Health Behaviors and Labor Market Status: The Impact of Substance Abuse

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ABSTRACT

Previous studies on the effects of illicit drug and alcohol consumption on labor market outcomes have been mixed, with some studies even finding positive effects of drug and alcohol use on wages and employment status. Buchmueller and Zuvekas (1998) argue that it is necessary to separate out moderate use from more problematic use or abuse in understanding labor market impacts. We extend their work in two important directions. First, we use data from the 1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES), which provides a larger (n=42,862) and nationally-representative survey, with improved labor market measures and similarly rich measures of alcohol and drug use and problems. Second, we jointly analyze the impacts of alcohol and drugs, whereas their previous work considered only drug use and abuse. Indeed, most of the previous literature focuses on either alcohol or drugs, but not both. Overall, we find that drug disorders are negatively associated with the probability of being employed but not earnings, while moderate drug use was not statistically associated with either outcome. We find no statistically significant effects of alcohol abuse on either employment or earnings.

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INTRODUCTION

Conventional public policy wisdom holds that illicit drug use has large negative effects on productivity and labor market outcomes. Estimates of the productivity losses due to drug abuse and addiction range from $9 billion (Rice et al. 1990) to $37 billion (Harwood et al 1984), with the most recent estimates placing the figure at about $23 billion (Office of National Drug Control Policy, 2001). In contrast, evidence from a number of econometric studies over the decade is mixed. Earlier studies not only failed to find adverse effects, but often found positive impacts of illicit drug use on labor market success (Kaestner 1991, 1994, Gill and Michaels 1992, Register and Williams 1992). Buchmueller and Zuvekas (1998) suggest that these studies failed to adequately discriminate between moderate drug consumption and heavy drug consumption or abuse/addiction. When separating moderate drug users from more problematic users, they find the expected negative labor market effects of drug problems.

Other more recent studies find that chronic use or substance abuse substantially reduces the probability of employment (Alexandre and French, 2004; French, Roebuck, and Alexandre, 2001; Terza and Vechnak, 2001). DeSimone (2002) using instrumental variables methods, also finds drug use reduces employment, although the study does not distinguish between types of use. However, the recent evidence of negative impacts of chronic or heavy use on hours worked and productivity is much weaker (Zarkin et al. 1998a; French, Zarkin and Dunlap 1998).

The distinction between moderate consumption and heavy consumption or abuse/addiction appears to be important in the parallel literature on the labor market effects of alcohol use, as well. French and Zarkin (1995) and Berger and Leigh (1988) find positive effects of moderate alcohol consumption on wages. In contrast, Mullahy and Sindelar (1993, 1991, 1989) and Ettner, Frank and Kessler (1997) all find negative effects of alcoholism on wages and

employment. Similarly, Mullahy and Sindelar (1996) and Terza (2002) find negative effects of problem drinking on employment (although Mullahy and Sindelar's IV estimates were imprecisely estimated and not statistically significant). French and Zarkin (1995) also find negative effects of heavy alcohol use on wages. However, Zarkin et al (1998b) find positive effects of both moderate and heavy alcohol consumption.

We examine the question of the impacts of drug and alcohol use on labor market outcomes by extending the work of Buchmueller and Zuvekas (1998) in two general directions. First, we use data from the 1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES) which is a larger (n=42,862), nationally-representative data source with better labor market measures and similarly rich measures of alcohol and drug use and problems. Second, we jointly analyze the impacts of alcohol and drugs, whereas Buchmueller and Zuvekas considered only drug use and abuse. Indeed, most of the previous literature focuses on either alcohol or drugs, but not both.

Section II describes the NLAES sample used in our analyses. We restrict our analyses to males because of their greater likelihood of labor force participation and substantially greater likelihood of drug use and drug-related problems. Section III describes our methods, where we incorporate drug and alcohol measures into standard wage and employment models. Section IV presents descriptive results and estimation results from the wage and employment models. We conclude, in Section V, with a discussion of the implications of our results and the need for better methods to control for endogeneity.

II. DATA

The data used in this study come from the first and only wave of the 1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES).[1] The NLAES was sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and was designed to estimate the prevalence of alcohol and substance use disorders in the U.S. The major strength of the NLAES lies in its comprehensive measures of both alcohol and drug consumption and the disorders associated with their use. Respondents were asked not only about their alcohol and drug consumption, but detailed question about associated symptoms (e.g. shakes, inability to stop using, interference with social activities, etc.) using a clinically-based diagnostic instrument. Alcohol and drug use disorders were then classified using clinical-diagnostic criteria contained in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders, 4th edition* (DSM-IV) based on the responses to the symptom-based questions. These clinical measures of alcohol and drug use disorders allow us to separate casual drug and alcohol use from substance abuse and dependence.

The NLAES is a nationally representative sample of the civilian non-institutionalized population. The U.S. Census Bureau fielded the survey and collected data from October 1991 to November 1992. In addition to measures of substance use and disorder , the NLAES contains socio-demographic characteristics including age, race, sex, and marital status, and labor market characteristics such as employment, wage income, industry, and occupation.

Overall, the NLAES sample contains data on 42,862 persons aged 18 and over. We focus our analyses on men for two main reasons. First, men tend to have much greater rates of both drug and alcohol use and problems compared to women (Kessler 1994; Regier et al 1993). Second, men traditionally have greater labor force attachment. We limit our analyses to men

aged 25-54 to minimize potential problems that might result from retirement decision of older men, and differences in the timing of entry into the labor market for younger men. In addition, we exclude full-time students and persons who have never worked. Our final sample of men aged 25-54 includes 9,820 persons.

Drug and Alcohol Measures

We combine two sets of measures from the NLAES data to characterize each person's drinking and drug use patterns. The first set defines whether a person currently (in the last 12 months) uses, formerly used, or never used alcohol and drugs, respectively. Persons who used drugs less than 12 times in their lifetimes were classified as non-users in the NLAES survey. The second set defines whether the person met clinical criteria for either dependency or abuse for alcohol and drugs, respectively, and whether this was ever in their lifetime or in the last 12 months. We then classify each person into three mutually exclusive categories of lifetime alcohol use: dependence or abuse ever in lifetime, moderate use in lifetime, or lifetime nonuser. We do the same for lifetime drug use patterns, as well as current alcohol and drug use patterns.

The measures of clinical dependency as mentioned above come from the *DSM-IV* criteria which include symptoms such as not being able to stop or limit use, and delusions as a result of use. Symptoms of drug or alcohol abuse include occupational impairment, according to *DSM-IV* definitions which were the basis of the original NLAES abuse measures. This creates the potential for an obvious endogeneity problem when using a measure based, in part, on occupational impairment to look directly at labor market outcomes. Following previous analyses (Buchmueller and Zuvekas, 1998; Mullahy and Sindelar 1993, 1991, 1989), we eliminated this potential endogeneity by reconstructing the NLAES measures without using occupational

[1] Despite it name, the NLAES only collected data for a single cross-section.

impairment as a criterion. However, like these previous analyses, we found a high degree of association between occupational impairment due to drug and alcohol abuse so that our redefinition affected only 10 people in all.

In Table 1, we report descriptive statistics of our drug and alcohol measures for our full sample of men age 25-54 (column 1), as well as separately for those who are currently employed (column 2) and those who are not (column 3). In the first panel, we see that a fairly high proportion, 29 percent, of men experienced either alcohol dependence or abuse at some point in their lifetime. Another 54 percent had used alcohol but did not have problematic use and 17 percent reported never having used alcohol. Drug use and problems were less common. About 10 percent of men had a problem with drug abuse or dependence at some point of their lives, 15 percent had used drugs moderately, and 74 percent had either never used drugs or used them just a few times (less than 12). Some 7.5 percent of men had an alcohol and drug problem (either abuse or dependence) in their lifetime, which means that three-quarters of those with a drug problem also had an alcohol problem.

Rates of current (in the last 12 months) alcohol and drug use, and especially problems, are much lower than lifetime rates. Only 2 percent of men had a drug problem in the last 12 months, and a further 5 percent had used drugs without signs of a drug problem. About 11 percent of men experienced dependence or abuse problems with alcohol in the last 12 months, while 38 percent reported no alcohol use in the last 12 months. For this reason and because of potential endogeneity problems that we will discuss later in the paper, we concentrate on lifetime effects of drug and alcohol abuse/dependence.

Labor Market Outcomes

We use two measures of labor market outcomes as dependent variables in our analyses, current employment status and annual earned income. Annual earnings is a product of hourly wages and hours work.[2] While hourly wages would provide a more direct measure of productivity, it is not available in the NLAES. About 92 percent of the men in our sample currently worked with average annual reported earnings of $34,581 in 1992 dollars (see Table 2).

Other variables

In addition to our measures of substance use and disorders, we include standard determinants of labor market outcomes including age, race/ethnicity, sex, current marital status, education, and geographic indicators. Age squared is included along with age to account for any non-linear relationship between age and labor market outcomes. Mutually exclusive indicators for black and Hispanic are used to describe race and ethnicity, with white and other groups the omitted category. For education, we include mutually exclusive indicators of having a high school degree, associate degree or some college, bachelor's degree, and advanced degree, with less than a high school degree as the omitted category. Geographic indicators include the 9 census divisions and an indicator for residing in an urban versus a rural area. Descriptive statistics for these variables are reported in Table 2.

[2] We also examined an alternative measure of monthly earnings from a separate series of questions about labor market outcomes in the NLAES. Our results were not sensitive to whether we used the annual or monthly measure of earnings, but we opt for the annual measure because there are fewer missing responses and to maintain consistency within a single series of labor market questions.

III. Econometric Specification

We estimate a probit model of current employment status and an OLS model on log annual earnings. We include on the right-hand side of the equations age and age squared, race/ethnicity, education, marital status, and geographic indicators as described above in addition to drug and alcohol measures. The potential endogeneity of drug and alcohol use and associated problems is an importation consideration in estimating their impacts on labor market outcomes. In addition to the endogeneity problem we addressed in the data section concerning occupational impairment, endogeneity may come from two other sources. First, there are likely income effects related to the consumption of drugs and alcohol, which might lead to a positive bias on our drug and alcohol coefficients. Second, those with drug or alcohol problems, those using drugs or alcohol without problems, and nonusers may differ in unobserved ways, including preferences, that are correlated with labor market outcomes. The direction of this potential bias cannot be signed *a priori*.

We rely on our clinical measures of drug and alcohol problems, which are based on a person's physiological and psychological responses to drug and alcohol consumption, to help minimize potential endogeneity. Buchmueller and Zuvekas (1998) argue that these clinically-based measures should be "much less influenced by income than simple measures of use frequency." Furthermore, physiological responses to drug and alcohol use (for example, propensity to become dependent) are, in part, genetically determined in ways that are unlikely to be correlated with labor market outcomes. We also follow Buchmueller and Zuvekas and Mullahy and Sindelar (1993, 1991, 1989) in using lifetime measures of drug and alcohol use and disorders, rather than current consumption, to further minimize potential endogeneity problems.

It is expected that the endogeneity bias will be less than if regressing current employment and income on current alcohol and drug consumption. For example, current drug problems may result from poor labor market success.

We considered, but ultimately rejected, the use of an instrumental variables approach used in some of the literature on the effects of drug and alcohol use on labor market outcomes (see for example, Terza and Vechnak 2001; Terza 2001; Mullahy and Sindelar 1996; Kaestner 1991). Recent work (Rashad and Kaestner 2004) points to many potential problems with the state-level instruments commonly used in these studies such as alcohol and cigarette tax rates and prices. Other instruments commonly used include whether a person's mother and father were alcoholics. While parental history of alcoholism is strongly correlated with both drug and alcohol problems, there may be direct effects of growing up in a home with alcoholics that influences future labor market success.

A second key issue with respect to estimation of the annual earnings equation conditional on employment is selectivity bias. The Heckman model or (other sample selection models) would be a natural choice for this problem. However, we lack adequate exclusion restrictions to identify sample selection models, and such models are well-known to be quite sensitive when relying on functional form alone to achieve identification. We thus present estimates of the wage equation without correcting for possible selectivity bias.

We correct the standard errors of all estimates for the complex survey design of the NLAES .

IV. RESULTS

Descriptive

We report descriptive statistics for the labor market outcomes in Table 3. The first column reports the probability that a male aged 25 to 54 was currently employed at the time they were interviewed along and the second column reports the mean annual earnings among those currently employed. There were little or differences in the probability of employment by lifetime alcohol and drug use patterns. Men who had an alcohol disorder at some point in their life were equally likely as men who had never drunk alcohol to be currently employed (.91) and only slightly less likely than moderate alcohol users (.91 vs. .92, p=.09). Similarly, men who had a drug disorder at some point in their life were somewhat less likely (.90 vs. 92, p=.07) to be currently employed, but there was no statistically difference between moderate drug users and non-users. Differences among men by their current (last 12 months) alcohol and, especially, drug use patterns were greater. Current moderate alcohol drinkers were actually more likely than those who had not drunk alcohol in the last year to be employed (.93 vs. 91), while those with a current alcohol problem were less likely to be employed than either moderate or nondrinkers (.89). In contrast to moderate alcohol users, current moderate drug users were less likely to be employed than nonusers (.88 vs. .92). Men with a current drug problem were substantially less likely to be employed (.82) than either moderate or non drug users.

Differences in earnings among those employed were generally greater than differences in employment by alcohol and drug use patterns. Men who had never used alcohol had the lowest average annual earnings ($29.0 thousand), while men who had used in moderate amounts ($37.1 thousand) had the highest earnings. Those with alcohol problems at some point in their lifetime ($33.0 thousand) fell in between. Interestingly, those with current (last 12 months) alcohol problems had on average about the same annual earnings as non drinkers, but current moderate alcohol users had the highest annual earnings of any group ($38.0 thousand). It is implausible

that moderate alcohol use (either current or in the past) would have a strong direct effects on productivity and earnings either positively or negatively, so the higher average earnings among these men more likely reflects differences in observed and unobserved characteristics, such as personal preferences for alcohol consumption.

Men with moderate drug use during their lifetime had slightly higher average earnings than nonusers ($36.2 vs. $34.8 thousand), while those with drug problems at some point in their life had the lowest earnings ($30.6 thousand). In contrast, current moderate drug users had 16% lower earnings on average than either lifetime or current nonusers. In addition to being the most likely to be unemployed, men with current drug problems earned substantially less than any other group of men ($25.5 thousand) and more than 25 percent less than non drug users.

While the bivariate results reported in Table 3 reveal interesting differences in average employment and earnings by alcohol and drug use history, they cannot tell the whole story. There are several confounding factors that may be driving these differences. Education perhaps being the most relevant example. If the more educated are more likely to consume alcohol and drugs, then the positive association of alcohol use and problematic alcohol use on labor market outcomes reported in tables 2 and 3 may not be due to use of alcohol, but instead, may be a result of education being a positive correlate of drinking. We turn now to our multivariate regression results to control for education and other socioeconomic differences in understanding the impacts of drug and alcohol problems on labor market success.

Multivariate

We report results from the probit regression on probability of current employment and the OLS regression on logged annual earnings if employed in Table 4. As described in the

econometric specification section, we focus on lifetime measures of alcohol and drug problems to minimize potential endogeneity bias. We find that having a drug problem (abuse and dependence) at any point during a man's life is associated with a 2.6 percentage point reduction in the probability of being currently employed (p=.06). We find no effect on the probability of being employed associated with having an alcohol problem . Moderate drug use was not statistically associated with employment. Specifications where we dropped this moderate drug use and focused strictly on the clinically-based measures of drug and alcohol problems yielded nearly identical results.

Although there were large differences in average annual earnings by lifetime alcohol and drug use patterns as seen in Table 3, these differences disappeared after controlling for education and other sociodemographic characteristics. No statistically significant effects of either lifetime drug or alcohol problems and moderate drug problems were apparent.[3]

The other independent variables behave as expected. Men who are white, married, have higher levels of education and who live in urban areas are more likely to be employed and have higher earnings than men who are Hispanic or black, single, who did not possess a high school diploma, and who live in non-urban area. As expected, age has a significant nonlinear effect on the probability of being employed and annual earnings.

Sensitivity Analyses

We also performed separate analyses for men aged 25-34, 35-44, and 45-54, respectively. Not surprisingly, income increased with age and men aged 45-54 were slightly less likely to be in the labor force compared to younger men. Men aged 45-54 were also less likely to report any

alcohol and, especially, drug abuse or dependence then their younger counterparts. However, the relationships between drug and alcohol problems and labor market outcomes were similar across all three age groups, both in the descriptive and regression analyses. For the sake of parsimony and to increase statistical power, we report only the results for the three age groups combined.

V. DISCUSSION AND SUMMARY

We find a negative association between having drug problems and employment but no effects of lifetime drug problems on annual earnings conditional on employment. The increase of 3 percentage points in the unemployment rate among males associates with a lifetime drug problem is rather substantial. This increased unemployment may results from the direct impacts of drug problems, as well as difficulties in obtaining employment because of a criminal record associated with drug problems.

The lack of a negative impact of lifetime drug problems on earnings conditional on employment is puzzling. Buchmueller and Zuvekas (1998) found substantial negative impacts of problematic drug use, on the order of 12 to 13 percent lower earnings. Both that study and our current study use data from epidemiologic surveys and similar econometric methods. However, there are substantial differences in the labor market measures available, definitions of drug problems (because of ongoing revisions to the psychiatric profession's *Diagnostic and Statistical Manual*), and in fielding methods between the two epidemiologic surveys used which may account for these differences. Most notably the ECA survey used in Buchmueller and Zuvekas (1998) was not nationally representative, but was collected from five sites (Eastern Baltimore, New Haven, St. Louis, Los Angeles, and Durham, NC) during the early 1980s. Local labor

[3] Some studies (Mullahy and Sindelar 1989; 1993; French and Zarkin 1995) have run specifications without controlling for educational attainment and marital status because of the potential for indirect effects of drug or

market conditions of these five sites, may not have been reflective of the U.S. as whole, and unmeasured market characteristics may have altered the association between drug problems and earnings. For example, drug problems may have been relatively concentrated in areas with poorer economic prospects. Still, we had expected to find a negative association between lifetime drug problems and labor market productivity. We note though that French, Zarkin and Dunlap (1998) also did not find significant impacts on productivity.

The stronger association between current drug and alcohol problems and poor labor market outcomes noted in the descriptive results (Table 3) warrants closer investigation. The problem comes in sorting out whether current drug and alcohol problems are the result of poor labor market outcomes or vice versa, as well as omitted variables bias due to other unmeasured preferences and characteristics. While some studies have attempted to use instrumental variables to address these problems, there are substantial questions about the instruments that have been proposed to date as we discussed earlier. As a result, we did not attempt to estimate the relationship between current drug and alcohol problems and labor market outcomes here, but continue to investigate potential methods and data sources for future work.

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alcohol problems on education and marriage. However, employment and wage regressions without education are clearly misspecified

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Table 1. Drug and Alcohol Measures by Labor Market Status

Variable	In Labor Force	Currently Employed	Not Employed
Alcohol Use (Lifetime)			
Dependence or Abuse	29.4%	29.1%	31.9%
Moderate use	53.9%	54.2%	50.7%
No use ever	16.7%	16.7%	17.4%
Drug Use (Lifetime)			
Dependence or Abuse	10.3%	10.2%	12.9%
Moderate use	15.3%	15.3%	15.5%
No or minimal use ever (< 12 times)	74.3%	74.5%	71.6%
Any Alcohol or Drug Disorder (Lifetime)	7.5%	7.3%	9.0%
Alcohol Use (last 12 months)			
Dependence or abuse	11.3%	10.9%	15.7%
Moderate use	50.4%	51.1%	42.3%
No use in last 12 months	38.3%	38.0%	41.9%
Illicit Drug Use (last 12 months)			
Dependence or Abuse	1.9%	1.7%	4.1%
Moderate use	5.4%	5.2%	8.0%
No use last 12 months	92.7%	93.1%	87.9%
N	9,820	9,018	802

Table 2 Descriptive Statistics

	Employment Regression		Wage Regression	
Variable	Mean	Std. Err.	Mean	Std. Err
Probability of Employment	.918	(.004)		
Annual Earnings			34,581	(844)
Log Annual Earnings			10.139	(.023)
Age	38.016	(.100)	37.93	(.107)
Age squared	1510.18	(7.75)	1502.44	(8.302)
Black	.106	(.007)	.102	(.007)
Hispanic	.086	(.013)	.083	(.012)
Married	.699	(.006)	.711	(.006)
High school diploma	.294	(.009)	.288	(.009)
AA or some college	.257	(.007)	.259	(.007)
BA	.210	(.007)	.217	(.007)
Advanced degree	.105	(.006)	.110	(.006)
Education missing	.012	(.001)	.012	(.001)
Part-time student	.008	(.001)	.007	(.001)
Urban	.714	(.020)	.717	(.021)
Urban missing	.021	(.002)	.020	(.002)
Census Division 1	.054	(.014)	.053	(.014)
Census Division 2	.152	(.050)	.150	(.048)
Census Division 3	.172	(.033)	.172	(.033)
Census Division 4	.063	(.012)	.064	(.012)
Census Division 5	.166	(.024)	.168	(.025)
Census Division 6	.054	(.010)	.054	(.011)
Census Division 7	.125	(.022)	.124	(.022)
Census Division 8	.059	(.009)	.060	(.010)
N	9,820		9,018	

Table 3. Employment and Earnings by Drug and Alcohol Use Characteristics

Variable	Probability Employed	Mean Annual Earnings If Employed (000s 1992 $)
Alcohol Use (Lifetime)		
Dependence or Abuse	.91 (.006)	33.0 (0.7)
Moderate use	.92 (.005)	37.1 (1.2)
No use ever	.91 (.007)	29.0 (0.8)
Drug Use (Lifetime)		
Dependence or Abuse	.90 (.012)	30.6 (1.0)
Moderate use	.92 (.008)	36.2 (1.1)
No or minimal use ever (< 12 times)	.92 (.005)	34.8 (0.9)
Any Alcohol or Drug Disorder (Lifetime)	.90 (.013)	27.7 (1.0)
Any Alcohol or Drug Disorder (Lifetime)	.90 (.013)	27.7 (1.0)
Alcohol Use (last 12 months)		
Dependence or abuse	.89 (.011)	31.2 (0.7)
Moderate use	.93 (.005)	38.0 (1.1)
No use in last 12 months	.91 (.005)	30.6 (0.9)
Illicit Drug Use (last 12 months)		
Dependence or Abuse	.82 (.026)	25.5 (1.6)
Moderate use	.88 (.014)	29.3 (1.3)
No use last 12 months	.92 (.004)	35.0 (0.9)
N	9,820	9,018

Table 4. Regression Results

	Probit Probability Currently Employed		OLS Log Annual Income if Employed	
Variable	Coefficient	Std. Err.	Coefficient	Std. Err
Constant	-0.200	0.249	7.813 ***	0.335
Age	0.074 ***	0.025	0.077 ***	0.016
Age squared	-0.001 ***	0.000	-0.001 ***	0.000
Black	-0.194 **	0.079	-0.227 ***	0.047
Hispanic	-0.157 **	0.079	-0.131 ***	0.042
Married	0.319 ***	0.040	0.232 ***	0.026
High school diploma	0.163 ***	0.054	0.301 ***	0.050
AA or some college	0.339 ***	0.066	0.474 ***	0.054
BA	0.511 ***	0.073	0.720 ***	0.054
Advanced degree	0.658 ***	0.102	0.844 ***	0.071
Education missing	0.248	0.204	0.388 **	0.166
Part-time student	-0.610 ***	0.170	-0.268 **	0.129
Urban	0.077 **	0.054	0.067 **	0.025
Urban missing	-0.133	0.126	0.097	0.129
Census Division 1	-0.108	0.093	0.041	0.081
Census Division 2	-0.069	0.098	0.059	0.067
Census Division 3	0.064	0.094	0.031	0.050
Census Division 4	0.140	0.127	-0.128	0.078
Census Division 5	0.181 *	0.100	-0.016	0.058
Census Division 6	0.110	0.098	-0.070	0.070
Census Division 7	0.024	0.096	-0.193 ***	0.063
Census Division 8	0.119	0.133	-0.131	0.073
Drug disorder (lifetime)	-0.167 *	0.088	0.001	0.042
Moderate drug use (lifetime)	-0.086	0.055	0.036	0.038
Alcohol disorder (lifetime)	-0.024	0.051	0.023	0.025
R^2			.103	
Sample size	9,820		9,018	

Standard errors are corrected for complex design of the NLAES survey.
*p<.10,**p<.05,***p<.01