SUMMARY

Of the various possible approaches toward alleviating America's problems with illicit drugs, the greatest emphasis—in both political rhetoric and dollars allocated—has long been placed on enforcement against traffickers, dealers, and users. Recently, however, public-opinion polls have shown strong support for prevention—even a preference in some cases.

But how effective is prevention? How much does it cut drug use? How does it compare, dollar for dollar, with other approaches to drug control such as enforcement or treatment? Would it be fiscally feasible to put every American youth through a cutting-edge drug prevention program, and, if so, would it have a modest or substantial effect on the severity of America's drug problems?

We have sought to provide quantitative answers to these questions. The answers all take the form of plausible ranges of values, not just point estimates, because there is considerable uncertainty involved in the data and the calculations—hence, this book's title.

Some of the uncertainty is the natural and largely unavoidable consequence of the complexity of human behavior and social systems. Some arises because most prevention research has focused on only a subset of the factors relevant for estimating prevention's aggregate effect. Indeed, we are not just interested in providing estimates but also in creating a logical structure or framework for understanding how to think about prevention's effectiveness and the associated uncertainties and how research should best proceed to reduce the uncertainty.

To begin to answer the general question of how effective prevention is at controlling problems associated with illicit drugs, we start with the following more specific question: Dollar for dollar, by how much *can model* school-based prevention programs reduce the nation's *cocaine* consumption? The italicized words are important, because if we simply ask whether prevention has typically been as cost-effective as other strategies, the answer is even simpler: No. Many programs have been found not to be effective. But we want to give prevention its best shot. Thus, for our analysis, we have chosen two model programs that have been demonstrated to affect student drug use, but which are not yet widely implemented: Project ALERT and Life Skills Training. Both of these are school-based programs that seek to inculcate in adolescents the skills to resist social influences to use drugs. We focus on cocaine use because that is the country's most problematic illicit drug and the one we have previously used in assessing the cost-effectiveness of other drug control interventions.

As suggested above, we find that we cannot answer the cost-effectiveness question as precisely as we would like to. Our estimate of prevention's cost-effectiveness is less certain than our past estimates for enforcement and treatment were. In recognition of the uncertainty, we define the factors contributing to prevention's cost-effectiveness so that they can simply be multiplied together to obtain the final result. Besides our mid-range preferred estimate of each factor, we present a reasonable low and high value. We carry these low and high estimates through the analysis to show how strongly the uncertainty qualifies our conclusion regarding the relative cost-effectiveness of prevention and enforcement.

EFFECT PER PROGRAM PARTICIPANT

Figure S.1 presents the factors in our analysis. We discuss each briefly in turn, from top to bottom.

RAND *MR923-S.1*

Proportion of Persons Who Would Have Ever Used Cocaine
×
Lifetime Cocaine Consumption Per User
×
Percentage Reduction in Cocaine Use Due to Prevention Program
×
Discount Factor
×
Social Multiplier
×
Market Multiplier
×
Causation/Correlation Ratio
×
Scale-Up Factor

Figure S.1—Factors Contributing to the Effectiveness of Prevention at Reducing Cocaine Consumption

Proportion of Persons Who Would Have Ever Used Cocaine

Low	Middle	High
13%	20%	27%

To know how much prevention will reduce consumption, we need to know how much cocaine the program participants would have used without prevention. That depends on the proportion who would ever use cocaine and on the amount that eventual users would consume over their lifetime. From the National Household Survey of Drug Abuse (NHSDA), we know the historically low and high proportions of persons using cocaine. We take these values as our low and high estimates; for our preferred mid-range estimate, we take the average of the two.

Lifetime Cocaine Consumption Per User (grams)

This factor is not known and cannot be measured easily, so we developed six alternate ways of estimating it. Each way individually has weaknesses, but collectively they establish a reasonable range.

Low	Middle	High
225	350	475

Percentage Reduction in Cocaine Use Due to Prevention Program

Together the first two factors describe how much cocaine the average adolescent would eventually use in the absence of a prevention program.[1] What effect would model prevention programs have on this? We cannot answer this question directly since data on lifetime cocaine use by program participants are not available. However, the program evaluations furnish good data regarding the effect of prevention on marijuana initiation, and we know from NHSDA data that delays in marijuana use are associated with two things: lower likelihood of ever using cocaine and, for those who do use it, lower amount used. Our low estimate of the effect on *marijuana* initiation comes from the 5 percent reduction achieved by Project ALERT, which was implemented only during seventh and eighth grades. The high estimate (17 percent) is the average of ALERT and Life Skills reductions in other indicators of marijuana use. For a mid-range estimate, we split the difference.

Low	Middle	High
2.9%	7.6%	13.6%

But how long can these effects be expected to last—just through adolescence or all life long? We have no information on this because the evaluation data follow subjects only through the end of high

[1]Because the proportions ever using are less than 50 percent, the *typical* adolescent will use none at all. For accounting purposes, however, it is useful to estimate the average across all individuals.

school. So we assume, in the worst case, that the program merely delays marijuana initiation until after high school. For the best case, we assume that reductions in use are permanent. For a mid-range estimate, we assume that half the reduction is permanent. It is important to realize, however, that both a permanent drop in initiation and "mere" delay are associated with a reduction in lifetime cocaine consumption.

We draw from this association to translate estimates of reduction in marijuana initiation and the permanence of that reduction into estimated changes in cocaine use (see Figure S.2). For program effect, we take the bar in the middle as our preferred estimate and the largest and smallest bars as our high and low.

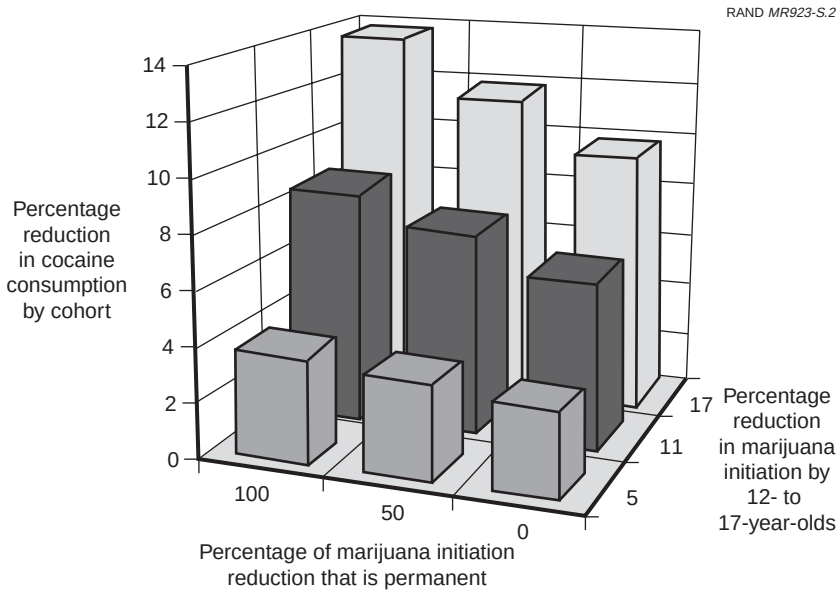

Figure S.2—Reduction in Cohort's Cocaine Consumption for Different Assumed Values of Marijuana Initiation Reduction and Permanence

Discount Factor

Low	Middle	High
0.388	0.507	0.692

The benefits of prevention accumulate over a number of years. It is a conventional assumption in economic analysis that people would rather have money (or benefits) sooner rather than later. We thus discount future program benefits at 4 percent per year (the rate we have used in our previous analyses of enforcement and treatment). We also use lower and higher rates (2 and 6 percent) and in each case convert the annual rates into aggregate discount factors.

Social Multiplier

Low	Middle	High
1.0	2.0	2.9

A prevention program can affect persons *not* participating in it. Project ALERT and Life Skills are both based on the assumption that adolescents use drugs largely because of peer pressures and other social influences. In other words, if one person initiates use, he or she will influence others to do so. It follows, then, that if that person's use is delayed or prevented by a program, so will the use of the others who would have been influenced. The program effectiveness data cited above reflect these indirect effects on marijuana initiation, but not those pertaining to cocaine use, whose initiation usually occurs after individuals leave secondary school. The social multiplier is the total number of persons not initiating cocaine use per program participant not initiating cocaine use (if it is just the participant, the multiplier is 1). We theorize that social influence is inversely related to the number of heavy users, who offer examples of the ill effects of a drug. From the numbers of light and heavy users over time, we infer a social multiplier between 1.0 and 2.9. We take 2.0 as our "best estimate."

Market Multiplier

Low	Middle	High
1.0	1.3	2.0

Another way a prevention program affects consumption by nonparticipants is through the cocaine market. Reduced consumption by program participants implies a reduction in the demand for cocaine. For any given level of enforcement, decreasing the demand for cocaine increases the amount of enforcement relative to the amount of use. This increase in enforcement pressure will tend to drive up cocaine's price. Even those who did not participate in the prevention program see the higher prices, so they are likely to use less cocaine. We use a model of the cocaine market to arrive at a "best estimate" of the market multiplier. To derive low and high estimates, we use a factor-by-factor analysis of uncertainty similar to that we use for this study as a whole.

Causation/Correlation Ratio

Low	Middle	High
0.5	0.9	1.0

There are also ways in which the program effect given above may be *overestimated*. First, our calculation of reduction in cocaine use is based on a correlation of past cocaine use with past marijuana initiation age. If the prevention program is affecting some underlying propensity to use drugs, our strategy is valid. But if the prevention program only affects marijuana use, not whatever drives cocaine use, future reduction in marijuana initiation may imply nothing about future cocaine use. Evidence is particularly thin regarding this factor. What analysis we *can* do supports the middle estimate, and we believe the low and high estimates reflect a reasonable range. However, this is conjectural; we cannot "prove" that readers who prefer an even lower or higher estimate have beliefs that are inconsistent with data.

Scale-Up Factor

Low	Middle	High
0.5	0.6	0.7

Second, it is not reasonable to assume that model programs implemented in resource-intensive demonstrations under the guidance of their designers will work as well when implemented on a large scale. There is virtually no basis for estimating the degradation in effectiveness accompanying scale-up. We take a conjecture from a previous study as our middle estimate. The low and high are arbitrarily and symmetrically selected around that middle estimate.

Overall Effectiveness (grams per participant)

Low	Middle	High
1.01	3.77	8.82

Multiplying all the preceding factors together gives an overall effectiveness estimate. Our best estimate is that a model school-based prevention program will reduce future cocaine consumption by a net present value of about 3.8 grams per participating adolescent.

To get the low and high estimates for overall effectiveness, we assumed for each factor that all values between the low and high factor estimates were equally likely and multiplied together values randomly drawn from the ranges given.[2] We did this thousands of times. The low estimate is the value lower than all but 5 percent of the results and the high is the value higher than all but 5 percent.

Combining all the factors allows us also to say something about the avenues of prevention's effectiveness. Only about a quarter of the reduction in cocaine consumption is in the form of reduced initiation by program participants—a typical objective of prevention. About 10 percent is in the form of reduced consumption by partici-

[2]These random draws were made for all factors except the discount factor, which was held at 0.507, the value corresponding to a discount rate of 4 percent. This distinction was made because variation in discount rates reflects variation in decisionmakers' relative valuation of present and future events, not uncertainty about cocaine consumption or program performance.

pants who eventually initiate anyway. The rest, almost two-thirds, is from reduced consumption by nonparticipants—mostly through direct social influences, some through indirect market influences.

COST-EFFECTIVENESS

Cost-effectiveness is estimated by dividing the effectiveness estimates by the cost of the prevention program.

Program Cost (dollars per participant)

Low	Middle	High
$1.94	$67.12	$146.50

Program cost is straightforwardly calculated once it is defined. It is in defining program cost that people are likely to disagree. Everyone would agree that program cost should include at least the cost of the program materials and of the time required to train the teacher. That minimal definition of cost results in our low estimate.

We believe, however, that the cost of the program should also include the lost learning opportunity involved in having students take the drug use prevention program instead of some academic subject. That opportunity cost is difficult to evaluate. However, states and school districts have apparently thought the value of academic learning was, on average, high enough to justify allocating funds to teacher salaries and to school buildings. For a middle estimate, we thus add to the low estimate the cost of the teacher's time in offering the program. To get a high estimate, we add to the middle estimate a per-student, per-class-session share of a typical school facilities budget. We prefer the high estimate for the reasons just given and because it is consistent with the approach taken in our analyses of enforcement and treatment (where we counted facility and other opportunity costs).

Cost-Effectiveness (kilograms of cocaine consumption averted per million dollars spent)

Low	Middle	High
7 kg./$M	26 kg./$M	60 kg./$M

Dividing the effectiveness numbers by the cost numbers gives cost-effectiveness. We show here the estimates derived from our preferred high-cost estimate only. These numbers are of limited interest in themselves; they need to be compared with cost-effectiveness estimates for other cocaine control strategies (all of which were based on full accounting of costs). This comparison is done in Figure S.3 for the following programs:

- Coca leaf eradication and seizures of coca base, cocaine paste, and cocaine in the source countries.
- Extended sentences for typical cocaine dealers.
- Interdicting cocaine en route from source countries.
- Expanding the mix of enforcement strategies used against typical dealers before the advent of mandatory sentencing.
- Current mandatory sentences of dealers prosecuted at the federal level.
- Expanding the mix of enforcement strategies used against dealers prosecuted at the federal level before the advent of mandatory sentencing.
- Treating heavy users with a program effective enough to keep the great majority off cocaine during treatment and cause a small minority to remain off heavy use after leaving treatment.

Our best estimate of prevention's cost-effectiveness suggests that model school-based prevention programs can reduce cocaine consumption as much per dollar spent as some enforcement programs do. The uncertainty is such, however, that low and high estimates would imply that prevention is not as cost-effective as *any* of the enforcement approaches shown or is more cost-effective than almost *all* of them. However, even if we give prevention the benefit of the

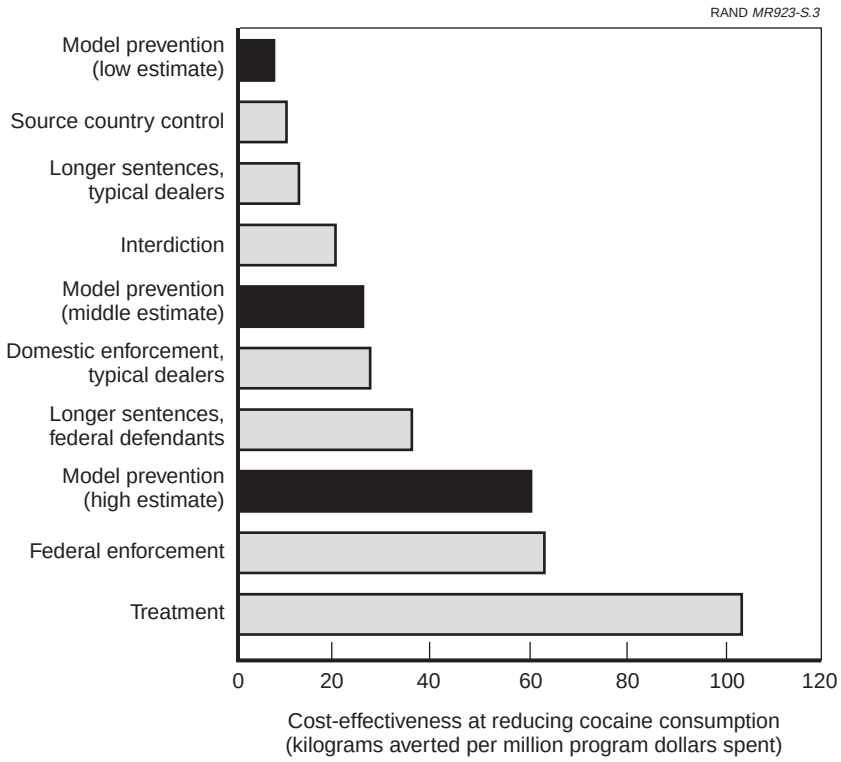

Figure S.3—Comparison of Prevention With Other Cocaine Control Programs

doubt and take the high estimate, it is not as cost-effective as treating heavy users—at this point in the cocaine epidemic (we will return to this temporal qualification below).

Narrowing the reasonable range of cost-effectiveness values for prevention would require more information about the various factors in the analysis. It is interesting in this regard that most of the research funded to date on prevention has been devoted to measuring one factor—program effectiveness narrowly considered. This factor accounts for only a small portion of the uncertainty.

AGGREGATE EFFECTS AND OTHER BENEFITS

Cost-effectiveness estimates are important but not the only information required for allocating resources or formulating policy. For such purposes, the total or aggregate effects of a program must also be understood. What would be the costs and consequences of nationwide implementation of cutting-edge school-based drug prevention programs?

It is easy to demonstrate that a full-scale national prevention program is affordable. Using our preferred (high) cost estimate, putting all adolescents through a program like the models we discuss here would cost about $500 million to $600 million a year. That is about 1.5 percent of current national drug control spending.

We can also demonstrate that implementing such a program today would not come close to eliminating cocaine use. We would expect reductions of between 2 percent and 11 percent relative to a hypothetical, no-prevention baseline.

A corollary of this is that prevention cannot substitute for enforcement in a legalization regime. It has been argued that if the money saved by not having to enforce drug prohibition were used to fund drug prevention, the latter could offset any increase in use resulting from relaxation of controls. However, this hope cannot be justified even by our most optimistic estimates of prevention's effectiveness.

Furthermore, it would be years before the benefits of prevention manifest in indicators of national use. With our middle estimate of effectiveness, it would take a nationwide model prevention program 10 years to reduce the number of past-year cocaine users by 2.5 percent relative to a scenario in which model programs were not implemented. It would take 20 years to reduce the number of users by 5 percent and 40 years to achieve a 7.5 percent reduction.

Greater effects and cost-effectiveness might be possible in the early, explosive stages of epidemic growth when preventing one person from initiating could prevent a cascade of subsequent initiations. Unfortunately, there is a considerable delay between implementation of a prevention program and when it begins to affect initiation into and use of cocaine. But drug epidemics are difficult to predict and, indeed, are not even always recognized as problematic until af-

ter the peak years of initiation have passed. It would thus be difficult for a reactive prevention strategy to affect those early growth stages of an epidemic. An alternative would be to run prevention continuously as insurance against future drug epidemics.

The limited effects of a nationwide program notwithstanding, even today the magnitude of the benefits prevention would bring through reduced cocaine use appears to justify the costs of prevention. We estimate that $2.40 in social costs would be averted for every dollar of resources used by a model prevention program. Again, however, this estimate is subject to substantial uncertainty: The actual cost averted per dollar could be as low as 60 cents or as high as $5.60.

Although we developed our methodology to estimate effects on cocaine use, it can also be used to obtain rougher estimates of effects on marijuana, cigarettes, and alcohol use. The estimated reductions are more modest: 0.6–3.4 percent for marijuana use, 0.1–1.2 percent for cigarette use, and 0.1–0.6 percent for drunkenness and heavy alcohol use. The less "deviant" the substance, the smaller the projected effect on use in percentage terms. However, cigarettes and heavy alcohol use are associated with such great problems that these reductions could generate considerable benefits. Our point estimates are that a dollar spent on prevention might avert $0.75 and $0.80 in social cost associated with cigarettes and alcohol, respectively, although again there is a wide range of uncertainty surrounding those point estimates. There may be still other benefits of prevention. Strengthening the resistance skills and perceived self-efficacy of adolescents may dissuade them from associating with gangs, getting pregnant, dropping out of school, and other behaviors potentially injurious to their health or economic prospects. But we do not estimate the magnitude of any of these benefits.

CONCLUSION

There is considerable uncertainty surrounding the magnitude of the effects of school-based drug prevention programs. However, a few things are clear. Nationwide implementation of a model program today is affordable, but it would not dramatically affect the course of drug use and the benefits would take years to accrue. On the other hand, the range of cost-effectiveness estimates we derive here for prevention is comparable to that previously derived for different en-

forcement interventions. Furthermore, implementing model prevention programs seems to be justifiable in the sense that the benefits produced would likely outweigh the costs of the resources used.