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ORIGINAL RESEARCH ARTICLE

The Effects of Workplace Substance Use Programs, Policies, and Practices on Current Substance Use Among A National Sample of Low-Income Workers: Differences by Race/Ethnicity and Education Level

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Abstract

Poverty and substance use are inextricably and bidirectionally related, but the workplace may represent an opportunity for substance use intervention among low-income workers. Although many employers have policies regarding substance use, they vary with respect to punitiveness and approach. Using cross-sectional data from the 2019 National Survey on Drug Use and Health ($N = 7{,}953$ low-income workers), we examined the separate associations between several organizational-level workplace factors and current substance use and whether these associations differed by race/ethnicity and education level. We also examined the simultaneous effects of multiple workplace programs, policies, and practices on current substance use. Having *any* written policy on employee substance use was associated with lower odds of cannabis use, illicit substance use, and misuse of prescription drugs. Having a policy to terminate employees who test positive for illicit substances was *not* associated with any substance use outcome and pre-employment substance screening was only associated with lower odds of cannabis use. Workers who received education on substance use at their workplace and workers with an employee assistance program were both less likely to report current use of cannabis and illicit substances. However, these effects were not universal across all racial/ethnic groups or levels of educational attainment and were no longer significant when examining their simultaneous effects.

Keywords Workplace drug use · Cannabis use · Illicit substance use · Misuse of prescription psychotherapeutic drugs

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Introduction

Research has shown that poverty and substance use are inextricably and bidirectionally related and are associated with other adverse psychosocial sequelae (e.g., homelessness, suicidal thoughts and behaviors, and the development of substance use disorders) (Langlois et al., 2020; Manhica et al., 2021; Thompson et al., 2013, 2017). National data show that there are significant differences in the likelihood of engaging in specific types of substance use based on socioeconomic status (Substance Abuse & Mental Health Services Administration, 2020b), and some studies have shown that those with lower income levels are more likely to report problematic substance use (Baptiste-Roberts & Hossain, 2018) and experience a fatal drug overdose (Frankenfeld & Leslie, 2019). Given that many people who are living in poverty in the United States (US) are also employed (Shrider et al., 2021), the workplace may represent an opportunity for substance use intervention among low-income populations. However, the workplace is frequently overlooked as an intervention setting for addressing substance use (Cooper & Bixler, 2021). Despite many workplaces having policies regarding substance use, they are heterogeneous with respect to punitiveness and approach, which may have differential effects on workers' likelihood of drug use. It is unclear whether non-punitive worker-centric approaches (e.g., substance use education, employee assistance programs) or more punitive employer-centric approaches (e.g., pre-employment substance use testing, random substance testing) have any effects on low-wage workers' likelihood of engaging in substance use.

Low-Wage Employment

The conditions of low-wage employment may contribute to substance use among low-income workers (i.e., people who are working but live in poverty or in "near poor" conditions). For example, a large study that examined data from the Panel Study of Income Dynamics and the Occupational Information Network found that many common lower-wage occupations (e.g., manual labor, customer interaction, other service-oriented labor, etc.) were associated with increased problems with mental health and substance use, while occupations characterized by higher authority, autonomy, and expertise were associated with better health outcomes (Prins et al., 2019). Similarly, workers whose labor is exploited (i.e., unpaid productive hours) are at increased risk for psychological distress (Prins et al., 2021). Moreover, workers in manual labor industries have higher rates of injury and chronic pain (Leff et al., 2003), which may contribute to higher rates of prescription opioid use and poisoning (Cerdá et al., 2017).

Low-wage workers in the United States are more likely to be younger, female, Hispanic, Black, and with lower educational attainment than their higher-earning counterparts (U.S. Bureau of Labor Statistics, 2022). These workers often have precarious employment arrangements (e.g., temporary work, gig work, contract work), more dangerous working conditions (e.g., increased risk of adverse workplace

exposures and injuries), and are less likely to have union representation (resulting in fewer worker protections), all of which have implications on workers' health and safety (Sorensen et al., 2021). Moreover, national data show that over the last several decades, inflation-adjusted hourly wages among low-income workers declined while the average number of hours worked annually among this group increased by more than 22% (1,248 h vs. 1,523 h; Mishel, 2013), suggesting that the working conditions of this group have continued to decline, which is likely to have substantial implications for the health of these workers (Sorensen et al., 2021). Taken together with an increased risk for substance use among lower-wage occupations (Prins et al., 2019), these findings suggest that organizational-level influences have significant implications on the well-being of lower-wage workers and underscore the importance of the workplace as a possible intervention setting to prevent problematic substance use.

Socioecological Perspective

Much of the research on substance use in adult populations has focused on individual-level risk factors, while the effects of other social and environmental influences (including workplace policies, programs, and practices) have received comparatively less attention. Work has been recognized as a critical determinant of health, and workplace policies, programs, and practices can be understood as a driving factor in the conditions of work, workers' behaviors, and workers' well-being (Sorensen et al., 2021). Broadly, ecological frameworks describe the mutual influences between people and their social and physical environments (Sallis & Owen, 2002). Built on Bronfenbrenner's (1977) multilevel ecological model of nested systems, the Social Ecological Model posits that individual behaviors are driven by factors beyond the individual and interpersonal levels, including those at the community, organizational, and policy levels (McLeroy et al., 1988), suggesting that workplace programs, policies, and practices (i.e. organizational-level factors) are likely to affect workers' behaviors.

Substance Use Policies, Practices, and Programs in the Workplace

The use of psychoactive substances has been associated with an increased risk of workplace injuries (Chau et al., 2009; Dong et al., 2015), which has substantial legal, ethical, and health implications for employers and workers, alike. Workplace programs, policies, and practices to address substance use among workers have proliferated in recent years, particularly random drug and alcohol testing (Els et al., 2020). Although mandatory substance testing is common in US workplaces, empirical results have been mixed and this practice has received little critical analysis (Christie, 2015). An analysis of the National Drug Strategy Household Survey suggested that having a comprehensive workplace policy regarding substance use was associated with lower odds of worker drug use, whereas drug testing in isolation (without the provision of information, education, and/or assistance) was not associated with the likelihood of worker drug use (Pidd et al., 2016). In fact, a systematic

review concluded that there is not enough evidence to recommend the use of drug and alcohol testing in the workplace (Cashman et al., 2009). A nuanced examination of data from the 2000 – 2002 waves of the National Survey on Drug Use and Health (NSDUH) suggests that after accounting for other organizational workplace factors (i.e., having a substance use policy, providing substance use education, and providing an employee assistance program [EAP]) the observed relationships between drug testing and worker drug use were attenuated (Carpenter, 2007). However, this sample was restricted to employees of private for-profit firms, including many higher-wage workers. Further, many states have since legalized medical and recreational cannabis, highlighting the need to further examine more recent relationships between organizational-level factors and substance use, especially as they pertain to low-income populations.

The Role of Race/Ethnicity and Educational Attainment

Although substance-related programs, policies, and practices are common in US workplaces, they are not universally enforced or accessed by the workforce. For example, national data suggest that drug testing is more likely to be employed as a tactic to address worker substance use among Black populations and lower-wage technician and support occupations than among White populations and higher-wage occupations (Becker et al., 2014). Moreover, a survey of union officials suggested that workplaces with a higher proportion of minoritized workers were more likely to conduct pre-employment substance screenings and were more likely to engage in drug testing (as opposed to testing for alcohol), suggesting that these policies may be rooted more in "social control" than in productivity and safety concerns (Gee et al., 2005). Beyond the implications of structural racism in the development and enforcement of certain workplace policies and practices, worker-centric programs like substance education and EAPs may play an important role in preventing problematic substance use, but they are not unilaterally provided or promoted. Research suggests that worksites that engage in greater EAP promotion observe greater EAP utilization among workers (Azzone et al., 2009). This may be critically important for low-wage workers, as these workers are both less likely to work for an organization with an EAP (U.S. Bureau of Labor Statistics, 2016) and may be less likely to be *aware* of these types of organizational services when they are available (Jacobson & Sacco, 2012), which might manifest in a greater likelihood of problematic substance use and related harms.

Current Study

Given the known differences in the prevalence and types of substances used by poverty level (Substance Abuse & Mental Health Services Administration, 2020b) and the paucity of literature regarding organizational-level influences on drug use among low-income workers, a broader examination of the effects of workplace drug use programs, policies, and practices on current substance use among low-income workers is warranted. Moreover, given the heterogeneity

of the low-income workforce and the overrepresentation of people of color and people with a high school education or less among workers living below the federal poverty level (U.S. Bureau of Labor Statistics, 2022), there is a need to better understand how these effects might differ by race/ethnicity and educational attainment. Results from the current study have the potential to illuminate how organizational-level interventions to address substance use may *not* universally benefit low-wage workers, which may be the result of structural racism and classism – both of which are entangled and prevalent in the workplace (Bailey et al., 2017; Byrd et al., 2018). To begin to address these gaps, we used a subset of data from the 2019 wave of the National Survey on Drug Use and Health (NSDUH; $N = 7{,}953$ low-income workers) to answer the following research questions: 1) are organizational-level factors (i.e., having *any* workplace policy about employee use of substances, substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program) associated with current substance use (i.e., alcohol use, cannabis use, illicit substance use, and misuse of prescription drugs) among low-income workers?; and 2) do these associations differ by race/ethnicity and education level? Based on socioecological theory which posits that there are organizational-level influences on behavior, we hypothesized that workers who reported having these substance-related workplace programs, policies, and practices would also be less likely to report current substance use. Our secondary aim was exploratory.

Methods

Data Source

The National Survey on Drug Use and Health (NSDUH) is a national survey directed by the Substance Abuse and Mental Health Services Administration (SAMHSA) and includes topics such as substance use, mental health, and behavioral health services utilization. The NSDUH has been administered periodically since 1971 and every year since 1990. Each wave of the NSDUH is cross-sectional and participants are not followed over time. The NSDUH samples people in the non-institutionalized population living in the United States who are aged 12 years and older. The NSDUH incorporates complex clustered sampling methods to obtain a nationally representative sample of survey respondents and the weighted screening and interview response rates for the 2019 wave exceeded 70% and 64%, respectively (Substance Abuse & Mental Health Services Administration, 2020a). We did not use data from the 2020 NSDUH (the most current available public dataset) as the COVID-19 pandemic necessitated substantial methodological changes to data collection and comparability to other years is unknown.

Procedures

Data for the NSDUH are collected using computer-assisted interviewing methods at participants' places of residence. Participants have the option to read or listen to the questions on headphones and they enter their responses directly on a laptop computer provided by NSDUH staff. These interviews take approximately 1 h to complete and participants are compensated $30 for their time (Substance Abuse & Mental Health Services Administration, 2020a). Additional details regarding the recruitment and survey administration procedures for the NSDUH have been published elsewhere (Substance Abuse & Mental Health Services Administration, 2020a).

Participants

To obtain a sample of low-income workers who responded to the 2019 wave of the NSDUH, data were limited to respondents aged 18 – 64 years who reported currently having a job but were living at or below 200% of the federal poverty level based on family income, household size, and state of residence. Low income was operationalized as living at or below 200% of the federal poverty level, which included people who are working but remain in poverty or in an economically precarious position. Moreover, "near-poor" populations are ineligible for Medicaid (Roberts et al., 2021) but are at substantial risk for substance use and substance-related harms, including overdose (Gu et al., 2022; Knapp et al., 2019; Thakur et al., 2020). Low-income workers who reported that their only employer in the past year was themselves (i.e., self-employed) were excluded from the current study.

Measures

Figure 1 displays the key variables of interest and relations examined in the current study and a description of all variables is included here.

Substance Use Policy

Having *any* workplace policy about employee use of substances was assessed with the question "At your workplace, is there a written policy about employee use of alcohol or drugs?" and responses were dichotomized (No/Yes).

Pre-employment Testing

Substance use testing as a part of the hiring process was evaluated with the following NSDUH question: "Does your workplace test its employees for drug or alcohol use as part of the hiring process?" This question was only assessed among participants who endorsed working for an employer that *ever* tests employees for

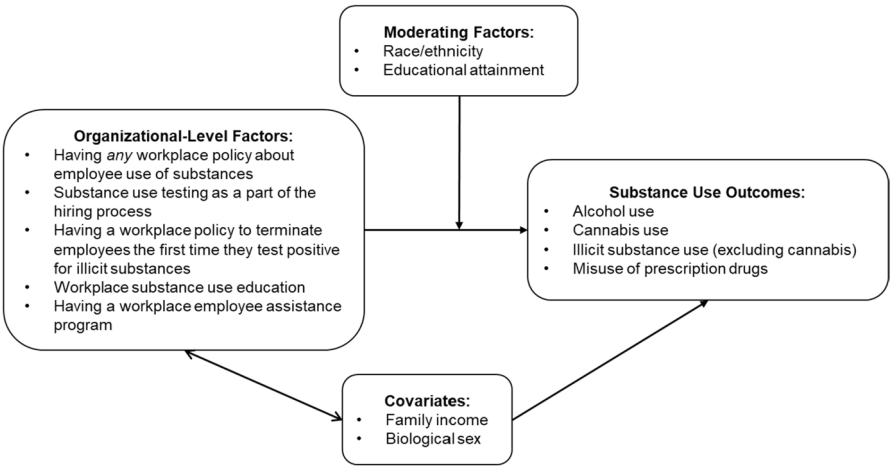

Fig. 1 Key variables and relations examined in the current study

alcohol or drug use. Responses were parameterized as a binary variable for analyses (No/Yes).

Termination Policy

To assess having a workplace policy to terminate employees the first time they test positive for illicit substances, we used responses from the NSDUH question "According to the policy at your workplace, what happens to an employee the first time he or she tests positive for illicit drugs?" This question was only assessed among participants who endorsed working for an employer that *ever* tests employees for alcohol or drug use. If respondents answered "Employee is fired" were coded Yes = 1 and those with other valid responses were coded No = 0.

Substance Use Education

Substance use education in the workplace was assessed with the following survey question "At your workplace, have you ever been given any educational information regarding the use of alcohol or drugs?" and responses were dichotomized (No/Yes).

Workplace EAP

Having a workplace EAP was assessed with the following NSDUH question: "Through your workplace, is there access to any type of employee assistance program or other type of counseling program for employees who have alcohol or drug-related problems?" and was included as a binary variable (No/Yes) in all models.

Alcohol Use

The NSDUH assessed alcohol with the following lead-in text: "These questions are about drinks of alcoholic beverages. Throughout these questions, by a "drink" we mean a can or bottle of beer, a glass of wine or a wine cooler, a shot of liquor, or a mixed drink with liquor in it. We are not asking about times when you only had a sip or two from a drink." Past-month alcohol use was assessed with the question "How long has it been since you last drank an alcoholic beverage?" Those who responded "Within the past 30 days" were coded as Yes and those who gave a response indicating they drank more than 30 days ago or did not drink at all were coded as No for past-month alcohol use.

Cannabis Use

The NSDUH assessed cannabis use with the following lead-in text: "The next questions are about marijuana and hashish. Marijuana is also called pot or grass. Marijuana is usually smoked, either in cigarettes, called joints, or in a pipe. It is sometimes cooked in food. Hashish is a form of marijuana that is also called "hash." It is usually smoked in a pipe. Another form of hashish is hash oil." In the current study, we used past-month cannabis use as a dependent variable, which was based on how long it had been since the respondent last used cannabis. Answers were dichotomized (No/Yes) based on whether the respondent had used cannabis in the past month.

Illicit Substance Use

If NSDUH respondents endorsed past-month use of any illicit substance other than cannabis, they were coded Yes = 1 and those with other valid responses were coded No = 0.

Misuse of Prescription Drugs

Misuse of prescription drugs was defined as use in any way not directed by a doctor, including use without a prescription of one's own medication; use in greater amounts, more often, or longer than told to take a drug; or use in any other way not directed by a doctor. Respondents who reported past-month misuse of prescription pain relievers, sedatives, stimulants, or tranquilizers were coded Yes = 1 and those with other valid responses were coded No = 0.

Demographic Variables

Race/ethnicity was self-reported by participants and grouped into the following categories: White, Black, Native American/Alaska Native, Native Hawaiian/Pacific Islander, Asian, more than one race, and Hispanic, which was entered as a nominal variable in relevant interaction models. Participants were also asked to report their biological sex (i.e., male, female) and their highest level of education (i.e., less than

high school, high school graduate, some college/associates degree, college graduate), which were entered into our regression models as binary and ordinal variables, respectively. Self-reported annual family income was grouped into the following ordinal categories by NSDUH: less than $20,000; $20,000—$49,999; $50,000—$74,999; and $75,000 or more. Living in a state with a medical cannabis policy at the time of the NSDUH interview was coded as Yes/No.

Focal Analyses

We first used descriptive statistics to characterize this sample of low-income workers and examine the bivariate relations between key variables of interest and sample demographic characteristics. Given that all NSDUH-provided variables were categorical (i.e., ordinal, nominal, or binary), we examined chi-square tests. We then separately examined the cross-sectional associations between several organizational-level workplace factors (i.e., having *any* workplace policy about employee use of substances, substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program) and measures of current drug use (i.e., alcohol use, cannabis use, illicit substance use excluding cannabis, and misuse of prescription drugs) using logistic regression models controlling for annual family income and sex. Both of these variables were significantly associated with organizational-level workplace factors and substance use outcomes in our bivariate analyses. Moreover, there are significant differences in the substance use patterns, (SAMHSA, 2020) and occupations/working conditions (Campos-Serna et al., 2013; Gradín, 2020) of adults according to these demographic variables, making them likely to confound the examined relationships of interest. Odds ratios (ORs) and 95% confidence intervals (CIs) are reported for all main effects models. Finally, we examined for separate interactions between organizational-level workplace factors and race/ethnicity and education level on each of the substance use outcomes by adding an interaction term to each adjusted model while also controlling for the main effect of the moderator and conducted a Wald test to examine if each overall interaction was statistically significant. We then reported the corresponding F statistic and p-value for the overall interaction and presented the point estimates, confidence intervals, and p-values for the interaction terms of each interaction model in supplemental tables. In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as covariates to control for their potential confounding effects. Statistical significance for all tests was determined at an alpha level of 0.05. We probed each statistically significant interaction by calculating predictive margins (i.e., predicted probabilities of the corresponding substance use outcomes, ranging from 0.0 to 1.0) to examine stratum-specific effects and presented these results in corresponding figures.

For all substance-related outcomes and demographic characteristics examined, we used the NSDUH-provided imputed variables, which use data from elsewhere within the same respondent's record to reduce the occurrence of missing or

ambiguous data or to resolve inconsistencies between related variables. After sample restriction based on study inclusion criteria, the missingness of focal correlates (i.e., having *any* workplace policy about employee use of substances, substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program) ranged from 3.9% to 11.3% (blank, refused, or "don't know" responses). We performed pairwise deletion to preserve all data with non-missing values. We performed all analyses in 2022 incorporating the NSDUH sampling weights and controlling for complex clustered sampling using Stata version 17.0 (College Station, TX).

Post-Hoc Analyses

Given the heterogeneity of cannabis laws in the US, we conducted post-hoc analyses to determine whether respondents' state of residence significantly affected the observed relationships between organizational-level workplace factors and current substance use outcomes. We added a dichotomized covariate that reflected whether the respondent resided in a state where there was a law or initiative allowing the use of cannabis had been passed on or before the interview date to each main effect model that examined cannabis use as an outcome. Additionally, not all substance use is in and of itself inherently problematic given varying substance properties consumption patterns, and contexts, so it is important to distinguish between substance use and addiction. To better contextualize our findings among low-income workers generally, we reran all our main effects and interaction models among the subsample of low-income workers who also reported that they have had a problem with drugs or alcohol ($n = 845$). Finally, we tested the *simultaneous* main effects of the four specific workplace factors (i.e., substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program) on each substance use outcome separately, controlling for family income and biological sex.

Results

Descriptive Results

The low-income workers included in the current study sample ($N = 7{,}953$) were diverse with respect to age, sex, and race/ethnicity (Table 1). Approximately half of the sample were young adults aged 18—25 years, but older adults were also represented. The sample consisted of slightly more women than men, but this is consistent with national estimates of the demographic characteristics of low-wage workers in the US (U.S. Bureau of Labor Statistics, 2022). Non-Hispanic White participants were the largest represented racial/ethnic group (46.5%), followed by Hispanic participants (25.3%), and non-Hispanic Black participants (18.0%). The median family

Table 1 Participant characteristics and key variables of interest (N = 7,953)

Characteristic	%
Age Category	18.7%
18—20 years	31.0%
21—25 years	11.5%
26—29 years	11.1%
30—34 years	21.2%
35—49 years	6.4%
50—64 years	
Sex	43.8%
Male	56.2%
Female	
Race/Ethnicity	46.5%
Non-Hispanic White	18.0%
Non-Hispanic Black	1.5%
Non-Hispanic Native American or Alaska Native	0.7%
Non-Hispanic Native Hawaiian or Other Pacific Islander	3.9%
Non-Hispanic Asian	4.1%
Non-Hispanic More Than One Race	25.3%
Hispanic	
Family Income Category	38.8%
Less than $20,000	55.4%
$20,000—$49,999	5.4%
$50,000—$74,999	0.4%
$75,000 or More	
Federal Poverty Level	35.5%
Living in Poverty	62.0%
Income up to 2 × Federal Poverty Threshold	
Education Level	14.7%
Less than High School	34.3%
High School Graduate	39.3%
Some College/Associates Degree	11.7%
College Graduate	
Employment Status	66.8%
Full-time (≥ 35 h/week)	33.2%
Part-time (< 35 h/week)	
Residing in State with Medical Cannabis Policy	67.8%
Past Month Alcohol Use	54.3%
Past Month Cannabis Use	20.0%
Past Month Illicit Substance Use	5.2%
Past Month Misuse of Prescription Drugs	2.8%
Any Workplace Policy about Employee Use of Substances	77.1%
Policy to Terminate Employees	23.5%
Substance Use Testing for Hiring	40.1%
Workplace Substance Use Education	37.2%
Workplace Employee Assistance Program (EAP)	35.1%

income category was $20,000—$49,999 per year and the majority of participants were employed full-time. The results from bivariate analyses of key variables of interest and demographic characteristics are presented in Table 2.

Table 2 Bivariate relations[a] between key variables of interest and demographic characteristics (N = 7,953)

Characteristic	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age																	
2. Sex	**24.21****																
3. Race/Ethnicity	**113.25*****	**24.57*****															
4. Family Income	**451.15*****	**14.05****	**145.86*****														
5. Education Level	**797.83*****	**109.27*****	**374.62*****	**36.86*****													
6. Employment Status	**489.89*****	**90.64*****	**72.19*****	**308.31*****	**73.96*****												
7. Alcohol Use	**454.74*****	**4.09***	**105.59*****	**16.17****	**180.69*****	**13.12*****											
8. Cannabis Use	**178.34*****	**37.57*****	**84.42*****	**59.85*****	**22.71*****	**4.80***	**465.75*****										
9. Illicit Substance Use	**28.18****	**5.09***	**50.36*****	**24.78*****	1.24	3.14	**120.15*****	**604.45*****									
10. Prescription Drug Misuse	**20.84***	0.59	**22.26****	6.86	2.00	**4.03***	**50.07*****	**247.15*****	**4200.00*****								
11. Any Policy	**17.54***	2.50	**55.24*****	**23.18*****	**29.04*****	**105.07*****	**5.26***	**66.27*****	**39.79*****	**24.58*****							
12. Termination Policy	**29.51****	0.71	**49.09*****	7.00	**67.64*****	**7.82****	0.91	0.10	0.00	0.31	0.00						

Table 2 (continued)

Characteristic	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
13. Hiring Substance Test	**51.56*****	2.75	**25.99*****	**11.63****	**11.69****	**93.08*****	2.98	**22.86*****	**5.56***	0.27	**10.69****	**42.29*****					
14. Education	10.53	**22.63*****	**87.06*****	7.46	**8.90***	**48.90*****	2.96	**22.10*****	**13.59*****	**5.38***	**659.63*****	2.73	**25.40*****				
15. EAP	**88.87*****	0.01	**72.88*****	**20.60*****	**203.73*****	**86.03*****	3.23	**31.09*****	**15.63*****	**4.58***	**618.96*****	**78.64*****	**20.30*****	**1100.00*****			
16. State Cannabis Policy	9.58	3.32	**160.74*****	4.44	3.66	**7.51****	1.71	**52.34*****	2.05	0.59	**8.84****	**11.78****	**6.20***	0.35	2.60		
17. Drug/Alcohol Problem	**89.23*****	**27.18*****	**174.64*****	1.75	1.89	0.48	**45.30*****	**247.56*****	**311.61*****	**160.93*****	**16.49*****	**4.69***	**7.03****	**31.82*****	**11.52****	0.01	

[a]Chi-square values and level of statistical significance; EAP = employee assistance program; *$p < 0.05$; **$p < 0.01$; $p < 0.001$

Having any workplace policy about employee use of substances was negatively correlated with all substance use outcomes. Having a policy to terminate employees who test positive for illicit drugs was not correlated with any substance use outcome. Pre-employment substance screening was negatively correlated with cannabis and other illicit drug use, but not alcohol use or prescription drug misuse. Workplace education on substance use and EAP were both negatively correlated with cannabis, illicit, and prescription drug misuse, but not alcohol use

Among this sample of low-income workers, more than half (54.3%) reported consuming alcohol in the past 30 days and about 1 in 5 (20.0%) reported using cannabis in the past month. Approximately 5.2% of these workers reported using an illicit substance (excluding cannabis) in the past month, and 2.8% reported current misuse of prescription drugs. Most participants (77.1%) reported having *any* written workplace policy about employee use of substances. Among this sample of workers, 23.5% reported that their employer had a specific policy to terminate employees the first time they test positive for illicit substances. About 2 in 5 low-income workers (40.1%) reported that their workplace had pre-employment substance use screening practices. Additionally, 37.2% of the current study sample reported that their employer-provided substance use education in the workplace, and 35.1% reported that their employer had an EAP to address problematic substance use among employees.

Main Effects of Organizational-Level Workplace Factors on Current Substance Use

Participants who reported having *any* workplace policy about employee use of substances were less likely to report current cannabis use (aOR = 0.63, 95% CI: 0.53, 0.76; $p < 0.001$), illicit substance use (aOR = 0.56, 95% CI: 0.41, 0.77; $p < 0.01$), and

Table 3 Main effects of having any workplace policy about employee use of substances on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 7,762	Cannabis Use aOR (95% CI) N = 7,762	Illicit Substance Use aOR (95% CI) N = 7,734	Misuse of Prescription Drugs aOR (95% CI) N = 7,734
Any Policy	Referent	Referent	Referent	Referent
No	0.91 (0.77, 1.07)	**0.63 (0.53, 0.76)*** **	**0.56 (0.41, 0.77)*** **	**0.56* (0.36, 0.88)**
Yes				
Family	Referent	Referent	Referent	Referent
Income	0.94 (0.80, 1.10)	**0.64 (0.56, 0.74)*** **	**0.58 (0.45, 0.76)*** **	**0.66 (0.46, 0.94)***
Category	0.77 (0.56, 1.05)	**0.53 (0.35, 0.79)****	0.78 (0.35, 1.60)	0.86 (0.32, 2.32)
Less than $20,000	**0.32 (0.11, 0.95)***	**0.05 (0.01, 0.35)****	NA	NA
$20,000—$49,999				
$50,000—$74,999				
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.79 (0.69, 0.90)****	**0.67 (0.57, 0.79)***	0.87 (0.65, 1.15)	**1.67 (1.19, 2.34)****
Female				

aOR = adjusted odds ratio; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present); In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as additional covariates to control for their potential confounding effects

misuse of prescription drugs (aOR = 0.56; 0.36, 0.88; $p < 0.05$), but not with alcohol use (aOR = 0.91, 95% CI: 0.77, 1.07; $p > 0.05$; Table 3).

Working for an employer with pre-employment substance use screening practices was associated with lower odds of current cannabis use (aOR = 0.72, 95% CI: 0.53, 0.98; $p < 0.05$), but not with alcohol use (aOR = 0.90, 95% CI: 0.69, 1.16; $p > 0.05$), illicit substance use (aOR = 0.73, 95% CI: 0.41, 1.28; $p > 0.05$), or misuse of prescription drugs (aOR = 1.11, 95% CI: 0.55, 2.27; $p > 0.05$; Table 4).

Having a workplace policy to terminate employees the first time they test positive for illicit substances was not associated with the odds of current alcohol use (aOR = 1.10, 95% CI: 0.90, 1.36; $p > 0.05$), cannabis use (aOR = 1.26, 95% CI: 0.92, 1.72; $p > 0.05$), illicit substance use (aOR = 0.99, 95% CI: 0.55, 1.78; $p > 0.05$), or the misuse of prescription drugs (aOR = 0.98, 95% CI: 0.52, 1.83; $p > 0.05$; Table 5).

Participants who reported working for an employer that provided substance use education programming in the workplace had lower odds of current cannabis use (aOR = 0.79, 95% CI: 0.66, 0.94; $p < 0.01$) and current use of illicit substances (aOR = 0.75; 95% CI: 0.56, 0.99; $p < 0.05$), but not with alcohol use (aOR = 0.92, 95% CI: 0.78, 1.08; $p > 0.05$) or misuse of prescription drugs (aOR = 0.67, 95% CI: 0.42, 1.07; $p > 0.05$; Table 6).

Similarly, participants who reported having an EAP in the workplace to address problematic substance use had lower odds of current cannabis use (aOR = 0.72, 95% CI: 0.60, 0.86; $p < 0.01$) and illicit substance use (aOR = 0.61, 95% CI: 0.44, 0.84; $p < 0.01$), but not alcohol use (aOR = 1.02, 95% CI: 0.90, 1.17; $p > 0.05$) or misuse of prescription drugs (aOR = 0.70, 95% CI: 0.47, 1.06; $p > 0.05$; Table 7).

Interaction Effects of Organizational-Level Workplace Factors and Race/Ethnicity on Current Substance Use

There was a significant interaction between having *any* workplace policy about employee use of substances and race/ethnicity on the odds of current alcohol use ($F(6, 45) = 3.17$; $p < 0.05$; Supplemental Table 1), such that low-income White, Native American/Alaska Native, Native Hawaiian/Pacific Islander, Asian, and multiracial workers were less likely to report current alcohol use when their employer had a workplace policy about the use of substances compared to when their employer did not have a workplace policy about the use of substances, but this effect did not extend to Black and Hispanic workers (Fig. 2, Panel A). Race/ethnicity also moderated the association between having any written substance use policy and race/ethnicity on current cannabis use ($F(6, 45) = 3.29$; $p < 0.01$), such that White, Black, Native Hawaiian/Pacific Islander, Hispanic, multiracial workers were less likely to report current cannabis use when their employer had *any* policy about the use of substances, but the inverse was observed among Native American/Alaska Native and Asian workers (Fig. 2, Panel B). There were no statistically significant interactions between having any workplace substance use policy and race/ethnicity on illicit substance use ($F(5, 46) = 1.96$; $p > 0.05$) or misuse of prescription drugs ($F(4, 47) = 0.43$; $p > 0.05$).

Table 4 Main effects of substance use testing as a part of the hiring process on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 3,799	Cannabis Use aOR (95% CI) N = 3,799	Illicit Substance Use aOR (95% CI) N = 3,781	Misuse of Prescription Drugs aOR (95% CI) N = 3,781
Hiring Substance Test	Referent	Referent	Referent	Referent
No	0.90 (0.69, 1.16)	**0.72 (0.53, 0.98)***	0.73 (0.41, 1.28)	1.11 (0.55, 2.27)
Yes				
Family Income Category	Referent	Referent	Referent	Referent
Less than $20,000	1.12 (0.88, 1.43)	**0.69 (0.51, 0.92)***	**0.63 (0.41, 0.98)***	0.69 (0.33, 1.42)
$20,000—$49,999	0.89 (0.56, 1.42)	0.63 (0.35, 1.14)	0.82 (0.25, 2.66)	0.19 (0.03, 1.06)
$50,000—$74,999	0.28 (0.07, 1.15)	**0.01 (0.01, 0.09)*****	NA	NA
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.72 (0.59, 0.90)****	**0.62 (0.46, 0.84)****	0.76 (0.49, 1.19)	1.62 (0.87, 3.01)
Female				

aOR = adjusted odds ratio; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present); In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as additional covariates to control for their potential confounding effects

Table 5 Main effects of having a workplace policy to terminate employees the first time they test positive for illicit substances on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 3,397	Cannabis Use aOR (95% CI) N = 3,397	Illicit Substance Use aOR (95% CI) N = 3,382	Misuse of Prescription Drugs aOR (95% CI) N = 3,382
Termination Policy	Referent	Referent	Referent	Referent
No	1.10 (0.90, 1.36)	1.26 (0.92, 1.72)	0.99 (0.55, 1.78)	0.98 (0.52, 1.83)
Yes				
Family Income Category	Referent	Referent	Referent	Referent
Less than $20,000	1.14 (0.89, 1.46)	**0.69 (0.50, 0.95)***	**0.61 (0.39, 0.96)***	0.65 (0.31, 1.37)
$20,000—$49,999	0.91 (0.57, 1.46)	0.67 (0.37, 1.20)	0.76 (0.24, 2.45)	**0.17 (0.03, 0.90)***
$50,000—$74,999	0.49 (0.12, 1.98)	**0.01 (0.01, 0.11)*****	NA	NA
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.68 (0.54, 0.86)****	**0.63 (0.46, 0.87)***	0.78 (0.49, 1.25)	1.59 (0.84, 3.04)
Female				

aOR = adjusted odds ratio; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present); In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as additional covariates to control for their potential confounding effects

Table 6 Main effects of workplace substance use education on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 7,875	Cannabis Use aOR (95% CI) N = 7,875	Illicit Substance Use aOR (95% CI) N = 7,845	Misuse of Prescription Drugs aOR (95% CI) N = 7,845
Workplace Education	Referent	Referent	Referent	Referent
No	0.92 (0.78, 1.08)	**0.79(0.66, 0.94)****	**0.75 (0.56, 0.99)***	0.67 (0.42, 1.07)
Yes				
Family Income Category	Referent	Referent	Referent	Referent
Less than $20,000	0.95 (0.82, 1.10)	**0.68 (0.58, 0.79)*****	**0.58 (0.45, 0.75)*****	**0.63 (0.44, 0.90)***
$20,000—$49,999	0.79 (0.56, 1.10)	**0.57 (0.39, 0.79)****	0.76 (0.35, 1.64)	0.78 (0.28, 2.15)
$50,000—$74,999	**0.29 (0.10, 0.84)***	**0.05 (0.01, 0.33)****	NA	NA
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.73 (0.64, 0.84)****	**0.63 (0.54, 0.75)*****	0.84 (0.64, 1.10)	**1.57 (1.13, 2.19)****
Female				

aOR = adjusted odds ratio; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present); In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as additional covariates to control for their potential confounding effects

Table 7 Main effects of having a workplace employee assistance program on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 7,355	Cannabis Use aOR (95% CI) N = 7,355	Illicit Substance Use aOR (95% CI) N = 7,328	Misuse of Prescription Drugs aOR (95% CI) N = 7,328
Workplace EAP	Referent	Referent	Referent	Referent
No	1.02 (0.90, 1.17)	**0.72 (0.60, 0.86)****	**0.61 (0.44, 0.84)****	0.70 (0.47, 1.06)
Yes				
Family Income Category	Referent	Referent	Referent	Referent
Less than $20,000	0.99 (0.85, 1.16)	**0.65 (0.56, 0.77)*****	**0.59 (0.45, 0.78)*****	**0.66 (0.46, 0.93)***
$20,000—$49,999	0.82 (0.58, 1.16)	**0.51 (0.34, 0.77)****	0.74 (0.33, 1.67)	0.83 (0.30, 2.29)
$50,000—$74,999	**0.31 (0.11, 0.89)***	**0.06 (0.01, 0.40)****	NA	NA
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.76 (0.67, 0.87)*****	**0.65 (0.54, 0.77)*****	0.87 (0.64, 1.17)	**1.64 (1.17, 2.30)****
Female				

aOR = adjusted odds ratio; EAP = employee assistance program; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present); In the absence of statistically significant interactions, race/ethnicity and educational attainment were added back to corresponding main effects models as additional covariates to control for their potential confounding effects

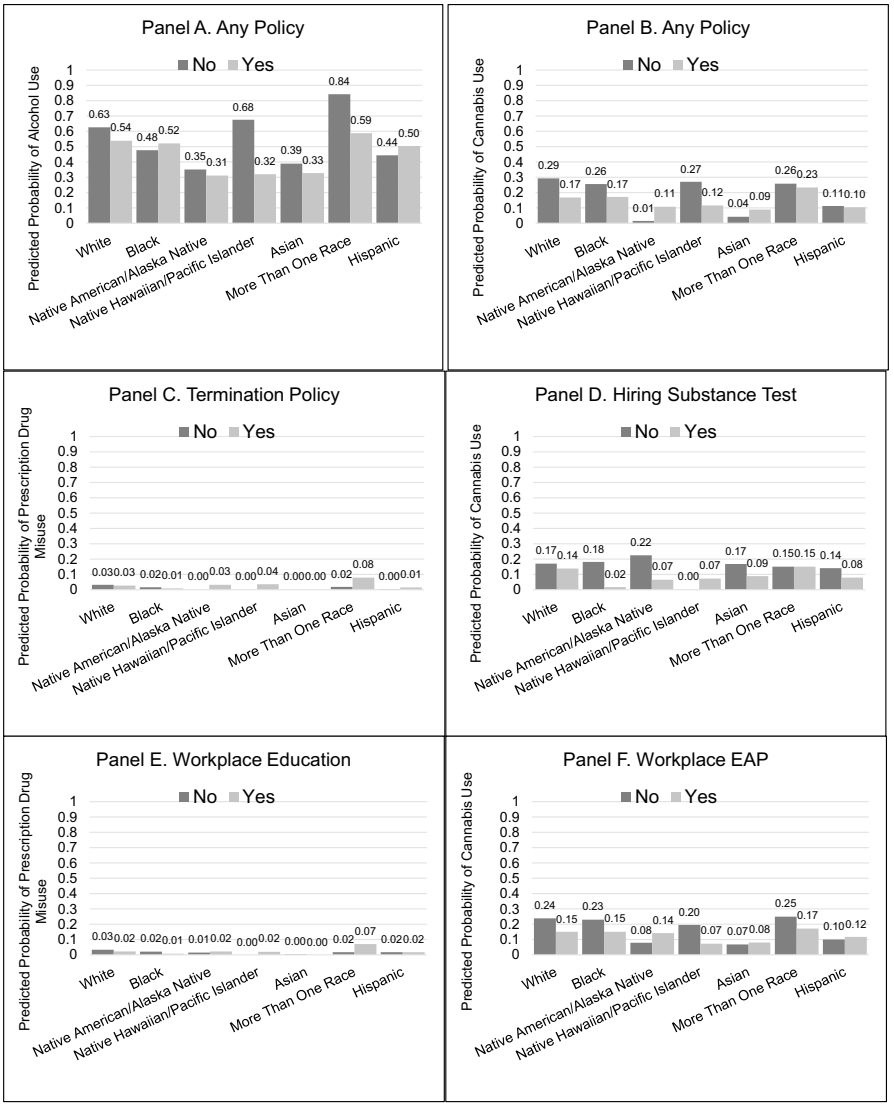

Fig. 2 Predicted probability of past-month substance use by organizational factors and race/ethnicity

There was a significant interaction between having a policy to terminate employees the first time they test positive for illicit substances and race/ethnicity on current misuse of prescription drugs ($F(3, 48) = 2.90$; $p < 0.05$), with multiracial workers being *more* likely to report current misuse of prescription drugs in the presence of this type of policy (Fig. 2, Panel C). There were no significant interactions between substance use termination policies and race/ethnicity on alcohol ($F(6, 45) = 2.12$; $p < 0.05$), cannabis ($F(5, 46) = 2.36$; $p > 0.05$), or illicit substance use ($F(4, 47) = 1.49$; $p > 0.05$).

Race/ethnicity did not moderate the association between pre-employment substance testing practices and current use of alcohol ($F(5, 46) = 0.41$; $p > 0.05$), illicit substances ($F(4, 47) = 2.50$; $p > 0.05$), or misuse of prescription drugs ($F(2, 49) = 0.46$; $p > 0.05$), but did moderate the association between pre-employment substance testing practices on current cannabis use ($F(5, 46) = 3.03$; $p < 0.05$). White, Black, Native American/Alaska Native, Asian, and Hispanic workers were less likely to report cannabis if their employer conducted pre-employment screening practices, but this was not the case for workers in other racial/ethnic groups (Fig. 2, Panel D).

There was a significant interaction between race/ethnicity and workplace substance use education on the likelihood of prescription drug misuse ($F(4, 47) = 3.07$; $p < 0.05$), such that multiracial workers were *more* likely to report prescription drug misuse when workplace education was provided as compared to when it wasn't provided, but this effect was not observed among the other racial/ethnic groups (Fig. 2, Panel E). There were no interactions between race/ethnicity and workplace substance use education on alcohol use ($F(6, 45) = 1.47$; $p > 0.05$), cannabis use ($F(6, 45) = 1.22$; $p > 0.05$), or illicit substance use ($F(5, 46) = 0.94$; $p > 0.05$).

There was a significant interaction between having a workplace EAP to address problematic substance use and race/ethnicity on cannabis use ($F(6, 45) = 2.36$; $p < 0.05$), such that White, Black, Native Hawaiian/Pacific Islander, and multiracial workers were less likely to use cannabis when they reported having a workplace EAP (Fig. 2, Panel F), but Native American/Alaska Native, Asian, and Hispanic workers were more likely to use cannabis when they reported having a workplace EAP. However, there were no significant interactions between having a workplace EAP and race/ethnicity on the likelihood of alcohol use ($F(6, 45) = 2.02$; $p > 0.05$), illicit drug use ($F(5, 46) = 1.46$; $p > 0.05$), or misuse of prescription drugs ($F(5, 46) = 1.46$; $p > 0.05$).

Interaction Effects of Organizational-Level Workplace Factors and Education Level on Current Substance Use

Education level moderated the association between having *any* workplace policy about employee use of substances and current alcohol use ($F(3, 48) = 6.50$; $p > 0.001$; Supplemental Table 2; Fig. 3, Panel A) and cannabis use ($F(3, 48) = 2.98$; $p < 0.05$; Fig. 3, Panel B), such that low-income workers with at least some college were less likely to report current use when their employer had a workplace policy about the use of substances compared to when their employer did not have a workplace policy about the use of substances, but this effect was not present among workers with lower educational attainment. There were no interactions between having a workplace substance use policy and education level on illicit substance use ($F(3, 48) = 2.10$; $p > 0.05$) or misuse of prescription drugs ($F(3, 48) = 1.34$; $p > 0.05$).

There were no interactions between having a workplace policy to terminate employees the first time they test positive for illicit substances and education level on alcohol use ($F(3, 48) = 0.44$; $p > 0.05$), cannabis use ($F(3, 48) = 0.16$; $p > 0.05$), illicit substance use ($F(3, 48) = 0.36$; $p > 0.05$), or misuse of prescription drugs

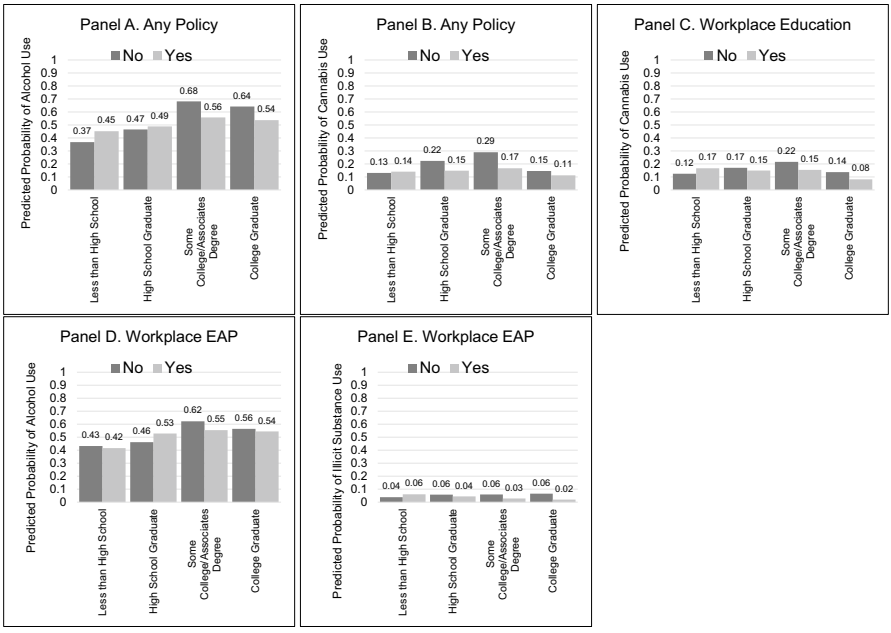

Fig. 3 Predicted probability of past-month substance use by organizational factors and education level

(F(3, 48) = 0.04; $p > 0.05$). Likewise, there were no interactions between education level and pre-employment screening practices on alcohol use (F(3, 48) = 2.76; $p > 0.05$), cannabis use (F(3, 48) = 1.05; $p > 0.05$), illicit substance use (F(3, 48) = 2.02; $p > 0.05$), or misuse of prescription drugs (F(3, 48) = 0.70; $p > 0.05$).

Level of education moderated the relation between workplace substance use education and current cannabis use (F(3, 48) = 3.15; $p < 0.05$), but not alcohol use (F(3, 48) = 2.70; $p > 0.05$), illicit substance use (F(3, 48) = 1.02; $p > 0.05$) or misuse of prescription drugs (F(3, 48) = 0.45; $p > 0.05$). Examining the predicted probability of substance use by whether respondents' employers offered substance use education in the workplace and level of education suggests that those with at least a high school education were less likely to report the use of cannabis (Fig. 3, Panel C) in the presence of workplace education. However, this effect was not observed among those with lower educational attainment.

There was a significant interaction between having a workplace EAP to address problematic substance use and education level on current alcohol use (F(3, 48) = 4.72; $p < 0.01$; Fig. 3, Panel D) and illicit substance use (F(3, 48) = 3.59; $p < 0.05$; Fig. 3, Panel E), such that those with at least some college education were the least likely to report the use of these substances when their employer had an EAP to address problematic substance use as compared to when their employed did not have an EAP. There were no interactions between having a workplace EAP and level of educational attainment on current cannabis use (F(3, 48) = 1.76; $p > 0.05$) or misuse of prescription drugs (F(3, 48) = 1.24; $p > 0.05$).

Post-Hoc Analyses

Adding a dichotomized covariate that reflected whether the respondent resided in a state where there was a law or initiative allowing the use of cannabis had been passed on or before the interview date to each main effect model that examined cannabis use as an outcome did not result in any changes to the statistical significance of the effects of organizational factors on cannabis use and only affected the magnitude of these effects by 0.8 to 1.6%.

The subsample of low-income workers with a problem with drugs or alcohol ($n=845$), was similar to the full sample with respect to income and educational attainment but was more likely to be male (52.2%; $p<0.001$), Non-Hispanic White (63.4%; $p<0.001$), and include an older distribution of participants ($p<0.001$). Moreover, the subsample was *less* likely to endorse having *any* workplace policy about employee use of substances (73.7%; $p<0.001$), working for an employer with substance use testing as a part of the hiring process (79.1%; $p<0.01$), having a workplace policy to terminate employees the first time they test positive for illicit substances (49.3%; $p<0.05$), receiving workplace substance use education (28.7%; $p<0.001$), and having a workplace EAP (32.5%; $p<0.01$). Among this subsample, having *any* workplace policy about employee use of substances was associated with lower odds of current alcohol use (aOR=0.47, 95% CI: 0.28, 0.80; p<0.01), cannabis use (aOR=0.39, 95% CI: 0.27, 0.58; $p<0.001$), and illicit substance use (aOR=0.62, 95% CI: 0.39, 0.98; $p<0.05$). Having a workplace policy to terminate employees the first time they positive for illicit substances and pre-employment substance use screening were *not* associated with any substance use outcome in this subsample. However, workers who reported being provided substance use education in the workplace were less likely to report current alcohol use (aOR=0.65, 95% CI: 0.43, 0.98; $p<0.05$) and misuse of prescription drugs (aOR=0.46; 95% CI: 0.23, 0.94; $p<0.05$). Likewise, those who reported having an EAP were less likely to report alcohol (aOR=0.53, 95% CI: 0.35, 0.80; $p<0.01$) and cannabis use (aOR=0.59, 95% CI: 0.40, 0.88; $p<0.05$). However, the statistically significant interactions observed in the full sample were no longer significant among this subsample of low-income workers with a problem with drugs or alcohol. Given that there was less racial and ethnic diversity among the subsample, we may have been underpowered to detect differences by race/ethnicity in this group.

Lastly, our examination of the *simultaneous* main effects of the four specific workplace factors (i.e., substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program) on each substance use separately outcome did not reveal any significant effects of these factors on any of the substance use outcomes (Table 8).

Discussion

Low-wage employment has been shown to limit workers' time to search for better jobs, learn new skills, take classes, or obtain credentials, resulting in barriers to building human capital and "trapping" workers in low-wage positions (Halpin

Table 8 Simultaneous effects of specific workplace programs, policies, and practices on current substance use among low-income workers

	Alcohol Use aOR (95% CI) N = 3,266	Cannabis Use aOR (95% CI) N = 3,266	Illicit Substance Use aOR (95% CI) N = 3,251	Misuse of Prescription Drugs aOR (95% CI) N = 3,251
Hiring Substance Test	Referent	Referent	Referent	Referent
No	0.86 (0.65, 1.15)	0.74 (0.55, 1.01)	0.69 (0.38, 1.25)	1.08 (0.51, 2.32)
Yes				
Termination Policy	Referent	Referent	Referent	Referent
No	1.12 (0.91, 1.38)	1.28 (0.93, 1.75)	0.93 (0.50, 1.74)	0.96 (0.48, 1.92)
Yes				
Workplace Education	Referent	Referent	Referent	Referent
No	0.92 (0.74, 1.15)	(1.03, 0.81, 1.31)	0.90 (0.53, 1.51)	(0.43, 0.20, 0.93)
Yes				
Workplace EAP	Referent	Referent	Referent	Referent
No	1.14 (0.91, 1.43)	0.86 (0.64, 1.15)	0.74 (0.40, 1.37)	0.90 (0.47, 1.70)
Yes				
Family Income Category	Referent	Referent	Referent	Referent
Less than $20,000	1.17 (0.91, 1.51)	**0.69 (0.50, 0.95)***	0.57 (0.36, 0.92)*	0.62 (0.29, 1.34)
$20,000—$49,999	0.99 (0.63, 1.57)	0.62 (0.34, 1.12)	0.69 (0.22, 2.12)	**0.17 (0.03, 0.92)***
$50,000—$74,999	0.54 (0.13, 2.23)	**0.01 (0.01, 0.10)*****	NA	NA
$75,000 or More				
Sex	Referent	Referent	Referent	Referent
Male	**0.73 (0.58, 0.91)****	**0.67 (0.49, 0.92)***	0.77 (0.48, 1.23)	1.62 (0.83, 3.15)
Female				

aOR = adjusted odds ratio; EAP = employee assistance program; CI = confidence interval; ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$; NA = not applicable (0 value cell present)

& Smith, 2014). Many of these workers have erratic and precarious employment situations and are more likely to be adversely affected by the downstream effects of exploitive labor practices and occupational stressors than higher-income workers. Consistent with findings from Prins and colleagues (Prins et al., 2019), the current study suggests that many low-income workers use substances, and this substance use may be influenced by organizational-level factors. Our findings suggest that only *some* workplace organizational factors are cross-sectionally associated with current substance use among low-income workers, which was also generally supported by the findings from post-hoc analyses among low-income workers with and without a history of substance use problems. However, these effects do not extend to workers of all racial/ethnic groups or education levels.

Having a written policy on employee substance use was consistently associated with lower odds of current substance use in main effects models, but this was not the case for pre-employment substance testing and termination of employees who test positive for illicit substances. However, our data did suggest that employees who reported having a workplace EAP or other type of counseling program for employees who have alcohol or drug-related problems were less likely to report current substance use. Likewise, low-income workers who reported that their workplace provided educational information regarding the use of alcohol or drugs were also less likely to engage in substance use. Notably, both of these employee-centric workplace interventions are currently recommended by SAMHSA (Substance Abuse & Mental Health Services Administration, 2022). Moreover, the American Public Health Association recently released a policy statement regarding the role of the workplace as a source of occupational injuries, illness, and stress that *precipitates* substance use, and the need to transform the workplace into "a pathway for prevention" through the "replacement of stigmatizing, punitive workplace substance use programs" with worker-centric interventions (American Public Health Association, 2021).

Although substance use has been associated with involuntary job loss (Okechukwu et al., 2019), which may be driven in part by punitive workplace policies to terminate employees who test positive for substances, job loss also has significant detrimental effects on workers. For example, job loss has been associated with adverse effects on physical health, mental health, and health behaviors, particularly among minoritized workers with a low socioeconomic status prior to job loss (Canavan et al., 2021), suggesting that low-income workers of color who are already made vulnerable by structural racism inside and outside of the workplace may be especially vulnerable to the effects of punitive workplace policies regarding substance use. Moreover, our results suggest that not all low-wage workers derive the same benefits from worker-centric interventions like substance use education or EAP. This important difference suggests that there is a need to develop more tailored interventions and communication strategies that are culturally appropriate and accessible for workers of all races, ethnicities, and levels of educational attainment.

Our findings build on a previous examination of an older wave of NSDUH data (Carpenter, 2007), which demonstrated that the relationship observed between substance testing and worker cannabis use may partly be explained by other more salient organizational factors, like having a substance use policy, providing substance

use education, and providing an EAP. Our findings confirm the importance of these other factors using more recent data, additional substance-related outcomes, and among a specific population particularly at risk for substance-related harms. Consistent with Carpenter (2007), we found that pre-employment substance testing was cross-sectionally associated with lower odds of cannabis use. However, interaction models suggest that pre-employment substance testing may not be a universally effective intervention to prevent substance use among all low-income workers.

Key findings from the results of the current study suggest that non-punitive approaches to addressing drug use appear to be effective at preventing cannabis use and illicit substance use among low-income workers. Specifically, having a workplace EAP or other type of counseling program for employees who have alcohol or drug-related problems was associated with lower odds of current drug use. However, nearly two-thirds of these low-income workers reported that their employer did *not* have an EAP or other program to address problematic substance use among employees. This is in contrast to data from the Bureau of Labor Statistics (BLS) which suggests that 54% of all workers in the US have access to EAPs (U.S. Bureau of Labor Statistics, 2016), suggesting that low-income workers may be less likely to have access to EAPs than higher-income workers. Indeed, further data from the BLS (2016) demonstrates that workers in management and professional occupations were the most likely to report having access to EAPs (69%), while those working in service, construction, and maintenance-related occupations were the least likely to report having access to EAPs (39%). Prior research has shown that EAPs are uniquely positioned to reach vulnerable populations in the workplace and engage them in treatment (Jacobson & Sacco, 2012), and the current study suggests that the availability and accessibility of EAPs may contribute to a lower prevalence of problematic substance use among low-income workers. Although not examined in the current study, the potential benefits of EAPs suggest that similar interventions that provide the time and resources for workers to seek help for problematic substance use are important. Specifically, the Family and Medical Leave Act (FMLA) requires covered employers to provide workers with leave for medical reasons, including leaves of absence for inpatient substance use disorder treatment (U.S. Department of Labor). However, federal FMLA only guarantees protected *unpaid* leave, which is often not an option for low-wage workers who are also more likely to be minoritized or have a low educational attainment, further highlighting the need for more robust and equitable resources made available and easily accessible in the workplace.

The current study also demonstrates that workplace-provided substance use education may have a favorable effect on drug use. Low-income workers who reported being provided education in the workplace regarding the use of substances had 21% lower odds of current cannabis use and 30% lower odds of illicit substance use than low-income workers without this type of workplace intervention. Despite this apparent marked benefit and the current recommendation by SAMHSA to educate workers about the effects of substance use on health, job performance, and work safety (Substance Abuse & Mental Health Services Administration, 2022), 62.8% of the current study sample was *not* provided substance use education in the workplace. Few studies have examined the role of workplace-provided substance use education, but research regarding employer-provided education on other health behaviors

suggests that the workplace as an educational intervention setting is feasible, but the data regarding the effectiveness of these interventions are mixed (e.g., Proper & van Oostrom, 2019; Thomson et al., 2018).

It should also be noted that, when examined simultaneously, there were no statistically significant effects of substance use testing as a part of the hiring process, having a workplace policy to terminate employees the first time they test positive for illicit substances, workplace substance use education, and having a workplace employee assistance program on any of the substance use outcomes. Given the bivariate associations between some of these factors and the effect sizes of these factors in our other models, it is possible that none of the effects may be strong enough or sufficiently precisely estimated when controlling for the other factors. However, it is also possible that the separate main effects models may be confounded by these other workplace factors, and that by themselves, these interventions may have a more limited effect on employee substance use. Apart from their potential effects on employee substance use more broadly, workplace educational programming on substance use and EAPs may confer stronger benefits for employees who have problematic use of alcohol or drugs, as suggested by our post-hoc analyses.

Limitations

The findings from the current study should be considered within the context of its limitations. NSDUH data are cross-sectional, which limits our ability to draw causal inferences from the results of the current study. Moreover, reverse causality and alternative explanations for our findings cannot be ruled out. That is, it is unknown if the workplace programs, policies, and practices examined here were established or enforced as a *result* of employee substance use, if employees working for organizations with these types of programs, policies, and practices are less likely to *report* using substances (vs. actual substance use), or if organizations with certain substance use programs, policies, and practices may attract, select, and retain employees who do not use substances. All data were self-reported and as such, are subject to social desirability bias. However, confidential computer-assisted interviewing has been shown to produce valid estimates of substance use and other sensitive topics (Gerbert et al., 1999; Kumar et al., 2016; McNeely et al., 2016; Spear et al., 2016; Waruru et al., 2005), and this method of data collection is generally preferred by research participants over face-to-face interviews (Perlis et al., 2004; Waruru et al., 2005). If all participants underreported substance use, it is possible that the organizational factors examined here might have had an even stronger association with these outcomes. Additionally, the current study might also be subject to the healthy worker effect. That is, a selection bias resulting from workers who use substances being more likely to be unemployed (e.g., due to termination) at the time of survey administration, and thus not included in the current study of low-income workers. However, it should be noted that this type of selection bias would result in an underestimation of the prevalence of substance use among low-income workers. Moreover, it is possible that workers who do not use substances may be less likely to recall whether their employer has a substance-related program, policy, or

practice. However, this type of differential underreporting of these organizational factors among people who don't use substances is likely to result in underestimates of the true associations between these workplace factors and the likelihood of substance use.

It is important to note that although we found a number of statistically significant associations in our study that were consistent in direction, they were small in magnitude. It is possible that there are other factors (i.e., residual confounding) that might partially explain the associations observed in the current study. Moreover, it is also possible that some of the statistically significant interactions may be a function of our sample size and ability to detect small effects that may or may not be of theoretical or practical significance. This work could have been strengthened by accounting for whether workers sought out places of employment based on their substance-related programs, policies, and practices, as well as more detailed information about these workplace factors (e.g., duration, content, and delivery method of substance education program). However, our selection of dependent and independent variables was restricted to those collected in the NSDUH, which is an inherent limitation to all secondary data analyses and the use of a large, nationally representative sample strengthens the current study design. Additionally, the sample examined in the current study was consistent with national estimates of the demographic characteristics of low-wage workers (Ross & Bateman, 2019).

Future research studies regarding the effects of organizational-level factors on worker drug use should consider a longitudinal design to better understand the effects of these factors over time, including whether these factors reduce substance-related occupational injuries. Likewise, future studies should also collect data on a broader range of workplace programs, policies, and practices that might affect worker substance use beyond those examined here, including FMLA. More granular information regarding the duration, content, and delivery method of workplace education programming and EAP would be important to examine in future research, given the observed associations between these factors and substance use. Moreover, future research should consider if there are any additive or multiplicative effects of multiple workplace programs, policies, and practices on workers' likelihood of substance use. Finally, given the interactions observed in the current study by race/ethnicity and education level, subsequent research should examine how workplace programs, policies, and practices are perceived and accessed by minoritized workers and workers without a college education.

Conclusions

Consistent with the notion that work is a critical determinant of health, and that workplace policies, programs, and practices are driving factors in the conditions of work, workers' behaviors, and workers' well-being (Sorensen et al., 2021), our results suggest that non-punitive approaches may be effective in preventing substance use, but these approaches are not widely used in the workplaces employing low-income workers and may be undermined by punitive approaches to addressing substance use in these same workplaces (e.g., pre-employment substance screening,

termination practices). Moreover, while minoritized workers and workers with less than a high school education may be at the greatest risk for substance use, our results suggest that these approaches do not have a universal effect for all workers. We recommend that all workplaces consider the use of an EAP or other type of counseling program for employees who have alcohol or drug-related problems, provide substance use education, and develop tailored intervention approaches to reach workers of all races/ethnicities and levels of educational attainment.

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Code Availability Not applicable.

Data Availability All NSDUH data are made publicly available via SAMHSA.

Declarations

Ethics Approval As a secondary data analysis of publicly available de-identified data, the current study is exempt.

Conflicts of Interest The authors declare no conflicts of interest or competing interests.

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