

Drugs and the Workplace

By

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June 1998



Acknowledgements

This project was funded by a generous grant from the Robert Wood Johnson Foundation's Substance Abuse Policy Research Program (SAPRP). The authors would like to thank David G. Altman, Ph.D., National Program Director, and Andrea L. Ebbers, Deputy Director, of the SAPRP for their support of this project. We would also like to thank our colleagues at the National Opinion Research Center (NORC) for helpful suggestions and an encouraging environment within which to work. In particular, we appreciate the assistance of Allen Sanderson, Angela Brittingham, and Mary Grace Kovar during early phases of our general project. Dean R. Gerstein, NORC's Vice-President for Substance Abuse, Mental Health, and Disability Studies, has created a supportive environment within which to conduct research. Finally, John Philipps and James Yu served superbly as grant

administrator and financial manager for the project. Their work allowed us to focus our efforts on data analysis and report writing and saved us from many of the tedious administrative details of the project.

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Executive Summary

Drug and alcohol use exact a heavy toll on American society. Although there are a number of ways in which this occurs, a large amount of attention has been directed at drug use by the American work force. Many people believe that drug and alcohol use by U.S. workers cause accidents and injury, increase job turnover, make insurance costs higher, and lead to a loss of public trust in the American work force. U.S. companies have attempted to prevent employee drug use through a number of approaches, most notably by implementing work-place drug testing programs. The growth of drug testing programs has been accompanied by a decrease in the prevalence of drug use among U.S. workers.

Nevertheless, the precise associations between worker drug use and workplace phenomena such as accidents and employee turnover remain shadowy. In addition, it is not clear whether drug testing has directly affected drug use among U.S. workers. By analyzing data from the 1994 National Household Survey on Drug Abuse (NHSDA), this report seeks to answer some basic questions about worker drug use, relevant workplace outcomes, and drug testing.

There was no evidence from these nationally representative data that drug or heavy forms of alcohol use were associated with work-related accidents. However, weekly users of marijuana or cocaine were highly likely to have been fired from a job in the past year. Furthermore, workers who said they got drunk at least once a week and those who showed symptoms of drug dependence were likely to have been fired in the past year. Weekly marijuana users and those who got drunk frequently were also more likely than others to have resigned from a job in the past year. These results suggest that frequent use of drugs increases the risks of employee turnover.

About one-third of the survey participants said that their company had an at-hiring or a random drug testing program. However, weekly users of marijuana or cocaine were much less likely than others to work for companies with these drug testing programs. In addition, they were much less likely than others to say they would work for a company with a drug testing program. These results suggest that drug testing programs may discourage employee drug use, especially more frequent forms of marijuana and cocaine use.

Introduction

A great deal of attention has been directed at drug use by the American work force. A series of accidents in the 1980s that were allegedly caused by worker drug use and the obvious link between alcohol use and motor vehicle accidents have led to a widespread perception that worker drug use must be prevented. Conventional wisdom suggests that drug and alcohol use reduce workplace productivity not only by causing accidents, but also by leading to higher worker absenteeism and job turnover.¹ These, in turn, lead to higher insurance costs, increased training expenses, and a general loss of public trust in the American work force. Some observers propose that drug and alcohol use cost U.S. industry from 8-30 billion dollars per year in lost productivity alone.²

In order to reduce the negative consequences of worker drug use, many companies have taken a series of measures that are intended to prevent employee drug use. Employee assistance programs (EAPs) that focus on drug and alcohol abuse, drug-free workplace posters that have appeared in many office coffee rooms, and supervisory training that includes recognizing the symptoms of employee drug use are only a few of the numerous efforts undertaken by companies to combat worker drug use. Perhaps the greatest attention, however, has been directed at

workplace drug testing programs. Although no national-level data exist, several indicators show the rapid rise of drug testing programs by U.S. companies. For example, an annual survey conducted by the American Management Association (AMA) indicates that the percent of major U.S. companies with drug testing programs increased from 22% in 1986 to 81% in 1997.³ A recent study by the Substance Abuse and Mental Health Services Administration (SAMHSA) shows that about 13% of full-time workers in the U.S. have taken a mandatory workplace drug test.⁴ An encouraging trend is that the positive rate of these tests has gone down in recent years,⁵ thus suggesting that drug use by U.S. workers has declined.

Nevertheless, there are a number of questions about worker drug use that remain unanswered. A basic question involves the association between worker drug use and workplace productivity. Although it seems perfectly obvious that drug use impairs the user, thus increasing the chance of accident or injury on-the-job, there is little solid evidence that this is true. Rather, a number of studies have been unable to find an association between drug or alcohol use and workplace accidents.⁶ A more consistent finding is that drug use is associated with more frequent job turnover,⁷ although it is not always clear whether this is because drug users are more likely to be fired, to resign, or both.

Another set of questions concerns workplace drug testing programs. Simply put, there is no evidence that drug testing programs directly prevent employee drug use. Although advocates often point to the success of the U.S. military's widespread drug testing program as proof that testing works,⁸ there has been little research to support this claim among U.S. companies. Considering the sizable amount of money paid each year to test employees, it is imperative that research address the efficacy of drug testing programs. A vital question is whether there is a direct association between worker drug use and workplace drug testing programs.

The findings presented in this report are designed to address some of these issues. In particular, answers to the following questions are provided:

- (1) What is the association between current and former drug use and workplace accidents?
- (2) What is the association between current and former drug use and job turnover?
- (3) What is the association between current and former drug use and workplace drug testing programs?
- (4) What is the association between current and former drug use and perceptions of

Introduction

workplace drug testing programs?

There are several advantages to the analyses that are presented in this report. First, the analyses use data from a nationally representative survey of a large sample of U.S. residents. Therefore, the findings are generalizable to the entire population of full- and part-time workers in the United States.

Second, rather than examining only current drug use, we investigate the effects of both current and former drug use. One explanation for an association between, for example, drug

use and workplace accidents might be that drug users are simply more likely than other workers to take risks.⁹ If this is true, then one might expect former drug users to also have a heightened risk of workplace accidents. Unfortunately, a lot of past research on drug use has failed to distinguish those who have used drugs in the past from those who have never used drugs,¹⁰ even though they may be entirely different types of people in terms of behavior and attitudes.

Third, the analyses examine the association not only between drug use and workplace drug testing programs, but also between drug use and

perceptions of these programs. Therefore, we may determine whether drug users are actually less likely to work for companies that test for drugs and whether they are more reluctant than others to wish to work for such companies. By making this determination, a better overall picture will emerge of the effectiveness of drug testing in preventing worker drug use.

More detailed information about the sample, the variables, and the statistical analyses are presented in the technical appendix.

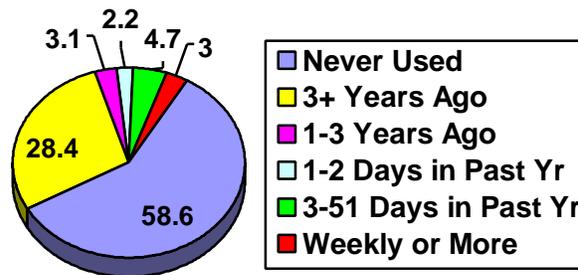
Worker Drug Use

How Widespread Is Drug Use Among U.S. Workers?

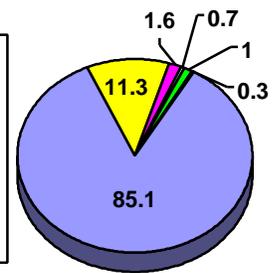
The first set of findings shows the reported frequency of drug and alcohol use among the sample of full- and part-time workers in 1994. Rather than providing combined totals, the figures show separate results for marijuana and cocaine, the two most commonly used illicit drugs in the U.S. They also present the number of reported days drunk in the past year and the percentage who showed symptoms of drug dependence in the past year. (See the technical appendix for a definition of symptoms of drug dependence.)

It is obvious from the figures that most workers had never used marijuana or cocaine in their lives. Over half of the workers had never used marijuana and over three-quarters have never used cocaine in their lives. In addition, a majority of those who had ever used marijuana or cocaine did so over three years ago. Slightly less than 10% of workers said they had used marijuana in the past year, while only about 2% said they had used cocaine in the past

Marijuana Use History



Cocaine Use History



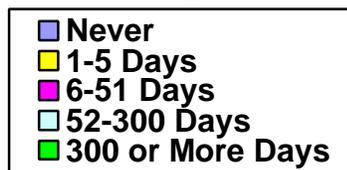
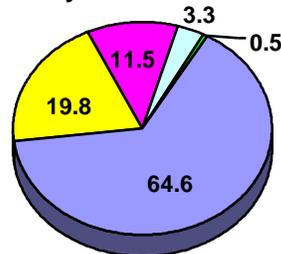
year. Only a small percentage reported weekly use of marijuana (3.0%) or cocaine (0.3%) in the past year.

A majority of workers also said they had not been drunk in the past year (64.6%). As with marijuana and cocaine, very few said they got drunk weekly or more often in the past year (3.8%). A small percentage showed symptoms of drug dependence in the year before the survey was administered (1.5%).

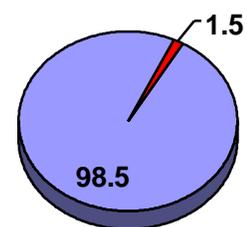
However, these modest percentages should not mask the substantial number of workers who were using these

drugs. Given an estimated 119 million full- and part-time workers in the U.S. in 1994, we may infer that over 3 million were weekly marijuana users, almost 400,000 were weekly cocaine users, over 4 million got drunk at least weekly, and over 1.5 million showed signs of drug dependence.¹¹ Therefore, even with a small proportion of workers using these substances, there was still a substantial number of frequent users who may have posed various problems for U.S. companies.

No. Days Drunk in Past Year



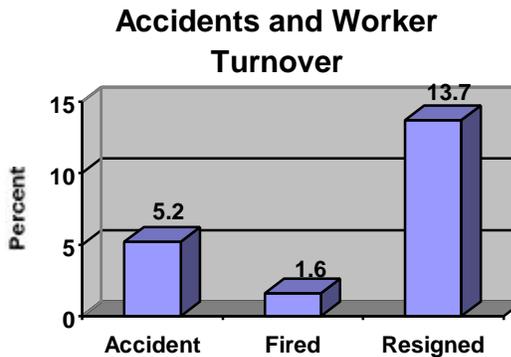
Symptoms of Dependence in Past Year



Accidents and Worker Turnover

Do Drug Users Have Accidents?

The first substantive question addressed is whether drug users were more likely than other workers to have work-related accidents. The answer to this question is a uniform no. About 5% of the survey participants said they had been involved in a work-related accident in the past year, although, not surprisingly, this percentage varied dramatically by occupation (see Table 1). Nevertheless, drug users, past or present, were no more likely than those who had never used to be involved in an accident. Some research indicates that drug use leads to accidents only in “high-risk” occupations such as construction work or among machine operators.¹² This seems reasonable given that these occupations require a high degree of manual dexterity that may be impaired by drug use. We explored the relationship between drug use and accidents in “high-risk” occupations, but found no evidence that it exists. These results show clearly the lack of a relationship between drug use and accidents. Although they may seem surprising, they actually support other research in this area.¹³ Perhaps drug users are able to moderate their use so that it does not affect their manual skills at work, or it may be that only some types of on-the-job drug use lead to accidents. Since there is no in-



formation available in this data source about on-the-job use, we cannot examine for this possibility.

Do Drug Users Get Fired Or Resign?

A small percentage of workers said they had been fired in the past year (1.6%), while a much higher percentage said they had resigned in the past year (13.7%). It appears that these percentages vary somewhat by occupation, with workers from traditional “blue collar” occupations having a higher risk of being fired. Construction workers and laborers and helpers were more likely than other workers to have resigned from a job.

Unlike the results for work-related accidents, drug users were more likely than non-users to have been fired. In particular, weekly users of marijuana or cocaine were over three times as likely as non-users to have been fired in the past year. Even workers who used marijuana only 1-2 times in the past year were more likely than non-users to have been fired. Furthermore, those who were drunk weekly were about twice as likely, while those who showed symptoms of drug dependence were over *seven times as likely* as others to have been fired in the past year.

Table 1 Percent reporting work-related accidents, being fired, or resigning from a job in the past year, by selected occupations, 1994

Occupation	Accident	Fired	Resigned
<i>Executive/Managerial</i>	2.0	0.7	11.8
<i>Professional Specialty</i>	4.2	0.3	11.2
<i>Sales</i>	3.9	1.6	15.8
<i>Administrative Support</i>	2.1	1.6	15.6
<i>Service</i>	5.3	3.4	15.3
<i>Construction</i>	8.6	2.9	20.9
<i>Machine Operators</i>	9.1	2.6	13.0
<i>Transportation</i>	13.9	2.2	14.1
<i>Laborers & Helpers</i>	14.7	2.8	17.5

Accidents and Worker Turnover

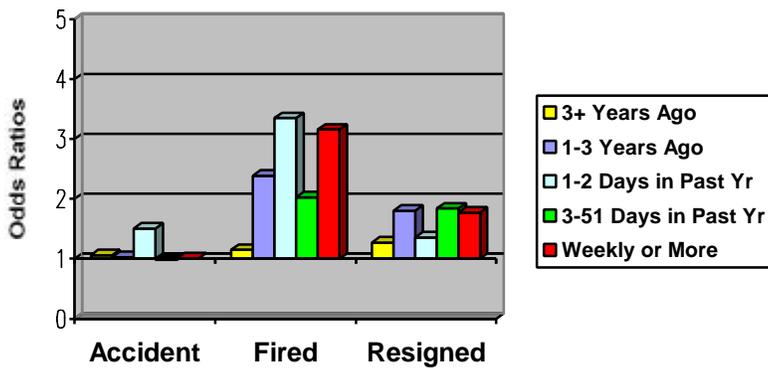
The results for resignation from a job are somewhat different. Cocaine users and those who showed symptoms of dependence were no more likely than others to resign, but marijuana users, even those who had not used in over three years, were more likely than non-users to have resigned from a job in the past year. Although at first

glance this may seem unusual, it may support the argument that marijuana use is associated with a personality trait that leads to loose attachment to the work force.

These findings do not explain why drug users were more likely to be fired. However, there are two overlapping reasons that come immediately to mind. First, frequent drug use is detected more easily by super-

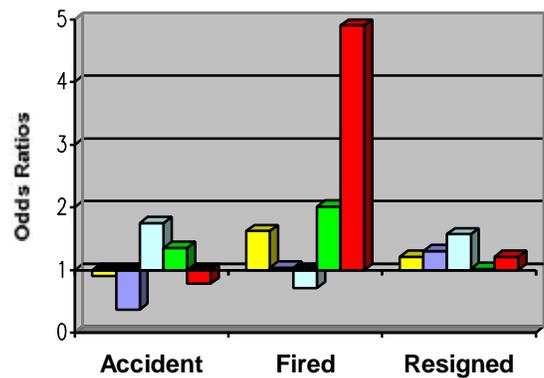
visors and coworkers and thus leads to job termination. Second, frequent drug use may have led to poor job performance, which then increased the risk of being fired. In either case one must ask the question of whether drug users are being offered employee assistance to stop drug use or whether they are being terminated soon after drug use is detected.¹⁴

Likelihood of Accidents and Worker Turnover, by Marijuana Use History



Compared to workers who have never used marijuana.

Likelihood of Accidents and Worker Turnover, by Cocaine Use History



Compared to workers who have never used cocaine.

Likelihood of Accidents and Worker Turnover, for Workers with Symptoms of Dependence in the Past Year



Compared to workers who have no symptoms of dependence.

Likelihood of Accidents and Worker Turnover, for Workers Who Were Drunk Weekly or More in the Past Year



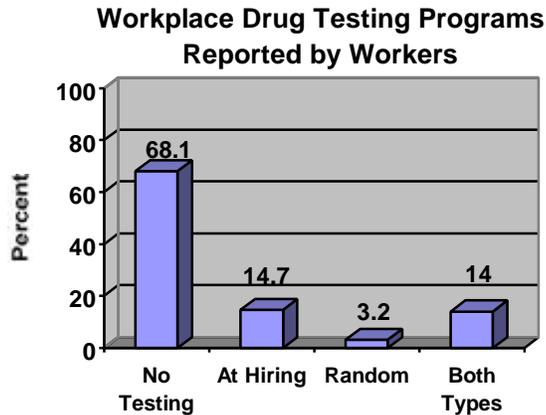
Compared to workers who have not been drunk as often as weekly.

Workplace Drug Testing

Do Drug Users Work For Companies That Drug Test?

The next set of questions addresses workplace drug testing programs. Although there are a number of types of programs available, two of the most common are at-hiring testing (also known as pre-employment testing) and random testing. At-hiring tests are usually administered after an offer of employment has been made. An offer may be contingent upon successfully completing the test. Random tests are less common and are usually reserved for “safety-sensitive” jobs. However, many companies employ both types of tests.

In 1994 over half of full- and part-time workers in the U.S. said that their companies had neither an at-hiring nor a random drug testing program.¹⁵



About 14% said their company had either an at-hiring program only or a combination of at-hiring and random programs. Only a small percentage of workers said their company had only a random drug testing program (3.2%). As above, these small percentages may mask the large number of workers who are exposed to drug testing programs. Based on these percentages, we may infer that over 36 million workers were employed by companies that tested for drugs in some way.

At-hiring and random testing programs were most common among machine operators and transportation workers, two groups with modest to low levels of weekly drug use (see Table 2).

Weekly marijuana users were only about half as likely as non-users to be employed by companies with drug testing programs. Cocaine users were also less likely than other workers to be employed by companies with at-hiring or random programs.

Table 2 Weekly use of marijuana and cocaine, and drug testing, among selected occupation groups, 1994.

Occupation	Percent Reporting Weekly Use		Percent Reporting Drug Testing Program	
	Marijuana	Cocaine	At Hiring	Random
<i>Executive/ Managerial</i>	1.3	0.1	31.6	20.2
<i>Professional Specialty</i>	1.0	0.1	23.8	15.3
<i>Sales</i>	3.1	0.7	23.3	12.8
<i>Administrative Support</i>	2.4	0.1	36.0	16.6
<i>Service</i>	4.1	0.4	20.5	15.9
<i>Construction</i>	7.2	0.5	30.6	22.3
<i>Machine Operators</i>	3.7	0.4	56.9	29.6
<i>Transportation</i>	3.3	0.1	59.9	49.1
<i>Laborers & Helpers</i>	5.4	1.0	37.6	23.9

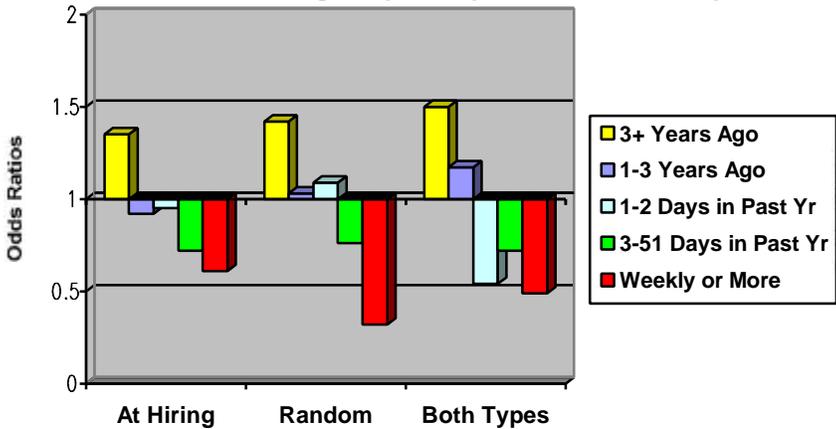
Workplace Drug Testing

In fact, it appears that weekly cocaine users are rarely employed by companies with random drug testing programs. Workers who used cocaine occasionally in the past year (3-51 times) were also less likely to be employed by companies with both random and at-hiring testing programs.

These results suggest that weekly users of marijuana and cocaine do not usually work for companies that have drug testing programs. There are several possible sources of this relationship. Perhaps drug users shy away from working for companies with drug testing programs. Alternatively, some

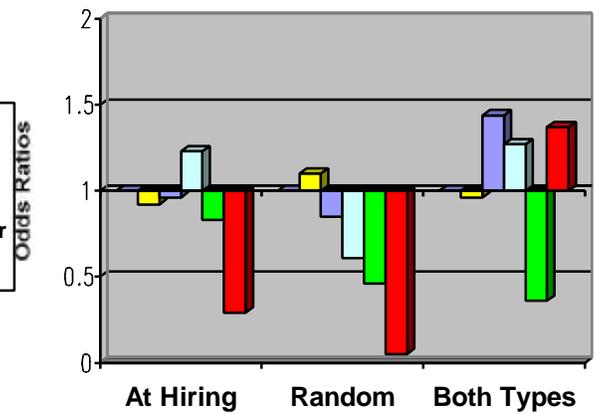
workers may stop using drugs once their company introduces a drug testing program. Although both explanations may hold a grain of truth, this association is indicative of the success of drug testing programs in preventing frequent drug use among workers.

Likelihood of Working for Employer that Tests for Drugs, by Marijuana Use History



Compared to workers who have never used marijuana.

Likelihood of Working for Employer that Tests for Drugs, by Cocaine Use History



Compared to workers who have never used cocaine.

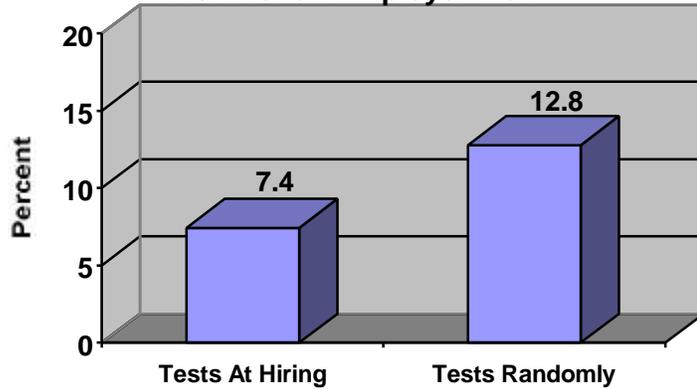
Perceptions of Drug Testing

Are Drug Users Less Likely To Want To Work For Companies With Drug Testing Programs?

The final set of findings provides a complementary picture of the drug testing results presented in the previous section. These findings represent a survey question that asked whether the participant would be less likely to work for a company that had a drug testing program. A little over 7% of workers would be less likely to work for a company that tests at-hiring and almost 13% would be less likely to work for a company that tests randomly. For a large majority of workers, their perceived employment decision did not rest on whether a company tests for drug use.

Nevertheless, the results display a distinct pattern when considering workers' drug use. As marijuana use becomes more recent and frequent, the aversion to

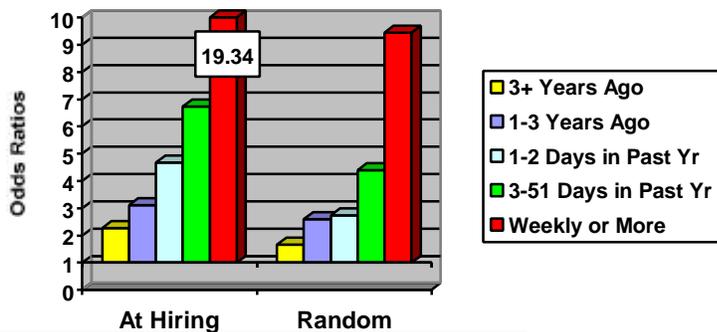
Workers Who Would Be Less Likely to Work for an Employer that:



companies with drug testing programs increases in a step-wise fashion. By the time we reach weekly marijuana use, we find that workers were almost **20 times as likely** to say they would not want to work for a company with an at-hiring program and almost **10 times as likely** to say they would not want to work for a company with a random testing program. Cocaine users, current and former, were also less likely to want to work for companies that drug test, although the results are not as dramatic.

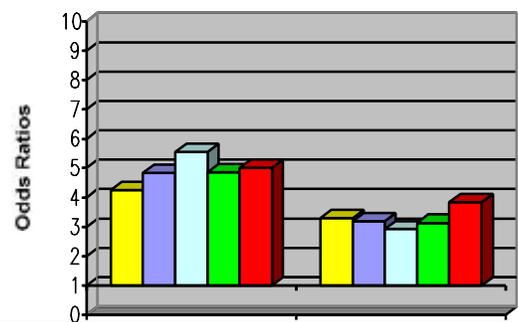
Perhaps the most interesting result is that even former users of marijuana and cocaine said they were reluctant to work for companies with drug testing programs. It is not entirely obvious why those who did not use drugs currently were reluctant to work for companies that drug test. Nonetheless, an important issue is whether drug testing programs have cast too wide a net and discouraged a portion of the work force that does not use drugs from working for certain companies.

Less Likely to Work for Employer that Tests for Drugs, by Marijuana Use History



Compared to workers who have never used marijuana.

Less Likely to Work for Employer that Tests for Drugs, by Cocaine Use History



Compared to workers who have never used cocaine.

Conclusions

The findings indicate that drug use among the U.S. work force was rare. Although there were many former users of marijuana and cocaine in the work force, few were currently using and fewer still were using frequently. For instance, weekly use of marijuana and cocaine was very uncommon among workers.

However, weekly marijuana and cocaine use have important consequences for the U.S. workplace and for the nation's economic productivity in general. Workers who used these drugs on a weekly basis were more likely than other workers to be fired and to resign from jobs. In addition, those who showed symptoms of drug dependence or got drunk weekly were at substantial risk of being fired. Although the reason these associations exist cannot be identified with currently available information, it is reasonable to say that frequent use of these drugs, or problematic forms of use, affects the economic productivity of the U.S. work force. When a worker gets fired, a replacement often must be found. This entails substantial costs to locate and train new hires. It also often involves other costs as many terminated employees collect unemployment insurance or may be forced to

rely on other government assistance programs. A key question that remains is whether terminating drug users is the best policy option, or whether an expansion of employee assistance programs is required to minimize the negative consequences of employee drug use.¹⁶

In response to the perceived problems associated with worker drug use, many U.S. companies have implemented drug testing programs. A growing number of companies are following this course with the goal of obtaining a drug-free workplace. However, the success of these programs remains a question mark. The findings presented in this report should be encouraging to those who advocate drug testing programs. We find that frequent users of marijuana and cocaine were substantially *less likely* than other workers to be employed by companies that have drug testing programs. Furthermore, drug users were very unlikely to say they would work for a company that tests for drugs either at-hiring or randomly. Although neither of these results is surprising intuitively, both are based, for the first time, on data that are national in scope. The results are also based on models that controlled statistically for a number of variables that have been found to affect both drug use and workplace behaviors. Combining these two results

suggests strongly that workplace drug testing programs can act as a general deterrent to employee drug use either by discouraging current employees from using drugs or by restraining frequent drug users from applying for jobs.

As a policy option, drug testing has several possible drawbacks, however. In one set of analyses, we found that even former users of marijuana and cocaine were reluctant to work for companies that drug test. Therefore, drug testing programs may have cast a net of deterrence that is too broad and discourages many otherwise capable workers from applying for jobs. Furthermore, the costs of drug testing programs may exceed any benefits of deterrence. There are few good data on the costs of drug testing, although one must consider not only the direct costs of testing, but also the indirect costs of lost employee time. Finally, it is still not clear whether drug testing actually causes an employee to change his or her drug use. (See the technical appendix for a description of the limitations of these data.) Therefore, although these results appear to encourage drug testing as a policy option for employers, care must be taken to implement policies that are effective on a case-by-case basis.

Notes

1. See Normand, Lempert, & O'Brien, 1994, *Under the Influence? Drugs and the American Work Force*, National Academy Press, Washington, DC.

2. Rice et al., 1990, *The Economic Costs of Alcohol and Drug Abuse and Mental Illness: 1985*, U.S. Department of Health and Human Services, Washington, DC; Harwood et al., 1984, *Economic Costs to Society of Alcohol and Drug Abuse and Mental Illness: 1980*, Research Triangle Institute, Research Triangle Park, NC.

3. American Management Association, 1997, *1997 AMA Survey: Workplace Drug Testing and Drug Abuse Policies, Summary of Key Findings*. American Management Association, New York.

4. Substance Abuse and Mental Health Services Administration, 1996, *Drug Use Among U.S. Workers: Prevalence and Trends by Occupation and Industry Categories*, U.S. Department of Health and Human Services, Rockville, MD.

5. SmithKline Beecham Clinical Laboratories, 1996, *SmithKline Beecham Drug Testing Index*, SmithKline Beecham, Collegeville, PA.

6. Normand, Salyards, & Mahoney, 1990, "An evaluation of preemployment drug testing," *Journal of Applied Psychology*, 75, 629-639; Kaestner & Grossman, 1995, "Wages, workers-compensation benefits, and drug use: Indirect evidence of the effects of drugs on workplace accidents," *American Economic*

Review, 85, 55-60; French et al., 1995, "Prevalence and consequences of smoking, alcohol use, and illicit drug use at five worksites," *Public Health Reports*, 110, 593-599; but see Dawson, 1994, "Heavy drinking and the risk of occupational injury," *Accident Analysis and Prevention*, 26, 655-665; and Holcom, Lehman, & Simpson, 1993, "Employee accidents: Influences of personal characteristics, job characteristics, and substance use in jobs differing in accident potential," *Journal of Safety Research*, 24, 205-221.

7. Kandel & Yamaguchi, 1987, "Job mobility and drug use: An event history analysis," *American Journal of Sociology*, 92, 836-878; Zwerling et al., 1990, "The efficacy of preemployment drug screening for marijuana and cocaine in predicting employment outcomes," *Journal of the American Medical Association*, 264, 2639-2643.

8. Bray et al., 1992, "Progress toward eliminating drug and alcohol use among US military personnel," *Armed Forces and Society*, 18, 476-496.

9. See, for example, Leigh, 1996, "Alcohol abuse and job hazards," *Journal of Safety Research*, 27, 17-32.

10. Kandel & Yamaguchi, 1987, "Job mobility and drug use: An event history analysis," *American Journal of Sociology*, 92, 836-878.

11. These estimated numbers are computed by multiplying the relevant percentage by the estimated number of workers represented in the 1994 NHSDA,

or about 119 million. See the technical appendix for more information on the sample and its weighting scheme.

12. Holcom, Lehman, & Simpson, 1993, "Employee accidents: Influences of personal characteristics, job characteristics, and substance use in jobs differing in accident potential," *Journal of Safety Research*, 24, 205-221.

13. See, for example, the references listed in note 6.

14. See Hazelden Foundation, 1998, "National survey shows many employers immediately fire employees who show signs of substance abuse," Press release, Minneapolis, MN, February 10.

15. These percentages are substantially lower than those from the American Management Association (see note 3) because the NHSDA includes a national sample while the AMA includes only large companies that belong to the Association. The lower percentages in the NHSDA suggest that small companies are less likely to have drug testing programs.

16. See Hazelden Foundation, 1998, "National survey shows many employers immediately fire employees who show signs of substance abuse," Press release, Minneapolis, MN, February 10. The survey reported in this press release suggests that employee assistance programs are not be utilized adequately to address employee drug problems.

Technical Appendix

The Data

The data that we analyze in this report are from the 1994 National Household Survey on Drug Abuse (NHSDA). The NHSDA is one of the main sources of information on drug use in the United States. It is a cross-sectional survey that is based on a national probability sample designed to represent the population of the United States aged 12 and older who do not reside in institutions. Of the 17,809 participants in 1994, 9,097 reported working full- or part-time (51.1%). These participants represent over 119 million workers in the United States.

Since the NHSDA is not designed specifically to be an employment survey, the distribution of workers in the NHSDA was compared to the distribution of workers in the 1994 Current Population Survey (CPS) conducted by the U.S. Bureau of the Census. The distribution of workers by sex, race, region, and occupation in the NHSDA and the CPS were remarkably similar. The estimated number of male workers is about four percent smaller in the NHSDA than in the CPS (63,846,000 vs. 66,450,000), however, this difference is well within the 95 percent confidence bounds of the two estimates.

The Variables

Many studies of drug use that use survey data rely on what are known as frequency measures. These are based on questions that ask survey participants to report how often they used various drugs in the past month or the past year. Measures of past-month or past-year drug use are then examined to determine their association with other important variables. A problem with this approach is that it does not distinguish people who may have used drugs in the past from those who have never used drugs in their lifetime. Even though employers may not be concerned with former users, an important question is whether drug use actually affects workplace behaviors or whether some other aspect of a worker—such as a personality trait—leads to both drug use and adverse workplace behaviors. If research does not distinguish former users and those who have never used, then it is not possible to determine which of these possible scenarios is correct.

Therefore, we developed two variables that measure both current and past drug use. These variables are concerned with marijuana use and cocaine use. Each variable identifies six categories of use:

(1) Never used;

- (2) Used at some time more than three years ago;
- (3) Used at some time one to three years ago;
- (4) Used on one or two days in the past year;
- (5) Used 3-51 days in the past year;
- (6) Used 52 or more days in the past year (weekly use).

There are also a number of other possible variables that measure drug use. Two are used in this study. One is based on a question that asks survey participants on how many days in the past year they were drunk. It ranges from never to 300 or more days. The other variable is called “symptoms of drug dependence” and is designed to measure behavioral and social problems that are due to a participant’s drug use. The questions used to develop this variable ask whether a person’s drug use in the past year or past month caused him or her to

- (1) feel depressed or lose interest in things;
- (2) get into arguments or fights;
- (3) feel lonely or isolated from others;
- (4) feel nervous or anxious;
- (5) develop health problems;
- (6) experience difficulty in thinking clearly; or
- (7) feel irritable or upset.

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These questions were asked for alcohol, marijuana, and other illicit drugs such as cocaine, hallucinogens, amphetamines, barbiturates, and opiates. Answers to these questions were combined with answers to other survey questions about “trying to cut down” and needing to use more of a drug to “get the same effect” to define five criteria for symptoms of drug dependence. These five criteria are

- (a) The drug caused one or more of the seven consequences or symptoms and the drug was used in the past month;
- (b) The drug caused the respondent to get less work done during the past year and the drug was used in the past year;
- (c) The participant was unable to reduce his or her use of the drug in the past year;
- (d) The participant needed more of the drug to get the same effect in the past year;
- (e) The participant felt sick when he or she tried to cut down on use in the past year.

Participants were identified as meeting the definition of drug dependence if two or more of the five criteria were satisfied. About 1.5% of the participants met the criteria for drug dependence.

In order to place participants into occupation

groups, the system developed by the U.S. Bureau of Labor Statistics was used. This consists of 15 occupation groups such as Managers and Administrators, Professional Specialty (for example, engineers, teachers, lawyers, writers), Administrative Support (for example, secretaries, bookkeepers), Sales, Protective Service (for example, police officers, fire fighters), Construction, Machine Operators, Transportation, and Laborers.

A number of demographic variables were also considered in this study. These variables included age, education, sex, race, region of residence, population size of area of residence, marital status, and family income. In addition, we considered the effects of full- versus part-time work status and the size of the participant’s workplace. Several of these variables have been shown in previous research to affect the likelihood of worker drug use and also to influence work-related behaviors.

A number of outcome variables were examined to determine the effects of worker drug use. The first of these is concerned with work-related accidents. The survey question used to construct this variable was preceded by the following definition:

“Work-related accidents ...mean that you were part of an accident... [that] took place while you were

working, and that resulted in any or all of the following: damage to property or equipment, an injury to yourself, or an injury to another person.”

The question that followed this definition asked about any work-related accident in the year before the survey was administered. However, the survey did not ask how many times in the past year the participant may have been involved in an accident.

The second outcome variable was based on the following survey question:

“During the past 12 months, have you involuntarily left an employer for any of the following reasons? You were fired?”

The third outcome variable was based on the following question:

“During the past 12 months, have you voluntarily left an employer?”

These outcome variables have only two potential responses, yes or no. Therefore, they are known as binary or dichotomous variables.

The next set of outcome variables is concerned with workplace drug testing programs. The first of these was based on a series of questions that asked whether the participant’s company has various types of drug testing programs. These questions were used to develop a

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variable that has the following four categories:

- (1) The company has neither an at-hiring nor a random drug testing program;
- (2) The company has only an at-hiring drug testing program;
- (3) The company has only a random drug testing program;
- (4) The company has both an at-hiring and a random drug testing program.

Although there are other types of testing programs, such as post-accident, at-hiring and random programs may cover the broadest range of workers. It is important to realize that the NHSDA asked only whether the participant's company had these drug testing programs, but it did not ask whether the respondent was subject to the program or had been tested under the program.

The second set of drug testing variables is based on two survey questions that asked whether the participant would be less likely to work for a company that has an at-hiring or a random drug testing program. As with several of the other outcome variables described above, these variables are binary or dichotomous.

Appendix table 1 provides the percentage and number of NHSDA participants who fell within each of the respective categories of the variables.

The table also shows the estimated number of workers in the United States who fell within the categories. These were derived by using the sample weights (see below) to infer how many workers were represented by the participants in the NHSDA.

The effects of the variables listed in Appendix table 1 were statistically controlled in the analysis described below.

The Statistical Methods

There are two important issues to consider when analyzing the NHSDA variables described above. First, the outcome variables are categorical, with most of them having only two possible categories. Therefore, many commonly used statistical techniques, such as least squares regression, are inappropriate for analyzing these variables. The most common alternatives fall under a class of statistical techniques known as logistic regression. The goal of logistic regression is to estimate the odds that a participant falls into one of the categories of the outcome variable relative to the odds of falling into another category. For example, in a statistical model that examines workplace accidents, the intent of a logistic regression analysis might be to determine the odds that a worker had an accident in the

past year. In a statistical model that examines drug testing, the goal might be to determine the odds that a participant worked for a company with an at-hiring program relative to the odds that she worked for a company with no drug testing program.

In and of itself, this type of analysis might not be interesting. An advantage of a logistic regression analysis, however, is that we may determine these relative odds, which are usually called odds ratios, based on a set of explanatory variables. For instance, in a statistical model with workplace accidents as the outcome variable, a logistic regression analysis may be used to determine the odds of having an accident among weekly marijuana users relative to those who had never used marijuana. An additional advantage is that we may control statistically for the effects of other variables in the model. Thus, the effects of drug use on work-related outcomes may be isolated from the effects of other variables such as age, education, income, and occupation. In all results in this report that show likelihoods, we control for the effects of the demographic variables listed in Appendix table 1.

We rely on odds ratios to determine the association between drug use and workplace outcomes. Odds

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ratios indicate the effect of a variable on the odds that an event will occur relative to some predefined reference category. An odds ratio greater than one indicates a relatively higher likelihood of the outcome, while an odds ratio less than one indicates a relatively lower likelihood of the outcome. For example, suppose we find that symptoms of dependence has an odds ratio of 2.0 in a statistical model predicting accidents. This implies that workers who showed symptoms of dependence were about two times as likely as those who were free of symptoms to have had an accident in the past year.

The odds ratios were computed using two types of logistic regression models. Bivariate logistic regression was used when the outcome variable has only two categories. Multinomial logistic regression was used when the outcome variable has more than two categories. This latter option was used in the statistical model that examined the type of drug testing program reported by NHSDA participants. In this model, we used the category “neither at-hiring nor random testing program” as the reference category. Therefore, the odds ratios indicate the odds of falling into another drug testing category relative to the odds of falling into this reference category.

The second important issue to address concerns the sampling design of the NHSDA. The NHSDA was collected through a complex sample design, which is commonly used to collect data from a national sample. A drawback to this type of sample is that standard statistical software packages should not be used to analyze its data. Most statistical software assumes that data were collected through simple random sampling, with each sample unit having an equal chance of selection. A complex sample, however, does not use simple random sampling; rather, it randomly chooses sample units in multiple stages. Although the point estimates derived from statistical models are correct, assuming the analyst uses properly computed sample weights, the standard errors are usually incorrect. The standard errors of the point estimates are used to determine the statistical significance of a result.

In order to compute the correct standard errors in analyses of complex survey data, specialized statistical software is needed. In this report, we rely on two statistical software packages, SUDAAN and Stata, that include a number of statistical procedures for analyzing complex survey data. We also use the sample weights available with the NHSDA in all analyses.

Thus, the descriptive statistics and logistic regression coefficients shown in this report are unbiased, nationally representative estimates.

Some Limitations

In the analysis of any data there are always limitations, some of which are due to the assumptions of the analyst and some of which are due to limitations inherent in the data themselves. Most introductory textbooks on analyzing data include some discussion of various limitations. We focus on only three of a number of possible limitations here.

First, the NHSDA interviews participants one time only. Thus, the NHSDA is known as a cross-sectional survey. A limitation of this type of survey is that it is often difficult to establish the time ordering of variables. For instance, the results presented in this report indicate that weekly marijuana use increases the risk of being fired in the past year. However, it is conceivable that a participant was fired 11 months before the survey was administered, but only began using marijuana frequently after being fired. Similarly, a person may have joined a company with a drug testing program just before the survey was administered. Therefore, her drug use over the past year may have had little bearing on the likelihood of working for a

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company with a random testing program. A similar problem haunts other possible associations presented in this report. Given the annual time frame of the data collection and the relevant questions, it is difficult to overcome this potential problem. The analyst can merely hope that it does not affect the results to any significant degree.

Second, given that the data are based on individual reports, there is bound to be error for a number of reasons (memory problems, difficulty with questions, etc.). For example, some workers may not know whether their company has a drug testing program. Although the NHSDA is administered using state-of-the-art techniques, there is still room for errors due to the way participants respond to questions.

Third, the NHSDA is concerned mainly with the prevalence of drug use; in other words, it addresses primarily what percentage of the population has used marijuana, cocaine, and other drugs. But it is not concerned with describing patterns of drug use; it does not seek answers to questions such as why people begin to use, why some escalate use during certain periods of their lives, or when and why most people stop using. It also does not ask the circumstances of use, such as whether a person uses

at work, at home, only on the weekends, etc. The key drawback for this report is that we have no information on whether the participant used on-the-job or off-the-job only. Since on-the-job use may be more consequential than other forms of use for accidents, being fired, or even drug testing, the results presented in this report must remain tentative.

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Appendix Table 1 Distribution of Variables, National Household Survey on Drug Abuse, 1994

Variable	Percentage or Mean	Number	Estimated Number
<i>Outcomes Variables</i>			
Work-related accident, past year	5.2%	502	6,134,000
Fired from job, past year	1.6%	182	1,549,000
Resigned from job, past year	13.7%	1,414	14,865,000
<i>Type of Drug Testing Program</i>			
No testing program	68.1%	6,019	81,095,000
At-hiring only	14.7	1,478	17,508,000
Random only	3.2	294	3,787,000
At-hiring and random	14.0	1,306	16,698,000
Less likely to work for company that Drug tests at-hiring	7.4%	618	8,813,000
Less likely to work for company that Drug tests randomly	12.8%	1,099	15,194,000
<i>Drug Use</i>			
<i>Marijuana Use</i>			
Never used	58.6%	4,925	69,844,000
Used 3 or more years ago	28.4	2,556	33,770,000
Used 1-3 years ago	3.1	377	3,730,000
Used 1-3 years ago	2.2	284	2,659,000
Used 1-2 days in past year	4.7	550	5,547,000
Used 3-51 days in past year	3.0	405	3,539,000
Used at least weekly in past year			
<i>Cocaine Use</i>			
Never used	85.1%	7,849	97,853,000
Used 3 or more years ago	11.3	1,096	13,423,000
Used 1-3 years ago	1.6	190	1,856,000
Used 1-2 days in past year	0.7	94	801,000
Used 3-51 days in past year	1.0	171	1,218,000
Used at least weekly in past year	0.3	57	394,000
Mean number of days drunk, past year	0.97	C	C
Symptoms of dependence (illicit drugs & alcohol), past year	1.5%	227	1,840,000
<i>Demographic Variables</i>			
Mean age (in years)	38.6	C	C
<i>Sex</i>			
Male	53.6%	4,490	63,846,000
Female	46.4	4,607	55,244,000

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Appendix Table 1 Distribution of Variables, National Household Survey on Drug Abuse, 1994

Variable	Percentage or Mean	Number	Estimated Number
Mean years of education	13.4	–	–
Full-time worker	79.5%	7,215	94,689,000
<i>Race</i>			
White	76.6%	4,750	91,275,000
Black	10.6	1,861	12,601,000
Hispanic	8.8	2,274	10,521,000
Other	3.9	212	4,692,000
<i>Region</i>			
Northeast	18.9%	1,552	22,558,000
North Central	25.0	1,982	29,761,000
South	35.1	3,498	41,732,000
West	21.0	2,065	25,038,000
<i>Marital Status</i>			
Married	62.6%	4,454	74,588,000
Widowed	2.1	100	2,471,000
Divorced/separated	11.5	1,236	13,743,000
Never married	23.8	3,307	28,288,000
<i>Family Income</i>			
\$75,000 or more	15.0%	792	17,878,000
\$40,000-\$74,999	37.7	2,677	44,846,000
\$20,000-\$39,999	29.9	3,204	35,582,000
\$9,000-\$19,999	13.5	1,789	16,031,000
Less than \$9,000	4.0	635	4,754,000
<i>Occupation Group</i>			
Executive-managerial	13.3%	942	15,775,000
Professional specialty	16.4	1,031	19,464,000
Technicians & related support	4.2	363	5,025,000
Sales	10.9	996	12,959,000
Administrative support	14.2	1,311	16,850,000
Private household	0.6	62	732,000
Protective service	2.0	167	2,358,000
Service	10.6	1,305	12,558,000
Farming, fishing & forestry	2.1	266	2,500,000
Precision production & repair	3.5	290	4,122,000
Construction	4.3	396	5,079,000
Extractive & precision production	4.1	342	4,881,000
Machine operators & assemblers	5.8	737	6,896,000
Transportation & material moving	4.0	374	4,709,000
Handlers, helpers & laborers	3.9	454	4,643,000
Total	100.0%	9,097	119,090,000

Note: Totals in the Percentage and Estimated Number columns may not sum to total due to rounding.