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Substance Abuse Prevention Dollars and Cents:

A Cost-Benefit Analysis

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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1. Executive Summary

Policymakers and other stakeholders can use cost-benefit analysis as an informative tool for decisionmaking for substance abuse prevention. This report reveals the importance of supporting effective prevention programs as part of a comprehensive substance abuse prevention strategy. The following patterns of use, their attendant costs, and the potential cost savings are analyzed:

- Extent of substance abuse among youth
- Costs of substance abuse to the Nation and to States
- Cost savings that could be gained if effective prevention policies, programs, and services were implemented nationwide
- Programs and policies that are most cost beneficial

1.1. Costs of Substance Abuse

Studies have shown the annual cost of substance abuse to the Nation to be $510.8 billion in 1999 (Harwood, 2000). More specifically,

- Alcohol abuse cost the Nation $191.6 billion.
- Tobacco use cost the Nation $167.8 billion.
- Drug abuse cost the Nation $151.4 billion.

Substance abuse clearly is among the most costly health problems in the United States. Among national estimates of the costs of illness for 33 diseases and conditions, alcohol ranked second, tobacco ranked sixth, and drug disorders ranked seventh (National Institutes of Health [NIH], 2000). This report shows that programs designed to prevent substance abuse can reduce these costs.

1.2. Savings From Effective School-Based Substance Abuse Prevention

If effective prevention programs were implemented nationwide, substance abuse initiation would decline for 1.5 million youth and be delayed for 2 years on average. It has been well established that a delay in onset reduces subsequent problems later in life (Grant & Dawson, 1997; Lynskey et al., 2003). In 2003, an estimated:

- 8 percent fewer youth ages 13 to 15 would not have engaged in binge drinking
- 11.5 percent fewer youth would not have used marijuana
- 45.8 percent fewer youth would not have used cocaine
- 10.7 percent fewer youth would not have smoked regularly

The average effective school-based program in 2002 costs $220 per pupil including materials and teacher training, and these programs could save an estimated $18 per $1 invested if

implemented nationwide. Nationwide, full implementation of school-based effective programming in 2002 would have had the following fiscal impact:

- Saved State and local governments $1.3 billion, including $1.05 billion in educational costs within 2 years
- Reduced social costs of substance-abuse–related medical care, other resources, and lost productivity over a lifetime by an estimated $33.5 billion
- Preserved the quality of life over a lifetime valued at $65 billion

Although 80 percent of American youth reported participation in school-based prevention in 2005 (SAMHSA, 2004), only 20 percent were exposed to effective prevention programs (Flewelling et al., 2005). Given this level of participation, it is possible that some expected benefits already exist for these students, and the estimates in this paper are adjusted for these probable benefits. These cost-benefit estimates show that effective school-based programs could save $18 for every $1 spent on these programs.

Table A1 in the appendix lists 35 effective prevention programs and strategies and the estimated cost-benefit ratios for each program. The array of demonstrated effectiveness among prevention programs and strategies is impressive. Of the 35 substance abuse prevention programs, practices, or related interventions, 15 reduced medical, criminal justice, and other spending by more than the cost to implement the program.

In a program targeting families with low income, intensive home visitation coupled with preschool enrichment reduced infant/toddler abuse (Aos et al., 1999; Karoly et al., 1998). As these toddlers reach adolescence and adulthood, visitation programs also can reduce a range of problems including substance abuse and violence.

Among indicated programs (targeted to individuals who have detectable symptoms), cost estimates that primarily focused on substance abuse were not available. However, estimates indicating good returns on the investment were available for several violence prevention interventions that address the roots of multirisk behavior. Moral reconation therapy for adult and youth offenders, and multisystemic therapy and functional family therapy for youth offenders returned more than $30 per dollar invested.

1.3. Conclusion

The cost of substance abuse could be offset by a nationwide implementation of effective prevention policies and programs. SAMHSA's Strategic Prevention Framework should include a planning step that considers cost-benefit ratios. Communities should consider a comprehensive prevention strategy based on their unique needs and characteristics and use cost-benefit ratios to help guide their decisions. Model programs should include data on costs and estimated cost-benefit ratios to help guide prevention planning.

2. Introduction

Historically, cost-benefit analyses have enabled policy and program managers to make informed decisions about resource allocations for substance abuse treatment policies, programs, and practices. Such analyses also can inform decisionmaking for substance abuse prevention. This report provides the best estimates of the magnitude of the costs to society from substance abuse and the costs and benefits gained through effective prevention. The report draws on the data and methods of recent substance abuse costs and cost savings studies. The overarching goal is to provide a broader base from which to understand the costs of substance abuse prevention programs and the potential cost savings as a result of implementation.

Increasingly, the American public supports investment in prevention programs as a strategy for dealing with America's substance abuse problems (Blendon & Young, 1998; Maguire & Pastore, 1996). Research demonstrates that substance abuse prevention programs work: they can reduce rates of substance use and can delay the age of first use. Studies also have shown that prevention programs not only prevent substance abuse; they can contribute to cost savings (Aos et al., 2004; Caulkins et al., 2002; Miller & Hendrie, 2005; Swisher et al., 2003).

2.1. Contents of This Report

Section 3 of this report summarizes existing estimates of the costs of substance abuse and its damaging consequences. These cost estimates are used to evaluate the benefits of prevention in existing cost-benefit analyses and are available for use in new analyses. The estimates reviewed highlight the total annual costs of substance abuse from a number of perspectives including social costs and the direct costs to State government. The social perspective includes everyone's costs and benefits: people who abuse substances, family members, the general public, communities, and all levels of government (Federal, State, and local).

Section 4 analyzes the probable outcomes of implementing school-based substance abuse prevention programming nationwide in 2002 for youth ages 12–17. The report first documents existing levels of substance abuse among youth and then develops composite estimates of the approximate program costs for school-based programs and the probable impact on substance abuse.

Section 5 summarizes existing costs and benefits of substance abuse and related prevention programs from society's perspective. It draws heavily on two systematic evaluations of cost-savings estimates, adds new analyses, and includes many programs listed on SAMHSA's National Registry of Evidence-based Programs and Practices (NREPP). These cost-savings analyses show that savings from substance abuse prevention generally exceed the costs of prevention programs.

Section 6 suggests how the estimates in Section 5 might be used to create an integrated, comprehensive, and highly cost-effective approach to substance abuse prevention and also suggests directions for future work. Section 7 provides a concise conclusion to this report.

2.2. Definitions of Cost, Cost-Effectiveness, and Cost Benefit

The economic literature uses a variety of definitions for cost, cost-effectiveness, and cost benefit. However, for the purposes of this report, each of these terms is defined below:

1. Costs are defined as expenditures to deliver services and expenditures to receive services (Chatterji et al., 2001).
2. Cost-effectiveness is defined as expenditures required to achieve an effect (Hurley, 1990).
3. Cost benefit is defined as the ratio between expenditures to deliver a program and the reduced social costs over time as a result (Plotnick, 1994).

2.2.1. Cost-Benefit Analysis

A cost-benefit analysis places dollar values on all significant outcomes, including death, pain and suffering, and property loss, so that benefits are directly compared with costs in monetary terms. Reporting costs and outcomes in a common metric facilitates comparison among diverse programs, and allows the benefits to be clearly distinguished from the costs. However, valuing the quality-adjusted life year (QALY) losses in dollars is methodologically challenging and controversial.

As well as reporting the ratio of benefits to costs, a cost-benefit analysis typically provides a net benefits estimate, which is computed by subtracting the cost of intervention from the benefits of the intervention (Mishan, 1988). For example, the All Stars program has a cost-benefit ratio of 34:1 (see Table 12), which means it returns $34 dollars in savings for every dollar invested, yielding net benefits of $4,670 per pupil ($4,810 in social cost savings minus $140 in program costs). By comparison, the Life Skills Training program has a cost-benefit ratio of 21:1 and yields net benefits of $4,380 per pupil.

Although the All Stars and Project Northland programs save more than it costs to develop and deliver them, the return on investment in All Stars is 34:1, and the return on Project Northland is just 17:1. However, other factors should be considered, e.g., the level of outcome and long-term effects. For example, Project Northland also involves developing a community coalition that remains after the program and can address related issues without additional costs. In allocating resources, analysts often trade off the most efficient investments—those with the highest cost-benefit ratios against those with a broader reach that can produce a larger total benefit.

2.2.2. Discounting to Present Value

A basic concept underlying any cost-benefit analysis is that intervention delays or prevents costs in the current year and in the future. Because money earns interest even in the absence of

inflation, if a dollar must be paid in 5 years, one could invest less than a dollar today in order to cover that expense (Hargreaves et al., 1998).

The generally accepted practice is to adjust future costs to their present value by applying a *discount rate* (Gold et al., 1996). The discount rate is essentially the reverse of an interest rate. Whenever possible, this report uses the 3 percent discount rate recommended by the Panel on Cost-Effectiveness in Health and Medicine (Gold et al., 1996) and the U.S. Office of Management and Budget (OMB, 2003). As recommended, this rate is used to discount all future costs and benefits, including QALY gains (Gold et al., 1996; OMB, 2003; Keeler & Cretin, 1983).

2.2.3. Assumptions

This report made the following assumptions:

- Estimates of effectiveness from Table 4 apply to U.S. youth ages 12 to 14 (9.483 million).
- The impact was reduced by 25 percent to account for reduced intervention effectiveness as one scales up from controlled demonstrations to full-field implementation (Aos et al., 1999; Greenwood et al., 1996; Miller and Levy, 2000).
- Youth would not be participating in two effective family/community-based prevention programs at the same time.
- Benefits apply to youth who actually participated in effective school-based substance abuse prevention programs in 2002.
- Costs or benefits were determined by estimates from Table 4, and ratios from the 2003 YRBS of (1) current to lifetime users by substance, (2) binge drinkers during the past month to lifetime drinkers, and (3) youth smoking on at least 20 of the past 30 days to lifetime.
- Substance abuse costs decline in proportion to delays in initiation as a result of prevention programming.
- Total costs equal the monetary costs plus the value of pain, suffering, and loss in quality of life. Estimates are the product of the costs in Table 1 and the percentages in Table 3.
- Benefits accrue over a multiyear period, and future costs can be converted to present value using a 3 percent discount rate.
- Costs from substance abuse among youth decline at the same rate as the number of those who initiate use.
- Savings from existing school-based programs are included in these estimates.

2.2.4 Using Cost-Benefit Analyses To Guide Program and Strategy Selection

Cost-benefit analyses respond to only one consideration in selecting programs and strategies for reducing substance abuse and its costs to society. The estimates in this report eliminate interventions that offer a questionable return on investment and should be used to guide choices between interventions that score comparably on other criteria. However, as discussed

in detail in Section 6, when selecting interventions, policymakers also must consider political feasibility, local priorities, appropriateness for the target population, affordability, and the immediacy of the impact (weeks versus years).

Substance abuse ranks among the top 10 health problems in the United States.

3. Direct Economic Impact of Substance Abuse

NIH ranks alcohol second, tobacco sixth, and drug disorders seventh among estimated costs of illness for 33 diseases and conditions (NIH, 2000). The year 1999 is the most recent year, with estimates available for all three categories of substance abuse. Despite a smaller number of deaths from alcohol use, alcohol-related costs are greater than tobacco costs because alcohol-related mortality tends to occur at younger ages than smoking-related mortality.

The categories used to develop the alcohol and drug abuse estimates include specialty alcohol and drug services; medical consequences; lost earnings due to premature death; lost earnings due to substance-abuse–related illness; goods or services related to crashes, fires, criminal justice, other; and lost earnings resulting from crime. The categories used to develop the smoking estimates were medical consequences and lost earnings due to morbidity and premature death. Tobacco prevention costs are excluded; the largest share of these prevention costs, State spending, averages $600 million annually (Campaign for Tobacco-Free Kids, 2004).

3.1. Current National Estimates of Social Costs

For 1999, the Department of Health and Human Services estimates the annual total resource and productivity cost of substance abuse at $510.8 billion (see Table 1) (Harwood, 2000; Harwood & Bouchery, 2001; Fellows et al., 2002). Adjusted for population and wage/price trends in the 1990s, the estimates provide an overview of the social costs of substance abuse in terms of lost goods, lost productivity, treatment, and medical services. Extensive data that track substance use and abuse show moderate changes (both increases and decreases) in their prevalence during that period. The studies cited here factored these changes into their updated estimates.

Table 1 shows the social cost of alcohol, tobacco, and drug abuse in the United States by substance. Alcohol abuse was responsible for $191.6 billion (37.5 percent) of the $510.8 billion, tobacco use was responsible for $167.8 billion (32.9 percent), and drug abuse was responsible for $151.4 billion (29.6 percent). Almost all of these costs are a result of the following events:

- Resource costs of substance abuse: Costs related to substance abuse include treatment and prevention, medical care, police, fire department, adjudication, and sanctioning expenses,

as well as property damage and related expenses associated with crime, motor vehicle crashes, and fires involving alcohol (Harwood & Bouchery, 2001).

- Loss of potential productivity and earnings: Smoking accounted for almost 440,000 deaths in 1999 (Fellows et al., 2002), alcohol abuse accounted for 42,000 (Harwood, 2000) to 76,000 deaths (Midanik et al., 2004), and drug abuse accounted for an additional 23,000 deaths (Harwood & Bouchery, 2001). Additional productivity losses occurred when individuals who abused substances did not work (e.g., were sick, unemployed, or in prison), or were impaired or disabled.

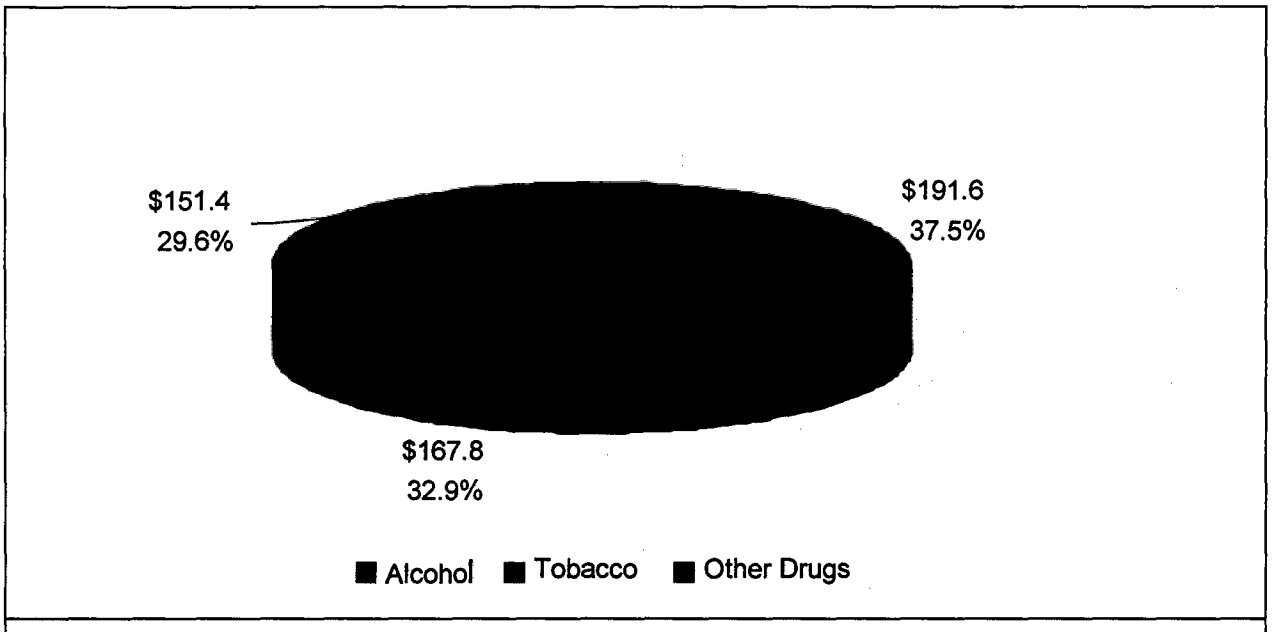
Table 1: Estimated Economic Cost of Substance Abuse to Society in 1999 (in billions)[1]

Substance Abuse	Alcohol	Tobacco	Drugs	Total
Resource Costs				
Specialty treatment and prevention services	7.8	N/A	7.6	15.4
Treatment of medical consequences	20.0	75.9	5.4	101.3
Goods and services related to crashes, fires, crime, criminal justice	24.4	N/A	31.1	55.5
Total Resource Costs				**172.2**
Productivity Costs				
Work loss due to premature death	37.4	81.9	20.9	140.2
Work loss due to illness related to substance abuse	91.1	10.0	26.7	127.8
Work loss by crime victims	1.0	N/A	2.0	3.0
Work loss by perpetrators due to incarceration and criminal careers	9.9	N/A	57.7	67.6
Total Productivity Costs				**338.6**
Total Resource and Productivity Costs	**191.6**	**167.8**	**151.4**	**510.8**

The total annual costs to society for substance abuse are $510.8 billion.

[1]Sources: For alcohol, Harwood (2000), trend-adjusted from 1998 to 1999; for tobacco, Fellows et al., (2002) except illness earnings loss from Harwood & Bouchery (2001); for other drugs, Harwood & Bouchery (2004). Similar costs are incurred annually. State prevention spending driven by tobacco settlement funds is the bulk of prevention spending. It averages $0.6 billion annually (Campaign for Tobacco-Free Kids, 2004).

Figure 1: Total Resource and Productivity Costs of Substance Abuse in Billions for 1999



This pie chart compares the social costs of alcohol, tobacco, and other drug use.

Lost productivity makes up two-thirds of the costs of substance abuse. Lifetime wage and household work lost to premature death is the largest component of these costs, followed closely by work lost to acute and chronic illness and injury. Incarceration results in $32 billion in earnings losses. Almost $25 billion more is lost when people who abuse substances pursue criminal careers rather than enter the labor force.

These estimates are conservative; they omit some costs that result from substance abuse. Specifically, they exclude (1) the impact on the quality of life of those who abuse substances and the people they harm and (2) the health care costs and work losses of victims who were involved in alcohol-attributable crashes even though they had not been drinking. These estimates also exclude the impact on the quality of life, although the Federal Government has set a precedent for including this impact. For example, the U.S. Office of Management and Budget (OMB, 2002) requires cost-benefit analyses of health-related regulatory proposals to include a monetized or nonmonetized measure of the loss in quality of life. French and colleagues (1996) make a similar recommendation specifically for analyses of substance abuse prevention. Finally, some economists (e.g., Cohen, 1998) suggest including spending on substances of abuse, or at least on illegal sales, including purchase price and travel costs. Like all the substance abuse cost and cost-savings estimates in this paper, Table 1 omits the purchase price.

3.2. Costs of Alcohol and Drug Abuse to States

The National Center on Addiction and Substance Abuse (NCASA, 2001) reported the cost of substance abuse to States.[2] As shown in Table 2, the total cost in 1998 was an estimated $81.3 billion.[3] The greatest expenses were justice (adult corrections, juvenile justice, judiciary), education (elementary, secondary), health (primarily Medicaid), child/family assistance (child welfare, income assistance), and mental health/developmentally disabled. However, the total cost does not account for actual savings in Medicaid spending. On average, because people who abuse substances die earlier, they use public health services less (Manning et al., 1991).

States spend another $81.3 billion on substance abuse.

Table 2: Cost of Alcohol and Drug Abuse to States in 1998 (in millions of 1998 dollars)[4]

Type of Cost	Cost
Prevention, Treatment and Research	$ 3,011
Justice	30,655
Education (Elementary/Secondary)	16,498
Health	15,167
Child/Family Assistance	7,722
Mental Health/Developmentally Disabled	5,888
Public Safety	1,507
State Workforce	408
Regulation/Compliance	433
TOTAL	**$81,289**

[2]After a review of the literature on substance abuse costs and consequences to government programs, NCASA selected five States (California, Florida, Minnesota, New Jersey, and Vermont) for site visits with State budget and program officials to understand how programs are financed and how best to gather spending data. With input from the five model States, NCASA analysts developed a questionnaire designed to collect data on revenues, expenditures, and all costs for the State fiscal year 1998. This questionnaire was pretested with three States and ultimately administered to 45 States, Puerto Rico, and the District of Columbia. Costs for the remaining States were estimated by assuming mean costs per capita in responding States were representative of costs in similar non-responding States.

[3]Section 4 illustrates one way to use these estimates to help understand prevention savings.

[4]Source: NCASA, 2001.

4. Costs and Benefits of Preventing Substance Abuse

This section uses the percentage of youth who might have started using substances in the United States and published estimates of prevention effectiveness to analyze the probable impact of a nationwide implementation of effective school-based substance abuse prevention programming. The following were estimated:

- Potential reduction in substance use and abuse as a result of providing effective school-based prevention interventions to all U.S. youth ages 12–14 in middle school
- Potential social cost savings as a result of providing effective school-based prevention interventions to all U.S. youth ages 12–14
- Social return on investment in preventive intervention measured in terms of costs and benefits
- Potential State government savings in juvenile justice and education costs as a result of providing effective school-based prevention interventions to all U.S. youth ages 12–14

The analyses primarily draw on data from the following sources:

- A report by Caulkins and colleagues (1999) for RAND titled *An Ounce of Prevention, a Pound of Uncertainty: The Cost-Effectiveness of School-Based Drug Prevention Programs*
- The NCASA report titled *Shoveling Up: The Impact of Substance Abuse on State Budgets* (NCASA, 2001)
- National Survey on Drug Use and Health (NSDUH) (SAMHSA, 2004))
- Youth Risk Behavior Survey (YRBS) (Centers for Disease Control and Prevention, 2003)
- Two meta-analyses on the effectiveness of school-based youth substance abuse prevention programs (Aos et al., 2004; Hansen et al., 2004)
- Table 3 (percentage of youth who delay initiation of substance abuse)

4.1. Youth Delaying or Never Using Substances

Nearly every youth ages 12–14 is at risk for trying alcohol, tobacco, and drugs and may be aware of social norms and feel peer pressure to start using these substances. The initial analysis involved estimating the number of youth who would not have tried or would not regularly use these substances if effective school-based prevention programs were in place nationwide. To determine these estimates, the number of youth ages 12–14 was multiplied by three factors: the low, medium, and high estimates of the percentage of youth who would delay initiating use of each substance if they received effective school-based prevention programming. The effectiveness estimates were drawn from two meta-analyses on the effectiveness of school-based youth substance abuse prevention programs (Aos et al., 2004; Hansen et al., 2004).

Table 3 shows the range of estimates of effectiveness. The midrange estimates of youth receiving effective school-based prevention services across intervention programs are as follows:

- 4.7 percent will delay using alcohol
- 4.1 percent will delay using marijuana
- 2.7 percent will delay using cocaine
- 4.7 percent will delay smoking

These estimates represent the mean values from an array of school-based prevention programs that evaluations found significantly (>.05) delayed or prevented initiation of youth substance use. The individual estimates of effectiveness were derived from meta-analyses that generally excluded evaluations that did not use some sort of comparison or control group. Prevention programs for cocaine use had the smallest range of effectiveness from 2.3 percent to 5.3 percent of youth delaying or never initiating use. Prevention programs that delayed or prevented initiation of alcohol use had the greatest range of 1 percent to 10.3 percent.

Table 3: High, Medium, and Low Estimates of the Percentage of All Youth Ages 12–14 Whose Initiation of Substance Use Would Be Delayed or Prevented Through Participation in Effective Nationwide School-Based Prevention Programming

	Range of Percentage of Youth Delaying Initiation or Never Initiating		
Substance	Low Estimate	Medium Estimate	High Estimate
Alcohol	1.0	4.7	10.3
Basis for assumed effectiveness	lowest of 9 nonzero estimates[5]	mean of 10 estimates	highest of 10 estimates
Marijuana	1.9	4.1	6.8
Basis for assumed effectiveness	lowest of 8 nonzero estimates	mean of 9 estimates	highest of 9 estimates
Cocaine	2.3	2.6	5.3
Basis for assumed effectiveness	lowest of 6 nonzero estimates	mean of 8 estimates	highest of 8 estimates
Tobacco	2.0	4.6	8.8
Basis for assumed effectiveness	lowest of 8 nonzero estimates	mean of 9 estimates	highest of 9 estimates

[5]Nonzero means that the outcome had a numeric value greater than zero. Assumption: Means for each outcome measure ignore the 11 evaluated school-based substance abuse interventions and 3 tobacco-only interventions that had an insignificant or unknown effect on outcome. Medians differ from the means by no more than 0.3 percent, e.g., 4.2 percent versus 4.5 percent for marijuana. See Table A2 for the estimates of effectiveness by intervention used in constructing this table.

Table 4 shows a range of estimates of the number of youth who would delay substance use if they received effective school-based prevention programming. For all youth ages 12–14, universal prevention programming in 2002 would have delayed 1.5 million initiations of substance use, with a range from 0.7 to 3 million. The largest absolute impact would be on drinking, with 446,000 youth delaying their first drink, followed closely by smoking with 436,000 youth delaying their first smoke. (A youth who delays both smoking and drinking is counted in both categories.) For drug abuse, the corresponding estimates are 247,000 youth delaying their first cocaine use and 389,000 delaying their first use of marijuana.

An analysis of NSDUH data by Caulkins and colleagues (2002) suggests the delay in initiating use as a result of effective prevention services would average 2 years, with some youth never initiating. Importantly, according to NSDUH, an estimated 80 percent of youth ages 12–17 actually participated in some form of education about drugs and alcohol in 2004, but only 20 percent were exposed to effective prevention programs (Flewelling, 2005). To the extent that these programs are operating effectively, it is possible that as much as half of the potential prevention savings may already have been realized. These already realized savings are subtracted from the savings estimates in this report.

The rationale for this analysis is that when youth delay onset of substance use, on average, two years less of lifetime use occurs. When prevention programs delay the onset of substance use, the number of future dependent users also decreases (Grant & Dawson, 1997), but the analysis does not estimate that further saving.

Table 4: High, Medium, and Low Estimates of the Number of Youth Ages 12–14 Whose Initiation of Substance Use Would Be Delayed or Prevented Through Participation in Effective Nationwide School-Based Prevention Programming in 2002[6]

Substance	Low Estimate	Medium Estimate	High Estimate
Alcohol	95,000	446,000	977,000
Marijuana	180,000	389,000	645,000
Cocaine	218,000	247,000	503,000
Tobacco	190,000	436,000	835,000
Total	**683,000**	**1,518,000**	**2,960,000**

[6]Product of the U.S. population ages 12–14 of 9.483 million and the estimates of effectiveness from Table 3. The estimates at all levels were reduced by 25 percent to account for reduced intervention effectiveness as the implementation moves from demonstration to full implementation (Greenwood et al.,1996; Miller and Levy, 2000; and Aos et al.,1999).

Many youth who try using substances do not regularly use or abuse substances immediately. To determine these estimates, the number of youth in Table 4 who delayed initiating substance use was multiplied by substance-specific ratios of current users and regular/heavy users from the 2003 Youth Risk Behavior Survey (YRBS). The estimates are given for specific substances:

- Illicit drugs (past month use of cocaine and marijuana)
- Alcohol (past month use, binge drinking: 5 or more drinks at 1 time in the past month)
- Cigarettes (past month use, regular smoking: use on at least 20 days in the past month)

Effective nationwide school-based prevention programming for youth ages 12–14 in 2002 would have prevented 267,000 youth from drinking during 2003, 183,000 from using marijuana, 138,000 from using cocaine, and 205,000 from using tobacco (see Table 5, medium estimates). Prevention programming also would have prevented 169,000 youth from binge drinking in 2003, and 72,000 youth from smoking regularly.

Following Greenwood and colleagues (1996); Miller and Levy (2000); and Aos and colleagues (1999), the impact was reduced by 25 percent to account for reduced intervention effectiveness as one scales up from demonstration to full nationwide implementation. It is assumed that as programs move from the laboratory to full field implementation, some drop in effectiveness will occur.

Table 5: High, Medium, and Low Estimates of the Number of Youth Ages 12–14 Who Would Avoid Past Month Substance Use, Binge Drinking, and Smoking Regularly During 2003 If They Participated in Effective Nationwide School-Based Prevention Programming in 2002[7]

Substance	Low Estimate	Medium Estimate	High Estimate
Alcohol Use	57,000	267,000	586,000
Binge Drinking	36,000	169,000	369,000
Marijuana Use	100,000	183,000	359,000
Cocaine Use	103,000	138,000	237,000
Tobacco Use[8]	89,000	205,000	393,000
Regular Smoking	32,000	72,000	139,000

[7]Product of the estimates from Table 4 and ratios from the 2003 YRBS of current to lifetime users by substance, of binge drinkers during the past month to lifetime drinkers, and of youth smoking on at least 20 of the past 30 days to lifetime smokers. Assumes youth would not also be participating in effective family/community-based prevention programs. Includes benefits from youth who actually participated in effective school-based substance abuse prevention programs in 2002.
[8]Tobacco use includes smokeless (chewing) tobacco.

Table 6 translates these results into percentage decreases in substance use by youth ages 13–15 in 2003. All use reported is based on YRBS responses reporting use in the past 30 days. The percentage of youth who use cocaine would decline by 45.8 percent.[9] In percentages, the declines in abuse of other substances are smaller although still substantial. They include a 7.4 percent decline in alcohol use, an 11.5 percent decline in marijuana use, and an 11.8 percent decline in tobacco use. Binge drinking among these youth would drop by 8 percent, and regular smoking would drop by 10.7 percent. These reductions would diminish over time.

Table 6: Number and Percentage of Youth Ages 13–15 Who Were Using and Abusing Alcohol, Marijuana, Cocaine, and Tobacco in 2003, United States, and Reduction Achievable If All Had Participated in Effective Nationwide School-Based Prevention Programming in 2002[10]

Current Behavior	Number of Youth Using	Number Reduced	Percentage Reduction
Alcohol Use	3,603,000	267,000	**7.4**
Binge Drinking	2,104,000	169,000	**8.0**
Marijuana Use	1,591,000	183,000	**11.5**
Cocaine Use	301,000	138,000	**45.8**
Tobacco Use	1,737,000	205,000	**11.8**
Regular Smoking	674,000	72,000	**10.7**

Effective prevention programs would reduce binge drinking by 8 percent, marijuana use by 11.5 percent, cocaine use by 45.8 percent, and regular smoking by 10.7 percent.

4.2. National Cost Savings

The estimates in this report update the analysis of Caulkins and colleagues (2002) with refined program cost estimates and the social cost estimates in Table 4 and Table A5 in the Appendix.

[9]This estimate may be conservative. It excludes any possible multiplier effect from reduced peer pressure to try cocaine associated with a reduction in the number of peers using cocaine or from reduced cocaine availability to youth as a result of a substantial drop in demand.

[10]Number of youth using is the product of the U.S. population ages 12–17 and usage rates reported in the 2003 YRBS of youth ages 14–17. Usage for youth ages 12–13 was inferred from 1996 data from the Health Behaviors of School Children survey.

As shown in Table 7, nationwide school-based prevention program would save an estimated range of costs:

- $2.2 to $22.3 billion in monetary costs related to alcohol
- $7.0 to $30.8 billion in monetary costs related to tobacco
- $40.8 to $197.2 billion for all substances and all costs

Table 7 also shows that the potential national monetary cost savings from implementing effective school-based substance abuse prevention programming in 2002 would total between $14.4 billion and $67.7 billion, with a best estimate (i.e., medium estimate) of $33.5 billion. Of the $33.5 billion, $16.1 billion would result from reduced tobacco use, $10.1 billion from reduced alcohol use, $6.7 billion from reduced cocaine use, and $0.6 billion from reduced marijuana use. Taking the more controversial step of adding the value of the loss in quality of life yields a total cost savings of $98.6 billion.

The impact of substance abuse prevention may extend over a lifetime and is most obvious when prevention fails to deter an individual from substance abuse, and the abuse results in premature death. Substance abuse may last many years and often entails periods of recovery and relapse. Furthermore, the effects of substance abuse may continue well beyond the period of time when an individual is actively abusing substances.

Table 8 breaks down the potential cost savings by cost category. The following cost factors were considered:

- Medical costs
- Other resource costs, ranging from property damage to police, criminal justice, litigation, and insurance administration expenses
- Lost wage and household work
- Value of pain, suffering, and loss in quality of life

Table 7: High, Medium, and Low Estimates of Potential Lifetime Monetary and Total Cost Savings to Society From Implementing Effective Nationwide School-Based Prevention Programming in 2002 for Youth Ages 12–14, by Type of Substance (in billions)[11]

Substance	Low Estimate	Medium Estimate	High Estimate
Monetary Costs			
Alcohol	$2.2	$10.1	$22.3
Marijuana	$0.3	$0.6	$1.0
Cocaine	$4.9	$6.7	$13.6
Tobacco	$7.0	$16.1	$30.8
Total	**$14.4**	**$33.5**	**$67.7**
Overall Costs			
Alcohol	$5.5	$25.9	$57.1
Marijuana	$0.6	$1.0	$1.7
Cocaine	$8.4	$11.5	$23.4
Tobacco	$26.3	$60.1	$115.0
Total	**$40.8**	**$98.6**	**$197.2**

Table 8: High, Medium, and Low Estimates of Potential Total Cost Savings to Society From Implementing Nationwide School-Based Prevention Programming in 2002 for Youth Ages 12–14, by Cost Category (in billions)[12]

Cost Category	Low Estimate	Medium Estimate	High Estimate
Medical	$1.5	$4.0	$8.4
Other Resource	$1.6	$3.3	$6.9
Work Loss	$11.3	$26.2	$52.4
Quality of Life	$26.4	$65.1	$129.5
Total Cost	**$40.8**	**$98.6**	**$197.2**

[11]Assumptions: Cost savings accrue over a multiyear period. Future costs were converted to present value using a 3 percent discount rate. Costs due to youth substance abuse decline at the same rate as the number of initiators. All assumptions in Table 3 apply as well. Estimated substance abuse costs to society were computed with the model described in chapter 5, which is adapted from Caulkins et al. (2002). Savings from existing school-based programs are included in these estimates.

[12]Assumptions: Cost savings accrue over a multiyear period. Future costs were converted to present value using a 3 percent discount rate. Costs due to youth substance abuse decline at the same rate as the number of initiators. All assumptions in Table 3 apply as well. Substance abuse costs to society were computed with the model described in chapter 5, which is adapted from Caulkins et al. (2002).

4.2.1. Cost-Benefit Ratios

To achieve these savings school-based prevention programming would cost an estimated $220 per pupil nationwide. This cost represents the average across the 11 school-based prevention programs analyzed in this section. Knowledge of program costs makes it possible to estimate the cost-benefit measures defined in Section 2.

The return on investment in school-based prevention services would range between $7.40 and $36 per dollar invested, with a medium estimate of $18 (see Table 9). The best estimate equates to a net saving of $3,740 per youth served, including a $74 net savings in medical and other resource costs ($294–$220).

Since expected medical and other resource cost savings exceed program costs, the program would yield net cost savings to society. School-based substance abuse prevention programming that effectively addresses substance abuse appears to be an excellent investment and is likely to pay for itself in resource cost savings alone.

Table 9: High, Medium, and Low Estimates of Savings Per Pupil, Cost-Benefit Ratio, and Net Cost Savings From Implementing Nationwide School-Based Prevention Programming in 2002 for Youth Ages 12–14[13]

Cost Category	Low Estimate	Medium Estimate	High Estimate
a. Total Cost Savings Per Pupil	$1,633	$3,960	$7,926
b. Cost-Benefit Ratio (@$220) per pupil	$7.40:1	$18.00:1	$36.00:1
c. Net Savings (@$220) per pupil	$1,413	$3,740	$7,706

For every dollar spent per pupil, society would save $18.

[13]Costs to State government from NCASA (2001) are summarized in Table 2. State estimates for juvenile justice and education were calculated by multiplying the average percentage reduction in drug and alcohol abuse combined, adjusted downward by 25 percent for loss in effectiveness through replication, by the CASA study's estimated costs to State governments. Local savings on education were computed from State savings using the 0.87 ratio of local to State contributions to elementary and secondary school budgets (U.S. Census Bureau, 2005).

4.2.2. Cost Savings to States

The costs of implementing nationwide school-based substance abuse prevention programming for youth ages 12–14 in 2002 largely would be marginal costs: the costs of diverting teacher and student time from other activities with no increase in teacher salaries or costs for facilities. Nevertheless, at $220 per student, the national cost would be almost $2.8 billion. Of that amount, cost estimates suggest that $670 million ($53 per student) are direct costs with additional out-of-pocket expenses for training and materials. The direct costs come from State and local government coffers. The net impact on State and local government finances is relevant although they generate far larger savings to society (documented in Tables 7 and 8).

This section estimates low, medium, and high estimates of the likely near-term savings (within 2 years) to States and localities from the nationwide program. It builds from NCASA's estimates of the cost of substance abuse to States (see Table 2). Among the costs NCASA examined, the costs associated almost exclusively with youth substance abuse are juvenile justice and education (elementary and secondary).

NCASA's cost estimates represent totals for youth ages 12–17. To estimate the portion that the nationwide program would prevent, this analysis multiplied NCASA's estimates by the number of initiations of alcohol, marijuana, and cocaine use that would be delayed (see Table 4) and divided by the number of youth ages 12–17 using alcohol, marijuana, or cocaine in 2003.[14] Because initiation will be delayed for an average of 2 years, estimates of the annual cost savings were multiplied by 2 to estimate the aggregate savings, discounting the savings in the second year to the present value with a 3 percent discount rate.

Local near-term savings in education expenditures were computed from State savings by applying a ratio of $0.87 in elementary and secondary education funding in 2003 from local government for every dollar provided by State government (U.S. Census Bureau, 2005, Table 1).

Rather than trying to apportion NCASA's State health care spending estimates for alcohol and drug abuse among age groups, this analysis directly estimated the proportion of reductions in medical spending shown in Table 10 that States would pay. To do so, the medical cost savings were multiplied by the percentage of national health care expenditures paid by Medicaid (16 percent), then by the percentage of Medicaid spending paid by the

[14] The computation uses the estimate for ages 13–15 from Table 4 with the number of users age 12 computed comparably to users age 13, and using 2003 YRBS data, the estimated number of users ages 16–17.

States (41.2 percent) (Office of Research, Development and Information, 2004). This estimate includes near-term savings from reduced tobacco use as well as reduced alcohol and drug use.[15]

Some unknown portion of costs in additional cost categories also results from youth substance abuse. For lack of data on the portion of costs associated with youth, the impact of cost on the following was omitted:

- Public safety
- Judiciary
- Child/family assistance (child welfare, income assistance)
- Mental health/developmental disabilities

Table 10 also identifies a portion of near-term savings to State and local governments that can be expected from a nationwide school-based prevention program. State and local government savings in the first 2 years after implementing nationwide school-based substance abuse prevention programming for youth ages 12–14 would exceed the direct additional costs for teacher training and program delivery. Indeed, cost savings to the education system alone appear likely to exceed direct programs costs. The education system would save money by implementing substance abuse prevention programming.

Table 10: High, Medium, and Low Estimates of Potential Near-Term Cost Savings to State and Local Governments From Implementing Effective Nationwide School-Based Substance Abuse Prevention Programming in 2002 for Youth Ages 12–14 (in millions)[16]

Cost Category	Low Estimate	Medium Estimate	High Estimate
Juvenile Justice	$36	$98	$199
Education	$383	$1,038	$2,119
Health Services	$68	$175	$360
Total	**$487**	**$1,310**	**$2,678**

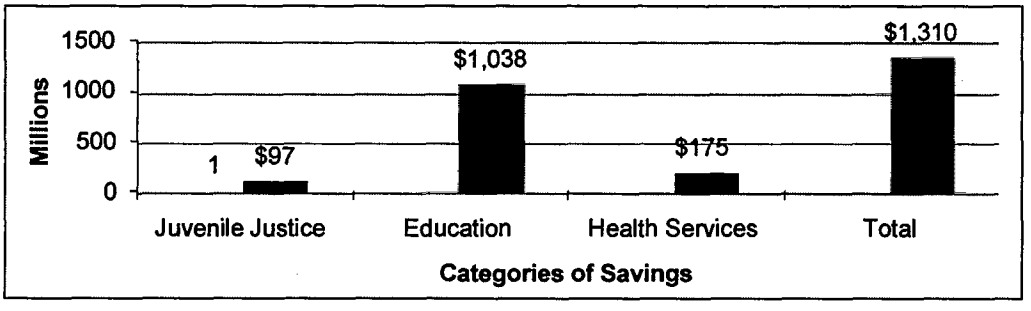
[15]Tobacco use does not affect juvenile justice and education costs.

[16]Costs to State government from NCASA (2001) are summarized in Table 2. State estimates for juvenile justice and education were calculated by multiplying the average percentage reduction in drug and alcohol abuse combined, adjusted downward by 25 percent for loss in effectiveness through replication, by the CASA study's estimated costs to State governments. Local savings on education were computed from State savings using the 0.87 ratio of local to State contributions to elementary and secondary school budgets (U.S. Census Bureau, 2005).

Effective nationwide school-based substance abuse prevention programming would offer State savings within 2 years ranging from:

- $36 million to $199 million in juvenile justice
- $383 million to $2.1 billion in education
- $68 million to $360 million in health services

Figure 2: State Savings Within 2 Years of Implementation of Effective Prevention Programs Using Medium Estimates



While NSDUH reports that nearly 80 percent of students receive some form of alcohol and drug education (SAMHSA, 2004), Flewelling and colleagues (2005) report that schools nationwide were only using evidence-based prevention programs about 20 percent of the time.

5. Cost-Benefit Analyses of Specific Policies and Programs

SAMHSA's continuum of care suggests some overlap in prevention programs (i.e., universal, selected, and indicated).[17] For example, when the Strengthening Families Program prevents a youth from adopting multirisk behavior, it clearly is prevention. Similarly, when Project Northland prevents a youth from ever trying cocaine or delays initiation of cocaine use, it unambiguously prevents illicit substance use. Indicated prevention programs can also work to prevent an increase or expansion of early experimental substance use behaviors. When the topic is preventing the costs of substance abuse, the distinction blurs between programs that prevent binge drinking per se and those that prevent costly adverse consequences attributable to substance abuse (e.g., programs to prevent drinking and driving).

This section provides more detail about the cost-benefit ratios of different types of effective prevention policies and programs. Nine environmental strategies that create laws and policies

[17]Universal preventive interventions are targeted to the general public or a segment of the entire population with an average probability of developing a disorder, risk, or condition. Selected preventive interventions are targeted to specific populations whose risk of a disorder is significantly higher than average, either imminently or over a lifetime. Indicated preventive interventions are targeted to designated individuals who have minimal but detectable signs or symptoms suggesting a disorder or who carry biological markers for a disorder often referred to as high risk.

that limit access are discussed and their cost-benefit ratios listed. The cost-benefit ratios for 10 prevention interventions that integrate family, community, and school efforts to reduce substance abuse are compared, as are 12 programs typically offered by schools. This section also presents cost-benefit ratios estimated for programs that specifically target tobacco use. Table A1 in the appendix includes cost-benefit ratios for 95 effective prevention programs.

5.1. Environmental Interventions

Nine environmental interventions directly target reducing consumption of alcohol or drugs or over-the-limit consumption of alcohol (see Table 11). Most of the proven environmental interventions focus on alcohol consumption, which is responsible for 38 percent of all substance abuse costs (computed from Table 1).

The interventions reduce consumption through various means, including raising price, inducing servers to discontinue service for patrons experiencing intoxication, imposing a driving curfew on youth (along with other provisional driving restrictions), and combining peer pressure with random testing for illicit drugs or for alcohol use in the workplace. Five of these nine interventions offer net cost savings (cost/QALY saved < $0 in Table 11), meaning their costs are less than the medical and other resource cost savings they yield.

The provisional licensing and youth driving curfew measure is likely to affect a range of risky youth behaviors, but only its impact on motor vehicle crashes has been evaluated. A midnight curfew offers a higher return than a 10 p.m. curfew.

Some interventions are well supported; others are quite promising but warrant wider evaluation. Raising alcohol excise taxes to 20 percent of the pretax selling price, having a minimum legal drinking age of 21, and a curfew for novice drivers are already well supported. The highest ratios were for passing and enforcing laws against serving patrons who are intoxicated and training servers to recognize impairment. Although very promising, these interventions need wider evaluation before moving to national implementation.

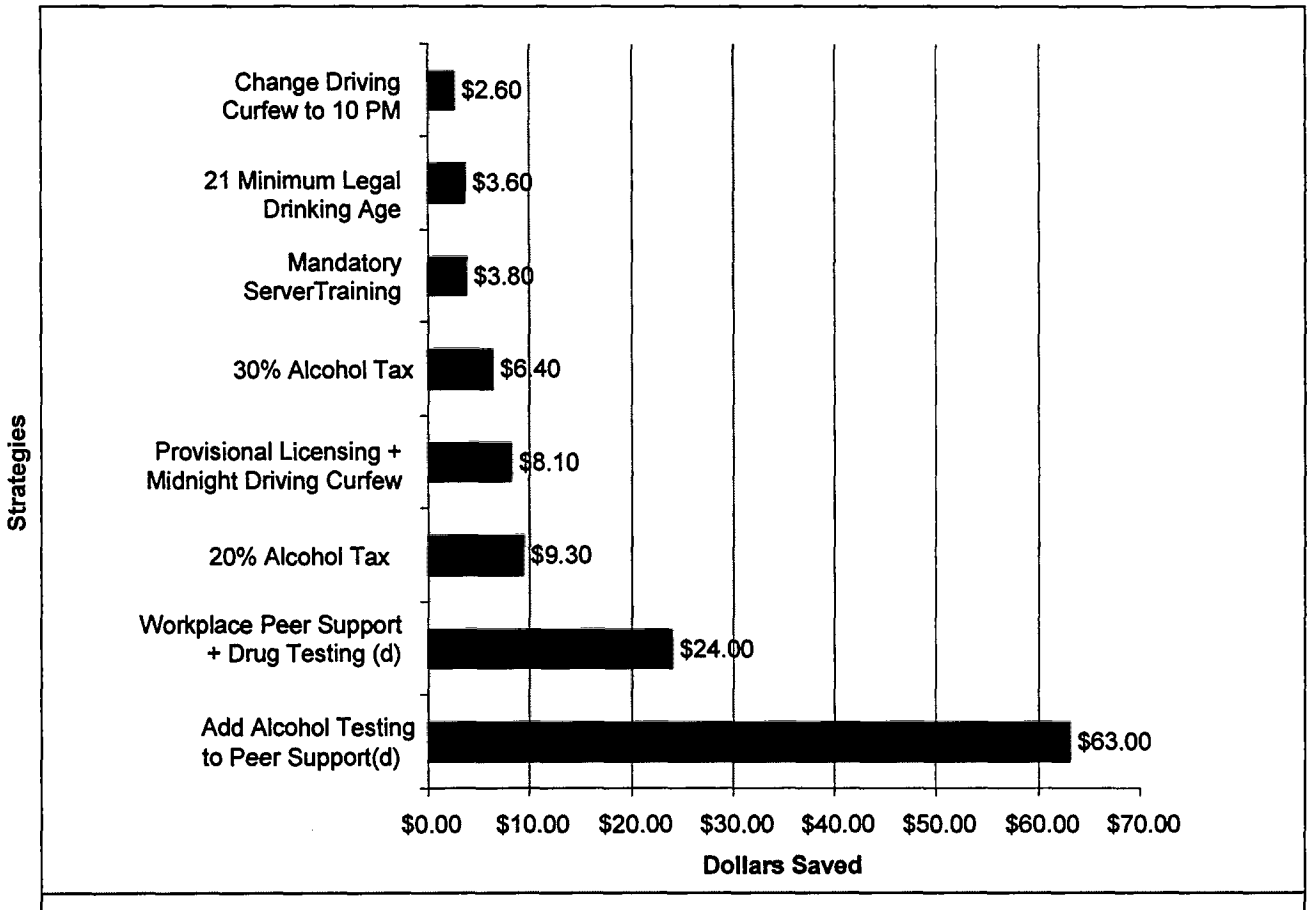
In workplaces where substance abuse is endemic, coupling peer support with a program to change workplace culture, and providing management support for substance abuse rehabilitation and drug and alcohol testing also are quite promising and merit broader evaluation.

Table 11: Cost-Benefit Ratios and Cost/QALY for Nine Environmental Alcohol and Drug Use/Abuse Interventions (in 2002 dollars)

	Unit Cost	Medical	Other Monetary [18]	Quality of Life	Total Benefits [19]	Cost-Benefit Ratio	Cost/ QALY Saved
Environmental Interventions							
20 Percent Alcohol Tax	$9/drinker/ year [20]	$4	$30	$50	$84	9.3:1	<$0
30 Percent Alcohol Tax	$17/drinker/ year	$5	$38	$66	$110	6.4:1	$6,800
21 Minimum Legal Drinking Age	$160/**youth** 18–20	$34	**$190**	**$360**	$590	**3.6:1**	**$18,000**
Mandatory Server Training	$40/driver	**$9**	$56	$95	$160	3.8:1	$16,000
Enforce Serving Intoxicated Patron Law	**$.30/driver**	$3	$10	$13	$25	84:1	**<$0**
Provisional Licensing and Midnight Driving Curfew	**$68/driver**	**$34**	$200	**$320**	$550	**8.1:1**	<$0
Change Driving Curfew to 10 p.m.	$130/driver	**$20**	**$120**	$190	**$330**	2.6:1	$31,000
Workplace Peer Support and Drug Testing[21]	**$61/** employee				$1,500	24:1	<$0
Add Alcohol Testing to Peer Support	$10/ employee				**$628**	63:1	<$0

[18]Monetary costs include direct nonmedical cost savings and indirect work loss savings. Cost/QALY saved = QALYs saved/(intervention cost – direct cost savings).
[19]Numbers do not correspond exactly to prior columns due to rounding. All numbers were computed, and then rounded.
[20]Weimer and Vining (1999) computed cost as the "deadweight loss" or loss in "consumer surplus" as a result of the tax. This loss is the difference between the price of a drink without added taxes and the price with taxes that consumers were not willing to pay because of added taxes. Miller and Levy (2000) divided the annual national cost from Weimer and Vining by the number of drinkers in the United States.
[21]Cost savings from this program were evaluated from the employer's perspective. Social savings would be larger. Source: Miller and Levy, 2000; Miller and Hendrie, 2005; Weimer and Vining, 1999.

Figure 3: Savings Per Dollar Spent From Nationwide Implementation of Environmental Strategies



This bar chart highlight s the savings for every dollar spent on environmental programs

5.2. Youth-, Family-, and School-Based Programs

Youth ages 12–17 who abuse substances constitute approximately 11 percent of people who engage in binge drinking and 15 percent of people involved in illicit drug use in the United States.[22] Table 12 reports the return on 22 youth development programs that integrate school, family, and community efforts to strengthen family and adolescents and reduce the initiation of alcohol, tobacco, and drug use.

The highest estimated returns may be achieved through Adolescent Transitions, Family Mattes, the Good Behavior Game, and Strengthening Families. The Child Development Project; Skills, Opportunities, and Recognition (SOAR, previously the Seattle Social

[22]Estimated with online data from the 2003 YRBS and the 2003 NSDUH.

Development Program); and Social Competence Promotion also may offer solid returns on investment. Conversely, the proven benefits of CASA Start and Project PATHE appear smaller than the costs of these programs, and Across Ages offers a minimal proven return.[23]

Five of the 10 effective school-based substance abuse prevention programs may yield net cost savings to society. The mean return on investment across these interventions is calculated to be $15.3:1, with a range from $3.8:1 to $34:1. To some extent, these results may be influenced by the sample size in existing evaluations, which may keep reductions in substance abuse from achieving statistical significance in some programs.

Family-centered interventions with a school component generally are more costly than school-based life skills training, but they offer larger benefits per youth assisted. The most effective programs strengthen youth bonds to family, school, and community, increasing protective factors while reducing risk factors. These include Adolescent Transitions, Strengthening Families, Guiding Good Choices, Project Northland, and SOAR.

Although family-centered programs achieve more in terms of bonding and protective factors, some narrower life skills programs offer larger returns per dollar invested. With a limited budget, life skills programs allow a school system to reach the most children. However, the same money probably would yield greater benefits per youth assisted if spent targeting the broader family-centered programs and related mentoring to the schools at highest risk.

[23]Miller and Hendrie (2005) followed the model in Spoth et al. (2002) in evaluating the Strengthening Families Program and Preparing for the Drug-Free Years rather than the model used here to evaluate all of the youth substance abuse prevention programs. Spoth's model ignores the likelihood that youth typically are delayed in initiating alcohol use rather than prevented from initiating. Therefore, Miller and Hendrie's cost-benefit estimates were much higher. The estimates here for other youth substance abuse interventions are based on meta-analyses of effectiveness rather than the Caulkins et al. (2002) estimates of effectiveness used by Miller and Hendrie. Some of their intervention cost estimates were refined; therefore, the estimates in this analysis supersede their estimates.

Table 12: Cost-Benefit Ratios and Cost/QALY for 22 School-, Family-, or Community-Based Substance Abuse Prevention Programs (in 2002 dollars)

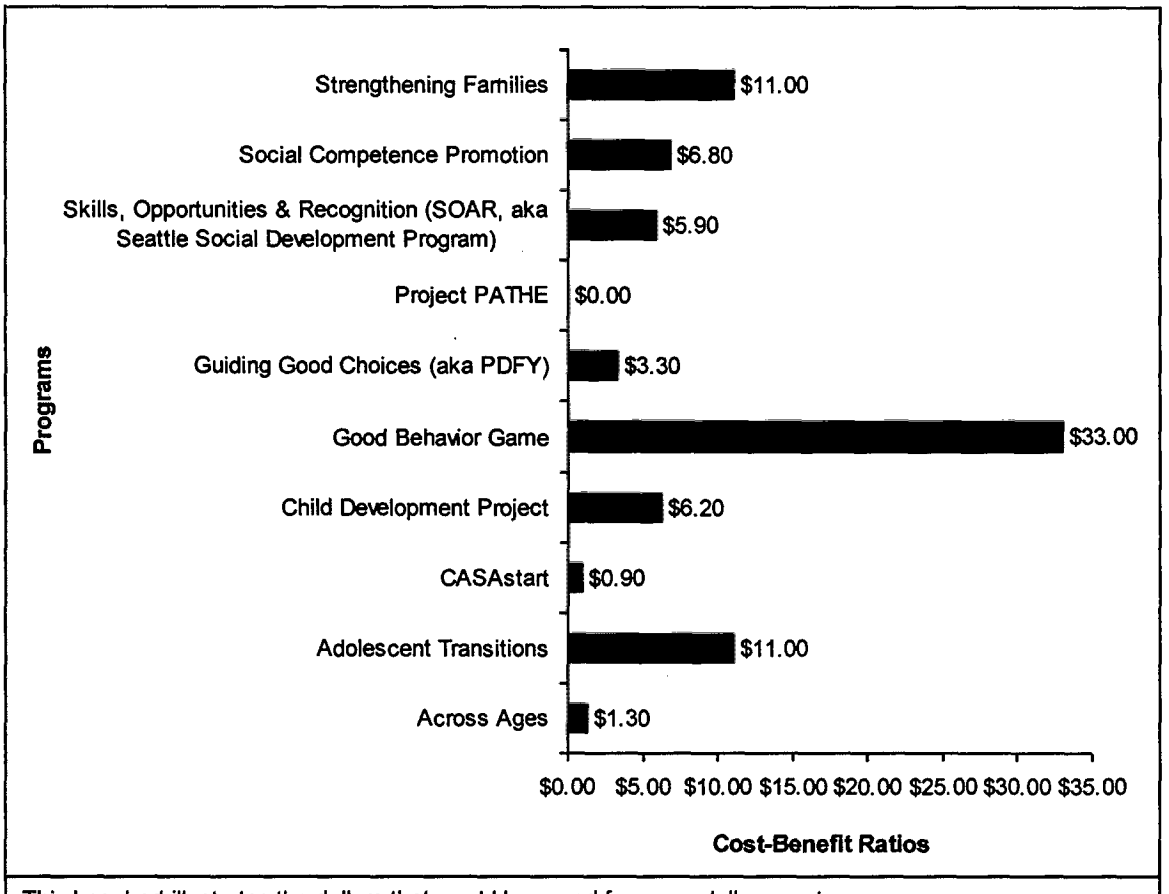
	Unit Cost	Medical	Other Monetary [24]	Quality of Life	Total Benefits [25]	Benefit-Cost Ratio	Cost/ QALY Saved
Youth Development Through Integrated Family or Community and School Programs							
Across Ages	$1,750/pupil	$210	$780	$1,440	$2,400	1.4	$99,000
Adolescent Transitions	$1,200/pupil	$370	$2,570	$6,570	$9,500	7.8	$10,300
CASA Start	$5,650/pupil	$370	$1,710	$2,780	$4,900	0.9	$173,000
Child Development Project	$230/pupil	$120	$550	$790	$1,500	6.3	<$0
Family Matters	$160/Family	$180	$1,280	$3,300	$4,800	30	<$0
Good Behavior Game	$61/pupil	$32	$540	$1,570	$2,100	35	$1,900
Guiding Good Choices (a.k.a. PDFY)	$710/family	$180	$900	$1,370	$2,500	3.4	$15,000
Project PATHE	$800/pupil	$0	$0	$0	$0	0.0	Infinite
Skills, Opportunities and Recognition (SOAR, a.k.a. Seattle Social Development Program)	$3,200/child	$600	$7,600	$11,000	$19,000	5.9	<$0
Social Competence Promotion	$350/pupil	$220	$760	$1,530	$2,500	7.1	$0
Strengthening Families	$880/family	$550	$3,200	$6,100	$10,000	11	<$0
All Stars	$140/pupil	$185	$1,310	$3,310	$4,810	34	<$0
DARE (original program)	$100/pupil	$0	$0	$0	$0	0.0	Infinite
Keepin' It Real	$130/pupil	$230	$1,040	$2,310	$3,600	28	<$0
Life Skills Training	$220/pupil	$110	$1,310	$3,200	$4,600	21	$800
Project Alert	$120/pupil	$52	$360	$290	$700	6.0	<$0

	Unit Cost	Medical	Other Monetary [24]	Quality of Life	Total Benefits [25]	Benefit-Cost Ratio	Cost/ QALY Saved
Youth Development Through Integrated Family or Community and School Programs							
Project Northland	$400/pupil	$250	$1,990	$4,680	$6,900	17	<$0
Project STAR (a.k.a. MPP)	$400/pupil	$160	$1,330	$2,630	$4,100	10	$2,300
Project TND (Toward No Drugs)	$180/pupil	$50	$350	$290	$690	3.8	$12,600
STARS for Families	$120/pupil	$73	$170	$250	$490	4.0	<$0
Other Social Influence/Skills Building	$150/pupil	$63	$490	$1,270	$1,800	12	$4,600
Other Risk and Protective Factors	$400/pupil	$240	$1,950	$4,720	$6,900	17	$40

[24]Monetary costs include direct nonmedical cost savings and indirect work loss savings. Cost/QALY saved = QALYs saved/(intervention cost – direct cost savings).

[25]Numbers do not exactly correspond to prior columns due to rounding. All numbers were computed, and then rounded Source: Original estimates by Miller and Hendrie.

Figure 4: Cost-Benefit Ratios for Youth Development Through Integrated Family or Community and School Programs



This bar chart illustrates the dollars that would be saved for every dollar spent.

5.3. Programs Exclusively Focused on Tobacco

Among current smokers, 7.5 percent are youth ages 12–17.[26] The four prevention programs in Table 13, of which three are school-based, focus on youth tobacco use. The Minnesota Smoking Prevention Program and Know Your Body offer larger returns on investment than Project TNT (Toward No Tobacco) or a youth antismoking media campaign. Although the return on investment in smoking prevention is quite large, much of this return is due to life years that will be saved in the distant future. The cost per QALY saved by some of these programs is higher than for many of the broader substance abuse prevention programs.

Table 13: Cost-Benefit Ratios and Cost/QALY for Four School- or Community-Based Tobacco Use Prevention Programs (in 2002 dollars)

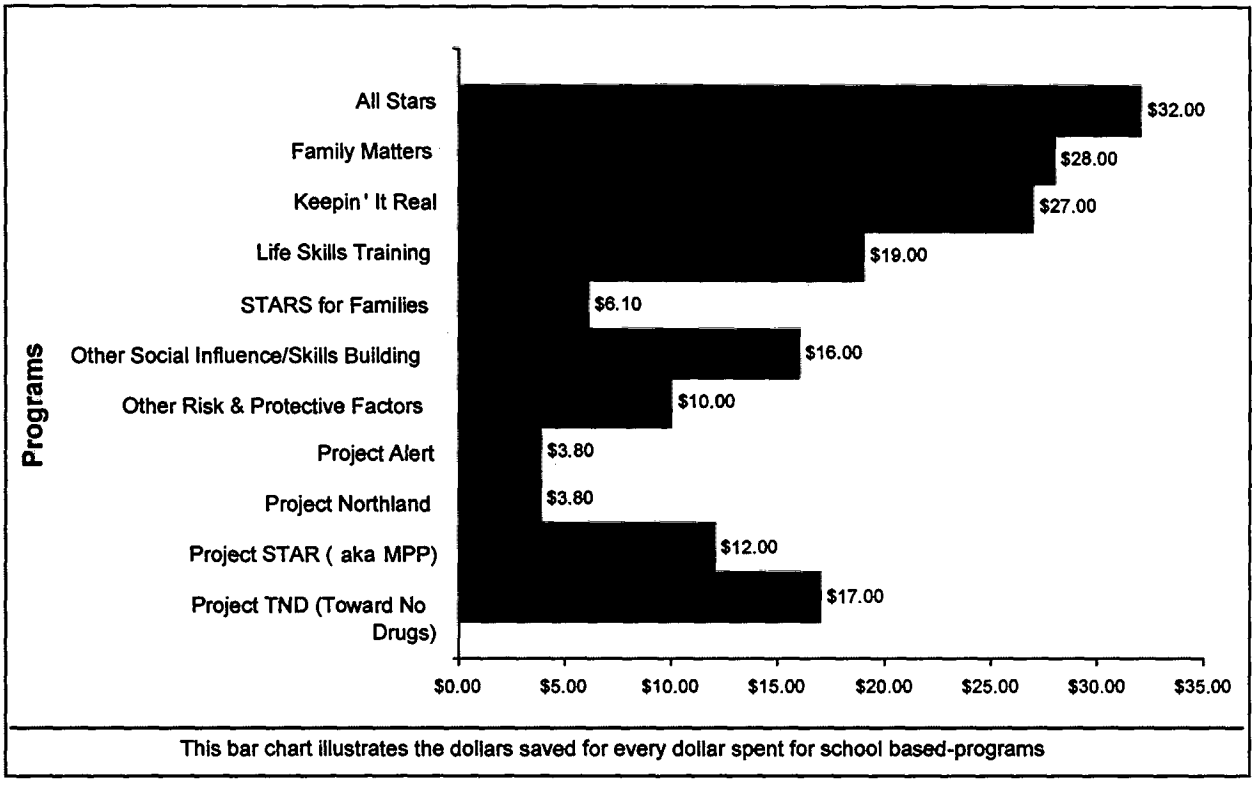
	Unit Cost	Medical	Other Monetary [27]	Quality of Life	Total Benefits [28]	Benefit-Cost Ratio	Cost/ QALY Saved
Youth Tobacco Use Prevention Programs							
Know Your Body	$140/pupil	$90	$1,560	$4,490	$6,100	43	$1,200
MN Smoking Prevention Program	$95/pupil	$83	$1,430	$4,130	$5,600	59	**$300**
Project TNT (Toward No Tobacco)	**$180**/pupil	$43	**$730**	**$2,120**	$2,890	16	$6,600
Youth Antismoking Mass Media Campaign	**$370/pupil**	$57	$980	$2,830	$3,870	**10**	**$11,000**

[26]Estimated with online data from the 2003 YRBS and 2003 NSDUH.

[27]Monetary costs include direct nonmedical cost savings and indirect work loss savings. Cost/QALY saved =QALYs saved/(intervention cost – direct cost savings).

[28]Numbers do not correspond exactly to prior columns due to rounding. All numbers were computed, and then rounded. Source: Original estimates by Miller and Hendrie.

Figure 5. Cost-Benefit Ratios for School-Based Prevention Programs (in 2002 dollars)



6. Policy Implications and Future Directions

As these findings indicate, the costs of substance abuse to society are significant, and cost savings may offset the cost of providing effective prevention. This study's set of cost-benefit analyses will further the prevention field's ability to justify increases in public support for effective prevention funding. This section raises some considerations involved when using cost-savings analyses to structure a prevention package. Directions for future analysis are suggested.

6.1 Prevention Program Packages

Substance abuse has a wide range of adverse consequences. In order to optimally reduce consumption and its adverse consequences, a comprehensive package of prevention programs and strategies is required. No single intervention will reduce the problem so dramatically that no further public action is desirable. Given the number and diversity of proven interventions, optimal resource allocation requires selecting the most complementary, politically feasible, and culturally and demographically appropriate set to maximize a return on investment within the available funding. Of critical concern is to identify a sensible package of interventions that complements existing interventions.

Policymakers selecting substance abuse interventions can apply a series of filters. The estimates in this report provide the first filter: eliminating interventions that offer a questionable return on investment. However, "new and improved" versions of the original DARE program, *Here's Looking At You* (Farley & Associates 2002) and the *Adolescent Substance Abuse Prevention Study* (Sloboda & Hawthorne, 2003) have produced better results and consequently better cost-benefit ratios and should not be dismissed arbitrarily. This financial information should be used as only one of an array of measures in selecting effective programs.

Additional filters that policymakers can use in selecting interventions are political feasibility, local priorities, appropriateness for the target population, cultural sensitivity, affordability, and the immediacy of the impact (weeks versus years). Political feasibility is especially important. A slightly less cost-beneficial program can be superior if the alternative with the higher return has a lower chance of widespread implementation or involves a long delay in implementation. As the subsections that follow describe, all things are not equal when selecting a package that yields the maximum gains at the lowest possible price. Other factors, such as aggregate benefits obtained, overlapping effects, spillover costs and benefits, and government cost can and should weigh into the decision process.

6.1.1. Decisionmaking Based on Aggregate Benefits

When evaluating alternatives in a resource-constrained world, the highest cost-benefit ratio may not always be the best choice. Another program alternative may yield larger benefits, but at a slightly higher cost per unit of safety. Choosing interventions to address a problem

requires weighing the overall impact of the problem and the benefits per dollar invested. For example, zero alcohol tolerance for youth and child safety seat laws has much higher cost-benefit ratios than sobriety checkpoints, regional trauma systems, alcohol taxes, and airbags. But drivers under 21 account for only 18 percent of alcohol-impaired driving deaths in the United States, young child occupants 1 percent, motorcyclists 7 percent, and hardcore recidivists 10 percent. Interventions targeted on these groups leave 64 percent of the problem untouched. Less cost-effective interventions address broader aspects of the problem and can prevent many more impaired driving deaths.

In contrast, Table A1 in the appendix, shows that the largest return on investments in public interventions to reduce impaired driving or its adverse consequences occurs from laws mandating child passenger protection, child bicycle helmet use, and zero alcohol tolerance for drivers below the legal drinking age. In a resource-constrained economy, the greatest reduction in the aggregate might occur from interventions that do not overlap and have high returns—not those with the greatest impact in the aggregate on the problem.

6.1.2. Intervention Overlap

No single intervention has been demonstrated to reduce the problem of alcohol-impaired driving by more than 17 percent. Therefore, a far more important concern than the best single intervention to implement is the best package of interventions to apply. Understanding how interventions overlap is key to selecting that package.

Interventions that largely address different aspects of the problem are good candidates for combined implementation. For example, if one intervention reduces the risk of drivers below the minimum legal drinking age, while a second reduces the risk of hardcore repeat offenders whose licenses previously were revoked due to impaired driving, implementing both together will yield the full benefits that both have to offer. But if provisional licensing with a midnight curfew for new drivers offers an 11 percent reduction in substance-related crashes in this age group, and zero tolerance for alcohol for drivers below the legal minimum drinking age offers a 40 percent reduction, the two interventions combined may offer only a 46.6 percent reduction (40% + 11%) (100% – 40%) among young drivers.

6.2 Future Directions

Clearly, the ability to conduct cost-outcome analyses of substance abuse prevention efforts has improved. Although this report evaluated a wide range of interventions, it was challenging because of the difficulties in determining program costs. It was often unclear how many youth would be targeted, and estimates of some costs were not readily available (methamphetamine use, club drug use, and college drinking). These difficulties prevented an accurate analysis of the return on investment in programs targeting those behaviors. In the future, evaluative research priorities may include (1) tracking long-term outcomes beyond a 2-year period, (2) examining the impact of delaying initiation on the seriousness and consequences of future use, (3) performing replications to refine estimates of effectiveness from youth interventions that presently have been evaluated with only a single randomized

controlled trial, and (4) developing, implementing, and reporting on interventions that drive costs.

7. Conclusion

If effective prevention programs were implemented nationwide, substance abuse initiation would decline for 1.5 million youth and be delayed for 2 years on average. In 2003, an estimated:

- 8 percent fewer youth ages 13–15 would not have engaged in binge drinking
- 11.5 percent fewer youth would not have used marijuana
- 45.8 percent fewer youth would not have used cocaine
- 10.7 percent fewer youth would not have smoked regularly

The average effective school-based program costs $220 per pupil. It would save an estimated $18 per $1 invested if implemented nationwide. Nationwide school-based effective programming in 2002 would have had the following fiscal impact:

- Saved State and local governments $1.3 billion, including $1.05 billion in educational costs during 2003 and 2004
- Reduced social costs of substance-abuse–related medical care, other resources, and lost productivity over a lifetime by an estimated $33.5 billion
- Preserved the quality of life over a lifetime valued at $65 billion

These cost-benefit estimates show that effective school-based programs pay for themselves and more. For every dollar spent on these programs, an average of $18 dollars per student would be saved over their lifetime.

Among 10 effective school-based life skills programs, the average return on investment exceeded $15 to 1. That is, every dollar spent on these programs returned an average of $15 dollars per student. The probable costs and cost savings involved in implementing a composite of these programs for middle school youth ages 12–14 nationwide were estimated. The average program would delay more than a million initiations of alcohol, cocaine, marijuana, or tobacco use by youth for an average of 2 years. Its cost would be $220 per pupil.[29]

The out-of-pocket expenses would be repaid by savings to the education system alone in less than 2 years. The program would offer additional savings to State and local governments by reducing spending on Medicaid, police, and other criminal justice services. School-based

[29] Added expenses for program materials and teacher training would average $53 per pupil with the value of teacher time diverted from other instruction accounting for the remaining cost.

programs that offer a particularly large return on investment include All Stars, Family Matters, Keepin' It Real, Life Skills Training, and Project Northland. Although Project TND and STARS for Families yielded lesser returns than competing NREPP programs, they still yielded $4 in savings per $1 invested.

Programs designed to strengthen families generally cost more than the school-based life skills programs. Several of them also were highly cost-beneficial and offered much larger returns in the aggregate per youth served than the school-based life skills programs.

In a program targeting families with low income, intensive home visitation, coupled with preschool enrichment, reduced infant/toddler abuse (Aos et al., 1999; Karoly et al., 1998). As these toddlers reach adolescence and adulthood, visitation programs also can reduce a range of problems including substance abuse and violence. However, the net returns are often realized in the long term (for actual longitudinal cost-benefit results see Karoly, et al., 1998; Schweinhart, et al., 1993).

The proven interventions often cover different aspects of the problem (such as youth drug use initiation, impaired driving, and violence), which make a complementary set of interventions more beneficial. Several interventions are best directed toward different aspects of the problem. If they are massed against the same aspect, the size of that aspect will shrink, and the return on added interventions will decline below the levels shown in this study.

Taken as a whole, the benefits of substance abuse prevention well outweigh the costs of providing that service. Cost-benefit ratios can guide the selection of an optimal intervention package within the available resources. Political feasibility, cultural and demographic differences, and local priorities also must be considered.

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9. Appendix: Methods

This section explains how published benefit-cost ratios estimates were adjusted for 86 youth development or youth substance abuse prevention programs and related strategies (see Table A1). Program costs for the youth programs occasionally came from the literature, but for this report, they were usually modeled largely from educational statistics and CSAP summaries of costs for training and materials and teacher time requirements (Western Center for the Application of Prevention Technologies [Western CAPT], 2005), or similar summaries from Maryland Blueprints (Maryland Governor's Office of Crime Control and Prevention [MD GOCCP], 2005). Estimates of program effectiveness were derived from three meta-analyses (Aos et al., 2004; Hansen et al., 2004; Hopkins et al., 2001). Table A2 lists the estimates used and their sources.

All individually targeted substance abuse prevention programs with available estimates of effectiveness in Aos and colleagues' 2004 study were analyzed, as were the subset from Hansen and associates' 2004 study. The estimates applied a modified version of the benefits valuation model in Caulkins et al. (2002) as refined by Miller and Hendrie (2005). It further adjusted the model for consistency with the methods used in the existing cost-savings analyses and used effect sizes from the meta-analysis as inputs in place of the estimates of effectiveness in percentages used by Caulkins and colleagues (2002). The remainder of this appendix lists the major assumptions and discusses the cost-benefit estimation processes.

9.1 Assumptions

This report made the following assumptions:

- Estimates of effectiveness from Table 4 apply to U.S. youth ages 12–14 (9.483 million).
- The impact was reduced by 25 percent to account for reduced intervention effectiveness as one scales up from controlled demonstrations to full field implementation (Aos et al., 1999; Greenwood et al., 1996; Miller & Levy, 2000).
- Youth would not be participating in effective family/community-based prevention programs.
- Benefits apply to youth who actually participated in effective school-based substance abuse prevention programs in 2002.
- Costs or benefits were determined by estimates from Table 4, and ratios from the 2003 YRBS of (1) current to lifetime users by substance, (2) binge drinkers during the past month to lifetime drinkers, and (3) youth smoking on at least 20 of the past 30 days to lifetime.
- Substance abuse costs decline in proportion to delays in initiation as a result of prevention programming.

- Total costs equal the monetary costs plus the value of pain, suffering, and loss in quality of life. Estimates are the product of the costs in Table 1 and the percentages in Table 3.
- Benefits accrue over a multiyear period, and future costs can be converted to present value using a 3 percent discount rate.
- Costs from substance abuse among youth decline at the same rate as the number of those who initiate abuse.
- Savings from existing school-based programs are included in these estimates.

9.2 Cost Estimation

Program costs include materials costs, training costs, and labor costs to deliver the intervention. Because costs rarely are fully documented, estimating them was the most difficult analytic step. Moreover, some estimates are approximations of the order of magnitude.

Training costs are included to comply with accepted cost-outcome analysis guidelines (Gold et al., 1996; Haddix et al., 2003). Without teacher training, school-based prevention programming cannot be delivered with fidelity and is unlikely to be fully effective. Many prevention programs will not sell their materials to schools unless their teachers have been trained in the proper use of the materials. Therefore, training costs (including travel to training) are an essential element of the costs of prevention programs.

Where studies of all three cost components (materials, training, and labor) existed, their estimates were used. Estimates for three programs (CASA Start, Family Matters, and DARE), came from Aos et al. (2004). Spoth et al. (2002) provided detailed cost studies for Strengthening Families and Guiding Good Decisions, the two that were more comprehensive.

The mean cost of $800/pupil from these two programs was applied to two other programs, which are broad in scope (school, community, and often media components): Adolescent Transitions and Project PATHE. This report used the mean cost of Project Northland and Project STAR for a generic risk and protective factors program and the mean cost from the six skills-building programs for a generic skills-building program. Cost estimates were inflated to 2002 dollars using the Consumer Price Index (CPI).

The remaining 12 interventions are school-based, and their estimates were based on materials costs from the Western CAPT Web site (Western CAPT, 2005) when available, from Maryland Blueprints (MD GOCCP, 2005), or from Aos et al. (2004). Where materials costs were given per teacher, costs per pupil were computed by dividing by class size (see Table A3, item 9). For example, materials for Project Toward No Drugs cost $10/pupil for student workbooks, plus $105 for class-level materials that serve an average of 23.6 high school students (National Center for Education Statistics [NCES], 2003), adding $4.45 per student ($105/23.6) to the materials cost.

To estimate labor and training costs, the value of teacher time was computed. Table A4 shows the calculations, which are built primarily from NCES data. Instruction hours by program came from the Western CAPT Web site, supplemented as needed with Internet searches of the Maryland Blueprints Web site (MD GOCCP, 2005), and individual program Web sites. Labor costs beyond the first year of the program were discounted to the present value with the 3 percent discount rate recommended by the Panel on Cost-Effectiveness in Health and Medicine (Gold et al., 1996).

Training costs were estimated from the training cost and time information on the Western CAPT (2005) and Maryland Blueprint Web sites (MD GOCCP, 2005), plus teacher cost estimates. This report assumed that travel to training sessions cost an average of $500, including airfare and airport transfers; per diem was $150 per day. For example, 1-day teacher training on All Stars would cost the following: (1) $250 registration fee, (2) $500 travel, (3) $150 per diem, and (4) one day of trainee time at $650 per day. These costs are spread over 23.6 students, yielding an estimated training cost of $65 per pupil ($1,550/23.6).

When program developers trained a trainer, who in turn trained other teachers, this report assumed that the local trainer would train 12 teachers in a 1-day session. These estimates are higher than would be incurred if trainers traveled to be with teachers. Table A4 summarizes the estimates per pupil of trainer fees and travel costs for training, materials costs, and teacher salaries including fringe benefits and overhead (for training and separately for preparation and classroom delivery.)

Table A1: Reviewed Studies, Intervention Descriptions, Recomputations, and Quality Ratings[30]

Authors, Year Published	Description	Recomputed Cost Savings	Other Mod	Demo Adj	Rating
Substance Use/Abuse Interventions					
Environmental Interventions					
Miller and Levy, 2000	Alcohol tax of 20% of the pretax retail price	Yes	No	No	C
Miller and Levy, 2000	Alcohol tax of 30% of the pretax retail price	Yes	No	No	C
Miller, 2001	21 minimum legal drinking age	No	No	No	A
Miller, 2001	Mandatory server training to recognize intoxication, cut-off service	No	Yes	Yes	C
Miller and Levy, 2000	Enforcing laws against serving intoxicated patrons of bars and restaurants (SIP laws)	No	No	Yes	B

[30]Table A1 displays the sources for the 35 cost-savings estimates and briefly describes the 35 interventions. Most of the estimates come from Aos et al. (1999), Miller and Levy (2000), and Miller and Hendrie (2005). The columns provide the following information. "Authors, Year Published" provide a brief citation for each analysis. (Full citations are available in the reference list.) "Description" briefly states the nature of each intervention analyzed, often providing a more detailed explanation that appears in subsequent tables that summarize the cost-savings estimates. "Recomputed Cost Savings" indicate whether the authors, Miller and Levy (2000) or Miller and Hendrie (2005) replaced the cost saving with uniformly computed benefits estimates. "Other Mod." indicates whether the authors Miller and Levy (2000) or Miller and Hendrie (2005) made other modifications in the cost-benefit computation besides substituting uniform benefit estimates (e.g., recomputing program costs to capture omitted elements like teacher time, switching discount rates or values of travel time to uniform values, or updating injury incidence rates). "Demo Adj." indicates whether the estimate of effectiveness for the intervention came from an intervention in the demonstration stage of development. In Aos et al. (1999, 2004), Miller and Levy (2000), and Caulkins et al. (2002), the estimates of effectiveness were arbitrarily adjusted downward for all demonstrations because some effectiveness would probably be lost in replication/scale-up. The percentage reduction applied was 25 percent. "Rating" provides a judgmental estimate of general study quality. This rating came from Miller and Levy (2000) for studies it included. It primarily focuses on the strength of the estimate of effectiveness. "A" ratings were assigned to randomized controlled trials without serious attrition problems and to interventions that were implemented at a large scale and evaluated with cross-sectional time series or other designs that included a credible comparison group. Rating levels declined as the quality of the evidence of effectiveness declined, based largely on the design hierarchy and review criteria in Zaza et al. (2000). Ratings also were reduced when benefit valuations were hampered by lack of quality data.

Miller and Levy, 2000	Provisional licensing of new, typically young drivers with a midnight curfew until 6 months of driving without crash or violation	No	Yes	No	B
Miller and Levy, 2000	Change youth driving curfew from midnight to 10 p.m. until 6 months driving without crash or violation	No	Yes	No	B
Miller et al., 2005, under review	Workplace peer support and drug testing	No	No	Yes	C
Miller et al., 2005, under review	Add alcohol testing to peer support	No	No	Yes	C
Youth Development Through Integrated Family or Community and School Programs					
Hansen et al., 2004, effectiveness	Across Ages, strengthen adult and youth bonds through mentoring, community service, family activities, ages 9–13	Original est.		Yes	A
Aos et al., 2004, effectiveness	Adolescent Transitions, parenting skills combined with universal, indicated, and selective prevention, middle and high school	Original est.		Yes	A
Aos et al., 2004, effectiveness	CASA Start, case management, after-school, and law enforcement efforts selectively targeting multirisk youth ages 8–13	Original est.		Yes	B+
Aos et al., 2004, effectiveness	Child Development Project, build sense of school community, grades 3–6	Original est.		Yes	C
Aos et al., 2004, effectiveness	Good Behavior Game, classroom management strategy to reduce aggression/disruption, grades 1–3	Original est.		Yes	B
Spoth et al., 2002	Guiding Good Choices, parent-child behavioral training, ages 12–13, aka, Preparing for the Drug-Free Years	Yes	Yes	Yes	A

Aos et al., 2004, effectiveness	Project PATHE (Positive Action Thru Holistic Education), secondary school organizational change	Original est.	Yes	Yes	B
Aos et al., 1999	Skills, Opportunities and Recognition (SOAR a.k.a. Seattle Social Development Program), parent/teacher social development training to promote bonding, ages 6–11, in high crime areas	Original est.		Yes	B-
Hansen et al., 2004, effectiveness	Social Competence Promotion, grades 5–7	Original est.		Yes	C
Spoth et al., 2002	Strengthening Families Program, parent-child behavioral training, ages 12–13	Yes	Yes	Yes	A
School-Based Life Skills					
Hansen et al., 2004 effectiveness, original est.	All Stars, middle school, ages 11–14	Original est.		Yes	B-
Ennett et al., 1994 effectiveness; Aos et al., 2004, cost	Drug Abuse Resistance Education (DARE), police speakers at school assemblies	Original est.		No	A
Aos et al., 2004, effectiveness	Family Matters, family-focused tobacco and alcohol, ages 12–14	Original est.		Yes	B
Hansen et al., 2004 effectiveness, original est.	Keepin' It Real, video-enhanced, culturally grounded, 2-year communications and life skills program, ages 10–17	Original est.		Yes	C
Hansen et al., 2004 effectiveness, original est.	Life Skills Training, 3-year program, ages 13–16	Yes	Yes	Yes	A
Aos et al., 2004, effectiveness	Project Alert (Adolescent Learning Experiences in Resistance Training), school-based life skills, alcohol and drug 2-year program, ages 13–15	Yes	Yes	Yes	C

Aos et al., 2004, effectiveness	Project Northland, school-based child-parent training, 3-year program, ages 12–15	Yes	Yes	Yes	B
Aos et al., 2004, effectiveness	Project STAR, school/family/community/ media, 2-year program, ages 12–15, a.k.a. Midwest Prevention Project	Yes	Yes	Yes	B
Aos et al., 2004, effectiveness	Project TND (Toward No Drugs), high school	Original est.		Yes	B
Aos et al., 2004, effectiveness	STARS for Families (Start Taking Alcohol Risks Seriously), health promotion by nurses, 2-year program, middle school	Original est.		Yes	B
Aos et al., 2004, effectiveness	Other social influence/skills building	Original est.		Yes	B
Aos et al., 2004, effectiveness	Other risk and protective factors	Original est.		Yes	B
Youth Tobacco Use Prevention Programs					
Aos et al., 2004, effectiveness	Know Your Body, smoking prevention program, grades K–6	Original est.		Yes	C
Aos et al., 2004, effectiveness	Minnesota Smoking Prevention Program, grades 4–8	Original est.		Yes	C
Aos et al., 2004, effectiveness	Project TNT (Toward No Tobacco), 2-year program, middle school	Original est.		Yes	C
Hopkins et al., 2001	Mass media campaign to reduce youth smoking initiation	Yes	No	No	A-

9.3 Benefits Estimation

Caulkins and colleagues (2002) developed a model for estimating the benefits of reduced youth initiation of alcohol, tobacco, marijuana, and drug use. Miller and Hendrie's (2005) modifications were as follows:

1. Drop Caulkins' social and market multipliers for cocaine to be conservative because Caulkins indicated the empirical basis for these estimates was "very uncertain" and might be close to 1.0.

2. Shift from a 40-percent reduction in effectiveness for demonstrations to the 25 percent reduction used throughout the estimates by Aos et al. (1999), Greenwood et al. (1996), and Miller and Levy (2000). Without this shift, the estimates could not have been compared with those for other interventions.

3. Add quality-of-life costs to comply with the mandate in OMB (2003) and the guidelines in Mishan (1988) and French et al. (1996), among many others. Distribute the economic costs into cost categories using the cost distributions by problem in Table A5, so the costs could be displayed in the same format as the other cost-savings analyses.

4. Inflate to 2002 dollars using the CPI, all items, medical spending per capita, and the Employment Cost Index – Total Compensation as price adjusters. For consistency with the rest of the cost-savings estimates, a causation/correlation multiplier of 0.9 was dropped as used by Caulkins et al., (2002). The procedures for estimating effectiveness from the meta-analyses also dictated removing another multiplier from the Caulkins et al. (2002) model: the percentage of the population using each substance. This factor was accounted for in the estimates of effectiveness that were derived.

A chain of computations was used to estimate the absolute percentage reduction in substance abuse from the meta-analysis data (see Table A6). The meta-analyses that supplied estimates of effectiveness show the effect size, which was converted to another common meta-analysis measure, the binomial effect size display (BESD), which shows the correlation between substance abuse outcomes and membership in the treatment versus the control group (Rosenthal & DiMatteo, 2001).

Following Lipsey and Derzon (1998), and Derzon and Lipsey (1999), BESD was used to construct a two-by-two contingency table based on the assumption that the treatment and control groups were of equal size. This computation used data from Caulkins et al. (2002) on the percentage of youth who would abuse the substance of relevance absent intervention. Finally, a formula from Falk and Well (1997) was applied to extract the percentage of all program participants who would reduce their substance abuse or forego initiation because of the program.

Two interventions, Guiding Good Choices and CASA Start, reduced violence as well as substance abuse. To value the reductions in crime, the cost of a youth's violent crime career was used. This cost was determined by multiplying the percentage reduction in violence by the probability a youth exposed to the program would become a violent criminal, and a factor of 17 percent to account for the likelihood that most potentially violent youth would experience a delay in becoming violent but eventually would do so. (The latter factor is used in Caulkins et al. [1999, 2002], and the choice of 17 percent was typical of the range of values that Caulkins derives.)

Guiding Good Choices is a universal program, so the exposure probability can be computed as 560,359 youth ages 12–20 committing violent crimes in 1999 (spreadsheets supporting

Biglan et al., 2004), divided by 35.26 million U.S. youth ages 12–20 (U.S. Census Bureau, 2002). CASA Start is an indicated program targeted to multirisk youth. For this program, the probability is determined by dividing 560,359 by 35.26 million youth multiplied by 44.1 percent multirisk (Miller & Taylor, 2005).

Table A2: Percentage of Participants Delaying Initiation or Reducing Alcohol, Marijuana, Cocaine, and Tobacco Use and a Meta-Analytic Estimate of the Source of Effectiveness for School and Family/Community-Based Prevention Programs[31]

Program	Alcohol	Marijuana	Drugs	Tobacco	Source
Youth Development Programs					
Across Ages	9.9%	-12.9%	1.9%		Hansen et al., 2004
Adolescent Transitions	14.4%			12.0%	Aos et al., 2004
CASA Start		12.4%	8.6%		Aos et al., 2004
Child Development Project	4.5%	4.1%	3.1%	0.0%	Aos et al., 2004
Family Matters	6.9%			6.1%	Aos et al., 2004
Good Behavior Game				4.9%	Aos et al., 2004
Guiding Good Choices	8.2%	8.9%	0.0%	0.0%	Aos et al., 2004; Hansen et al., 2004
Project PATHE		-5.3%			Aos et al., 2004
Skills, Opportunities, and Recognition (SOAR)	8.4%	2.4%		0.4%	Aos et al., 2004
Social Competence Promotion	11.3%				Hansen et al., 2004
Strengthening Families	18.0%	15.4%	10.3%	7.3%	Aos et al., 2004

[31] All effects shown are significant at the 90 percent confidence level or greater. Negative numbers mean that intervention participants increased use or demonstrated more substance use than those in the comparison group. Blank cells indicate no significant effect at the 90 percent confidence level, or that the impact of the intervention on this outcome was not tested, in which case the analysis assumed it had no effect. Guiding Good Choices and SOAR also reduce violence. SOAR improves school outcomes.

Program	Alcohol	Marijuana	Drugs	Tobacco	Source
Youth Substance Abuse Prevention Programs					
All Stars	7.0%	6.4%	0.0%	6.0%	Hansen et al., 2004
DARE	0.0%	0.0%	0.0%	0.0%	Aos et al., 2004
Keepin' It Real	10.9%	4.9%		2.1%	Hansen et al., 2004
Life Skills Training	1.0%	3.4%	2.7%	7.4%	Hansen et al., 2004; Aos et al., 2004
Project Alert	0.0%	3.6%	3.7%	0.0%	Aos et al., 2004
Project Northland	6.9%	6.6%	3.3%	9.0%	Aos et al., 2004
Project STAR	2.9%	7.1%	5.2%	4.8%	Aos et al., 2004
Project Toward No Drugs	0.0%	0.0%	3.9%	0.0%	Aos et al., 2004
STARS for Families	8.3%				Aos et al., 2004
Other Social Influence/Skills Building	2.5%	1.9%	0.0%	2.7%	Aos et al., 2004
Other Risk and Protective Factors	7.1%	3.4%	2.3%	9.3%	Aos et al., 2004
Youth Tobacco Use Prevention Programs					
Know Your Body	N/A	N/A	N/A	13.9%	Aos et al., 2004
MN Smoking Prevention Program	N/A	N/A	N/A	10.7%	Aos et al., 2004
Project Toward No Tobacco	N/A	N/A	N/A	5.5%	Aos et al., 2004
Youth Antismoking Mass Media Campaign	N/A	N/A	N/A	5.5%	Hopkins et al., 2001

Table A3: Teacher Cost Estimates and Their Sources

Factor	Primary (grades 1–6)	Secondary (grades 7–12)	Source
1. Annual teacher salary (in 2001 dollars)	$44,604	$44,604	NCES, 2003
2. Instruction days/year	180	180	Tomlinson, 2004
3. Salary/instruction day	$247.80	$247.80	Computed item 1/item 2
4. Ratio of salary plus fringe benefits to salary	1.2494	1.2494	NCES, 2003
5. Ratio of total school spending to instructional salary and fringe benefits	2.0528	2.0528	NCES, 2003
6. Loaded salary per instruction day	$635.55	$635.55	Computed item 3[32], item 4[33], item 5
7. Price adjuster to 2002 from 2001	1.0228	1.0228	Employment Cost Index, Total Compensation
8. Loaded salary per instruction day (in 2002 dollars)	$650.03	$650.03	Computed item 6[34], item 7
9. Pupils/class	21.1	23.6	NCES, 2003
10. Cost per pupil day	$30.81	$27.54	Computed item 8/item 9
11. Instruction hours/day	5.5	5.5	Mode of several State Web sites
12. Cost per pupil hour	$5.60	$5.01	Computed item 10/item 11

[32]Assumes that average teacher salaries and overheads are the same for primary and secondary schools.
[33]Assumes that average teacher salaries and overheads are the same for primary and secondary schools.
[34]Assumes that average teacher salaries and overheads are the same for primary and secondary schools.

Table A4: Estimated Program Costs by Component (in 2002 dollars)

Program	Trainer and Travel for Training	Materials	Teacher Time for Training	Teacher Time for Delivery	Total
Youth Development Programs					
Adolescent Transitions	$83	$12	$83	$1,038	$1,216
Child Development Project	$24	$16	$124	$67	$231
Good Behavior Game	$34	$0	$28	$0	$62
Social Competence Promotion	$0	$4	$124	$226	$354
Average	**$35**	**$8**	**$90**	**$333**	**$466**
Youth Substance Abuse Prevention Programs					
All Stars	$38	$5	$28	$70	$141
Keepin' It Real	$14	$5	$55	$55	$129
Life Skills Training	$36	$13	$28	$147	$224
Project Alert	$34	$0	$28	$55	$117
Project Northland	$51	$32	$83	$234	$400
Project Toward No Drugs (TND)	$78	$14	$28	$61	$181
STARS for Families	$36	$9	$0	$77	$122
Average	**$41**	**$11**	**$36**	**$100**	**$188**
Youth Tobacco Use Prevention Programs					
Know Your Body (Smoking)	$3	$0	$68	$72	$143
MN Smoking Prevention Program	$9	$1	$55	$30	$95
Project Toward No Tobacco (TNT)	$78	$14	$28	$60	$180
Average	**$30**	**$5**	**$50**	**$54**	**$139**

TABLE A5. Updated Estimates of the Societal Costs of Alcohol and Illicit Drug Abuse That Include Lost Quality of Life and Costs to Victims, United States, 2000 (in millions of 2002 dollars)[35,36]

	Medical	Other Resource	Work	Quality of Life	Total	Medical	Other Resource	Work	Quality of Life	Total
Violent Crime	3,396	13,126	13,757	67,664	97,943	885	4,740	11,674	20,260	37,559
Property Crime	3	1,384	2,998	62	4,437	32	10,872	3,760	413	15,077
Public Order/Supply	-	1,219	133	-	1,352	-	16,266	22,880	-	39,146
Impaired Driving	6,354	15,195	24,845	54,464	100,858	-	-	-	-	-
Other Injury	12,514	1,528	18,815	124,605	157,462	-	-	-	-	-
Illness & Poisoning	26,589	504	79,208	100,392	225,288	15,709	252	44,902	74,232	135,095
Total	48,856	32,956	139,746	347,187	568,745	16,626	32,130	83,216	94,905	226,877

[35]Assumptions: Excludes $9.9 billion in earnings lost to incarceration for alcohol-attributable crime and $58.6 billion in earnings lost to incarceration and criminal careers for drug-attributable crime. Estimates of these omitted costs are from Exhibit 2. Unlike in Exhibit 2, work includes the value of lost housework. The value of lost housework came from Haddix et al., (2003). It is based on a survey of how much time people spend on different household tasks (by age group and sex) and wage rates from those tasks from the U.S. Department of Labor. Future costs are discounted to present value using a 3% discount rate.

[36]Source: Miller and Hendrie (2005), with illness and poisoning costs from Harwood (2000). Uses Bury-Maynard's (1999) survey-based estimates that average quality of life loss for alcohol abusers is 23.4% and for drug abusers is 30.5%. Kraemer et al., (2005) obtains a consistent survey-based estimate that the quality of life loss for an alcohol abuser relative to a non-drinker averages 18%-25%, while Murray and Lopez (1996) synthesize an 18% estimate.

Table A6: Factors That Are Multiplied Together To Calculate the Social Benefit From Reduction in Substance Use Over a Lifetime[37]

Factor	Source
Lifetime Substance Use Per Person in the Absence of Prevention	
1. Use per initiate in the absence of prevention	Caulkins et al., 2002
2. Proportion of cohort who would initiate in the absence of prevention	Caulkins et al., 2002
3. Discount factor (at 3%)	Caulkins et al., 2002
Percentage Reduction in Lifetime Use Expected From Prevention	
4. Percentage reduction in initiation observed at the end of the prevention program	Computed from meta-analyses and factor 2
5. Percentage reduction in lifetime use per unit reduction in initiation at the end of the prevention program	Caulkins et al., 2002
Adjustments to Reduction in Use	
6. Scale-up qualifier	75% (25% reduction)
Social Cost Per Unit of Use	
7. Social cost per unit of use	Social costs from Tables 3 and 11 divided by units of use from Caulkins et al., 2002

[37]Source: Adopted from Caulkins et al., 2002.

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