

Prevalence of Alcohol and Drug Use in a Highly Educated Workforce

Robert A. Matano, PhD
Stanley F. Wanat, PhD
Darrah Westrup, PhD
Cheryl Koopman, PhD
Shelly D. Whitsell, BA

Abstract

This study examined alcohol and licit and illicit drug use in a highly educated workforce. A comprehensive health survey of a 10% random sample of a workforce (n = 8,567) yielded a 60% response rate (n = 504) after accounting for 15 undeliverable surveys. Many respondents reported past-year use of alcohol (87%). Thirteen percent of respondents consumed three or more drinks daily; 15% were binge drinkers. Twelve percent of the workforce was assessed as having a high likelihood of lifetime alcohol dependence; 5% of respondents met criteria for current problem drinking. Overall, 42% reported using mood-altering prescription drugs (analgesics, antidepressants, sedatives, or tranquilizers). Eleven percent reported using illicit drugs (cocaine, hallucinogens, heroin, or marijuana) in the past year. Significant relationships were found between gender, age, ethnicity, and occupation with some measures of alcohol consumption and use of mood-altering drugs. These results indicate prevention and early intervention programs need to address use of mood-altering substances (including alcohol) in highly educated workforces.

Introduction

Alcohol consumption and drug use are widespread. The 1998 Household Survey on Drug Abuse¹ reported the following important findings: (1) an estimated 113 million Americans were current users of alcohol (had consumed alcohol within the past month), (2) approximately 33 million individuals were binge drinkers (at least once during the past month had five or more drinks on the same occasion), (3) 12 million people reported heavy drinking (on at least 5 days during the past month had five or more drinks on the same occasion), (4) an estimated 13.6 million Americans were current users of

Address correspondence to Robert A. Matano, PhD, Assistant Professor of Psychiatry and Behavioral Sciences, Emeritus, Principal Investigator/Program Director, CopingMatters Program, School of Medicine, Stanford University, Stanford, CA 94305-5724, e-mail: rmatano@stanford.edu.

Stanley F. Wanat, PhD, is Deputy Program Director, CopingMatters Program, School of Medicine, Stanford University.

Darrah Westrup, PhD, is Post-Doctoral Fellow in Psychiatry and Behavioral Sciences, CopingMatters Program, School of Medicine, Stanford University.

Cheryl Koopman, PhD, is Associate Professor of Psychiatry and Behavioral Sciences, School of Medicine, Stanford University.

Shelly D. Whitsell, BA, is Program Coordinator, CopingMatters Program, School of Medicine, Stanford University.

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illicit drugs (used an illicit drug at least once during the 30 days prior to the interview), and (5) 4.1 million were dependent on drugs, including 1.8 million (0.8 percent) Americans who were current users of cocaine.

In addition, as in previous years, the 1998 National Household Survey¹ found a strong association between level of alcohol consumption and illicit drug use; the survey reported the following related findings: (1) of the 12.4 million heavy drinkers in the United States, 3.7 million (29.5%) were current illicit drug users, (2) among the 20.5 million binge (but not heavy) drinkers, 3.7 million (17.8%) were illicit drug users, and (3) among other drinkers (past month but not binge), 4.4 million (5.5%) had used illicit drugs. In contrast, among non-drinkers, 1.8 million (1.7%) had used illicit drugs.

Given the widespread use of alcohol and drugs in American society, it should be no surprise that an overwhelming majority of individuals who consume alcohol and/or drugs are employed. In fact, approximately 73% of illicit drug users are employed either part time or full time; of those individuals employed full and part time, more than 14% reported consuming five or more drinks on 5 days or more in the last month.¹

Substance abuse profoundly impacts the workplace in a number of ways. An estimated 7% of employees incur workplace injuries each year, and high alcohol use (at least five daily drinks on average) doubles an employee's chance of having an accident at work.^{2,3} Such incidents cost, on average, approximately \$1,500.⁴ Alcoholism causes 500 million lost workdays each year.⁵ Additional workplace effects of substance abuse include lowered productivity and higher operating expenses resulting from absenteeism, employees showing up late to work, and high job turnover, as well as employee inattention, careless work, and errors causing employer liability.

As employees' level of drinking increased, so did problems at work.⁶ A 1997 analysis⁷ of worker drug use found that full-time workers aged 18–49 who reported current illicit drug use were more likely than those reporting no current illicit drug use to report the following employment-related problems: (1) they had worked for three or more employers in the past year (32% for current illicit drug users versus 18% for others) and (2) they had voluntarily left an employer in the past year (26% versus 14%), had been fired in the past year (5% versus 1%), and had taken an unexcused absence from work in the past month (12% versus 6%). Similar results were reported for employees who were heavy alcohol users. Drug-using employees were twice as likely to request early dismissal or time off, and three times as likely to have absences of 8 days or more.⁸ Furthermore, drug-using employees were three times as likely to be late for work, four times as likely to be involved in a workplace accident, and five times as likely to file a workers' compensation claim.⁸ Substance abuse also affects employee health and well-being, including worksite accidents and injuries, driving under the influence (on the job, while commuting to and from work), disability, and premature death.⁹

Within the field of substance abuse research, a number of topics have been widely studied. For example, substantial research exists on the genetic, cultural, and familial causes of addiction. Furthermore, there is a considerable body of research on groups who are likely to develop substance abuse, such as runaway adolescents and children of alcoholics. However, there are some groups who could be at risk for developing substance abuse problems that have not been thoroughly researched. For example, little research exists pertaining to substance use and abuse among the group of highly educated workers who are a large part of the United States workforce. This group of highly educated employees is the focus of the present study, which endeavors to better understand the prevalence and patterns of alcohol and drug use and abuse.

The size of the highly educated workforce in the United States makes it an important focus for studying the nature and extent of use of alcohol and licit and illicit drugs. In 1998, 10% (10.9 million workers) of individuals in the civilian labor force had an advanced degree; an additional 20% (22.1 million workers) had, as their highest level of education, a bachelor's degree.¹⁰ Furthermore, work sites with substantial numbers of highly educated employees constitute one of the largest employment sectors in the United States.¹¹ Society's profound shift from a production economy to one dominated by the service and technology sectors increases the need for better educated workers.

Further, alcohol and drugs not only negatively affect physical functioning, but also impair cognitive functioning. Therefore, the use of alcohol and drugs in the highly educated sector of the workforce becomes a critical issue for productivity.

In studying the workforce, it is important to examine demographic differences in the use and abuse of substances because available research indicates that the prevalence of substance use-related problems varies with demographic factors (eg, age, gender, race/ethnicity, and income). The prevalence of such problems also varies with environmental factors (eg, place of residence; type and level of workplace stress).¹²⁻¹⁴ For example, in 1998, fewer women than men reported consuming alcohol in the past month (45% and 59%, respectively); 23.2% of men reported binge drinking as compared with 8.6% of women; and men were more likely than women to report heavy drinking (9.7% and 2.4%, respectively).¹ Previous research¹⁵ regarding the United States indicates that individuals who identified themselves as "Asian" reported drinking significantly less alcohol and reported fewer problems associated with alcohol than those individuals who identified themselves as "white." Also, previous research⁷ has shown that individuals who had not finished high school tended to report heavier alcohol consumption than those who had completed college. Therefore, this study of a highly educated workforce will examine the relationships of education, occupational status, gender, age, and ethnicity to the prevalence of use of substances.

In addition to demographic differences, the prevalence of substance abuse varies with occupational category. Among 14 such categories, the prevalence of current illicit drug use ranged from 3% for employees in the protective service occupation category to 19% for those in food preparation, waiters, waitresses, and bartenders.⁷ The prevalence of heavy alcohol use (on at least 5 days during the past month having five or more drinks on the same occasion) varied from 4% in the professional specialty occupation category to 15% for the food preparation, etc, occupation category previously mentioned.⁷

Most research on alcohol use in the workforce has focused on the assessment of alcohol dependence, whereas this study focuses on other alcohol-related problems such as binge drinking and injuries due to alcohol use. Therefore, a large, comprehensive, randomized survey was conducted of individuals employed at a major Silicon Valley corporation to investigate the extent to which employees in a highly educated workforce used alcohol and drugs and, if so, determine the patterns and severity. The terms *problem drinking* and *alcohol abuse* are used interchangeably in this study to refer to current problem drinking; that construct is distinguished from "high likelihood of lifetime alcohol dependence."

Methods

Study design and procedures

Ten percent of the workforce (8,567 employees) were randomly selected to receive an anonymous survey (857 surveys mailed). A computerized randomization program (the random number function in Excel [Microsoft]) was used to randomly select the employees of an organization in northern California who would be asked to participate in the study. Potential respondents were offered the option of returning consent forms in one envelope and surveys anonymously in another, offering payment of subject fees to all respondents who completed and mailed in a consent form. This procedure ensured complete anonymity to all respondents. The first survey was delivered in January 1999, followed up with two additional mailings, each a month later, to all respondents who had not yet returned a consent form. Fifteen of the mailed surveys were returned as undeliverable, resulting in 842 potential respondents. Of this potential pool, 504 respondents returned completed questionnaires, resulting in a 60% response rate.

Sample description

Respondents' ages ranged from 21 to 78, with a mean age of 43.8 years (standard deviation [SD] = 11.8). Table 1 presents the percentage of respondents who described themselves by each

Table 1Descriptive statistics summarizing respondents' demographic characteristics ($n = 504$)

Demographic characteristic	Percentage
Gender	
Male	37.2
Female	62.8
Education (highest level)	
Less than high school graduation	0.8
High school graduation	2.2
Some college	8.6
Associates degree	7.5
Bachelor's degree	29.9
Master's degree	23.4
Doctoral degree	27.5
Ethnic background	
African American/black	2.6
Asian American/Pacific Islander	15.7
Caucasian	73.3
Hispanic	4.2
Native American/Alaskan Native	1.2
Other	3.0
Employment status	
Employed full time	87.0
Employed part time	10.8
Other employment status, medical leave, etc	2.2
Type of job	
Administrative support	21.8
Management	17.9
Professional	52.8
Other	7.5

category of the other demographic characteristics. As shown, the percentage of respondents who are female is greater than that of males in this survey, which reflects the gender distribution in the larger workforce population, as well as the result of the random sampling procedure, which slightly skewed the sample in favor of sampling females. Furthermore, female respondents tend to be managers or administrators, whereas male respondents tend to be professionals, which also reflects this particular workforce. In addition, females who were mailed the survey were slightly more likely to return it than were males (of those who were mailed the survey 57% were female and of those who returned the survey 62.8% were female), which suggests a slight gender response bias. Furthermore, the ethnic breakdown shows a higher representation of Caucasians and Asian Americans than other ethnic groups, which reflects fairly well the composition of this workforce population.

Measures

Demographic characteristics

This study used self-report items to assess the demographic characteristics of gender, age, education, ethnicity, employment, and marital status.

The CAGE

The CAGE is a standardized assessment tool^{16,17} that is used for rapid screening of the likelihood of alcohol dependence. It consists of four questions: (1) Have you ever felt you should cut down on your drinking? (2) Have people annoyed you by criticizing your drinking? (3) Have you ever felt bad or guilty about your drinking? and (4) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (eye opener)? (The instrument's name comes from a key word in each of the questions: "Cut" in the first question, "Annoyed" in the second, "Guilty" in the third, and "Eye opener" in the fourth.) The use of the modifier *ever* in three of the CAGE questions makes the instrument an assessment tool that gauges the likelihood of having experienced a problem of alcohol dependence in one's lifetime (as opposed to assessing likelihood of just current alcohol dependence).

The CAGE is valued for its brevity and relatively high level of clinical validity. The instrument's validity is supported by the item content, which focuses on problems widely recognized as clinically significant indicators of likely alcohol dependence. Two aspects of its clinical validity are its sensitivity and specificity. The research literature discusses the utility of using either (1) one positive or (2) two or more positives on the CAGE as a cut-off point. For two or more positives, the CAGE is reported to have a range of sensitivity from 72% to 91% and a range of specificity from 77% to 96%.^{16,18} The CAGE also is reported to be clinically useful with a cut point of one positive, with sensitivity in the area of 79% and specificity in the area of 67%.^{19,20} However, some research²¹ suggests that lowering the cut-off score increases the number of false positives. Other research²² suggests that lowering the cut-off score to one when screening women may improve the instrument's sensitivity with no loss of specificity; for the men, the lowered cut-off score did not affect the instrument's sensitivity, but significantly lowered specificity.

The AUDIT

The alcohol use disorders identification test (AUDIT) was used to assess current problem drinking, as distinguished from likelihood of lifetime alcohol dependence. Developed by a panel of experts, including clinicians, working with the World Health Organization (WHO), it has been used internationally.²³ This instrument consists of 10 items (see Table 2 for the items and a description of this scoring procedure). The wording of these 10 items focuses on the respondent's current drinking behavior. Seven items refer to behavior within the past year, and three items refer to current behavior.

The developers of the AUDIT created a scoring procedure that is used to weigh the answers provided by the individual being assessed. The AUDIT is a well-researched assessment tool, with criterion validity correlations between AUDIT and interviews ranging from 0.47 to 0.66. With respect to discriminative validity, the AUDIT questions' sensitivity ranged from 54% to 79%; specificity ranged from 90% to 93%, for heavy drinking.²⁴ Another analysis reported the sensitivity of AUDIT questions to have an overall value of 92% and the specificity to have an overall value of 93%.²⁵ Test-retest reliability correlations ranged from 0.65 to 0.85.²⁴ The sensitivity and specificity values stated above use the standard cut point of 8; however, the AUDIT also has been tested with differing cut points.²³

Frequency of use of alcohol and other mood-altering drugs in the past 12 months

We assessed employees' use of 10 categories of drugs by means of a standardized set of questions. A group of researchers comprising a federally funded Cooperative Agreement on Workplace Managed Care agreed on these categories.²⁶ Each item assessed the respondent's reported frequency of use of the substance in the past 12 months. The following response options were provided: "not at all," "once or twice," "a few times," "one to two times a week," "almost daily," and "daily." For ease of presentation of the results, the responses were combined for the categories of "once or twice" and

Table 2
The AUDIT questionnaire

The response choices for questions 1–8 are scored 0, 1, 2, 3, or 4. The response choices for questions 9 and 10 are scored 0, 2, or 4 only. The minimum score (for nondrinkers) is 0; the maximum possible score is 40. A score of 8 or more indicates a strong likelihood of hazardous or harmful alcohol consumption.³⁴

1. How often do you have a drink containing alcohol?
 (0) Never (1) Monthly or less (2) Two to four times a month (3) Two to three times a week (4) Four or more times a week
2. How many drinks containing alcohol do you have on a typical day when you are drinking?
 (0) 1 or 2 (1) 3 or 4 (2) 5 or 6 (3) 7 to 9 (4) 10 or more
3. How often do you have six or more drinks on one occasion?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
4. How often during the last year have you found that you were not able to stop drinking once you had started?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
5. How often during the last year have you failed to do what was normally expected from you because of drinking?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
7. How often during the last year have you had a feeling of guilt or remorse after drinking?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
 (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
9. Have you or someone else been injured as a result of your drinking?
 (0) No (2) Yes, but not in the last year (4) Yes, during the last year
10. Has a relative or friend, or a doctor or other health worker, been concerned about your drinking or suggested you cut down?
 (0) No (2) Yes, but not in the last year (4) Yes, during the last year

"a few times" as were the categories of "one to two times a week" and "almost daily." The drugs included in this part of the study include the following.

- Analgesic drugs (codeine, Darvon, Demoral, Percodan, and Tylenol with codeine)
- Antidepressants (Elavil, Paxil, Prozac, and Zoloft)
- Cocaine
- Hallucinogens
- Heroin
- Marijuana
- Tranquilizers (Ativan, Dalmane, Halcion, Librium, Valium, and Xanax)
- Sedatives (barbiturates, Benadryl, Nembutal, phenobarbital, and Seconal)
- Stimulants (Apidex, Dexedrine, Fastin, methamphetamine, Ritalin)
- Other (other drugs included herbals; respondents were asked to specify the drug)

Indication of likely alcohol dependence and abuse

Employees who responded "Yes" to two or more of the CAGE items were scored as being likely to have lifetime alcohol dependence. Employees whose AUDIT scores were 8 or above were scored as likely current problem drinkers.

Use of mood-altering drugs

This study analyzed separately the use of any mood-altering drugs that can be legally prescribed from those that are illicit. This distinction did not permit the determination of whether the prescription drugs were actually used as medically prescribed. Four summary variables were created to indicate frequency of use of licit and illicit drugs, as described below:

1. Any use of analgesics, antidepressants, sedatives, or tranquilizers during the previous 12 months was labeled "use of mood-altering prescription drugs in past year."
2. Any use of cocaine, hallucinogens, heroin, or marijuana during the previous 12 months was labeled "use of illicit drugs in past year."
3. "Weekly or more use of mood-altering prescription drugs" was used to report taking analgesics, antidepressants, sedatives, or tranquilizers during the previous 12 months either "one to two times a week," "almost daily," or "daily."
4. "Weekly or more use of illicit drugs" was employed to report using cocaine, hallucinogens, heroin, or marijuana during the previous 12 months either "one to two times a week," "almost daily," or "daily."

"Stimulants" could not be coded in these summary categories because illicit and prescribed stimulants were combined in assessing respondents' use of stimulants; hence, any use and weekly or more use of stimulants were reported separately from the other summary variables.

Treatment for alcohol and drug use

We also created a summary variable to determine how many employees had received treatment for alcohol or drug abuse (or both). This summary variable combined responses to six survey items so that a positive response to any of these items indicated treatment. These items included the following types of substance abuse treatment during the past 12 months: outpatient visits to therapists, day treatment intensive outpatient days, hospitalization (detox) days, and hospitalization (residential) days. Also included were the items: "During the past 6 months, did you receive substance abuse treatment through your employee health plan?" and "In the past 12 months, have you received substance abuse treatment outside your health plan?"

Results

Indications of high likelihood of alcohol dependence and abuse

Survey responses to the items assessing prevalence and problems associated with alcohol consumption are summarized in Tables 3 and 4. Overall, 87% of the respondents reported consumption of alcohol on the AUDIT, and 13% consumed three or more drinks daily. Consuming six or more drinks on one occasion during the past year was reported by 15% of the respondents, with 4% consuming six or more drinks on at least one occasion within the last month. The results showed that 12% of the workforce were assessed to be likely to have lifetime alcohol dependence based on having two positive responses on the CAGE. As Table 4 indicates, if a cut-off score of one positive on the CAGE is used, 23% of the respondents would be found to likely be suffering from lifetime alcohol dependence. However, as mentioned previously, lowering the cut-off score of the CAGE has been found to increase the number of false positives.²¹ In terms of problem drinking, 5% of the respondents were assessed as having a high likelihood for alcohol abuse, as indicated by a score of 8 or more on the AUDIT. Furthermore, 3% of the respondents reported that someone else had been injured due to their alcohol consumption. Only 1% of the employees reported receiving any type of substance abuse treatment during the past year.

Demographic characteristics in relation to drinking

Table 5 presents the percentages of the sample reporting various kinds of drinking behavior analyzed by demographic characteristics. Given that some of the demographic subgroups are small (eg, $n = 22$ for the age category of 18–24), it is important to use the results of multiple regression analysis to identify which demographic differences are statistically significant. Those who reported any drinking in the past year were significantly more likely to be males (beta = .10, $t[1, 461] = 2.06$, $p < .05$) and significantly less likely to be Asian American (beta = $-.33$, $t[1, 461] = -3.79$, $p = .001$); overall $F(11, 461) = 5.33$, $p < .001$, overall adjusted $R^2 = .09$. Reported binge drinking

Table 3
Current use of alcohol ($n = 504$)

Item	Respondents (%)
How often do you have a drink containing alcohol?	
Never	13.5
Monthly or less	26.4
2–4 times/month	17.9
2–3 times/week	19.5
4 or more times/week	22.7
How many drinks containing alcohol do you have on a typical day when you are drinking? (For those who report using alcohol)	
1 or 2	87.4
3 or 4	10.3
5 or 6	2.2
How often do you have six or more drinks on one occasion?	
Never	84.7
Less than monthly	11.1
Monthly	3.0
Weekly	0.8
Daily or almost daily	0.4

Table 4Percentages of respondents reporting problems related to alcohol ($n = 504$)

Problem	Percentage
Problem identified by CAGE	
No positives	77.5
One positive	10.5
Two positives	8.7
Three positives	2.5
Four positives	0.8
Problem identified by AUDIT	
Scored below cut off (score < 8)	94.7
Scored above cut off (8 or higher)	5.3

Table 5Drinking behavior analyzed by demographic characteristic ($n = 504$)

Demographic characteristic	Any alcohol use	Binge drinking	AUDIT hits (>7)	CAGE hits (>1)
Gender				
Female	83.5%	11.9%	3.9%	10.2%
Male	91.4%	21.1%	7.6%	14.4%
Age				
≤24 years of age	90.5%	31.8%	0%	4.5%
25–44 years of age	86.9%	17.4%	4.7%	9.5%
45–64 years of age	86.0%	12.2%	6.3%	15.5%
65+ years of age	82.4%	5.9%	5.9%	5.9%
Education (highest level)				
<Bachelor's degree	81.5%	19.4%	10.8%	14.4%
Bachelor's degree	86.4%	17.9%	2.8%	11.3%
Master's degree	88.4%	14.9%	7.1%	11.8%
Doctoral degree	90.3%	9.0%	2.2%	11.4%
Ethnic background				
African American/black	84.6%	30.8%	16.7%	23.1%
Asian American/Pacific Islander	65.3%	13.2%	0%	5.6%
Caucasian	91.2%	15.0%	6.1%	13.5%
Hispanic	70.0%	14.3%	5.0%	5.6%
Other	95.2%	23.8%	4.8%	5.0%
Type of job				
Administrative support	77.8%	12.3%	3.8%	8.7%
Management	90.7%	20.2%	9.0%	14.0%
Professional	90.0%	12.4%	3.5%	11.8%
Other	80.6%	29.7%	11.4%	17.1%

Table 6Prevalence of use of mood-altering drugs other than alcohol in the past year ($n = 504$)

Drug	Not at all	Once to a few times in the year	Once a week to almost daily	Daily
Licit (prescription) drug				
Analgesics	72.3%	24.2%	2.6%	0.8%
Antidepressants	88.3%	2.4%	2.6%	6.6%
Sedatives	91.5%	6.6%	1.4%	0.4%
Tranquilizers	89.6%	8.8%	1.2%	0.4%
Illicit drug				
Cocaine	98.0%	2.0%	0%	0%
Hallucinogens	99.8%	0.2%	0%	0%
Heroin	99.8%	0.2%	0%	0%
Marijuana	89.7%	8.5%	1.8%	0%
Additional drug				
Stimulants	97.2%	1.4%	1.0%	0.4%
Other drug	82.5%	9.3%	8.1%	0%

in the past year (greater than six drinks in a single session) was significantly more prevalent among males ($\beta = .14$, $t[1, 461] = 3.01$, $p < .01$) or African Americans ($\beta = .18$, $t[1, 461] = 3.31$, $p < .001$), and binge drinking was significantly less prevalent among those who were older ($\beta = -.13$, $t[1, 461] = -2.76$, $p < .01$), or who were employed as administrators ($\beta = -.22$, $t[1, 461] = -2.74$, $p < .01$) or as professionals ($\beta = -.19$, $t[1, 461] = -1.99$, $p < .05$); overall $F(11, 461) = 4.94$, $p < .001$, overall adjusted $R^2 = .08$. Meeting criteria for current problem drinking on the AUDIT was significantly greater among African Americans ($\beta = .11$, $t[1, 460] = 2.08$, $p < .05$); overall $F(11, 460) = 2.36$, $p < .01$, overall adjusted $R^2 = .03$. Meeting criteria for likely lifetime alcohol dependence on the CAGE was not significantly related to any of the demographic characteristics; overall $F(11, 450) = 1.66$, $p = \text{not significant (NS)}$. No other relationship between demographic characteristics and these indices of drinking behavior was found to be statistically significant.

Use of mood-altering licit drugs in the past year

Table 6 presents the prevalence of use of licit mood-altering drugs other than alcohol. In the past year, substantial percentages of respondents reported use of licit mood-altering drugs, including: 28% for analgesics, 12% for antidepressants, 10% for benzodiazepines, and 8% for sedatives. Overall, 42% of the sample reported use of a licit mood-altering drug in the past year, when counting only once all individuals who used any of these drugs, regardless of how many of these drugs they used. Weekly or more use of mood-altering licit drugs was reported by 13% of respondents.

Use of mood-altering illicit drugs in the past year

Table 6 also presents the prevalence of use of stimulants and illicit mood-altering drugs other than alcohol. In the past year, substantial percentages of respondents reported use of illicit mood-altering drugs, including 10% for marijuana and 2% for cocaine. Use of an illicit drug in the past year was reported by 11% of the respondents, with 2% reporting weekly or more use of illicit drugs.

Table 7Use of mood-altering drugs analyzed by demographic characteristic ($n = 504$)

Demographic characteristic	Prescription	Illicit	Stimulant	Antidepressant	Marijuana
Gender					
Female	44.6%	9.8%	3.2%	15.0%	9.3%
Male	38.4%	13.5%	2.2%	6.0%	12.4%
Age					
≤ 24 years of age	45.5%	22.7%	0%	9.1%	22.7%
25–44 years of age	43.3%	13.1%	2.1%	12.8%	11.9%
45–64 years of age	42.0%	8.9%	4.0%	11.7%	8.5%
65+ years of age	35.3%	0%	0%	0%	0%
Education (highest level)					
< Bachelor's degree	43.6%	12.8%	5.3%	14.9%	11.7%
Bachelor's degree	42.2%	15.6%	4.1%	12.5%	14.4%
Master's degree	48.7%	9.6%	1.8%	12.3%	8.8%
Doctoral degree	37.6%	6.8%	0.8%	9.1%	6.8%
Ethnic background					
African American/black	53.8%	23.1%	0%	0%	15.4%
Asian American/Pacific Islander	37.2%	7.8%	2.6%	5.2%	7.9%
Caucasian	43.5%	12.4%	2.8%	13.9%	11.6%
Hispanic	33.3%	4.8%	4.8%	4.8%	4.8%
Other	38.1%	4.8%	4.8%	9.5%	4.8%
Type of job					
Administrative support	48.1%	11.1%	2.8%	18.5%	10.3%
Management	43.8%	13.5%	1.1%	11.5%	13.5%
Professional	40.4%	10.8%	3.1%	9.7%	9.7%
Other	37.8%	10.8%	5.4%	8.1%	10.8%

Use of stimulants in the past year

Furthermore, use of stimulants (licit or illicit) was reported by 3% of respondents for the past year; 1% of respondents reported weekly or more use.

Demographic characteristics in relation to mood-altering drugs

Table 7 presents the percentages of the sample reporting use of mood-altering drugs, analyzed by demographic characteristics. Again, the results of the multiple regression analysis identify the demographic subgroups that differ statistically. Use of prescription drugs in the past year was not significantly related to any of the demographic variables, overall model $F(11, 464) = 0.57$, $p = \text{NS}$. Use of illicit drugs in the past year was significantly greater among males ($\beta = .12$, $t[1, 463] = 2.33$, $p < .05$) and African Americans ($\beta = .12$, $t[1, 463] = 2.28$, $p < .05$), and use of illicit drugs was significantly less prevalent among those who were older ($\beta = -.17$, $t[1, 463] = -3.68$, $p < .001$); overall $F(11, 463) = 2.96$, $p < .001$, overall adjusted $R^2 = .04$. Use of stimulants in the past year was not significantly related to any of the demographic variables; overall model $F(11, 461) = 1.19$, $p = \text{NS}$. Use of antidepressants in the past year was significantly greater among females ($\beta = -.16$, $t[1, 459] = -3.04$, $p < .01$); overall $F(11, 459) = 2.43$, $p < .01$, overall

adjusted $R^2 = .03$. Use of marijuana in the past year was significantly lower among those who were older (beta = $-.15$, $t[1, 461] = -3.15$, $p < .01$); overall $F(11, 461) = 1.84$, $p < .05$, overall adjusted $R^2 = .02$. No other relationship between demographic characteristics and these indices of mood-altering drug use was found to be statistically significant.

Discussion

This study centered on three topics relating to substance use and abuse in a highly educated workforce: (1) the extent of, and problems related to, alcohol consumption; (2) the prevalence of using mood-altering prescription drugs; and (3) the use of illicit drugs. Regarding alcohol consumption, prevalence rates similar to those found for the general population were reported in this sample, with high likelihood of lifetime alcohol dependence of 12% and current problem drinking of 5%. Furthermore, with respect to binge drinking, one in seven respondents reported consuming more than six drinks on one occasion. The finding that 4% of the workforce reported consuming six or more drinks on one or more occasions within the past month suggests increased likelihood within this subgroup of health and legal problems, as well as impairment in interpersonal relations or work performance. The finding that 3% reported having injured someone else due to their alcohol use indicates second-hand effects of alcohol use.

Gender, ethnicity, and age were related to several measures of alcohol consumption. Males were more likely to report any drinking in the past year and also to report binge drinking. In terms of ethnic differences, Asian Americans were less likely to report any drinking, and African Americans were more likely to report binge drinking and to meet criteria for current problem drinking on the AUDIT. Regarding occupational category, binge drinking was significantly less prevalent among those who were administrators or professionals. Younger employees were significantly more likely to report binge drinking than were older employees.

Educational level was not related to any of the measures of alcohol consumption. However, the sample in this study was predominantly highly educated individuals. Consequently, this study lacked the statistical power for possible differences in alcohol or other drug use between employees who did not attend college and those who were more highly educated. Furthermore, the R^2 values in the multiple regressions examining the relationships between demographic characteristics and the measures of alcohol and other drug use indicated that demographic characteristics never accounted for more than 9% of the variance. Hence, the associations of demographic variables with the alcohol and other drug measures indicated the presence of only minor relationships. This suggests that in this highly educated workforce, factors other than demographic characteristics are likely to be related to alcohol and other drug use. For example, in this population perhaps the norms of employees' social networks about use of alcohol and other drugs play a greater role than demographic characteristics in accounting for the differences in these behaviors. The failure of this study to account for a greater proportion of the variance with demographic characteristics was interesting, but not problematic, since the primary purpose of this study was to examine prevalence of usage in the highly educated workforce as a general population.

This survey yielded the findings that 42% of respondents reported using mood-altering prescription drugs within the last year and that 13% of respondents were using such drugs on a weekly basis. This survey did not allow for distinguishing how respondents actually used these drugs (ie, whether for recreational purposes or as medically prescribed). Analyzing within the category of prescription drugs (ie, analgesics, antidepressants, sedatives, and tranquilizers), antidepressants accounted for most of this use, with daily use of prescribed antidepressants reported by 6.6% of respondents. An additional 2.6% reported using antidepressants on a slightly less frequent basis (once a week to almost daily). Thus, 9.2% of these employees reported regular use of antidepressants. These findings raise questions about the more general prevalence of antidepressant use in the workplace. The use of antidepressants is widespread and has been increasing over the past two

decades, most particularly during the past 10 years. Repeated surveys conducted from 1981 to 1993 indicate that the prevalence of antidepressant use went from 1% to 3%.²⁷ In 1997, Prozac, Zoloft, and Paxil were the 11th, 15th, and 19th most frequently prescribed drugs, respectively, in the United States.²⁸ In 1998, Prozac, Zoloft, and Paxil went from the previous rankings to 8th, 12th, and 13th, respectively.²⁹

One in eight respondents (11%) reported illicit drug use in the past year. Furthermore, 2% reported use of illicit drugs within the past week. Marijuana and cocaine were the illicit drugs whose use was most frequently reported in this sample. In addition, 3% of respondents reported the use of stimulants within the past year, and 1% of the respondents reported such use on a weekly or more frequent basis. This raises concerns about the safety of the employees themselves, as well as the safety of their coworkers and other individuals.

Several significant relationships were found between demographic characteristics and the measures of mood-altering drug use. Males and African Americans were more likely to report use of illicit drugs. Also, younger employees reported greater use of illicit drugs in general, and of marijuana in particular. With respect to prescription medications, females were more likely than males to report use of antidepressants. Educational level and occupational status were not related to any of the measures of mood-altering drug use.

Employer-provided benefits for alcohol and drug treatment have been decreasing.³⁰ However, the results of this study suggest that significant numbers of employees may need such services, but are not receiving them. Thus, this study raises concerns about employees' access to treatment and substance abuse prevention services. Depending on the measure used, this study provides evidence for two types of alcohol-related problems. These results indicate that if using the standard scoring system of two or more positives on the CAGE, then 12% of this study population is likely to have lifetime alcohol dependence. If using the standard scoring system of 8 or higher on the AUDIT, then 5% of this study population appears to engage in current problem drinking. If using the CAGE to identify problem drinkers by one positive response to the CAGE, as studies^{19,20} have suggested, the identification of likely problem drinkers would be increased to a total of 23%. Only 1% of this study's participants reported receiving any alcohol-related treatment in the past year. Table 4 presents the results of using these different measures with this study population.

This study's results suggest at least two patterns of problematic alcohol consumption, which may require different prevention and treatment strategies. One pattern is that of the binge drinker, who consumes many drinks on a single occasion, but who may not be alcohol dependent. This person is still in danger because of potential safety and legal issues, as well as potentially impaired relations with family members and coworkers. Further, this pattern could lead to alcohol dependence. The potential of alcohol consumption to bring harm to others is documented in this study's finding that 3% of all respondents reported having injured someone due to their alcohol use. A second pattern of problematic alcohol use is that of the likelihood of alcohol dependence in which drinkers report symptoms of loss of control over their consumption of alcohol. These different types of drinking problems require different strategies. For example, for those who drink "too much" (eg, binge drink), a strategy to reduce the amount of drinking on a single occasion could be employed. For those who demonstrate loss of control or who are alcohol dependent, a strategy facilitating abstinence from alcohol might be employed. This is an important issue that behavioral health service researchers should investigate further, especially in light of the recent finding suggesting that problem drinkers pose more of a problem to a workplace than those who are alcohol dependent.³¹

The limitations of this study include the use of a self-report format, which may result in underreporting of behaviors such as alcohol consumption and drug use.³² This limitation is in part counterbalanced by a major methodologic strength of this study, which is its use of the anonymous survey format. The self-report format also has the limitation of depending on the person's ability to recall his or her behavior accurately over time, a limitation that this study could not address within the requirements of an anonymous survey.

Another methodologic limitation of this study is the relatively high homogeneity of the study respondents (ie, they were employed, highly educated, and predominantly Caucasian). This limits confidence in generalizing the study findings to unemployed/underemployed, less educated, and more ethnically diverse populations. However, three additional methodologic strengths of this study provide a counterpoint to the limitations associated with respondent homogeneity. One such strength is the random selection of potential subjects. Another strength is that this study extends the research base on worksite alcohol use by assessing current problem drinking as well as high likelihood of lifetime alcohol dependence. These methodologic strengths support the generalizability of the findings to the larger population from which these respondents were drawn. Finally, another strength is this study's high response rate of 60%. One meta-analysis of mailed surveys suggests that the average response rate is 47%.³³ In particular, the high response rate may be attributable to the study procedure that directed subjects to return their signed consent form in one envelope and their completed survey (without any personally identifying information whatsoever) in a separate envelope.

Two limitations of the study relate to the survey instruments. First, the survey did not gather sufficient information on illicit drug use to allow the distinction of drug use from abuse. Fortunately, however, this study was able to make this distinction in examining alcohol consumption, as standardized assessment tools designed for this purpose were used in this study. A second limitation of this survey is that it used a version of the AUDIT that does not further define what is meant by a drink.²⁵

This study suggests several directions for future research. First, there is a need for further development of assessment tools for differentiating drinking patterns, as alcohol-dependent individuals require different interventions than do other problem drinkers. Second, while this study did not control for whether mood-altering drugs were used as prescribed, it indicates a need for further research into the prevalence of prescription drugs in the workforce. Third, the finding that 2% of the workforce is reporting weekly or more frequent use of illicit drugs speaks to the continued need to identify effective prevention strategies targeting such use. Finally, these results indicate the need to explore means for harnessing the worksite as a context for alcohol and drug abuse prevention. In particular, future research should examine the development of corporate policy and medical benefits that encourage self-disclosure of potentially stigmatizing data and confidential access to, and provision of, treatment.

Implications for Behavioral Health Services

The results of this study have important implications for professionals providing behavioral health services for highly educated workforces. Substantial numbers of individuals in such workforces may have one or more of the following problems: (1) high likelihood of alcohol dependence, (2) current problem drinking, and (3) use of illicit drugs. Employees' alcohol treatment benefits have been reduced over the last decade.³⁰ Therefore, the findings of this study call for the reprioritization of prevention, early intervention, and treatment efforts, as appropriate, on the part of behavioral health service professionals. Substance abuse in highly educated workforces creates health and safety hazards for those engaged in such abuse as well as for their coworkers and others who may be impacted by those behaviors. Such substance abuse may seriously affect employees' cognitive functioning; this is particularly crucial in industries where such functioning is the very core of what workers do.

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