). For estimating direct healthcare costs, however, Rice did not use the attributable percentages employed by Harwood. Instead, a methodology was created for addressing issues of comorbidity. Using the National Hospital Discharge Survey (NHDS), Rice first estimated the cost of alcohol, drug, or mental illness as a primary diagnosis following Harwood’s model. Then, recognizing that secondary diagnoses of substance abuse complicate the treatment of other diseases and thus add to hospital costs, Rice also calculated the additional days of care reported for *all* primary diagnoses that had a secondary ADM diagnosis. Rice acknowledged at the outset that the resulting estimates were low, restricted by the information reported on the medical records. In fact, many studies have documented that underreporting of secondary diagnoses is common, especially for conditions such as substance abuse, which do not require direct treatment but contribute to longer stays and are considered embarrassing by the patient.

## BUILDING ON PAST WORK

Past studies have already provided considerable evidence on the costs of tobacco, alcohol, and drugs to the country’s healthcare system (Rice et al. 1986, 1990, 1991; Harwood et al. 1984; Rivo et al. 1989; Adams et al. 1993; Cruze et al. 1981; Office of Technology Assessment 1985; Shultz et al. 1991*a, b*; Berry and Boland 1977). Some of these studies have applied an epidemiologic approach, identifying etiologic fractions that estimate the percentage of cases of a given illness attributable to one or more of these substances (Rice et al. 1986, 1990; Harwood et al. 1984; Adams et al. 1993; Cruze et al. 1981). Other studies have addressed the impact of only one substance on morbidity (Rivo et al. 1989; Hauswald 1989; Adams et al. 1993; Shultz et al. 1991*a, b*), while others have focused on the impact of a given substance on a specific

disease or medical condition (e.g., alcoholic cirrhosis) (Adams et al. 1993). Finally, researchers have also quantified the impact of substance abuse on the costs to a specific payer (such as medicare) (Center on Addiction and Substance Abuse 1993, 1994; Fox et al. 1995).

Building on this previous work, particularly that of Rice and Harwood (Rice et al. 1986, 1990; Harwood et al. 1984; Cruze et al. 1981), CASA at Columbia University initiated a comprehensive study in 1992 to document the full extent to which all forms of substance abuse contribute to the costs of the healthcare system.

While relying heavily on the prior work, the CASA study goes beyond it in a number of ways. For example, CASA's study quantifies in a single report the total cost of substance abuse in all its forms (tobacco, alcohol, and licit and illicit drugs). It also enlarges earlier efforts to incorporate findings from epidemiologic research in healthcare cost analyses and uses morbidity-related attributable risks. CASA conducted a critical review of the medical and epidemiologic literature linking substance abuse as a risk factor for a wide variety of medical conditions. Based upon the best available epidemiologic studies, CASA's work updates and expands the information available on the proportion of patients who acquired diseases or conditions as a result of the abuse of alcohol, drugs, or tobacco. Combining this review and consultations with physicians and researchers knowledgeable in this area, CASA was able to estimate the magnitude of this problem and its associated costs as they affect the overall healthcare system, public and private payers, and individual services.

The first phase of this project, which examined the extent to which medicaid hospital costs are attributed directly or indirectly to substance abuse, was completed in July 1993 (Center on Addiction and Substance Abuse 1993). This phase found that at least 1 in 5 hospital days billed to medicaid could be linked with the use or abuse of alcohol, tobacco, or drugs. An additional report was released in May 1994 on the impact of substance abuse on medicare hospital costs (Center on Addiction and Substance Abuse 1994). This report, which documented an even stronger influence (1 in 4 hospital dollars) upon medicare costs, also demonstrated the large toll that cigarettes take on people over age 65. More than 80 percent of the medicare hospital costs that were attributable to substance abuse were related to the use of cigarettes and other tobacco products.

But these early phases of CASA's research dealt only with the impact on medicaid or medicare, and focused exclusively on inpatient hospital costs. This chapter not only examines the impact of substance abuse on the total attributable costs of all services including physician care, long-term care, and prescription drugs, but also identifies its costs to all Federal health entitlement programs. In addition, using in some cases a similar approach (i.e., for Social Security Disability Insurance [SSDI]) and, in others, a more prevalence-based method, the authors have estimated the costs of substance abuse on other Federal entitlement programs as well.

## METHODOLOGY

The following is a brief description of the methodology employed by CASA in making these estimates.<sup>1</sup>

### Substance Abuse Impacts Healthcare Costs in a Variety of Ways

In order to estimate healthcare costs associated with substance abuse, costs have been divided into four general categories:

1. Direct treatment of substance abuse.
2. Treatment of medical conditions totally attributable to substance abuse.
3. Treatment of medical conditions for which substance abuse is a major risk factor.
4. Treatment of medical conditions for which the length of stay was extended due to complications arising from a secondary diagnosis of substance abuse.

In general, for each provider group (i.e., inpatient hospital, physician, nursing home, etc.), the costs were calculated by multiplying the numbers of units of service or their costs (e.g., hospital days, physician visits, prescriptions) by the percentage attributable to substance abuse for each disease or medical condition.

The following paragraphs describe how costs were calculated for each of the four categories enumerated above.

Direct Treatment. If discharge or encounter involved, based upon the diagnostic name given to the ICD9 code, a primary diagnosis of either substance dependence or substance-induced psychosis or poisoning, the entire cost was assumed to be for the direct treatment of the substance abuse problem. For these diagnoses, 100 percent of the units of service were attributed to substance abuse.

Treatment of Diseases Totally Attributable to Substance Abuse. In category 1, the costs were specifically for the direct treatment of a substance abuse problem. For the second and third categories, the costs were identified for those cases where a disease or health problem (e.g., trauma) was caused by the use or abuse of a substance, but did not directly involve a substance abuse problem. A case may have had substance abuse as a secondary diagnosis, but this treatment was for the primary diagnosis. In category 2, the costs are those for which the diagnosis specifically mentioned a substance by name (e.g., alcoholic cirrhosis), a diagnosis that the National Institute on Alcohol Abuse and Alcoholism (NIAAA) considers as solely attributable to alcohol (e.g., pellagra), or for which a secondary diagnosis of substance abuse is involved in 100 percent of the cases reported (e.g., esophageal varices). Since all of these cases could be attributed to abuse of either drugs or alcohol, 100 percent of the units of service were considered to be related to substance abuse.

Treatment of Diseases When Substance Abuse Is a Major Risk Factor. From an extensive review of epidemiologic research, CASA identified 70 conditions and diseases that include substance abuse as a major, but not the exclusive, risk factor. These involve diseases such as lung cancer and low birthweight associated with smoking; accidents and cardiovascular diseases associated with alcohol use; and strokes in people under age 65 or acquired immunodeficiency syndrome (AIDS), both of which are associated with drug use. The prospective, population-based, or case control studies used for this analysis often calculated (or provided relative risks that allowed CASA to calculate) a population-attributable risk (PAR) for a specific substance and disease. PAR is an epidemiologic term defining the percentage of cases of a given illness that could be prevented if, in this case, the use of the substance were eliminated.<sup>2</sup> In other words, the PAR for cigarettes and lung cancer is 87 percent, indicating that 87 percent of lung cancers could have been prevented if there were no cigarette smoking. Based on the authors' research of the epidemiologic literature, a PAR was assigned for each of the 70 substance abuse-related diseases. With the help of a medical records coder, the diagnostic codes (ICD9)

associated with these diseases were then identified. For any conditions that involved these primary diagnoses, the associated PAR for that disease was multiplied by the total number of units of service (i.e., hospital or nursing home days, physician visits, prescriptions) reported for that diagnosis to determine the extent to which that diagnosis was attributable to substance abuse.

Two health problems, AIDS and birth complications, proved particularly difficult with respect to estimating their costs resulting from substance abuse. Determining AIDS costs was difficult, given that an AIDS-related condition (such as pneumocystosis) is often the primary diagnosis and AIDS is only listed secondarily, if at all. For example, only 10,000 medicaid recipient discharges listed AIDS as the primary diagnosis, clearly an underestimate. To complicate matters further, even among the cases in which AIDS was a secondary diagnosis, a person's hospitalization may have nothing to do with AIDS (other than to complicate the treatment); e.g., someone may be hospitalized for appendicitis and only coincidentally have AIDS. Thus, these costs could not be attributed to AIDS or substance abuse. To get a more precise estimate of AIDS-related hospital days, the authors identified the primary diagnoses for all medicaid recipient discharges that listed a secondary diagnosis of AIDS. Then, consulting with physicians specializing in AIDS care and research, the AIDS-related primary diagnoses were selected. These AIDS-related hospital days or other health-related care were added to those for patients with a primary AIDS diagnosis and then multiplied by the percentage of cases attributable to intravenous drug use as determined by the Centers for Disease Control and Prevention (CDC) AIDS Surveillance to determine substance abuse-related AIDS days.<sup>3</sup>

Birth complications also required special analysis as they related to the number of incremental hospital days for substance-exposed babies rather than the percent of attributable births. Since the abuse of a substance is not responsible for the admission (i.e., the birth itself), but only for certain associated complications, the marginal impact of those complications needed to be calculated. For alcohol, the number of additional days was calculated by comparing the length of stay for births when an alcohol-related diagnosis was indicated on the NHDS as a secondary diagnosis with those for which there was no such diagnosis. With respect to the impact of smoking, a PAR was applied to low birthweight babies and the number of days was calculated using the methodology described above. However, the length of stay for a normal neonate (2.3 days for each discharge) was deducted from this since, absent the



complication, this number of days still would have been used. For cocaine-exposed babies, costs related to birth complications were estimated based upon both a study by Phibbs and colleagues (1991) of the added days associated with babies exposed to cocaine and other drugs and a study from Los Angeles (Health Care Financing Administration [HCFA] 1990) on the added use of intensive care. The results of the Phibbs study (based on a multivariate analysis) estimated that, in the case of a baby exposed to cocaine, the average length of stay was 11 days longer than for a baby without this exposure. In 1988, the Los Angeles research estimated that 30 percent of these children required intensive care at a cost of \$1,500 per day. To estimate the incremental days attributable to drugs, the total number of births billed to medicaid that involved maternal cocaine use (8 percent of all births) was multiplied by 11 days. A cost per day of \$750 was used, except for 18 percent of the attributable days when a neonatal intensive care unit (NICU) cost of \$1,500 was applied. (These were 1988 costs which were inflated to 1995 levels using the medical care component of the CPI.)

**Additional Days for Medical Treatment Due to Substance Abuse Complications.** In addition to being a risk factor for certain specific illnesses, substance abuse can also complicate any illness and add to the patient's length of stay. For example, substance abuse can compromise the immune system, reducing the body's ability to fight infection. Some substance abuse patients (e.g., with delirium tremens) need to be stabilized before doctors can treat the primary medical condition. To estimate the cost of substance abuse comorbidity, the difference in lengths of stay for a given diagnosis for patients with and without substance abuse as a secondary diagnosis, controlling for age and sex, was computed. The total number of incremental days identified in this way was counted as substance abuse-related days.<sup>4</sup>

Once the PARs were calculated, costs attributable to substance abuse could be estimated. For each payer (i.e., medicare, medicaid, other government programs), the substance abuse-attributable costs (SACs) for a given service  $i$  (e.g., inpatient care, physician services, ER) were calculated using the following formula:

where  $P_d$  is the PAR for a given diagnosis  $d$ ;  $U_{id}$  is the number of units of service (e.g., days, discharges, visits, or prescriptions, depending on the service) for a given service pertaining to diagnosis  $d$ , and  $E_i$  is the amount of expenditures for a given service and payer group. Data on utilization of different services were drawn from the NHDS, National Medical Care Expenditure Survey, National Nursing

Home Survey, and the National Ambulatory Care Survey. Expenditures were based on those reported by the fall 1994 *Health Care Financing Review*.

Aggregating these SACs for each type of service for a specific payer group, and dividing by the total expenditures for all of those services in that payer group, an aggregate attributable risk (AAR) for that payer was calculated [ $AAR = (\% SAC_i) / (\% E_i)$ ]. This AAR was then applied to other expenditures (i.e., dental care, durable medical products, and other professional services and personal healthcare) to calculate the proportion of those services attributable to substance abuse. This was added to the aggregated SAC to obtain a total SAC [ $\% SAC_j$ ] for all services for that payer group.

An exception to this methodology was veterans' healthcare, for which an overall attributable risk was calculated using data from a study by the Department of Veterans Affairs (DVA) (1994). In addition, the percentage of costs in psychiatric hospitals attributable to substance abuse was derived from data reported by the National Association of Psychiatric Health Systems (1993). Overall costs for care in these facilities was obtained from the American Hospital Association (American Hospital Association 1994).

For SSDI costs attributable to substance abuse, a similar approach was used. In this case, based on statistics from the *Social Security Bulletin* (Social Security Administration 1994), the distribution of disease categories leading to eligibility was derived. Then the relevant attributable risks (as used above) for each of these disease categories were applied to the number of individuals in those categories. In addition, based upon data from the Social Security Administration, 43,000 beneficiaries became eligible for SSDI specifically due to a primary diagnosis of substance abuse. Aggregating these substance abusers to those eligible due to diseases attributable to substance abuse (as derived from the disease categories) and dividing this sum by the total SSDI caseload provided a percentage of cases—and thus costs—that were attributable to substance abuse. The assumptions that went into calculating other entitlement costs are explained as part of the Results section below.

It should be noted that these estimates of the impact of substance abuse on healthcare costs are likely to be lower than the actual costs. First, while attempting to pull together all available epidemiologic research on the health effects of substance abuse, more research is needed. The authors' results reflect only the current state of the art in this area.<sup>5</sup> Second, studies reveal that

identification and reporting of substance abuse problems by medical practitioners is poor. For example, estimates of underreporting of substance abuse as a secondary diagnosis run as high as 60 percent. For reasons of confidentiality and concern over insurance reimbursement, physicians are reluctant to record substance abuse unless it relates directly to the primary diagnosis or the treatment plan. Thus, the incremental costs attributable to comorbid substance problems are low. Third, there is little identification of either tobacco use or the abuse of prescription medications on the medical record; thus, the authors' estimates include only the complications of alcohol and illicit drug abuse. Fourth, with the exception of neonatal care, these numbers do not take into account the added costs for intensive care associated with substance abusers who, research shows, require a greater intensity of services.<sup>6</sup> Finally, the authors' estimates do not include general hospitalization costs of caring for people who join the medicaid rolls and benefit from its coverage because of job loss, disability, or poverty related to substance abuse.

## RESULTS

Before discussing the specific results, it may be helpful to put this in the perspective of what is meant by entitlement spending. A report by the Bipartisan Commission on Entitlement and Tax Reform (1994) stated that spending for entitlement programs almost doubled between 1983 and 1993, from \$360 billion to nearly \$700 billion. The commission had been created to "resolve the imbalance between government's entitlement promises and the funds it will have available to pay for them" (Bipartisan Commission on Entitlement and Tax Reform 1994).

Definitions of what constitutes an entitlement program can vary. For the purpose of this chapter, an entitlement is any program to which an individual is entitled to the benefits if he or she meets the statutory definition of eligibility. In other words, in the same way that an individual over the age of 65 who has worked for the required number of quarters is eligible for Social Security and medicare, so too are active military or civil service personnel entitled to health and disability benefits, and veterans with service-connected disabilities can receive health or compensation benefits. In all of these cases, in order to reduce funding, statutory change would be required to alter either the eligibility criteria or benefit levels. This is quite different from a discretionary program, in which funding is not tied to explicit eligibility and benefit criteria.<sup>7</sup>

While this is a slightly broader definition of entitlements than used by the Federal Government, the differences are relatively small with respect to the overall problem.

Regardless of the specific definition used, reducing the size of entitlement programs is a bipartisan concern. In fiscal year (FY) 1995, Federal expenditures for welfare (including AFDC, SSI, and food stamps); health (including medicare, medicaid, veterans' health, and other Federal health programs); retirement (including Social Security, veterans pension, and civil service and military retirement<sup>8</sup>); disability (disability insurance, coal miners black lung, and veterans compensation); and unemployment compensation will total \$835 billion or 55 percent of the Federal budget (figures 1 and 2). Of these, retirement programs will account for about \$366 billion or 44 percent of the total expenditures for entitlements, and health and disability programs for \$377 billion or 45 percent.

While much of the public's attention to entitlements is focused on welfare programs, these actually represent a very small portion (4 percent) of overall Federal outlays and 8 percent of all Federal entitlement payments. This amount not only includes the AFDC program, but SSI and food stamps as well. The single largest entitlement spending category is Social Security and other retirement programs for which eligibility is determined principally by age and years of employment. Thus, the size of these programs is not directly affected by substance abuse. On the other hand, Federal health and disability programs

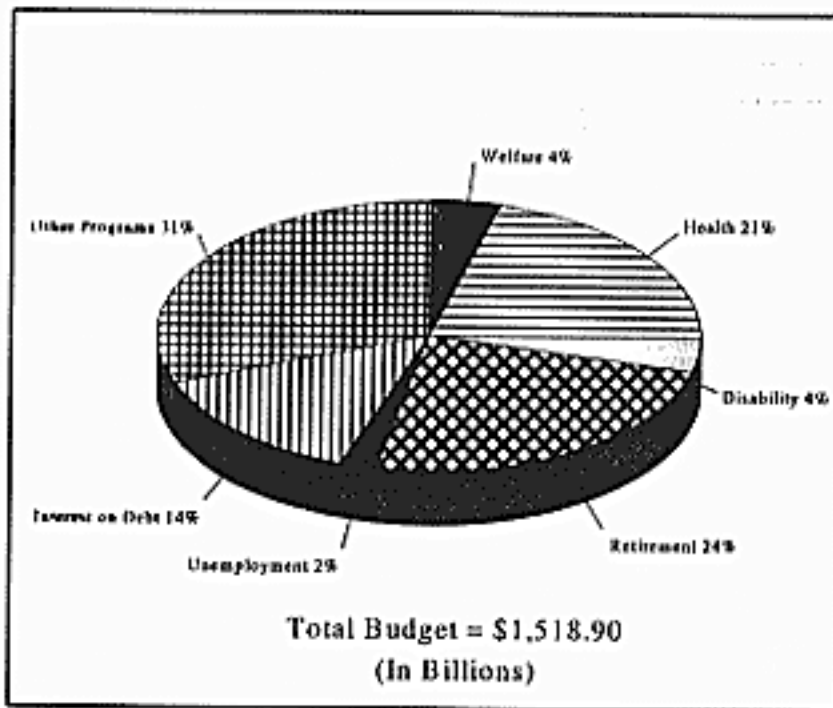


FIGURE 1. *The 1995 Federal Budget.*

SOURCE: Budget of the United States Government, Fiscal Year 1995.

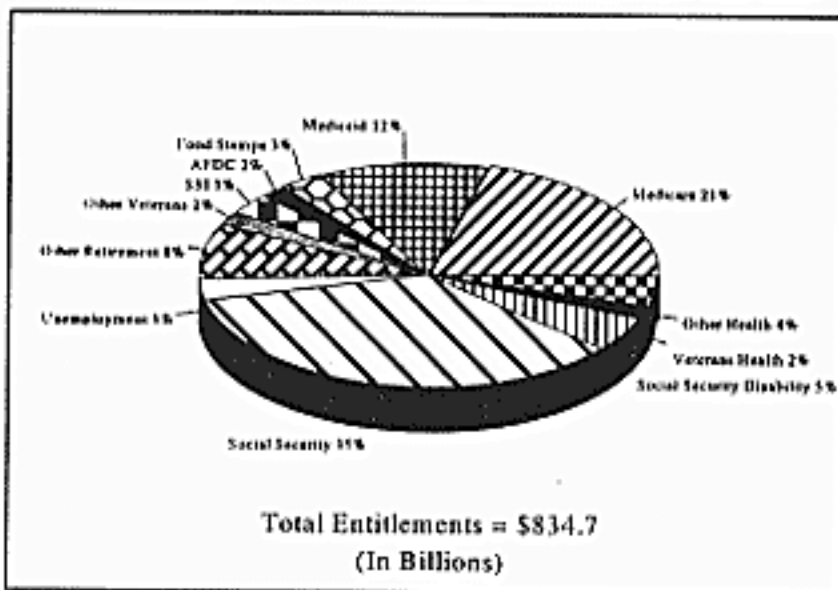


FIGURE 2. *1995 expenditures for Federal entitlement programs.*

SOURCE: Budget of the United States Government, Fiscal Year 1995.

account for more than 45 percent of all entitlement spending, and substance abuse contributes significantly to the size of both of these types of programs. By identifying epidemiologic research on the relationship between the abuse of tobacco, alcohol, or other drugs and specific diseases and applying these relationships to national databases,<sup>9</sup> the authors were able to determine the extent to which substance abuse contributes to the costs of Federal healthcare and disability benefits programs. It should be noted that, while similar relationships may hold between substance abuse and other disability programs (such as Civil Service Disability), no detailed data were available that would have allowed calculation of the impact of substance abuse on those programs. Given this limitation, therefore, the costs accounted for in this report relating substance abuse to disability programs are understated.

As can be seen in table 1, the total impact of substance abuse on Federal entitlement programs can be conservatively estimated to be more than \$77 billion. Of this, \$66.4 billion represents costs directly attributable to substance abuse and \$11.2 billion for expenditures that cannot be saved unless substance abuse is addressed as part of reform efforts. The amount of Federal dollars expended either directly or indirectly as a result of substance abuse would account for nearly 10 percent of total spending on entitlements and 5 percent of the overall Federal budget for FY 1995.

The first column of table 1 reports the costs of health entitlement coverage for conditions attributable to tobacco, alcohol, and other drugs, as well as income assistance provided to individuals who became disabled solely as a result of substance abuse or substance abuse-related illnesses. Health costs include the costs of treating diseases attributable to tobacco, alcohol, and drugs. Disability insurance costs include income benefits paid to individuals who became disabled by smoking-related illnesses such as coronary heart disease or by alcohol or drug abuse. For SSI, this first column includes Federal dollars spent on individuals who became eligible for SSI specifically *because* of their alcohol or drug disability.

Of the \$66.4 billion directly attributable to substance abuse, the bulk is spent on health entitlements, particularly medicare and the Federal portion of medicaid. The SSI costs included in this category (\$442 million) are those benefit payments for the 90,000 disabled beneficiaries whose SSI eligibility is reported to be based solely on a drug- or alcohol-related disability (U.S. General Accounting Office 1994).<sup>10</sup> It should be

**TABLE 1.** *The impact of substance abuse on Federal health entitlement programs.*

| Entitlement program  | (\$ in billions)                          |   |              |
|----------------------|---|---|--------------|
|                      | Costs directly related to substance abuse | Costs indirectly related to substance abuse** | Total impact |
| Health               | \$60.3                                    | —   | \$60.3       |
| Disability insurance | 5.6                                       | —   | 5.6          |
| SSI                  | 0.5                                       | 3.2   | 3.7          |
| AFDC                 | *   | 3.1   | 3.1          |
| Food stamps          | *   | 4.9   | 4.9          |
| Total                | \$66.4                                    | \$11.2  | \$77.6       |

KEY: \* = There is inadequate data from which to estimate how many individuals become eligible solely because of a substance abuse problem; \*\* = These costs are benefit payments to individuals who are regular alcohol or drug users, i.e., those who use drugs at least monthly and/or binge drink (consume five or more drinks in one sitting) at least weekly.

noted that the disability costs cited in this figure include only SSI and DI; they do not include substance abuse-related costs to other disability programs, such as Civil Service or veterans' disability, since the data needed to reliably estimate those costs were not available.

In addition, it is impossible to estimate how many recipients of AFDC and food stamps became eligible because of a substance abuse problem. However, the totals in the second column are based on the proportion of individuals on public assistance who admit to regular alcohol or drug use<sup>11</sup> and who, as a result, may need treatment before they can complete job training and/or be placed in a job, so that they might leave the public assistance rolls. With the passage of welfare reform legislation, this has become particularly important.

While these individuals did not necessarily get on welfare because of substance abuse, they are likely to stay on AFDC or SSI unless they receive adequate and appropriate treatment. As both the GAO report (General Accounting Office 1994) and that of the DHHS inspector general (DHHS 1994) noted, substance abuse is a serious barrier to effective job training and employability. Currently, nearly 1 in 5 recipients of AFDC and food stamps and almost 30 percent of SSI recipients (18 to 44 years old) report regular alcohol and/or drug use.<sup>12</sup> If efforts to get these individuals off public assistance through education, job training, and employment placement programs do not

include a substance abuse treatment component, it will be very difficult for these recipients to enter and remain in the workforce. Providing substance abuse treatment may not guarantee that these individuals will get off public assistance, but not offering this service will guarantee that it will be impossible for them to become or remain employable. If all of these individuals were treated successfully and left the public assistance rolls, then up to \$11.2 billion could be saved in FY 1995 alone. Over the next 7 years, the time during which most budget proposals anticipate balancing the budget, this amounts to over \$100 billion. If substance abuse is not addressed during this time, it may be impossible to realize any of these potential savings. This is particularly critical given the recent passage of welfare reform.

The single largest area of expenditures is for healthcare. As shown in table 2, nearly 1 out of every 5 dollars spent on Federal healthcare entitlements is attributable to the use and abuse of tobacco, alcohol, and other drugs. In FY 1995, these substance abuse-related costs accounted for \$60.3 billion of medicare, medicaid, veterans' health benefits, and other major health entitlements. medicare substance abuse-related costs accounted for \$31.9 billion, or more than half of the total; medicaid represented nearly one-third of substance abuse-attributable costs.

Previous reports released by CASA (1993, 1994) revealed the proportion of medicare and medicaid hospital costs that are associated with substance abuse. The estimates in table 2 reflect spending not only for hospital care but for all healthcare services covered by these benefit programs, including inpatient hospitalizations in both general and specialty hospitals, emergency room and outpatient hospital services, ambulatory and inpatient physician visits, long-term care, and prescription drugs (where applicable). In addition, the cost to other major health entitlement programs, including the veterans' health benefits, the Federal Employees Health Benefits (FEHB) and military health programs, the Indian Health Services, and health services for coal miners were also estimated.

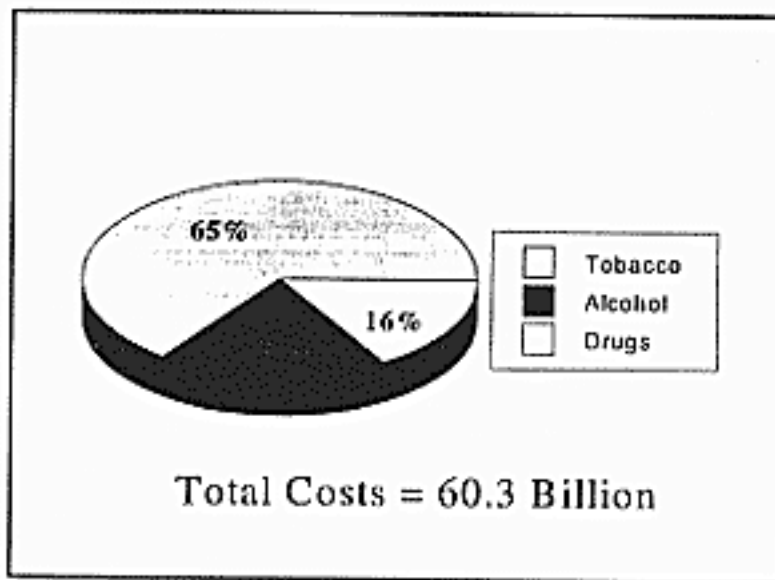
As shown in figure 3, of the \$173 billion medicare is projected to spend in FY 1995, more than 18 percent (or \$31.9 billion) will result from illnesses and other medical problems attributable to substance abuse.



**TABLE 2.** *Substance abuse costs by Federal health entitlement program.*

| Entitlement program | (\$ in billions) |                       |                         |
|---------------------|------------------|-----------------------|-------------------------|
|                     | Total cost       | Substance abuse costs | Substance abuse percent |
| Medicare            | \$173.3          | \$31.9                | 18.4%                   |
| Medicaid            | 96.4             | 18.2                  | 18.9%                   |
| Veterans health     | 17.7             | 5.1                   | 28.8%                   |
| Other health*       | 33.5             | 5.1                   | 15.2%                   |
| Total               | \$320.9          | \$60.3                | 18.8%                   |

KEY: \* = Includes Federal employees health benefits, military health, Indian Health Service, and retired coal miners health benefits.



**FIGURE 3.** *Proportion of substance abuse costs by type of substance: Federal health entitlement programs.*

Nearly 1 out of 5 Federal dollars spent on medicaid is attributable to substance abuse, accounting for nearly \$20 billion in FY 1995. Since this report only focuses on the impact of substance abuse on Federal health entitlement programs, it is important to note that this medicaid

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estimate includes only the Federal share of medicaid payments. While on average, the State pays about 47 percent of the costs of medicaid, these are not included in the authors' estimates since the focus of this analogy is Federal spending on entitlements. The State share has not been included in these estimates. However, an analysis of State medicaid costs would probably reveal an even higher proportion of substance abuse-related costs because State programs include optional welfare categories that provide cash payments to poor individuals not eligible for AFDC, such as single men whose level of substance abuse is higher than for those covered under the AFDC program. For these recipients no Federal payments were involved.

The total cost of substance abuse to veterans' health programs is \$5.1 billion. This represents nearly 30 percent of the costs for DVA health-related services, a proportion much higher than for other Federal health programs.<sup>13</sup> Because of the needs of the population it serves, the DVA provides considerably more direct substance abuse treatment services through both inpatient substance abuse and psychiatric units and outpatient substance abuse clinics than do other entitlement programs.

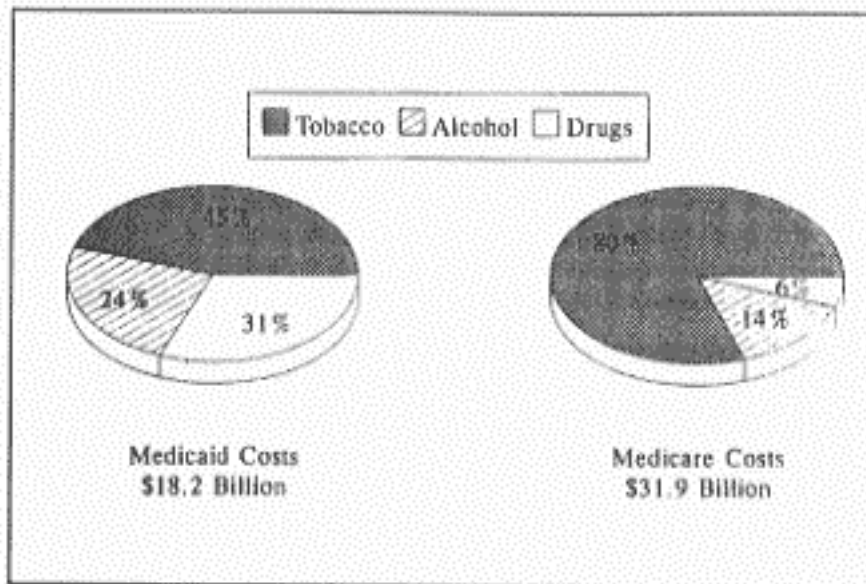
Other major health entitlements include the FEHB program, military health, the Indian Health Service, and health benefits for coal miner retirees. These will account for 7 percent—or \$5.1 billion in FY 1995—of substance abuse-related health entitlement costs. The lower substance abuse-attributable percentage—15.2 percent—in these other health programs compared to medicare and medicaid is due in part to the fact that the FEHB accounts for half of these. The FEHB program purchases private health services for Federal employees and retirees. Since the FEHB beneficiaries tend to be healthier than the medicaid or medicare populations, with a lower use of tobacco, alcohol, and other drugs, their costs attributable to substance abuse are lower. Their costs are based on the percentage of substance abuse-attributable costs calculated by CASA for individuals with private insurance.

As noted earlier, these estimates of substance abuse-related costs must be considered quite conservative. As related to Federal entitlement spending, this is particularly the case for several reasons. First, individuals who become eligible for an entitlement program due specifically to their substance abuse are not accounted for in these estimates. Technically, in these cases, all of their healthcare costs, not only those for treating substance abuse-related illnesses, would be included in substance abuse-related costs. As already seen in table 1, some costs to the SSI and disability program have been factored into this analysis. However, these estimates only include the income assistance portion of DI and SSI, and not the associated medicare and medicaid costs.

Second, except in the case of AIDS and babies born to drug-abusing mothers, the authors' estimates do not include the indirect negative health effects of substance abuse on nonsubstance abusers. Cases in which an individual requires medical care due to the actions of someone else who is under the influence of alcohol or drugs, as in DWI or an occupational accident, are not included in the authors' substance abuse-related costs. Finally, as mentioned previously, another reason that these figures underestimate the cost of substance abuse is that the epidemiologic literature linking alcohol and other drugs to subsequent illness is limited compared to the available work studying the health effects of tobacco. As more research is conducted on the health effects of alcohol and drug use, the substance abuse-related costs are likely to increase.

As shown in figure 3, nearly two-thirds—or \$39.2 billion—of all substance abuse-related health entitlement costs were for treating tobacco-related diseases and illnesses. Alcohol-related conditions accounted for nearly 1 out of 5 of these dollars—\$11.5 billion—and drugs accounted for the remaining 16 percent—\$9.6 billion.

A breakdown of tobacco-, alcohol-, and drug-related costs by program (figure 4) is revealing. The vastly different distribution of substance abuse-related costs by type of substance within the medicare and medicaid populations is due both to the progression of these illnesses and to different drug use behavior in these two populations. Tobacco-related illnesses are much more prevalent in the medicare population, where the long-term effects of smoking are more likely to have taken their toll. For medicare, 80 percent—or \$25.5 billion—of substance abuse costs are attributed to tobacco. For medicaid, tobacco-related illnesses accounted for only 45 percent—or \$8.2 billion—of substance abuse-related costs, with drug-related conditions accounting for nearly another third—\$5.6 billion—and alcohol-related diseases responsible for the remaining quarter—\$4.4 billion. The elderly have a higher rate of smoking than the population under age 65, with almost 56 percent having smoked during their lifetimes. In part, this higher smoking rate may be due to the fact that the hazards of smoking were not fully evident until the 1970s. But more germane is the fact that the elderly have also smoked for longer periods of time, which greatly increases their risk of acquiring



**FIGURE 4.** *Proportion of substance abuse costs by type of substance: medicare and medicaid.*

smoking-related illnesses. Among the elderly, 58 percent of the current smokers and one-third of former smokers consumed at least a half a pack a day for 35 years or more.

Although the medicaid population also has a higher smoking rate than the general population, medicaid recipients are much younger and therefore less likely to acquire diseases from the long-term effects of smoking until they are older (however, this does not bode well for the future). The significant proportion of drug-related conditions in medicaid are almost entirely due to birth complications resulting from drug use during pregnancy, drug-related trauma, and human immunodeficiency virus (HIV) acquired through intravenous drug use.

While all categories of health providers treat substance abuse-related conditions, for some services these conditions are more prevalent. Table 3 shows the percentage of medicare and medicaid payments to specific health providers that are attributable to substance abuse. Clearly, hospitals bear a large burden of treating substance abuse-related conditions. medicare and medicaid substance abuse-related costs in both general and specialty hospitals (including psychiatric, rehabilitation, and tuberculosis [TB] hospitals) make up more than 20 percent of the total dollars spent under these programs for treatment of conditions

**TABLE 3.** *Proportion of medicare/medicaid expenditures attributable to substance abuse—by provider.*

| Provider              | Medicare | Medicaid |
|-----------------------|----------|----------|
| Hospital              | 22.0%    | 23.8%    |
| Specialty hospital    | 21.0%    | 21.0%    |
| Outpatient services   | 7.8%     | 9.1%     |
| Emergency rooms       | 14.9%    | 16.3%    |
| Ambulatory physician  | 8.2%     | 8.9%     |
| Inpatient physician   | 16.3%    | 14.4%    |
| Prescription medicine | n/a      | 9.4%     |
| Nursing homes         | 20.0%    | 18.3%    |
| Home health           | 20.0%    | 18.3%    |
| Total                 | 18.4%    | 18.7%    |

attributable to substance abuse. Many of the conditions associated with substance abuse that were identified in the literature, such as lung cancer and AIDS, require extensive inpatient hospital services. But conditions that otherwise would not require hospitalization are exacerbated by substance abuse, such as is the case with smoking and respiratory infections or drinking and ulcers. In the absence of tobacco or alcohol use, these conditions might not have been as serious and, thus, might have been treatable on an ambulatory basis.

In psychiatric hospitals, which make up the vast majority of specialty hospitals, 15 percent of patients have a primary diagnosis of substance abuse, and approximately 25 percent have a secondary substance abuse diagnosis according to surveys of mental institutions. Thus, substance abuse is involved in nearly two out of every five cases treated in these facilities (National Association of Psychiatric Health Systems 1993).

In contrast to inpatient care, only 8 to 9 percent of outpatient clinic care and ambulatory physician services are spent treating substance abuse-related conditions. Since many individuals go to clinics and physicians' offices for either preventive services (such as physical examinations or pap smears) or for relatively minor problems (such as cold or flu), it is understandable that a lower proportion of these services are associated with substance use or abuse.<sup>14</sup>

Emergency room services, especially for trauma, are much more directly associated with substance abuse than other outpatient services. However, the higher substance abuse-attributable percentage that was applied to medicaid emergency room expenditures than to medicare is due to the difference in the percentage of trauma cases

that can be attributed to substance abuse in the elderly and nonelderly populations. While most surveys of trauma units and emergency rooms have revealed that substance abuse is involved in anywhere from 40 to 60 percent of the cases, further research revealed that this proportion only applies to trauma cases for individuals under 65. Nearly two-thirds of trauma in the elderly is related to hip fractures, which have not been linked to substance abuse. However, studies of falls in the elderly have indicated that alcohol consumption is a contributing factor. Smoking may also be indirectly related to hip fractures since it has been linked to osteoporosis, which degenerates bone mass and facilitates bone breakage. Forty percent of trauma in the medicaid and general population was attributed to substance abuse, while in medicare only 14 percent was attributable.

Table 4 breaks out the medicaid substance abuse-related hospital costs for 1991 by the four categories of costs described in the Methodology section. The largest share—71 percent—of these attributable costs is for treatment of diseases and other health conditions for which substance abuse is a major risk factor. Direct treatment of substance abuse disorders, primarily detoxification, accounted for only 19 percent of substance abuse-related costs.

As discussed earlier, in addition to the costs for healthcare entitlements, substance abuse either directly adds to the cost of other government programs or makes it difficult to decrease the size of those efforts. One example of this is SSDI (see figure 5). This pie chart depicts the costs to the Federal DI Fund attributable to substance abuse. Overall, substance abuse accounts for \$5.6 billion of expenditures from the DI Trust Fund. More than 80 percent of these costs were incurred due to disability from tobacco-related disease; only 20 percent of these cases attributable to substance abuse were related to alcohol or drugs.

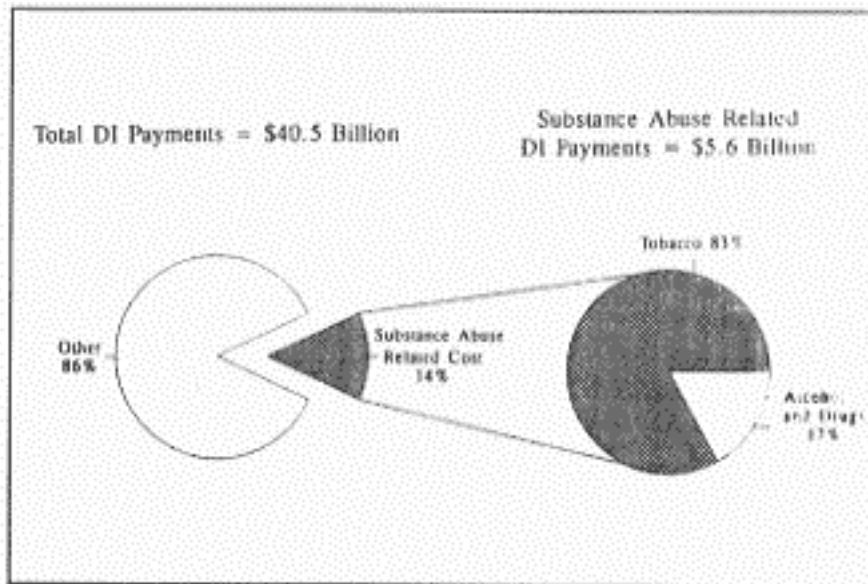
Applying the same attributable risk factors that were used for calculating health costs, the percentage of the disabled who became eligible by virtue of the abuse of tobacco, alcohol, or drugs was calculated. For the same reasons outlined in the discussion of tables 1 and 2, these must be considered lower-bound estimates. In addition, the Social Security Administration estimates that only 43,000 of the 915,000 DI beneficiaries

**TABLE 4.** *Substance abuse costs to medicaid: Total hospital care, 1991.*

|   |               |                 | % of total |
|---|---------------|-----------------|------------|
| Direct treatment for substance abuse  |               | \$776,305,150   | 18.7       |
| General hospitals - inpatient   | \$538,607,250 |                 |            |
| Psychiatric hospitals   | \$237,697,900 |                 |            |
| Treatment for diseases/conditions totally attributable to substance abuse           |               | \$112,014,143   | 2.7        |
| Treatment for diseases/conditions where substance abuse is a major risk factor      |               | \$2,932,558,132 | 70.5       |
| Additional days required for patients with a secondary diagnosis of substance abuse |               | \$336,461,250   | 8.1        |
| Substance abuse total   |               | \$4,157,444,995 |            |

SOURCES: National Hospital Discharge Survey 1991; 1992 HCFA Statistics; National Association of Psychiatric Hospitals Annual Survey 1992.

classified with mental disorders were eligible by virtue of having a primary diagnosis of substance abuse. This also appears to be a low estimate because there may be more who were not correctly classified as having a primary diagnosis of substance abuse, and the estimate does not include those who are dually diagnosed with a mental and substance abuse disorder. Thus, it is reasonable to assume that the attributable costs of substance abuse to the DI program are higher. Nevertheless, despite these limitations, substance abuse is still responsible for more than 1 in every 7 dollars spent by the DI program. It should be noted that, subsequent to the preparation of this chapter, Congress passed



**FIGURE 5.** Substance abuse-related disability insurance (DI) payments.

legislation eliminating drug and alcohol abuse as a disability for purposes of eligibility in both the SSDI and SSI programs.

As noted earlier, data for the disabled were only available for the DI program (although an additional 90,000 beneficiaries of the SSI disability program are also eligible solely by virtue of a substance abuse-related disability). However, it could be assumed that a significant portion of civil service personnel, veterans, or SSI recipients are also eligible as a result of illnesses attributable to the effects of abusing tobacco, alcohol, or drugs. The costs associated with these individuals are not included in the authors' estimates.

Unlike SSDI, it is not possible to estimate how many recipients of AFDC and food stamps are eligible *because* of substance abuse. Even within SSI, which had an explicit alcohol and drug disability eligibility category, many individuals disabled by chronic illness resulting from substance abuse were not easily identified.<sup>15</sup>

However, estimates can be made of the number of recipients who may abuse substances from surveys of regular use of alcohol or illicit drugs. Extrapolating from these prevalence statistics, the public assistance benefit costs for maintaining individuals on welfare who abuse substances can be determined.



Based on data reported in the 1991 National Household Survey on Drug Abuse (NHSDA), tables 5 through 7 indicate the percentage of recipients for each program who reported using alcohol and/or drugs on a regular basis. Of women between the ages of 18 and 44 receiving AFDC, about 1 in 10 report that they have had at least four binge drinking episodes (five or more drinks in one sitting) in the last month; 1 in 8 indicate monthly or more frequent use of an illicit drug; and 1 in 5 report regular use of alcohol, drugs, or both.

**TABLE 5.** *Substance abuse among AFDC women (ages 18 to 44).*

|                            | % regular users* |
|----------------------------|------------------|
| Alcohol only               | 9.9              |
| Other drugs only           | 12.5             |
| Alcohol and/or other drugs | 20.0             |

KEY: \* = Regular use is defined as at least monthly use of drugs or four or more episodes of binge drinking (five or more drinks in one sitting) in the last month.

SOURCE: 1991 National Household Survey on Drug Abuse, U.S. Department of Health and Human Services.

Similar percentages can be observed overall among recipients of food stamps, although male recipients report considerably higher use. Almost 30 percent of men in households receiving food stamps indicate regular use of alcohol, illicit drugs, or both. In general, male recipients appear approximately twice as likely to admit regular use of either or both of these substances than do females.

For the SSI population,<sup>16</sup> an even more pronounced difference exists in regular drug and alcohol use between men and women: 42 percent of the men report regular drug or alcohol use, while only 17 percent of the women indicate such use. More than one-third of the men admit to regular use of illicit drugs.

It should be noted that all of these statistics on regular use must be considered conservative. Since the NHSDA is a government-sponsored survey, many individuals are reluctant to report any substance use and are even less likely to admit to regular use. This is particularly true of individuals receiving some form of public assistance who may believe such an admission could lead to a termination of their benefits, loss of custody of their children, or even criminal prosecution. In addition, since the data are based on a household survey, individuals who are homeless or institutionalized and more likely to be substance abusers are underrepresented.

**TABLE 6.** *Substance abuse among food stamp recipients (ages 18 to 64).*

|                            | % regular users* |       |       |
|----------------------------|------------------|-------|-------|
|                            | Men              | Women | Total |
| Alcohol only               | 20.5             | 7.5   | 11.4  |
| Other drugs only           | 16.2             | 9.8   | 11.7  |
| Alcohol and/or other drugs | 29.2             | 15.3  | 19.5  |

KEY: \* = Regular use is defined as at least monthly use of drugs or four or more episodes of binge drinking (five or more drinks in one sitting) in the last month.

SOURCE: 1991 National Household Survey on Drug Abuse, U.S. Department of Health and Human Services.

**TABLE 7.** *Substance abuse among SSI recipients (ages 18 to 44).*

|                            | % regular users* |       |       |
|----------------------------|------------------|-------|-------|
|                            | Men              | Women | Total |
| Alcohol only               | 19.9             | 4.3   | 11.1  |
| Other drugs only           | 34.6             | 14.0  | 22.3  |
| Alcohol and/or other drugs | 42.4             | 17.2  | 28.2  |

KEY: \* = Regular use is defined as at least monthly use of drugs or four or more episodes of binge drinking (five or more drinks in one sitting) in the last month.

SOURCE: 1991 National Household Survey on Drug Abuse, U.S. Department of Health and Human Services

## CONCLUSION

The triangle of epidemiologic, economic, and policy research can be a powerful tool in converting technical or scientific information into relevant and persuasive information for public policy. At a time when priorities are focused on how less money can be spent, this kind of research should shed a very different light on the nature of current government spending and how spending might be more realistically reduced through positive rather than negative means. Substance abuse pervades many of those entitlement programs that draw the most attention from budget cutters. As the attempt to balance the budget is made and commitments to constituents continue, it is important to bear in mind the terrible toll that tobacco, alcohol, and drugs are

having on the Federal budget. Research looking at both the causes and the effectiveness of various prevention and treatment efforts becomes critical if the budget and many other problems are to be solved through realistic and long-term solutions that also reflect the caring and generous nature of society.

## NOTES

1. A more complete description of this methodology is contained in a number of papers issued by CASA and in a publication in the *American Journal of Public Health*. The CASA papers (and article reprints) are available through the Center on Addiction and Substance Abuse, 152 West 57th Street, New York, NY 10019.
2. These PARs are based on the best available epidemiologic research investigating the relationship between substance abuse and morbidity. For some diseases and conditions, there was clear evidence that a relationship exists between substance abuse and the occurrence of the condition, but prospective or case control studies that calculate PARs had not been conducted. In these cases, the authors employed measures other than PARs, including estimates from large surveys and from medical experts. For example, in the case of AIDS, 1992 Centers for Disease Control and Prevention (CDC) surveillance data were used to estimate the percentage of these cases that were caused by intravenous drug use (IVDU). These surveillance data do not establish causality; they merely categorize new cases by the risk groups they fall into. In 1992, 55 percent of new pediatric AIDS cases and 33 percent of adult cases fell into the IVDU risk group. The authors applied these percentages to total reported medicaid AIDS days to estimate those that were substance abuse related.
3. A similar problem exists for other diseases such as lung cancer where, after the initial diagnosis, future hospitalizations would be for other problems or procedures such as related respiratory distress or chemotherapy. However, disentangling the overlap between alternative causes for these other diagnoses and those attributable to the lung cancer made it difficult to count those days in the authors' estimates. Thus, there is reason to believe that these estimates are low since this problem would exist for a number of diagnoses.
4. With respect to this fourth category, the authors' analysis understates the impact of substance abuse comorbidity due to limitations of medical reporting.

5. The association between illicit drug use and resulting illness has not been as thoroughly studied as those of smoking and alcohol because drug use is less prevalent in the general population and more difficult to identify; subjects are reluctant to admit openly to illegal conduct. Alcohol studies are also somewhat limited, due in part to the greater difficulty in establishing level of use (self-reporting of alcohol use is less reliable than that of tobacco because heavy use of alcohol has a negative social stigma). Even for cigarette smoking, a great deal of research is available on illnesses highly prevalent in the population such as lung cancer and heart disease, but less is available for less prevalent diseases, such as Crohn's disease. Thus, the authors' study includes only those diseases and conditions that have been clearly documented as related to substance abuse. The authors attempted to use the best research available, recognizing that the field of epidemiology is constantly evolving and sharpening its findings. Further inquiry into other related conditions would most likely significantly increase substance abuse-related medicaid hospitalization costs.
6. A study at Johns Hopkins Hospital revealed that 28 percent of 435 ICU admissions and 39 percent of ICU costs were substance abuse related (Baldwin et al. 1993).
7. Using this definition, entitlement programs include: Social Security and other Federal retirement programs; DI and disability compensation for Federal employees, veterans, and coal miners; SSI for the poor and aged disabled and income assistance through AFDC and food stamps; health benefits through medicare, medicaid, the Veterans Administration, Federal Employees Health Benefits, military health services, the Indian Health Service, and coal miner retirees health benefits; and unemployment compensation.
8. Civil service retirement also includes some disability costs, but the authors were unable to separate these out.
9. Including the National Hospital Discharge Survey, the National Medical Expenditure Survey, the National Nursing Home Survey, and a 1-percent sample of DI beneficiaries.
10. These numbers are the most recent reported by the Office of the Inspector General as of June 1994 (U.S. General Accounting Office 1994). An earlier report released by GAO estimated 249,199 SSI and DI beneficiaries had a primary or secondary diagnosis of substance abuse. They estimate for SSI alone that 90,687 beneficiaries were addicts.

11. According to the 1991 National Household Survey on Drug Abuse. Regular use is defined as monthly or more frequent use of an illicit drug and four or more episodes of binge drinking (five or more drinks in one sitting) in the last month.
12. For more information on the welfare programs, read CASA's reports on *Substance Abuse and Women on Welfare* and *Substance Abuse and Federal Entitlement Programs*.
13. These costs are estimated from a report by the Department of Veterans Affairs (1994) on substance abuse in VA facilities. That report estimated an even higher percentage of substance abuse-related costs because it included all medical services used by individuals with either a primary or secondary diagnosis of alcohol or drug abuse. The authors' estimate includes only services directly attributable to substance abuse, not all services provided to substance abusers.
14. Note, however, that the same argument used above regarding hospitalization can also be made for visits to doctors' offices. Minor conditions, such as colds or minor bronchial infections, are exacerbated by smoking. Smokers may thus be more likely to seek a doctor's intervention; these costs have not been factored into the authors' analysis because there is insufficient research in this area to make an estimate.
15. The SSI program is separate from SSDI.
16. These percentages refer to all those SSI recipients who are disabled and blind. The numbers do not include SSI recipients over the age of 65.

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# A Historical Perspective on Effective Prevention

*Richard I. Evans*

A history of effective drug abuse prevention research can be viewed as relatively short, but it also must be considered in terms of developmental stages in the evolving science of drug prevention. This chapter will focus on the earlier history of prevention science. Another chapter, by Botvin (this volume), will review the more recent research findings.

In an early review of research, NIDA Research Monograph 47, *Preventing Adolescent Drug Abuse: Intervention Strategies*, Leukefeld and Moskowitz (1983) stated that:

“... Research on prevention interventions is in its infancy due to theoretical and methodological inadequacies. Few interventions are theoretically based... Most evaluations have suffered from weak research designs...most studies evaluate program effects, few...evaluate program implementation. The result of these shortcomings is that there is little knowledge regarding how prevention programs actually operate; which programs have been effective; why certain programs have been effective; and whether these programs are likely to be effective in other settings or with other populations.” (p. 253)

This position was reiterated by Durell and Bukoski (1984) in reviewing 20 years of drug abuse prevention efforts including media campaigns, school drug education programs, and generic programs. They concluded, somewhat pessimistically, that:

“... Drug information curriculums in the schools have had little or no discernible effect on intentions to use drugs and actual drug-using behavior” (p. 26), and that “...both generic prevention programs and certain information programs have little or no effect in

producing desired changes in attitudes toward drugs and in actual drug use patterns.” (p. 27)

In a widely cited review of findings related to psychosocial approaches to smoking prevention, which have become one central approach to programs addressed to other harmful substances as well, Flay (1985) was more optimistic about the progress of such research:

“Four generations of research have been conducted within less than one half of a human generation (indeed, less than one decade). Given this, remarkable progress has been made in an important area of health psychology and public health... Research on smoking prevention...has evolved more systematically and progressed further than most other areas of health promotion.” (p. 482)

For more than four decades, it has been the privilege of this author to be an active participant-observer in the research processes described above, and this chapter will present a historical perspective from that frame of reference. Whereas a number of examples will be drawn from the smoking prevention research to which Flay refers, there is growing evidence, as suggested above, that the effective components of these smoking prevention programs may also be effective in addressing the prevention of use of alcohol and other drugs as described, for example, by Glynn and colleagues (1985).

In examining the history of prevention efforts, one first encounters the approach of conventional wisdom that high fear arousal is perceived as the major device for discouraging children and youth from engaging in self-destructive behaviors such as cigarette smoking and the use of alcohol and other drugs. As Janis and Feshbach (1953) originally suggested in their now classic study, high fear arousal does have some impact on short-term changes in behavior but not on truly long-term changes. For example, Marston (1970) reported that, immediately after a heart attack, individuals may change their behavior to avoid a recurrence but, over time, return to their original risk-taking lifestyle, which often includes smoking. So, even under conditions of intense fear, as Evans (1979) points out, permanent changes in health habits may not occur. Despite such evidence that high fear arousal by itself is not necessarily effective, it is still perceived in popular culture as a powerful deterrent to the use of harmful substances. As indicated below in excerpts from an editorial in *USA Today* (July 14, 1994), the editor seems to applaud the effectiveness of high fear messages in themselves, not considering the

probably critical role of other types of persuasive strategies to which the individuals might be exposed:

“Good News on Drugs. Just when hopes for success in the drug war looked darkest, a light has flickered on...independent researchers tracked 15,000 New York City grade-school children during 1992 and 1993. Among the findings: Urban children view drug dealers negatively and see drugs themselves as too scary to be tried. About 85 percent said they would walk away if offered drugs, up 7 percent from 1992. *The reason: Kids in inner cities witness the devastation of crack. Many have attended funerals of their friends. Dodged bullets. Seen dead bodies. And gone hungry because food money was spent on drugs. They want to avoid the grief of the older generation. Public service messages lend a powerful force, notably...ads targeting urban youth. You’ve seen them. They compare drug users’ brains to a frying egg and depict drug dealers as the losers and criminals they are. They work...* Kids are hearing and heeding the anti-drug message in the very areas where the tragedy of drugs is most vivid... This new evidence suggests a decade of effort is paying off.”

In an extensive review of the fear arousal literature, Higbee (1969) pointed out that no blanket statements could be made supporting the value of fear by itself as a motivator. Yet Higbee described various interventions that indicated how various levels of fear arousal might enhance the impact of other components of prevention programs. Such general conceptualizations concerning fear arousal were supported by Janis (1967), by Evans and colleagues (1970), and more recently by Sutton (1982). Several studies that have assessed the contributions of fear arousal, alone or combined with other factors, in preventing health-threatening behaviors will be used as examples in the discussion that follows.

As it became increasingly evident that fear arousal itself (that is, simply emphasizing the negative effects of engaging in a particular behavior) was not enough (Evans 1979), investigators sought to expand their prevention models. Janis and Feshbach (1953), in the study mentioned earlier, reported that the combination of a minimal fear approach with general toothbrushing instructions was more effective in increasing the incidence of toothbrushing among adolescent subjects than was a strong fear appeal alone. Subsequently,

Leventhal and colleagues (1965) challenged the relative importance of fear as a motivator to change a health-related behavior. In a study involving persuasion to submit to tetanus inoculations, they found that providing highly specific instructions on how to obtain such inoculations, without further fear arousal, was effective in motivating individuals to engage in the specific prevention behavior.

The University of Houston Research Group pursued the problem of the relative effectiveness of fear arousal in a series of basic studies in preventive dentistry<sup>1</sup> with young adolescents (Evans et al. 1970). Results of these studies indicated that exposing the student subjects on only one occasion to elaborated and modeled specific oral hygiene behaviors (without fear appeals or positive appeals) resulted in significantly more effective oral hygiene behavior. General oral hygiene instructions coupled with a positive appeal were almost as effective. Effective, but significantly less so, were fear appeals coupled with general oral hygiene instructions. Further, it was found that simple testing of subjects at irregular intervals, possibly perceived as monitoring, was almost as effective as the various persuasive messages. The effectiveness of monitoring itself was also demonstrated in a subsequent smoking prevention investigation by the Houston Group (Evans 1976). When the short-term study was extended over time, behavioral changes were maintained (Evans et al. 1975). To cross-validate self-reports of toothbrushing, a chemical indicator of cleanliness of teeth was employed (Evans et al. 1968). This cross-validation procedure was later effectively generalized to smoking prevention studies as the Houston Research Group developed the "pipeline procedure," which included chemical analyses of saliva to increase the validity of self-reports (Evans et al. 1977).

Other traditional approaches to prevention that have been used extensively, but with only limited success, include the information model and the affective model described by Edmundson and colleagues (1991). The information model is based on the assumption that providing adolescents with factual information about a potentially destructive behavior, such as smoking or drug use, will prevent them from engaging in the behavior. Information may be presented in a variety of ways, such as didactic lectures by the classroom teacher, videotapes and films, posters and pamphlets, or guest speakers who are experts in the area. Despite evidence that this approach, which is essentially fear arousal, is largely ineffective (Goodstadt 1978; Thompson 1978), it remains the approach of choice of many school-based programs according to Murray and colleagues (Murray et al. 1988). Programs based on the affective model address more global attitude changes directed at such factors as enhanced self-esteem and

improved decisionmaking and goal setting, and often do not include specific information about self-destructive behaviors such as smoking or drug use (Durell and Bukoski 1984). Little evidence exists in support of this model for effective drug use prevention as well (Hansen et al. 1988; Tobler 1986).

The limited effectiveness of programs based primarily on fear arousal plus information led the Houston Research Group to consider a stronger conceptual foundation for prevention interventions. During the early 1970s, as a research group component of the National Heart Center at Baylor College of Medicine,<sup>2</sup> Evans and colleagues noted that children and young adolescents were aware of the dangers of smoking in terms of the long-term health consequences such as heart disease and cancer. As elementary school children, they often marshaled their knowledge of the dangers of smoking in an attempt to persuade their parents to quit smoking. At about the time they entered junior high school, however, many began to smoke. Fear induced by knowledge of the long-term dangers of smoking appeared to be insufficient to prevent its onset among many young adolescents when exposed to social pressures to engage in the behavior. It was decided to attack the problem through an intervention program designed to influence students to refrain from smoking as they entered and moved through junior high school (Evans 1976).

Given the prevailing belief of the effectiveness of fear arousal described previously, it was not surprising that a survey of junior high school smoking prevention programs at this time revealed that most programs focused too intensely on fear-arousing messages. As suggested earlier, they emphasized the long-term effects of smoking such as heart disease or cancer without recognizing the present-oriented rather than future-oriented time perspective of young adolescents (Mittelmark 1978). The programs rarely reflected feedback from target groups in their designs and seemed to ignore previous research on effective use of media. A critical deficit in most of these early programs was the lack of any form of systematic evaluation. The Houston Research Group conducted a series of focused interviews drawing from a large population of seventh grade students (Evans et al. 1984). Subject responses suggested that various levels of peer pressure, models of smoking parents, and smoking-related messages in the mass media that featured attractive smokers were influences that might encourage them to initiate smoking. Such influences seemed to outweigh concerns about the dangers of smoking. A pilot study was conducted that supplemented fear arousal messages with information concerning the social pressures impacting young adolescents to begin smoking, together with training in specific skills

to resist these pressures (Evans et al. 1978). Based on the results of this pilot study, a prevention program that incorporated these social influences was developed and evaluated. This social inoculation model, as it was described, appears to have guided much of the prevention research for the past two decades. Referring to the work of the Houston Group (Evans 1976, 1983, 1984; Evans and Raines 1982; Evans et al. 1981, 1984), Edmundson and colleagues (1991) stated:

“The social influences model recognizes smoking in adolescents as primarily a social behavior. This model includes the following four components: (1) information on the negative social effects and short-term physiological consequences of tobacco use; (2) information on the social influences that encourage smoking among adolescents, particularly peer, parent, and mass media influences; (3) correction of inflated normative expectations of the prevalence of adolescent smoking; and (4) training, modeling, rehearsing, and reinforcing of methods to resist those influences and to communicate that resistance to others, particularly peers.” (p. 154)

The evolution of such social influences models has drawn on various concepts in psychology. Bandura’s social learning theory (1977) was particularly relevant in the early formulations of the social inoculation model. As applied to the initiation of smoking, the theory suggested that children might acquire expectations and learned behaviors vis-a-vis smoking through observation. They might learn vicariously that smoking appears to relieve tension or anxiety. Vicariously learned expectations of the positive and negative consequences of cigarette smoking could be important factors in the ultimate decision regarding smoking behavior. Bandura’s (1982, 1989) more recent development of the concept of self-efficacy that further explicates this notion has become central to some current models of smoking and drug use cessation, such as the stage theories developed by DiClemente and colleagues (1991). This social inoculation model, which also incorporated effective skills to resist social influences to smoke by “inoculating” adolescents with knowledge and social skills for resisting such pressures, might be perceived as a behavioral variation of McGuire’s (1961) cognitive inoculation model. McGuire’s (1968) communication-persuasion model, essentially an information-processing analysis, proved to be useful as a guide to the sequence of messages within prevention programs targeted for the young adolescent audience.

To more fully describe the content of the social inoculation model, it should be mentioned that it included both social-environmental and personality or intrapersonal determinants that contribute to the complex of influences that encourage the use of harmful substances. Implicit in the model was the conception that as children reach early adolescence, they experience greatly increased vulnerability, greater mobility, and greater freedom from adult authority figures. Experimentation with personal identity and lifestyle choices, which marks this period of development, could include use of tobacco or other harmful substances, and conflicting expectations could override both personal beliefs and parental or family values. This model identified smoking, or use of alcohol and other drugs, both as a form of rebellion against authority, including risk taking, and as part of a new and different lifestyle for adolescents during the early teenage years. For example, it might predict the initiation of smoking for children as young as 10 or 11. In fact, it might be noted here that in the early 1970s, as the original social inoculation studies (which addressed smoking) were being planned, smoking initiation reflected an upward trend from the elementary grades to high school (Johnston et al. 1979; Thompson 1978), with a significant enough shift at about the seventh grade level that the Houston Group chose to begin its prevention intervention at seventh grade. Even preliminary results from the current NIDA-supported Minority Adolescent Drug Use Prevention project (for which the author serves as principal investigator)<sup>3</sup> indicate that 31.8 percent of the subjects had initiated cigarette smoking at or before the age of 11 and prior to entry into sixth grade. Similar patterns of initiation appear to be operative in the use of alcohol and illegal drugs.

Variations of the social influences-based models that have been involved in the formation of prevention programs have appeared to be quite effective, at least initially, in preventing substance use, as reported by a number of investigators including Best and colleagues (1984), Biglan and colleagues (1987*a, b*), Elikson and colleagues (1993), Flay and colleagues (1983, 1987), McAlister and colleagues (1979, 1980), Pentz and colleagues (1989), and Perry and colleagues (1989). The cognitive-behavioral model, which expands the social influences model with additional problemsolving, decisionmaking, and self-control methods, has also been the basis for prevention programs that have produced positive results as reported by Kendall and Hollon (1979), Gilchrest and colleagues (1979), Schinke and Blythe (1981), and Schinke and Gilchrest (1983). The life skills model developed by Botvin and colleagues (1980, 1982) incorporates components of the social influences model and the cognitive-behavioral model, with a

particularly strong emphasis on training adolescents to cope with social challenges. This program also appears to have produced promising results.

Additional conceptual areas in psychology have been utilized in programs designed to prevent the use of harmful substances. Included here would be Festinger's (1957) theory of cognitive dissonance used in explorations of conflict between health beliefs and the initiation of health-threatening behaviors such as smoking and the Jessor and Jessor (1977) multi-determinant conceptual structure of problem behavior, which has been successful in predicting age-graded problem behaviors that are considered acceptable in adults but not in adolescents. The latter model has been incorporated into several longitudinal research designs, for example, the work of Sherman and colleagues (1979, 1982). These investigators attempted to explain the onset of smoking and the transition in status from nonsmoker to smoker. Ajzen and Fishbein proposed a framework for predicting behavioral intentions, which were assumed to mediate and thus predict subsequent overt behavior (Ajzen and Fishbein 1970; Fishbein and Ajzen 1975). This model, which has been applied with some success in studies of alcohol use in adolescents (Schlegel et al. 1977), also appears to lend itself to empirically testable hypotheses that could tease out important components of the development of smoking behavior. For example, within the Houston Group's research program, Henderson's (1979) small-scale study of smoking in a population of older adolescents, based on this model, provided a provocative basis from which more elaborate investigations could employ structural equation or causal models (e.g., Dill 1981). Subsequent investigators also developed interventions directed toward altering some of the situational and intrapersonal determinants of smoking (Botvin et al. 1980; Hurd et al. 1980). Other investigators began focusing on mediators of the initiation of substance use, such as modifying perceptions of social norms and directly addressing moderators such as peer pressure (e.g., Sussman 1989).

More recently, as researchers began working within the framework of structural equation modeling and path analyses, they also began to address the question of synergism; that is, to what degree does the initiation of use of one harmful substance trigger the initiation of use of another substance? A syndrome of problem behavior may be present that includes the use of tobacco, alcohol, and illegal drugs together with other risk-taking behaviors (Elders et al. 1994). It appears that adolescents often engage in more than one risk behavior during this stage of their lives. Even though the specific risk behaviors may differ, the common thread for all adolescents may be



exposure to such risk factors. Researchers in prevention began to recognize that all prevention programs, however different (e.g., avoiding tobacco, illegal drugs, and alcohol; preventing pregnancy and sexually transmitted diseases (STDs); prevention of violence), may be influenced by the same set of factors that make adolescents susceptible to choosing high-risk behaviors. Another operant consideration in prevention programs became apparent when Vega and colleagues (1993) suggested that distribution of risk factors is similar among ethnic groups even if the susceptibility to those risk factors may differ. Also in this area of interconnectedness of risk behaviors is the possibility that risk taking may begin with one risk behavior such as cigarette smoking and progress to other more risky behaviors as the student gets older. Kandel and Yamaguchi (1993) have suggested that cigarette smoking itself is a risk factor for illegal drug use and that there is a predictable pattern of engaging in harder and harder drugs. Such hypothesized synergism among the use of various drugs must be considered in prevention programs (Stall et al. 1986). Aside from investigating synergisms, longitudinal designs employing confirmatory factor analysis, and structural equation modeling that NIDA-funded investigators are employing in current investigations, should help to identify multiple indicator latent variables and possible causal relationships among the use of various substances and other health-risk behaviors.

For example, at least three theoretical possibilities for drug progression exist within various ethnic groups: (1) nonsynergism, that is, there is no tendency for persons engaging in particular risk behaviors to be engaging in other such behaviors; (2) simple synergism, which describes persons engaging in particular risk behaviors tending to engage in other risk behaviors without a specific causal sequence in the initiation of such behaviors; and (3) gateway synergism, as demonstrated in the Kandel and Yamaguchi (1993) study referred to previously, in which persons engaging in particular risk behaviors tend to engage in other risks, with certain risk behaviors leading causally to the initiation of others. While risk-behavior synergism has been reported by some investigators who utilized cross-sectional data (Biglan et al. 1990; Hingston et al. 1990), the lack of data obtained from sound prospective investigations precludes distinguishing between simple and gateway synergism. Therefore, a general guideline is not clearly developed concerning whether interventions should focus on the prevention of the use of one harmful substance or should address various harmful substances simultaneously.

The issue of acquired immunodeficiency syndrome (AIDS) prevention must now be seriously considered within this context of synergism among such risky behaviors. Because of the current concern about risky sexual behavior, including exposure to human immunodeficiency virus (HIV) among adolescents, a drug use prevention investigation could hardly be undertaken without recognizing the relation between drug use and sexual behavior. Teenage sexual activity within the context of drug use may well result in impairment of responsible decisionmaking that would otherwise lead to the practice of “safer sex” (Adler et al. 1990).

According to Evans and associates (1991), the relationship between HIV risk, drug use, and sexual behavior is a complex, reciprocally reinforcing, biopsychosocial phenomenon. Despite their increasing knowledge of the dangers of drug use, and unprotected sexual behaviors, as would be predicted from the limitations of the effectiveness of high fear arousal messages in themselves and as would be expected based on earlier studies of the use of harmful substances, many young adolescents still initiate such behaviors (Miller et al. 1990; Morrison 1985). When theory is marshaled to explain such phenomena, possible interpretations might be gleaned from some variant of rational choice theory or subjective expected utility theory (Gilbert et al. 1986; Luker 1975; Weisman et al. 1991). These theories could also be utilized to examine the decisionmaking process involving cost-benefit analyses of alternative behaviors. Another investigation dealing with AIDS prevention currently being conducted by the Houston Research Group employs a planned behavior/action control perspective, which pays close attention to the role of social influence in the use of harmful substances as related to risky sexual behavior. Consistent with the discussion of sexual behavior presented by Weisman and colleagues (1991), it can be inferred that the initiation of drug use is best regarded as relationally determined; i.e., not only does it require the presence of another person (at least for it to constitute an HIV risk), but the actions of that other person occur within a social context having impact upon the quality of one’s decisionmaking processes vis-a-vis drug use.

While suggesting that teenage sexual behavior can be interpreted as rational (Loewenstein and Furstenberg 1991), it can be argued that sexual activity in the context of drug use can result in the derailing of a decision process that might otherwise lead to the practice of safer sex as described by Adler and others (1990). Dryfoos (1990) estimates that 25 percent of the adolescent population is using alcohol or marijuana heavily and is engaging in unprotected sexual intercourse. If this estimate is correct, it might be inferred that this

same proportion is at high risk for contracting HIV. Dryfoos' (1990) estimation that underprivileged black and Hispanic adolescents, particularly those who are falling short academically, are overrepresented in this high-risk group is consistent with epidemiological data linking drug use, early sexual activity, race/ethnicity, and AIDS prevalence (Miller et al. 1990; Strassberg and Mahoney 1988).

A review by Kirby (1994) that assessed curriculums used for preventing sexual risk behavior suggests that successful programs might be based on social learning or social influence models such as social inoculation. These programs focus on reducing specific risk-taking behaviors, are interactive, provide training for teachers who are taught about social influences such as the media, and, finally, focus on specific behavioral values and norms. Interestingly, findings concerning sexual risk behavior are relevant to drug prevention programs and other risk-taking interventions as well.

Another significant problem that should be addressed is the at-risk status of minority youth (Carvajal et al., in press). For example, in the current NIDA-supported study previously described,<sup>3</sup> differences among minority groups in incidence of use of various substances represent critical issues that must be addressed. Prevention programs must be sensitive to the distinctions that are present when minority populations are targeted. For example, preliminary research suggests a correlation between the use of certain substances and ethnic affiliation. As shown in tables 1 and 2, data from this study indicate some significant differences in use among three ethnic groups. It can be seen, for example, that African-American adolescents as a group tend to report less smoking than whites and Hispanics. Some Hispanic populations report a much greater use of inhalants than other groups. As a result, prevention/intervention programs need to be sensitive to these possible distinctions to ensure that the most effective indigenous message is presented to each group.

**TABLE 1.** *Percentage reporting use of various drugs x ethnicity among middle school students in grades 6 through 8 (N = 2,446).*

|                   | Whites<br>(44%) | African Americans<br>(36%) | Mexican<br>(20%) |
|-------------------|-----------------|----------------------------|------------------|
| Americans         |                 |                            |                  |
| Alcohol           | 61              | 42                         | 54               |
| Beer              | 58              | 50                         | 60               |
| Cigarettes        | 48              | 32*                        | 54               |
| Cocaine           | 3               | 3                          | 5                |
| Downers           | 4               | 2                          | 3                |
| Hallucinogens     | 7               | 2*                         | 6                |
| Inhalants         | 17              | 7*                         | 20               |
| IV drugs          | 2               | 2                          | 2                |
| Marijuana         | 12              | 18                         | 21               |
| Smokeless tobacco | 21              | 6*                         | 12               |
| Speed             | 5               | 3                          | 7                |
| Steroids          | 4               | 2                          | 1                |
| Ecstasy           | 2               | 1                          | 2                |

KEY: \* = Significantly less reported use than other ethnic groups

SOURCE: Evans, in press.

**TABLE 2.** *Percentage reporting use of various drugs x ethnicity among high school students in grades 9 through 12 (N = 2,190).*

|                   | Whites<br>Americans<br>(49%) | African Americans<br>(34%) | Mexican<br>(17%) |
|-------------------|------------------------------|----------------------------|------------------|
| Alcohol           | 84                           | 70                         | 78               |
| Beer              | 80                           | 69                         | 75               |
| Cigarettes        | 66                           | 40*                        | 65               |
| Cocaine           | 6                            | 2                          | 10               |
| Downers           | 6                            | 2                          | 5                |
| Hallucinogens     | 15                           | 2*                         | 15               |
| Inhalants         | 15                           | 4*                         | 18               |
| IV drugs          | 2                            | 1                          | 1                |
| Marijuana         | 30                           | 27                         | 40               |
| Smokeless tobacco | 34                           | 5*                         | 20               |
| Speed             | 13                           | 1*                         | 8                |
| Steroids          | 3                            | 1                          | 2                |
| Ecstasy           | 6                            | 1                          | 5                |

KEY: \* = Significantly less reported use than other ethnic groups

SOURCE: Evans, in press.

Although use of substances and the prevention of such use among members of the majority population have been widely studied (Bell and Battjes 1985; Glynn et al. 1985), few large-scale studies target

minority populations. Among these are investigations conducted by Botvin (1986), Evans (1989, 1994), Schinke and colleagues (1988), and Orlandi (1986). Minority and low socioeconomic status generally are considered important risk factors for drug abuse although the relationships are complex (Dryfoos 1990; Pentz et al. 1990).

Another issue confronting prevention researchers is that high-dosage/high-frequency prevention programs and their benefits, in terms of cost effectiveness, must be considered because the effects of short-term interventions often wash out (Murray et al. 1989). Johnston and colleagues (1996) indicate that there is a marked increase in the rate of cigarette smoking and use of other substances among high school seniors. These data reinforce the consequences of the washout of long-term effects of middle school or early high school intervention programs that are not adequately reinforced. Ellikson and colleagues (1993) point out, however, that even with equivocation concerning long-term effectiveness of prevention programs, any successful delay of engaging in high-risk behavior results in a lowered risk of contracting an STD, being in a car wreck, or other consequences that can result in poorer health and higher treatment costs. The longer that onset is delayed, the more success will be gained in avoiding illness and psychosocial effects attached to high-risk behavior. If initiation can be delayed long enough, will the adolescent high-risk avoidance behavior carry over into adult decisionmaking about health choices? If success is to be achieved in changing social norms, these same messages must be communicated within the community as well as in the school or social setting where adolescents may initially be exposed to the messages. Considerable evidence of the value of this approach is apparent as more and more institutions and communities commit to limiting exposure of nonsmokers to cigarette smoke.

Finally, although economic terms such as “cost-effectiveness” and “cost-benefit analysis” are used in politics and administration and to define outcomes in evaluation, there is surprisingly little cost-benefit analysis in research in the prevention area. Even in sustained prevention programs such as Project Head Start, cost-benefit data appear to be equivocal or limited in scope (Cicirelli 1969). One major reason for the dearth of such analyses seems to be that too few prevention program administrators and evaluators utilize the various disciplines that can contribute to such analyses. As Levin (1983) points out, “Policy decisions in the public sector must be based increasingly upon a demonstrated consideration of both the costs and the effects of such decisions.” (p. 11). Future prevention research

needs to focus on the cost-benefit and cost-effectiveness of drug prevention programs.

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# School-Based Approaches to Drug Abuse Prevention: Evidence for Effectiveness and Suggestions for Determining Cost-Effectiveness

*Gilbert J. Botvin, Elizabeth M. Botvin, and Hirsch Ruchlin*

## INTRODUCTION

Considerable effort has been expended over the past two decades to understand the causes of drug abuse and to identify effective prevention strategies. Much of this work has taken place in school settings, mainly because schools provide easy access to large numbers of individuals judged to be the primary target population for prevention efforts. They also provide a reasonably suitable environment for conducting prevention research studies. Despite their traditional educational mission, schools have been increasingly directed by State and local governments to assume responsibility for addressing an array of social and health problems. While not enthusiastic about mandates that some may see as distracting schools from their primary mission, many educators have a growing recognition that problems such as drug abuse are a significant barrier to achieving basic educational objectives. On a Federal level, for example, the U.S. Department of Education has included drug-free and safe schools as one of its goals for improving the quality of education in this country.

Although the focus of this monograph is on the important issue of cost-effectiveness as it relates to drug abuse prevention, a necessary precondition for a meaningful discussion of cost-effectiveness is the existence of evidence concerning the effectiveness of existing approaches to drug abuse prevention. This chapter will briefly review the evidence for the effectiveness of contemporary school-based drug abuse prevention programs. By and large this research literature and the authors' review focus on microlevel interventions targeting individuals. Not discussed in this chapter are macrolevel efforts such

as those relating to legislation or policy changes. The authors also offer some suggestions concerning how cost-effectiveness might be determined with respect to school-based drug abuse prevention.

## CLASSIFICATION OF PREVENTION APPROACHES

A wide range of prevention approaches has been developed and conducted in school settings over the past few decades. While schools and the communities within which they are located have long been concerned about the problem of tobacco, alcohol, marijuana, and other forms of drug abuse, the passage of the 1986 Drug-Free Schools and Communities Act by the U.S. Congress served as a major stimulus for schools to adopt drug abuse prevention programs. However, despite the proliferation of prevention programs, they mainly represent different permutations of only a few different prevention models. Most of these prevention approaches have never been properly evaluated in their current forms and are of questionable effectiveness. Some were based on prevention approaches that previous research has consistently demonstrated to be ineffective. Some were grounded in theory; most, however, were not. Notwithstanding these limitations of school-based prevention programs, there is a considerable body of high-quality research demonstrating the effectiveness of prevention approaches that are theoretically based, are well conceptualized, and have been subjected to extensive evaluation over the past 15 years. Following similar classification schemes used in prior reviews of the prevention literature (e.g., Botvin and Botvin 1992; Dielman 1994; Ellickson 1993; Hansen 1992; Perry and Kelder 1992), contemporary school-based prevention has been divided into four general categories: (1) information dissemination approaches, (2) affective education approaches, (3) social influence approaches, and (4) comprehensive or expanded social influences approaches, which include the teaching of generic skills training. In view of the evidence from past research studies, previous literature reviews, and the results of meta-analyses, the primary focus of this chapter will be on the last two categories of prevention approaches, since they provide the strongest results both in terms of methodological rigor and impact on drug use behavior. However, before discussing these approaches, the findings of studies evaluating information dissemination and affective education approaches will be briefly summarized.



## Information Dissemination Approaches

Growing out of an educational tradition, the most common approach to drug abuse prevention found in most schools has had a singular focus, that is, providing information about drugs and the consequences of drug abuse. The focus of tobacco, alcohol, and drug education programs (as they are frequently called by school personnel) involves factual information about the adverse health, social, and legal consequences of drug use without providing any skill training relevant to drug prevention. Fear arousal strategies are frequently incorporated into these programs in an effort to dramatize the deleterious effects of drug use and motivate (i.e., scare) adolescents into remaining abstinent. Other topics usually covered in informational programs include patterns of drug use, the pharmacology of various drugs of abuse, and methods of using drugs. While most programs have a distinctly antidrug use orientation, some programs endeavor to present the facts in a balanced and neutral manner. Such approaches to the problem of drug abuse rest on an implicit assumption that drug use and even drug abuse are the end result of a logical decisionmaking process. It is further assumed that if adolescents were better informed about the dangers of using drugs they would make a rational and informed decision to remain drug free. There are several inherent dangers in programs that simply present the facts. These programs may be ineffective because they are based on a faulty conceptualization of the causes of drug use and/or abuse, adolescents may be unable to easily weigh the pros and cons of using drugs, discussions of drug pharmacology may arouse curiosity, and providing information on how drug addicts use drugs may be giving program participants more information about using drugs than about not using them.

To increase the credibility of the antidrug message and to make programs more relevant, many schools recruit community leaders, law enforcement officers, or health professionals to administer part of the prevention program. For example, some programs have police officers come into the classroom and discuss law enforcement issues including drug-related crimes and penalties for buying or possessing illegal drugs. Other programs have used doctors or nurses to talk about the adverse health effects of using drugs. Still others invite former drug addicts into the classroom to discuss the problems they have encountered as the result of drug abuse.

According to previous reviews of the drug abuse prevention literature (Botvin and Botvin 1992; Dielman 1994; Dryfoos 1993; Ellickson

1993) and the results of meta-analytic studies (e.g., Bangert-Drowns 1988; Tobler 1986), evaluation studies have consistently shown that prevention approaches that rely exclusively or primarily on the information dissemination model do not prevent, reduce, or deter drug use. Although virtually all information-based prevention programs are able to demonstrate an increase in knowledge, and some studies have demonstrated an impact on attitudes in a direction consistent with nondrug use, there is little evidence indicating that they can have any meaningful impact on drug use behavior. The results of these studies should not be taken to mean that knowledge or information does not have a role in prevention programs. Rather, they underscore the fact that there are multiple factors promoting adolescent drug use and that prevention approaches based on more complex models of drug initiation are required in order for prevention efforts to be effective.

### Affective Education Approaches

During the 1970s, the nature of drug education began to change in some quarters. This change grew out of a dissatisfaction with the information approach and a recognition that some individuals were more likely to become involved with drugs than others. While drug education efforts based on teaching facts focused largely on drugs and their effects, affective education involved a change in perspective and focus from drugs to the psychosocial needs of the individual. Implicit in the affective education model of drug initiation was the underlying belief that individuals with a certain constellation of characteristics were at risk for becoming drug users and that the solution was to be found in programs promoting affective development. In contrast to information-based approaches, affective education emphasizes personal and social development in order to either overcome personal deficiencies believed to increase risk for using drugs or provide individuals with characteristics hypothesized to be associated with decreased risk of using drugs such as high self-esteem, personal insight, and self-awareness. Thus, the emphasis is on the affective rather than the cognitive.

An interesting feature of affective education is that it was more comprehensive than information dissemination approaches and recognized the role of psychosocial factors in the etiology of drug abuse. It also foreshadowed the expanded social skills training approach to drug abuse prevention, which has demonstrated significant reductions in both the incidence and prevalence of drug use. For example, components of affective education approaches

that are used in some of the most successful prevention programs include decisionmaking, effective communication, and assertiveness. However, studies evaluating the effectiveness of affective education have produced disappointing results. Some affective education approaches have demonstrated an impact on one or more of the correlates of drug use, while others have not produced the expected effects on drug-related variables. More important, they have not demonstrated an impact on drug use itself (Kearney and Hines 1980; Kim 1988).

Despite several strengths (i.e., emphasis on psychosocial variables and a more comprehensive intervention approach), the affective education model has several major weaknesses. These include a focus on a narrow and incomplete set of etiologic determinants, the use of ineffective methods to achieve their stated program goals (such as the use of experiential games and classroom activities rather than skills training methods), a lack of domain-specific information related to drug abuse, and the inclusion of “responsible use” norm-setting messages that may be counterproductive (Botvin 1995*a, b*).

### Social Influence Approaches

In response to the disappointing findings of studies testing the effectiveness of information dissemination and affective education approaches to prevention, researchers began testing a prevention model based in social psychology. From this perspective, adolescent cigarette smoking, for example, was conceptualized as being the result of social influences (persuasive messages) from peers and the media in the form of peer offers to smoke cigarettes, of advertising appeals, or of exposure to smokers who may serve as role models for these students.

The prevention approaches based on this model have typically contained two or more of the following components: psychological inoculation, correcting normative expectations, and resistance skills training. Early research with approaches based on this model emphasized psychological inoculation and modifying normative expectations. More recent approaches have tested variations on this model, emphasizing resistance skills training. Some approaches have added other components such as having students make a public commitment not to use drugs.

For the most part, the various permutations of the social influence model are similar in that they are based on social cognitive theory

(Bandura 1977) and a conceptual model that stresses the fundamental importance of social factors in promoting the initiation of adolescent drug use. Although this model includes social influences coming from the family, peers, and the media, the focus of most preventive interventions is on the last two of these, with the primary emphasis being placed on peer influences.

**Psychological Inoculation.** Social psychological research in persuasive communications (McGuire 1964, 1968) led prevention researchers (Evans 1976; Evans et al. 1978) to attempt to prevent cigarette smoking by “psychologically inoculating” adolescents against prosmoking messages coming from their social environment. These messages were conceptualized as the equivalent of “germs” with the potential for infecting adolescents with prosmoking attitudes. In order to build up resistance to these germs, adolescents were exposed initially to weaker forms of these messages and then to gradually stronger prosmoking messages.

Adolescents were trained in critical techniques to refute these prosmoking messages. These techniques included recognizing a persuasive prosmoking message, analyzing the message and its source, and developing tactics for coping with these situations. For example, adolescents are taught skills for dealing with situations involving an offer by a peer to smoke cigarettes. It was hypothesized that, by being prepared for the situation and having a counterargument ready before the offer is made, the adolescent would be better able to resist the pressure to try a cigarette. Although this foreshadowed the use of refusal skills, it focused more on cognitions and attitudes with little or no focus on skills training. Thus, the primary goal of this prevention approach was to prepare adolescents for eventual exposure to persuasive prosmoking influences from peers and/or the media.

**Correcting Normative Expectations.** A second component of social influence approaches to drug abuse prevention was based on a social psychological principle called the “false consensus effect” (Ross et al. 1977). The false consensus effect helps explain the observation that adolescents who believe that cigarette smoking is a behavior that nearly everyone engages in are more likely to smoke cigarettes. Providing students with accurate information about the actual smoking rates or having them conduct their own survey to discover the information themselves alters their perceptions of smoking norms.

**Resistance Skills Training.** The third major component of social influence approaches, which has become a central feature of such

approaches over the past decade, is to provide adolescents with the skills needed to identify and resist common social influences to use drugs—influences coming from the media and especially influences from peers. However, an important difference in these approaches is the focus on teaching students the skills needed to resist these influences.

The resistance skills dealing with the media are intended to make students aware of the media influences they will be exposed to, with a particular emphasis on the techniques used by advertisers to influence consumer behavior. Students are taught to recognize advertising appeals designed to sell tobacco products or alcoholic beverages as well as how to formulate counterarguments to those appeals. Resistance skills are also taught to combat both subtle and more direct (and at times coercive) pressure from peers to smoke, drink, or use illicit drugs. These skills typically include refusal skills, which are a subset of general assertive skills. Using behavioral training techniques, skills for refusing offers to use drugs are modeled and practiced in the classroom. Students are taught to identify high-risk situations (such as parties or hanging around after school) where they are the most likely to experience peer pressure to smoke cigarettes, drink, or use illicit drugs. They are shown how to handle these situations through a repertoire of verbal (refusal) responses. They are also taught how to use these verbal responses in an effective (assertive) manner (i.e., with an appropriate tone of voice, making eye contact, using “I” statements, maintaining an assertive body position, speaking clearly and confidently).

## TARGET POPULATION AND PROGRAM PROVIDERS

The target population for most of the research conducted with resistance skills training approaches has been middle school or junior high school students (grades six to nine). Some studies have targeted younger populations, such as fourth or fifth graders (Flynn et al. 1992). The length of prevention approaches based on the resistance skills training model has ranged from as few as 3 or 4 sessions to as many as 11 or 12 sessions conducted over a 2-year period. Different types of program providers have also been used in various research studies. Some programs have been implemented by research staff members, others have been implemented by regular classroom teachers.

Many prevention programs teaching resistance skills have done so with the assistance of peer leaders serving as program providers.

These students are either older (e.g., 7th graders may be taught by 9th or 10th graders) or the same age as the students participating in the prevention program. A common argument for using peer leaders as program providers is that they have greater credibility with junior high school age students with respect to lifestyle issues than do adults, since adolescence is a time characterized by some degree of rebellion against parents and other adult authority figures. In addition to providing students with information concerning rates of drug use and skills for resisting offers to use drugs, a potentially powerful benefit of peer leader programs is that they may help alter school norms regarding drug use and its social acceptability. To the extent that peer leaders are viewed by students as being credible sources of information and influential role models who do not regard drug use as being socially acceptable, peer-led prevention programs may have an important impact on normative beliefs supportive of nondrug use.

## EFFECTIVENESS

After more than 15 years, there is an impressive literature of studies testing interventions based on the social influence approach. These studies have been published in high-quality peer-reviewed journals and have documented its effectiveness in both small- and large-scale studies (Arkin et al. 1981; Donaldson et al. 1994; Ellickson and Bell 1990; Hurd et al. 1980; Luepker et al. 1983; Pentz et al. 1989*a, b*; Perry et al. 1983; Snow et al. 1992; Sussman et al. 1993; Telch et al. 1982). The focus of most of these studies has been on smoking prevention with some studies reporting results in terms of smoking onset (preventing the transition from nonsmoking to smoking), others reporting results in terms of overall smoking prevalence, and still others reporting results with respect to an index measure or scale of smoking involvement.

Although there is considerable variability across studies in terms of methods and the magnitude of effects, these studies have generally indicated that this type of prevention approach is capable of reducing drug use by 30 to 50 percent after the initial intervention (based on a comparison of the proportion of smokers in the experimental group with the proportion of smokers in the control group). Studies reporting results in terms of smoking incidence have shown reductions ranging from approximately 30 to 40 percent (comparing the proportion of new smokers in the experimental group with the proportion of new smokers in the control group). Several studies have demonstrated reductions in the overall prevalence of cigarette smoking in terms of both occasional smoking (one or more cigarettes

per month) and/or regular smoking (one or more cigarettes per week). Those reductions have ranged from approximately 40 to 50 percent. Although there are fewer studies assessing the impact of social influence approaches to substances other than tobacco, such as for alcohol or marijuana use (Donaldson et al. 1994; Ellickson and Bell 1990; McAlister et al. 1980; Pentz et al. 1989*a*; Shope et al. 1992), the magnitude of the reductions reported has generally been similar to that found for smoking.

Over the years, several followup studies have been published that report positive behavior effects lasting for up to 3 years (Luepker et al. 1983; MacKinnon et al. 1991; McAlister et al. 1980; Pentz et al. 1989*b*; Shope et al. 1992; Sussman et al. 1993; Telch et al. 1982). However, data from several longer term followup studies have shown that these effects gradually decay over time (Bell et al. 1993; Ellickson et al. 1993; Flay et al. 1989; Murray et al. 1988), suggesting the need for ongoing intervention or booster sessions. Because little is known about the nature and timing of booster interventions, additional research is needed. Also, because relatively little research has been conducted with substances other than tobacco, data concerning the durability of prevention effects on other substances are not available.

The studies testing social influence approaches have been similar in most respects. There are, nonetheless, some differences. In order to gain a better understanding of the underlying mechanism of these programs, and to develop more effective interventions, the various intervention components of these programs deserve closer scrutiny. A common component of several resistance skills training approaches has been a procedure through which individuals make a public commitment not to smoke, drink, or use drugs. However, a study by Hurd and colleagues (Hurd et al. 1980) suggests that this component may not contribute to any observed prevention effects. Another common component is the use of videotaped or filmed prevention materials similar to those utilized by Evans and colleagues (Evans et al. 1978). Still, it is not yet clear what type of media material is the most effective or the extent to which it is a necessary component of these prevention programs. Similarly, little is known about the optimal time of intervention (age or grade level), program length, program structure, type of provider, type of booster intervention and its timing, or the characteristics of the individuals who are the most affected by these interventions.

Finally, nearly all of the studies testing resistance skills training approaches have used peer leaders. Moreover, some studies have

attempted to determine the effectiveness of peer leaders relative to other program providers. By and large, the existing evidence supports the use of peer leaders for this type of prevention approach (Arkin et al. 1981; Perry et al. 1983). Yet it is not altogether clear from the available evidence that peer leaders are either necessary or better than other providers. More work is necessary to determine the most appropriate kind of program provider and the optimal mix of responsibilities between adult and peer providers.

#### INTEGRATED SOCIAL INFLUENCE/COMPETENCE ENHANCEMENT APPROACHES

The underlying conceptual framework for social approaches is that adolescents begin to smoke, drink, or use drugs either because they succumb to the persuasive messages targeted at them or because they lack the necessary skills to resist social influences to use drugs. Although social influence approaches are important because they recognize the role social factors play in the etiology of drug abuse, they have been criticized because they do not pay sufficient attention to the intrapersonal factors involved in the etiology of drug use and abuse (Botvin and Botvin 1992). More comprehensive than either informational or affective education approaches, they still may be based on an understanding of drug abuse etiology that is too narrow and fails to fully appreciate the array of etiologic factors not subsumed under the social influence model. These approaches also largely ignore the fact that there may be multiple developmental pathways leading to drug abuse. While it may be the case that social influences may be the most potent factors promoting drug use for some individuals, intrapersonal factors may be more important for others. For example, using drugs may not be a simple matter of yielding to peer pressure for some adolescents, but it may be instrumental in helping them deal with anxiety, low self-esteem, or a lack of comfort in social situations. To the extent that this is correct, prevention approaches need to go beyond the social influences model to interventions, which are broader based and more comprehensive.

Studies concerning the etiology of tobacco, alcohol, and drug use indicate that a variety of cognitive, attitudinal, social, personality, pharmacological, and developmental factors promote and help maintain drug use (Baumrind and Moselle 1985; Blum and Richards 1979; Jessor and Jessor 1977; Jones and Battjes 1985; Kandel 1978; Meyer and Mirin 1979; Newcomb and Bentler 1988; Wechsler 1976). It therefore seems logical to conclude that the most effective



prevention strategy would be one that is comprehensive, targeting a broad array of etiologic determinants.

Research has been conducted over more than 15 years with broader based prevention approaches that emphasize the teaching of generic personal and social skills either alone (Caplan et al. 1992) or in combination with components from the social influence model (Botvin et al. 1980, 1983, 1984*a, b*, 1990*b*; Gilchrist and Schinke 1983; Schinke and Gilchrist 1983, 1984). This type of prevention strategy is more comprehensive than traditional cognitive/affective approaches or social influence training approaches. Moreover, unlike affective education approaches, which rely on experiential classroom activities, these approaches emphasize the use of proven cognitive-behavioral skills training methods.

The theoretical foundation for these approaches is Bandura's social cognitive theory (Bandura 1977) and Jessor's problem behavior theory (Jessor and Jessor 1977). Drug abuse is conceptualized as a socially learned and functional behavior, which is the result of the interplay between social (interpersonal) and personal (intrapersonal) factors. Drug use behavior is learned through a process of modeling/imitation and reinforcement and is influenced by an adolescent's cognitions, attitudes, and beliefs.

Although these approaches have several features that they share with social influence approaches, a distinctive feature of these approaches is an emphasis on the teaching of generic personal self-management skills and social skills. These skills are taught in a systematic fashion using a combination of instruction and demonstration, feedback, reinforcement, behavioral rehearsal (in-class practice) and extended (out-of-class) practice through behavioral homework assignments.

Examples of the skills typically included in this prevention approach are decisionmaking and problemsolving skills, cognitive skills for resisting interpersonal and media influences, skills for enhancing self-esteem (goal setting and self-directed behavior change techniques), adaptive coping strategies for dealing with stress and anxiety, general social skills (complimenting, conversational skills, and skills for forming new friendships), and general assertive skills (requests and refusals). Most variations on this prevention approach teach generic skills along with their application to situations related directly to tobacco, alcohol, or drug use. An added benefit of this type of program is that it teaches students a repertoire of generic skills that can be used to deal with many of the challenges confronting adolescents in their everyday lives.

The purpose of programs based on this model is to provide students with the kind of generic skills for coping with life that will have broad application. This contrasts markedly with social influence approaches that focus exclusively on information and skills relating to the problem of drug abuse. Although the problem-specific social influence approaches are most easily contrasted with the generic skills training model, the most effective approaches appear to be ones that integrate features of both. In fact, there is some evidence to suggest that generic skills training or competence enhancement approaches are not effective unless they also contain domain-specific material (Caplan et al. 1992).

#### TARGET POPULATION AND PROVIDERS

The target population for most of the studies conducted with the personal and social skills training approach has been middle school and junior high school students. The vast majority of published studies have involved students who were in the seventh grade during the first year of intervention. Multiyear studies and followup studies have involved students during the 8th and 9th grades, and some more recent studies have followed students up to the 12th grade (Botvin et al. 1995*a, b*). On the other end of the age spectrum, very little work has been done with younger populations, although some studies have been conducted with sixth graders (Kreutter et al. 1991). The reason for this is that researchers have generally avoided younger populations because of the difficulty in demonstrating statistically significant behavioral effects because the base rates of drug use are too low.

Most of the studies conducted with approaches that emphasize the teaching of personal self-management skills and generic social skills have been implemented with adults as the primary program provider. In many cases these adults were regular classroom teachers; in some cases they were outside health professionals (i.e., members of the research project staff). Some studies used college students as program providers, while others used either same age or older peer leaders. Peer leaders, when used, frequently had clearly delineated responsibilities and worked under the direction and supervision of an adult primary provider. Some studies have actually used peer leaders who had sole responsibility for conducting these interventions and who did so on their own and without the help of adult providers. Studies testing this prevention strategy have shown that it can be

successfully implemented by peer leaders, outside health professionals, and teachers.

## EFFECTIVENESS

The effectiveness of the expanded social influence/competence enhancement approaches has been tested in a number of research studies, from small studies involving a few schools to large-scale, randomized clinical trials. These studies have consistently demonstrated behavioral effects as well as effects on hypothesized mediating variables. Importantly, the magnitude of reported effects of these approaches has typically been relatively large. These studies have generally produced 40 to 80 percent reductions in drug use behavior. One criticism of contemporary prevention programs is that even though they have been able to demonstrate impressive reductions in the incidence and prevalence of drug use behavior, these reductions have generally occurred with respect to experimental or occasional use. Although it is important to demonstrate reductions in the early stages of drug use, critics argue that what matters most is demonstrating reductions in more frequent levels of use—i.e., the kind of regular use that eventuates in addictive or compulsive patterns of use. Data from two studies of a prevention program called Life Skills Training (LST) deal directly with this issue by demonstrating reductions of 56 to 67 percent in the proportion of pretest nonsmokers becoming regular smokers 1 year after the conclusion of the prevention program without any additional booster sessions (Botvin and Eng 1982; Botvin et al. 1983). For those students receiving booster sessions, these reductions have been as high as 87 percent (Botvin et al. 1983). Equally important is the finding from several studies that produced initial reductions of 50 percent or more for regular cigarette smoking (Botvin and Eng 1982; Botvin et al. 1983, 1990*b*).

Another important issue concerns the durability of prevention effects. Long-term followup data from a large-scale randomized trial involving students from 56 schools in New York State found reductions in smoking, alcohol, and marijuana use 6 years after the initial baseline assessment (Botvin et al. 1995*a*). The magnitude of these reductions ranged up to 44 percent in drug use and 66 percent in polydrug use (defined as adolescents who used all three gateway substances during the past week).

Results of studies utilizing generic skills training approaches such as the LST program have also demonstrated an impact on other forms

of drug use. Several studies have demonstrated an impact on the use of alcohol (Botvin et al. 1984*a, b*, 1990*a*, 1994*b*) and marijuana (Botvin et al. 1984*a, b*, 1990*b*, 1995*a, b*). These reductions have generally been of a magnitude equal to that found with cigarette smoking.

A gap in the drug abuse prevention field that has only recently begun to be addressed concerns the lack of high-quality research with racial/ethnic minority populations. Although there are only limited data concerning the etiology of drug abuse among minority populations, existing evidence suggests that there is substantial overlap in the factors promoting and maintaining drug use/abuse among different racial/ethnic groups (Botvin et al. 1993*a, b*, 1994*b*; Dusenbury et al. 1992).

Research has shown that the LST approach is effective in preventing cigarette smoking with Hispanic youth (Botvin et al. 1989, 1992) and African-American youth (Botvin and Cardwell 1992). Followup data with Hispanic youth have demonstrated the continued presence of prevention effects through to the end of the 10th grade (Botvin 1994). Although most of the research with minority populations has focused on smoking prevention, some recent evidence indicates that it may also be effective in reducing alcohol and marijuana use (Botvin et al. 1994*a*, 1995*b*) and that tailoring the intervention to the target population can enhance its effectiveness (Botvin et al. 1995*b*).

## ASSESSING COST-BENEFIT AND COST-EFFECTIVENESS

### Economic Assessments of Program Impact

In general, most economic assessments in the healthcare field utilize cost-effectiveness rather than cost-benefit analyses. The difference between these two techniques is that cost-effectiveness studies report outcomes in noneconomic units, whereas cost-benefit analyses monetize outcomes and as a result focus only on those types of outcomes that can be readily expressed in dollars. The broader outcome scope of cost-effectiveness studies is believed to be more amenable to capturing the full scope of clinical benefits (Russell 1986; Weinstein and Stasson 1977). Critics of the use of cost-benefit analysis point to the following drawbacks associated with its use. It does not account for pain and suffering; its valuation of human life based on a person's labor market earnings is open to biases due to race- and sex-related discrimination in the marketplace; and it

overlooks issues regarding the equitable distribution of benefits among the various groups in society (Scheffler and Parringer 1980; Sindelar 1991).

Nevertheless, when done well cost-benefit analysis aids in the complete enumeration of costs and benefits as well as in the explicit consideration of assumptions and underlying quantitative benefits (Swint and Nelson 1977). In the authors' opinion it should be used as a key measure of an intervention's success.

The authors' suggested emphasis on cost-benefit analysis is based on two considerations. First, noneconomic benefits normally highlighted in a cost-effectiveness study are usually included in traditional program evaluations. Second, the results of a cost-effectiveness analysis do not directly reflect on the economic gain; rather, they indicate the cost to attain important life enhancing, quality-of-life, or psychosocial gains. The results of a cost-benefit analysis explicitly indicate whether costs are being recouped (Eisenberg 1989; French 1993). Without advocating that cost recovery should be the sole criterion upon which policy is set, it is desirable to know if the value of the economic benefits exceeds the costs incurred. Cost-benefit studies provide this type of information.

#### Evaluating an Intervention's Economic Impact: A Cost-Benefit Approach

This methodology entails comparing the incremental (marginal) cost of the intervention with the savings achieved through a different overall resource utilization pattern associated with participation in the study

intervention. Represented in simplified equation form, program benefits (savings) are defined as follows:

$$B = MCC_c - MCC_i$$

where

B = discounted (i.e., constant dollar) program benefits

MCC<sub>c</sub> = discounted expenditures of clients in the control group

MCC<sub>i</sub> = discounted expenditures of clients in the intervention group

Overall program benefit is estimated by the use of either of two statistics: a benefit-cost ratio (B/C) and net present value (NPV). Representing program cost (in constant dollars) by C, the benefit-cost ratio is the value obtained by dividing benefits by costs. If this quotient exceeds 1, benefits exceed costs; a value less than 1 indicates that costs exceed benefits; and a value of 1 indicates that benefits equal costs. As the B/C does not indicate the actual magnitude of the savings, an NPV statistic should also be reported. NPV is calculated by subtracting C from B (i.e.,  $NPV = B - C$ ), and it indicates the actual amount saved.

As interventions span multiyear periods, all costs should be discounted to a base-year period. A 5 percent discount rate is traditionally used; alternate rates are then used as part of the sensitivity analysis.

Two types of cost savings should be included in the benefit calculations: savings arising from reduced direct costs and savings arising from reduced indirect costs. The analysis should adopt a societal perspective, recognizing all relevant direct and indirect costs incurred by patients and their families in the intervention and control groups (Eisenberg 1989).

Direct costs are usually divided into three categories: the first focuses on medical care costs; the second on costs arising from criminal activity, violence, and accidents; and the third on community-based social services. Criminal activity, violence, and accident-associated costs, although not emphasized in traditional cost-of-illness studies, are a major component of the expected benefits in the substance abuse area as previously noted. These activities have also been recognized in other studies (Apsler and Harding 1991; French 1993; Goldsmidt 1976; Hayashida et al. 1989; Plotnick 1994; Saxe et al. 1983; Walsh et al. 1991). Indirect costs consist of any out-of-pocket costs incurred by the patient and her/his family in connection with participating in the intervention, lost earnings due to absence from work, and other productivity losses related to restricted activity days.

A third cost category, informal care, can also be included. Informal care refers to unpaid assistance given by friends and/or relatives.

### Evaluating the Intervention's Economic Impact: A Cost-Effectiveness Approach

Each project traditionally evaluates its impact in noneconomic terms. These outcome measures can then be combined with estimates of program cost to derive a cost-effectiveness measure. Investigators in each project should select the most important single evaluation statistic to be compared to cost. If a single statistic is inadequate to capture the full scope of the intervention's accomplishments, then a tabular-display approach will be used (Doherty and Hicks 1977). Under this approach all outcome and cost measures form rows in a cost-outcome table and the experimental and control groups constitute the columns in the table. The reader can thus see the costs associated with each array of outcomes. If all of the study outcomes are superior for one group, then cost-effectiveness assessment is straightforward. If the direction of outcome measures differs across groups, the study investigators subjectively value the outcomes and offer their assessment of the overall cost-effectiveness of the intervention. Under this approach the reader is free to adopt a different valuation scheme and reach her/his own conclusion.

### SUMMARY AND CONCLUSIONS

This chapter has briefly summarized the major work conducted over the past 15 years in school-based approaches to drug abuse prevention. During this time, it has become clear that some of the most widely used prevention approaches are ineffective and many other approaches are untested. Notable among those approaches found ineffective are traditional prevention approaches that rely on teaching information concerning the adverse consequences of drug abuse and affective education. Other research has demonstrated the efficacy of prevention approaches that focus on psychosocial factors associated with drug use initiation and/or drug abuse. These approaches emphasize the teaching of social resistance skills and correcting normative expectations. Some of the most effective approaches also include the teaching of generic personal and social skills. Studies testing the efficacy of these approaches have shown that they are capable of reducing drug use for up to 6 years. Although most of this research has been conducted with white youth, evidence from several studies also shows that these approaches are effective

with inner-city, minority youth. However, beyond the issue of effectiveness are the related issues of cost-effectiveness and cost-benefits, which are the subject of this monograph. Other chapters have addressed these issues in more detail; this chapter provides a brief discussion concerning how the cost-effectiveness and cost-benefit of school-based drug abuse prevention programs may be determined.

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# Effectiveness of Prevention Interventions With Youth at High Risk of Drug Abuse

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A recent report describes three types of prevention programs: universal, selected, and indicated (Institute of Medicine 1994). Universal prevention approaches are those that serve the entire population who share a general risk to the disorder without regard to specific risk status. Selected prevention approaches serve those whose precursors of problem behaviors are elevated but who have not yet manifested the problem behavior to be prevented. Indicated prevention approaches serve those who have initiated the problem behavior to be prevented but have not yet developed a serious or chronic behavior problem and do not warrant at that time a clinical diagnosis of the disorder according to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R or DSM-IV).

The effects of universally applied prevention approaches for substance abuse and other problems are well documented in the literature (Hansen et al. 1990; Hawkins et al. 1992; Moskowitz 1989). Less attention has been given to the effects of prevention approaches with selected youth whose specific characteristics put them at higher risk. This chapter first examines several definitions of high-risk youth and chooses one based on youths' exposure to consistently identified, longitudinal correlates or risk factors for substance abuse. This discussion is followed by a selective review of prevention program research studies chosen for their demonstrated effectiveness of program promise for reducing risk among high-risk populations.

## DEFINITIONS AND ISSUES

Many definitions of high-risk youth have been offered over the last 10 years. Several identify as high risk those youth who have

symptoms of problems other than drug abuse. For example, in 1989 the Office of Substance Abuse Prevention (OSAP) defined high-risk youth as those who are abused, neglected, homeless, runaway, economically disadvantaged, physically or mentally challenged, pregnant, school dropouts, children of substance abusers, or latchkey children (OSAP 1989). The Anti-Drug Abuse Act of 1986 as amended in 1988 defined high-risk youth as children of substance abusers; latchkey children; those eligible for Head Start; those not attending school; and those at risk for various problems other than drug abuse, including child abuse and neglect, school dropout, teen parenthood, and unemployment. In a later definition, OSAP (1990) added conduct-disordered children with social deviancy to its list of high-risk youth.

Race also has been used as a defining characteristic of high-risk youth, with minority youth considered to be at high risk. OSAP (1990) suggested this criterion because of the high levels of poverty, difficult environments, and educational problems often experienced by minority groups. Others have also used the racial criterion in defining high-risk youth. Johnson (1990) noted the overrepresentation of minorities in statistical reports of drug abuse and adverse health consequences of drug abuse. In a report on high-risk youth, Dryfoos (1991) noted that African Americans and Hispanic Americans are more likely than European Americans to be exposed to poverty and poor living conditions and to perform poorly academically. Of African Americans and Hispanic Americans, 51 percent and 47 percent respectively are exposed to these factors, compared with 17 percent of European Americans. Dryfoos noted, however, that a greater absolute number of European Americans experience these conditions because of their much larger population size.

Poverty also has been used as a defining characteristic of high-risk youth because of the number of disadvantages associated with living in poverty. For example, the Children's Defense Fund (1994, p. 3) describes the cumulative disadvantages of poverty by estimating that "every year spent in poverty adds two percentage points to the chances that a child will fall behind in school...[further,] family income is a far more powerful correlate of a child's IQ at age 5 than maternal education, ethnicity, and growing up in a single-parent family." Those who live in poverty are also exposed to other adverse conditions, including availability of drugs, lack of legitimate opportunity, alienation and hopelessness (OSAP 1990), and family conflict and domestic violence (Children's Defense Fund 1994).



The list of possible criteria to define high-risk youth is endless. Although these definitions may be useful for many purposes, there is little rational or empirical basis for choosing among them. This chapter proposes a definition of high-risk youth that incorporates knowledge about those factors identified by research as increasing children's likelihood of developing problems with substance use in adolescence. These characteristics are empirically associated with higher rates of substance abuse in adolescence and provide diagnostic as well as intervention-relevant information.

Much work has been done to identify risk factors for substance abuse over the past 30 years, and several summaries exist (Hawkins et al. 1992, 1995; Kandel et al. 1986). Risk factors are characteristics that demonstrate a prospective relationship with the given disorder in multiple studies (Hawkins et al. 1992; Institute of Medicine 1994). They include environmental factors (availability of substances, community laws and norms favorable to use, extreme economic deprivation, high rates of transition and mobility, and community disorganization); family factors (family history of alcoholism, poor family management practices, parental drug use and favorable attitudes toward drug use, and family conflict); school factors (academic failure and low commitment to school); and individual and peer factors (constitutional factors, peer rejection, early and persistent problem behavior, alienation and rebelliousness, friends who use drugs, favorable attitudes toward drug use, and early initiation of drug use) (Hawkins et al. 1992, 1995).

Causality has not yet been established for all of these risk factors. Some may simply be markers, whereas others may be true causes of substance abuse. If the risk factors are causal, then modifying or buffering their effects may reduce the incidence of later adolescent substance abuse. Only experimental manipulation of modifiable risk factors will reveal their status as causal factors. Nevertheless, these identified risk factors provide a current source of promising targets for prevention (Hawkins et al. 1992; Institute of Medicine 1994).

Before intervening with high-risk populations, two issues must be addressed. The first is how to target individuals for preventive intervention. Strategies include targeting the high-risk individuals (selective prevention) or targeting entire communities in which a high percentage of the residents are exposed to high levels or multiple risk factors, but which also include low-risk individuals (a type of universal prevention). If high-risk individuals are targeted, care must be taken to avoid potential harm from labeling. This problem may be ameliorated if exposure to the risk factor is a problem in itself. For

example, high levels of family conflict, academic failure, or poor family management practices characterized by abuse and neglect are themselves reasons for intervention.

Selecting high-risk community areas for intervention is another approach to targeting. Universal prevention efforts that have focused sample selection on high-risk community areas have shown positive effects on both low- and high-risk youth (Hawkins et al. 1988, 1992; Kellam and Rebok 1992; O'Donnell et al. 1995; Rotheram 1982*b*). Targeting high- and low-risk individuals together has the advantage of enabling high-risk individuals to observe and learn positive behavioral patterns from their low-risk peers. Several studies have supported this advantage. For example, the St. Louis Conundrum reported on the effects of grouping strategies in their intervention with delinquent adolescents (Feldman and Caplinger 1982). Two approaches were employed for intervention: grouping delinquents separately for intervention and grouping delinquents and nondelinquents together. The results suggested that the latter was the more successful strategy to prevent reoffending, and the nondelinquents appeared to be little affected by exposure to delinquent models.

The second issue is that the risk factors used to define high-risk youth can be employed as the targeting factor only, as the focus of intervention, or as both. There are advantages to employing the definition of high risk as both a targeting factor and as an active focus of the intervention. As mentioned above, the dangers of labeling individuals as high risk for future problems are reduced when children with elevated levels of risk factors are selected, if a high level of the given risk factor constitutes a problem requiring intervention. A second advantage of using the risk factor as both targeting factor and intervention focus is that the targeting factor provides valuable assessment information that can be used to determine the course of preventive intervention. It is unfortunate that prevention programs for high-risk youth often ignore the targeting factors when they design their interventions. For example, a program may target children from low-income families but never take steps to improve the earning potential of the children or their parents, delivering instead the same interventions used with children who are not from low-income families.

This chapter defines high-risk youth as those exposed to multiple risk factors or to a high level of a single risk factor for substance abuse. Using this definition, a comprehensive review of interventions would include any intervention, selected or universal, that focused on

children at elevated risk due to exposure to a broad range of factors—community, family, school, peer, and individual. Because such a breadth of review is beyond the scope of a single chapter, this discussion is limited to research-evaluated interventions targeting children of substance abusers (COSAs), who are exposed to multiple risk factors, and those targeting children with elevated levels of the single risk factors academic failure and early antisocial behavior.

## CHILDREN OF SUBSTANCE ABUSERS

Families play a significant role in either preventing or contributing to their children's involvement in adolescent problem behaviors, including substance abuse (Chassin et al. 1993; Hawkins et al. 1992; Yoshikawa 1994). Research shows that children growing up in families where parents abuse substances are exposed to multiple risk factors for substance abuse as well as other problem behaviors (Catalano et al., in press; Chassin et al. 1993; Goodwin et al. 1977; Sher 1991). Family history of addiction is itself only one risk factor and does not condemn the child to a life of addiction. However, many other risk factors may result from the difficult life circumstances of families in which parents abuse substances. Consequently, compared to general population youth, these children's problem behaviors, including involvement in substance use, school misbehavior, and delinquency, begin earlier and at higher rates (Catalano et al., in press).

Many children of substance abusers live in conditions characterized by extreme economic deprivation, social isolation, multiple entrapment, poor living conditions, and parents in low-status occupations (Kumpfer and DeMarsh 1986). These conditions often result in exposure to numerous risk factors, including high rates of transition and mobility and low neighborhood attachment and community disorganization. Family life characterized by trouble with the law, frequent moves, frequent arguments, illness, drug and alcohol use by household members, and abusive relationships make parenting more difficult (Barnard 1989; Mercer 1990; Sher 1991; Spieker and Booth 1988), often resulting in family management problems and family conflict. Substance-abusing parents spend fewer hours with their children per week, have poorer parenting practices, and have more problems in many areas of their lives (Bauman and Levine 1986; Kolar et al. 1994; Sowder and Burt 1978). Numerous studies have found that family conflict characterizes the homes of active substance abusers (Ackerman 1983; Kolar et al. 1994; Kumpfer and DeMarsh 1986; Moos et al. 1979). Finkelstein (1990) reported that women

substance abusers suffer a higher degree of violence. These families are generally disorganized and have few home management skills, low family cohesion, and high stress; suffer financial troubles (Kumpfer 1987; Kumpfer and DeMarsh 1986); and experience elevated discipline problems (Tarter et al. 1993).

Children of substance abusers often experience the individual risk factors of early antisocial behavior, academic failure in elementary school, lack of commitment to school, alienation and rebelliousness, friends who engage in problem behaviors, and favorable attitudes toward substance abuse. Mothers' problems with pregnancy due to inadequate prenatal care and poor prenatal nutrition may lead to constitutional risk factors for the child. Such risk factors include preterm delivery, low birthweight, small head circumference, minor physical abnormalities, and brain damage (Griffith et al. 1994). Other constitutional risk factors may result from drug use during pregnancy, such as genetic susceptibility to problems with substance use or early temperamental and behavioral difficulty (Berstein et al. 1984). Overall, being the child of an alcoholic is negatively related to experiencing positive events and positively related to experiencing negative events (Roosa et al. 1990). Children may develop mental disorders, including depression, emotional problems, relationship problems, and violence (Bernardi et al. 1989; Kolar et al. 1994; West and Prinz 1987).

On the other hand, research with populations exposed to multiple risks has identified subgroups of individuals who negotiate risk exposure successfully. This research has identified factors that protect against risk factors, especially among children of substance abusers (Bennett et al. 1988; Chassin et al. 1993; Garmezy 1985; Hussong and Chassin 1994; Werner 1989). Hussong and Chassin found that children of alcoholics whose families also had high levels of family organization had drug use levels as low as children from nonalcoholic families. Other factors that appear to protect against the risk of drug abuse are attachments to positive adults (Brook et al. 1990; Werner 1989), positive temperament in the early years (Garmezy 1985; Tarter et al. 1993), being female (Chassin et al. 1993), and positive social orientation (Rutter 1985; Werner and Smith 1982).

Prevention programs that attempt to reduce or buffer these children's exposure to specific risk factors while strengthening protective factors hold promise for preventing substance abuse among children of substance-abusing parents. Many programs of this type exist, but few have been evaluated. Examples of unevaluated programs are

Connections, developed and distributed by the U.S. Department of Education, and Kids Like Us Everywhere (KLUE), distributed by the Seattle/King County Public Health Department. Two selection options have been used to work with this population: working with families who have parents in treatment and working with the children of substance abusers only. However, little research has been completed on the effectiveness of programs that intervene with the parents or their children (Falco 1992; Gross and McCaul 1992; Sher 1991). The four interventions reviewed below are among those that have been evaluated and show evidence of short-term success in reducing risks while enhancing protection against substance abuse. Due to the existence of few studies of this nature, some studies have been included despite design weaknesses.

Catalano and associates (in press, under review) report on Focus on Families, a program designed to address the family-influenced risk factors of poor family management, parental drug use and positive attitudes toward use, early antisocial behavior, friends who use drugs, favorable attitudes toward drugs, and early first use. It also addressed the school risk factors of academic failure and low commitment to school. The intervention included behavioral skills training sessions and case-management services. The behavioral skills program consisted of a 5-hour family retreat and 32 twice-weekly, 90-minute sessions (16 weeks) of parent training. Children attended 12 of the sessions to provide families the opportunity to practice skills together in a controlled environment. Training sessions followed a structured curriculum with a cognitive-behavioral approach. The family retreat assisted parents and children to set family goals together, set norms for the group, and complete group bonding activities. The program sessions taught parents skills in preventing and coping with relapse; refusing unwanted drug offers; solving problems; controlling anger; managing their families, including setting limits, monitoring, and imposing consequences on children's behavior; and supporting their children's success at school. Each session provided a review of skills from previous sessions and progress toward family goals. New skills were introduced and then practiced using role-plays, which were videotaped, viewed, and discussed in the group. Home practice assignments were given at the end of each session. The program was delivered by master's-level therapists in a group setting at the methadone clinics with 8 to 10 families per group. Case managers provided home-based services to families to help them maintain and generalize the skills they had learned, assist in crises, and provide other services. Referrals to other services were made if necessary. Case managers conducted a comprehensive needs assessment with families and spent 5 to 10 hours each month per family for 8 months,

including the 4 months during the parenting group and 4 months after group completion. They encouraged families to use program tools such as holding family meetings, increasing opportunities for each member's family involvement, and increasing opportunities for children to be involved in prosocial activities outside the family.

Parents were recruited from two methadone treatment programs in Seattle, Washington. Of those who were identified as eligible and invited to participate, 78 percent consented and completed baseline interviews. These parents were randomly assigned into one of two conditions: either the methadone treatment program plus the supplemental parenting program (N = 82), or the standard methadone treatment alone (N = 62). At posttest, 135 (94 percent) families were interviewed (77 experimental and 58 control); 9 were unavailable (5 experimental and 4 control). At immediate posttest, approximately 1 to 4 weeks after the conclusion of the skills training group, parents in the experimental group showed significant reductions in family risk factors compared to those in the control group, including an increase in parent-child involvement in family meetings to plan fun activities and a reduction in frequency of parental opiate use. Parents' opiate use was verified on a 25 percent random sample of experimental and control subjects selected for urine analysis. There were no differences between groups in truthful reporting of drug use in this subsample. The impact on parent risk factors is promising, but full assessment of the impact of the program on child risk factors and drug use awaits analysis of 6-month followup data still in progress.

Kumpfer and DeMarsh (1986) and Kumpfer (1987) reported on the Strengthening Families Program, which addressed the family risk factors of family management problems, family conflict, alienation/rebelliousness, and antisocial behavior. Parents in mental health and methadone treatment and their children participated in the study, although the program did not explicitly address parents' drug use. Participants focused on identifying and reducing their children's problem behaviors and increasing the number of positive interactions with their children. The full intervention consisted of 14 parent training sessions using a structured curriculum, parent manuals, and homework exercises. Children attended the last four sessions, and during this time parents developed and began to implement a behavioral change program with their children.

Using a quasi-experimental dismantling design, the investigators conducted three intervention groups: (1) the full Strengthening Families Program, (2) a group with 14 sessions of parent skills training only, and (3) a group with parent and child training offered

independently during the same period of time. Fifty-eight families were recruited into the study and assigned to the three conditions. A battery of family assessment measures were administered before and after the 14-week intervention. The instruments included a parent questionnaire, a child questionnaire, the Achenbach Child Behavior Checklist (Achenbach and Edelbrock 1983), and the Moos Family Environment Scale (Moos 1974). The authors stated that the Strengthening Families Program was the most effective of the three conditions; however, there is no published report explicitly comparing the outcomes across the three conditions. Comparisons made between baseline and immediate postprogram within the Strengthening Families Program group showed significant improvements in the clarity of family rules, increased knowledge of child behavior management principles, and increased family communication of problems. Parent reports of child behaviors also showed significant changes, with less impulsive behavior and fewer behavior problems at home. Children reported improved peer relations and a decrease in intention to smoke and drink. These findings are promising, although they are based on change within the Strengthening Families Program condition only (DeMarsh and Kumpfer 1985). This study has several methodological problems, which include the lack of comparisons between conditions, small sample size (fewer than 20 in each condition), unknown equivalence between conditions, and lack of longitudinal followup data.

Roosa and colleagues (1989, 1990) evaluated the Stress Management and Alcohol Awareness Program (SMAAP). The intervention was based on the stress process model, which posits that high-stress environments contribute to mental health problems. This program taught children of untreated alcoholics skills and strategies for dealing with stress and how to buffer the effects of living with a drug-using parent. The risk factors addressed included parental drug use and positive attitudes toward use, and early first drug use.

The study was conducted in three low-income elementary schools with a high percentage of Hispanic students. Reporting on subject recruitment is somewhat unclear, although the method appears to be self-referral. The film *Lots of Kids Like Us* was shown at the schools for interested students in fourth, fifth, and sixth grades. Those who expressed an interest were invited to a second meeting later the same day. Approximately two-thirds of the students who viewed the film attended the followup meeting, and about one-third of these children (N = 81) obtained parental permission and were randomly assigned to the intervention (N = 26) or the control (N = 55) condition.

Sessions were conducted 1 hour a week for 8 weeks at the school site, with six to eight students led by two group leaders. One group leader was a graduate student member of the research team and one was a teacher or social worker from the host school. Specific coping, self-esteem, and social support skills were taught using didactic presentation, group discussion, class exercises, videotape demonstration, role play, and homework assignments. Children at one of the schools (N = 10) also received services from a “personal trainer.” Personal trainers were undergraduate students who had received intensive training. They spent 3 to 4 hours a week helping each child develop a skill of the child’s own choosing.

A self-report pretest assessment was conducted 1 week before the intervention, and a posttest assessment was completed 3 weeks after the intervention. Teachers also provided a brief report on children’s classroom behaviors. Children involved in the program reported a greater increase in positive coping strategies taught by the curriculum, compared with students in the control condition. There was a trend-level difference in help-seeking behavior and a significant difference in the use of problem-focused and emotion-focused coping strategies. Teachers reported a trend toward less moodiness among experimental subjects. There was also a trend toward decreased depression for those involved with the SMAAP curriculum. The results are promising but should be interpreted with caution, because followup data and specific risk factor and drug use outcome data are lacking. A more rigorous test of an enhanced curriculum is currently being conducted with over 200 children in 13 schools (Roosa et al. 1990).

Gross and McCaul (1992) reported on the COSAs risk reduction intervention, which was provided to a group of urban, primarily minority public school children aged 11 to 18 whose parents were substance abusers. The program consisted of 13 weekly 1-hour sessions to provide social support and enhance drug resistance skills. All sessions were led by professional counselors. The support component included group and individual support, and the resistance skills training utilized Botvin’s Life Skills Training curriculum, adapted for African American low-income students.

The quasi-experimental research design assigned 75 children with a family history of alcoholism to the intervention group and 33 youth at risk for dropout who reported no parental substance abuse to the control group. Data were collected at baseline, immediately after the group sessions, and 1 year after program completion. Primary outcomes measured were depression, self-esteem, and self-reports of drug abuse. Only 35 (22 program, 13 controls) of the initial sample



of 108 students participated in the followup data collection activities. There were no changes at posttest nor at 1-year followup on any of the measures. The study suffers from many methodological problems, including small sample size, large and differential attrition, measurement problems, nonrandom assignment, and comparison group differences on parent substance abuse.

In summary, prevention interventions for children of substance-abusing parents hold promise, but more studies are needed that employ rigorous research designs to evaluate the outcomes of such prevention programs. The four prevention program evaluations reviewed above illustrate the need for stronger experimental designs. Only one study (Catalano et al., under review) offered an experimental demonstration of effectiveness in reducing risk factors, and this study has so far examined only immediate posttreatment effects on parent risk factors. Most evaluations were plagued by multiple methodological problems, including nonrandom assignment to study groups without demonstrating equivalence at baseline, small sample sizes, lack of long-term followup assessments, and followup attrition. The paucity of research on preventive interventions with COSAs is disturbing, given the substantial risks these children face.

## EARLY ANTISOCIAL BEHAVIOR

Both universal and selective interventions have shown effects on high-risk youth defined by high levels of the risk factor early antisocial behavior. They include individual, parent, and comprehensive (school/family/individual) interventions. Most of these studies have selected children with conduct disorders as their subjects.

Lochman and Curry (1986) reported a study that targeted the risk factors of early antisocial behavior, peer rejection, and academic failure. This study looked at the impact of two cognitive behavioral treatments on these risk factors. One treatment consisted of an 18-session anger-coping intervention that included a 12-session anger-coping program followed by 6 sessions on interpersonal problemsolving. The other treatment consisted of 6 sessions from Kendall's self-instruction training program (Padawer et al. 1980) on interpersonal problemsolving and academic tasks, followed by the 12 anger-coping sessions.

Fourth- and fifth-grade teachers at four different schools identified the most aggressive and disruptive boys in their classrooms. Using a

comparison group design, the 20 boys selected were assigned to the two intervention groups; boys at two of the schools were assigned to one treatment, whereas boys at the other two schools were assigned the other treatment. The subjects included 10 African American boys and 10 European American boys with average achievement scores on the California Achievement Test (CAT) at the 50th percentile, indicating that they also had elevated levels of the risk factor academic failure. Subjects in the two conditions were not significantly different on their CAT total score or on their Cognitive Abilities Test Verbal IQ score. Data were collected 2 weeks prior to the beginning of the intervention and again during the 3 weeks following completion of the intervention. In both conditions, parents reported a decrease in their children's aggressive, disruptive behavior. However, parent data rating aggression were incomplete, limiting this finding. An increase in classroom on-task behavior and a small increase in social competence were also reported. No academic gains were reported, possibly due to the short followup period and small sample size reported in this study. The internal validity is also compromised by the lack of random assignment to both conditions.

Rotheram (1982a) reported on a universal program intended to reduce the risk factors of antisocial behavior and peer rejection by increasing children's assertiveness and enhancing positive social contacts. The intervention demonstrated effects with high-risk groups defined by high levels of early antisocial behavior and underachievement. All fourth- and fifth-grade students (N = 343) were randomly assigned by classroom to experimental (assertiveness training) and no-treatment control conditions. The 24-session assertiveness training focused on problemsolving skills, impulse control, and social skills and utilized both didactic and role-play exercises. Immediately following the intervention there were significant increases in assertiveness among experimentals compared with controls based on teacher and objective observer ratings. There were no significant differences between experimental and control subjects in terms of self-reported measures of self-esteem and peer ratings of popularity. The program also had significant effects on academic performance, including improvements in grades and in achievement ratings by teachers. Extended analyses (Rotheram 1982b) showed that the intervention was successful in reducing risk among high-risk groups, including increasing peer popularity among underachievers and increased academic achievement among disruptive students. The program was also successful in reducing antisocial behavior among both underachievers and disruptive students. The evaluation was limited by examining only immediate posttest

outcomes. Further, random assignment was at the classroom level, whereas the outcome analyses focused on individuals.

Several selective prevention interventions for reducing antisocial behavior have focused on the family or parents. Webster-Stratton's early work (1984) showed promise in teaching parents to reduce early antisocial behavior in their children. Families with conduct-disordered children were randomly assigned to one of three conditions: individual therapy (N = 11), group therapy with videotape modeling (N = 13), or a wait list control group (N = 11). Both experimental interventions sought to increase parents', primarily mothers', family management skills and positive parent-child patterns of interaction and to reduce antisocial behavior among the children. The content of the two experimental conditions was similar. Both included family management training, e.g., limit setting, nonviolent discipline, and positive reinforcement; lessons in parental self-control; and parent-child involvement in play. The two conditions differed primarily in their use of individual versus group therapy and in the group's use of videotaped vignettes demonstrating positive and negative interactions between parent and child. Although the sample was small (N = 35), both experimental conditions showed short-term (1-month followup) changes compared to the wait list controls, and the experimental groups had maintained these changes at 1-year followup. These included changes in parental attitudes and behaviors as well as reductions in antisocial behaviors among the children. Webster-Stratton concluded that both the individual and the group approaches were effective, but that the cost of the group-led video condition was much less than individual treatment.

More recently, Webster-Stratton (1992) experimented with an individually administered videotape modeling parent training program for parents with conduct-disordered children. In this program no therapists were involved. Parents (N = 100) were randomly assigned to view videotapes or to a wait list control group. At immediate postintervention, experimental parents reported using less physical discipline and observing less antisocial behavior among their children than did control parents. Furthermore, home observations revealed more positive parent-child interactions. Self-report and objective data were collected only from experimental subjects at 1-year followup. Changes in parenting practices were maintained, and children's behavioral problems continued to improve. Although there was no comparison group assessment at the 1-year followup, the maintenance of effects by experimental subjects suggests the promise of videotaped training as a cost-effective technique for training parents of children with conduct disorders. Full assessment of the

efficacy of the intervention at 1-year followup would require the use of a comparison or control group not receiving the intervention.

Strayhorn and Weidman (1991) evaluated a different approach to training parents with preschool children who had exhibited emotional or behavior problems. Their approach included both the children and parents in the program, attempting to increase family management skills and decrease children's antisocial behavior. The curriculum included four or five 2-hour group sessions that addressed reinforcing children's behavior with positive and negative consequences as well as problemsolving responses to problem behavior. Children and parents also had practice play sessions to enable parents to apply the skills they had learned. Ninety-eight low-income families (105 children) were randomly assigned to treatment or a minimal treatment intervention. Parent ratings of approximately 80 (76 percent) children available at 1-year followup showed little difference between the experimental and control group. However, a subsample of the older children in school (N = 56) were also rated by teachers who were blind to experimental condition. Controlling for baseline levels of the same behavior, teachers rated experimental subjects as having lower levels of hyperactivity, attention deficits, and antisocial behavior. The intervention's failure to change parents' behavior or their perceptions of their children's problem behavior is disappointing, but may partially be explained by low parent involvement in the program. For instance, 12.5 percent of the parents did not attend a single session, and 35 percent did not complete the training exercises. The results were also compromised by the high attrition rate and lack of attrition-by-condition comparison. The teachers' more promising reports were based on a select subsample not randomly assigned to condition and must be interpreted with caution.

Hughes and Wilson (1988) also focused on parents of conduct-disordered children. Forty-two parents were randomly assigned to receive contingency management or communication/problemsolving skills training or to a wait list control condition. Within each treatment condition, half of the children were assigned to participate directly in the program. The contingency management condition was designed to increase monitoring and reinforcement by parents. The communication/problemsolving skills training incorporated role-play techniques to teach basic communication skills as well as problemsolving skills requiring consideration of both the parent's and the child's perspective. The analysis consisted of a 2 (contingency management versus communication skills training) x 2 (children present versus absent) x 2 (pretreatment versus posttreatment) repeated measures design. Immediate posttreatment comparisons

showed significant reductions in antisocial behavior among subjects in both treatment groups compared to the control group. Although the contingency management group had the greatest reduction in problem behavior, there was little discernible difference in outcomes between the contingency management and the communication skills group, and no statistically significant differences were reported between conditions that included children and those that did not. The power of this intervention to produce statistically significant differences between groups with a very small N is promising. However, further evaluation of long-term followup and objective measures of parent and children's behavior are needed. Given the small sample size and lack of replication, it seems premature to suggest that contingency management is equivalent to communication skills training or to reject the utility of including children in the intervention.

Dadds and colleagues (1987) report on a family-focused intervention that attempted to decrease antisocial behavior among conduct-disordered children. This program focused on the role of marital discord in treatment outcomes. Parents (N = 24) with and without marital problems were assigned to contingency management training or contingency management training plus a relationship-building (parent-parent and parent-child) component. Risk factors addressed included antisocial behavior, family management, and family conflict. The contingency management training consisted of instruction in the use of praise and consequences in response to five behaviors including aggression and defiance. The relationship-building component consisted of marital conflict resolution, communication, and problemsolving skills. All groups improved from pre- to posttest on children's antisocial behavior, parent-child involvement, and marital satisfaction, but there were few differences between groups. Parents having marital discord problems at baseline were least likely to respond positively to treatment as defined by a 50 percent reduction in deviant child behavior and maternal aversiveness since baseline, and the relationship-building component of the intervention did little to overcome marital discord. However, the small sample size provides power to detect large effects only and may mask small or moderate effects.

Tremblay and colleagues (1992) evaluated a selective prevention program that combined parent training with children's social skills training to prevent disruptive children from becoming involved in antisocial behaviors. Specifically, the program sought to address the following risk factors: poor family management, peer rejection, academic failure, and early antisocial behavior. Boys identified as being disruptive in kindergarten were randomly assigned to treatment

(N = 46), attention but no actual treatment (N = 84), or an observation-only control condition (N = 42). Children assigned to the treatment condition received school-based social skills and self-control training and a home-based program that trained them to recognize aggression and make nonaggressive choices. For parents, the intervention offered parent training in family management techniques including monitoring, positive reinforcement, appropriate punishment, and how to manage family crises. The results at 1-year followup showed lower levels of academic failure, less delinquency initiation, and evidence of reduced aggression among the children in the treatment condition. There was no apparent impact on parents' monitoring of children's behavior or on parents' disciplinary behaviors. This may be partially explained by the lack of parental participation in the program. Although a maximum of 46 parent training sessions were offered over 2 years, families attended an average of only 17 sessions. Another limitation of the program was the lack of objective measures of parents' and children's behavior. However, the program is a promising approach to protecting disruptive boys from problem behaviors.

Kellam and Rebok (1992) reported on a comprehensive program evaluation that took a universal preventive approach focused on elementary school students. Although the program did not focus solely on high-risk youth, it was effective with youth who had elevated levels of early aggressive behaviors. The study matched 19 schools and randomly assigned them to the experimental and control conditions. The program sought to address academic failure and early aggressive behavior. First grade students in the experimental schools received a "mastery learning intervention" and a "good behavior game intervention." The mastery learning intervention was a group approach to learning in which at least 80 percent of the students had to meet the criteria before the class moved on to a new topic in each subject. The good behavior game intervention was a team-based behavior management strategy in which individual good behavior was cumulated for the group as a whole, and the group was rewarded when it reached threshold levels of good behavior. The program was successful in reducing aggression among the experimental subjects compared to controls. When aggressive children were examined separately, the largest decreases in aggression were found for children in the experimental group, who were rated as most aggressive by teachers and peers at baseline. Furthermore, academic benefits on CAT reading scores were significantly improved for low-achieving boys in the experimental group compared to low-achieving boys in the control group (Dolan et al. 1993). These results are promising. However, a methodological shortcoming is that random assignment

was made at the school level, whereas the group differences were analyzed at the individual level. Tests of this type of intervention without this methodological shortcoming are warranted.

In summary, a variety of program strategies to reduce risk factors for substance abuse among high-risk youth defined by elevated levels of antisocial behavior have shown promise, including individual, family-focused, and comprehensive programs. A number of methodological limitations appear throughout the evaluations, tempering their findings and indicating the need for replication without the design flaws noted. However, taken as a whole, the evidence is much stronger and the methodological problems far fewer for these interventions compared to prevention interventions with children of substance abusers.

#### ACADEMIC FAILURE

Both universal and selective interventions have shown risk-reduction effects on high-risk youth defined by high levels of the risk factor academic failure. Academic failure is frequently accompanied by low socioeconomic status, adding to the risk that low-achieving students will ultimately develop problems. Following is a summary of promising selective and universal interventions.

Coie and Krehbiel (1984) reported on an intervention designed to target selected students who were experiencing academic failure and peer rejection. Forty African American third grade students who were identified by their classroom teachers as socially and academically troubled were chosen to participate in the project from seven different schools in a large urban center in the South. These students had also scored as socially rejected on a sociometric test given to all students and had scored at or below the 36th percentile on the CATs in reading or math.

The students (29 boys and 11 girls) were assigned to one of four groups: (1) academic skills training (AS), (2) social skills training (SS), (3) a combined academic and social skills training, or (4) a no-treatment control condition. Before the intervention began, each child was observed in the classroom for two 30-minute intervals at least 2 days apart. Children were observed by trained observers for on-task and off-task behavior and social interactions. The reported observer rate of agreement ranged from 0.88 to 0.99.

The two intervention groups that included academic skills consisted of 45-minute tutoring sessions with individual tutors, twice a week, from October to April. Tutoring was designed to promote self-efficacy and self-confidence, as well as academic skills. The social skills training was conducted by advanced undergraduates trained in methods identified by Oden and Asher (1977). Six weekly sessions emphasized participation, cooperation, communication, and validation. During these sessions, a target child was paired with another child from the classroom and coached in positive behavior before and after the sessions. After these six weekly sessions, students were divided into four same-sex groups which met after school for 6 weeks. One of the individual trainers and a clinical psychology graduate student were paired up as leaders for each group. Using group games and videotape, different components of group interaction were observed and discussed every week.

Postintervention and 1-year followup data were collected to evaluate the effectiveness of the intervention. The analysis strategy examined the dependent variables at both timepoints using a 2 x 2 (academic skills x social skills) analysis of covariance. At postintervention there were significant effects in reading comprehension and mathematics computation for the academic skills group and marginal effects for reading vocabulary and mathematics application. The academic skills group showed improvement in social standing and were observed to increase individual on-task behavior in the classroom. Immediately after the intervention, the social skills group showed significant effects in reading comprehension only. At the 1-year followup, the academic skills group maintained gains in reading vocabulary, reading comprehension, and social status, whereas there were no main effects detectable for the social skills group. No additional effect was observed when the academic and social skills programs were combined. This study was limited because of its small sample size, which may have masked moderate to small effects. In addition, only 28 of the 40 students were available for achievement tests, and 32 for sociometric data, at the 1-year followup, further limiting conclusions from this study.

Comer (1988) evaluated the Yale-New Haven Primary Prevention Project, which involved two elementary schools (N = 350 and 300) in New Haven in an intervention program designed to empower all of the people involved in the educational process to improve the academic and social competence of students. Although the intervention reported was universal, this study targeted entire schools at risk, much like the selected interventions reviewed above. The schools selected had the worst attendance rates, and their students



ranked lowest in the district for reading and math on standardized tests. Risk factors addressed included academic failure and early antisocial behavior.

The intervention brought parents, teachers, students, and mental health leaders together through the use of several key components. First, a school advisory council worked as a team to manage problems pertaining to school social climate, the academic curriculum, and staff development. The second component, parent participation, was encouraged through parent representation on the school advisory council, part-time employment opportunities at school, and volunteer activities. In the third key component, mental health teams were developed to provide assessment and treatment planning for children referred for academic or behavior problems. Finally, an academic curriculum and staff development program were developed based on actual student achievement and concerns from school staff and parents. The program was evaluated by comparing these schools to the district average and determining if children's scores were at grade level on standardized tests. Results indicated that children's reading and math scores improved from 18 to 19 months behind grade level to on par with grade level on the Iowa Test of Basic Skills. Limitations of the study include lack of random assignment to a control group, baseline differences between study and comparison groups, and no reporting of attrition.

Hawkins and colleagues (1988) reported the effects of the Seattle Social Development Project, a comprehensive, universal, school-based intervention on a subgroup of high-risk seventh grade children. The main study included five middle schools; students and teachers within three schools were randomly assigned to either control or experimental classrooms and all of the students and teachers in the other two schools were assigned to either the control or experimental condition. After assignment, the total sample included 513 experimental students and 653 control students.

The intervention included three instructional methods implemented in all experimental classrooms aimed at addressing the risk factors for academic failure, commitment to school, and antisocial behavior. The three instructional interventions included proactive classroom management, designed to increase learning time and reduce classroom disruptions; interactive teaching, designed to foster student motivation and involvement; and cooperative learning, designed to foster learning through enhanced social skills and cooperation in teams on academic tasks. Experimental teachers received training in the three methods before the school year began and in three booster

sessions during the school year. In addition, experimental teachers each month received coaching in the three instructional methods. During the year, both experimental and control classrooms were observed using a minute-by-minute system to record implementation of instructional methods and student behavior.

To examine the effects of this program on low achievers, a subsample of students who scored in the lower three stanines on the CAT was constituted. The subsample included 77 experimental students and 83 control students. Results indicated no differences on achievement, but experimental students increased their commitment to school, had higher expectations for future education, and reduced their antisocial behavior as indicated by school suspensions. Findings have some limitations due to assignment at the classroom and school level and analysis completed at the individual level.

Slavin and colleagues (1990) reported on Success for All, a universal school-based intervention that addressed academic achievement. This study was implemented in grades K-3 in an inner-city elementary school, and a neighboring school with similar demographics was used as a control/comparison school. It is not clear how schools were chosen or assigned to treatment and control status. The approximately 300 students in the intervention school target grades received the multicomponent program, including reading tutors to provide one-on-one help for students, reading aids to assist teachers in the classroom, cooperative learning groups with children at the same ability level, and parent education-support teams to encourage parents to get involved in their child's education. At 1-year followup, combined results for grades K-3 indicated reading performance was higher among the intervention students compared with the control students, with an average effect size of +0.50. Separate analyses for those who were academically in the lowest 25 percent indicated that, for reading, these students improved more than the overall population, achieving an average effect size of +0.65. No information on attrition was presented. An additional flaw to the internal validity of the design is the nonrandom assignment to intervention and control conditions.

In summary, there are a number of models of successful interventions targeting children at high risk for substance abuse due to elevated levels of the risk factor academic failure. Both selective and universal types of interventions were reviewed and showed promise to reduce risk among high-risk youth. Further research to replicate findings is indicated due to several methodological flaws in the studies.

## CONCLUSIONS

This chapter sought to review the impact of prevention programs on youth at high risk for substance abuse. To do this, definitions of high-risk youth were reviewed and a definition of high-risk youth was proposed for use: exposure to multiple identified risk factors or to an elevated level of one such risk factor. This definition has a distinct advantage over other definitions. It is based on factors that have consistently shown empirical relationships to increased levels of substance abuse in longitudinal studies, and it provides diagnostic- and intervention-relevant information.

This approach not only provides a useful definition of high-risk youth, it also broadens the number of interventions that have the potential to reduce the risk of substance abuse. Because of this, volumes would be needed for a thorough review. This chapter was limited to three groups of studies, each examining the risk-reduction effects of preventive interventions on a different group of high-risk youth: children of substance abusers who are exposed to multiple risk factors, youth with high levels of the single risk factor early antisocial behavior, and youth with high levels of the risk factor academic failure.

The reviewed studies demonstrate the promise of prevention programs for youth at high risk of substance abuse. In each of the three areas, programs have been evaluated with experimental or quasi-experimental designs. Results have shown at least short-term reductions in risk factors. Risk reduction effects on high-risk youth have been demonstrated by prevention approaches that select for intervention only those at high risk and by prevention interventions universally applied. Interventions that have shown effects have focused on individuals, families, and comprehensive approaches including individuals, families, and school personnel in intervention delivery.

Of importance is that the preventive interventions reviewed here do reduce risk to problem behaviors. With one exception, the existing studies have not examined substance use by children who are the subjects of study. This often results from short followup periods in studies with young subjects as well as from addressing risk factors without an explicit focus on substance abuse outcome. The risk reduction approach broadens the potential to examine an array of preventive interventions to influence multiple problem behaviors among high-risk youth. However, investigators should be encouraged

to measure multiple problem behavior outcomes as well, including substance use, in order to fulfill the potential of such an approach. If results are demonstrated on risk factors, studies must be sustained to track subjects and collect long-term followup data in late adolescence and early adulthood. This is necessary in order to investigate effects on substance abuse that are not likely to occur until these later years for large proportions of high-risk populations.

Most of the evaluations of prevention programs have some type of methodological flaw. The most serious are lack of random assignment, short followup periods, and analysis of data at a level different from subject treatment condition assignment. These flaws need to be addressed by both investigators and funding agencies, who must demand high design standards and longer followup periods for preventive interventions that demonstrate their promise through short- and medium-term risk reduction.

Finally, comprehensive efforts to review interventions for youth exposed to multiple risk factors or high levels of a single risk factor are needed. These efforts will be aided by reviews conducted in other substantive areas, since risk factors for substance abuse touch many other areas of investigation, including normal adolescent development, school dropout, teenage pregnancy, delinquency, and youth violence. Such reviews will assist the field in choosing effective risk-reduction approaches to investigate further for their effectiveness in reducing substance use and abuse.

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# Costs, Benefits, and Cost-Effectiveness of Comprehensive Drug Abuse Prevention

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## INTRODUCTION

Several reviews of the literature suggest that prevention programs aimed at counteracting social influences to use drugs show effects on delaying onset rates, and in some cases decreasing prevalence rates, of gateway drug use—tobacco, alcohol, and marijuana use (Botvin and Botvin 1992; Pentz 1993*b*; Tobler 1992). Short-term reductions in monthly use rates have ranged from 20 to 67 percent, based on the calculation of a net program effect as the difference in the rates of increase in use between program and control groups, divided by the control group rate of increase (Pentz 1994*b*). Most of the reductions have been reported for prevention programs that are delivered through a single delivery channel—the school, and a single grade—usually seventh grade, with the number of sessions or contact hours ranging from 3 to 30 (Pentz 1993*b*; Pentz et al. 1990). A few programs have included boosters delivered across multiple grades, such as Life Skills Training, Know Your Body, the Minnesota Youth Smoking Prevention Study, and the health curriculums delivered as part of the School Health Education Evaluation Study (Botvin et al. 1990; Connell et al. 1985; Murray et al. 1989; Walters et al. 1989). These programs, more comprehensive than others in terms of the years and number of sessions delivered, have been associated with longer term, if not larger, reductions lasting up to 5 years, or through the end of high school. A recent review of longitudinal drug abuse prevention studies, however, has indicated no long-term effects of school-based prevention programs after 5 years (Murray 1994). Three longitudinal studies have reported effects after 5 years: the North Karelia Project, the Minnesota Youth Project (part of the Minnesota Heart Health Project), and the Midwestern Prevention Project (MPP) (Murray 1994; Pentz 1993*a*). All three were comprehensive community-based prevention programs that included a school program with boosters and multiple additional components or strategies that were designed to support the school program, including mass media, community organization, and parent involvement. Two of them—the North Karelia and Minnesota Projects—have reported net group differences in smoking prevalence rates that were maintained through or past the last year of high school (6 percent in monthly smoking in the North Karelia study, 8 percent

in weekly smoking in Minnesota), although, since both of these are heart disease prevention studies with a primary focus on adults, effects on other drug use among adolescents have not been reported. One—the MPP—has reported net reductions in daily smoking, drunkenness, and heavy marijuana use among adolescents (Pentz 1993*a*). Adolescent drug abuse prevention is the primary focus of the MPP.

Collectively, results of all of these reviews suggest that the more comprehensive drug abuse prevention programs, operationalized as programs that span several years and include multiple program channels and community support, may yield more long-lasting effects on drug use prevalence than single-year, single-channel programs (Pentz 1993*b*). Because long-lasting effects on use prevalence can be assumed to have more of an effect on deterring health and social costs associated with drug abuse than short-term effects on prevalence or onset (Rice et al. 1990), the costs and benefits of comprehensive prevention programs are the focus of this chapter.

Policymakers, payers, and administrators formulate their decisions about the benefits of drug abuse prevention interventions based on projected healthcare costs of drug abuse, healthcare savings expected from early treatment or prevention, and costs associated with delivery of intervention (Rice et al. 1990). Unfortunately, in the field of drug abuse control, under which treatment and prevention fit, costs and savings, or benefits, are often difficult to estimate. There are at least four factors that inhibit valid and reliable estimation of costs and savings or benefits:

- Since most costs are extrapolated from disease states, estimates derived for any substance other than tobacco (for its clear relationship to lung cancer disease) must often be pieced together from a combination of an assumed disease morbidity (e.g., drinking-related liver enlargement assumed to develop into liver cirrhosis) and disease risk behaviors (e.g., drunk driving associated with accidents and injuries).
- The costs of intervention, particularly prevention, vary widely according to length of subject time in intervention, whether costs are partially donated from community resources (e.g., mass media coverage donated as part of a prevention campaign), and type or content of intervention (there is no one definitive treatment or prevention approach that has been shown to be unequivocally more effective than other approaches [Rogers 1992]). The cost issue is compounded for comprehensive prevention programs. Little is known about whether the greater and longer lasting effects shown for comprehensive programs are outweighed by the greater costs incurred with longer programming and a greater number of resources required for delivery of such programs.

- Prevention and early intervention effects and healthcare cost savings often do not appear for several years, during which secular trends, historical events, and an individual's own health development confound effects and costs of intervention (Pentz 1994*b*). Furthermore, effects of prevention programs may not fit a linear trend. For example, a prevention program may show a sleeper effect, i.e., an effect that does not appear until several years after programming. Alternatively, adolescents may progress, regress, terminate, and/or resume stages of drug use and types of drug use over several years for reasons unrelated to prevention programming, for example, because of critical life events, a change in friendship patterns that reflects different peer norms for drug use, or availability of a certain drug.
- The relative costs and benefits of prevention programs and prevention policies are not well understood. The relationship of program to policy also is not understood. For example, if local policy change is supported as a result of an effective prevention program, the policy change should be treated as a program benefit (Casswell et al. 1989; Pentz, in press).

With these limitations in mind, approximate costs, benefits, and cost-effectiveness were calculated from 5-year followup (6-year) outcome data and operational costs of a large, multicomunity-based drug abuse prevention trial, the MPP.

#### COSTS OF A COMMUNITY-BASED DRUG ABUSE PREVENTION TRIAL

The MPP is a large community-based prevention trial funded by the National Institute on Drug Abuse (NIDA) involving all of the communities (N = 26) and schools (N = 107 middle/junior high schools and N = 62 high schools) that comprise the Kansas City, Kansas; Kansas City, Missouri; and Indianapolis/Marion County metropolitan areas (Pentz et al. 1989*b*). The combined population base is approximately 2.6 million, 75 percent white, 22 percent black, with an average of 26,000 new adolescents exposed to intervention after the first year. The program, research and measurement designs, theory, implementation models, and outcomes are described in detail elsewhere (Pentz 1994*b*; Pentz et al. 1989*b*, 1990). The designs are summarized in table 1 (also see Pentz 1994*b*). Briefly, the intervention consists of five components introduced into schools and communities in sequence at the rate of every 6 months to 1 year: mass-media programming (approximately 31 programs per year for the first 3 years); a school program (an average of 18 sessions over the first 2 years: 13 in sixth/seventh grade, 5 booster sessions in the following year); a parent program (parent education and school policy coordination over years 2 and 3 through the end of middle school); community organization (community leader training, organization, planning, and implementation of

community prevention campaigns, events, services, and planning of policy initiatives in years 3 to 5); and local policy change in years 4 and 5.

In a project of this type and scale—a prevention research trial involving multiple program components—estimation of costs must include program development and research/evaluation (Pentz et al. 1990). Approximate MPP costs per category are shown in table 2. Note that overall, costs in early years are higher than costs in later years because of more extensive program development and that costs per family unit decrease over time as more of the population is exposed to the intervention.

It is assumed that costs of delivering the same program as a “packaged product” for demonstration or service would be less than those shown in table 2 (Bukoski 1990). Of the approximate costs of \$7.6 million paid for the MPP (exclusive of donated costs) over the first 6 years, 4.1 or 54 percent were designated for programming and 3.5 or 46 percent for research. Calculated on an average per-year, per-family unit cost with 26,000 new families added per year once both cities were implementing the program in all schools and communities, the paid cost per new family per year is approximately \$69, including \$37 for programming and \$32 for research (Pentz et al. 1990). The cost per family per year is considerably less (\$48) when averaged across all families (new and continuing) participating in prevention in any one year. A conservative

TABLE 1. Abbreviated design of the midwestern prevention project.

| Sample                             | Midwest Longitudinal Intermittent |          |          |          |          |          |          |          |          |          | Measurement |          |          |
|------------------------------------|-----------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------------|----------|----------|
|                                    | 84-85                             | 85-86    | 86-87    | 87-88    | 88-89    | 89-90    | 90-91    | 91-92    | 92-93    | 93-94    | 94-95       |          |          |
| Frost<br>(N=1067)                  | $O_{10}$                          | $X_{10}$ | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$    | $X_{15}$ | $O_{16}$ |
|                                    | $X_{10}$                          | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$ | $X_{15}$    | $O_{16}$ | $X_{16}$ |
| K-8<br>Grade<br>Cohort<br>(N=1086) | $O_{10}$                          | $X_{10}$ | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$    | $X_{15}$ | $O_{16}$ |
|                                    | $X_{10}$                          | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$ | $X_{15}$    | $O_{16}$ | $X_{16}$ |
| X-Club<br>Cohort<br>(N=240)        | $O_{10}$                          | $X_{10}$ | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$    | $X_{15}$ | $O_{16}$ |
|                                    | $X_{10}$                          | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$ | $X_{15}$    | $O_{16}$ | $X_{16}$ |
| Soybean<br>(N=240)                 | $O_{10}$                          | $X_{10}$ | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$    | $X_{15}$ | $O_{16}$ |
|                                    | $X_{10}$                          | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$ | $X_{15}$    | $O_{16}$ | $X_{16}$ |
| Frost<br>(N=240)                   | $O_{10}$                          | $X_{10}$ | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$    | $X_{15}$ | $O_{16}$ |
|                                    | $X_{10}$                          | $O_{11}$ | $X_{11}$ | $O_{12}$ | $X_{12}$ | $O_{13}$ | $X_{13}$ | $O_{14}$ | $X_{14}$ | $O_{15}$ | $X_{15}$    | $O_{16}$ | $X_{16}$ |

Note: X = observation, O = measurement, X<sub>1</sub> = approximately 1st grade at enrollment, X<sub>2</sub> = grade of measurement, X<sub>3</sub> = grade of measurement, X<sub>4</sub> = intervention component (M = mass media, S = school, P = parent, C = community organization, H = health policy change), \* = low-high school enrollment assessment. (Reprinted with permission from Pease, M.A., in press (1)).

**TABLE 2.** *Approximate direct costs of prevention, by component (in thousands of dollars unless otherwise noted).*

| Prevention component       | 1984-85<br>Paid (donated) | 1985-86<br>Paid (donated) | 1986-87<br>Paid (donated) | 1987-88<br>Paid (donated) | 1988-89<br>Paid (donated) | 1989-90<br>Paid (donated) |
|----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Program development        | 110 (40)                  | 250                       | -45                       | 180                       | 90                        | 90                        |
| Training                   | 25 (19)                   | 50 (38)                   | 50 (68)                   | 75 (87)                   | 100 (76)                  | 100 (76)                  |
| Implementation             | 89 (90)                   | 166 (150)                 | -459 (150)                | 547 (120)                 | 684 (150)                 | 715 (150)                 |
| Institutionalization       |                           | 22                        | 44                        | 44                        | 66                        | 88                        |
| Program subtotal           | 224 (149)                 | 488 (188)                 | 598 (218)                 | 846 (207)                 | 940 (226)                 | 993 (226)                 |
| Research/evaluation        | 191 (55)                  | 415 (55)                  | 510 (55)                  | 721 (55)                  | 800 (79)                  | 846 (79)                  |
| Total (program + research) | 415 (353)                 | 903 (243)                 | 1108 (273)                | 1567 (262)                | 1740 (305)                | 1839 (305)                |
| Total (paid + donated)     | 768                       | 1146                      | 1381                      | 1829                      | 2045                      | 2144                      |
| Dollars per family unit    |                           |                           |                           |                           |                           |                           |
| Total (paid + donated)*    | 102                       | 51                        | 37                        | 36                        | 34                        | 30                        |



estimate of program development costs is \$150,000 per component, in this case, also per year, or \$6 per family unit. Thus, one might conclude that a comprehensive community-based program that is delivered as a packaged product to a large city with a population base of over one million would cost about \$31 per family unit per year (\$37 minus \$6). This cost would appear to be very reasonable compared to the cost of a health education textbook alone, which typically exceeds \$30.

The costs of delivering a community-based prevention program as a packaged product are misleading, for at least two reasons (Pentz et al. 1990; Rogers 1992). First, an underlying principle of comprehensive social influences prevention programs is dynamism. No program component is a finished product; rather, researchers, community planners, and educators regularly review, refine, and modify components to address changes in the community. Second, an underlying principle of successful adoption, implementation, and maintenance of a program is local ownership. Ownership has a reciprocal relationship with program tailoring. A program that has been tailored specifically to meet the needs of an individual community is more likely to be owned by that community, and thus more readily adopted, implemented, and maintained. Conversely, a community that perceives ownership of a program is more likely to tailor it to its own needs. The two principles of dynamism and ownership represent, further, a tension between two “states” of prevention programming: a product sufficiently stable to represent a reference point, source credibility, and external validity, and yet sufficiently flexible to yield a program that is unique and individual to a particular community and its needs.

With the principles of dynamism and ownership in mind, costs of a packaged product should include some costs for program redevelopment, and some costs for local evaluation that is used to inform redevelopment, if not outcome. Based on local staff estimates from the MPP, program redevelopment costs might be arbitrarily calculated as the cost of one health educator per year, or roughly \$45,000 per year; this is approximately 30 percent of new program development costs. Furthermore, based on MPP and Center for Substance Abuse Prevention (CSAP) estimates for community partnership grants, local evaluation costs should constitute approximately 15 to 20 percent of the operating budget, rather than the 46 percent calculated for research in the MPP (see Bukoski 1990).

The costs of developing, mounting, implementing, and maintaining the MPP for the first 6 years in the Kansas City metropolitan area were calculated as \$62 per family for the first year and cohort of 26,000, decreasing thereafter as the number of students receiving intervention increases. The costs used here are based on delivery and research to half of the city’s student population in the experimental cohort, followed by delivery and evaluation of each entire subsequent cohort; thus, the costs are

considered high and subsequent savings estimates are considered conservative. Calculated in this manner, the cost for delivering and assessing the community prevention program for 6 years in Kansas City alone was approximately \$108 per adolescent and the adolescent's family (see Pentz 1994a):

Based on a randomly selected subpanel of 1,000:  
 $\$108 \times 1,000 = \$108,000$

Based on the experimental group of 7,500:  
 $\$108 \times 7,500 = \$810,000$

Based on each subsequent cohort of 15,000 receiving the program:  
 $\$108 \times 15,000 = \$1,620,000$

These costs include all research costs, development and piloting costs, and delivery and monitoring of the five program components (mass-media, school, parent, community organization, and health policy change).

In addition to costs associated with the MPP program, costs were also estimated for drug abuse treatment. The major hypothesis underlying the calculation of treatment costs was that the MPP program would, over the long term, prevent drug abuse and thus the need for drug abuse treatment. Costs for drug abuse were based on estimates used by the Kansas City, Missouri, office of the National Council on Alcohol and Drug Abuse (NCADA) for treatment in local area facilities (William Calherka, NCADA, personal communication). These included: \$1,500 to \$2,000 for outpatient counseling and therapy calculated at an average of 6 weeks duration per client; \$10,000 for public inpatient treatment with private treatment ranging up to \$15,000 to \$20,000 for an average of 30 days duration per client; \$5 to \$10 per session of student assistance in a college or student health center, based on an average of one session prior to referral to other services; and \$150 for a basic alcohol- or drug- related emergency room admission at a local hospital, exclusive of ambulance or treatment costs.

## BENEFITS OF THE PROGRAM (EFFECTS)

Some of the effects of the MPP intervention have been reported through 5-year followup (Pentz et al. 1989b, 1993a, 1994b). Cumulative effects of the program components on daily cigarette use, monthly drunkenness, and heavy marijuana use (two or more times per week) are summarized in figure 1 (Pentz 1994a). The sample is a random sample of 5,055 students from all 50 public junior high and 29 high schools in the Kansas City area. Note that, as an example, prevalence rates for daily cigarette use in program and control groups are plotted as two lines representing year-to-year changes in the upper left-hand part of the figure. These rates are adjusted for individual school differences in race, socioeconomic status, grade, and

urbanicity; unadjusted rates are similar. When changes in these rates are converted to net group differences as described earlier, the approximate reduction in would-be users from year to year can be estimated (Pentz 1994b).

$$\text{Net group difference} = \bar{d} [(P_i - P_j) - (C_i - C_j)],$$

$$\text{Net program effect} = \bar{d} [(P_i - P_j) - (C_i - C_j)] / \bar{d}(C_i - C_j),$$

where

P = program, C = control, i = previous year, j = current year.

The conversion for daily cigarette use is shown in the upper right-hand corner of figure 1; drunkenness and heavy marijuana use (two or more times used in the last week) rates are shown in the bottom of figure 1. The results indicate that the community program components produced an accumulated 5-year net reduction of 12 percent of would-be daily cigarette users, an accumulated 3-year net reduction of 9 percent of would-be monthly drunkenness decreasing to approximately 2.5 percent by 5-year followup, and a 3-year net reduction of 3.5 percent of would-be heavy marijuana users decreasing to approximately 2.5 percent by 5-year followup. The MPP policy change component of the MPP was associated with a 40 percent net reduction in perceived smoking. Effects of the community program components on any monthly and weekly use are larger and have been reported elsewhere (see Pentz et al. 1989b).



Here rates are shown for heavier or regular use rather than occasional use because of their long-term health and social care cost implications (Oster et al. 1984; Rice et al. 1990, 1992). The net reductions are compared to effects reported for school programs, which disappear 3 to 5 years after programming, as indicated by the dashed line on each graph (Pentz 1993a).

Two arbitrary but conservative assumptions are made in reporting the program effects in figure 1. One is that the effect of a particular program component is tied to the year in which the component was introduced into the community. The second assumption is that once an effect associated with the introduction of a particular program component appears, the effect of that component will be maintained relative to the introduction of other components.

Additional recent analyses have focused on the effects of the program on reducing the proportion of adolescents and their family members who must seek professional counseling or treatment for drug abuse. An analysis of a subsample of the original Kansas City cohort that is followed annually through adulthood, a panel of 1,002, indicated that significantly fewer adolescents in the program compared to the control group received professional counseling or treatment by 5-year followup (5.1 percent versus 7.3 percent,  $p < 0.04$ ), and significantly fewer adolescents in the program compared to the control group had family members who received counseling or treatment (18.5 percent versus 22.9 percent,  $p < 0.01$ ). The effects of the program on cigarette, alcohol, and marijuana use in this randomly selected subpanel were the same as those reported for the larger sample above.

The benefits can be estimated as follows (Oster et al. 1984): For changes in use prevalence rates, total health and social care cost savings are limited to estimates per prevented daily smoker, exclusive of use of other substances. The savings were previously calculated as \$40,000-plus per prevented male smoker and \$17,000-plus per prevented female smoker, for an average savings of \$28,000-plus (savings are averaged since there is no evidence for differential effects of the program on males versus females).

Based on the subpanel of 1,002:  
120 prevented smokers x 28,000 = \$3,360,000

Based on the experimental group of 7,500:  
900 prevented smokers x 28,000 = \$25,200,000

Based on each subsequent cohort of 15,000:  
1,800 prevented smokers x 28,000 = \$50,400,000.

For treatment savings, based on a conservative estimate using outpatient counseling and treatment costs only, the savings are:

Based on the subpanel of 1,002:  
22 prevented treatment x \$2,000 = \$44,000

Based on the experimental group of 7,500:  
165 prevented treatment x \$2,000 = \$330,000

Based on each subsequent cohort of 15,000:  
330 prevented treatment x \$2,000 = \$660,000.

For treatment savings from family members, the savings are:

Based on the subpanel of 1,002:  
44 prevented treatment x \$2,000 = \$88,000

Based on the experimental group of 7,500:  
330 prevented treatment x \$2,000 = \$660,000

Based on each subsequent cohort of 15,000:  
660 prevented treatment x \$2,000 = \$1,320,000.

If treatment savings are added across self plus family members, the savings are \$132,000; \$990,000; and \$1,980,000, respectively. The benefits of the MPP are summarized in table 3.

## COST BENEFIT OF PREVENTION

For policymakers, the benefits of comprehensive community-based drug abuse prevention must be compared to its costs. The major question in cost-benefit calculations is: “Is prevention worth it?” A summary of cost-benefit for the MPP is shown in table 3.

**TABLE 3. Benefits, cost-benefits, and cost-effectiveness of prevention by 1989-90.**

| Benefit category  | Benefit (% reduction x cost saving per family) in thousands of dollars | Cost-benefit for every \$1 spent on prevention: saved in dollars | Cost-benefit per affected family in dollars | Cost-effectiveness (ratio of incremental cost of MPP compared to alternative drug education: incremental effectiveness) in % net reduction |
|---|--|--|---|--|
| Net reduction in daily smoking  | 3360.00  | \$1:8.12   | \$1:67.63                                   | \$1:.48  |
| Net reduction in monthly drunkenness                                  | 700.00   | \$1:1.69   | \$1:67.63                                   | \$1:.10  |
| Net reduction in heavy marijuana use                                  | 700.00   | \$1:1.69   | \$1:67.63                                   | \$1:.10  |
| Net reduction in need for treatment                                   |  |  |   |  |
| - Outpatient treatment  | 4.40   | \$1:.11  | \$1:4.83                                    | \$1:.09  |
| - Inpatient treatment   | 3.00   | \$1:.80  | \$1:36.23                                   | \$1:.09  |
| - Counseling center   | .22  | \$1:.00  | \$1:1.02                                    | \$1:.09  |
| - Emergency room admission  | 3.30   | \$1:.01  | \$1:1.36                                    | \$1:.09  |
| Net reduction in family member need for treatment                     | .88  | \$1:.21  | \$1:4.83                                    | \$1:.18  |
| - Outpatient treatment  | 6.60   | \$1:1.59   | \$1:36.23                                   | \$1:.18  |
| - Inpatient treatment   | .44  | \$1:.00  | \$1:.02                                     | \$1:.18  |
| - Counseling center   |  |  |   |  |
| - Emergency room admission  | 6.60   | \$1:.02  | \$1:.36                                     | \$1:.18  |
| Net reduction in perceived smoking at school related to school policy | 896.00   | \$1:2.16   | 1:67.63                                     | \$1:1.6  |

NOTE: Costs and benefits are based on 26,000 new families added per year to the prevention program.

The costs and benefits of community-based prevention can be compared as a ratio of costs of the program: benefits derived from reduced prevalence rates of daily smoking and reduced proportions of the population in drug treatment. The cost-benefit ratio in table 3 is calculated twice: once assuming that all families must participate in order for prevention effects to appear, and again assuming that only affected families (would-be users) must participate. For daily smoking, the ratio is 1:67.63, or \$1 expended for prevention programming for \$67.63 per affected family in health and social care cost savings from prevented smoking. For treatment through 5-year followup (6 years), exclusive of any future treatment, the ratio is 1:4.83, or \$1 expended for prevention programming for \$4.83 per affected family saved in outpatient counseling or similar treatment up through the first 5-year followup. Note that this saving would be much higher if inpatient costs were used in lieu of outpatient costs, and if treatment savings were extrapolated into adulthood, as are estimates of prevented smoker cost savings.

#### COST-EFFECTIVENESS OF PREVENTION

For policymakers and program administrators, the decision to adopt a comprehensive community-based drug abuse prevention program depends on its costs and benefits relative to the costs and benefits of existing, readily available, and/or alternative prevention programs or services (Hurley 1990). The major question implied in cost-effectiveness calculations is: "Is this type of prevention worth the time, trouble, and costs relative to other alternatives?" For the MPP, cost-effectiveness should be based on comparing the relative effects or benefits of the community program with another type of educational or prevention program. A recent report to the U.S. Congress estimated school-based drug education costs at between \$2 and \$6 per student per year, exclusive of textbooks (see Bukoski 1990; MMWR 1989). Relatively little is known about the benefits of traditional drug education delivered in health education as usual curriculums, other than knowledge change (Goodstadt 1989). However, in the case of the MPP, since all students in the control group received health and drug education "as usual" in schools, in one sense, the cost-benefit could be considered a cost-effectiveness analysis. Cost-effectiveness of the MPP is summarized in table 3, using an estimate of \$6 per student per year to deliver drug education, with essentially zero effects accrued on use, compared to \$31 per family per year to deliver a packaged product, with 12 percent (daily cigarette use), 2.5 percent (monthly drunkenness), and 2.5 percent (marijuana use  $\times$  two times in last week) reductions accrued by 5-year followup. The cost-effectiveness ratio of the MPP relative to school drug education is equal to the ratio of the incremental costs of the MPP to its incremental effectiveness.

#### COST-UTILITY OF PREVENTION



Cost-utility is similar to cost-effectiveness, except that benefits are expanded to include outcomes that are immediately measurable, for example, whether a comprehensive prevention program is readily adopted, well-liked by deliverers and consumers, fits easily with other existing services, and potentially benefits other services (Booth 1990; Hurley 1990). The implied questions of interest are whether the program is used and is user friendly. Although no systematic evaluations are available on the relative user friendliness of comprehensive community-based prevention programs relative to other types of programs, the general response of communities to research-based prevention programs is that they are not as readily adopted or institutionalized as school-mandated health curriculums, commercially marketed programs (e.g., Here's Looking At You), grassroots-prompted programs (e.g., MADD), or agency-endorsed programs (e.g., QUEST and DARE) (Pentz et al. 1990; Rogers 1992). More research is needed to operationalize and evaluate the utility of various prevention program alternatives.

## CONCLUSION

The costs and savings estimated here were based on conservative formulas such that the costs of the program were deliberately inflated and savings were underestimated. Even so, the results presented here indicate that comprehensive drug abuse prevention programs, such as a multicomponent community-based prevention program, are highly cost-beneficial and cost-effective. Future research should focus on developing methods for estimating valid and reliable costs and savings associated with drugs other than tobacco and alcohol. In addition, more research is needed to estimate benefits of traditional health and drug education in terms of changes in drug use behavior for cost-effectiveness analyses. For cost-utility calculations, research is needed to identify appropriate indicators of prevention utility, and then to evaluate utility of prevention relative to other alternatives (Hetherington and Calderone 1985).

Identifying costs and benefits of prevention for various analyses is not the only issue. The analysis methods and databases routinely used in econometrics analyses have not readily transferred to prevention researchers. For example, prevention researchers rarely use discounting methods for cost calculations, or relative risk ratios or Markov models to estimate different outcomes of prevention intervention (Hurley 1990; Oster et al. 1984; Rice et al. 1990, 1992). The estimates in this chapter are not discounted, raising the possibility that benefits are inflated if the discounted rate were the same for costs of prevention and later treatment and morbidity costs. Further inflation may have occurred due to benefits in this chapter calculated on a relative net reduction in the dependent variable, rather than absolute values. Furthermore, the archival databases that yield morbidity and mortality data for econometricians are rarely used by prevention researchers, with the exception of estimating effects of policy changes.

Finally, relatively little is known about the costs and benefits associated with local policy change and its relationship to comprehensive drug abuse prevention (Pentz, in press; Pentz et al. 1989*a*). It is generally assumed, for example, that enacting a restrictive community smoking policy should be far less costly than a smoking or drug abuse prevention program, with greater benefits since an entire population is supposedly affected (Goodstadt 1989). However, labor and other costs involved in developing and promoting policy change are typically not considered, and benefits will be directly related to policy compliance. In the MPP, recent preliminary analyses of policy changes in schools showed that schools assigned to the intervention condition adopted more restrictive smoking policies (96 percent versus 88 percent) and had less observed student smoking than schools assigned to the control condition (48 percent versus 88 percent). These results suggest that policy change may be an additional benefit of comprehensive community-based prevention programs rather than an alternative prevention strategy (Bracht 1990). More research is needed to elucidate the temporal, if not causal, relationship of community-based prevention programs and local policy change.

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# Overview of Methods: Cost-Effectiveness, Cost-Benefits, and Cost-Offsets of Prevention

*Albert Woodward*

## INTRODUCTION

A review of the health services literature reveals that there are relatively few cost-effectiveness studies of substance abuse prevention. In contrast, a large number of cost-effectiveness studies of medical treatment have been published over the last two decades (e.g., Hurley 1990). In the field of substance abuse treatment there are a number of studies evaluating the cost-effectiveness of treatment (Cartwright and Kaple 1991). The field of substance abuse prevention research is a relatively new field (Clayton and Cattarello 1991). Also, there may be a perception among prevention researchers and prevention program administrators that prevention programs are cost-effective. These reasons may help explain the relative paucity of prevention cost-effectiveness literature in substance abuse. This suggests that more work needs to be done if researchers are to provide decisionmakers with the arguments that prevention interventions are worth their cost.

This overview suggests that cost-effectiveness analysis is an adjunct to the decisionmaking process. Such analysis may prove useful in comparing costs of two or more programs, or costs of doing a program versus not doing it, but such analysis alone cannot be used for making a decision. Its importance arises because, in a world where choice among alternatives constantly has to be made, it is a useful tool in comparing programs.

## DEFINITIONS AND CONCEPTS

The definition of cost-effectiveness is relatively simple as economic concepts go, but it is frequently confused with cost-benefit and cost-

savings definitions. It is useful to define these terms so that they can be differentiated. Once the definitions are clear, the basic concepts of measuring costs and the issues in their measurement are presented.

- **Cost-effectiveness:** Cost-effectiveness measures outcome against cost—usually the prevention effect of a program versus no program or, in a more sophisticated context, the prevention effects of two programs against one another, with the dollar costs of the programs being held constant. In other words, a prevention program is cost-effective if it yields more health benefits (or outcomes) than do alternative uses of healthcare resources (Weinstein 1990). The outcomes are hard to define, let alone measure. One widely used outcome is “years of life gained or quality adjusted years of life gained” (Hurley 1990). Outcomes can also be expressed as prevention of adverse behaviors and consequences of substance abuse as well as the increase in desired positive behaviors (Hser and Anglin 1991).
- **Cost-benefit:** Costs and benefits, unlike cost-effectiveness, are expressed in terms of dollars. They are expressed as a ratio with both the benefits (the numerator) and the costs (the denominator) in monetary terms. The benefits often have to be assigned or imputed in quantitative money amounts; they are hard to define and hard to measure. A recent article provides systematic guidelines in conducting cost-benefit analysis (Plotnick 1994).
- **Cost-offset:** Cost-offset has not been used in prevention research literature. It has been used in a context of treatment costs reduced following treatment intervention. That is, it is known that persons with substance abuse problems cost more to treat than healthy individuals, not just for the treatment of the particular substance abuse problem but also because they have other costly medical problems.<sup>1</sup> As a result of the substance abuse treatment, the reduction in the costs of substance abusers’ care over time is less than the cost of the intervention itself. This implies that researchers have to measure costs of not treating the problem—not that easy to do. In the realm of prevention this is of critical importance and has to be done, e.g., estimating the costs of prevention intervention versus cost-savings from reduced illness or premature death.

By use of the term “substance abuse,” alcohol is not considered independently of other drugs. Alcoholic beverages can be bought and drunk in the United States by persons 21 years or older, whereas other drugs cannot. The raising of the drinking age from 18 to 21 is a

legislated prevention that has had a large, measurable impact on curbing underage drinking (Wagenaar et al. 1994). Preventing the sale of alcoholic beverages to underage drinkers is quite different from preventing the use of illicit drugs. The research into this aspect of prevention is subsequently different (Hilton and Bloss 1993). However, other aspects of alcohol consumption, such as binge drinking or use by pregnant women, require the same types of prevention efforts as other drugs. In this way, alcohol is a part of substance abuse prevention.

## CONSIDERATIONS IN COST-EFFECTIVENESS ANALYSIS

Many considerations go into the measurements in cost-effectiveness analysis (or cost-benefits or savings of a prevention program or intervention). Such considerations make measurement of costs and outcomes difficult, but they must be addressed if the intervention is to be evaluated competently. These considerations focus on costs, obviously, and they should be viewed as a supplement to the methodological considerations in undertaking prevention research studies (see, for example, National Institute on Drug Abuse [NIDA] Research Monographs 107 [Leukefeld and Bukoski 1991], 139 [Cazares and Beatty 1994], and 142 [Collins and Seitz 1994], cited in the reference section at the end of the chapter).

There may be a perception in the substance abuse prevention field that prevention programs are cost-effective or produce cost-savings for society. One recent study, however, suggests that there is no a priori reason to think so. This study by the Institute of Medicine, titled *Reducing Risks for Mental Disorders*, points out that the costs of prevention are not necessarily less than the costs of treatment (Mrazek and Haggerty 1994). In part, this is due to the costs of reaching a wide population in prevention, whereas treatment is focused on individuals.

This study builds on the work of Russell, then at the Brookings Institution (Russell 1986). Russell's first consideration was the link between the target population and the risk of what was being prevented. That is, the total costs of a prevention program depend on the size of the targeted population relative to the number in the target population who are at risk. The more focused the targeting to the group perceived to be at risk, the more the prevention intervention will be cost-effective or produce cost-savings. Thus, information about the population at risk was paramount to any



prevention strategy. Also, it was important to be able to describe on a per-dollar program basis the impact on behavior and how this varied among different populations (Hueston et al. 1994).

Russell's second consideration was that the cost and frequency of intervention should account for startup costs, frequency of contact with the population and contact duration per person, and the type of prevention program (for example, an innovation to a school curriculum was much less intensive and expensive than individual interventions).

Russell's third consideration was the potency of the intervention: the program design must link the proportion of persons at risk with the size of the effect of an intervention. This link will affect costs of the prevention program. As an example, one study in England (Tolley and Rowland 1991) examined the cost-effectiveness of adding a specialist-worker in a hospital to screen admissions to determine potential alcohol problems as a prevention measure. The study found that the more intensive effort of intervention by the specialist-worker identified more cases for prevention, but at a greater cost. Even the brief advice about smoking from a physician during an office visit has been shown to be cost-effective (Cummings et al. 1989).

The fourth consideration was the uncertainty of risk: if the risk of developing an alcohol, tobacco, or other drug-related disorder was not well known, then measuring the costs of risk was difficult. Also, the costs of prevention intervention among the general population were not easy to measure. This situation offered a potential for uncontrolled program costs.

Russell's fifth consideration was time. The perceived benefits were much greater for interventions that produced effects promptly than for those with delayed results. The timing of intervention effects was an important part of any cost-effectiveness study.

Another caveat was that the costs of intervention may not be uniform among the general or target populations. Some in a target population may be more amenable to an intervention than others. The target population may be distinguishable by certain characteristics that might make an intervention easier or harder to achieve; for example, homelessness or being at risk for human immunodeficiency virus (HIV) or acquired immunodeficiency syndrome (AIDS).

Another analytic concern is to make sure to include more than program costs, i.e., costs incurred by the target population. These

might include the costs of travel to the program location, time for lost activities, or costs of lost income. Even the costs of child care should be considered. Such costs can differ among different cultures or by economic levels: low-income mothers might be unable to afford reliable child care and might consider it unwise or unsafe to leave children at home in the care of others.

## CONSIDERATIONS IN THE MEASUREMENT OF OUTCOMES COSTS

The second major subject of this chapter is cost-measurement. In prevention studies, there are two types of costs, and each has a different type of measurement and associated difficulties. First, there are costs of administering and conducting a particular intervention program. Second, there are the costs associated with the prevention of risk factors or adverse outcomes such as years of healthy life lost.<sup>2</sup>

In the prior section, the considerations in measuring and defining costs associated with a particular intervention or program were reviewed. Costs and their measurement for adverse outcomes forgone, i.e., prevented, have their own set of considerations. These considerations come from the extensive body of literature on measuring the costs of various illnesses.

Methods for studying cost of illness are described concisely and clearly by Rice and colleagues in the second chapter of *The Economic Costs of Alcohol, Drug Abuse, and Mental Illness: 1985* (Rice et al. 1990). Several applicable ideas are presented. Although these ideas have been applied to treatment, they also apply to prevention, even though prevention data may be more difficult to obtain.

One of two general approaches to measuring adverse costs forgone is the human capital approach, which was pioneered by Rice and is the more widely used approach. The human capital approach assumes that an individual's value is measured by his/her earnings, or potential earnings, and the value of life is the potential earnings discounted over an average individual's life.

The usefulness of the human capital approach comes from the ready availability of data needed. The costs of alcohol, tobacco, and other drug disorders are measured by costs of health treatment, health-related costs of premature death, and the like.

The human capital approach is either incidence based or prevalence based. The former focuses on a short time period, typically 1 year, and includes a smaller population, i.e., new cases in that period. The latter focuses on lifetime costs and usually includes a larger number of cases. Prevalence-based studies are done more frequently because prevalence data are more available than incidence data.

In addition to health and related costs, the human capital approach includes other nonhealth costs such as costs of police and criminal justice, motor vehicle crashes, crime, social welfare program administration costs, destruction of property, lost productivity of crime victims, and the like. These nonhealth costs are tied to consequences of alcohol and other drug use, but not to tobacco.

The human capital approach fits well with the conceptualization of costs of adverse outcomes prevented by an intervention program. The costs of illness forgone or prevented, and the costs of premature death prevented, can be measured and then associated with a particular intervention program. The same applies to nonhealth costs: the probability of a portion of the target population ending up in the criminal justice system can be measured, and the costs saved by a particular intervention or program that reduces that probability also can be measured.

The human capital approach has at least one large weakness: it yields low values for children and adolescents. These younger persons are often key target populations for prevention programs and interventions. The same weakness applies to persons of color, another key target population. That is, because the expected lifetime incomes of these groups may be lower than average, the costs of improved years of life attributable to a prevention program may be correspondingly lower.

The willingness-to-pay approach is the second general approach. It is another way to measure the valuation of human life for both morbidity and mortality. In this approach, individuals say directly or indirectly how much they would be willing to pay to reduce the likelihood of illness or death. It focuses on the individual and thereby includes all aspects of well-being, including labor and nonlabor income and the value of leisure, pain, and suffering.

The applicability of the willingness-to-pay approach to measuring adverse costs forgone is not immediately obvious. The approach would ask how much targeted individuals would be willing to pay to prevent early death or illness from drugs, alcohol, tobacco, or other

illnesses. As for all other diseases, individuals have a difficult time knowing how to answer this type of question. If the target population is young, the population may discount the future more than an older population, thereby biasing cost-measurements. Also, individuals at risk may not be able to answer this type of question because they might deny that they are at risk, also biasing cost-measurement.

Rice points out other problems with the willingness-to-pay approach: it is difficult to implement in practice, and it depends on the income distribution of the population (e.g., the rich can pay more to stay well).

One of the most important considerations in the application of cost-effectiveness analysis and related types of studies is the clear accounting of costs. The more detailed and the more clearly specified the costs are, the better for analysis. Only in this way can specific findings for a prevention program in one community be made comparable to that in another community.

Researchers have three approaches or perspectives available for conducting drug abuse prevention research: a primary prevention model, a communicable disease model, and a risk factor model (Bukoski 1991). Costs are easier to define and measure in the first type, the primary prevention model, because the costs of disease and death are known. Also, the incidence and onset of disease are known, and their costs can be measured. The other two models frequently end up with the same cost-measures as the primary prevention model.

The objectives of effectiveness analysis need to be clearly stated: the focus can be either on outcomes as measured by illness, death, and social and employment status, or on the impact of prevention programs or strategies on the progress of drug use. As noted, the costs of outcomes can be measured, but the costs of changes in behavior, e.g., drug use, are more difficult to measure (other than in an outcome of illness or death).

If cost-effectiveness or cost-benefit analysis is focused on evaluation of a program's or strategy's impact on risk factors, again the costs are difficult to measure. For example, peer pressure or perception of harm of use are risk factors. In order to explain these factors in risk terms, there has to be an explicit model of how these factors affect outcomes (Pentz 1994). If the STAR Program in Kansas City finds lower levels of alcohol, tobacco, and marijuana use at 1-year and 4-year followup among the target populations, how can the costs of lower levels of use be measured except in terms of outcome(s)?

The model of MacKinnon is instructive here: the prevention program influences such mediating variables as biological, psychological, behavioral, and social factors, which in turn have an effect on outcomes (MacKinnon 1994). To the extent that the mediator analysis model can specify how prevention programs affect mediating variables and outcomes, that model will have an important impact on how well costs can be assigned to outcomes.

It may be possible to conduct a willingness-to-pay study to explain these costs in economic terms. The considerations described above still apply. Also, the target population's willingness to pay may change as a result of the program or strategy. This change confounds the cost-measurement.

The cost-savings or cost-offset analysis should be applied carefully. Without careful analysis and measurement, it could be concluded that doing nothing might be better. A "comment" in the *New Yorker* (1994) is worth citing:

Florida says that it has spent a billion two hundred million dollars over the past five years in medicaid payments for smoking-related illnesses. But that figure is misleading. While smokers use a lot of State-sponsored healthcare, and about three and a half billion dollars a year of Federal medicare money, they also tend to die around five years earlier than nonsmokers. That means five fewer years of the heavy health-care burden of old age, five fewer years of nursing-home care, and five fewer years of drawing a Federal pension.

What the comment misses, however, is that before they die, smokers use much more in healthcare services than they save the Nation by dying sooner.

## A FEW SUMMARY CONSIDERATIONS

It must be remembered that cost-effectiveness analysis can be a useful tool in differentiating relative impacts among programs or strategies, but it is only one factor among several that are used in decisionmaking. It is not a certainty that all programs are cost-effective (or cost-beneficial): because the costs of substance abuse to the Nation are so high and the costs of prevention on a per-person

basis are so low, it may seem obvious, a priori, that prevention programs and strategies pay for themselves. Prevention programs should be expected to improve health as measured by certain outcomes at a reasonable cost (Weinstein 1990).

Finally, remember also that only a substantial body of research in the substance abuse prevention field will significantly influence decisionmaking. Without this body of work, researchers will continue to use resources inefficiently and to the detriment of both patients' and at-risk groups' welfare (Maynard 1993). At this time researchers need to devote more efforts to improving cost-effectiveness research in the prevention of substance abuse problems. Cost-effectiveness is not a final determinant of programs' usefulness in prevention success, but it is an important component of the decisionmaking process.

## NOTES

1. This occurs whether the added medical problems are attributable to the substance abuse problem or occur at the same time, regardless of cause.
2. These costs, in particular, can be seen as benefits if conducting cost-benefit analysis. In cost-effectiveness analysis, two programs under comparison may cost the same to run but produce different impacts on the healthy years gained by the targeted population as a consequence of the programs.

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

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## INTRODUCTION

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

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

These different target groups can be found in schools, social service agencies, family planning agencies, the criminal justice system, the healthcare system, and in treatment settings. The likelihood of

reaching each of these groups varies across different locations. For example, virtually all pregnant women will access the healthcare system, but the prevalence of substance-abusing women in this location is relatively low, and they are difficult to identify. However, in treatment settings, reaching large numbers of substance-abusing women of childbearing age is easier.

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

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

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

The cost of the program.

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

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

## CONCEPTUAL FRAMEWORK

The conceptual framework for the economic evaluation of prevention programs is based on a decision tree model commonly used

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

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

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

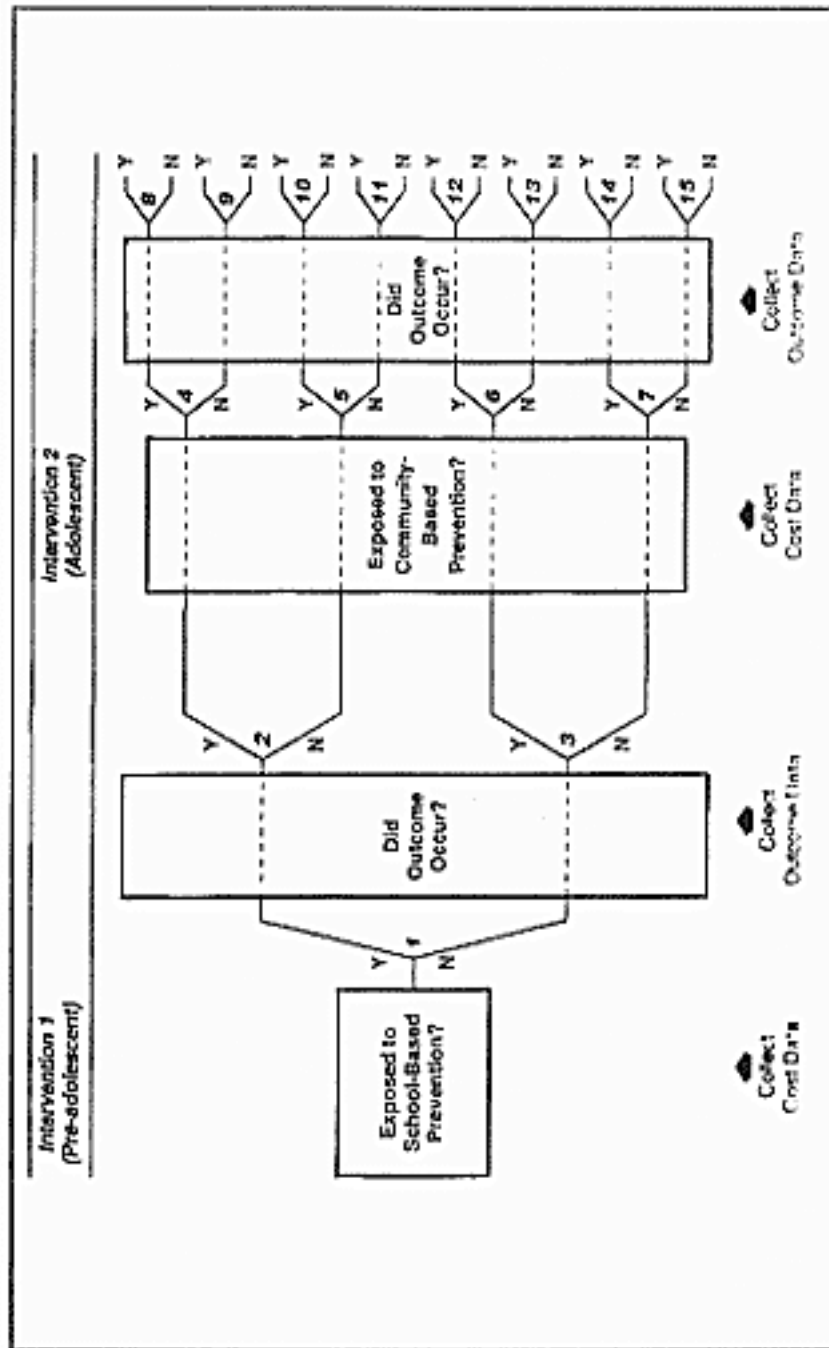


FIGURE 1. Example of a decision tree model simplified dynamics of substance abuse prevention interventions

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

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

Figure 1 highlights the various stages in the prevention intervention dynamics at which cost and outcome data must be collected to perform a cost-outcome evaluation of the interventions. Cost data should be collected prospectively for each prevention intervention. Cost data have typically not been collected in prevention studies, and there are few estimates of the cost of prevention interventions. The

next section discusses some of the methodological issues in collecting these cost data. Collection of outcome data is the focus of recent prevention studies (e.g., Botvin et al. 1990; Pentz et al. 1989), and the results of this work can be viewed as estimating the outcome probabilities in figure 1.

## COST-OUTCOME EVALUATION METHODS

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

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

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

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

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

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

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

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

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

A similar procedure can be followed for equipment, but the equipment rental market is not as well defined as the real estate market. In addition, because the annualized cost of equipment is relatively small, it may not be worth the effort of collecting the current market value for several types of equipment. Instead, the authors recommend collecting information on the original purchase price of equipment

and amortizing the initial purchase price over its useful economic life (Drummond 1991).

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

### Economic Evaluation Methods

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

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

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

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



- Improvement in education and labor market outcomes.

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

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

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

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

In cost-effectiveness analysis, a policy option is said to be dominated if at least one other option is both less expensive and more effective. In selecting the optimal policy, all dominated options should be

removed from further consideration. However, for the remaining policy options, cost-effectiveness analysis does not provide an explicit decision criterion for choosing the optimal policy.

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

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

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

In contrast to market-based methods, expressed preference methods of benefit estimation rely on contingent valuation (CV) techniques. CV uses a series of survey questions to elicit preferences for public

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

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

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

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

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

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

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

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

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

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

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

- The city has a population of 100,000 people and 10 percent of the population consists of adolescents who are at high risk of initiating use of a substance such as illicit drugs or cigarettes.
- A baseline community-based intervention is targeted at these high-risk individuals, but only 10 percent of them are exposed to the prevention program (node 5).
- Of the 1,000 high-risk individuals exposed to the existing program (0.10 x 10,000), 80 percent initiate substance use (node 14).
- However, of the 9,000 high-risk individuals who are not exposed to the program (0.96 x 10,000), 96 percent initiate substance use (node 15).
- The baseline program costs \$200,000.

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

Table 2 illustrates how the baseline probabilities translate into numbers of individuals. The first column notes that 1,000 high-risk

individuals are exposed to the intervention at baseline, and the second column notes that 160 fewer individuals initiate substance use in response to the intervention (equal to  $[0.96 - 0.80] \times 1,000$ ).

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

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

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

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

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

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

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

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

Note that as long as the dollar value of the benefits exceeds \$3,750 per individual, the program effectiveness enhancement generates more net benefits than the outreach program. If only \$300,000 is available and the program effectiveness enhancement can be partially funded, yielding only 240 individuals who change their behavior (equal to  $360 \times [\$300,000/\$450,000]$ ), then the outreach program generates more net benefits (\$980,000 versus \$660,000) and is the preferred



program from society's perspective. Thus, in this case of equal spending for each alternative, both the cost-effectiveness analysis and the benefit-cost analysis yield the same optimal policy.

## SUMMARY

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

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

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

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

- The costs of the intervention.
- Measures that can be used in benefit estimation (e.g., healthcare expenses, criminal activity, and labor market outcomes).
- The concurrent and lifespan exposure to other prevention activities.

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

## NOTES

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

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

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

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# Benefits and Costs of a Family-Focused Methadone Treatment and Drug Abuse Prevention Program: Preliminary Findings

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## INTRODUCTION

Benefit-cost analysis is a widely applied, but often controversial and misunderstood, tool of program evaluation. It was initially used to assess the economic soundness of infrastructure projects such as locks, dams, and highways. Analysts now routinely apply it in evaluations of environmental and occupational safety and health regulations (Cropper and Oates 1992; Viscusi 1985); health and mental health interventions (Keeler and Cretin 1987; Weisbrod 1981); and a wide variety of human resources programs, including ones for alcoholism treatment (Rundell et al. 1991; Saxe et al. 1983), education (Berrueta-Clement et al. 1984), family planning services (Levey et al. 1988), job training (Kemper et al. 1983; Long et al. 1981), vocational rehabilitation (Lewis et al. 1992), and welfare-to-work programs (Gueron and Pauly 1991).

Benefit-cost analysis has been recommended for drug abuse program assessment (Des Jarlais et al. 1981; Hubbard and French 1991; Maynard and Powell 1985) and can be readily adapted for analyzing such programs. It has been applied infrequently, however. Anglin and colleagues (1989), Hannan (1975), Hollister and colleagues (1984), and Harwood and colleagues (1988) are among the few examples of such applications.

The fundamental idea of benefit-cost analysis is straightforward: to comprehensively identify and measure the benefits and costs of a program, including benefits and costs that arise in the longer term

after treatment ends as well as those that occur during treatment. If benefits exceed costs, the program improves economic efficiency—the value of the output exceeds the cost of producing it. “Net social benefits” are positive, so the program makes society better off. If costs exceed benefits, society would be better off using the program’s funds to support other interventions that do pass a benefit-cost test. If none of the existing interventions pass benefit-cost tests, research to develop better interventions is necessary.

One may view benefit-cost analysis as a way to calculate the “social profit” from an activity. In a sense, it is the public sector analog to private sector decisions about where to invest resources, but more complex because all benefits and costs to all members of the society are considered, not just financial ones affecting one enterprise.

Benefit-cost analysis can help society wisely allocate the scarce resources it makes available for drug abuse prevention and treatment programs. It provides a method for informing decisionmakers about which programs hold the most promise for preventing substance use and the large costs associated with it, and which ones fall short. Choices among competing uses of funds must always be made, and the final choices inherently embody judgments about relative benefits and costs. Benefit-cost analysis seeks to make the basis of such choices explicit so that difficult tradeoffs can be weighed with better information.

This chapter applies benefit-cost analysis to early results from a field experiment, Focus on Families, that is testing the effectiveness of a novel parent training program among parents receiving methadone treatment.<sup>1</sup> The results are preliminary in nature because economic benefits and costs are assessed at 4 months after treatment and only monetizeable benefits and costs are considered. Nonetheless, these analyses provide a valuable illustration of the application of benefit-cost analysis to prevention programs. The intervention’s main goals are to prevent relapse into drug use by methadone treatment parents and to lower the risk that the children of these parents will become substance users (Catalano et al., in press).

The chapter first summarizes the theoretical and empirical underpinnings of the Focus on Families program and the nature of the treatment it offers. It then considers how the program’s goals and anticipated effects translate into “benefits,” as understood in benefit-cost analysis. After the data and analytic methods are explained, preliminary benefit-cost findings based on 6-month followup data from Focus on Families are presented.

## FOCUS ON FAMILIES: A RISK-FOCUSED APPROACH TO PREVENTION OF SUBSTANCE ABUSE AMONG DRUG-AFFECTED FAMILIES<sup>2</sup>

The traditional focus in drug abuse treatment has been on addict behavior, which often extends to the role of the family in influencing addiction (Stanton and Todd 1982; Surgeon General 1988). Little attention has been given to the role of recovering addicts serving as drug prevention agents for their own children. Yet these children are often at high risk for substance abuse given parental modeling, favorable parental attitudes toward drug use, and poor parenting practices. In addition to placing children at high risk for drug abuse, these conditions also place them at risk for other problem behaviors such as school dropout, delinquency, and teenage pregnancy (Dryfoos 1990; Slavin 1991).

Research has identified risk factors predicting teenage drug abuse (Hawkins et al. 1992, 1995; Jessor 1976; Newcomb et al. 1987; Simcha-Fagan et al. 1986). Family risk factors include family history of addiction; family management problems including conflict, lack of monitoring, inconsistent or harsh discipline, and lack of clear rules and expectations; parental drug use; and positive parent and sibling attitudes toward use. School risk factors include low commitment to school, academic failure, and early and persistent antisocial behavior. Peer and individual risk factors include biological and genetic predispositions, alienation or rebelliousness, friends who use drugs, favorable attitudes toward drug use, and early first drug use. Many of these risk factors are present in the lives of children whose parents are in methadone treatment.

Research has also identified environmental and situational predictors of posttreatment relapse among substance abusers (Surgeon General 1988). Relapse factors include family conflict, lack of family support, drug use among other family members, lack of involvement in nondrug leisure activities, association with substance-abusing peers, skill deficits, high life stress, and lack of needed services. Such relapse factors often characterize the lives of parents in drug treatment.

Protective factors may buffer the effect of exposure to risk. Three broad categories of protective factors against risk in children have been identified: (a) individual characteristics including resilient temperament, positive social orientation, and intelligence (Radke-Yarrow and Sherman 1990); (b) family or external social supports

characterized by warm, supportive relationships or bonding (Catalano and Hawkins 1996); and (c) healthy beliefs and clear standards that promote prosocial behavior (Garmezy 1985; Werner 1989). Protective factors are hypothesized to operate indirectly through interaction with risk factors and to mediate or moderate the risk exposure (Hawkins et al. 1992; Rutter 1985).

The evidence shows that children of parents in methadone treatment are exposed to multiple risk factors for teenage drug abuse and are likely to have fewer protective factors in their lives. Their parents' lives are characterized by continued use or high risk for relapse. A risk-focused approach seeks to prevent drug abuse by eliminating, reducing, or moderating risk factors for drug abuse while enhancing protective factors. This is the fundamental premise of Focus on Families (Catalano et al., in press).

Focus on Families is a 5-year field experiment funded by the National Institute on Drug Abuse (NIDA). Its central goals are to reduce the risk of posttreatment relapse among methadone-treated parents and to reduce the risk of drug abuse by children of methadone-treated parents. Achieving these main goals is expected to lead to other long-range beneficial outcomes for client families such as less involvement in crime and improved performance in the labor market.

Focus on Families served parents enrolled in two methadone programs in Seattle, Washington, who had children between the ages of 3 and 14 years living with them at least 50 percent of the time. They also had to have completed at least 90 days of methadone treatment before beginning the program. Parents voluntarily agreed to participate and accept random assignment to experimental or control conditions. Parents and children received a pretreatment baseline interview; only the parents received a posttest interview after the parent training sessions (approximately 4 months after baseline). Parents and children were interviewed 6 months following posttest. Interviews at 12 and 24 months posttest will be administered.

Members of the control group received standard methadone treatment only. Those in the experimental group received the same methadone treatment plus two novel components—parent and child skill training and case management.

Parents received intensive training in relapse prevention and coping, appropriate child developmental expectations, communication, anger control, family involvement, and use of appropriate rewards and disciplinary consequences for children's behavior. Parents also



learned how to support their children's academic progress and how to teach them drug refusal and problemsolving skills. Parents had the opportunity to attend 33 training sessions, totaling 53 hours, while children could attend 12 sessions.<sup>3</sup> Case managers worked with families in their homes to help them maintain the skills they learned, to generalize these skills to their natural environment, and to help parents obtain other needed social services. Case managers worked with the children to encourage involvement in prosocial opportunities outside the family structure. Case management services began about 1 month before the initial training session to engage families into the project. Home-based case management was completed 4 months after the end of the training sessions.

The parent training and case management activities were based on the social development model (Catalano and Hawkins 1996). They sought to create conditions for bonding within the family and to prosocial others outside the family by enhancing opportunities and skills and recognition for social involvement, and encouraging families to set clear family policies on drug use. In doing so, Focus on Families addressed the following risk factors for teen drug abuse: family management problems, parental drug use and positive attitudes toward use, family history of addiction, early antisocial behavior, early first use, academic failure, low commitment to school, and friends who use drugs. It also addressed several risk factors for relapse by parents: drug use in the family, peer drug use, family conflict, lack of involvement in nondrug-use leisure activities, isolation, and little family support for abstinence.

## BENEFITS AND COSTS OF FOCUS ON FAMILIES

Focus on Families creates benefits when it produces results with a positive value to either the participants in the treatment program or to other members of society. For example, if the program reduces parental drug use and parents are able to earn more as a result, the increase in earnings is a benefit since it reflects the value of the extra economic production. Similarly, less drug use may reduce the costs of crime and illness that otherwise would have occurred. Focus on Families creates costs when it uses resources that could have been used for some other worthwhile purpose. The value of the labor of the professionals who provide the parent training and case management activities is a cost.

The effects of Focus on Families' innovative program components—the parent training and case management

activities—are determined by comparing outcomes for experimental and control groups. Thus, the difference in costs between the experimental and control treatments will be compared to the difference in benefits to determine if Focus on Families yields a net benefit relative to conventional interventions.

This chapter analyzes benefits and costs of Focus on Families from the social perspective. Benefits and costs from the perspectives of participants (including family members who may also benefit from the program) and nonparticipants (often labeled “taxpayers”) will be analyzed in later work. A simple example can illustrate the difference among these perspectives. An increase in gross earnings is a social benefit because it measures the value of extra production for the whole economy. The participant benefit is his or her gain in after-tax income. Nonparticipants gain from the taxes paid on the higher earnings because, other things equal, their taxes can be lowered.

## Benefits

Figure 1 displays a comprehensive list of potential benefits organized into three categories. The categories derive from the conceptual model that underlies Focus on Families. Focus on Families’ treatment directly seeks to reduce factors that predict greater risk of relapse among parents and greater risk of initiating substance use among children, and to enhance those factors associated with lower risks of these behaviors. For example, successful training for relapse prevention among parents is likely to decrease stress, social isolation, the number of drug-using social network members, and the frequency of drug use, and to increase relapse-coping skills and the number of nondrug-using network members. Among the changes anticipated from successful training for preventing drug abuse by children are decreases in favorable attitudes toward drugs; involvement of children in parents’ drug use, family conflict, and antisocial behavior; and increases in family management skills, family bonding, social skills to refuse drugs, and positive school performance (Fraser et al. 1988; Hawkins et al. 1992). If such changes in risk and protective factors occur, one can consider them to be benefits in themselves since they are likely to be valued by clients, whether or not they have a significant effect on drug use.

|   |
|---|
| Risk and protective factors                 |
| <u>For parents on methadone maintenance</u> |

Improved relapse coping and drug refusal skills.  
 Less drug use among family members.  
 Increased family support for being drug free.  
 Reduced family conflict and stress.  
 Increased skills to interact with school personnel.  
 Fewer drug-using and more prosocial network members.  
 Less social isolation.

For children of opiate users

Less favorable attitudes towards drugs.  
 Decreased involvement in parental drug use.  
 Improved family management.  
 Improved family communication and bonding.  
 Less family conflict.  
 Less antisocial behavior.  
 Fewer drug-using and more prosocial network members.  
 Improved drug refusal and other skills.  
 Stronger bonding to school; positive school performance.

Substance use

Relapse prevention.  
 Decreased drug use.  
 Prevention or reduction of use.

Other outcomes

Higher earnings.  
 Reduced healthcare costs.  
 Reduced morbidity and mortality.  
 Reduced domestic violence.  
 Better mental health.  
 Reduced use of social services.  
 Less crime (reduced costs to criminal justice system, reduced costs of victimization).  
 Reduced use of income support programs.  
 Variety of better social outcomes, including improved education, reduced delinquency, etc.

**FIGURE 1.** *Potential benefits of Focus on Families for parents on methadone maintenance and their children.*

The key desired outcomes of Focus on Families are a lower rate of relapse among parents, less drug use should relapse occur, and less drug use by the children. Such outcomes form a second category of benefits.

Less drug use by parents and children, in turn, is likely to lead to other outcomes that improve the quality of participant families' lives. It is also possible that changes in risk and protective factors might directly

lead to changes in these outcomes. These outcomes form the third category of benefits. Among the major favorable long-term outcomes expected to flow from less drug use are higher earnings; less crime and the costs associated with it; fewer accidents, medical emergencies, illnesses, fatal overdoses or other deaths; fewer incidents of domestic violence; and improved mental health. Less use of other government, nonprofit, or for-profit agency social services by users and their family members and, hence, lower service costs may result from reduced drug use. If avoiding drug use leads some parents to obtain more or better education or job training than they would otherwise, the higher expected future earnings that result would be an additional benefit. If less drug use reduces reliance on income support programs, savings in administrative costs would be a benefit.<sup>4</sup> These kinds of benefits are among those that typically receive attention in benefit-cost analyses.

Because children of drug users are more likely to become users themselves (Hawkins et al. 1992), intergenerational benefits would exist if the program curbs parental drug use. Benefits of reduced substance use among the children would be similar to those for the parents. Less parental drug use may also foster other prosocial outcomes for children such as better school performance.

Figure 1 also implies the time sequencing of potential benefits. The Focus on Families program is expected to affect risk and protective factors immediately. Changes in such factors are expected to lead to less drug use for parents and children. These changes in turn are expected to bring about economic benefits.

## Costs

Because both treatment and control families received basic methadone treatment services, the additional costs of the special training sessions and associated aftercare and home-based services received by the treatment group measure the incremental direct costs of Focus on Families. Some of the sessions were conducted during working hours. Thus, there were also costs for forgone earnings (or for the value of forgone leisure for participants who altered their schedules to attend sessions), although these extra costs were not borne directly by the Focus on Families program. Costs of conducting the research on Focus on Families are not counted, since they would not be part of a permanent program.

## DATA AND METHODS

### Sample

There were 144 parents who were recruited from two methadone clinics and who accepted random assignment to experimental and control conditions. Blocking criteria were applied before random assignment. Blocking criteria were the ages of the participants' children, race, and age at first drug use. Because of anticipated attrition from the program, a higher proportion of eligible participants was assigned to the experimental (N = 82) than to the control (N = 62) condition. Nine participants (4 experimentals and 5 controls) were unavailable at 6-month followup, leaving 135 (94 percent) interviewed respondents (78 experimentals and 57 controls).

Participants were recruited in cohorts of approximately 20 individuals. Seven cohorts comprised the Focus on Families sample. Because subjects participated in the intervention at different times, the 6-month followup periods occurred between May 1991 and January 1994.

Table 1 provides descriptive information on the sample of 135 participants. The mean year of birth for participants is 1956. The majority of the sample is female (69 percent) and Caucasian (71 percent).

### Measuring Benefits

This preliminary analysis focuses on measuring the monetary value of changes in several of the outcomes identified in the bottom section of figure 1. Changes in these outcomes may plausibly be attributed to the change in drug use, to the changes in risk and protective factors, or to both kinds of changes produced by the intervention.

Earnings are measured by asking subjects about their total before-tax earnings over the 6-month followup period. Earnings are deflated to fall 1993 (the midpoint of the last followup period) dollars.

**TABLE 1.** *Descriptive information on Focus on Families participants.*

| Demographics              | Mean                |         | SD                   |         |
|---------------------------|---------------------|---------|----------------------|---------|
| Year of birth             | 1956                |         | 5.74                 |         |
| Male                      | 0.26                |         | 0.44                 |         |
| Nonwhite                  | 0.24                |         | 0.43                 |         |
| Experimental              | 0.58                |         | 0.50                 |         |
| Outcomes                  | 6-month mean        | SD      | Baseline mean        | SD      |
| Earnings                  | \$1,955             | \$4,991 | \$1,505<br>(N = 134) | \$4,420 |
| Work accidents            | 0.017<br>(N = 119)  | 0.129   | 0.067                | .283    |
| Home accidents            | 0.089               | 0.334   | 0.126                | .413    |
| Vehicle accidents         | 0.126               | 0.395   | 0.141                | .521    |
| Nights in hospital        | 3.52                | 12.2    | 4.25                 | 13.1    |
| Subject hits <sup>a</sup> | 0.111               | 0.315   | 0.156                | .364    |
| Partner hits <sup>a</sup> | 0.104               | 0.306   | 0.178                | .384    |
| Self-help meetings        | 19.7<br>(N = 134)   | 39.0    | 12.8                 | 27.2    |
|                           | Outpatient          |         |                      |         |
| counseling visits         | 1.77                | 5.05    | 2.66<br>(N = 133)    | 12.0    |
|                           | Inpatient treatment |         |                      |         |
| days                      | 0.874               | 5.12    | 3.96                 | 16.1    |
|                           | Visits to private   |         |                      |         |
| practitioner              | 1.33                | 3.82    | 2.84                 | 12.68   |
|                           | Drug use led        |         |                      |         |
| to police trouble         | 0.119<br>(N = 134)  | 0.325   | 0.403<br>(N = 134)   | .492    |

KEY: N = 135 unless otherwise noted. a = Variable is dummy coded no = 0 and yes = 1.

Experimental and control subjects' responses to questions about the number of serious work, home, and vehicle accidents over the 6-month followup period showed whether Focus on Families affected these outcomes.<sup>5</sup> If there is a significant change, the monetary value of this benefit can be estimated by multiplying the average reduction in the quantity of each type of accident by the estimated average savings of avoiding such an accident. The magnitude of cost savings would then be extrapolated beyond the 6-month period because it is likely to persist. The same approach is followed to determine whether the program affected nights of hospitalization by participant and family members, spouse or partner abuse, and use of publicly and

privately provided social services not delivered as part of Focus on Families.<sup>6</sup> For the last outcome the analysis distinguishes among days of inpatient treatment, visits for outpatient counseling at community agencies, visits to private practitioners, and number of self-help group meetings attended. The indicator for analyzing whether Focus on Families reduced criminal involvement and its associated costs was a question about whether drug or alcohol use led to trouble with the police during the 6-month followup period.

In principle, the contingent valuation method can be used to assess the monetary value of changes in risk and protective factors and in drug use identified in the top two sections of figure 1. One can ask client families what they would be willing to pay to have reduced levels of family stress, better relapse-coping skills, better school performance, less drug use, and other improvements in family functioning and social well-being. Similarly, nonparticipants can be asked how much they would be willing to pay for improving the social and psychological well-being of at-risk families and reducing the level of current and future drug use among such families, and for reductions in the psychological and social costs of crime and victimization.<sup>7</sup> However, the Focus on Families data from this study are not suitable for implementing a contingent valuation analysis.

Table 1 lists means and standard deviations for all outcomes for the entire sample at both 6-month followup and baseline periods. Every outcome showed improvement between the baseline and 6-month followup period. Mean real earnings rose. Accidents, nights of hospitalization, and incidents of spouse or partner abuse all declined. Subjects reported less use of publicly and privately provided social services and less trouble with the police due to drug or alcohol use. They reported greater use of self-help groups, a change that may be considered beneficial.

These observed changes over time may have occurred for at least three reasons. Families recruited from the methadone maintenance programs may well have been at or close to a nadir in terms of the quality of their lives when they agreed to participate in the study. As time passed, they may have shown improvement on these indicators whether or not they received any services simply because they “had no place to go but up.” Second, the standard methadone treatment that both controls and experimentals received may have worked well on average and led to improvements in these indicators. (All subjects had received a minimum of 13 months of methadone treatment at 6 months postbaseline.) Neither of these reasons implies that Focus on Families was effective. Third, Focus on Families’ additional services

may have led to improvements in these indicators for the experimental group and, consequently, raised the overall means at the 6-month period. The second and third reasons are not mutually exclusive.

## Statistical Methods

Multivariate regression techniques were used to examine whether Focus on Families had a significant effect on benefit variables identified in the bottom section of figure 1. Three regression specifications were run for each benefit measure. The first included the treatment variable coded as a dummy variable (control = 0, treatment = 1) as the only independent variable. The second specification included the dummy treatment variable and the corresponding baseline variable as covariate. The third included the treatment dummy, baseline covariate, and three demographic covariates: year of birth, gender, and race. Gender and race were dummy coded with female and Caucasian given 0s and male and nonwhite given 1s. Logistic regression was used for the dichotomous dependent variables.

## RESULTS

### Costs

Table 2 displays the per family incremental costs of providing Focus on Families' training and case management services. Almost 80 percent of program costs were for professional staff who provided the services. Staff included the project director, who co-led the training sessions and provided clinical supervision; case managers; training group leader; and child care providers. Clerical support staff accounted for a minor share of the costs. Staff costs, including both wages and fringes, averaged \$2,733 per client. Operating costs included office rent for professional staff and for holding the training sessions, telephone, staff travel, photocopies, other consumable supplies, depreciation on equipment used in training sessions, participant incentives for attending sessions, and other minor financial assistance to participants. Operating costs equaled 19.9 percent of total costs. The value of donated goods and services that helped provide incentives for family participation formed a third, minor category of costs. These included such items as tickets to major league baseball games and local department store gift



certificates. The average cost of delivering Focus on Families was \$3,444 per client family.

**TABLE 2.** *Focus on Families cost per client family.*

| Amount  | Total      |                       |
|---|------------|-----------------------|
| Professional and support staff                        |            |                       |
| Project director                                      | \$ 542     |                       |
| Case managers   | 1,998      |                       |
| Training group leaders                                | 117        |                       |
| Child care providers                                  | 51         |                       |
| Clerical support                                      | <u>25</u>  |                       |
| Total staff costs                                     |            | \$2,733               |
| Operating costs                                       |            |                       |
| Office rent   | \$ 144     |                       |
| Telephone and travel                                  | 292        |                       |
| Photocopying, other consumable supplies, depreciation | 35         |                       |
| Participant incentives and assistance                 | <u>213</u> |                       |
| Total operating costs                                 |            | 684                   |
| Value of donated goods and services                   |            | <u>27</u>             |
| Total cost per client family                          |            | <u><u>\$3,444</u></u> |

Data on participants' travel and time costs of attending sessions are not available. A conservative estimate of these costs is about \$180, or approximately 5 percent of direct program costs.<sup>8</sup>

These costs must be put in the context of the dysfunction of the population. These subjects are not drawn from the general population of most prevention programs. They experience multiple problems and face multiple risks. The families are characterized by the social isolation and multiple entrapments of extreme poverty, poor living conditions, and parents with low status occupations (Kumpfer and DeMarsh 1986). Families characterized by addiction often share other mental disorders, including depression, emotional problems, relationship problems, violence, and criminal activity (Finkelstein 1990; Kolar et al. 1994).

## Benefits

Table 3 displays the coefficients on the treatment dummy variable for the three regression specifications.<sup>9</sup> Nearly every coefficient is statistically insignificant. The six that pass a 10 percent significance test suggest that the experimentals did slightly worse than the controls. There is no evidence that Focus on Families led to beneficial changes in any of the outcomes focused upon in this study and shown in the bottom portion of figure 1.

Row 1 shows that one cannot reject the hypothesis that real earnings of experimentals and controls were the same during the followup period. Results were similar when a regression omitted the extreme outliers. A logit regression with the outcome indicating whether the subject had any earnings (row 2) also showed no significant difference.

Eight of the nine coefficients in rows 3 to 5 show no significant effect of Focus on Families on work, home, or vehicle accidents. One coefficient suggests experimentals had more home accidents. Row 6 shows no effect of the intervention on nights of hospitalization. Rows 7 and 8 show no effect on the likelihood that either the subject hits or is hit by his or her spouse/partner.

Findings on use of social services are mixed. The professional staff of Focus on Families encouraged experimentals to get better connected to their local social service providers. Rows 9 and 12 show no evidence that Focus on Families affected attendance at self-help meetings or the number of visits to private practitioners. However, rows 10 and 11 show a trend difference implying that the encouragement succeeded. Experimentals obtained about 1.5 more outpatient and inpatient treatments over the 6-month period. This greater use of services appropriately counts as an additional cost of Focus on Families. If the services are effective, in the long run experimentals should exhibit reduced rates of relapse and child drug use, more favorable outcomes on other variables (e.g., higher earnings), and ultimately use fewer social services. More intense use of social services in the first 6 months of followup can be viewed as an investment that may potentially yield

**TABLE 3. Coefficients on treatment dummy variable for 6-month outcomes.**

| Outcome                        | Regression Specification |       |   |       |  |       |
|--------------------------------|--------------------------|-------|---|-------|--|-------|
|                                | Treatment dummy only     |       | Treatment dummy with baseline covariate |       | Treatment dummy with baseline and demographic covariates |       |
|                                | Coefficient              | SE    | Coefficient                             | SE    | Coefficient  | SE    |
| Earnings                       | -389.0                   | 872.0 | -641.0<br>(N = 134)                     | 857.0 | -932.0<br>(N = 134)                                      | 873.0 |
| Employed*                      | 0.249                    | 0.369 | 0.062                                   | 0.400 | -0.079   | 0.418 |
| Work accidents                 | 0.052<br>(N = 134)       | 0.037 | 0.029<br>(N = 134)                      | 0.024 | 0.030<br>(N = 134)                                       | 0.025 |
| Home accidents                 | 0.093                    | 0.058 | 0.097*                                  | 0.059 | 0.084  | 0.060 |
| Vehicle accidents              | 0.005                    | 0.069 | 0.003                                   | 0.069 | -0.003   | 0.071 |
| Nights in hospital             | -0.105                   | 2.13  | -0.164                                  | 2.15  | 0.077  | 2.22  |
| Subject hits*                  | 0.103                    | 0.559 | 0.050                                   | 0.564 | 0.362  | 0.607 |
| Partner hits*                  | -0.029                   | 0.571 | -0.039                                  | 0.585 | 0.229  | 0.625 |
| Self-help meetings attended    | 0.333                    | 6.82  | -0.336<br>(N = 134)                     | 6.90  | 1.43<br>(N = 134)  | 6.91  |
| Outpatient counseling visits   | 1.55*                    | 0.873 | 1.57*<br>(N = 134)                      | 0.891 | 1.51*<br>(N = 133)                                       | 0.901 |
| Inpatient treatment days       | 1.51*                    | 0.885 | 1.59*                                   | 0.904 | 1.46   | 0.931 |
| Private practitioner visits    | 0.030                    | 0.667 | 0.015                                   | 0.669 | 0.038  | 0.682 |
| Drug use led to police trouble | -0.629<br>(N = 134)      | 0.538 | -0.675<br>(N = 134)                     | 0.558 | -0.640<br>(N = 134)                                      | 0.582 |

KEY: N = 135 unless otherwise noted. \* = alpha  $\leq$  0.10, a = variable dummy coded no = 0 and yes = 1.

benefits over a longer period. When 12- and 24-month followup data become available, this possibility can be investigated.

The final row in table 3 indicates that the program had an insignificant effect on the likelihood that clients would report trouble with the police because of drug or alcohol use.<sup>10</sup>

## DISCUSSION AND CONCLUSION

Taken at face value, the preliminary findings for the monetizeable variables in the bottom of figure 1 provide little indication that the risk-focused approach to prevention of substance abuse among drug-affected families embodied in Focus on Families will pass a benefit-cost test. The experimental treatment cost more than \$3,400 per client family in direct agency costs. If client costs are counted, the total exceeds \$3,600. Based on data for these monetizeable variables covering the first 6 months, there was no statistical evidence of positive benefits for a wide range of outcomes and some evidence that the program increased social service costs.

This conclusion may be premature for several reasons, however. The hypothesized relationship between the intervention and outcomes examined here is expected to be subject to some indefinite time lag. As discussed earlier, the intervention is expected to affect risk and protective factors immediately; these changes are expected to affect parent and child drug use, and these cumulative changes are expected to affect the outcomes reported in this chapter. The measurement point examined in this chapter is 6 months after completion of the training and 2 months after completion of case management services. Parents in the experimental condition showed significant improvement in relapse prevention and coping skills and reduced frequency of opiate use immediately posttraining. Because the client families for Focus on Families were highly dysfunctional, these improvements in risk and protective factors at posttreatment may not translate rapidly into better functioning in behaviors such as work, health care, accident prevention, or criminal involvement. It may take more than 6 months for families to break out of their dysfunctional patterns of behavior. If so, the 12- or 24-month followup data may show monetary benefits that had not yet emerged in the 6-month followup period.

An important goal of Focus on Families was to prevent children of drug-abusing parents from initiating drug use and to help them succeed at school and in other prosocial activities. Data on children's

outcomes are not yet available and may indicate other benefits when analyzed. Finally, outcomes in risk and protective factors and parents' and children's drug use have not yet been examined at 6 months. This chapter examined benefits only on easily monetized outcomes.

The improvements between baseline and 6-month followup shown in table 1 for both the experimental and control groups are consistent with the hypothesis that the standard methadone treatment received by all subjects worked well and may pass a benefit-cost test. The data do not permit a test of this hypothesis, however. If this is the case, the results in table 3 nonetheless still would suggest that the additional experimental services had little effect.

Alternatively, the families targeted by interventions such as Focus on Families may be so dysfunctional that the services are insufficient to effect significant lasting changes in the outcomes examined here. If so, one may speculate that a yet more intensive treatment regimen might yield benefits worth its cost by pushing families below a critical level of dysfunctional behavior. Whether such nonlinear responses to risk-focused drug abuse prevention services exist is an open question.

Despite the disappointing preliminary findings of this benefit-cost analysis, the authors think the method deserves to be part of evaluations of drug abuse prevention programs. To facilitate use of this method in future evaluations of prevention programs, researchers need to expand data collection beyond indicators of drug use to a broader set of outcomes, the etiologies of which are linked to changes in drug use (e.g., earnings, healthcare costs, use of social services). Researchers should also track the full economic costs of providing an intervention, which may extend beyond the direct, budgeted costs of delivering an intervention. Two such costs are the value of donated goods and services and the implicit costs to program clients.

Like any evaluation tool, benefit-cost analysis has limitations both in principle and in practice. Yet choices among competing uses of scarce resources must always be made. Benefit-cost analysis provides better information that can help society weigh these difficult tradeoffs more effectively.

## NOTES

1. See Plotnick (1994) for discussion of the case for using benefit-cost analysis in evaluations of drug abuse prevention programs and an

exposition of the fundamentals of the method. For more complete discussions of benefit-cost analysis, see Gramlich (1990) or Zerbe and Dively (1994).

2. This section is adapted from Catalano and colleagues (in press), which may be consulted for more detailed discussion.
3. On average, parents attended about half the sessions.
4. The analysis ignores changes in taxes or income support benefits since these are not social benefits or costs.
5. "Serious" means an accident requiring medical attention or costing more than \$50 in repairs.
6. Spouse/partner abuse was assessed with two dummy variables. Participants were asked to respond to the question, "During the past 6 months, has your spouse/partner slapped, hit, or shoved you?" Participants were also asked whether they had slapped, hit, or shoved their spouses/partners in the past 6 months (no = 0 and yes = 1).
7. The contingent valuation method was developed to help measure the benefits of environmental amenities for which well-organized markets do not exist. See Zerbe and Dively (1994, pp. 409-410) for a brief introduction. Though the method remains controversial, it would appear to be applicable to social services such as Focus on Families.
8. On average, participants attended 16 sessions. Most took 1.5 hours; the initial session lasted 5 hours. Assuming a mean of 28 hours in sessions and a conservative value of time of \$4 per hour, the implicit cost of attendance is \$112. Assuming a round trip of 10 miles to attend a session and travel time of 20 minutes per trip adds further implicit time costs of \$21. Out-of-pocket travel costs are estimated at \$46 (160 miles, with the cost of a mile set at \$.285 based on Federal tax rules). This totals \$179.
9. Complete regression results for the baseline and demographic covariates and the constant term are available upon request.
10. The analysis does not consider changes in use of income transfer benefits. Given the insignificant effects on earnings, a significant effect on transfer benefits would appear unlikely.

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# 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:<br>Year 1, Year 2, Year 3   |
|                         | Cost per youth served   | Annual number of youth served, cost per semester:<br>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:<br>Year 1, Year 2, Year 3   |
|                         | Cost per semester or program days                             | Number of semesters or operating days:<br>Year 1, Year 2, Year 3                        |
|                         | Cost per FTE staff  | Number of FTE staff:<br>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<br>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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# Implications for Prevention Policy: A Commentary

*Robert L. DuPont*

## INTRODUCTION

The prevention of addiction to alcohol and other drugs before it starts is a dream that is shared by parents, youth, educators, and the general public (DuPont 1989a). This goal is vividly reflected in public discussions of addiction and in funding decisions made at all levels of the public and private programs addressing addiction. Prevention does not depend only on research. It cannot be silenced by even the most negative research findings. For many people in North America and elsewhere around the world, the goal of drug use prevention is both a great hope and a deeply held belief.

Prevention research is of vital public interest even though belief in and support for prevention do not depend on prevention research. It is essential that research provide evidence that, when it comes to the prevention of addiction, “something works.” Especially in the increasingly contentious struggle for dwindling resources, a “no” vote from prevention research will have a dampening effect on prevention budgets. Conversely, findings from research that prevention is possible have strong positive effects on funding decisions, since they reinforce the underlying political will to support prevention programs. Far more important than the yes/no decision about the funding of prevention programs, prevention research can provide guidance for fundamental decisions about the what, the how, and the when of addiction prevention spending. Prevention research findings operate as pathfinders for funding and programmatic decisions as study results support the most fruitful approaches to fulfilling the irrepressible dream of addiction prevention.

It is useful to recall the history of prevention over the past three decades, the period of the modern drug abuse epidemic. Initially, when scare tactics were laughed at by skeptical youth, it was assumed that providing young people with factual information would deter them from using drugs. The early findings from the first prevention research that such information programs did not work was deflating to the goal of prevention. Especially troubling were facts presented to youth that tended to undermine the goals of primary prevention, which was to stop first use of addicting drugs including alcohol and

tobacco. The unsettling facts were that many youth use addicting drugs and then stop, and that many youth who use various drugs do so without apparent problems. These facts had a chilling effect on this first wave of information-based alcohol and drug use prevention. Not only were negative consequences uncertain, but they were often long delayed. Later, skills training, especially peer refusal techniques, were developed with better, but still modest, results. More recently, addiction prevention research has branched out to include a broad range of related problem behaviors of youth, including tobacco use, eating disorders, sexual activity, and violence (DuPont 1990, 1991).

The challenge for the next generation of prevention research is to define a practical, cost-effective array of promising prevention strategies and to conduct the studies needed to establish what works and what does not. Past studies have shown that the needs of youth when it comes to addiction prevention are heterogeneous. When it comes to prevention, one size definitely does not fit all. In particular, it is now clear that high-risk youth are an identifiable and a particularly important challenge for addiction prevention programs.

In earlier studies, it was enough to be able to show that experimental subjects did better than control subjects, however small the benefits. Experience has shown that it is remarkably difficult to demonstrate efficacy, especially sustained efficacy, in addiction prevention programs, so any benefit is hard earned and unusual. In the 1990s, the challenge for prevention research goes beyond simple efficacy to showing that specific, practical, and affordable interventions produce strongly positive and long-term cost-effective and cost-benefit results. The contemporary public and private funding environment requires that prevention research results be scored in economic terms. Prevention research is now being held to this additional standard: Can prevention programs marshal research evidence that shows they are wise investments of public and private funds, given the intense competition for these funds that exists today? Research that fails to meet the test of cost-benefit and cost-effectiveness will fail to be persuasive in the budget environments of the 1990s.

Even without reasonable results, significant sums will continue to be spent on addiction prevention programs because the goal of prevention is unstoppable. Prevention advocates will continue to complain that insufficient resources are being spent, regardless of the level of prevention funding. No matter how wise the decisions are in selecting which prevention programs to fund, the demands for more funding for addiction prevention programs will not be quieted, let alone silenced. If the experiences of addiction treatment and law enforcement during the past three decades are any precedent, the more money that is invested in addiction prevention, the more the demands for additional funding will increase. Funding for human

services, including addiction prevention, creates a powerful advocacy for additional resources.

The challenge for prevention research is less the determination of whether prevention is possible and whether funding should be increased than it is which prevention programs are the wisest investments of scarce funds. If poor choices are made about which addiction prevention programs to fund, there will be a waste of valuable resources, and the resulting addiction problem will only be made worse. The real losers in such a scenario are not the recipients of prevention funds. The real losers will be the youth, the families, and the communities of the Nation. The needs of real people who are suffering and dying because of addiction are the driving force behind prevention research today.

### HIGH-RISK YOUTH

There are some youth who are virtually invulnerable to addiction. Regardless of how negative their environments are, they simply will not use alcohol and other drugs. Other youth will use alcohol and other drugs in ways that create serious problems for themselves and others no matter how positive their environments are. The first group appears to be larger than the second group, but both groups are far smaller than the third group, youth who can go either way depending on their environments. These youth may or may not use alcohol and other drugs based on a wide variety of factors, and when they choose to use alcohol and other drugs they may quickly or slowly abandon the use, or they may progress to serious addiction problems, again depending on specific environmental factors. It is the third group that is the most important target of addiction prevention programs and addiction prevention research (DuPont 1984, 1997*a*).

Youth in the less vulnerable segment of this third group are particularly amenable to social influence programs using peer refusal and other techniques pioneered in the smoking prevention programs over the past three decades. Youth who are in the relatively more vulnerable segment of this third group are likely to need compelling reasons not to use alcohol and other drugs. Prevention programs that impose consequences are not in conflict with prevention programs that provide education and skills. These two approaches are synergistic.

The more vulnerable youth who are at high risk of addiction have an identifiable constellation of characteristics (DuPont 1984). The most striking aspect of the high-risk youth is their relative inability to think through choices to possible future negative consequences. Thinking only about the present places youth at great risk of

addiction because alcohol and other drugs produce immediate brain reward. The dangers and pain of using alcohol and other drugs are experienced in some relatively remote and uncertain future time. Youth who habitually are concerned about future consequences are less attracted to alcohol and other drugs because they are fearful of negative outcomes, ranging from social rejection by adults and nonusing peers to addiction and even death as a result of alcohol and other drug use.

Lying is like alcohol and other drug use: It is particularly attractive to high-risk youth because it gives them what they want right now. Lying puts off to some unconsidered future time the consequences of getting caught in the lie. Easy, frequent lying and cigarette smoking are the two most apparent markers of high-risk youth during the teenage years in North America today. Youth who are dominated by present reward, and who are relatively oblivious to uncertain and delayed future risks, are also attracted to high-risk sexual activity and violence. They are not attracted to delayed gratification, homework, or saving money, all of which involve pain now and reward later (DuPont 1988, 1994).

One of the most important research findings about drug use among young people is that, after two decades of steady and predictable declines, the rates of use for some drugs are again climbing. Johnston, the director of the Monitoring the Future Study of the University of Michigan Institute for Social Research, has noted that the best predictor of trends in future drug use is the extent to which youth perceive great risk from the use of alcohol and other drugs (University of Michigan 1996). Preceding the recent upturn in use rates was a downturn in the percentage of youth who perceived great risk from using drugs such as marijuana and the hallucinogens, the drugs whose use is now rising most rapidly.

What are the risks of trying illicit drugs, especially marijuana and the hallucinogens? More particularly, how would high-risk youth who characteristically do not think of low-probability future dangers answer that question? Many adults, as well as many low-risk youth, are acutely aware of serious risks from even trying alcohol and other drugs even once or twice, including the risk that the young people would like the drugs and that their attraction would lead to serious addiction. High-risk youth are seldom deterred by such concerns. They do not so much feel invulnerable as they simply do not think of the future at all when they make decisions, including decisions to use alcohol and other drugs. High-risk patterns of thought and behavior have both biological and environmental dimensions, but these patterns tend to peak during adolescence and to endure over many years. To prevent addiction, little can be done to change genetically determined risk factors for addiction except to identify them early and provide specific help to those at highest risk, including helping

their families cope with their behaviors. On the other hand, the environmentally determined risk factors of addiction offer great opportunities for prevention efforts (DuPont 1989*b, c*).

## SOCIAL TOLERANCE FOR ALCOHOL AND OTHER DRUG USE BY YOUTH

One prevention idea that deserves a thorough trial is to reduce the social tolerance for young people who use tobacco, alcohol, and other drugs, all of which are illegal for youth in the United States today. As long as the decision to use or not use these addicting substances is left to youth in environments that impose few predictable swift and painful consequences for use, there will continue to be large numbers of youth who choose to use alcohol, tobacco, and other drugs because of the predictable and effective brain rewards these substances produce (DuPont 1997*a*).

Modern drug testing technology permits easy identification of recent use of addicting substances (DuPont 1997*b*). Think how different the calculation would be for high-risk youth if they knew that they would be tested for alcohol, nicotine, and other drugs on a regular basis. Here is a simple, broadly based, and relatively low-cost prevention strategy: test all prospective automobile drivers under the age of 21 for recent use of tobacco and other drugs. If they test positive, indicating recent use, deny them a license until they are 21. This approach brings the consequences of deciding to use tobacco and other drugs right into the present where these consequences easily will be perceived to be serious, even by high-risk youth (DuPont 1988, 1994).

Here is another relatively simple way to change the environment in which decisions to use or not to use are made: when young people participate in extracurricular activities, including sports, test them for the use of alcohol, nicotine, and other drugs.

In the summer of 1995, the U.S. Supreme Court ruled 6 to 3 in favor of the constitutionality of mandatory random drug tests for public school athletes (*Vernonia School District 47J v. Wayne Acton, et ux., Guardians Ad Litem for Acton*, 115 S. Ct. 2386, 515 U.S. 646 [1995]). This was the first Supreme Court ruling on random drug testing. The major resistance to drug testing of students was removed by this definitive ruling, which was supported by the Clinton Administration and both of President Clinton's nominees to the U.S. Supreme Court.

Positive test results would disqualify the youth from participation for 30 days. Why not make testing technology accessible to the parents

of teenagers and provide these parents with support and guidance in imposing reasonable sanctions when use is detected? Coupling these testing programs with student assistance programs (SAPs), the way workplace testing uses employee assistance programs (EAPs), brings 12-step programs and addiction treatment into the prevention picture.

Addiction prevention needs to broaden its focus to include practical approaches to changing the social tolerance/intolerance balance in the use of tobacco, alcohol, and other drugs by young people. These ideas, which may appear radical, are a place to start this discussion.

## SUMMARY

Addiction prevention research today is a small but vitally important endeavor that promises to help the country make wiser choices for scarce prevention resources. Especially important are studies of specific, focused efforts to deal with high-risk youth and practical programs that decrease the social tolerance for young people who use tobacco, alcohol, and other drugs.

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