

Cross-sectional analysis of cannabis use at work in the USA: differences by occupational risk level and state-level cannabis laws

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ABSTRACT

Objective To examine the prevalence of workplace cannabis use, including by state-level cannabis laws, occupational risk and medical cannabis use.

Methods Data are cross-sectional from wave 6 (2023) of the International Cannabis Policy Study (ICPS) and include 26 458 respondents aged 16–65 years from the USA. Separate regression models were run analysing workplace cannabis use across: (1) state-level cannabis laws and occupational risk, (2) reasons for cannabis use and (3) medical cannabis authorisation. All models were adjusted for sociodemographic characteristics.

Results Overall, 7.4% of workers and 21.5% of past 12-month cannabis consumers reported using cannabis at or within 2 hours of starting work in the last 30 days. Workplace cannabis consumption was highest among workers in states with ‘recreational’ cannabis laws (8.5%) compared with states with medical (6.3%; adjusted OR (AOR)=1.45, $p=0.006$) or illegal laws (6.2%; AOR=1.06, $p=0.005$). Workers in high-risk jobs were more likely to use cannabis at work (11.4%) than those in lower risk jobs (5.8%; AOR=1.58, $p<0.001$). Workplace cannabis use was also greater among cannabis consumers who use cannabis for medical versus recreational (29.4% vs 15.6%; AOR=2.35, $p<0.001$) or mixed reasons (24.2%; AOR=1.78, $p=0.007$); the same was true for consumers who reported having medical cannabis authorisation (39.0%) versus those without authorisation (17.4%; AOR=2.66, $p<0.001$).

Conclusions Reported cannabis use at work was most prevalent in states with recreational legalisation, particularly among individuals with medical cannabis authorisation and those who work higher risk jobs. Longitudinal research should examine the individual and occupational-level factors associated with workplace cannabis use.

BACKGROUND

Cannabis policies are rapidly evolving in North America. Although cannabis remains a prohibited Schedule I substance at the federal level in the USA, as of 2024, over two-thirds of states have legalised ‘recreational’ and/or ‘medical’ cannabis.¹

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Few studies have examined the prevalence of using cannabis in the workplace, with some studies suggesting greater use among individuals who use cannabis for medical reasons and those who work in higher risk jobs.

WHAT THIS STUDY ADDS

⇒ Almost 1 in 10 of all workers reported using cannabis immediately before or at work, with higher levels of workplace use among workers in high-risk jobs, and among consumers who report using cannabis for medical reasons. Moderately higher levels of workplace cannabis use were associated with adult use ‘recreational’ cannabis laws.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings suggest that cannabis use in the workplace is prevalent, particularly in occupational settings with greater safety concerns. The findings highlight the need for greater research and understanding of substance use in the workplace.

Cannabis legalisation has the potential to directly and indirectly impact several public health outcomes through changes in cannabis access, product diversification, social norms, attitudes and beliefs.^{2–3} Acute injuries associated with impairment from cannabis use make an important contribution to the health burden from cannabis use.^{4–6} Δ -9-tetrahydrocannabinol (THC) intoxication can impair psychomotor abilities that can affect driving and performing hazardous work tasks,^{7–9} such as critical tracking, divided attention,⁷ executive function and motor control.^{8–9} Most literature on cannabis-related injuries has focused on traffic injuries; however, cannabis impairment also has potentially important implications for workplace injuries.^{2–8–9} The findings from these studies are mixed: some demonstrate an association



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between workplace consumption and increased risk of workplace injuries,^{10–14} while others do not.^{12 15 16} A longitudinal survey conducted from 2018 to 2020 with Canadian workers found that 20% of respondents who used cannabis at or 2 hours before work reported a workplace injury, a twofold higher risk of experiencing a workplace injury compared with workers with no past-year cannabis consumption.¹⁰ This is consistent with a cross-sectional survey conducted in New Zealand, in which past-year cannabis use was associated with increased likelihood of reporting a workplace injury among employees.¹⁷ In contrast, recent studies employing survey-based methods in Canada and post-workplace accident drug tests in the USA show no association between past-year cannabis use and workplace-related injuries.^{15 16} It is possible that this inconsistency is because most studies were unable to determine whether cannabis consumption preceded workplace injury.¹²

Workplace-related factors may influence the prevalence of cannabis use at work and associated risk of injury.¹⁸ Carnide and colleagues found that being a member of a union, having a supervisory role and ‘scarcely’ performing job duties in front of others were associated with greater odds of consuming cannabis at or 2 hours before work among Canadian workers.¹⁸ Interestingly, performing hazardous tasks was associated with increased odds of workplace cannabis consumption, with no significant differences between industries.¹⁸ To our knowledge, no other studies have assessed the association between workplace-related factors, including occupational hazard of job duties and workplace cannabis consumption.

The majority of the literature examining the prevalence of cannabis use at work is derived from Canada.^{10 18–20} According to Canada’s national monitoring survey, approximately one-fifth of consumers report using cannabis at or within 2 hours before work.^{19 20} Several sociodemographic factors are associated with increased likelihood of cannabis use in the workplace, including lower income, younger age, lower educational status and male sex-at-birth.¹⁸ People who use cannabis for medical as opposed to ‘recreational’ reasons are also more likely to report consuming cannabis in the workplace.¹⁸ To date, we are unaware of any studies that have examined the association between ‘formal’ authorisation for medical cannabis and workplace consumption. Formal medical authorisation is an important consideration, as some states, such as Massachusetts, have ruled that employers cannot terminate workers with medical cannabis authorisation for cannabis use alone.²¹ It is possible that there are differences in workplace use between those who are medically authorised and those who are not that have yet to be examined.

Few studies have examined whether cannabis legalisation is associated with greater use of cannabis in the workplace.²² Cannabis legalisation has the potential to impact cannabis use through increased positive social norms, decreased perceived risk and overall increases in prevalence of use.^{18 22–26} Conversely, legalisation could prompt

the development of workplace policies aimed at discouraging and detecting cannabis use at work.¹⁸ Canada’s national monitoring survey found similar rates of self-reported use at or shortly before work among cannabis consumers in the year prior to recreational legalisation (18%), compared with 1 and 3 years post-legalisation (22% and 17%, respectively).^{20 27 28} Another repeat cross-sectional study found no differences in the prevalence of workplace cannabis consumption before and after legalisation of recreational cannabis, despite an increase in past-year cannabis consumption and perceived risk towards use at work.²⁹ Finally, an American study using longitudinal census data found that medical cannabis legalisation was associated with a reduction in workplace fatalities between 1992 and 2015.¹¹ Overall, there is a need for additional research to understand patterns of cannabis use in the workplace and the potential impact of legalisation.

The primary objective of the current study was to examine the prevalence of cannabis consumption at work, including differences by state-level cannabis laws in the USA, occupational risk and by use of cannabis for medical reasons. It is hypothesised that: (1) workplace cannabis consumption will be greater in states with legal ‘recreational’ and ‘medical’ cannabis than states with illegal cannabis laws; (2) cannabis use at work will be greater among workers in higher risk jobs than those in lower risk jobs; (3) cannabis use at work will be more prevalent among those who have medical cannabis authorisation; and (4) those who are younger, of lower education and report male sex at birth will be more likely to use cannabis at work or 2 hours before starting work.

METHODS

Data are from the International Cannabis Policy Study (ICPS), which includes annual national population-based surveys conducted in Canada, the USA, Australia, New Zealand, the UK and Germany. The current study examined data from the ICPS survey conducted in 2023 (Wave 6) in the USA. ICPS respondents are aged 16–65 and recruited through Nielsen Global Panels. The Nielsen panels are recruited using a variety of probability and non-probability sampling methods. For the ICPS surveys, Nielsen draws stratified random samples from the online panels, with quotas based on age and state/province of residence. Nielsen emails panellists an invitation to access the ICPS survey via a hyperlink; respondents are unaware of the survey topic prior to accessing the link. Respondents confirm their eligibility and provide consent before completing the survey. To mitigate the risk of social desirability bias, participants were asked if they answered the survey honestly. Those who reported ‘no’ were removed from the sample. On completion of the survey, all respondents receive remuneration in accordance with their panel’s usual incentive structure. Monetary incentives have been shown to increase response rates and

decrease response bias in subgroups under-represented in surveys.

Measures

Sociodemographic variables

Respondents reported demographic information, including state of residence, sex-at-birth, age group, race, highest education level and income adequacy (see table 1). All demographic variables were asked using pre-existing measures drawn from census or health surveys. Income adequacy, defined as one's perceived ability to make ends meet, was assessed by asking 'thinking about your family's income, how difficult or easy is it to make ends meet?'.³⁰

State-level cannabis laws

Participants were categorised based on their state-of-residence into one of three categories representing state-level status of cannabis legalisation: (1) 'illegal', including states in which both medical and 'recreational' cannabis products are prohibited, other than hemp-derived products; (2) 'medical legal', including states where cannabis is permitted for authorised medical purposes; and (3) 'recreational legal' states, in which adult use of cannabis is permitted for both medical and non-medical purposes.¹ Legalisation status of each state is based on the date of enactment at the time of the survey. Online supplemental table S1 shows the coding for each state.

Cannabis use

Cannabis use was defined as having ever tried cannabis, including all different forms and preparation of the plant. To assess cannabis use, all participants were asked 'have you ever tried marijuana?' (Yes/No/Do not know/Refuse). Participants who reported consuming cannabis were then asked about their frequency of use and were analysed in the following mutually exclusive categories: use in the past 12 months (but less than once per month), past 30 days, past 7 days (weekly) or daily (≥ 5 days per week).

Cannabis use in the workplace

Workplace cannabis use was defined as using cannabis shortly before (within 2 hours) or at work. To assess workplace use, participants were asked, 'In the past 30 days, have you used marijuana at work (including breaks) or within 2 hours of starting work?' (Yes/No/Not applicable/I have not worked/gone to work in the past 30 days/Do not know/Refuse to answer). Participants who reported 'don't know', 'not applicable' or 'refuse to answer' were excluded from analysis.

Occupational status and risk

Participants were asked if they worked a job in the past 12 months (Yes/No/Do not know/Refuse to answer). Participants who reported 'no', 'don't know' or 'refuse to answer' were excluded from all analyses. Occupational risk was assessed by asking 'In your job, do you perform hazardous or safety-sensitive tasks at least once a week?'

Table 1 Sample characteristics among all participants who report working in the past 12 months

	Unweighted % (n) N=26 458	Weighted % (n) N=26 458
Sex at birth		
Male	33.0 (8741)	51.3 (13 578)
Female	67.0 (17 717)	48.7 (12 880)
Age, years		
16–20	7.3 (1937)	7.7 (2043)
21–35	30.1 (7966)	36.1 (9550)
36–50	35.3 (9334)	31.4 (8298)
51–65	27.3 (7221)	24.8 (6567)
Education		
Less than high school	6.4 (1700)	5.5 (1451)
High school diploma or equivalent	17.1 (4519)	21.0 (5554)
Some college or university	34.6 (9157)	33.6 (8880)
Bachelor's degree or higher	41.5 (10 986)	39.5 (10 444)
Not reported	0.3 (96)	0.5 (128)
Race		
White-non-Hispanic	66.8 (17 664)	63.4 (16 762)
White-Hispanic	9.2 (2444)	11.8 (3123)
American Indian or Alaskan Native	1.7 (441)	0.9 (225)
Asian	5.0 (1327)	4.9 (1303)
Black or African American	9.9 (2625)	14.2 (3745)
Native Hawaiian or Pacific Islander	0.9 (239)	0.3 (80)
Other	5.0 (1328)	3.2 (849)
Unstated	1.5 (390)	1.4 (370)
Income adequacy		
Very difficult	12.7 (3358)	12.1 (3200)
Difficult	25.8 (6837)	24.6 (6506)
Neither easy nor difficult	31.6 (8363)	32.6 (8634)
Easy	18.3 (4850)	17.9 (4728)
Very easy	9.7 (2571)	10.9 (2877)
Not stated	1.8 (479)	1.9 (513)
Occupational risk		
High risk*	32.9 (8870)	29.6 (7843)
Low risk†	65.3 (13 613)	69.0 (18 263)
Do not know	1.7 (363)	1.3 (352)
State cannabis laws		
Legal recreational	77.3 (20 459)	52.5 (13 884)
Legal medical only	12.5 (3312)	21.7 (5734)
Illegal market	10.2 (2687)	25.9 (6840)
Frequency of cannabis consumption‡		
Not in past 12 months	63.0 (16 668)	65.4 (17 315)

Continued

Table 1 Continued

	Unweighted % (n) N=26 458	Weighted % (n) N=26 458
Less than once per month	10.1 (2678)	8.7 (2309)
One or more times per month	7.1 (1864)	6.6 (1747)
One or more times per week	5.8 (1531)	5.5 (1446)
Everyday or almost everyday	14.1 (3717)	13.8 (3641)
Reason for cannabis use†		
Medical use only	4.4 (1170)	4.7 (1237)
Recreational use only	14.2 (3775)	12.3 (3246)
Both recreational and medical use	17.5 (4618)	16.7 (4428)
Do not know	0.9 (227)	0.9 (233)
Not asked	63.0 (16 668)	65.4 (17 315)
Medical cannabis authorisation§		
Yes	5.8 (1521)	6.4 (1695)
No	93.0 (24 607)	93.6 (24 763)

*Does not perform hazardous work tasks weekly.
†Performs hazardous work tasks at least weekly.
‡Among those who report consuming cannabis in the last 12 months.
§Medical cannabis authorisation in the past 12 months among those who live in states with legal medical cannabis.

(Yes/No/Do not know), based on a previously validated measure.¹⁸ To reduce subjectivity, participants were provided with a comprehensive list of tasks considered hazardous or safety sensitive. Participants who reported 'yes' were classified as having a high-risk job and those who reported 'no' were classified as having a low-risk job.

Medical reasons for cannabis use and medical authorisation

Cannabis use for medical purposes was assessed by asking participants, 'Do you use marijuana for medical reasons, 'recreational' reasons, or both?' (Medical use only/Recreational use only/Both recreational and medical use/Do not know/Refuse to answer). Medical cannabis authorisation was assessed by asking participants who resided in 'medical' and 'recreational' states whether they had a recommendation from a licensed healthcare professional to use medical marijuana in the past 12 months (Yes/No/Do not know/Refuse to answer). Those who reported 'don't know' were combined with those who reported 'no' for the purpose of analyses, as individuals who received medical cannabis authorisation in the past 12 months would likely not report 'don't know', and those who refused to answer were excluded.

Statistical analysis

Overall, 39 653 participants completed the 2023 US ICPS survey. The final analytic sample included 26 458 respondents after excluding respondents who did not

report working in the past 12 months (n=11 980 respondents), did not report whether they used cannabis at work (n=842), did not respond to the occupational risk question (n=745), reasons for cannabis use (n=131) or medical cannabis authorisation (n=181).

Post-stratification weights were constructed based on age, sex, education, race and region, using a raking algorithm, as reported elsewhere.³¹ All estimates were weighted unless otherwise specified.

Descriptive statistics were used to characterise the sample and overall prevalence of workplace cannabis consumption. Three logistic regression models were fitted. In Model 1, a logistic regression was conducted on all working participants (n=26 458) to examine the prevalence of cannabis use in the workplace in the past 30 days (where 0=no use and 1=use in the past 30 days). The model included the following variables: state-level cannabis law, occupational risk, sex at birth, age group, race, highest education level and income adequacy. In Model 2, the same logistic regression model was run, but was restricted to the subsample of respondents who worked in the past 12 months and reported cannabis use in the past 30 days (n=9790). Model 2 included the same outcome and variables as Model 1, with the addition of two variables specific to cannabis consumers: frequency of cannabis consumption and medical reasons for cannabis use. In Model 3, a logistic regression model was run among a subsample of workers who reported consuming cannabis in the last 12 months and resided in states with medical or recreational cannabis laws (n=9042). The variables were the same as the second model, except medical cannabis authorisation in the past 12 months replaced medical reasons for cannabis use.

Unadjusted and adjusted ORs, exact p levels to three decimal places and 95% CIs were reported. Analyses were conducted using survey procedures in SAS (SAS V.9.4, SAS Institute, Cary, North Carolina, USA).

RESULTS

Sample characteristics

Table 1 shows the unweighted and weighted sample characteristics for participants who reported working in the last 12 months and were included in the current analysis. Among all workers, 29.6% reported working at a high-risk job, 69.0% reported working a low-risk job and 1.3% reported 'don't know'.

Cannabis laws and frequency of cannabis use

Table 2 shows the unadjusted and adjusted ORs (AORs) for each model. As shown in figure 1, 7.4% of past 12-month workers reported consuming cannabis at work in the last 30 days. The odds of using cannabis at work were greater among workers living in states with 'recreational' cannabis laws compared to workers in states with 'medical' cannabis laws (8.5% vs 6.3% AOR=1.45, 95% CI=1.11 to 1.88), and workers in states with 'illegal' laws

Table 2 Unadjusted and adjusted ORs for cannabis use at/or within 2 hours of work among all workers (Model 1), all working cannabis consumers (Model 2) and working cannabis consumers from legal recreational or medical states (Model 3)

	% Workplace use	Unadjusted OR (95% CI) p level	Adjusted OR (95% CI) p level
Model 1: all workers (n=26 458)			
State-level laws			
Illegal	6.2	Ref	Ref
Medical	6.3	1.03 (0.73 to 1.46) p=0.88	1.06 (0.73 to 1.52) p=0.767
Recreational	8.5	1.41 (1.06 to 1.87) p=0.02	1.53 (1.14 to 2.05) p=0.005
Occupational risk			
Low risk*	5.8	Ref	Ref
High risk†	11.4	2.10 (1.73 to 2.56) p<0.001	1.58 (1.27 to 1.95) p<0.001
Do not know	4.8	0.82 (0.40 to 1.64) p=0.57	0.73 (0.35 to 1.53) p=0.403
Model 2: all working cannabis consumers (n=9790)			
Frequency cannabis			
Less than once per month	5.4	Ref	Ref
One or more times per month	14.7	2.99 (1.79 to 5.01) p<0.001	2.77 (1.66 to 4.61) p<0.001
One or more times per week	17.7	3.75 (2.30 to 6.11) p<0.001	3.44 (2.11 to 5.61) p<0.001
Every day or almost every day	36.5	10.00 (6.42 to 15.56) p<0.001	9.05 (5.82 to 14.07) p<0.001
Reason for use			
Recreational use only	15.6	Ref	Ref
Medical use only	29.4	2.26 (1.63 to 3.12) p<0.001	2.35 (1.64 to 3.37) p<0.001
Both recreational and medical use	23.8	1.68 (1.33 to 2.13) p<0.001	1.32 (1.02 to 1.70) p=0.033
Do not know	17.8	1.17 (0.44 to 3.14) p=0.751	1.31 (0.44 to 3.89) p=0.63
State level cannabis laws			
Illegal	20.2	Ref	Ref
Medical	20.3	1.00 (0.69 to 1.46) p=0.986	1.02 (0.67 to 1.55) p=0.937
Recreational	22.4	1.14 (0.84 to 1.54) p=0.406	1.23 (0.88 to 1.73) p=0.229
Occupational risk			
Low*	18.2	Ref	Ref
High†	27.6	1.71 (1.39 to 2.12) p<0.001	1.34 (1.06 to 1.70) p=0.016
Do not know	16.6	0.90 (0.41 to 1.95) p=0.782	0.86 (0.33 to 2.30) p=0.771
Model 3: working cannabis consumers from legal medical or recreational states (n=9042)			
Medical cannabis authorisation			
No	17.4	Ref	Ref
Yes	39.0	3.04 (2.39 to 3.87) p<0.001	2.66 (2.01 to 3.52) p<0.001
Frequency cannabis			
Less than once per month	5.3	Ref	Ref
One or more times per month	13.8	2.84 (1.61 to 5.01) p<0.001	2.33 (1.35 to 4.03) p<0.002
One or more times per week	17.6	3.81 (2.25 to 6.46) p<0.001	3.30 (1.97 to 5.54) p<0.001
Every day or almost every day	37.4	10.62 (6.60 to 17.08) p<0.001	9.60 (6.04 to 15.27) p<0.001
Occupational risk			
Low	18.2	Ref	Ref
High	28.8	1.81 (1.46 to 2.26) p<0.001	1.44 (1.12 to 1.86) p=0.004
Do not know	23.1	1.35 (0.60 to 3.03) p=0.465	1.32 (0.52 to 3.34) p=0.554

Note: All adjusted models include the following sociodemographic variables: sex-at-birth, income adequacy, educational attainment, age and race.

*Does not perform hazardous work tasks weekly.

†Performs hazardous work tasks at least weekly.

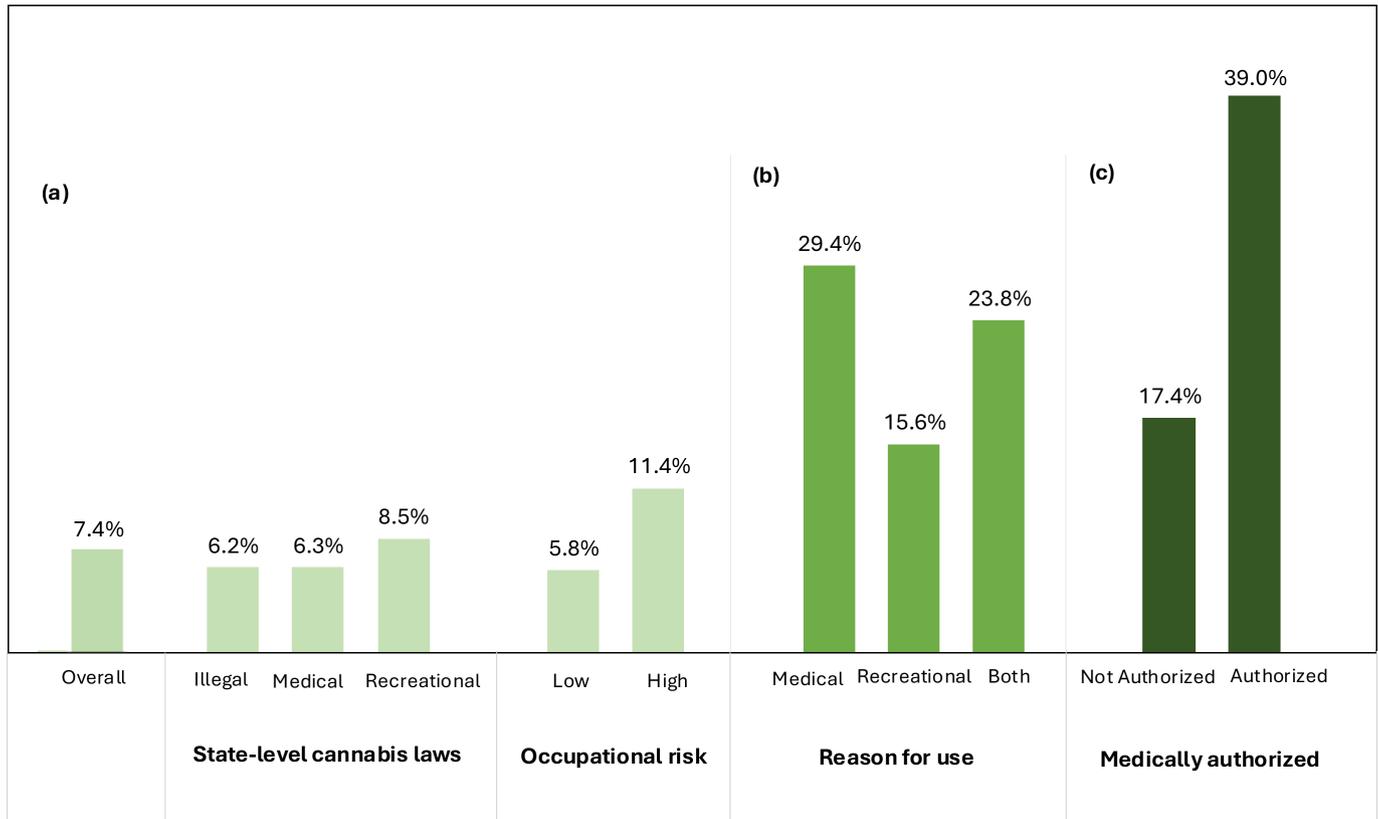


Figure 1 Prevalence of cannabis consumption at work in the past 30 days (a) overall, within state cannabis laws and level of occupational risk among all workers (n=26 458); (b) by reason for cannabis use among all cannabis consumers (n=9790); and by (c) medical authorisation among cannabis consumers who live in states with legal medical or recreational cannabis (n=9042).

(8.5% vs 6.2%, AOR=1.53, 95% CI=1.14 to 2.05). [Table 3](#) shows a full summary of this model and its covariates.

[Table 4](#) summarises the adjusted model restricted to only past 12-month cannabis consumers. In total, 21.5% of past 12-month cannabis consumers reported using cannabis at work. No significant differences were observed between states with different cannabis laws in the model that adjusted for cannabis consumers. The odds of using cannabis at work differed by frequency of cannabis consumption. Daily cannabis consumers were more likely to use cannabis at work compared with less than monthly cannabis consumers (36.5% vs 5.4%, AOR=9.05, 95% CI=5.82 to 14.07), cannabis monthly consumers (36.5% vs 14.7%, AOR=3.27, 95% CI=2.35 to 4.55) and weekly cannabis consumers (36.5% vs 17.7%, AOR=2.63, 95% CI=1.94 to 3.57).

Occupational risk

The odds of consuming cannabis at work differed by self-reported occupational risk among workers. As [table 2](#) shows, the odds of using cannabis at work were higher among those who reported working in high-risk versus low-risk jobs (11.4% vs 5.8%, AOR=1.58, 95% CI=1.27 to 1.95). This effect remained significant in models that only included past 12-month cannabis consumers after adjusting for the frequency of cannabis use (27.6% vs

18.2%, AOR=1.34, 95% CI=1.06 to 1.70), as shown in [table 4](#).

Medical cannabis use

Workers' reason for cannabis use was associated with consumption at work. As [table 2](#) indicates, the odds of workplace cannabis consumption were greater among those who reported consuming cannabis exclusively for medical versus recreational reasons (29.4% vs. 15.6%, AOR=2.35, 95% CI=1.64 to 3.37), and versus those who reported using cannabis for mixed purposes (29.4% vs. 23.8%, AOR=1.78, 95% CI=1.27 to 2.49). Consuming cannabis for mixed purposes was also associated with greater odds of workplace consumption compared to using cannabis exclusively for recreational reasons (23.8% vs 15.6%, AOR=1.68, 95% CI=1.33 to 2.13).

A similar pattern was observed when 'formal' authorisation for medical cannabis use was examined in a model restricted to cannabis consumers residing in states with legal medical or recreational cannabis (see online supplemental table S2). Cannabis consumers who were authorised to use medical cannabis in the last 12 months by a licensed health professional had greater odds of reporting cannabis use at work compared to cannabis consumers without authorisation (39.0% vs 17.4%, AOR=2.66, 95% CI=2.01 to 3.52).

Table 3 Regression summary for cannabis use in the workplace among all participants who worked in the past 12 months (n=26 458)

	% Workplace use	Adjusted OR (95% CI)	P level
State level cannabis law (n)			
Illegal market (6840)	6.2	Ref	Ref
Legal medical only (5734)	6.3	1.06 (0.73 to 1.52)	0.767
Legal recreational (13 884)	8.5	1.53 (1.14 to 2.05)	0.005
Occupational risk			
Low risk*	5.8	Ref	Ref
High risk†	11.4	1.58 (1.27 to 1.95)	<0.001
Do not know	4.8	0.73 (0.35 to 1.53)	0.403
Sex at birth			
Female	5.0	Ref	Ref
Male	9.7	1.78 (1.48 to 2.13)	<0.001
Age, years			
16–20	7.4	Ref	Ref
21–35	9.8	1.27 (0.78 to 2.07)	0.335
36–50	8.5	1.18 (0.73 to 1.92)	0.501
51–65	2.6	0.38 (0.22 to 0.64)	<0.001
Education			
Less than high school	7.5	Ref	Ref
High school diploma or equivalent	11.2	1.40 (0.86 to 2.28)	0.171
Some college or university	6.8	0.95 (0.58 to 1.57)	0.845
Bachelor's degree or higher	5.8	0.76 (0.46 to 1.26)	0.286
Not reported	14.5	1.90 (0.19 to 18.75)	0.581
Race			
White-non-Hispanic	6.2	Ref	Ref
White-Hispanic	8.7	1.13 (0.84 to 1.51)	0.418
American Indian or Alaskan Native	11.6	1.38 (0.77 to 2.47)	0.282
Asian	4.0	0.56 (0.26 to 1.23)	0.147
Black or African American	12.6	1.61 (1.22 to 2.12)	<0.001
Native Hawaiian or Pacific Islander	10.1	1.21 (0.44 to 3.37)	0.711
Other	7.7	1.14 (0.75 to 1.75)	0.541
Not reported	9.8	1.32 (0.41 to 4.32)	0.642
Income adequacy			
Very difficult	9.1	Ref	Ref
Difficult	6.1	0.75 (0.55 to 1.02)	0.068
Neither easy nor difficult	7.3	0.82 (0.61 to 1.10)	0.183
Easy	5.8	0.71 (0.51 to 0.99)	0.044
Very easy	11.3	1.30 (0.89 to 1.89)	0.177
Not reported	8.3	0.79 (0.31 to 2.03)	0.621

*Does not perform hazardous work tasks weekly.

†Performs hazardous work tasks at least weekly.

Sociodemographic factors

Table 3 shows differences in using cannabis at work by sociodemographic factors, adjusted for state-level cannabis laws and occupational risk. Workers aged

51–65 years were less likely to consume cannabis at work than respondents aged 16–20 years old. Male workers had higher odds of consuming cannabis at work than female workers (9.7% vs 5.0%, AOR=1.78, 95% CI=1.48

Table 4 Regression summary for workers who report cannabis use in the past 12 months (n=9790)

	% Workplace use	Adjusted OR (95% CI)	P level
State cannabis law (n)			
Illegal market (2235)	20.2	Ref	Ref
Legal medical (1917)	20.3	1.02 (0.67 to 1.55)	0.937
Legal recreational (5638)	22.4	1.23 (0.88 to 1.73)	0.229
Occupational risk			
Low risk*	18.2	Ref	Ref
High risk†	27.6	1.34 (1.06 to 1.70)	0.016
Do not know	16.6	0.86 (0.33 to 2.30)	0.771
Frequency of cannabis consumption‡			
Less than once per month	5.4	Ref	Ref
One or more times per month	14.7	2.77 (1.66 to 4.61)	<0.001
One or more times per week	17.7	3.44 (2.11 to 5.61)	<0.001
Everyday or almost everyday	36.5	9.05 (5.82 to 14.07)	<0.001
Reason for cannabis use‡			
Recreational use only	15.6	Ref	Ref
Medical use only	29.4	2.35 (1.64 to 3.37)	<0.001
Both recreational and medical use	23.8	1.32 (1.02 to 1.70)	0.033
Do not know	17.8	1.31 (0.44 to 3.89)	0.63
Sex at birth			
Female	5.7%	Ref	Ref
Male	26.2%	1.47 (1.18, 1.82)	<0.001
Age, years			
16–20	22.3	Ref	Ref
21–35	24.6	0.71 (0.41 to 1.23)	0.22
36–50	22.9	0.70 (0.40 to 1.23)	0.215
51–65	10.9	0.35 (0.19 to 0.63)	<0.001
Education			
Less than high school	20.8	Ref	Ref
High school diploma or equivalent	28.1	1.69 (1.00 to 2.83)	0.048
Some college or university	18.0	1.12 (0.65 to 1.92)	0.681
Bachelor’s degree or higher	20.2	1.64 (0.96 to 2.83)	0.073
Not reported	61.4	7.27 (1.21 to 43.83)	0.03
Race			
White-non-Hispanic	18.3	Ref	Ref
White-Hispanic	25.0	1.33 (0.94 to 1.88)	0.111
American Indian or Alaskan Native	22.7	0.87 (0.37 to 2.06)	0.751
Asian	21.7	1.07 (0.58 to 1.97)	0.824
Black or African American	29.4	1.38 (1.00 to 1.92)	0.050
Native Hawaiian or Pacific Islander	42.9	2.63 (0.85 to 8.11)	0.092
Other	19.2	1.11 (0.71 to 1.72)	0.654
Unstated	37.6	2.04 (0.90 to 4.62)	0.087
Income adequacy			
Very difficult	24.2	Ref	Ref
Difficult	18.5	0.72 (0.50 to 1.03)	0.074
Neither easy nor difficult	20.5	0.74 (0.52 to 1.05)	0.090

Continued

Table 4 Continued

	% Workplace use	Adjusted OR (95% CI)	P level
Easy	16.8	0.61 (0.41 to 0.91)	0.015
Very easy	34.3	1.27 (0.79 to 2.03)	0.327
Not reported	36.2	1.10 (0.50 to 2.43)	0.809

*Does not perform hazardous work tasks weekly.

†Performs hazardous work tasks at least weekly.

‡Among participants who report using cannabis in the past 12 months.

to 2.13), which remained significant in the model that was adjusted for frequency of cannabis use, as shown in table 4 (AOR=1.47, 95% CI=1.18 to 1.82). Workers who reported that it was ‘easy’ to make ends meet were less likely to report consuming cannabis at work than those who reported that it was ‘very difficult’ to make ends meet (9.1% vs 5.8%, AOR=0.71, 95% CI=0.51 to 0.99). This is consistent with the consumer-only model adjusted for frequency of use (16.8% vs 24.2%, AOR=0.61, 95% CI=0.41 to 0.91). Workers who reported their race as Black or African American were more likely to report consuming cannabis at work than white Non-Hispanic workers (12.6% vs 6.2%, AOR=1.61, 95% CI=1.22 to 2.12). This association was no longer significant in the consumer-only model.

DISCUSSION

Self-reported cannabis use was prevalent among workers aged 16–65 in this national survey. Approximately 8% of all workers—and 21% of past 12-month cannabis consumers—reported using cannabis shortly before or at work. The prevalence in this US sample is similar to previous estimates from national surveys in Canada, which estimate that between 17% and 22% of cannabis consumers report consuming cannabis at work.^{10 20 27 28} This could be associated with employee absenteeism and loss of productivity, as research shows past-month cannabis use is associated with increased workplace absences.^{32–34} Additionally, workers could be replacing alcohol use with cannabis consumption or combining the two, as American cross-sectional research found that 7.06% of working Americans report consuming alcohol during the workday.³⁵ This has implications for occupational health and safety, as the combined effects of alcohol and cannabis tend to be greater than their individual effects.⁹

Further, the use of cannabis at work was even higher among more frequent cannabis consumers: approximately 4 in 10 daily cannabis consumers reported cannabis use at work. In the current study, 14.1% of workers reported using cannabis generally near daily in the past 12 months. This is greater than previous cross-sectional research that found 3% of working Americans reported near daily use in the past 30 days.³⁶ This is also greater than research among American adults broadly that found fewer than 1 in 10 Americans reported past 30-day near daily use.³⁷ These discrepancies could be due

to differences in the timeframe of recall between these two studies (past 30 days vs past 12 months). However, the higher prevalence of daily use among workers compared with the general population suggests that workers might demonstrate more frequent use than non-workers and warrants more research.

Higher rates of workplace cannabis use were observed in states that have legalised recreational cannabis, compared with states with illegal or medical laws. The magnitude of this difference was modest—approximately 2 percentage points—with no differences between states with ‘medical’ or ‘illegal’ cannabis laws. State-level cannabis laws were not significantly associated with cannabis use at work in models that only included past 12-month cannabis consumers. This suggests that the higher rates of cannabis use at work in legal ‘recreational’ states are likely attributable to higher prevalence of cannabis use overall, rather than higher individual-level risk among cannabis consumers in ‘recreational’ states. This has been well-documented in a range of national monitoring surveys and reviews, which reflect both higher prevalence of use prior to legalisation in states that subsequently implemented ‘recreational’ cannabis laws and increased consumption among adults following legalisation.³⁸ These findings are generally consistent with previous research that demonstrates no significant differences in the prevalence of cannabis use at work before and 1 year after legalisation among Canadian workers.²⁹ Longitudinal studies are needed to estimate the impact of legalisation on cannabis use at work, ideally with ‘pre’ and ‘post-legalization’ time points and in states that have and have not changed cannabis laws.

Cannabis consumers who performed hazardous or safety-sensitive tasks at work were substantially more likely to report using cannabis at work (28%) compared with cannabis consumers working in lower-risk jobs (17%), which is consistent with previous studies conducted among Canadian workers.¹⁸ This finding has potential implications, as some studies demonstrate an association between workplace cannabis consumption and workplace injury.^{10–14} This association may be due to differences in the risk profile of individuals working in different settings, or to characteristics of the jobs themselves. For example, previous literature suggests that workplace consumption differs across industries, which may reflect different substance use policies or different social norms.¹⁸

Differences might also be due to satisfaction at work, as American cross-sectional evidence suggests that lower job satisfaction is associated with substance misuse.³⁹ It is also possible that workplace cannabis consumption is a result of work-related injuries.⁴⁰ An observational study among Canadian workers found that one-third of past-year cannabis users consumed cannabis to cope with a work-related injury.⁴⁰ As such, workplaces should ensure employees have access to the necessary supports to cope with their work-related injuries. This could include information generally about cannabis, medical cannabis use and the potential risk of using cannabis at work.

Medical cannabis consumption was associated with greater workplace cannabis use. Cannabis use at work was reported by more than a quarter of respondents who reported consuming cannabis for medical reasons (28%) and by 40% of cannabis consumers who reported receiving a professional's authorisation for medical cannabis use. This is consistent with cross-sectional research that found Canadian workers who reported workplace consumption were more likely to use cannabis for medical purposes; however, the present study is the first to analyse the association between formal cannabis authorisation and use at work.¹⁸ This finding may have implications for workplace substance use policies, as most US states do not require employers to provide accommodations for medical cannabis patients.⁴¹ Individuals who have medical authorisation may believe they are exempt from regular workplace drug testing protocols, which could explain why they are more likely to report cannabis use at work.⁴² Workplaces should consider implementing formal processes for individuals who use cannabis for medical purposes to acquire job-related accommodations, perhaps through medical authorisation. These policies could ultimately mitigate the risk of workplace cannabis use-related injuries, as individuals who use cannabis at work for medical reasons could be restricted to jobs that are not safety-sensitive.⁴²

Cannabis use at work also differed across age, sex-at-birth, race, education and income adequacy among all workers; however, several of these differences were not observed in models that only included cannabis consumers. This suggests that most of these differences are attributable to differences in cannabis prevalence across these groups, rather than 'more risky' patterns of use among cannabis consumers.^{20 24 43 44} Notably, males remained more likely to use cannabis at work after accounting for cannabis consumption, which is consistent with pre-existing research that suggests they are more likely to engage in other risky behaviours than females.^{18 45} Additionally, the association between income adequacy and workplace use also remained consistent; participants who reported it 'easy' to make ends meet were less likely to report using cannabis at work than those who reported making ends meet as 'very difficult'. This is consistent with cross-sectional research that shows lower socioeconomic groups are more likely to report cannabis use at work than higher socioeconomic groups.¹⁸ The

reason for this is unclear, but it could be due to differences between industries or experiences specific to those of lower socioeconomic position.⁴⁶

LIMITATIONS

As this study used self-report data, social desirability bias is a potential limitation. As a result, workplace cannabis consumption and frequency of use may be underestimated. However, responses were anonymised and self-administered online, and respondents were asked whether they were able to answer questions honestly. Participants who reported 'no' were excluded from the sample. The cross-sectional nature of this study limits the interpretation of the results, as temporality cannot be determined, and causal inferences cannot be made. Additionally, the use of non-probability-based sampling could lead to sampling bias; however, data were weighted to match the age, sex, region and education profile of the population. The sample excluded individuals over the age of 65; although the median retirement age in the USA is 62, some individuals work beyond 65 and are not represented in the current analysis.

The current study did not differentiate between part-time and full-time work, or work environment (work from home, office, etc). This has potential implications for self-reported prevalence of use at work, as consumption patterns may differ between part-time and full-time workers. Additionally, this study assessed self-reported prevalence of use and not the extent of impairment from cannabis use at work. In assessing the potential implications for workplace safety, it is important to distinguish between cannabis use and impairment or intoxication. Not all individuals who consume cannabis before work may be impaired, particularly among some medical cannabis consumers who either consume lower THC products or frequent cannabis consumers who have built up considerable tolerance.⁴⁷ Therefore, the increased 'risk' from cannabis use at work is likely to differ between individuals and should not be equated with the overall prevalence of use.

CONCLUSIONS

Approximately 1 in 10 of all workers reported using cannabis immediately before or at work. Workplace use was more common among workers in high-risk jobs and among cannabis consumers who report using cannabis for medical reasons. The results suggest that cannabis use in the workplace represents a potentially important indicator of problematic cannabis use that warrants greater attention. There is a clear need for the development of a cannabis workplace policy that protects workers who use cannabis for medical purposes, while preserving occupational health and employee productivity. Future research should examine the prevalence of use in industries with greater safety risks. Studies should also examine both the individual and occupational-level factors associated with workplace cannabis use, including the potential role of

workplace substance use policies, social norms, cannabis accessibility and medical cannabis authorisation.

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Competing interests DH has provided paid expert testimony on behalf of public health authorities in response to legal claims from the tobacco, vaping and cannabis industry. All remaining authors declare no conflicts of interest.

Patient and public involvement Individuals with lived experience with cannabis contributed to the design of the study through focus groups and cognitive interviewing. Study participants are also provided with an opportunity to access study findings through the project website and by directly contacting the principal investigator.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by University of Waterloo Research Ethics Committee (ORE #31330).

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