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School-Based Drug Prevention and Other Strategies For Reducing Drug Use

SUSAN M. PADDOCK

CT-237

March 2005

Testimony presented to the Oregon State Senate and House Judiciary
Committees on March 17, 2005

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Published 2005 by the RAND Corporation
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DRUG POLICY RESEARCH CENTER

School-Based Drug Prevention and Other Strategies For Reducing Drug Use

Statement of Susan M. Paddock, Ph.D.¹

The RAND Corporation

Before the Judiciary Committee

Oregon Senate and House

March 17, 2005

DPRC

Thank you for inviting me here today to share with you the results of a study I conducted with several other RAND researchers on the cost-benefit of school-based drug prevention programs. I was asked to present the results of our study, since there is concern in Oregon about methamphetamine use among adolescents and that alcohol use among adolescents is associated with methamphetamine use. Following my presentation of the results of our study, I will mention some other findings from RAND research that pertain to other strategies for reducing drug use.

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Motivation For Our Study

- **Model school-based prevention programs have demonstrated their effectiveness at reducing use of particular substances.**
 - NIDA, 1999
 - CSAP, 1999
- **Model school-based programs are also cost-effective at reducing use of cocaine.**
 - Caulkins *et al.*, 1999

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Drug prevention programs are now commonplace in the nation's schools. Their aim is to prevent, or at least to delay or diminish, children's use of a variety of substances, including illicit drugs such as marijuana and cocaine, along with licit substances such as alcohol and cigarettes. It has now been well established that school-based drug prevention *can* work to reduce drug consumption, at least in the short run. I say *can* because not all drug prevention programs have been shown to reduce drug use, even in the short run. However, there are proven models available for implementation that have been rigorously tested. I will call these types of programs "model" prevention programs throughout this presentation.

In addition, model school-based drug prevention programs have been shown not only to be effective at reducing use in the short run, but also to be cost-effective at reducing lifetime use of cocaine, as shown by Jonathan Caulkins and colleagues in their 1999 study. The motivation for our research at the time we did this project was that the question remained as to their cost-effectiveness at reducing other types of drug use.

Research Questions

- **Are model school-based drug prevention programs effective at reducing substance use across a variety of substances?**
- **What is the cost-benefit of a model school-based drug prevention program?**
- **What is the distribution of its benefits across substances?**

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In our study, we extended the assessment of the cost-benefit of school-based drug prevention for reducing use of a wider variety of substances than was considered by the 1999 Caulkins study of prevention's cost-benefit for reducing cocaine use. In particular, we extended that study to apply to alcohol, tobacco, and marijuana, simply because these are the three most frequently used substances. We retained cocaine in our current study since it maps back to the prior study. It would also be possible to look at the connections between methamphetamine and alcohol use or marijuana use to estimate prevention's cost-benefit for reducing just methamphetamine use by using our study's framework. However, the contribution of this study is that we look at the reductions in use of a number of drugs, rather than just focusing on one – whether that be cocaine or methamphetamine. Given that we find prevention is cost-effective for reducing alcohol, marijuana, tobacco and cocaine use combined, it would still be cost-effective if methamphetamine use were added to the list.

I will present to you the research questions we focused on and our conclusions about them throughout the presentation. First, we examined whether a model school-based drug prevention program would be effective at reducing lifetime use across a variety of substances. Second, we examined the cost-benefit of a model prevention program. Third, we examined the distribution across substances of the benefits realized from school-based drug prevention. We note that many of the most successful programs are not targeted to specific substances, which motivates the question: Which drugs do they affect?

Research Questions

- **Are model school-based drug prevention programs effective at reducing substance use across a variety of substances?**
- **What is the cost-benefit of a model school-based drug prevention program?**
- **What is the distribution of its benefits across substances?**

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First, I will summarize our results in estimating the lifetime reductions in substance use that are attributable to prevention.

Criteria For Identifying Model School-Based Prevention Programs

- 1) Published in a peer-reviewed journal.**
- 2) Based on experimental evaluations using pre-test/post-test designs with treatment and control groups on universal populations.**
- 3) Reported quantitative estimates of effect on tobacco, drinking, and/or marijuana use.**
- 4) Conducted long term follow-ups.**
- 5) Either provided cost information or a sufficient description of resources to infer costs.**

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In order to answer the question of whether model school-based drug prevention programs are effective at reducing lifetime use across a variety of substances, our first task was to summarize the effectiveness of prevention programs. We quickly discovered that there are literally hundreds of studies of such programs, and that these studies are of uneven quality. For example, the Blueprints project of the Center for the Study and Prevention of Violence at the University of Colorado has reviewed more than 450 programs. It found that only ten met its model-based criteria, which include having strong research design and evidence of a sustained program effect at multiple research sites.

Keeping that in mind, we cast a wide net in our literature search for identifying candidate model prevention programs, examining numerous lists of programs that are available from the Blueprints project, the National Institute of Drug Abuse, expert opinion we solicited at the start of this project, and many others.

In our analysis, we considered only those programs that met the following five criteria. First, the studies had to have been published in a peer-reviewed journal. Second, the studies must have been based on experimental evaluations using pre-test/post-test designs with treatment and control groups on universal populations – in particular, these studies had to apply to the general population and not be restricted in their focus on certain subpopulations, such as high-risk children. Third, the studies must have reported quantitative estimates of program effects on tobacco, drinking and/or marijuana use. Given this criterion, only a fraction of the high-quality evaluations are relevant to our study. For

example, some of these studies are process evaluations that answer questions such as whether teachers, police officers, and so on are effectively delivering the intervention, rather than focusing on the amount of substance use reduction realized due to these programs. In other cases, the studies focus on variables thought to be related to substance use rather than on substance use itself. The fourth criterion was that the studies must have included a long term follow up, so that some time elapsed between the end of the program and the follow-up assessment - typically a year passed between the end of the study and the first follow-up. Finally, the studies must have provided cost information or a sufficient description of the resources used to implement the programs such that we could infer program costs.

One might notice that I did not mention as a criteria that studies estimate the effect of prevention on cocaine use. That's because no such studies exist. We therefore use information on marijuana use to infer the impact of prevention on lifetime cocaine use, which I will say more about later.

Selected Model Programs

Program	Alcohol	Tobacco	Marijuana
LifeSkills	X	X	X
Midwest Prevention Project (MPP)	X	X	X
Project Alert	X	X	X
Project Northland	X	X	X
Enhanced Alcohol Misuse Prevention Study (AMPS)	X		
Iowa Strengthening Families	X		
Project Toward to Tobacco (TNT)		X	

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The programs we found that met these criteria are the presented in this table. The programs that made it to this list are the:

Life Skills program, The Midwest Prevention Project, Project Alert, Project Northland, Enhanced Alcohol Misuse Prevention Study (AMPS), Iowa Strengthening Families Program, and Project Towards No Tobacco (TNT).

All of these studies showed statistically significant effects for reductions in the use of these substances. There is clearly some variation as to which drugs were closely examined in the studies. For example, LifeSkills reported program effects on alcohol, tobacco and marijuana use, while the Enhanced Alcohol Misuse Prevention Study reported only reductions in alcohol use.

All of these programs apply primarily to 6th and 7th graders at the time of implementation. All of these programs found significant reductions in some type of drug use post-program implementation, while LifeSkills showed effects 5 years out during the senior year of high school.

These programs are also of different lengths. Life Skills had the greatest number of sessions – 30 sessions, spread over a period of 3 years during 7th, 8th, and 9th grades. Project Northland followed, with 20 sessions spread over 6th through 8th grades. The shortest prevention program was Iowa Strengthening Families, which had 7 sessions over 7 weeks, but with homework assignments extending over a period of 1-1/3 years.

Despite the commonality of the targeted age group for prevention by these studies, the strategies employed by the various prevention program varied, and I will describe those now.

Prevention Strategies Vary Across Programs

Program	Personal & Social Skills	Information Dissemination	Resistance Skills Training	Social Influence	Physical Consequences
LifeSkills	X		X		
MPP		X	X		
ALERT			X	X	
Northland		X	X		
Enhanced AMPS			X		
Iowa			X		
TNT				X	X

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As you can see from the Table, the prevention programs employed numerous strategies for prevention. For example, the LifeSkills program provided training in personal and social skills and resistance skills training. Resistance skills training was the most frequently-employed strategy for prevention. Information dissemination, typically through the distribution of information to parents or to the community through the media, was provided by the Midwestern Prevention Project (MPP) and Project Northland. The social influence model motivated Project ALERT and Project Towards No Tobacco (TNT). The social influence model provides education to the students on how peers influence their own behavior and how the media try to influence their own behavior, so that they can use this information to develop reasons not to use drugs.

Program Components Vary Across Programs

Program	School-Based Program	Parent Participation	Community Involvement	Mass Media	Drug-Free Activities
LifeSkills	X				
MPP	X	X	X	X	
ALERT	X				
Northland	X	X	X		X
Enhanced AMPS	X				
Iowa	X	X			
TNT	X				

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Further, there was variation in the program components used in these studies. All of the programs included a school-based, classroom component, but a few programs included additional components as well. In particular, three programs included parent participation components, two included community involvement – in Project Northland, local ordinances were passed to further restrict youth’s access to alcohol. Mass media were also used for one program (MPP), and Northland included alternative drug-free activities. Clearly, these programs offer a variety of approaches, and the needs of a particular school and community should guide which program is selected.

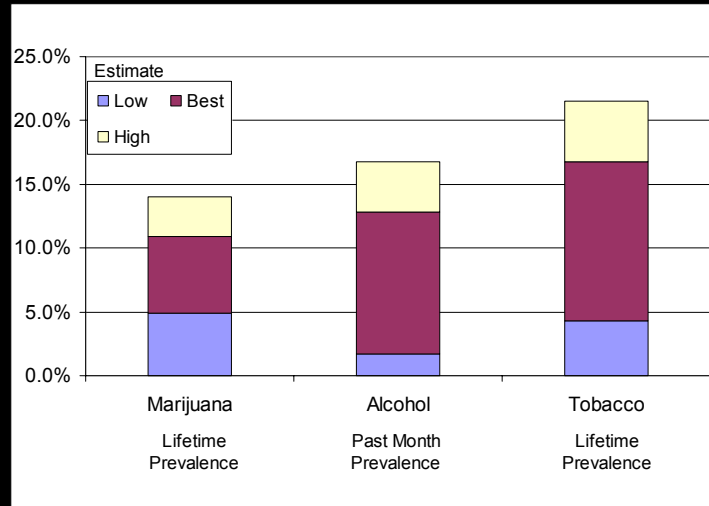
Develop a Model Program from These Studies

- **Aggregate outcome measures across studies.**
 - **Studies report on different outcomes.**
 - **Studies focus on different substances.**
- **Summarize reductions in use of:**
 - **Marijuana**
 - **Tobacco**
 - **Alcohol**
- **We do not evaluate specific programs or make recommendations of one program over another.**

RAND

Based on these 7 prevention programs, we developed a hypothetical, or “model” drug prevention program that is typical in the benefits accrued to those who participate in prevention. Our derivation of the typical effects of a model prevention program was complicated by the fact that these studies reported different outcome measures – for example, some studies reported weekly prevalence of use, while others reported monthly prevalence. Some studies examined the reduction in initiation of alcohol, tobacco, and marijuana, while other studies did not report the effect on ever having initiated at all. Also, as I mentioned earlier, some studies focused only on achieving reductions in one substance. I want to emphasize that we did not evaluate specific programs separately or make recommendations of one program over another in our work, but rather aimed to construct a “typical” model program to evaluate its cost-benefit.

Post-Program Reductions in Use for Our Model Program



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Our best estimate of prevention's overall effectiveness on the measures of use is given in the Figure by the purple bars – for example, our best estimate of the reduction in lifetime prevalence of marijuana use is 11%. As I alluded to before, there was considerable variation among the measures reported for these studies. For that reason, it is important to account for the uncertainty in these estimates by examining plausible ranges for the percent reduction in drug use. The upper and lower bounds of post-program effectiveness are provided by the blue and yellow bars on the Figure. Note that the best estimates are the effectiveness figures we will assume for our model program when we compute the cost-benefit of prevention. These estimates also reflect the program's effect after program implementation – which is typically 1 year following the program.

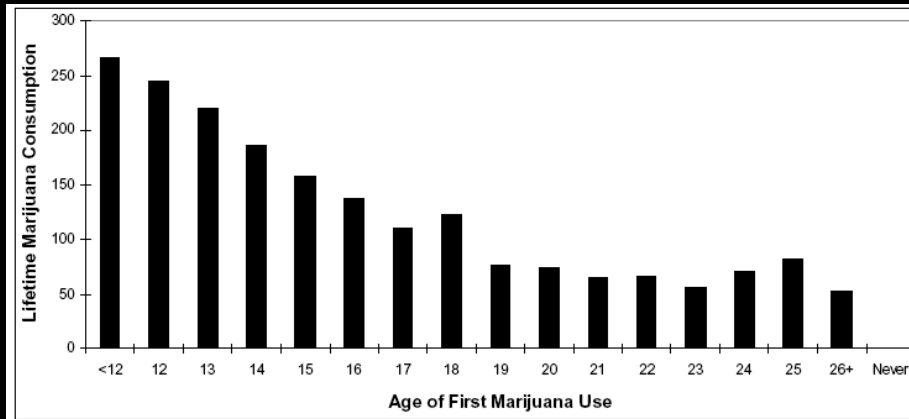
Translating Post-Program Effects into Lifetime Reductions In Use

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None of these prevention programs measure the effect of prevention on lifetime use. We must estimate that from data on lifetime use estimates for the substances in our study along with the National Household Survey on Drug Abuse (which is now called the National Survey on Drug Use and Health).

Translating Post-Program Effects into Lifetime Reductions In Use

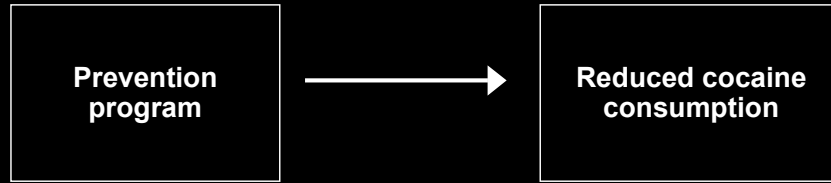
Age of Marijuana Initiation is Associated with Lower Lifetime Marijuana Use



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Since the 7 studies I described earlier do not report prevention's effect on lifetime use, we use the fact that reduced initiation predicts lifetime consumption of a given substance -- so we predict lifetime drug consumption in our model. This is straightforward to do for marijuana, tobacco, and alcohol, since we have estimates of prevention's effect on initiation and then we link initiation of any of these substances to lifetime use. This figure shows lifetime marijuana consumption as a function of the age of marijuana initiation, in which the inverse association between amount of lifetime use and age of initiation is clear. Similar patterns emerge for the relationship between use and initiation for heavy drinking and smoking.

Inferring Program Effects on Cocaine

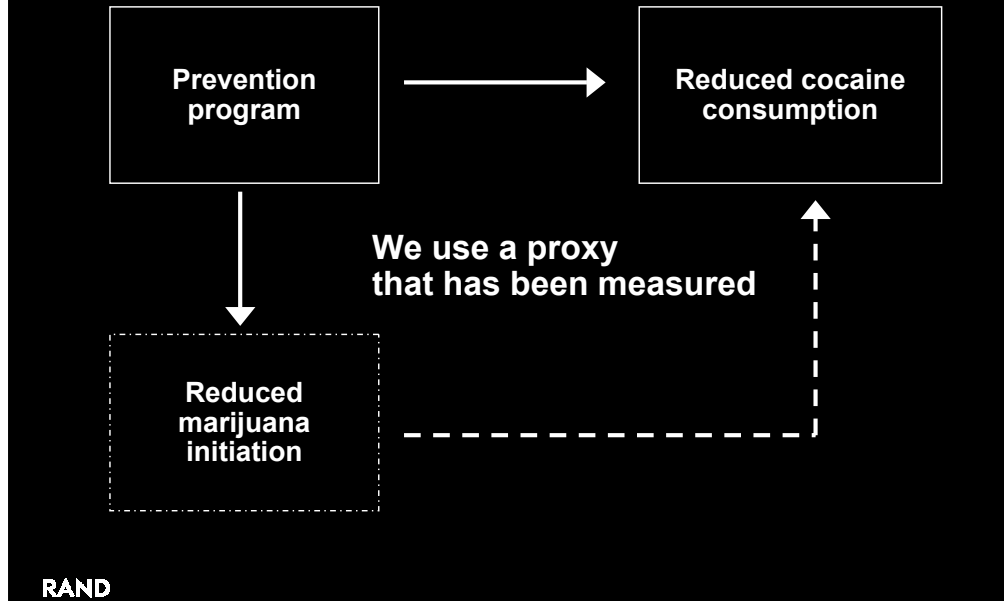


Effects of prevention programs on cocaine consumption have not been measured.

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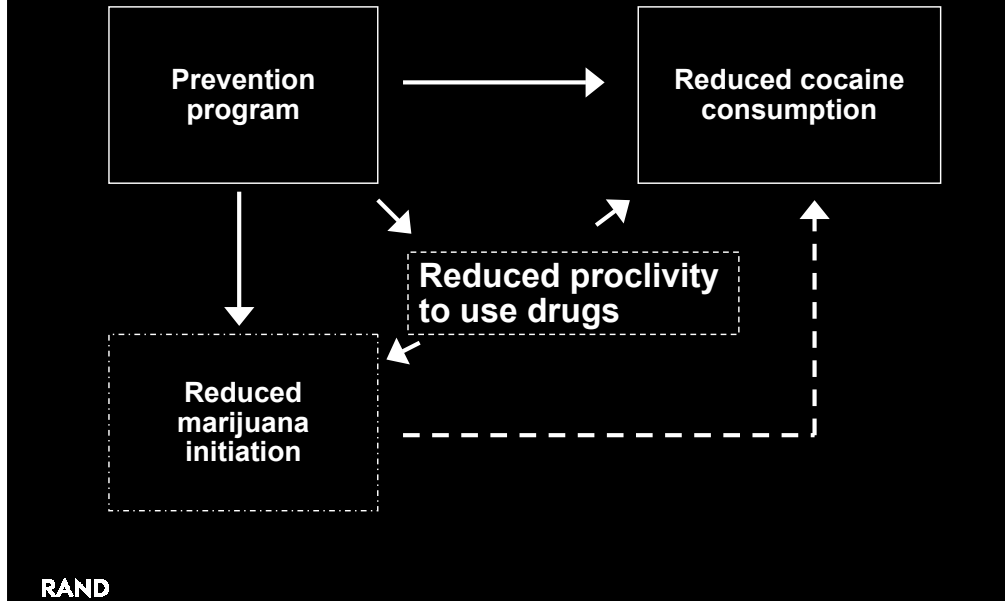
The link between prevention and reductions in the lifetime use of cocaine is a bit trickier to estimate, since cocaine use reductions were not reported in our model program.

Inferring Program Effects on Cocaine



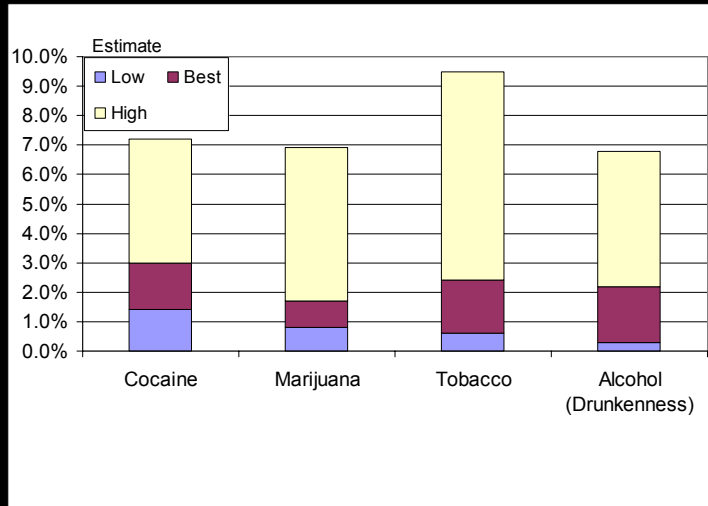
However, we used a proxy for cocaine initiation – and that is age of marijuana initiation – to infer the prevention program’s effect on the lifetime use of cocaine.

Our Proxy Entails an Important Assumption



However, using this proxy entails an important assumption: Prevention will reduce marijuana initiation and cocaine consumption through reducing the proclivity to use drugs. We could examine a similar scenario for methamphetamine use, using links from it to any of the other drugs we have studied that have been focused on explicitly in school-based prevention programs.

Reductions in Lifetime Use Are Small



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Finally, we combined our estimates of program effectiveness, its projected influence on lifetime use, and estimates of the sustained effect of prevention to estimate the reduction in the proportion of persons ever using each of these substances. Our best estimate of the percent reduction on lifetime use is given above, with low and high estimates reported as well. As is clear, the lifetime reduction in use is quite small – the best estimates (in purple in the figure) range from 1.7% for marijuana to 3 percent for cocaine.

Research Questions

- Are model school-based drug prevention programs effective at reducing substance use across a variety of substances?
- What is the cost-benefit of a model school-based drug prevention program?
- What is the distribution of its benefits across substances?

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Now that we have an estimate of the effect of prevention on lifetime use, we can estimate the cost-benefit of prevention.

The “Benefit” of Prevention Is the Social Cost Averted by Reducing Consumption

Substance	Cost in 2001 (\$billions)
Tobacco	177.2
Alcohol	101.9
Cocaine	62.6
Marijuana	9.1
Heroin	26.4
Other illicit drugs	7.8

RAND

First, let me clarify what I mean by a “benefit” of school-based drug prevention. We define “benefit of a prevention program” as the social cost averted by reducing consumption. As is clear from this Table, the social costs of the use of these drugs run into the billions of dollars. Further, you can see that even though a drug may not be a high-prevalence drug, it can still have relatively high costs. This is demonstrated best by comparing the social costs of marijuana and heroin use, which are 9 versus 26 billion dollars, despite heroin being less frequently used than marijuana.

Cost of School-Based Prevention per Participant Is Modest

<u>Cost Category</u>	<u>Cost</u>
Curriculum and training	\$ 2
Curriculum, training, and teacher time	\$ 70
Curriculum, training, teacher time, and facilities	\$150

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As drug use has costs, so does drug prevention. Most of the prevention programs we examined did not discuss costs explicitly. However, they did report resources used, making cost estimation possible.

There are several ways to define costs, and we examined three of them.

First, it seems reasonable to assume that program costs should include the costs of the curriculum materials and teacher training. Those costs are very small, just two dollars per program participant. And they are the only costs that would show up in a school district's budget. But from a societal perspective, the main cost of teaching a school-based drug prevention program is the opportunity cost of not using that class time to teach something else. Unfortunately, there is no easy way to place a dollar value on the class time used for standard, academic subjects, so it's hard to know what value to place on it for this analysis. Presumably the benefit society derives from educating children is at least as great as what it spends on education, otherwise we would spend less on education -- so you can get a sense of the value of a typical class by looking at how much taxpayers spend providing that class.

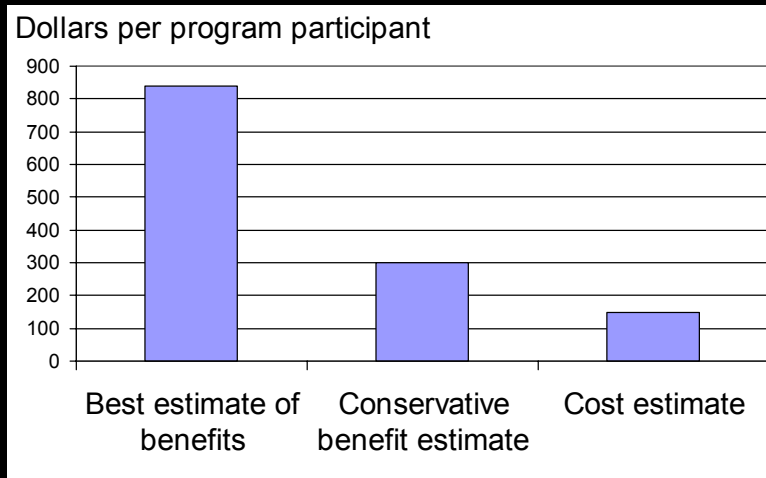
Cost of School-Based Prevention per Participant Is Modest

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Over a 30-class prevention curriculum like the Life Skills program, that works out to be about \$150 per participant, so we take that as our preferred estimate of the cost of running prevention. We also include the cost of materials plus teacher's time but exclude fixed capital costs.

Prevention Benefits Exceed Costs



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This chart shows the central conclusion of our study: That the benefits of school-based prevention do in fact exceed their costs. Our best estimate of the quantifiable effect of prevention is \$840 for each student's participation. By comparison, the social cost of providing prevention education for that student is \$150. While our analysis entailed numerous assumptions, we were careful to test the sensitivity of our results to these assumptions. You can see here that our most conservative estimate of prevention's benefit is \$300, which is twice the social cost of the prevention program.

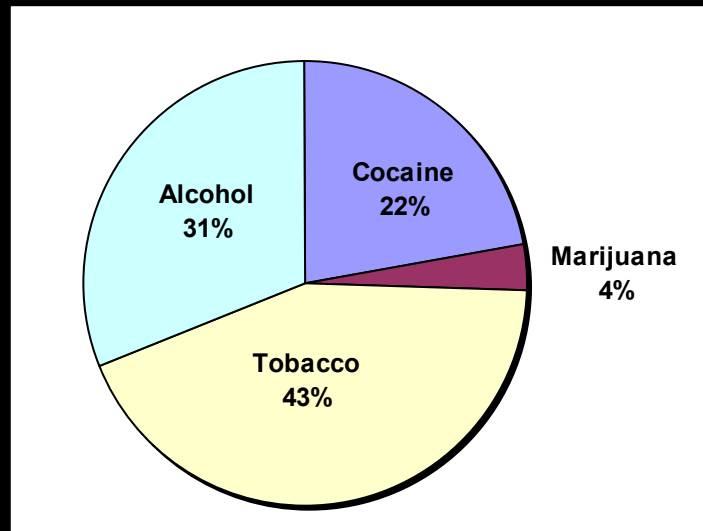
Research Questions

- **Are model school-based drug prevention programs effective at reducing substance use across a variety of substances?**
- **What is the cost-benefit of a model school-based drug prevention program?**
- **What is the distribution of its benefits across substances?**

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Finally, we determined the distribution of benefits realized from school-based drug prevention programs across the four drugs we examined.

The Largest Portion of Social Cost Savings Comes from Licit Substances



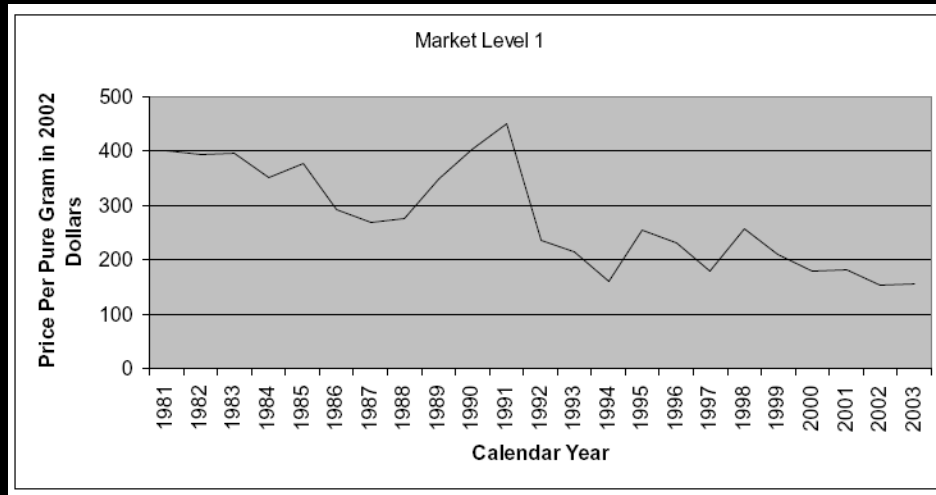
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The largest portion of the social cost savings due to prevention comes from reductions in alcohol and tobacco use. These account for 74% of the total social cost savings.

In our study, we did not explicitly examine other illicit drug use, including methamphetamine. To precisely comment on the cost-benefit of prevention for methamphetamine, we would need to formally incorporate it into our model. If prevention reduced the use of other illicit drugs by as much as it reduces cocaine use, then the benefit of prevention on all illicit drug use would increase, from 26% of the total when considering just cocaine and marijuana, to 33%, but two-thirds of the benefit of prevention would still be accrued by alcohol and tobacco.

Given that we find prevention is cost-effective for reducing alcohol, marijuana, tobacco and cocaine use combined, it would still be cost-effective if methamphetamine use were added to the list.

Annual Price of One Pure Gram of Methamphetamine



Source: ONDCP 2004

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School-based drug prevention is not all that can be done to reduce drug consumption. At this point, I want to touch upon some other RAND research related to reducing substance use that goes beyond school-based prevention.

Law enforcement can affect the supply, price -- and therefore the desirability -- of drug use.

This figure comes from a RAND study that was funded by the Office of National Drug Control Policy. It shows the annual price of one pure gram of methamphetamine in 2002 dollars, for a 23-year period extending from 1981 to 2003. There are price spikes just after 1989, 1995, and 1997. Federal regulation of the chemicals used in the production of methamphetamine occurred in each of these years.

In 1989, the Chemical Diversion and Trafficking Act regulated ephedrene and pseudoephedrene in bulk powder form, which are used in methamphetamine production. Producers of these bulk powder chemicals had to register with the Drug Enforcement Administration and keep records of their sales and customers.

In 1995, the Domestic Chemical Diversion and Control Act regulated the distribution of products that contained ephedrene as the only active medicinal ingredient.

In 1997, the Comprehensive Methamphetamine Control Act regulated products that included pseudoephedrene overall.

All three of these reforms targeted chemicals used by large-scale producers of methamphetamine and were associated with increases in price, and therefore the economic desirability of methamphetamine use.

Policies Aimed at Reducing Alcohol and Tobacco Use Could Reduce Illicit Drug Use

- **There is evidence that the following are economic complements:**
 - **Alcohol and marijuana**
 - **Alcohol and cocaine**
 - **Cigarettes and marijuana**

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Although alcohol and cigarettes are legal substances, it is useful to consider the policies applied toward these two substances when considering illicit drug policies for three basic reasons. First, significant evidence exists showing that relationships exist in the consumption of legal and illicit substances (see Chaloupka and Pacula, 2000, for a review) over time as well as during the same time period.

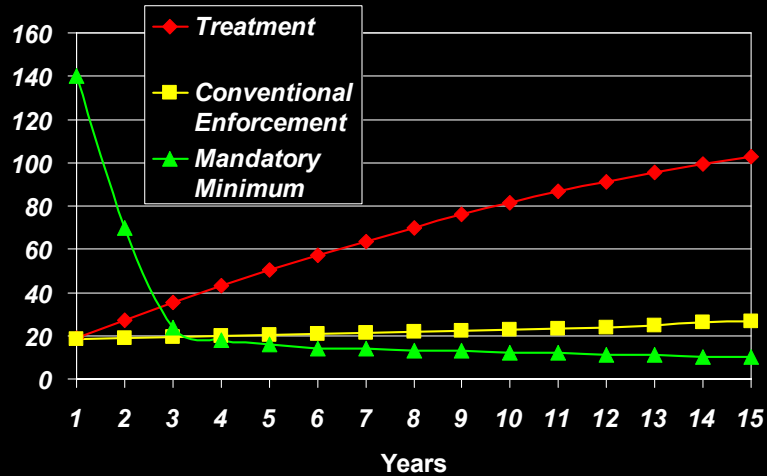
If consumption of one good rises in response to an increase in the price of a second good, then economists consider the goods to be substitutes. An example of two goods that are economic substitutes are pens and pencils. Either pens or pencils can be used to write, so people will tend to use whichever utensil has the cheapest price. If the price of that cheaper utensil goes up, then people will substitute the other utensil to avoid paying the higher cost. Conversely, if an increase in the price of one good leads to a reduction in the consumption of a second good, then economists consider these goods economic complements. The classic example of economic complements are peanut butter and jelly, two goods that are generally (although not always) consumed together.

During the past decade a growing economic literature has emerged investigating the contemporaneous relationship between the demands for alcohol and marijuana. Initial studies evaluating the relationship between demands in youth and young adult populations concluded that alcohol and marijuana were economic substitutes (Chaloupka and Laixuthai, 1997; DiNardo and Lemeiux, 1992), implying that if the price of alcohol went up, due to an increase in the beer tax for example, people would respond by reducing their alcohol use and increasing their marijuana use.

Subsequent research that has attempted to include additional proxies for the price of marijuana or that have examined more recent cohorts have generally found evidence of complementarity between alcohol and marijuana use, particularly among young adults (Farrelly et al 1999; Saffer and Chaloupka, 1999; Pacula, 1998; Thies and Register, 1993). Similar studies examining the relationship between alcohol and cocaine use as well as cigarettes and marijuana suggest that these goods are also economic complements (Saffer and Chaloupka, 1999; Chaloupka et al, 1999; Farrelly et al, 1999).

The implication of these findings of complementarity is that policies aimed at reducing alcohol and tobacco use (such as raising the tax on beer or cigarettes) will have the additional benefit of reducing marijuana and other illicit drug use.

Treatment Of Heavy Cocaine Users Is Cost-Effective Over The Long Run



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Finally, an additional strategy to reduce drug use is treatment. This figure comes from Jonathan Caulkins and colleagues at RAND, who compared the cost effectiveness of several options to reduce cocaine use. They found that treatment was very cost-effective over the long run – after a period of 3 or more years -- relative to other standard strategies such as conventional enforcement and mandatory minimum sentencing. While the benefits of conventional enforcement and mandatory minimums are immediate, the cost of treatment occurs up front, making it less cost-effective in the short run, but with benefits accruing over time. If the time line for the evaluation of a cocaine control policy is less than 3 years, then choosing, for example, mandatory minimums is rational and cost effective. If the evaluation time line is 3 years or greater, then treatment should be favored. A similar study of the cost-effectiveness of treatment for methamphetamine use has yet to be done, but the results of this study on cocaine use suggest that the treatment option could be very cost-effective for heavy users.

Key Findings Of Our School-Based Prevention Study

- **The effect of prevention on lifetime use is small.**
- **The benefits of model school-based drug prevention programs exceed their cost.**
 - **The cost of participation is \$150 per student.**
 - **The quantifiable benefit realized to society is \$840 per student.**
- **Most of the quantifiable social benefits from school-based prevention programs are due to reductions in the use of legal substances.**
- **School-based prevention is just one tool available for reducing drug use.**

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To summarize, the key findings of our study are that the effect of model school-based drug prevention programs on lifetime drug use is small at best. However, drug use is an extremely costly activity for society, so even very small reductions in drug use that are attributable to prevention make it extremely cost-effective. In particular, we estimated the social cost of participating in school-based drug prevention to be \$150, while the quantifiable benefit realized to society is \$840 per student.

We also found that almost three-quarters of the quantifiable social benefits from school-based prevention programs are due to reductions in the use of tobacco and alcohol.

Finally, drug prevention programs are but one component in the possible toolbox available to reduce drug use. As suggested by the methamphetamine time series, regulation and law enforcement strategies can also be effective at reducing the attractiveness of drugs. Even some of the school-based prevention programs I discussed today combined their school-based efforts with law enforcement, in particular with the passage of local ordinances aimed at reducing the supply of alcohol to minors.

What Can You Do?

- **Implement an evidence-based model prevention program.**
- **Make it difficult to obtain precursor chemicals.**
 - **Locked sales**
 - **Limit number of packages**
- **Increase taxes on alcohol and tobacco.**
- **Provide treatment for heavy users.**

RAND

Based on our study, we find that providing school-based drug prevention is extremely cost-effective at reducing the use of a number of drugs. None of the prevention studies we considered focused on methamphetamine use. The data on school-based drug prevention's effect on methamphetamine use has yet to be gathered, to the best of my knowledge. I am also not aware of research that identifies a particular gateway drug for methamphetamine use, so rather than select a prevention program that focuses on one substance that may or may not be a gateway to methamphetamine use, the greatest benefit would be obtained by applying a general school-based drug prevention program that provides skills or attitudes development aiming to prevent drug use in general.

In addition to prevention, research shows that making it difficult to obtain precursor chemicals that are used in methamphetamine production is associated with increases in methamphetamine prices. Some strategies can be enforced in a very low-cost or no cost way, such as limiting the number of packages of over the counter drugs containing ephedrene and pseudoephedrene that can be obtained by consumers. There is research support for increasing taxes on alcohol and tobacco as a means of reducing illicit drug use, given the complementarity of these legal substances with illicit drugs. Finally, for those persons who become heavy users, treatment is an option that should be considered as well. While the effect of treatment on reducing lifetime methamphetamine use remains to be studied, treatment has been shown to be very cost-effective at reducing cocaine consumption (Caulkins et al., 1999). The targeting of treatment to the heaviest users can efficiently reduce use dramatically among a small but very important subset of the population.

Acknowledgements

- Jonathan Caulkins, Carnegie Mellon University
- Rosalie Pacula, RAND
- James Chiesa, RAND
- Martin Iguchi, RAND/UCLA

The report, "School-Based Drug Prevention: What Kind of Drug Use Does It Prevent?" is available from <http://www.rand.org/publications/MR/MR1459/>

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