Marijuana Situation Assessment

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Contents

Executive Summary

By most accounts, marijuana use peaked in the U.S. in 1979 and has declined steadily ever since. However, there are now some indications that this downward trend has slowed, and perhaps even reversed course, among certain sectors of the population. The most recent National Household Survey on Drug Abuse (Household Survey) reports noticeable upturns in use among a number of demographic groups. So too do surveys of junior high school, high school, and college students. In most large cities, higher percentages of arrestees are testing positive for marijuana, and data on drug-related emergency room visits show more episodes where marijuana is involved.

The possibility that marijuana use is on the rise is worrisome. Since marijuana is by far the most widely used illicit drug, small percentage increases in use mean that large numbers of Americans have crossed the line from not breaking the drug laws to breaking them. And although marijuana is not as addictive or toxic as cocaine, its use, especially when heavy, can lead to problems of cognitive, personal, and social functioning. Perhaps the more profound worry about increased marijuana consumption is what it might portend for the use of more dangerous drugs.

One possibility is that marijuana use is a barometer of public attitudes about illicit drug use. If more people are smoking marijuana, it could reflect increased acceptance of illicit drug use in general. Or there could be a "gateway" effect. Smoking marijuana—or seeing others smoke marijuana—might make some individuals more disposed to use other drugs.

Is marijuana use increasing? There is not much indication of an across-the-board rise in the number of users—in the 1993 Household Survey, the estimated percentage of the population that smoked marijuana in the past month was virtually unchanged from the previous year. There is some evidence, however, of a rise in marijuana use among teenagers. The Household Survey reports increased use among those aged twelve to seventeen, and both the Monitoring the Future and PRIDE surveys show increased use for every student age group polled.

Among problem drug users—those whose drug consumption is connected with criminal activity or severe health problems—indicators of marijuana smoking are difficult to interpret. Data from the Drug Use Forecasting Program (DUF) indicates that in 1992, for the first time in years, the percentage of arrestees testing positive for marijuana use increased. But it is hard to draw any firm conclusions from this finding. Are marijuana smokers, previously law-abiding apart from their drug use, now engaging in other crimes? Are criminally active cocaine users switching to marijuana, or simply adding it to their drug menu?

Marijuana-related emergency room episodes, as tabulated by the Drug Abuse Warning Network (DAWN), also rose in 1992. Here too, it is difficult to know what the increase implies about marijuana use. When an overdose involves marijuana and other drugs or alcohol—as the overwhelming majority of marijuana-related emergency room episodes do—rarely is marijuana principally responsible for the adverse reaction. Thus, the data could reflect a spread in marijuana smoking among those using other drugs and alcohol. On the other hand, the data are also consistent with a different story: that more marijuana smokers are becoming polydrug users, mixing marijuana with other illicit drugs and with alcohol.

To the extent that marijuana smoking has become more prevalent among certain groups, it is important to know why. Market supply conditions do not appear to be responsible. When prices are adjusted for inflation and recent increases in potency, marijuana appears to be cheaper than it was a year or two ago, but only by a few percentage points, hardly enough to explain a shift in use patterns. Availability is high: when surveyed in 1993 by the Monitoring the Future program, 83 percent of high school seniors said that marijuana was "fairly easy" or "very easy" to obtain. But this figure is actually within a percentage point of the all-time low for the survey.

A more likely cause of any upturn in marijuana smoking—at least among teenagers—is a change in attitudes and fashions. Among high school seniors, there was, from 1980 to 1991, a steady increase in the fraction of students who considered smoking marijuana once, occasionally, or regularly a "great risk." In 1992, however, the trend reversed. A similar pattern appears when high school seniors were asked whether they "disapproved" of smoking marijuana once, occasionally, or regularly. Disapproval of occasional and regular use has declined since 1990, and disapproval of trying once has declined since 1992.

It is important to note that these reported attitude changes preceded by one or two years the recent increase in self-reported use. It is also important to point out that interpretation of these results is complicated by the possibility that strongly disapproved-of behavior is more heavily underreported. If marijuana use is now viewed by students as less dangerous and more acceptable, they may be more honest in reporting their use. Thus, the apparent increase in the number of users may overstate the change in actual behavior.

Ominously, teenage attitudes about marijuana use have continued to move since then in the direction of greater acceptance. This suggests that trends in marijuana consumption and supply deserve close attention. On the consumption side, it will be important to see whether the indications of growing teenage use are confirmed by other surveys, and if similar findings appear for other age groups. Even more important to watch for is evidence of any connection with other drug or alcohol use. In terms of supply, domestic marijuana production, which seems to account for half or more of U.S. consumption on a potency-adjusted basis, is the chief concern. When valued at retail prices, domestic production is probably worth $6 to $7 billion a year.

Introduction

By most accounts, marijuana use peaked in the U.S. in 1979 and has declined steadily ever since.[1] However, there are now some indications that this downward trend has slowed, and perhaps even reversed course, among certain sectors of the population. The most recent National Household Survey on Drug Abuse (Household Survey) reports noticeable upturns in use among a number of demographic groups. So too do surveys of junior high school, high school, and college students. In most large cities, higher percentages of arrestees are testing positive for marijuana, and data on drug-related emergency room visits show more episodes where marijuana is involved.

The possibility that marijuana use is on the rise is worrisome. Since marijuana is by far the most widely used illicit drug, small percentage increases in use mean that large numbers of Americans have crossed the line from not breaking the drug laws to breaking them. And although marijuana is not as addictive or toxic as cocaine, its use, especially when heavy, can obviously lead to problems of cognitive, personal, and social functioning. Perhaps the more profound worry about increased marijuana consumption is what it might portend for the use of more dangerous drugs.

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other drugs.

This report provides a summary and analysis of current evidence of trends in marijuana consumption and supply. The report also derives an estimate of total U.S. marijuana consumption and compares the estimate to others that have been produced.

Footnote

1 See, e.g., Herbert Kleber, "Our Current Approach to Drug Abuse—Progress, Problems, Proposals," *New England Journal of Medicine* 330 (5 Feb. 1994):361-365.

Marijuana Consumption

INDICATORS OF USE

There are two basic sources of information on drug use: surveys and field research (participant observation, direct observation, case studies). The great strength of surveys is that they can describe, with known accuracy and consistency, the characteristics of large populations. Surveys are also apt to be superficial. Field research can provide more depth of understanding, for it involves detailed study of attitudes and behaviors, with particular attention paid to social context and processes.[1] However, because field research is qualitative rather than quantitative, and because its findings have been filtered through the lens of researchers, any conclusions must be considered suggestive.

A literature review failed to reveal any field research specifically addressing recent developments in marijuana use. This is unfortunate, because such research might provide a better understanding of the social and cultural factors motivating these changes. In the absence of such work, we will rely exclusively on surveys.

Drug use surveys vary greatly, both in terms of subject population and measurement technique. The Household Survey, for example, casts a broad net and uses self-reporting for collecting information. In contrast, the Drug Use Forecasting Program (DUF) focuses on a narrow segment of the population (arrestees) and uses urine tests to supplement self-reports.

Self-Report Surveys

The accuracy of self-reported surveys depends on the honesty and memory of those questioned. Because marijuana use is illegal, one can expect some number of untruthful responses.[2] It is important to note, however, that if the level of deliberate and accidental misreporting is consistent from year to year, trends in survey data may nonetheless be reliable.

The National Household Survey on Drug Abuse

The largest and most comprehensive survey of drug use in the U.S. is the National Household Survey on Drug Abuse. Administered annually since 1990, and every second or third year prior to 1990, the Household Survey polls those aged twelve and older living in households. The table below reports, for the past five surveys, estimates of the percentage of such Americans who used marijuana in the past month and in the past year.

Reported Marijuana Use, National Household Survey on Drug Abuse, 1988-1993

	1988	1989	1990	1991	1992	1993
Used in Past Month	5.9%	—	5.1%	4.8%	4.4%	4.3%
Used in Past Year	10.6%	—	10.2%	9.5%	8.5%	9.0%

NOTE: The National Household Survey on Drug Abuse was not conducted annually until 1990

Source: National Household Survey on Drug Abuse

The figures in the table offer mixed news. The good news is that marijuana use among household members is much less common now than it was in 1988; indeed, according to Household Survey estimates, the prevalence of monthly marijuana use has fallen by sixty percent since 1979. The bad news: the steady decline in use since 1979 appears to have recently stalled.

Moreover, a closer look at the 1993 survey results shows notable increases in marijuana use among youths. The table on the next page

Percentages Reporting Past Month Marijuana Use, 1991-1993

Demographic Characteristic	AGE GROUP(Years) 12-17			18-25			26-34			35 and Older			All Ages		
	1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993	1991	1992	1993
Total	4.3	4.0	4.9	13.0	11.0	11.1	7.0	8.2	6.7	2.1	1.6	1.9	4.8	4.4	4.3
Race/Ethnicity															
White	4.4	4.1	4.5	13.7	11.6	12.5	6.6	8.8	6.8	1.9	1.6	1.7	4.5	4.4	4.2
Black	4.5	3.4	5.8	14.6	11.2	9.2	11.9	8.2	9.9	3.5	2.5	2.7	7.2	5.2	5.6
Hispanic	4.6	4.8	6.7	9.1	8.0	7.8	4.2	5.6	4.1	2.3	0.7	2.9	4.3	3.7	4.7
Other	1.2	2.9	3.1	4.8	6.4	3.7	6.5	4.8	4.4	*	*	1.7	3.4	2.4	2.7
Sex															
Male	5.0	4.6	5.5	15.7	14.5	16.5	9.5	11.0	9.0	3.0	2.3	2.5	6.3	5.9	6.0
Female	3.7	3.5	4.3	10.5	7.5	5.7	4.5	5.5	4.5	1.3	1.0	1.4	3.4	2.9	2.8
Population Density															
Large Metro	4.4	4.1	5.5	12.9	12.2	9.3	8.6	8.0	6.9	2.6	2.0	1.9	5.4	4.8	4.2
Small Metro	4.7	4.7	5.2	14.5	8.7	14.5	6.2	9.1	6.9	1.8	1.1	2.3	4.8	4.0	5.0
Nonmetro	3.9	3.0	3.5	11.0	11.8	10.1	4.5	7.5	6.0	1.6	1.5	1.4	3.7	4.0	3.5
Region															
Northeast	3.7	2.9	5.0	14.7	13.4	12.2	6.2	9.1	7.3	2.8	0.9	1.4	5.2	4.2	4.2
North Central	4.6	4.7	5.0	11.5	9.0	10.2	7.6	5.9	5.2	2.0	1.8	1.5	4.6	3.7	3.5
South	3.9	3.2	3.7	12.1	10.6	11.2	5.6	7.7	6.1	1.7	1.1	2.1	4.2	3.9	4.3
West	5.5	5.7	6.7	14.8	11.5	10.9	9.2	10.8	8.7	2.3	3.0	2.7	5.8	6.0	5.5
Adult Education															
Less Than High School	N/A	NA	N/A	16.0	14.0	15.1	11.7	9.5	10.0	1.3	1.6	1.2	5.1	4.5	4.3
High School Graduate	N/A	NA	N/A	13.0	11.8	11.6	8.3	8.5	8.3	2.5	1.5	2.0	5.5	4.6	4.8
Some College	N/A	NA	N/A	12.7	9.8	9.8	6.2	9.1	6.3	3.2	1.3	2.5	6.0	4.8	4.9
College Graduate	N/A	N/A	N/A	7.7	5.5	6.7	3.3	6.3	3.8	1.4	2.1	2.1	2.4	3.4	2.9
Current Employment															
Full-time	N/A	N/A	N/A	11.1	10.3	11.4	6.5	7.9	6.2	3.0	1.7	2.5	5.0	4.5	4.6
Part-time	N/A	N/A	N/A	14.4	10.1	10.4	5.8	8.4	8.6	1.9	1.4	2.5	6.3	5.3	6.1
Unemployed	N/A	N/A	N/A	17.4	19.6	19.0	19.8	15.8	12.9	7.7	4.8	2.5	13.6	11.7	9.5
Other	N/A	N/A	N/A	13.1	8.5	8.0	3.9	5.1	4.7	0.4	1.1	1.0	2.4	2.3	2.1

N/A Not applicable
* Low precision; no estimate reported

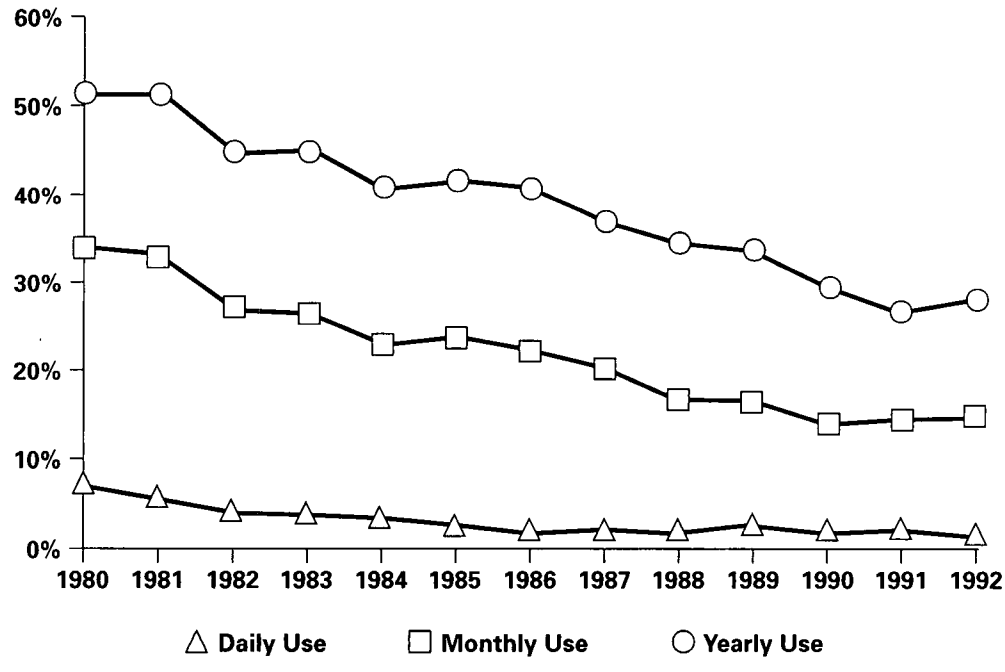
Source: SAMHSA, Office of Applied Statistics, National Household Survey on Drug Abuse

reports, for the 1991, 1992, and 1993 surveys, past month marijuana use for a number of age groups and demographic characteristics. In every demographic group, there is an increase in past month marijuana use among those aged twelve to seventeen. It should be noted, however, that none of these increases is considered statistically significant (at a five percent level of significance).

The Monitoring the Future Survey

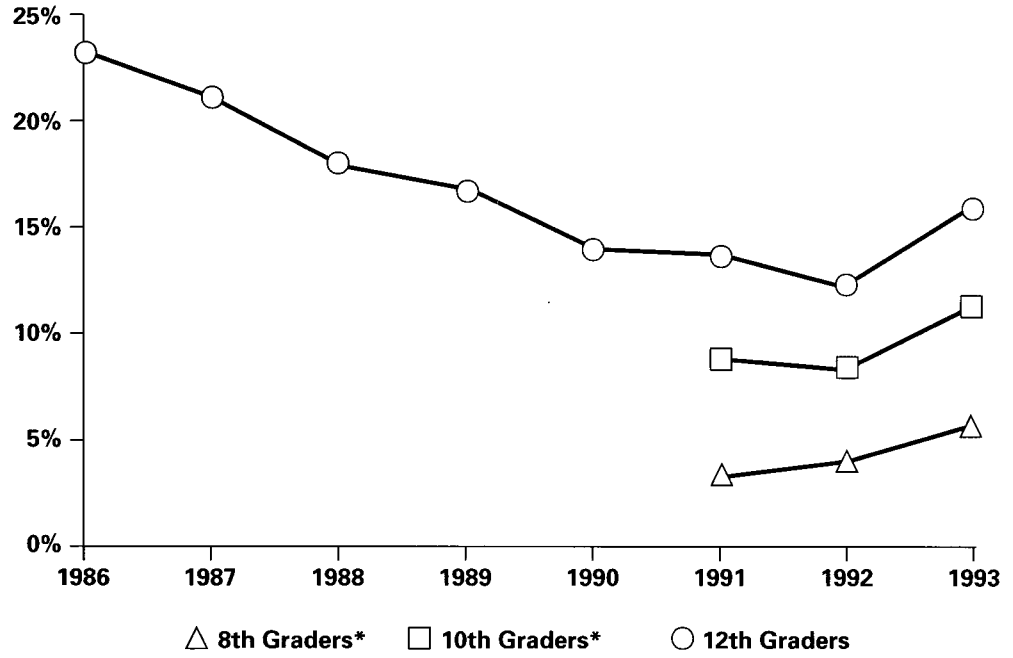
The Monitoring the Future survey (sometimes referred to as the High School Senior Survey) surveys college students and students in the eighth, tenth, and twelfth grades. The survey is an important supplement to the Household Survey. For one thing, prior to 1991, the Household Survey did not include in its panel college students living in dormitories. More important, the Monitoring the Future survey may receive fewer dishonest responses, since many of the Household Survey interviews of adolescents are conducted in the presence of parents. On the other hand, the Monitoring the Future survey does not interview school dropouts, some of whom are reached by the Household Survey.

Reported Marijuana Use Among College Students, 1980-1992



Source: Monitoring the Future

Reported Past Month Use Among 8th, 10th, and 12th Grade Students, 1986-1993



NOTE: Surveys of 8th and 10th graders began in 1991

Source: Monitoring the Future

The figure on the preceding page shows reported daily, monthly, and yearly use among college students since 1980. Note that, despite a sharp decline over the course of the entire period, rates appear to have steadied or increased in recent years. Daily use has been level since 1986; monthly use began increasing in 1991; and yearly use increased in 1992.

Such a change in trend is even more evident among eighth, tenth, and twelfth grade students. As illustrated in the figure above, monthly use has increased since 1991 for eighth graders, and since 1992 for tenth and twelfth graders.

PRIDE Survey of Secondary School Children

Each school year, PRIDE, a national drug prevention organization based in Atlanta, conducts a survey of over 200,000 primary and secondary school students (sixth through twelfth grade), asking about the use and availability of drugs and alcohol. One should be careful in drawing broad conclusions from the survey's results; unlike the Monitoring the

Future survey, the PRIDE survey is not a probability sample of the nation's students. Specifically, students in southeastern states are overrepresented, while students in populous states are given too little weight. Also, as in the Monitoring the Future survey, non-student youths are not included in the sample.

With this caveat in mind, the table below reports figures on marijuana use from the 1990-91, 1991-92, and 1992-93 school year surveys. The data suggest that there were across-the-board increases in past-year marijuana use among white and black junior high and senior high students from the 1991-92 to 1992-93 school years. The jumps were slightly greater among black students, although, with the exception of junior high males, marijuana use is still more prevalent among white students. Use overall began increasing in the 1991-92 school year among junior high students. (Prior to the 1991-92 survey, PRIDE did not report data by race and sex.)

Reported Past Year Marijuana Use Among Junior and Senior High School Students

	Junior High (6-8th Grades)			Senior High (12th Grades)		
	1990-91	**1991-92**	**1992-93**	**1990-91**	**1991-92**	**1992-93**
Total	4.5%	4.8%	5.8%	16.9%	16.4%	19.0%
White						
Male	—	5.8%	6.4%	—	20.3%	22.4%
Female	—	3.3%	3.9%	—	15.0%	17.0%
Black						
Male	—	4.5%	7.7%	—	13.2%	19.0%
Female	—	1.9%	3.8%	—	5.6%	9.7%

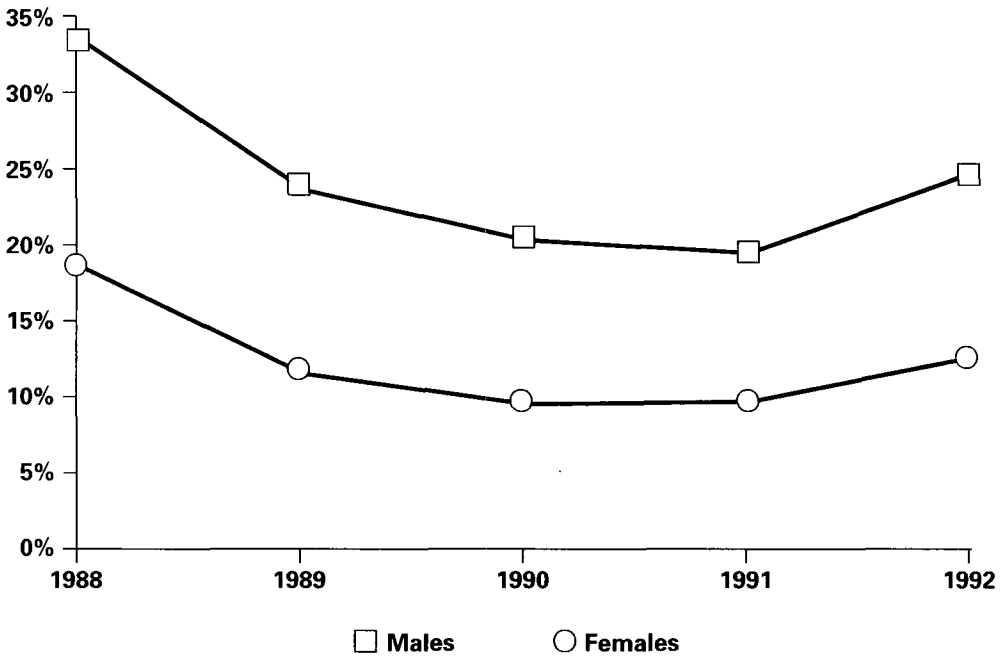
NOTE: PRIDE did not begin reporting data by sex and race until its 1991-92 report.

Source: PRIDE

Drug Testing of Arrestees

The Drug Use Forecasting Program (DUF), administered by the National Institute of Justice, conducts drug testing and interviews of arrestees in twenty-four cities. DUF data make two important contributions to

Percentage of Arrestees Testing Positive for Marijuana, all DUF Sites, 1988-1992



NOTE: Sites are weighted by the number of crimes in their city.

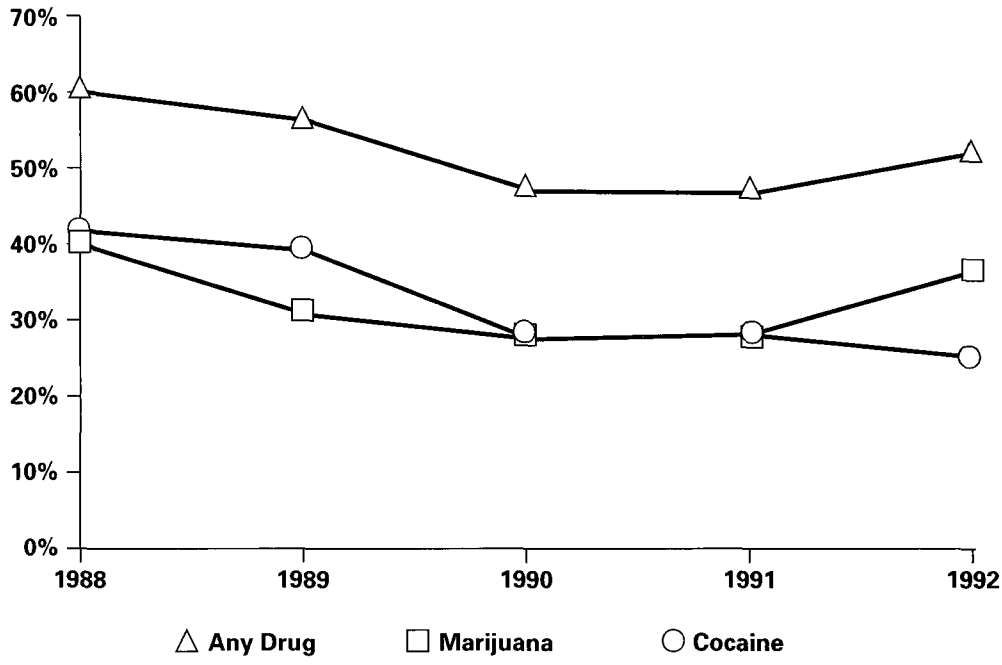
Source: Drug Use Forecasting Program

tracking trends in marijuana use. First, those who are criminally active are not only likely to go uncounted in population based surveys like the Household Survey, but also tend to have particularly high rates of substance abuse. (Whether DUF is a representative sample of the criminally active in the covered metropolitan areas depends on arrest patterns.) Second, urine tests do not suffer the misreporting problems inherent in self-report surveys.

DUF data are reported only on a city-by-city basis. To obtain an overall index, we constructed a weighted average based on the number of reported crimes in each city. The chart above shows the calculated percentage of male and female arrestees that tested positive for marijuana from 1988 to 1992. As indicated, the percentage of arrestees testing positive for marijuana declined from 1988 to 1991, but rose from 1991 to 1992.

Among arrestees, marijuana use varies significantly across age groups. Use is most prevalent among juveniles and young adults, and so it is worth looking at these groups in isolation. To do this, we constructed

Positive Drug Tests Among Male Arrestees Aged 15-20, all DUF Sites, 1988-1992



NOTE: Sites are weighted by the number of crimes in their city.

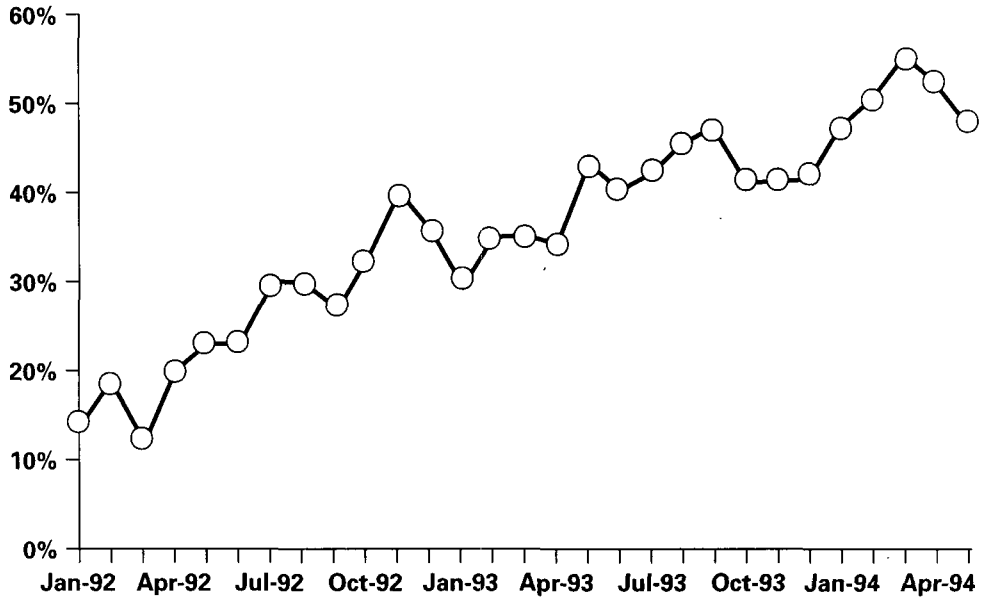
Source: Drug Use Forecasting Program

another weighted average, in this case using only males aged fifteen to twenty. The figure above shows the calculated data.[3] Again, the percentage of arrestees testing positive for marijuana use increased noticeably in 1992.

Several different mechanisms could lead to an increase in the number of criminally active marijuana users reflected in increased DUF marijuana positives. Non-criminal (apart from their drug use) marijuana users could become criminal; criminally active cocaine users could switch to marijuana; criminally active heroin users could begin using marijuana in addition to heroin; and so on. The graph shows that the increase in positive marijuana tests was similar in magnitude to the decrease in cocaine positives. This is consistent with the idea of young cocaine users switching to marijuana, though direct evidence of such a pattern has not been observed.

DUF is not the only program that conducts drug testing of arrestees; a few local programs do, as well. Perhaps the largest of these is the pro-

Juvenile Arrestee Marijuana Use, Washington, DC, January 1992-May 1994



Source: Data from the D.C. Pretrial Services Agency

gram that tests juvenile arrestees (including those as young as eight years old) in Washington D.C., administered by the D.C. Pretrial Services Agency. Because large numbers of arrestees are tested on a regular basis, the D.C. Pretrial Services Agency can report data on a monthly basis. Test results dating from January 1992 are summarized in the chart above. The increase in positive marijuana tests is startling.

Although an increase in the percentage of arrestees testing positive for marijuana suggests an increase in the absolute number of criminally active marijuana users, there are other possible explanations. Suppose, for example, that the number of criminally active marijuana users declined, while the number of criminally active non-marijuana users (those who do not use drugs, as well as those who use drugs other than marijuana) declined proportionately more. In that case, we would expect marijuana users to comprise a greater share of arrestees, even though their absolute number decreased. In principle, there are several other factors that could also account for the observed trend: a rise in crime or arrest rates among criminally active marijuana users, or a

decline in crime or arrest rates among criminally active non-marijuana users. Another problem with the arrestee data is that it is drawn from urban areas only. It is possible that drug use among arrestees in non-urban areas is quite different from that in urban areas.

Marijuana-Related Emergency Room Mentions

The principal source of data on drug-related emergency room mentions is the Drug Abuse Warning Network (DAWN), until recently managed by the National Institute on Drug Abuse (NIDA), but now under the auspices of the Substance Abuse and Mental Health Services Administration (SAMHSA).

DAWN reports a large increase (48 percent) in the number of marijuana-related emergency room mentions between 1991 and 1992. As can be seen in the table below, there were also large reported increases in cocaine and heroin mentions. (A detail of DAWN data, tabulated by population and city, is included in the appendix.)

Drug-Related Emergency Room Mentions (Estimated Rate per 100,000 Population)

	1988	1989	1990	1991	1992	Percentage Increase in Mentions, 1991-1992
Drug						
Cocaine	46.7	50.1	36.2	45.2	52.9	17%
Heroin	17.5	19.0	15.3	16.0	21.2	33%
Marijuana/Hashish	9.2	9.4	7.1	7.3	10.6	45%

Source: Drug Abuse Warning Network

What is not clear is how much of this increase is due to polydrug use (marijuana used in conjunction with other drugs or alcohol) as opposed to marijuana smoking alone. It is a good bet that most of the increase is attributable to a rise in polydrug mentions, since episodes involving marijuana alone are relatively rare. In 1992, DAWN estimated 23,997 emergency room mentions of marijuana; of these, 13,025 also involved alcohol, and 9,689 also involved cocaine. Alcohol and cocaine mentions also rose sharply from 1991 to 1992.

To the extent that the rise in marijuana-related emergency room mentions is a product of polydrug use, it is difficult to know what the increase implies about marijuana use. When an overdose involves marijuana and other drugs or alcohol, rarely is marijuana principally responsible for the adverse reaction. On the one hand, the data could reflect a spread in marijuana smoking among those using other drugs and alcohol. On the other hand, the data are also consistent with a different story: that marijuana smokers are more commonly using other drugs and alcohol.

Overall, marijuana appears to play a small role in drug-related overdoses. The table below shows, for 1988 to 1992, the proportion of drug-related emergency room episodes that involved alcohol (in combination with other drugs), cocaine, and marijuana. Marijuana was involved in only 5.5 percent of the episodes in 1992, and unless past patterns have changed radically, other illicit drugs or alcohol were also involved in the overwhelming majority of those cases.

Percentage of DAWN Emergency Room Episodes Involving Alcohol, Cocaine, and Marijuana

	1988	1989	1990	1991	1992	Percentage Increase in Proportion 1991 to 1992
Alcohol in Combination	28.7%	29.6%	31.0%	30.9%	32.7%	6%
Cocaine	25.2%	25.8%	21.6%	25.7%	27.6%	7%
Marijuana/Hashish	5.0%	4.8%	4.2%	4.2%	5.5%	33%

Source: Drug Abuse Warning Network

Drug Abuse Treatment

According to data compiled by the Substance Abuse and Mental Health Services Administration and the National Institute on Drug Abuse, there has been, since the mid-1980's, a substantial increase in reported admissions to treatment programs where marijuana is the primary drug of abuse. (See table on next page.)

Were these data to reflect an increase in the underlying demand for marijuana treatment, they would suggest a notable rise in problem marijuana consumption.[4] However, there are a number of reasons for

Client Treatment Admissions, Top Three Primary Drugs of Abuse, FY 1985-1991

	1985	1986	1987	1988	1989	1990	1991
Heroin	87,043	82,927	94,299	115,308	122,612	153,852	142,372
Cocaine	38,323	55,757	81,356	137,343	206,480	235,202	229,703
Marijuana/ Hashish	57,578	68,491	57,473	76,948	95,253	106,885	96,421

Source: SAMHSA, NIDA

discounting their significance. For one thing, the data are widely acknowledged to be an unreliable indicator of use. Several problems stand out in this regard: (1) there is no accepted federal standard of what does and does not constitute a treatment program; (2) data are submitted voluntarily by State Alcohol and Drug Abuse Agencies, and include data "*for only those programs which received at least some funds administered by the State Alcohol/Drug Agency*"[5]; and (3) since in many areas of the country there is unmet demand for drug treatment—as evidenced by waiting lists for programs—a rise or fall in admissions may denote a change in supply rather than demand.

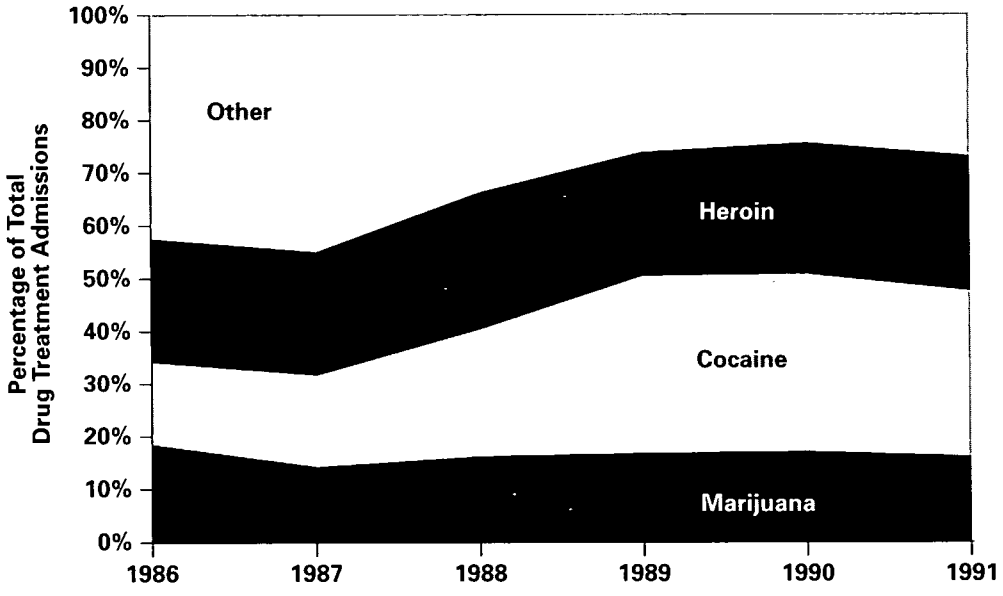
Since it is likely that these problems would affect data on treatment admissions for all drugs, it is probably more useful to look at the share of admissions where marijuana is the primary drug of abuse. This, at least, might indicate whether marijuana abuse was growing or shrinking in comparison to the abuse of other drugs.

The figure on the next page shows the relative percentage of treatment admissions where marijuana, cocaine, heroin, or some other drug was the primary drug of abuse. It does not appear, from this data, that marijuana abuse is increasing as a proportion of total drug abuse.

ESTIMATES OF TOTAL U.S. MARIJUANA CONSUMPTION

For policy purposes, it would be quite valuable to have an accurate estimate of total U.S. marijuana consumption. On the demand side, it would improve understanding of the use problem. On the supply side, it would enable law enforcement officials to better gauge the size of the illicit market and the achievements of their eradication and interdiction efforts.

Proportion of Drug Treatment Admissions Involving Marijuana, Cocaine, and Heroin



Source: DAWN Reports

In the pages that follow, we derive an estimate of total U.S. marijuana consumption based on data from the self-report surveys examined earlier in the report. We calculated the number of marijuana smokers using data from three government drug use surveys: the National Household Survey on Drug Abuse, the Monitoring the Future survey, and the Drug Use Forecasting Program. Information on user consumption levels was obtained from Household Survey data and through a telephone survey of 46 current marijuana users. The survey sample was an attempt at a cross-section of marijuana users, at least in terms of socioeconomic status and consumption levels, though not by geography; of those interviewed, half resided in or near Boston, Massachusetts, while half lived in other parts of the country. More detailed information on the user survey can be found in the Appendix.

Calculating User Consumption Levels

From the Household Survey and our user surveys, we were able to construct a probability distribution of consumption levels (or habit sizes)

among marijuana smokers. The Household Survey provides useful data on quantity and frequency of use among monthly users, and data on frequency of use among yearly users. Where quantity figures were unavailable, frequency was multiplied by an estimate of per-use consumption. (We estimate that marijuana users consume an average of about one fiftieth of an ounce, or roughly one half of a gram, to get high, and that the average size of a joint is one sixtieth of an ounce.)

Consumption by Users in Households

The Household Survey provided an estimate of the number of marijuana users residing in households. We revised (increased) the Household Survey estimates slightly to account for two instances of apparent underreporting. Those who were interviewed in a more private setting reported higher levels of use than those interviewed with others (sometimes parents) present. Also: the Household Survey estimates lower levels of use among teenagers than the Monitoring the Future survey. From our analysis, we estimate that in 1992, approximately 1,220 metric tons of marijuana were consumed in households.

College Students

Prior to 1991, the Household Survey sample did not cover college students living in dormitories. Thus, for our 1988 and 1990 consumption estimates, data from the Household Survey were supplemented with data from the Monitoring the Future survey, which does interview dormitory residents. We estimate that college students in dormitories consumed approximately 59 metric tons in 1990, the last year in which dormitory residents were not covered by the Household Survey.

Criminally Active Users

Those who are criminally active are likely to go uncounted in the Household Survey. To determine quantity consumed by this population, we examined DUF data on urine tests and self-reported use among arrestees. We estimated monthly marijuana consumption both among those who tested positive for marijuana use and those who tested negative. (Interestingly, about one-third of those who tested negative reported use.) Then, following the synthetic estimation methodology employed by Abt Associates,[6] we combined these figures with data on

arrest numbers and frequencies to estimate total marijuana consumption among the criminally active. We estimate that criminally active users consumed 379 metric tons of marijuana in 1992.

Total Marijuana Consumption

Combining the above numbers, we estimate that total U.S. marijuana consumption for 1992 was 1,599 metric tons. It should be noted that this estimate has some weaknesses. For starters, it probably misses marijuana consumption in some particularly isolated or difficult-to-reach populations, such as the homeless or transients. However, drug use in the populations, while significant, is probably very small compared to the populations that our methodology covered.

Our estimate may also understate marijuana consumption if underreporting is common in self-report surveys. Although adjustments were made where there was evidence of misreporting, we did not make any across-the-board corrections. While there is ample evidence that errors in reporting do occur, the overall magnitude and direction of the errors are unclear.

A final area of concern: a sizable percentage (16 percent in 1991) of those selected for polling by the Household Survey were not surveyed, either because a meeting could not be arranged or because the interview was refused. It is possible that these individuals differ in their marijuana use patterns from those who were surveyed.

The combined biases of misreporting and nonresponse may be significant. It is worth pointing out that an estimate of total U.S. alcohol consumption calculated from the Household Survey appears to be low by about half. According to data from Household Survey, Americans consume fewer than 50 billion drinks per year; revenues from alcohol taxes indicate annual consumption of more than 100 billion drinks.[7] Similar calculations with tobacco indicate that cigarette smokers underreport their consumption by about 30 percent.

Trends in Marijuana Consumption

In order to examine recent trends in marijuana consumption, we calculated our consumption estimates for 1988, 1990, 1991, and 1992 (the Household Survey was not conducted in 1989). We also translated con-

sumption estimates into retail dollar and THC (tetrahydrocannabinol) equivalents.[8] Since THC is the psychoactive agent in marijuana, and since the potency of marijuana varies greatly, THC consumption is in some ways the most relevant estimate of marijuana use.

The table below reports, for the years analyzed, estimates of gross marijuana and equivalent THC consumption (both in metric tons), as well as implied retail cost (in billions of dollars). As indicated, gross consumption appears to have declined from 1988 to 1991 among each user population. From 1991 to 1992, gross consumption appears steady, but with an increase among those involved with the criminal justice system.

Estimated U.S. Marijuana Consumption in 1988, 1990-1992 by Sub-Population

	1988	1989	1990	1991	1992
Households (Gross Metric Tons)	1,871	—	1,528	1,326	1,220
College Students (Gross Metric Tons)	77	—	59		
Criminally Active (Gross Metric Tons)	375	—	363	358	379
Total (Gross Metric Tons)	2,323	—	1,950	1,684	1,599
Total (Metric Tons of THC)	102	—	94	81	84
Retail Cost in Billions (nominal dollars)	$14.0	—	$14.4	$13.2	$13.1
Retail Cost in Billions (1992 dollars)	$16.6	—	$15.5	$13.5	$13.1

NOTE: The National Household Survey on Drug Abuse was not conducted in 1989.

THC consumption declined similarly from 1988 to 1991, with a slight decline as well from 1991 to 1992. Because of fluctuations in marijuana prices, retail cost estimates suggest a somewhat different pattern. Dollars spent on marijuana were relatively unchanged between 1988 and 1992, except for a sharp drop in 1990.[9]

Footnotes

1 See, e.g., Norman Zinberg, *Drug, Set, and Setting: The Basis for Controlled Intoxicant Use* (New Haven: Yale Univ. Press, 1984); Bruce D. Johnson, Paul J. Goldstein, Edward Preble, James Schmeidler, Douglas S. Lipton, Barry Spunt, and Thomas Miller, *Taking Care of Business: The Economics of Crime by Heroin Users* (Lexington, Mass.: Lexington Books, 1985).

2 However, one would expect self-reports of marijuana use to be more accurate than self-reports of other illegal drug use (such as cocaine or heroin use), since marijuana is the most widely used and least disapproved-of illegal drug.

3 It should be noted that the data reports only on those who were tested by the DUF program at adult booking facilities. DUF does conduct some testing and interviews at juvenile facilities; however, as of 1992, such sampling covered only twelve cities.

4 Aging of the user population can increase the demand for treatment, but probably not by enough to explain the sharp upturn shown in the table.

5 National Institute on *Drug Abuse, State Resources and Services Related to Alcohol and Other Drug Abuse Problems, Fiscal Year 1990* (Washington, D.C.: U.S. Department of Health and Human Services, 1991).

6 For an explanation, see William Rhodes, "Synthetic Estimation Applied to the Prevalence of Drug Use," *Journal of Drug Issues* 23 (Spring 1993):297-322.

7 See Congressional Budget Office, *Federal Taxation of Tobacco, Alcoholic Beverages, and Motor Fuels* (Washington, D.C.: Congress of the United States, 1990), table A-8, p. 110.

8 THC quantities were calculated using potency estimates derived from DEA data. For more detail, see the "Price, Potency, and Availability" section later in the report.

9 Our estimates of total spending on marijuana are approximately seventy percent higher than those derived for ONDCP by Abt Associates. See William Rhodes, Paul Scheiman, and Kenneth Carlson, *What America's Users Spend on Illegal Drugs, 1988-1991* (Washington, D.C.: Office of National Drug Control Policy, 1993). For example, Abt's estimate of total spending for 1991 is $7.69 billion, whereas our estimate is $13.1 billion. The difference can be accounted for by three factors. First, because of methodological differences in approximating from Household Survey data the number of marijuana users and their average consumption, our estimate of marijuana consumption among those populations represented in the Household Survey is twenty percent higher than the comparable Abt estimate. Second, Abt did not calculate a separate estimate for marijuana consumption among the criminally active. Third, Abt's calculations for 1991 were based on an average marijuana price of $195 per ounce; our calculations assumed a price of $222 per ounce.

Attitudes About Marijuana

Changes in public attitudes about any drug are likely to influence consumption. This is especially true in the case of marijuana, where most users are otherwise law-abiding and mainstream. In contrast, many of the heaviest cocaine and heroin users are socially isolated and disengaged, and so their drug use is less likely to respond to general public attitudes.

There is some evidence that anti-marijuana attitudes, after a decade of hardening, have begun to soften.

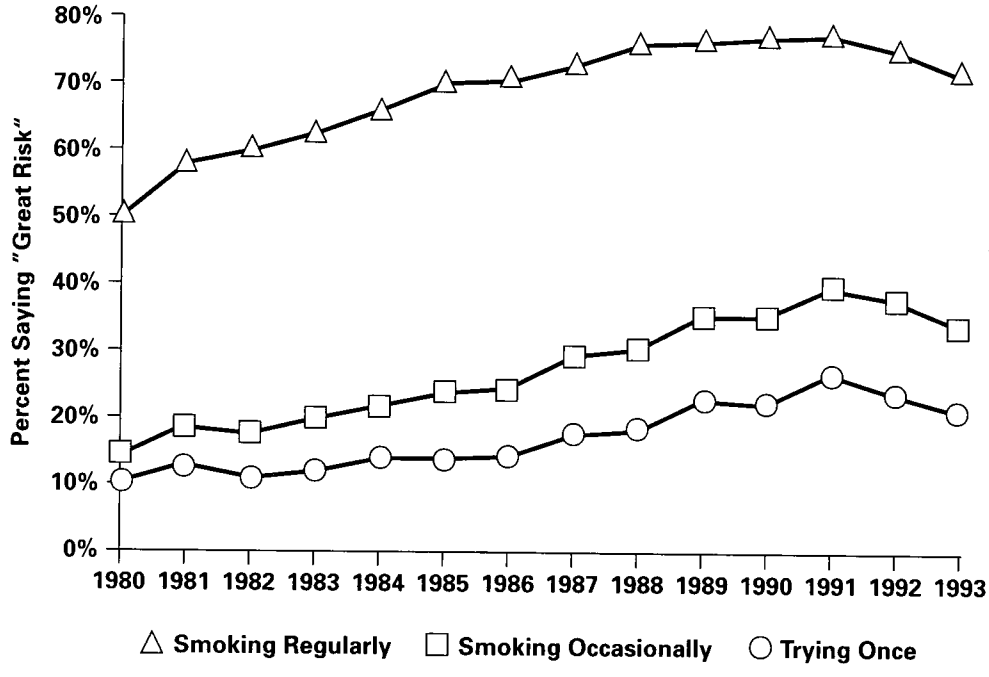
HARMFULNESS AND DISAPPROVAL

The Monitoring the Future survey asks respondents their views about the level of risk associated with marijuana use. The chart on the next page shows the percentage of high school seniors who perceived a "great risk" in smoking marijuana once, occasionally, and regularly. From 1980 to 1991 there was a steady increase in the fraction of students perceiving great risk. Beginning in 1991, however, the trend reversed.

A similar pattern appears when high school seniors were asked whether they "disapproved" of smoking marijuana once, occasionally, or regularly. As the chart that follows shows, disapproval of occasional and regular use appears to have declined since 1990. Disapproval of trying once increased until 1992, and then declined sharply.

It is important to note that the attitude changes reported in the Monitoring the Future survey preceded the increase in self-reported use. It

High School Seniors' Opinions of the Harmfulness of Marijuana Use

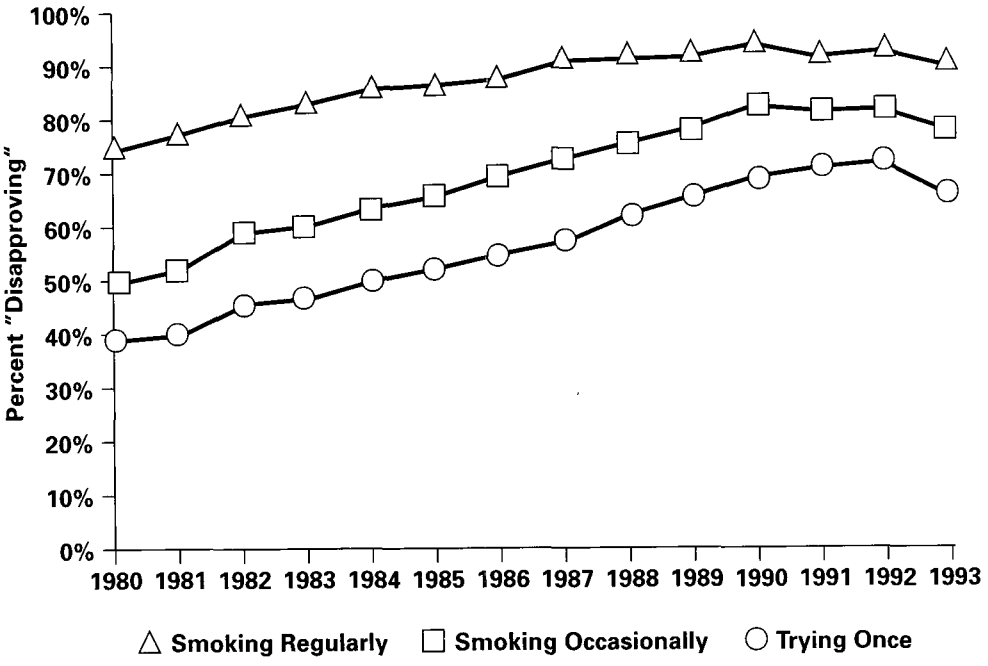


Source: Monitoring the Future

is also important to point out that interpretation of these results is complicated by the possibility that strongly disapproved-of behavior is more heavily underreported. If marijuana use is now viewed by students as less dangerous and more acceptable, they may be more honest in reporting their use. Thus, the apparent increase in the number of users may overstate the change in actual behavior.

The PRIDE survey asks students in grades six through twelve for their opinions on the harmfulness of marijuana, as well as liquor, beer, cocaine, and other drugs. The graph on page 34 reports grade-by-grade opinions, for the 1992-93 school year, on the harmfulness of these substances. Students see marijuana as more harmful than liquor and beer, but less harmful than cocaine. Particularly interesting are the apparent relationships between risk perception and age. Older students are less likely to view marijuana (and beer and liquor) as harmful, while they are more inclined to regard cocaine as dangerous.

High School Seniors' Disapproval of Marijuana Use



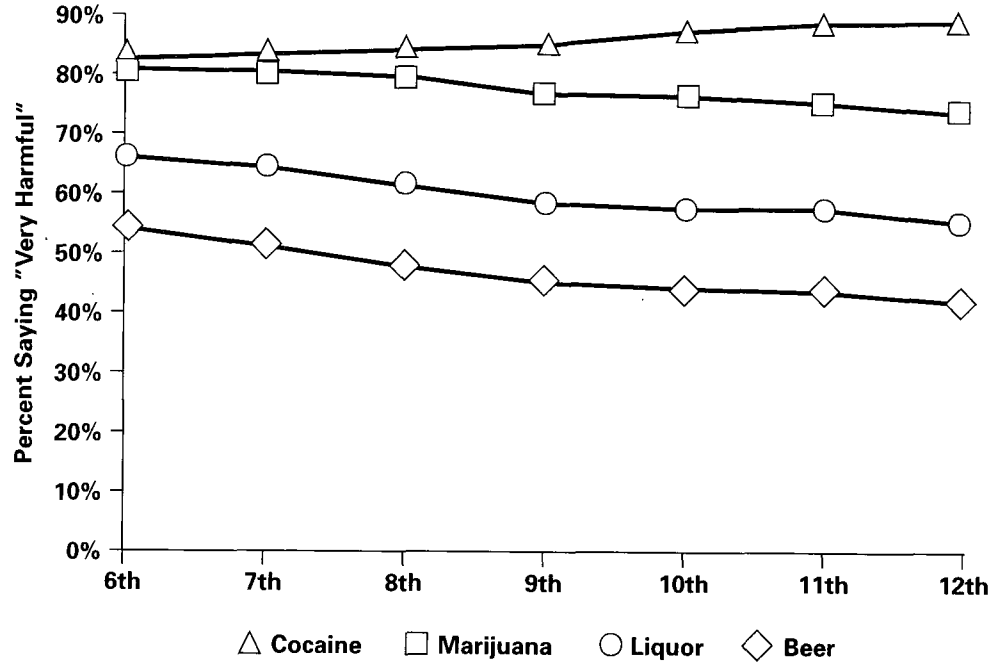
Source: Monitoring the Future

LEGALITY

There is no necessary connection between an individual's position on marijuana legalization and his or her attitude about or propensity to use marijuana. Indeed, many of those who advocate drug legalization are vehemently opposed to drug use, just as most of those who are strongly against cigarette smoking do not think that tobacco should be outlawed. Taken as a group, however, one would expect supporters of marijuana legalization to have comparatively benign views about its use, and be more likely to use themselves (presumably marijuana smokers would feel better about their lawbreaking if they disagreed with the law).

According to a survey by the Higher Education Research Institute survey, the percentage of college freshman who believed that marijuana should be legalized declined from 1980 to 1990, but has risen since.

Opinions on Harmfulness of Marijuana, Alcohol, Cocaine, by Grade (1992-93)

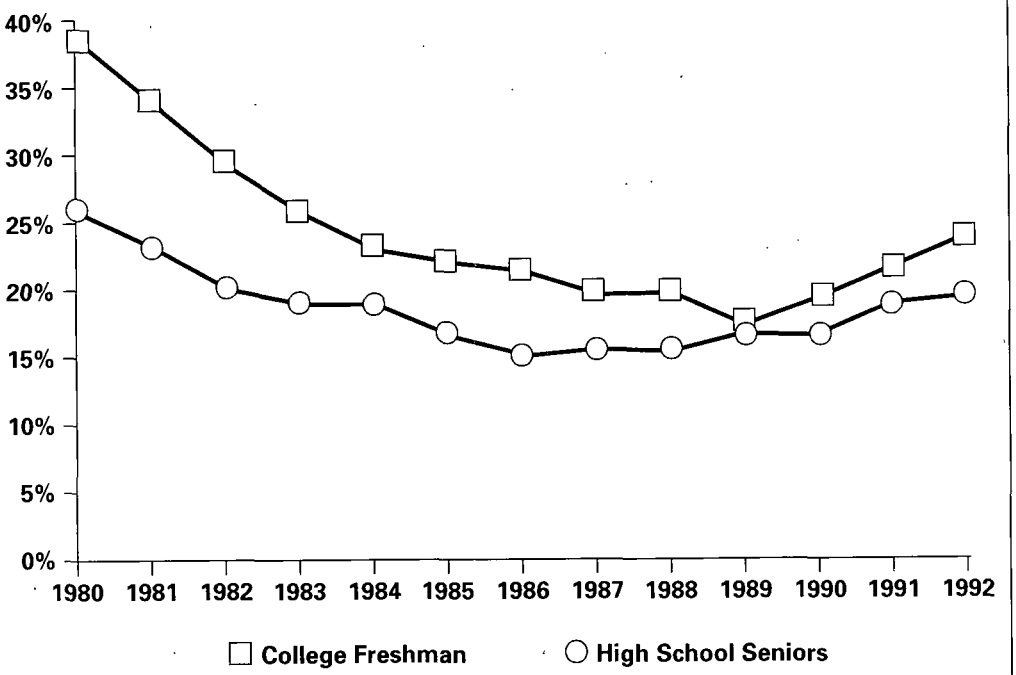


Source: PRIDE

The Monitoring the Future survey reports a similar turnaround among high school seniors: a decline since 1990 in the percentage who believe that marijuana use should be a crime, and an increase since 1986 in the percentage who believe that marijuana should be entirely legal.

Some of these results are summarized in the figure on the next page.

Opinions on Marijuana Legalization, College Freshman and High School Seniors



Source: HERI American Freshman Survey, Monitoring the Future

Marijuana Supply and Sales

PRICE, POTENCY, AND AVAILABILITY

Consumption of marijuana, like the consumption of any commodity, is influenced by its price. Other things being equal, one expects falling prices to be accompanied by increased use, and rising prices to go with falling consumption.

The Drug Enforcement Administration (DEA) has reported a rise in marijuana prices over the last several years, and an increase in potency throughout the 1980's and early 1990's. However, in the case of marijuana, DEA's price and potency estimates are not the result of systematic sampling or data analysis. (Considerably more effort is placed on price and purity estimates for cocaine and heroin.) For prices, DEA simply reports a range of low and high prices for a given period. With potency, averages are calculated, but the methodology behind these averages is unclear.

The DEA's drug evidence tracking database, STRIDE (System to Retrieve Information from Drug Evidence), does contain information from marijuana purchases. Yet the number of these purchases, especially at the retail level, is limited. More problematic still is that STRIDE does not contain potency information of any kind, principally because determining potency for large quantities of marijuana is difficult.

In light of these problems, we supplemented DEA price data with information gathered from two user-based sources. One of these was our user survey, described earlier. The other source was price quotes reported in the leading publication devoted to marijuana use, *High Times*.

Price Trends

DEA Intelligence Price Data

DEA reports low-high ranges of marijuana prices for commercial grade marijuana and sinsemilla,[1] at pound and ounce quantities. Ranges are the easiest statistic to produce, but they are not very informative. Without some measure of central tendency, it is difficult to explore trends over time.

Moreover, DEA reports prices without adjustment for potency. This also makes it difficult to analyze trends in prices. From the perspective of users, paying $400 for an ounce of marijuana with 10 percent THC content is roughly equivalent to paying $200 for an ounce with 5 percent THC content. Yet a price comparison that is unadjusted for potency makes one purchase appear twice as expensive as the other.

DEA does provide estimates of potency. But it is probably unreasonable to assume that potency is consistent over the range of reported prices. Expensive marijuana tends to be high-potency and cheap marijuana tends to be low-potency. Since there is no reliable way of estimating the potency of high and low price marijuana, we did not construct potency-adjusted price ranges with published DEA data.

Price Information from the STRIDE Database

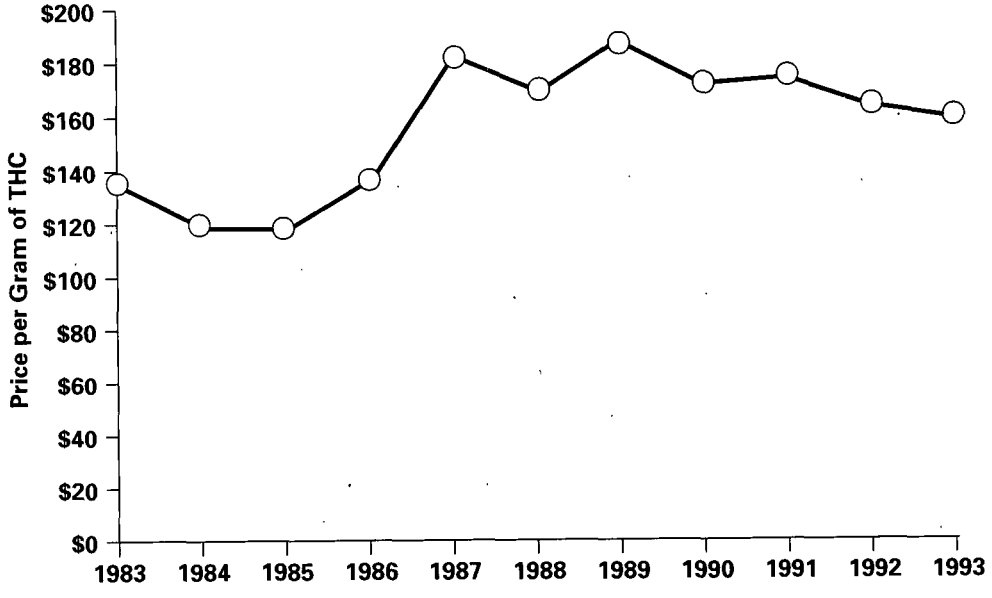
In constructing a retail price series from STRIDE, we attempted to correct for a number of data limitations. As noted above, most of the marijuana purchases recorded in STRIDE are not retail-level buys, and STRIDE does not provide information on potency.

We extracted from STRIDE all marijuana purchases from 1983 and 1993 that were between one-sixteenth of an ounce and one-and-a-half ounces in weight. (Retail marijuana purchases typically range from one-eighth of an ounce to an ounce.) Because larger buys tend to be relatively cheaper than smaller ones, we standardized the observed purchase prices to a quantity of one ounce, using a loglinear adjustment that assumed a twelve-percent discount between ounce and quarter-ounce purchases.[2] We then removed observations with prices above $500 per gram, judging them to be outliers. And to further mitigate the potential influence of outliers, we calculated median, rather than mean, prices.

To eliminate the influence of inflation, we converted the derived series of median purchase prices to 1993 dollars (using the consumer price index). Lastly, we converted the purchase-unit into a gram of THC, thereby adjusting the prices for changes in potency. To do this, we began with DEA estimates of the average THC content of high-potency (sinsemilla) and low-potency (commercial grade) marijuana. We assumed that forty percent of domestically grown marijuana, and five percent of imported marijuana, is high-potency; the remainder was assumed to be low-potency.[3] And we further assumed that the domestic share of the U.S. marijuana market increased from ten to fifty percent from 1983 to 1993.[4]

The chart below shows the derived price series. What is noteworthy is that, when inflation and increased potency are taken into consideration, the changes in marijuana prices over the past decade appear to be much more moderate than generally believed.

Retail Marijuana Price (1993 dollars), per Gram of THC, 1983-1993



NOTE: Price data for 1993 are incomplete; 1992 purity estimate was used for 1993 price calculation.

Sources: STRIDE; NNICC

User-Reported Price Data

User Survey

According to our user survey, marijuana smokers pay an average of about $55 for a quarter ounce. Adjusted for quantity discounts and potency (following the procedure used with STRIDE data), this translates into a price of $144 per gram of THC. By comparison, STRIDE data yielded an estimate of $157 per gram of THC. Most users thought that prices had not changed since the previous year (1992), but an overwhelming majority thought that they had risen over the past five years.

User Reports in *High Times*

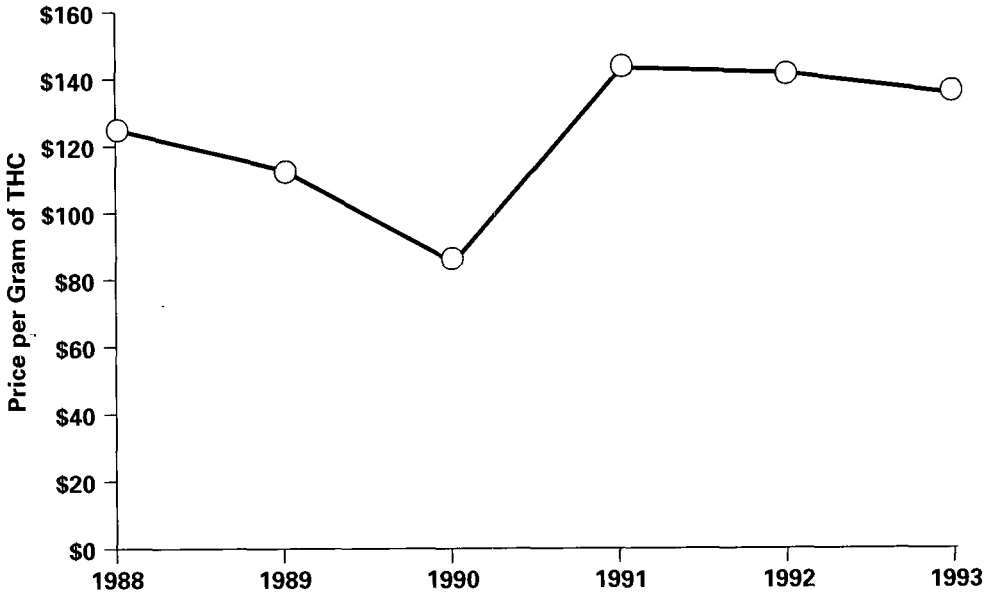
High Times magazine carries a monthly feature called Trans-High Market Quotations (THMQ), which is a compilation of price quotes that often includes additional information on quality, type, and source. The price quotes, which are voluntarily submitted, presumably by *High Times* readers (some of whom might be dealers), list the city and state of each report.

The THMQ data are not a representative sample of marijuana purchases. One would assume that those who submit price quotes to *High Times* have better-than-average contacts with marijuana suppliers. If so, then prices quoted in *High Times* are likely to be cheaper than market averages. (On the other hand, dealers who submit price quotes may overstate them in an effort to inflate the market.)

We tallied THMQ data for each month between March 1992 and October 1993, and for a few months each previous year dating back to 1988. We used only price quotes from the 10 states most commonly cited,[5] eight of which were among the ten most populous states. In compiling the data, we controlled for purchase unit, with a further adjustment for situations where an individual reported prices at two different quantities. By maintaining this information, we were able to estimate the quantity discounts available for larger purchases.

After compiling the data, we adjusted the prices for differences in potency (again using DEA potency estimates). To do this, we frequently had to guess the type of marijuana purchased, since few of the reports were explicitly identified as sinsemilla or commercial-grade. As a working

Retail Sinsemilla Price (1993 dollars), Ounce Level THMQ Purchases



NOTE: Price estimate for 1993 was calculated using 1992 estimate for potency.

Source: Abt Reports prepared for ONDCP

rule, we assumed that most, if not all, marijuana grown indoors or grown hydroponically is sinsemilla, since these production methods would be prohibitively expensive to employ in growing commercial grade. We also categorized as sinsemilla any purchase judged to be of "great" quality.

Only the ounce level purchase size had enough cases to provide a valid price series. The graph above shows the calculated price per gram of THC (in 1993 dollars) for purchases deemed to be sinsemilla. The data show prices to be slightly higher in 1993 than in 1988, partly due to a large price jump in 1991.

As noted earlier, the THMQ data allowed us to calculate quantity discounts. We found that on average a buyer received a discount of about twelve percent for buying one ounce of marijuana as opposed to buying one quarter of an ounce four times.

Trends in Potency

The table below reports DEA estimates of potency for sinsemilla and commercial grade marijuana from 1983 to 1992. Also included is an estimated market average, based on the assumption that the market share of high-potency marijuana has increased significantly since 1983.[6]

Marijuana Potency (Percentage THC Content), 1983-1992

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sinsemilla Potency	7.5	6.7	7.3	8.4	7.9	7.6	7.0	10.2	11.7	8.3
Commercial Grade Potency	2.9	3.5	3.1	3.3	3.5	3.8	3.5	3.6	3.1	3.7
Estimated Market Average	3.3	3.8	3.6	4.0	4.1	4.4	4.0	4.8	4.8	4.7

Source: NNICC and DEA Intelligence Reports

The data suggest that only about half of the increase in average potency is attributable to a rise in THC content; equally significant is the increased market share of domestically grown sinsemilla.

Two factors account for the general rise in THC content: One, particularly affecting sinsemilla, is the widespread introduction of high-technology growing methods beginning in the early 1980's.[7] The other, mostly impacting the figures on commercial-grade potency, is the declining market share of imported marijuana, which tends to be lower quality.

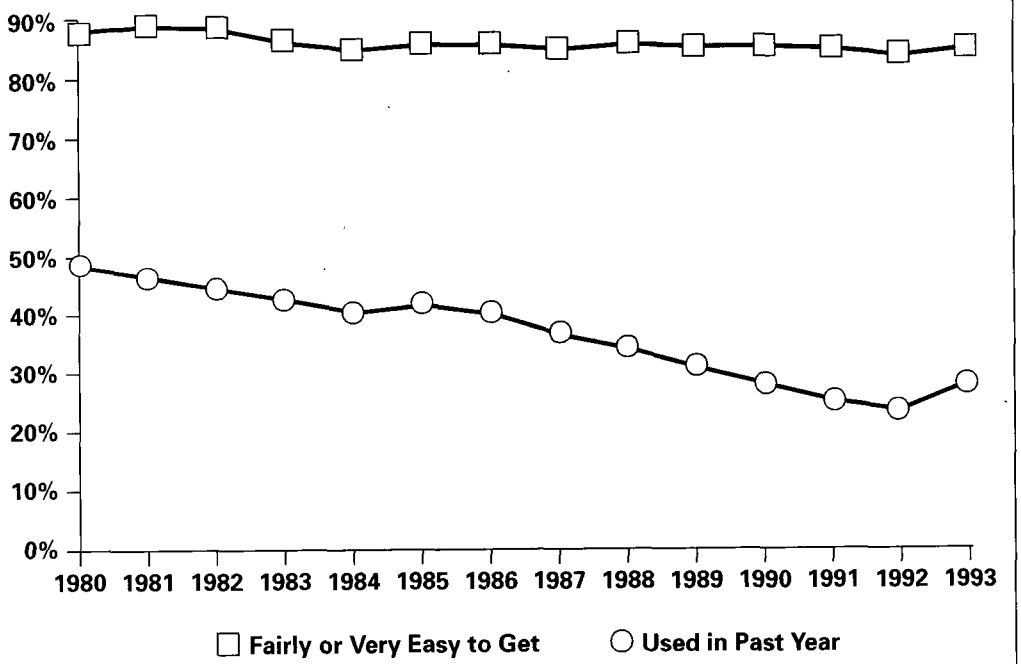
Our user survey corroborated DEA potency data. The majority of those interviewed thought that marijuana quality was about the same now as a year ago, but better than it was five years ago. However, THMQ reports suggested less of an improvement. The percentage of purchases judged "good" or "great" in quality increased only slightly between 1988 and 1993. One possible explanation: *High Times* readers were, in a sense, ahead of the curve, purchasing high-potency marijuana before it became available to less sophisticated buyers. Also, what was considered "great" in 1988 might be judged only "good" today.

The THMQ data does confirm the notion that domestically produced marijuana tends to be more potent than imported varieties. In 1993 price reports, domestic marijuana was judged to be of "great" quality 55 percent of the time, while foreign grown received this accolade only 24 percent of the time. Consistent with this quality difference, THMQ data show domestic marijuana to be consistently more expensive than imported marijuana.

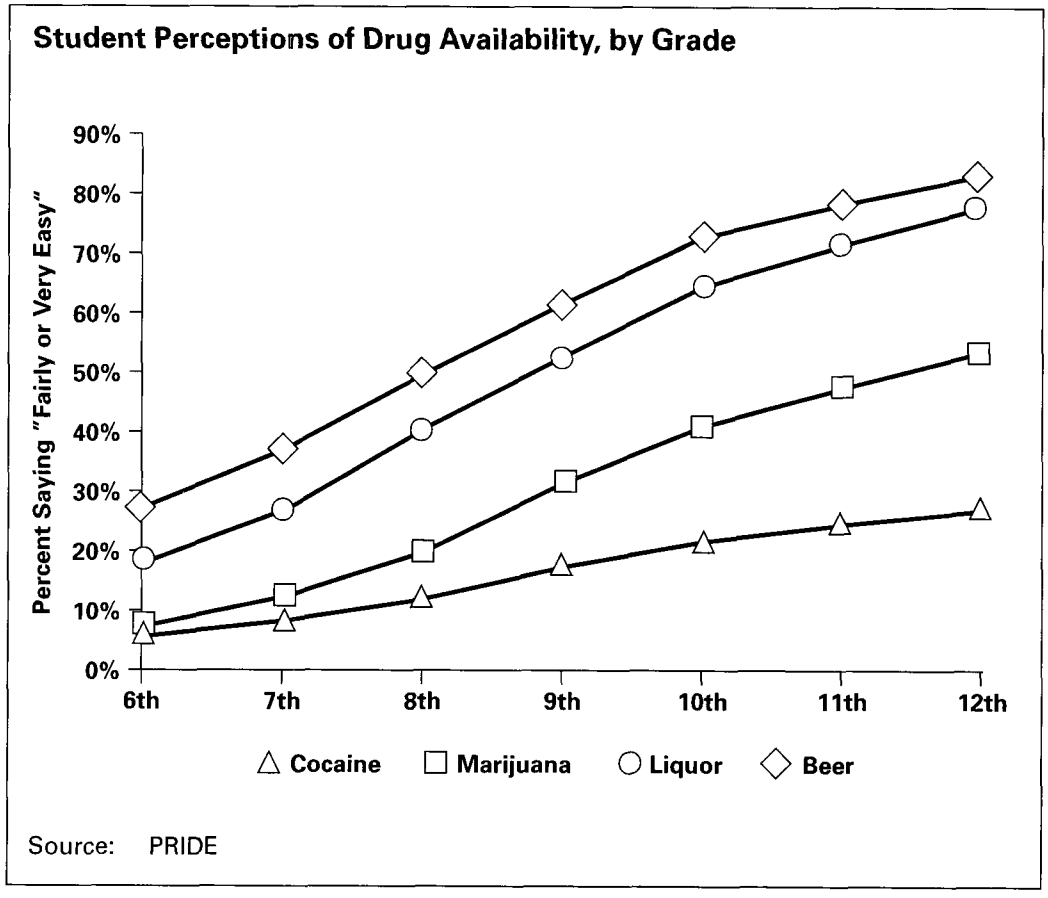
Trends in Availability

Using data from the Monitoring the Future survey, the figure below shows, for 1980 to 1993, the percentage of high school seniors who felt that marijuana was "fairly easy" or "very easy" for them to get. The figure also plots reported levels of past-year use. As indicated, perceptions of availability have fallen only slightly. But it seems hard to connect this in any way to the overall trend in use; in every year since 1980, over 80 percent of respondents thought that marijuana was fairly or very easy to obtain.

Past Year Use and Perceptions of Availability Among High School Seniors



Source: Monitoring the Future



In our user survey, we asked respondents if they thought that marijuana was more or less difficult to obtain than it was one and five years ago. The majority of users interviewed thought that marijuana was just as available as it was a year ago, but less available than five years ago.

Survey data can also indicate how availability differs across age groups. The chart above, derived from PRIDE data, compares the availability of marijuana to other drugs and alcohol across grade levels. As one would expect, all of these substances are more available to older students.

DOMESTIC PRODUCTION

Consumption-Based Estimate

Earlier, we estimated U.S. marijuana consumption for 1992 at just under 1,600 metric tons. How much of this is domestically grown is not certain. In our user survey, of those who knew the production source of

their marijuana, two-thirds reported smoking domestic marijuana. Data from the THMQ indicate that half of marijuana purchases were domestic. Since the THMQ has more data, it is probably a more reliable estimate. Combined with our estimate of total consumption, it implies that 800 metric tons of domestically grown marijuana are consumed annually. If we assume that 20 percent of what is grown fails to reach market (because of seizure, failure to harvest, theft, or loss) we obtain a total harvest of 1,000 metric tons.

DEA Estimates

The table below provides DEA estimates of domestic marijuana production for 1988 to 1992.

DEA Estimates Of Domestic Marijuana Production (Metric Tons)

	1988	1989	1990	1991	1992
Total Production	4,350-4,850	5,000-6,000	5,000-6,000	3,615-4,615	2,595-3,095

Source: NNICC

Clearly, DEA estimates of domestic marijuana production are not consistent with the consumption-based estimate. Not only is the DEA estimate of 1992 production approximately triple the consumption-based figure, but DEA data also suggest a roughly fifty percent decline in domestic marijuana cultivation from 1990 to 1992. By comparison, user surveys indicate only a twenty percent drop in consumption over the same period.

The Eradication and Suppression Program

The table on the next page presents data from DEA's Domestic Cannabis Eradication and Suppression Program.

If we take the 1992 total eradication figure, and use a conservative yield estimate of one half pound per plant for commercial grade and one quarter pound per plant for sinsemilla (DEA estimates a yield of a full pound per plant regardless of type), the eradication and suppression program appears to have prevented about 1,475 metric tons from being

Domestic Cannabis Eradication and Suppression Program Data

Type of Plant Eradicated (figures in millions of plants)	1987	1988	1989	1990	1991	1992
Outdoor Commercial Grade	4.33	2.49	3.55	5.29	3.01	5.13
Outdoor Sinsemilla Grade	3.11	2.85	2.08	2.04	2.25	2.36
Indoor					0.28	0.35
Total	7.43	5.34	5.63	7.33	5.54	7.84

NOTE: Commercial Grade may include tended ditchweed

NOTE: Prior to 1991 Indoor plants eradicated were not reported separately from Outdoor

	1987	1988	1989	1990	1991	1992
Indoor Growing Operations Seized	1,192	1,240	1,398	1,669	2,848	3,849
Number of Arrests	6,502	6,062	5,761	5,729	9,364	12,369
Assets Seized (cash value) in Millions	$13.67	$9.85	$29.54	$38.69	$52.83	$69.27

Source: DEA Eradication and Suppression Program Reports

harvested. When combined with the estimate of total domestic marijuana production, this implies that roughly sixty percent of domestically grown marijuana is eradicated. This seems unlikely. A plausible explanation for the apparent inconsistency is that a substantial fraction of the marijuana eradicated by authorities and reported as sinsemilla or commercial grade is in fact "ditchweed," a very low potency (generally less than 1 percent THC) variety of marijuana that grows wild in much of the U.S.

FOREIGN PRODUCTION

State Department Estimates

The table on the next page provides the State Department's Bureau of International Narcotics Matters' estimates of foreign marijuana production for 1988 to 1992.

The data illustrate the difficulty in deriving such estimates. The numbers vary considerably from year to year—or sometimes not at all—and

Potential Foreign Production Estimates in Metric Tons, 1988-1992

	1988	1989	1990	1991	1992
Mexico	5,655	30,200	19,715	7,775	7,795
Colombia	7,775	2,800	1,500	1,500	1,500
Jamaica	405	190	825	641	263
Other	3,620	3,565	3,560	3,549	3,550

Source: INCSR

some changes, like the increase in Mexican production from 1988 to 1989, are the result of alterations in estimation methodology.[8] It is thus difficult to make use of the figures in our analysis. Moreover, even if the production estimates were consistently accurate, they would still not tell us how much foreign production was shipped to the U.S. Marijuana is popular throughout the world, and much of what is grown in Mexico, Colombia, or Jamaica is either consumed at home or exported to countries other than the U.S.

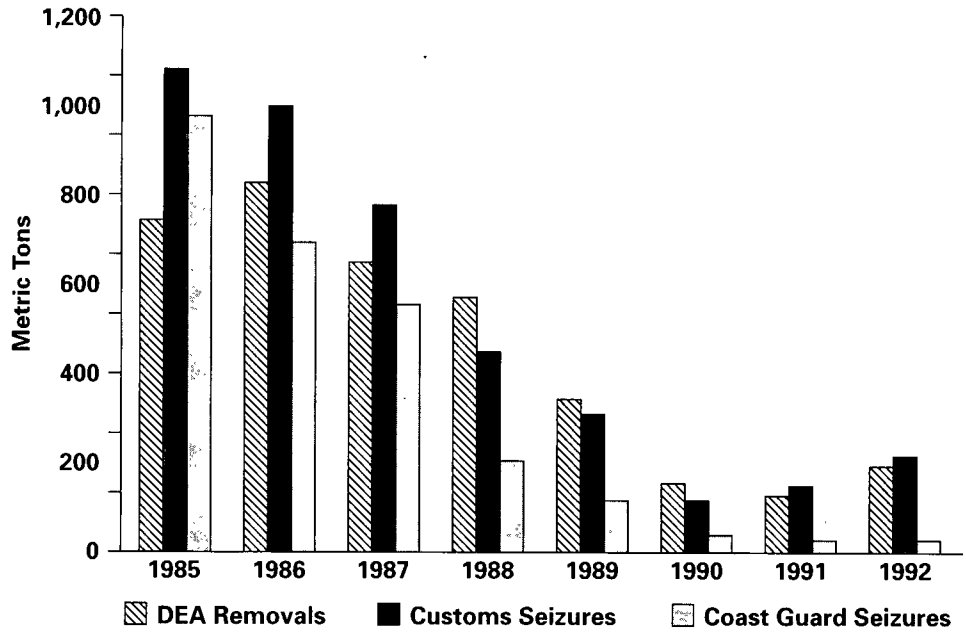
We do not know what fraction of the marijuana grown in Mexico, Colombia, and Jamaica is consumed in those countries or exported to countries other than the U.S. But unless the fraction is very large (over 90 percent), the State Department production estimates for these countries do not jibe with our estimate of U.S. consumption of imported marijuana. Marijuana production for these countries is estimated at 9,558 metric tons for 1992; we estimated U.S. consumption of imported marijuana to be 800 metric tons, and combined Customs and Coast Guard seizures for 1992 were 230 metric tons (see table above).

MARIJUANA SEIZURES

Data on marijuana seizures can often highlight trends in overall supply, trafficking patterns, or interdiction effectiveness. The figure on the next page shows federal removals and seizures of marijuana for 1985 to 1992.[9]

The data clearly show a very large overall decline in seizures. Several factors probably account for this trend. First, imports have declined as a share of U.S. marijuana consumption. Second, a larger portion of

Reported Federal Removals and Seizures of Marijuana, 1985 to 1992



Source: DEA Annual Reports, Stride Data

imported marijuana appears to come from Mexico than in the early and mid-1980's, when Colombia was a major producer. Marijuana shipped from Mexico is more difficult to interdict, since it is smuggled over land rather than by sea. Finally, enforcement agencies have, over the last decade, shifted emphasis from marijuana to cocaine.

Footnotes

1 Sinsemilla is an especially potent form of marijuana, produced from the resin of unpollinated female plants. The sticky resin that forms in the flower of the plant is the most potent (highest THC content) part of the plant, and it aids female plants in catching pollen. If the plant is pollinated, resin production is greatly reduced; keeping the plant unpollinated allows for much more flowering and resin production. To prevent fertilization, sinsemilla growers determine plant sex prior to pollen production and destroy or remove male plants.

2 The twelve percent discount was estimated from *High Times* price quotes, which are presented later in the report. The discounting methodology is explained in Jonathan P. Caulkins and Andrew Chalsma, *Creating Consistent Price Series* (Washington, D.C.: Office of National Drug Control Policy, 1993).

[3] Historically, approximately forty percent of the marijuana plants destroyed by DEA's Domestic Cannabis Eradication and Suppression Program are reported to be sinsemilla. Although a commercial grade plant typically yields twice as much marijuana as a sinsemilla plant, commercial grade plants are also more susceptible to detection (since sinsemilla is grown in smaller plots, and more often indoors). The estimate that five percent of imported marijuana is high-potency is rather arbitrary, but it reflects the fact that strains of high-potency imported marijuana have always been available.

[4] DEA has estimated that domestic sources comprised eleven percent of U.S. marijuana supply in 1983. See *National Narcotics Intelligence Consumers Committee, Narcotics Intelligence Estimate: The Supply of Drugs to the U.S. Illicit Market From Foreign and Domestic Source in 1983 (With Projections Through 1984)* (Washington, D.C.: Drug Enforcement Administration, 1983), p. 9. Data from our user survey and from *High Times* suggests that domestic sources now constitute half of the market.

[5] California, Colorado, Florida, Michigan, Illinois, New Jersey, New York, Ohio, Texas, and Washington.

[6] See the earlier section, "Price Information from the STRIDE database," for a more detailed explanation of this assumption.

[7] There has been a particularly sharp increase in the THC content of the most potent sinsemillia. DEA reports that a recent seizure had a THC content of 30 percent.

[8] National Narcotics Intelligence Consumers Committee, *The NNICC Report 1989* (Washington, D.C.: The Committee, 1990).

[9] The total weight of federal marijuana seizures is not equal to the sum of seizures reported by Customs, Coast Guard, and DEA. Because of joint operations, and the passing of custody from one agency to another, a given seizure is often claimed by more than one agency. The Federal-Wide Drug Seizure System (FDSS), which by and large corrects this data problem by assigning every large federal drug seizure a specific identification number, was only recently implemented, and so reliable data on total federal drug seizures is not available for years prior to 1989. FDSS reports total federal seizures of 486 metric tons (mt) of marijuana in FY 1989, 219 mt in FY 1990, 226 mt in FY 1991, 355 mt in FY 1992, and 341 mt in 1993.

Discussion

When examined, some of the indications of increased marijuana use are clearer than others. Although the Household Survey reports increased use in several demographic groups, it reports declines in many others—and overall use is virtually unchanged. That there has been a rise in marijuana use among teenagers in the last year seems more certain—the Household Survey reports increased use among those aged twelve to seventeen, and both the Monitoring the Future and PRIDE surveys show increased use for every student age group polled.

Data from the Drug Use Forecasting Program (DUF) indicate that in 1992, for the first time in years, the percentage of arrestees testing positive for marijuana use increased from the previous year. But it is hard to draw any firm conclusions from this finding. Are marijuana smokers, previously law-abiding apart from their drug use, now engaging in other crimes? Are criminally active cocaine users switching to marijuana, or simply adding it to their drug menu?

Marijuana-related emergency room episodes, as tabulated by the Drug Abuse Warning Network (DAWN) also rose in 1992. Here too, it is difficult to know what the increase implies about marijuana use. When an overdose involves marijuana and other drugs or alcohol—as the overwhelming majority of marijuana-related emergency room episodes do—rarely is marijuana principally responsible for the adverse reaction. Thus, the data could reflect a spread in marijuana smoking among those using other drugs and alcohol. On the other hand, the data are also consistent with a different story: that more marijuana smokers are becoming polydrug users, mixing marijuana with other illicit drugs and with alcohol.

To the extent that marijuana smoking has become more prevalent among certain groups, it is important to know why. Market supply conditions do not appear to be responsible. When prices are adjusted for inflation and recent increases in potency, marijuana appears to be cheaper than it was a year or two ago, but only by a few percentage points, hardly enough to explain a shift in use patterns. Availability is high: when surveyed in 1993 by the Monitoring the Future program, 83 percent of high school seniors said that marijuana was "fairly easy" or "very easy" to obtain. But this figure is actually within a percentage point of the all-time low for the survey.

A more likely cause of any upturn in teenage marijuana smoking—at least among teenagers—is a change in attitudes. Among high school seniors, there was, from 1980 to 1991, a steady increase in the fraction of students who considered smoking marijuana once, occasionally, or regularly a "great risk." In the 1991-92 school year, however, the trend reversed. A similar pattern appears when high school seniors were asked whether they "disapproved" of smoking marijuana once, occasionally, or regularly. Disapproval of occasional and regular use has declined since 1990, and disapproval of trying once has declined since 1992.

It is important to note that these reported attitude changes preceded by one or two years the apparent recent increase in use. This suggests that trends in marijuana consumption and supply deserve close attention. On the consumption side, it will be important to see whether the indications of growing teenage use are confirmed by other surveys, and if similar findings appear for other age groups. Even more important to watch for is evidence of any connection with other drug or alcohol use, although such links are admittedly hard to document. In terms of supply, domestic marijuana production, which may account for better than half of U.S. consumption, is the principal concern. When valued at retail prices, domestic production is probably worth $6 to $7 billion a year.

Appendix

DETAIL USE OF TRENDS

Percentage with Positive Marijuana Test Among Male Arrestees, 1988-1992 (DUF)

	1988	1989	1990	1991	1992
Atlanta	—	—	4%	12%	22%
Birmingham	36%	21%	14%	16%	22%
Chicago	50%	31%	27%	23%	26%
Cleveland	26%	20%	14%	12%	17%
Dallas	36%	27%	20%	19%	28%
Denver	—	—	27%	25%	34%
Detroit	33%	21%	15%	18%	27%
Fort Lauderdale	42%	27%	22%	28%	32%
Houston	43%	24%	21%	17%	24%
Indianapolis	42%	40%	31%	23%	35%
Kansas City	19%	25%	16%	18%	28%
Los Angeles	32%	20%	20%	19%	23%
Manhattan	30%	20%	19%	18%	22%
Miami	32%	29%	—	23%	30%
New Orleans	49%	28%	18%	16%	19%
Omaha	44%	—	20%	26%	38%
Philadelphia	32%	26%	18%	18%	26%
Phoenix	44%	34%	28%	22%	22%
Portland	50%	35%	42%	33%	28%
St. Louis	17%	27%	16%	16%	21%
San Antonio	44%	29%	26%	20%	28%
San Diego	49%	42%	35%	33%	35%
San Jose	—	25%	24%	25%	24%
Washington, DC	—	12%	7%	11%	20%

Percentage with Positive Marijuana Test Among Female Arrestees, 1988-1992 (DUF)

	1988	1989	1990	1991	1992
Atlanta	—	—	1%	8%	13%
Birmingham	15%	18%	8%	10%	13%
Chicago	33%	—	—	—	—
Cleveland	—	—	8%	7%	11%
Dallas	25%	14%	18%	11%	24%
Denver	—	—	15%	16%	19%
Detroit	26%	—	9%	4%	11%
Fort Lauderdale	—	12%	16%	14%	21%
Houston	—	16%	11%	8%	12%
Indianapolis	—	23%	21%	22%	26%
Kansas City	16%	19%	13%	13%	18%
Los Angeles	22%	13%	10%	9%	13%
Manhattan19%	10%	8%	11%	12%	
New Orleans	25%	18%	12%	7%	8%
Philadelphia	21%	14%	12%	14%	8%
Phoenix	31%	29%	18%	14%	15%
Portland	38%	23%	27%	28%	17%
St. Louis	15%	20%	10%	8%	11%
San Antonio	18%	15%	9%	9%	16%
San Diego20%	29%	19%	20%	25%	
San Jose	—	12%	12%	13%	18%
Washington, DC	—	10%	7%	6%	8%

Percentage with Positive Marijuana Test Among Males Aged 15-20, 1989 to 1992 (DUF)

	1988	1989	1990	1991	1992
Atlanta	—	—	4%	18%	30%
Birmingham	31%	29%	16%	20%	30%
Chicago	54%	34%	30%	28%	30%
Cleveland	29%	19%	15%	14%	23%
Dallas	42%	34%	26%	22%	34%
Denver	—	—	34%	27%	49%
Detroit	48%	34%	26%	31%	43%
Fort Lauderdale	46%	35%	31%	37%	52%
Houston	47%	26%	26%	24%	27%
Indianapolis	56%	45%	32%	27%	35%
Kansas City	14%	34%	23%	23%	39%
Los Angeles	45%	26%	26%	25%	32%
Manhattan	35%	31%	31%	34%	41%
Miami	56%	31%	—	39%	43%
New Orleans	51%	27%	18%	18%	23%
Omaha	—	—	21%	36%	42%
Philadelphia	50%	36%	26%	26%	43%
Phoenix	55%	42%	34%	28%	35%
Portland	61%	46%	52%	34%	36%
St. Louis	16%	31%	17%	21%	28%
San Antonio	56%	45%	34%	22%	28%
San Diego	52%	52%	40%	41%	55%
San Jose	—	34%	34%	26%	22%
Washington, DC	—	10%	9%	16%	38%

Percentage of Emergency Room Episodes that Mention Marijuana by Age, Sex, Ethnicity, and Location, 1988 to 1992 (DAWN)

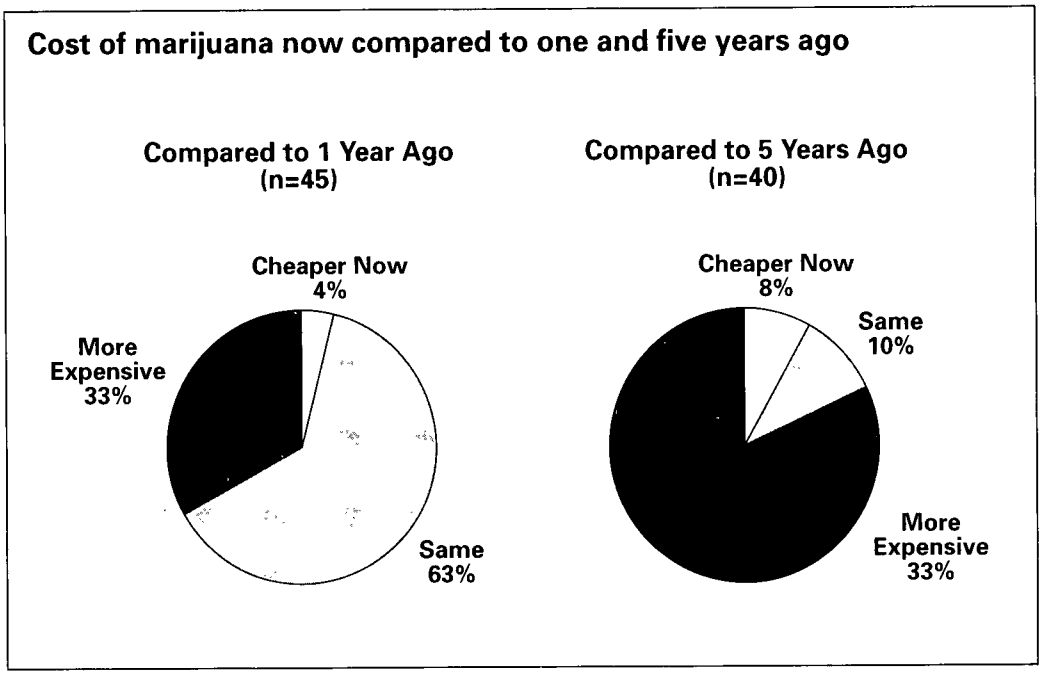
	1988	1989	1990	1991	1992	Percentage Increase in Percentage 1991 to 1992
Total	4.9%	4.9%	4.2%	4.1%	5.5%	34%
Age						
12-17	5.4%	5.7%	4.4%	4.5%	6.6%	48%
18-25	7.1%	7.4%	6.3%	6.2%	8.6%	40%
26-34	5.1%	4.9%	5.0%	4.5%	5.9%	31%
35+	2.2%	2.2%	1.9%	2.2%	3.0%	38%
Sex						
Male	7.2%	7.1%	6.3%	6.0%	7.8%	31%
Female	2.9%	2.7%	2.4%	2.4%	3.1%	31%
Race/Ethnicity						
White	4.2%	4.1%	3.6%	3.6%	4.4%	23%
Black	6.8%	6.5%	5.9%	5.3%	7.3%	38%
Hispanic	4.5%	4.1%	4.4%	4.2%	6.5%	54%
Location						
Central City	6.0%	6.1%	5.7%	4.8%	6.2%	29%
Outside Central City	7.1%	6.8%	5.2%	5.7%	7.8%	37%

Percentage of Emergency Room Episodes that Mention Marijuana by Metropolitan Area, 1988 to 1992 (DAWN)

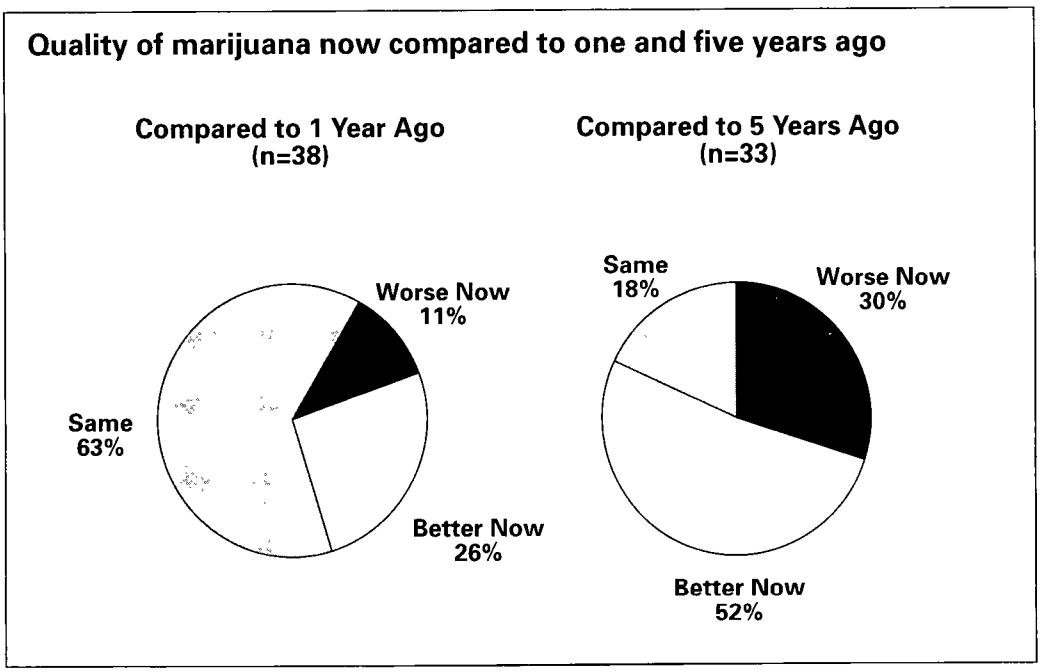
	1988	1989	1990	1991	1992	Percentage Increase in Percentage 1991 to 1992
Atlanta	7.2%	13.5%	7.1%	8.9%	10.9%	22%
Baltimore	3.6%	2.7%	3.0%	3.3%	5.2%	58%
Boston	3.4%	5.2%	4.1%	6.5%	7.9%	22%
Buffalo	1.8%	2.8%	2.4%	3.3%	3.3%	0%
Chicago	7.9%	7.9%	7.0%	5.8%	8.5%	45%
Dallas	11.3%	10.3%	7.8%	5.8%	8.4%	45%
Denver	6.8%	7.1%	5.1%	5.0%	6.3%	26%
Detroit	6.9%	7.7%	5.1%	5.6%	9.4%	67%
Los Angeles	5.3%	5.7%	6.3%	6.1%	6.8%	11%
Miami	3.7%	4.9%	4.5%	9.4%	7.7%	–18%
Minneapolis-St. Paul	4.0%	4.7%	4.1%	3.6%	7.0%	94%
New Orleans	9.2%	6.7%	10.5%	8.3%	9.2%	10%
New York	5.2%	5.1%	4.8%	3.2%	4.5%	38%
Newark	6.2%	5.1%	6.0%	insf.	4.5%	insf.
Philadelphia	5.5%	5.6%	4.8%	4.1%	8.0%	95%
Phoenix	6.1%	2.2%	2.3%	2.2%	2.8%	29%
St. Louis	0.0%	5.2%	4.2%	4.4%	4.9%	10%
San Diego	5.5%	6.9%	6.0%	5.7%	6.8%	20%
San Francisco	4.3%	3.9%	3.7%	2.6%	2.6%	1%
Seattle	4.7%	5.0%	6.0%	6.1%	5.5%	–10%
Washington, D.C.	12.6%	11.6%	8.7%	9.1%	11.8%	30%

USER SURVEY DETAIL

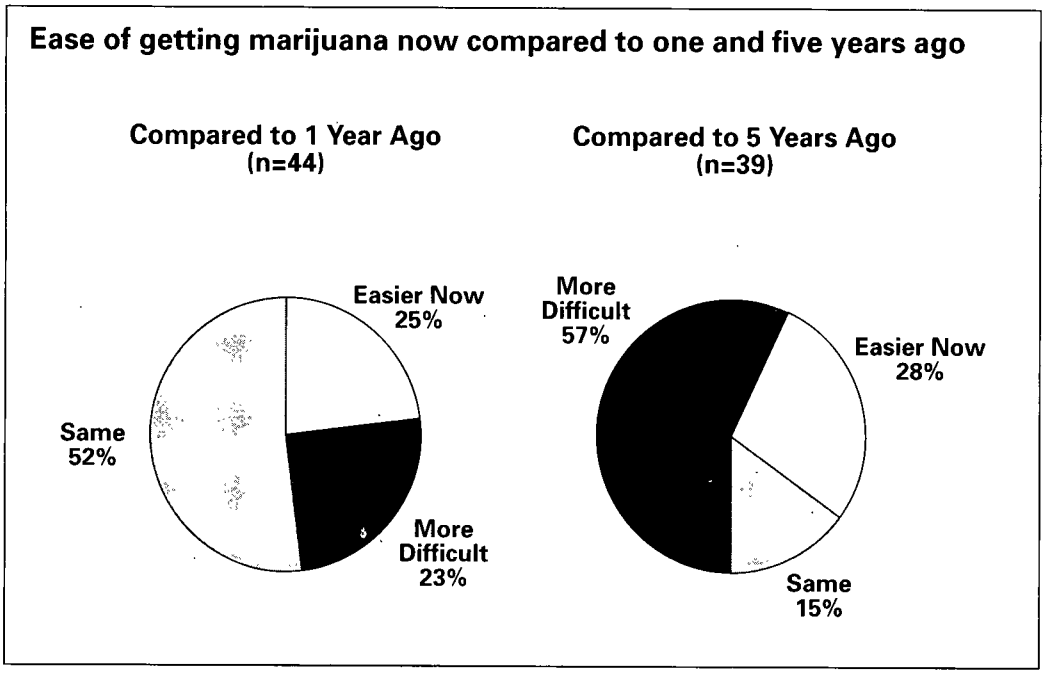
Opinions of Price



Opinions of Quality



Opinions of Availability in User Survey



USER SURVEY METHODOLOGY

We conducted 46 telephone interviews with current marijuana users to supplement the currently available data on marijuana consumption and price. We believe our sample, recruited using the "snowball sampling" technique, is fairly representative of marijuana users in terms of socioeconomic status and consumption levels.

Snowball Sampling and Survey Administration

Using the snowball sampling technique, we recruited marijuana users to participate in an anonymous twenty-minute telephone survey. We tried to vary socioeconomic status and consumption levels of our sample by selecting initial referents of diverse backgrounds. We included one of our former heroin interviewers as a recruiter and paid him a $10 referral fee for each successfully completed interview. In order to ensure that our sample was not dominated by any particular group, we limited each recruiter to ten referrals. We found that youths, aged 18 and under, were the most difficult group to target given the older ages of our recruiters. Local respondents called us directly and were inter-

viewed on the spot. Out-of-state respondents were given a toll-free phone number and the option of scheduling an interview outside of standard east coast working hours. Our two selection criteria were that respondents had to purchase marijuana themselves and they had to use on at least a weekly basis. The recruiters paid their successful referrals $20 cash for their participation in the survey.

Sample Demographics

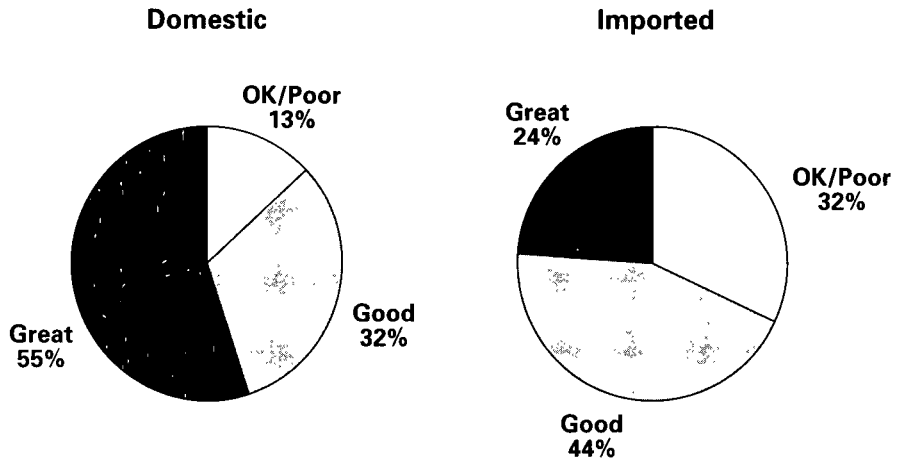
Most of the 46 participants in the study were white, just over one quarter were African American, and the remainder were Asian and Hispanic; approximately one-third of the respondents were female. The average age was 27.5. The sample included 30 employed individuals, 10 who were either unemployed or on public assistance, and 10 students. Geographically, 25 respondents were from eastern Massachusetts; the remaining respondents were almost evenly split from the west coast and other east coast states.

DETAIL OF THMQ DATA

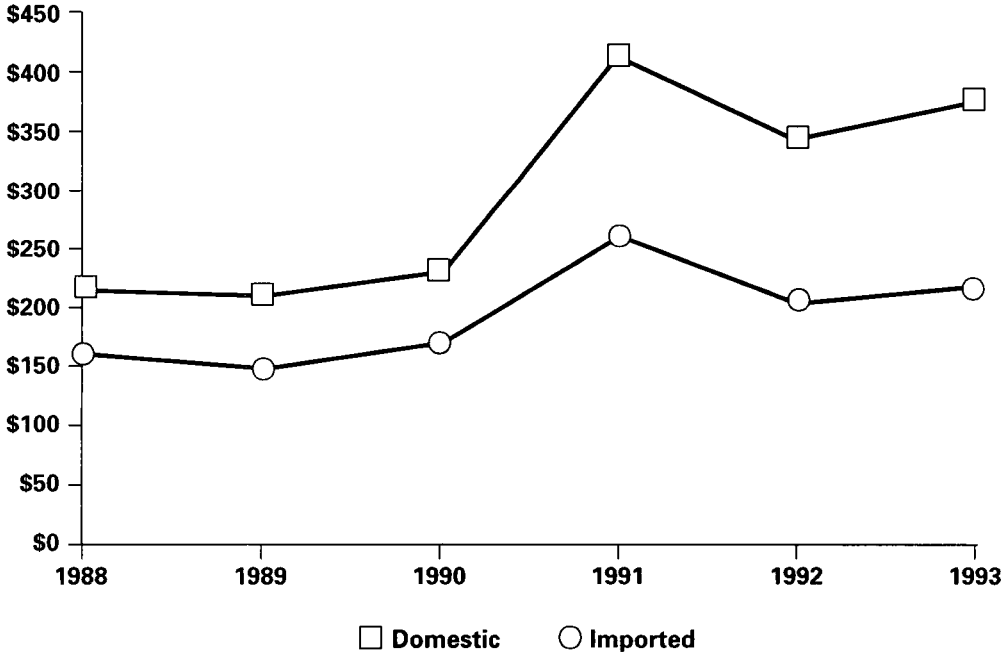
Mean Price for Selected Years at One Pound Level (THMQ)

	1989	1992	1993
One Pound Price (n)	$1,211 (15)	$2,042(22)	$2,431 (19)

Source vs. Quality in 1993 (THMQ)



Price for an Ounce by Source 1988 to 1993 (THMQ)



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