# Recreational Marijuana Laws and Workplace Absence*

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**Abstract**

A near majority of states have now passed recreational marijuana laws (RMLs), but their impact on labor market behavior remains unclear. This study provides new causal evidence on the relationship between RMLs and workplace absence. Leveraging a generalized difference-in-differences framework to exploit the staggered rollout of RMLs, I first document that state adoption of RMLs with recreational dispensaries generates a 50% increase in the rate of prior-month adult marijuana use in treated states relative to control states. Next, I show that RML adoption with dispensaries leads to a 9% increase in the incidence of prior-week workplace absence. Supplemental analyses of health outcomes support a mechanism consistent with these findings, revealing increases in self-reported physical and mental health problems and declines in general health and exercise following legalization. These findings suggest that marijuana legalization may affect labor market outcomes along margins not typically captured by employment status alone.

**Keywords:** Recreational Marijuana Laws, Employment, Health

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# 1 Introduction

The landscape of marijuana legalization in the United States has transformed considerably since 2012, with 23 states and the District of Columbia enacting recreational marijuana laws (RMLs) by September 2023. These laws permit adults aged 21 and older to possess, purchase, and, in many cases, cultivate marijuana for non-medical use, thereby expanding legal access to an estimated 158 million Americans. Public support for such laws has also grown, reaching 68% in 2020 (Gallup, 2020). Proponents of legalization emphasize potential economic benefits, including job creation, increased tax revenue, and the growth of a new legal industry, which advocates argue could support economic recovery efforts (Brown et al., 2023).

However, prominent health organizations such as the American Medical Association and the American Public Health Association have refrained from endorsing RMLs, citing unresolved concerns about public health consequences (APHA, 2020; Bailey, 2021). Critics contend that increased accessibility to recreational marijuana may contribute to workplace absenteeism (Yang et al., 2024), as excessive use has been associated with cognitive impairment (Hanson et al., 2010) and motivational deficits (Volkow et al., 2016), both of which are linked to lower workforce participation and engagement.

Concerns have also been raised regarding the potential rise in cannabis use disorder and heavy marijuana consumption, which may further affect labor force participation and productivity (Anderson & Rees, 2023; Brown et al., 2023). Some hypothesize that disordered marijuana use could increase the risk of developing amotivational symptoms (Dave et al., 2022; Lawn et al., 2016; Volkow et al., 2016) and lethargy (Dave et al., 2022; Irons et al., 2014; Pesta et al., 2013), which may impact absenteeism. Furthermore, physical and psychological health risks associated with frequent marijuana use (National Academies of Sciences, Engineering, and Medicine et al., 2017) could lead to increased sick leave and reduced workplace productivity. If RMLs amplify these trends[1], the resulting absenteeism and declining labor force engagement could have significant implications for labor market performance and economic stability.

Despite its importance, existing research on the effects of cannabis use on workplace absenteeism is predominantly correlational in nature and remains inconclusive and inconsistent. Studies have reported negative (Ullman, 2017), positive (Austin et al., 2020; Déguilhem et al., 2022; Morgan et al., 2022; Yang et al., 2024), and null effects (Abouk et al., 2021; Lund et al., 2019; van Ours & Williams, 2015). Most of this prior work has relied on correlational designs, or on identification strategies that may limit causal interpretation (Austin et al., 2020; Moughan & Katz, 2024). Although Abouk et al. (2021) provide a causal estimate in an auxiliary analysis, they focus narrowly on absences due to 'own illness,' which account for only 23% of non-layoff absences in the data.

Meanwhile, empirical evidence on the costs of absenteeism emphasizes the productivity losses associated with worker absence, suggesting that each instance of absence imposes considerable

[1]For a comprehensive review of health outcomes associated with marijuana use, see Anderson and Rees (2023).

costs. For example, in the educational sector, teacher absenteeism negatively affects student performance, with substitute teachers typically providing less effective instruction, comparable to a decrease in teacher quality (Herrmann & Rockoff, 2012). In broader labor contexts, any rise in absenteeism linked to marijuana legalization could likewise erode workforce productivity, increase dependency on temporary or less experienced workers, and impair organizational efficiency. Given the economic and operational relevance of absenteeism across sectors, examining the impact of RMLs on workplace attendance is critical to understanding their broader effects on labor market outcomes and productivity.

This paper helps fill this gap by testing the effects of recently passed recreational marijuana laws (RMLs) on workplace absence in a causal framework. Specifically, I estimate the effect of RMLs with recreational dispensaries on the probability of workplace absence using a difference-in-differences event study framework, exploiting the staggered adoption of RMLs across U.S. states over time. The analysis uses state-year data on marijuana use from the 2002-2019 National Survey on Drug Use and Health (NSDUH), individual-state-year data on workplace absence from the 2002-2023 Current Population Survey (CPS), and state-year data on work-related health outcomes from the 2002-2023 Behavioral Risk Factor Surveillance Survey (BRFSS). The outcomes of interest are the prevalence rate of prior-month marijuana use, the linear probability of workplace absence, and prior-month days suffering mental or physical health problems. All analyses rely on a generalized difference-in-differences framework, incorporating recent event study estimators designed to account for dynamic and heterogeneous treatment effects under staggered policy implementation (Goodman-Bacon, 2021; Sun & Abraham, 2021).

Employing this empirical strategy, I first document that state adoption of recreational marijuana laws with operational dispensaries leads to a 3.79 percentage point increase in the prevalence of prior-month adult marijuana consumption over and above medical marijuana laws and marijuana decriminalization. For the population aged 18+, this constitutes a 50% increase in the prevalence of prior-month marijuana use relative to the control group mean. This is similar to other findings in existing research.[2]

Next, I present causal evidence that recreational marijuana laws increase short-term workplace absence. The estimates indicate that the rollout of recreational dispensaries leads to a 0.27 percentage point increase in the probability of prior-week absence - a 9.2% increase relative to the control group mean of 2.92%. The effects are dispersed heterogeneously by age and gender, with young men aged 21-29 experiencing the greatest proportional increases. To explore potential mechanisms, I supplement the main analysis with data from the Behavioral Risk Factor Surveillance System (BRFSS). These auxiliary results show that RMLs lead to increases in self-reported disruptive physical and mental health problems, declines in general health status, and reduced physical activity. This suggests that deteriorations in mental and physical health following legalization may partly

[2]For example, Sabia et al. (2024) found that the passage of RMLs increased prior-month adult marijuana use by 4 percentage points.

explain the rise in absenteeism.

These findings make a substantial contribution to the emerging literature by providing some of the first causal evidence that recreational marijuana legalization increases workplace absenteeism. While extensive literature has looked into health outcomes related to legalization, less attention has been paid to labor market outcomes. This small but growing body of literature mostly focuses on extensive margin outcomes like employment (Anderson & Rees, 2023; Chakraborty et al., 2021; Jiang & Miller, 2022). Only a handful of papers have looked at the intensive margin, including recent work by Dave et al. (2022). This paper adds to that literature by examining a different measure of the intensive margin — workplace absence — and finds significant effects following legalization.

This study provides three additional contributions to this body of research. First, many of the above observational studies are from medical literature and do not use two-way fixed effects models or difference-in-difference methodology (Austin et al., 2020; Moughan & Katz, 2024). Several explicitly do not engage a causal framework (Morgan et al., 2022; Yang et al., 2024). In this paper I use modern difference-in-difference techniques for all analyses, testing whether all results are free from contamination by non-parallel trends in a robust causal framework. Second, recent studies indicate that traditional TWFE models may be subject to bias when applied to settings with staggered policy adoption (Goodman-Bacon, 2021; Roth et al., 2023). This study applies recent methodological advancements that specifically address these potential sources of bias. Within the economics literature, some of the aforementioned studies rely on traditional TWFE models (Chakraborty et al., 2021; Ullman, 2017). Third, by leveraging the 2002-2023 CPS and BRFSS datasets, the analysis incorporates several more years of post-treatment data than most prior work. For example, recent work by Dave et al. (2022) leverages data through 2020. Between January 2021 and March 2023, nine additional states opened recreational marijuana dispensaries. Incorporating these additional treated states and years of data into the analysis may facilitate a more comprehensive understanding of RML policy effects.

This paper also contributes to a broader literature on health outcomes of marijuana legalization informing the public discourse on this policy issue. As legislative developments have provided opportunities to study the impacts of marijuana use, researchers are compiling evidence to confirm or deny its numerous suspected public health effects. Research thus far examines health outcomes relevant to voters and policymakers, such as traffic fatalities, workplace health, crime rates, and mental health problems (Anderson & Rees, 2023). The findings in this study inform the public health debate by identifying a causal impact on short-term workplace absence and linking this outcome to deterioration in population health. Using BRFSS data, I document that dispensary openings are associated with an increase in the number of days individuals report disruptive physical or mental health problems, a rise in the share of adults reporting fair or poor general health, and a decline in regular physical activity. These patterns suggest that recreational marijuana legalization may have broader implications for workforce health and productivity than previously recognized.

The structure of this paper is as follows: Section 2 provides background on the relationship

between marijuana laws and workplace absence, as well as a review of the relevant literature. Section 3 outlines the data, specifying the measures used from publicly available datasets. Section 4 delineates the statistical methods employed in this study. The main findings are detailed in Section 5, with heterogeneity analysis and robustness checks. Section 6 presents supplementary analyses investigating potential mechanisms behind the observed effects. Section 7 concludes with a discussion of the implications of my findings in context.

# 2 Background and Related Literature

Several studies have explored the relationship between marijuana policy and workplace absenteeism, particularly in the context of medical marijuana laws or self-reported marijuana use. However, relatively little research has examined this question using recreational marijuana law variation or modern causal inference methods. This section summarizes the existing literature on marijuana and work outcomes, with particular attention to studies of absenteeism.

## 2.1 Marijuana Use and Workplace Absenteeism

Austin et al. (2020) examine the association between marijuana use and workplace absenteeism using data from the 2006–2007 NSDUH. The authors find that self-reported use of both marijuana and nonmedical use of prescription drugs are positively associated with self-reported absenteeism. To address potential endogeneity, they estimate instrumental variable models using three proxies: perceived risk of marijuana use, marijuana availability, and suicidal ideation. However, the instruments may be subject to validity concerns. For example, suicidal thoughts may be directly related to labor market behavior or absenteeism, complicating their exclusion restriction. Moreover, while the authors include a control for marijuana policy status, they find no significant relationship between legalization and absence, which may limit the interpretation of marijuana availability as a valid instrument. Finally, the analysis does not leverage quasi-experimental variation from policy changes or test for parallel trends, limiting its capacity for causal inference.

Moughan and Katz (2024) investigate the relationship between frequency of cannabis use, legalization, and employee sickness absence using data from the most recent wave of the Panel Study of Income Dynamics. They regress self-reported workplace absence on a three-way interaction between the legal status of marijuana, a respondent's frequency of marijuana use, and a respondent's depression status. They find a negative relationship between marijuana legalization and workplace absence.

Notably, the authors control for marijuana legalization status through a single policy variable equal to 0 if marijuana is illegal, or 1 if marijuana is legal or decriminalized. Related literature by leading authors Anderson and Rees (2014) stresses the importance of accurately capturing marijuana treatment levels when inference relies on policy variables. In their sample period 2019-2020, many states such as Florida, Minnesota, Delaware, Louisiana, Oklahoma, Utah, and New Hampshire had

decriminalized marijuana but not legalized it. This suggests that the use of a unilateral policy dummy for all marijuana liberalization may not induce realistic comparisons for inference. Further, the analysis is not grounded in a causal identification strategy, which limits interpretability of the estimated relationships.

Morgan et al. (2022) examine the 2018 NSDUH to study the relationship between substance use disorder and workplace absenteeism. Using a binomial regression model, they found that self-reported marijuana use was significantly correlated with increased workplace absenteeism. However, the authors do not adopt a causal identification strategy, and both the exposure and outcome measures are drawn from the same cross-sectional survey instrument. This introduces potential concerns about reverse causality and omitted variable bias, which limit the interpretability of the estimated associations.

### 2.2 Medical Marijuana Law and Workplace Absence

Turning specifically to medical marijuana, Ullman (2017) analyzes CPS ASEC data from 1992 to 2012 to show that state-level workplace sickness absences decrease by 8.3% relative to the pre-treatment mean after medical marijuana law adoption. However, this result may not generalize to recreational marijuana policies, because the effects of medical marijuana laws have been shown to differ substantially from recreational laws. For example, Hollingsworth et al. (2020) show that medical marijuana laws increase prior-month adult marijuana use by 5% and have negligible effects on adolescent use, whereas recreational laws generate a 25% increase for adults and a 10% increase in adolescent use.

### 2.3 Recreational Marijuana Law and Workplace Absence

To date, only one causal study has directly examined the relationship between recreational marijuana law and health-related workplace absenteeism (Abouk et al., 2021). While the primary focus of that study is the effect of marijuana legalization on workers' compensation, an auxiliary analysis investigates the impact of a one-year lagged RML indicator on workplace absences due to "own health" and finds no statistically significant effect. However, there are ten categories of workplace absence with "own health" comprising only 23% of the total share of non-layoff workplace absences. Several of the other categories (e.g., "vacation/personal days" or "other") likely contain important variation if the primary research question is about the effect of recreational marijuana policy on workplace absence. Appendix Table 2 contains a list of all included categories of absence in this study.

### 2.4 Recreational Marijuana Law and Other Workplace Outcomes

Prior work has examined the labor market consequences of recreational marijuana legalization. Dave et al. (2022) find little to no evidence that recreational marijuana laws negatively affect labor

market outcomes for working-age individuals, and instead document modest gains in agricultural employment following legalization. Their study does not examine workplace absenteeism. However, they do analyze labor supply on the intensive margin. The authors estimate the effect of RMLs on usual weekly hours worked using CPS data and find no evidence of significant changes among the overall workforce following policy adoption (Dave et al., 2022).

Two related studies have explored the relationship between recreational marijuana law and workplace outcomes; both are case studies of particular states and neither examines workplace absenteeism. Jiang and Miller (2022) use Census data from 2000 to 2019 to investigate the effects of recreational marijuana law passage in Washington and Colorado. Using a synthetic control approach, they show that RML passage leads to a decrease in weekly wages in the retail and agricultural sectors. Chakraborty et al. (2021) study the effects of recreational marijuana law passage on labor market outcomes in Colorado. Using county-level data from 2011-2018 in a difference-in-differences framework, they find that recreational dispensary openings increased local employment.

# 3 Data

## 3.1 National survey of drug use and health (NSDUH)

I begin by examining changes in marijuana use among adults ages 18 to 65 using data from the 2002–2019 National Survey on Drug Use and Health (NSDUH). While individual-level geographic identifiers are restricted, state-by-year averages are publicly available for this period. The survey collects data on marijuana use in each wave, with results reported over rolling two-year intervals.

The use of overlapping two-year survey periods complicates the construction of state-level marijuana policy indicators that align precisely with actual policy timing. To address this, I follow the approach in Choi et al. (2019, p. 312), defining policy exposure as the proportion of each two-year period during which the policy was in effect. These indicators range from 0 (no exposure) to 1 (full exposure). For instance, if a state enacted the policy two-thirds of the way through the period, its value would be coded as 0.66.

Marijuana prevalence rates are based on self-reported data of how many days in the last month each respondent used marijuana or hashish. Marijuana users are identified as the respondents reporting one day of marijuana use in the past month or more. Approximately 7.5 percent of all adult respondents met this criteria for marijuana use between 2002 and 2019. Some age groups have higher prevalence rates, with the highest rate of marijuana use at approximately 19 percent among those aged 18 to 25, contrasting the rate of 5.5 percent among respondents aged 26 and older. Prevalence rates overall steadily increased across the sample period, from 6 percent of all adult respondents in 2002 up to 11 percent in 2019.

### 3.2 Current Population Survey (CPS ASEC)

The primary analysis uses data from the 2002-2022 Current Population Survey Annual Social and Economic Supplement (ASEC). All of the data in this sample was observed in March, permitting temporally precise policy variables. The CPS instructions note that any estimation performed on this sample must use their supplied inverse probability weight to generate population-representative results.[3] Accordingly, all estimation on this dataset is weighted by ASEC sampling weights.

The analysis is restricted to employed observations, which is the effective universe of the absent question. The outcome measure, $Absent_{ist}$, is generated from a survey question which asks whether or not the respondent was absent from work in the past week. Respondents are also asked why they were absent from work in a follow-up question, with ten possible responses. The categories and corresponding absence counts are summarized in Appendix Table 2. I exclude respondents who report "maternity or paternity leave," which comprise 6.23% of total absences, because this typically requires advanced notice and a formal process. I also exclude respondents who report "labor disputes" and "civic or military duty", equal to 0.32% of total absences. The remaining categories are all included in $Absent_{ist}$.

Furthermore, to attenuate potential confounding variation related to childbirth and childcare availability, which may vary between treated and control states, I restrict the sample to exclude observations with newborn infants less than one year old. This group comprises 3.2% of the employed sample. After all stratification described in this section, 1,789,100 out of 2,011,953 employed observations aged 18-64 remain in the sample (88.9%), with 52,465 reported workplace absences. Table 1 provides descriptive statistics for the sample.

### 3.3 Behavioral Risk Factor Surveillance Survey (BRFSS)

To explore potential mechanisms, I collect all available data from the Behavioral Risk Factor Surveillance System (BRFSS) for the years 2002–2023. The BRFSS provides a cross-sectional dataset on the health behaviors of a large sample of nationally representative individuals. As in prior analyses, the sample is restricted to employed individuals aged 18–64.

Every year, survey respondents are asked several questions about their recent mental and physical health. I construct three outcomes from these questions: the number of days in the past month with disruptive physical or mental health problems; a self-assessed general health rating on a five-point Likert scale; and an indicator for any physical exercise in the past 30 days. To focus on population-level impacts and reduce measurement error in self-reported health outcomes, the data are aggregated to the state-year level prior to analysis.

[3]Weighting guidance and documentation is available from IPUMS (2025).

**Table 1:** Descriptive Statistics for Outcome Variables

| | All States | | Treated States | | Control States | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Panel A: NSDUH (2002-2019)** | | | | | | |
| *Used marijuana in the last 30 days* | | | | | | |
| Rate, Ages 18+ | 7.5% | (2.6%) | 9.8% | (3.1%) | 6.8% | (1.9%) |
| Ages 18-25 | 18.7% | (4.2%) | 22.2% | (4.6%) | 17.9% | (3.6%) |
| Ages 25+ | 5.6% | (2.4%) | 7.6% | (3.1%) | 5.0% | (1.8%) |
| State-year Observations | 867 | | 136 | | 731 | |
| Number of States | 51 | | 8 | | 43 | |
| **Panel B: CPS ASEC (2002-2023)** | | | | | | |
| *Absent from work last week* | | | | | | |
| Rate, Ages 18-64 | 3.00% | (0.10%) | 3.23% | (1.17%) | 2.85% | (0.85%) |
| Individual Observations | 1,787,708 | | 775,831 | | 1,011,877 | |
| Number of States | 51 | | 20 | | 31 | |
| **Panel C: BRFSS (2002-2023)** | | | | | | |
| *Physical or mental health problems disrupting usual activity* | | | | | | |
| Rate, Ages 18-64 | 8.23% | (2.35%) | 8.61% | (2.44%) | 7.89% | (2.22%) |
| *Fair or poor general health* | | | | | | |
| Rate, Ages 18-64 | 9.65% | (1.86%) | 9.26% | (1.71%) | 9.99% | (1.91%) |
| *Any exercise in the past month* | | | | | | |
| Rate, Ages 18-64 | 79.76% | (3.65%) | 81.56% | (2.87%) | 78.21% | (3.53%) |
| State-year Observations | 1,122 | | 434 | | 688 | |
| Number of States | 51 | | 20 | | 31 | |

Notes: This table presents the average characteristics across all states (columns 1–2), treated states (columns 3–4), and control states (columns 5–6) utilized in the baseline analysis. It reports both mean values and standard deviations, with observations weighted according to relevant state population using SEER data. The initial two columns encompass all states, while columns 3–4 focus on the treated states that enacted a Recreational Marijuana Law (RML) and opened recreational dispensaries. The final two columns pertain to control states that did not open recreational dispensaries prior to the conclusion of the sample period.

### 3.4 Recreational Marijuana Law Dates

I rely on the effective dates compiled by Anderson and Rees (2023), supplemented with independent research into further legislative changes. The complete set of implementation dates is shown in Appendix Table A1.

## 4 Methods

I leverage variation in the timing of recreational marijuana law adoption across states to estimate their impact on workplace absence rates. Following recent work by Sabia et al. (2024, p. 7-9), the empirical strategy comprises two parts. First, I implement two-way fixed effects (TWFE) regressions in a difference-in-differences framework to estimate the average effect of marijuana law changes on the outcomes of interest. Second, recent contributions to the econometrics literature highlight that TWFE estimates may be biased in settings with staggered treatment timing (Goodman-Bacon, 2021), which can also distort standard event study results used to assess pre-treatment trends (Callaway & Sant'Anna, 2021; Sun & Abraham, 2021). To address these concerns and assess the validity of the parallel trends assumption, I estimate event study specifications using the interaction-weighted estimator developed by Sun and Abraham (2021), which adjusts for treatment effect heterogeneity across adoption cohorts.

### 4.1 Empirical model

Following the work of Dave et al. (2022) and Sabia et al. (2024), I estimate the following two-way fixed effects (TWFE) difference-in-differences regression model:

$$Y_{st} = \beta_0 + \beta_1 RMD_{st} + \beta_2 MML_{st} + \beta_3 MDL_{st} + X'_{st}\beta_4 + \alpha_s + \gamma_t + \epsilon_{st} \tag{1}$$

where $Y_{st}$ denotes a given outcome observed in state $s$ during year $t$. These dependent variables include the prevalence of prior-month marijuana use, the linear probability of prior-week workplace absence, and the number of prior-month days suffering physical or mental health problems that disrupt usual activity. When using the CPS ASEC, I estimate a micro-level analogue of Equation (1), adapted for individual-level data[4].

The primary explanatory variable, $RMD_{st}$, captures the proportion of the year in which state $s$ had at least one operational recreational marijuana dispensary during year $t$. The variables $MML_{st}$ and $MDL_{st}$ indicate the share of the year during which medical marijuana laws and marijuana decriminalization laws, respectively, were in effect. The recovered LATE, $\beta_1$, can thus be interpreted as the marginal effect of RMLs with operational recreational dispensaries beyond the effect induced by MMLs and marijuana decriminalization laws.

[4]The estimating equation is as follows: $Y_{ist} = \beta_0 + \beta_1 RMD_{st} + \beta_2 MML_{st} + \beta_3 MDL_{st} + X'_{st}\beta_4 + Z'_{it}\beta_5 + \alpha_s + \gamma_t + \epsilon_{ist}$, where $Z_{it}$ is an additional vector of individual demographic controls for gender, race, age, and educational attainment.

The vector $X_{st}$ includes a set of time-varying, state-level covariates drawn from data sources including the ACS, FRED, and CDC. These variables capture shifts in state population characteristics over time, and include demographics controls (age, gender, race, ethnicity, education level); macroeconomic controls (the real state GDP, the unemployment rate, the real median household income); social welfare policies (whether or not the state adopted mandatory paid family leave laws, whether or not the state expanded Medicaid); and substance use controls (whether the state has a mandatory prescription monitoring drug program, the real state beer tax, the real state cigarette tax). $\alpha_s$ is a vector of time-invariant state effects and $\gamma_t$ is a vector of state-invariant time effects.

Treatment effects are identified using cross-state variation in the timing of RML adoption and the subsequent rollout of retail dispensaries. A total of 22 treated states contribute to the estimation of $\beta_1$ for the main outcomes. The validity of this estimate depends on the parallel trends assumption: that in the absence of treatment, trends in workplace absence would have evolved similarly across treated and control states. This assumption may be violated if pre-treatment absence rates were already diverging, or if RMLs were enacted in response to trends correlated with workplace absence.

To address potential violations of the parallel trends assumption, I employ several strategies. First, I evaluate the robustness of the results to a more limited control specification, relative to the full set of covariates used in the main analysis. Second, I test for differential pre-treatment trends using an event study design implemented with Sun and Abraham's interaction-weighted estimator, which accounts for variation in treatment timing across states (Sun & Abraham, 2021). This specification relies on never-treated states as the comparison group, thereby avoiding bias from comparing early adopters to later adopters. Third, I perform a placebo treatment analysis to test whether the main findings could be driven by spurious variation.

### 4.2 Event study methodology

To ensure the validity of estimates from Equation (1), it is necessary to test whether they are contaminated by differential pre-treatment trends. In addition, the effects of recreational marijuana laws could emerge gradually in the post-treatment period through a variety of mechanisms. To examine these dynamics, I construct a series of mutually exclusive RMD event-time indicators spanning five years before and after the first recreational dispensary opens in each treated state. I then estimate the following equation:

$$Y_{st} = \delta_0 + \sum_{t=0}^{5} \phi_t RMD_{st} + \sum_{t=2}^{5} \phi_{-t} RMD_{s(-t)} + \delta_1 MML_{st} + \delta_2 MDL_{st} + X'_{st}\delta_3 + \alpha_s + \gamma_t + \epsilon_{st} \quad (2)$$

where the year prior to the first recreational dispensary opening is excluded as the base period, and all RMD coefficients are estimated relative to this baseline. The vector $X_{st}$ includes the full set of covariates described above. When using CPS ASEC data, I adapt the event study to the individual level using a micro-data analogue of the equation. Given the staggered timing of RML adoption across states, I estimate Equation (2) using recent methodology proposed by Sun and Abraham

(2021). This accounts for variation in treatment timing and mitigates bias from inappropriate comparisons.

# 5 Results

This section proceeds in four parts. First, I present evidence that adult marijuana use rises following state adoption of RMLs with operational recreational dispensaries. Second, I show that these RMLs lead to increases in workplace absence. Third, I subject these findings to rigorous robustness checks to confirm that they are not driven by sample composition, alternative model specifications, or spurious policy timing. Fourth, I explore heterogeneity in treatment effects by demographics and industry. All standard errors are corrected for clustering at the state level (Bertrand et al., 2004).

## 5.1 Marijuana Use

I begin by estimating the impact of RMLs with operational recreational dispensaries on adult marijuana consumption. As shown in Table 2, TWFE estimates derived from Equation (1) indicate a statistically significant increase in usage. Estimates exhibit minimal sensitivity to the inclusion of additional covariates, with similar results observed across all three specifications. Panel A displays estimates for any marijuana use in the past 30 days among adults aged 18 and older. In the preferred model (column 3), which includes all covariates, RMLs with open dispensaries are associated with a 3.79 percentage point rise in the probability of recent marijuana use. This roughly corresponds to a 50% increase in the likelihood of adult marijuana use compared to the baseline mean in states that adopted RMLs.

The magnitude of this effect aligns closely with many estimates from recent literature, which mostly use policy instruments that do not distinguish between RML passage and retail dispensary operations. For example, relying on law enactment as the policy instrument, Dave et al. (2023), Hollingsworth et al. (2020), and Sabia et al. (2024) each find that adult past-month marijuana use increased by approximately 50% relative to baseline levels in states adopting legalization, based on 2002–2019 NSDUH data. This is roughly equal to 4 percentage points, comparable to the effect identified in Panel A of Table 2.

Panel B explores age-based heterogeneity, separating the analysis into adults aged 18–25 and those aged 26 and above. I find significant increases in marijuana use for both age groups after recreational dispensaries open. Among 18-25 year olds, I find that RMLs with active dispensaries lead to a 4.32-percentage point increase in the prevalence of prior-month marijuana use. I find a similar increase of 3.77-percentage points for adults aged 26 and over. These effects constitute a 23 and 69 percent increase over the control means, respectively.

**Table 2:** TWFE estimates for effect of RML with recreational dispensaries on prevalence of prior-month marijuana use (NSDUH, 2002-2019)

| | (1) Demographics Only[1] | (2) Add Social Welfare Controls [2] | (3) Add Substance Use Controls [3] |
|---|---|---|---|
| **Panel A: All 18+** | | | |
| *RML with dispensaries* | 0.0402*** | 0.0370*** | 0.0379*** |
| | (0.0083) | (0.0087) | (0.0082) |
| Control Mean | 0.0736 | 0.0736 | 0.0736 |
| State-year Observations | 867 | 867 | 867 |
| **Panel B: Age Heterogeneity** | | | |
| **Ages 18-25** | | | |
| *RML with dispensaries* | 0.0447*** | 0.0413*** | 0.0432*** |
| | (0.0102) | (0.0119) | (0.0107) |
| Control Mean | 0.1874 | 0.1874 | 0.1874 |
| State-year Observations | 867 | 867 | 867 |
| **Ages 26+** | | | |
| *RML with dispensaries* | 0.0404*** | 0.0371*** | 0.0377*** |
| | (0.0083) | (0.0086) | (0.0083) |
| Control Mean | 0.0543 | 0.0543 | 0.0543 |
| State-year Observations | 867 | 867 | 867 |
| Demographic Controls | Yes | Yes | Yes |
| Social Welfare Policies | No | Yes | Yes |
| Substance Use Controls | No | No | Yes |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

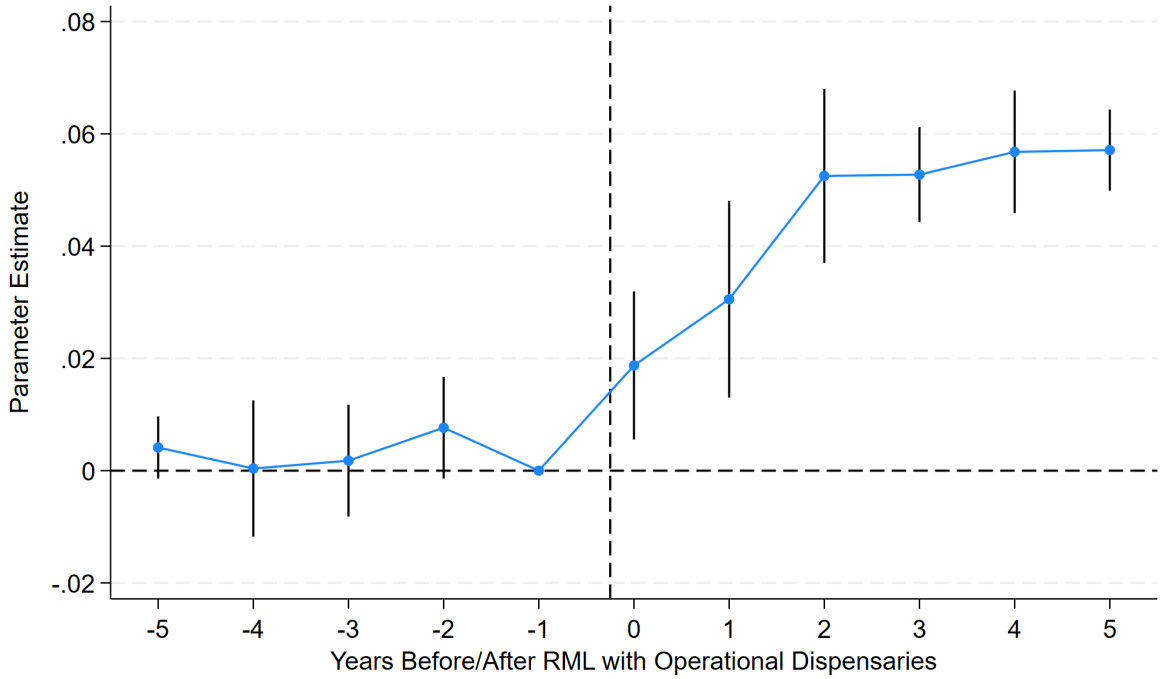
Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS using data from the 2002-2019 NSDUH. All regressions include state and year fixed effects. Standard errors, clustered at the state level, are in parentheses.

[1] Demographic controls encompass age, gender, race, ethnicity, and education level.

[2] Social welfare controls add a state-level indicator for Medicaid expansion under the Affordable Care Act, an indicator for mandatory paid family leave laws, the state unemployment rate, the real median household income, and the real state GDP.

[3] Substance use controls add mandatory prescription-monitoring drug laws, the real beer tax per gallon, and the real cigarette tax per pack.

**Figure 1:** Sun & Abraham Event Study, Effect of RML with recreational dispensaries on prevalence of prior-month marijuana use (NSDUH, 2002-2019)




Notes: The graph contains coefficient estimates with 95% confidence intervals for years before and after the change in RML, derived using Sun and Abraham's (2021) dynamic treatment effect estimator to account for timing-induced bias. The regression controls for all covariates in $X_{st}$, state and time fixed effects. Standard errors are clustered at the state level. Data are from the 2002-2019 NSDUH and include all observations aged 18+.

Figure 1 presents event study estimates for "any marijuana use" in the prior month among adults, derived using the interaction weighted estimator proposed by Sun and Abraham (2021). The analysis uses never-treated states as the control group, bypassing confounding comparisons between early and late adopters. There is no significant evidence of differential trends in adult marijuana use between treated and control states before recreational dispensaries opened. All pre-period estimates are statistically indistinguishable from zero ($p < .05$). This pattern validates the identifying assumption of parallel pre-treatment trends in the baseline difference-in-difference framework.

After recreational dispensaries open, the prevalence of adult marijuana use increases significantly in treated states during the first year, then increases again over the next two years to approximately 5.5 percentage points beyond the pre-treatment mean. The effect plateaus there, but remains elevated for at least three more years. These findings are consistent with a gradual expansion in marijuana availability following the implementation of recreational dispensaries.

### 5.2 Rates of work absence

Next, I turn to repeated cross-sectional data from the 2002-2022 CPS ASEC. I find causal evidence that recreational marijuana laws with operational dispensaries lead to an increase in workplace absenteeism. Table 3 below contains the results from Equation (1), estimates of the change in the linear probability of an employed observation reporting prior-week workplace absenteeism in states with operational recreational marijuana dispensaries versus those without. Column (3) represents the main specification. Generally, among adults aged 18-64, I find that state adoption of RMLs with active retail dispensaries leads to a 0.27 percentage point increase in the linear probability that an employed person will be absent from work in the prior week. This effect represents an approximate 9.2% increase over the control group mean absence rate.

In columns (1) and (2), I assess the integrity of the main specification by running the model without the full set of controls. The results are robust to the exclusion of additional controls, with minimal changes in coefficient size or standard error. This suggests that the main findings are not sensitive to model specification.

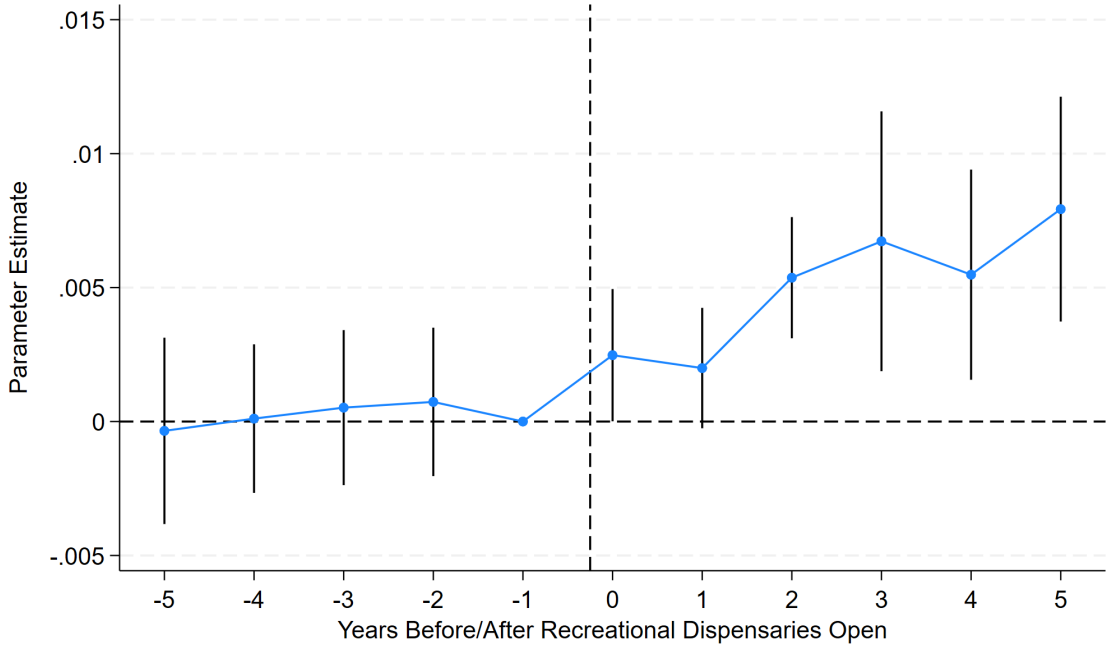
**Table 3:** TWFE Estimates for effects of RML with recreational dispensaries on workplace absenteeism (CPS ASEC, 2002-2023)

| | (1) Demographics Only | (2) Add Social Welfare Policies | (3) Add Substance Use Controls |
|---|---|---|---|
| **Absent from Work** (LPM) | | | |
| *RML with dispensaries* | 0.0026*** | 0.0027*** | 0.0027*** |
| | (0.0008) | (0.0009) | (0.0008) |
| Control Mean | 0.0292 | 0.0292 | 0.0292 |
| Individual Observations | 1,787,708 | 1,787,708 | 1,787,708 |
| Demographic Controls | Yes | Yes | Yes |
| Social Welfare Policies | No | Yes | Yes |
| Substance Use Controls | No | No | Yes |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS using data from the 2002-2023 CPS ASEC. All employed observations aged 18-64 are included in the sample. All regressions include state and year fixed effects. Standard errors, clustered at the state level, are in parentheses.

**Figure 2:** Sun & Abraham Event Study, Effects of RML with recreational dispensaries on workplace absenteeism (CPS ASEC, 2002-2023)




Notes: The graph contains coefficient estimates with 95% confidence intervals for years before and after the change in RML, derived using Sun and Abraham's (2021) dynamic treatment effect estimator to account for timing-induced bias. The regression controls for all covariates, state and time fixed effects, and is weighted by CPS ASEC sampling weights. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and includes all employed observations aged 18-64.

I next turn to Equation (2) to evaluate pre-treatment trends and investigate how effects evolve over time, using an event study approach estimated with recent methodology proposed by Sun and Abraham (2021). The results are presented in Figure 2. Consistent with the identifying assumptions, I find no significant evidence of differential trends in workplace absence between treated and control states in any years leading up to legalization. All pre-period point estimates for differences between treated and control states are centered near zero. This pattern bolsters the credibility of the parallel trends assumption underlying the identification strategy.

In the year after recreational dispensaries open, there is a significant jump in the predicted workplace absence rate. There is another jump two years later to around 0.5 percentage points, after which the effect remains elevated for at least three additional years. This pattern is consistent with the gradual increase in marijuana use observed following the expansion of legal access through dispensaries.

### 5.3 Robustness Checks

To evaluate the reliability of my findings, I perform three supplemental analyses. *First*, I test the robustness of the main results to the exclusion of parents who may need childcare. In Panel A of Table 4 below, I estimate Equation (1) for the effect of recreational dispensaries opening on prior-week workplace absence while excluding observations with children under 13 from the sample. I support this exercise by estimating Equation (2) for the same effect in an event-study framework using Sun & Abraham's interaction weighted estimator, depicted in Panel A of Figure 3. Estimates from both models remain stable when parents of childcare-aged children are excluded from the sample. The consistency of these results suggests that differences in parental leave or childcare availability are not driving causal identification.

*Second*, I assess the potential influence of the COVID-19 pandemic by re-estimating Equation (1) and Equation (2) while excluding data from 2020. The results, presented in Panel B of Table 4 and Figure 3, are highly consistent with the main estimates across both the TWFE and Sun & Abraham specifications. This suggests that the observed treatment effects are unlikely to be driven by pandemic-related disruptions.

*Third*, I investigate the possibility that the main results may be driven by spurious factors by performing a placebo treatment test on Equation (1). I perform 500 Monte Carlo simulations, generating falsified treatment scenarios by substituting the key policy variable, $RMD_{st}$, with a randomly generated placebo indicator. In each iteration, treatment status and timing are randomly assigned from uniform distributions, with an expected placebo treatment rate of approximately 10%. This matches the observed policy adoption rate in the 2002–2023 CPS sample. I collect the estimated treatment coefficient from each simulation, then compile them into the distribution shown in Figure 4.

The placebo test results reinforce the plausibility of the main findings shown in Table 3. The distribution of simulated treatment effects approximates a normal distribution with mean 0, consistent with a null difference-in-difference effect when no actual policy was applied. This finding is consistent with the parallel trends assumption. Next, I overlay the main estimate from Equation (1), capturing the impact of recreational marijuana dispensaries opening on workplace absence rates, onto the placebo distribution. This estimate lies within the upper 1% tail of simulated coefficients, indicating that the observed effects in Table 3 are unlikely to have arisen by chance.

**Table 4:** OLS TWFE Estimates for Sensitivity of Main Analysis (CPS ASEC, 2002-2023)

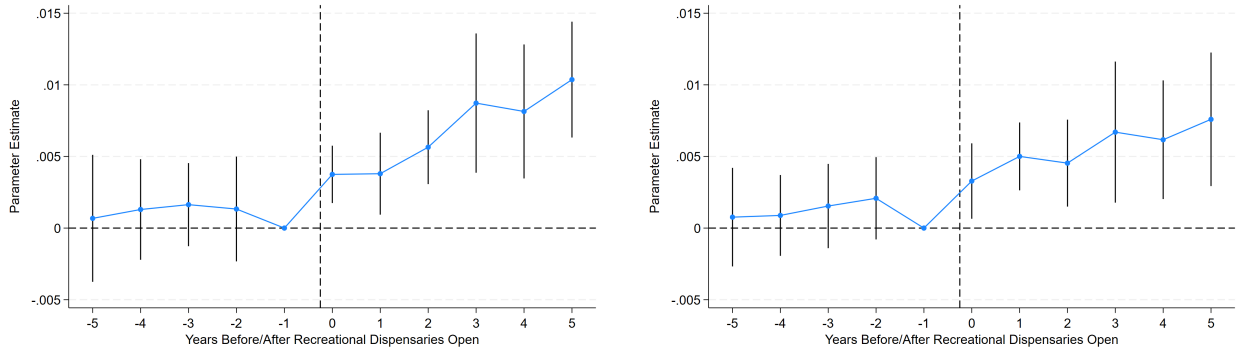
| | (1) Demographics Only | (2) Add Social Welfare Policies | (3) Add Substance Use Controls |
|---|---|---|---|
| **A: Excluding Parents** | | | |
| *RML with dispensaries* | 0.0033*** | 0.0036*** | 0.0036*** |
| | (.0008) | (.0009) | (.0010) |
| Control Mean | 0.0307 | 0.0307 | 0.0307 |
| Individual Observations | 1,162,208 | 1,162,208 | 1,162,208 |
| **B: Excluding 2020** | | | |
| *RML with dispensaries* | 0.0027*** | 0.0033*** | 0.0033*** |
| | (0.0008) | (0.0008) | (0.0008) |
| Control Mean | 0.0292 | 0.0292 | 0.0292 |
| Individual Observations | 1,722,623 | 1,722,623 | 1,722,623 |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS. All regressions control for all covariates, state and time fixed effects, and are weighted by CPS ASEC sampling weights. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and include all employed observations aged 18-64.

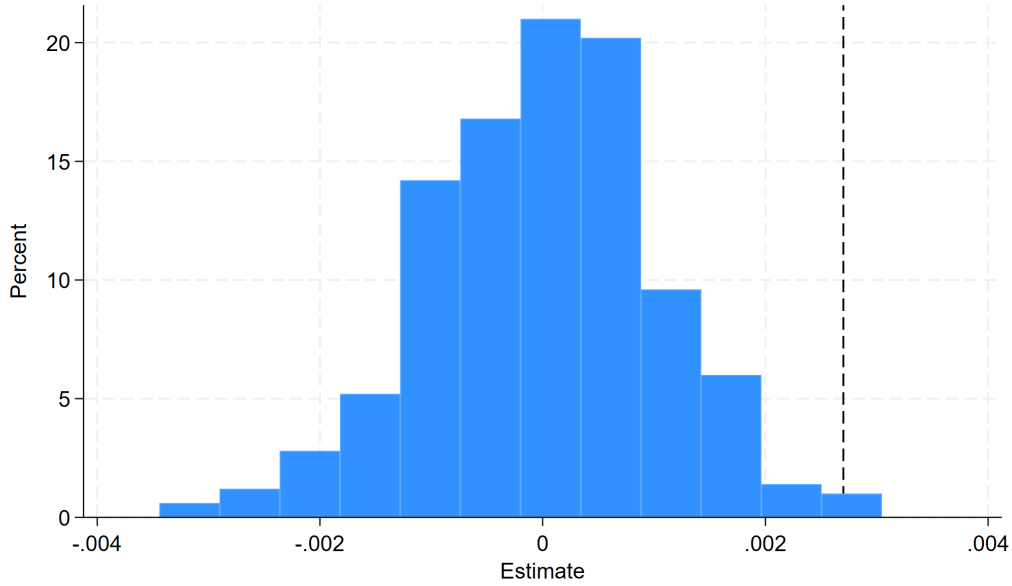
**Figure 3:** Sun & Abraham Event Studies, Sensitivity of main outcome (CPS ASEC, 2002-2023)

(a): Excluding Parents with Children Under 13 (b): Excluding 2020




Notes: The graphs contain coefficient estimates with 95% confidence intervals for years before and after the change in RML, derived using Sun and Abraham's (2021) dynamic treatment effect estimator to account for timing-induced bias. The regressions control for all covariates, state and time fixed effects, and are weighted by state population. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and includes all employed observations aged 18-64.

**Figure 4:** Placebo Test, Effect of RML with recreational dispensaries on workplace absence (CPS ASEC, 2002-2023)




Notes: The graph plots the density of parameter estimates from 500 Monte Carlo simulations of equation (1), replacing the main regressor ($RMD_{st}$) with a randomly generated placebo policy date drawn from a uniform distribution during each iteration. The dashed line represents the main estimate from column (3) of Table 3. Less than 1% of estimates fall to the right. Data are from the 2002-2023 CPS ASEC and include all employed observations aged 18-64.

### 5.4 Heterogeneity by demographic characteristics and industry

There is substantial evidence suggesting that the effect of recreational marijuana laws on workplace absence rates differs based on particular individual characteristics. Table 5 below describes heterogeneity by age and gender. Overall, RMLs with active dispensaries lead to more significant positive effects for males than females on workplace absence. This is primarily driven by young men in the 21-29 age category, with a generally statistically significant increase of approximately 0.7 percentage-points versus no discernible effect for women of the same age. Men in the 50-64 age category contribute to the remainder of the gap, with a significant increase of 0.6 percentage-points in workplace absence versus no significant increase for same-aged women.

The 30-39 age category is an exception, for whom men experience a 0.48 percentage point increase in absence compared to a statistically indistinguishable 0.54 percentage points for women. One might be reasonably suspicious that the effects in this particular age category are driven by confounding variation in access to childcare, or other related differences between treated and control states over the sample period. To address this concern, the model as specified excludes observations with infants less than one year old and controls for mandatory paid family leave laws. Further sensitivity testing of the main analysis by excluding observations with children under 13 years of age supports this result.[5] In the remaining age categories (18-20 and 40-49), there is no statistically significant effect for either gender.

In Table 6, I explore heterogeneity by race and ethnicity. There is significant evidence that increases in workplace absence after recreational dispensaries open differ by race and ethnicity. White Non-Hispanics are the only group to suffer a significantly different increase in absence ($p < .01$). On the contrary, the effects for Black and Hispanic populations are not statistically different from zero. This could make sense, if arrest rates for Black and Hispanic individuals disproportionally declined relative to White Non-Hispanics after recreational marijuana legalization.[6] For Asian populations, there is more of a null effect.

Table 7 examines heterogeneity in treatment effects across the five largest industries by employment share. Construction workers suffer the relatively largest increase of 1.32 percentage points, nearly 34%, in predicted workplace absence after dispensaries open. Retail trade workers, including those employed in chain stores and small businesses selling merchandise or food, experience a 0.68 percentage point increase (26%). Both these effects are statistically significant from zero ($p < .01$).

Employees of business and repair services (e.g., HVAC and electrical trades) show a 0.30 percentage point increase in absence (11.6%). Education workers, including all employees of schools, colleges and universities, experience a 0.64 percentage point increase after dispensaries open (14%). Both effects are statistically significant ($p < .10$). No statistically significant change is observed for

[5]Excluding observations with children under 13, $\beta_1 = .0096$ for women ($p < .01$) versus .0076 for men ($p < .01$) in the 30-39 age category.

[6]Dave et al. (2022) hypothesize that RMLs may improve labor market outcomes by lowering the likelihood of individuals acquiring a marijuana-related criminal record, which could be particularly relevant for young Black and Hispanic men.

healthcare workers.

**Table 5:** TWFE Estimates for heterogeneous effects of RML with recreational dispensaries on workplace absence probability by age and gender (CPS ASEC, 2002-2023)

| | Age Category | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| | Ages 18-20 | Ages 21-29 | Ages 30-39 | Ages 40-49 | Ages 50-64 |
| **A: All Genders** | | | | | |
| *RML with dispensaries* | 0.0032 | 0.0033* | 0.0050*** | -.0005 | .0037*** |
| | (.0051) | (.0019) | (.0012) | (.0014) | (.0014) |
| Control Mean | 0.0355 | 0.0250 | 0.0256 | 0.0285 | 0.0365 |
| Individual Observations | 75,576 | 301,835 | 434,467 | 490,004 | 485,826 |
| **B: Men** | | | | | |
| *RML with dispensaries* | 0.0032 | 0.0070*** | 0.0048*** | -0.0004 | 0.0058*** |
| | (0.0074) | (0.0021) | (0.0013) | (0.0021) | (0.0020) |
| Control Mean | 0.0328 | 0.0221 | 0.0217 | 0.0256 | 0.0336 |
| Individual Observations | 38,599 | 156,015 | 225,976 | 252,936 | 253,820 |
| **C: Women** | | | | | |
| *RML with dispensaries* | 0.0025 | -0.0007 | 0.0054*** | -0.0007 | 0.0015 |
| | (0.0069) | (0.0029) | (0.0019) | (0.0021) | (.0017) |
| Control Mean | 0.0382 | 0.0281 | 0.0301 | 0.0317 | 0.0397 |
| Individual Observations | 36,977 | 145,820 | 208,491 | 237,068 | 232,006 |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS. All regressions control for all covariates, state and time fixed effects, and are weighted by CPS ASEC sampling weights. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and include all employed observations aged 18-64.

**Table 6:** TWFE Estimates for heterogeneous effects of RML with recreational dispensaries on workplace absence probability by race and ethnicity (CPS ASEC, 2002-2023)

| | (1) White Non-Hispanic | (2) Black Non-Hispanic | (3) Hispanic | (4) Asian |
|---|---|---|---|---|
| **Absent from Work** (LPM) | | | | |
| *RML with dispensaries* | 0.0034*** | 0.0025 | 0.0028 | 0.0005 |
| | (0.0011) | (0.0031) | (0.0020) | (0.0025) |
| Control Mean | 0.0307 | 0.0290 | 0.0241 | 0.0261 |
| Individual Observations | 1,191,740 | 185,213 | 310,978 | 99,531 |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS. All regressions control for all covariates, state and time fixed effects, and are weighted by CPS ASEC sampling weights. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and include all employed observations aged 18-64.

**Table 7:** TWFE Estimates for heterogeneous effects of RML with recreational dispensaries on workplace absence probability by industry (CPS ASEC, 2002-2023)

| | (1) Retail Trade[1] | (2) Healthcare[2] | (3) Education[3] | (4) Construction | (5) Business & Repair Services |
|---|---|---|---|---|---|
| **Absent from Work** (LPM) | | | | | |
| *RML with dispensaries* | 0.0068*** | -0.0038 | 0.0064* | 0.0132*** | 0.0030* |
| | (0.0023) | (0.0025) | (0.0037) | (0.0035) | (0.0016) |
| Control Mean | 0.0264 | 0.0284 | 0.0454 | 0.0388 | 0.0259 |
| Individual Observations | 290,372 | 175,479 | 162,418 | 126,292 | 124,855 |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS. Each regression controls for all covariates, state and time fixed effects, and are weighted by CPS ASEC sampling weights. Standard errors are clustered at the state level. Data are from the 2002-2023 CPS ASEC and include employed observations aged 18-64.

[1] Includes employees of department stores, grocery stores, direct-selling establishments, and all other retail operations selling consumer goods

[2] Includes employees of offices and clinics of physicians, hospitals, and nursing and personal care facilities

[3] Includes employees of elementary and secondary schools, vocational schools, colleges, and universities

# 6 Changes in physical and mental health as a mechanism

The preceding analysis documents that the adoption of recreational marijuana laws with operational dispensaries leads to an elevated incidence of self-reported workplace absence. One potential explanation for this pattern is a deterioration in mental and physical health among some marijuana users following legalization. I conduct several supplementary analyses to assess the plausibility of this mechanism. I examine how recreational marijuana laws, and subsequent expanded marijuana access, may have affected the recent mental and physical health of the workforce. As with the primary analysis, I focus on individuals aged 18 to 64 who report being employed. I look at the number of days per month, on average, the workforce suffers mental or physical health problems that disrupt normal activity[7]. I also explore the share of the population that reports general health in the fair to poor range. Finally, I look at the share of the population that reports having engaged in any physical exercise in the prior month.

Table 8 displays results from that exercise using the TWFE model specifications from the primary analyses, with column (3) containing estimates from the preferred specifications. Panel A reports changes in the number of prior-month days the workforce suffers physical or mental health problems that disrupt regular activity, including working. I find that among adults aged 18-64, opening recreational marijuana dispensaries leads to an additional 0.061 problem days in the past month, an approximate 5% increase over the control mean of 1.25 days.

Panel B explores changes in the share of the population reporting fair or poor general health when interviewed. Among all employed adults aged 18-64, I find an increase of 0.42 percentage points over the control mean of 9.59%, approximately 4%. Finally, in panel C I analyze the share of the employed population that reports having engaged in any physical exercise in the past 30 days. I find a decrease of approximately 0.9 percentage points relative to the control mean of 79.35%, a 1% decline.[8]

All results are generally statistically significant from zero ($p < .05$). These findings suggest that recreational marijuana laws may lead to declines in the mental and physical health of the workforce. This could explain a substantial portion of the effects identified in the main analysis. However, as with the primary analysis, these findings are vulnerable to contamination from differential trends in the pre-treatment period. There is also substantial policy timing heterogeneity across the sample period. I address both concerns by estimating Equation (2) on all of these outcomes to conduct event study analyses, estimated using the interaction weighted estimator proposed by Sun and Abraham (2021). This should expunge potential bias arising from problematic comparisons in

[7]This outcome is generated from a survey question asking respondents, "During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?"

[8]This finding is consistent with results from a contemporaneous study by Wilk et al. (2024) on recreational marijuana, nutrition, and sedentary behavior. Leveraging a modern difference-in-differences event study design, they document a similar decline in physical activity among the general population of adults aged 21+ using BRFSS data. In contrast, this analysis focuses exclusively on employed adults.

outcomes between the states which adopted RMLs early in time, versus those that did so much later (Goodman-Bacon, 2021; Sun & Abraham, 2021).

The results for prior-month days with disruptive health problems are shown in Figure 5.A, and show no significant evidence of any non-parallel pre-treatment trends between states that opened recreational dispensaries and those that did not. A short time after recreational dispensaries open, there is a steady increase in the number of problem health days in treated states. This evidence supports the pre-treatment parallel trends assumption required for causal identification of the treatment effect found in Panel A of Table 8. It also suggests that there is some "take-up" time in the type of marijuana use that leads to health problems; or time for the effects of continual recreational marijuana use to unfold.

Figure 5.B depicts the event study results for the share of the population reporting fair or poor general health. There is no statistically significant evidence of non-parallel trends between treated and control states in the years before dispensaries open with most point estimates centered on zero. After recreational dispensaries open, there is a sharp but insignificant increase in the share reporting fair or poor general health. The effect persists for several years, and is significant ($p < .05$) in the fourth year. The average treatment effect in the post-treatment period is generally statistically different from zero ($p < .01$) and equal to 0.74 percentage points.

Finally, Figure 5.C shows the results for the share of the population reporting any exercise in the past 30 days. Although there is some significant evidence of non-parallel trends in the fifth year prior to dispensaries opening, there is no such evidence in the following four years with point estimates centered near zero. The average treatment effect in the pre-period (0.2 percentage points) is statistically indistinguishable from zero. Overall, this is strong evidence that exercise participation was not trending differently between treatment and control units prior to dispensaries opening. After dispensaries open, there is an immediate decline in the share of the population reporting any exercise in the past month. Consistent with the other health outcomes, the effect size increases over time. The effect is significantly different from zero in the majority of the post period estimates.

Summarizing, the results shown in Table 8 and Figure 5 provide evidence of significant increases in mental and physical health problems that may interfere with work, along with decreases in reported exercise participation. These impacts of recreational marijuana legalization may have made it more costly for some individuals to attend work, raising their absence likelihood.

**Table 8:** TWFE Estimates for effects of RML with recreational dispensaries on incidence of work-related health outcomes (BRFSS, 2002-2023)

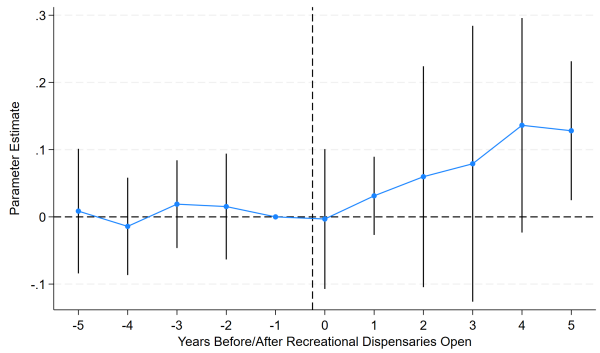
| | (1) Demographics Only | (2) Add Social Welfare Policies | (3) Add Substance Use Controls |
|---|---|---|---|
| **Panel A: Recent days with disruptive health problems** | | | |
| *RML with dispensaries* | 0.078** | 0.063** | 0.061** |
| | (0.033) | (0.027) | (0.027) |
| Control Mean | 1.249 | 1.249 | 1.249 |
| State-year Observations | 1,122 | 1,122 | 1,122 |
| **Panel B: Fair or poor general health** | | | |
| *RML with dispensaries* | 0.0055*** | 0.0041** | 0.0042** |
| | (0.0019) | (0.0016) | (0.0019) |
| Control Mean | 0.0959 | 0.0959 | 0.0959 |
| State-year Observations | 1,122 | 1,122 | 1,122 |
| **Panel C: Any exercise in the past month** | | | |
| *RML with dispensaries* | -0.0112** | -0.0099** | -0.0091** |
| | (0.0043) | (0.0042) | (0.0039) |
| Control Mean | 0.7934 | 0.7934 | 0.7934 |
| State-year Observations | 1,122 | 1,122 | 1,122 |
| Demographic Controls | Yes | Yes | Yes |
| Social Welfare Policies | No | Yes | Yes |
| Substance Use Controls | No | No | Yes |

* $p < 0.10$ , ** $p < .05$ , *** $p < .01$.

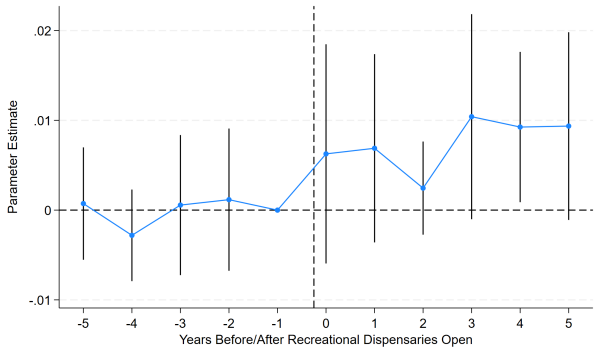
Notes: Each column represents a separate regression. Results are derived from linear probability models estimated through OLS using data from the 2002-2023 BRFSS. All observations aged 18-64 who report being employed are included in the analysis. All regressions include state and year fixed effects, and are weighted by state population using SEER data. Standard errors, clustered at the state level, are in parentheses.

**Figure 5:** Sun & Abraham Event Studies, Effects of RML with recreational dispensaries on work-related health outcomes (BRFSS, 2002-2023)

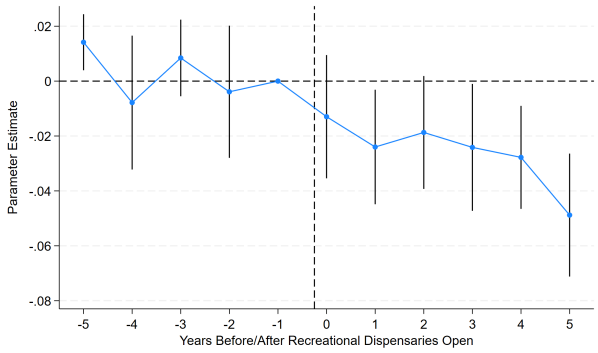
Panel (a): Recent Days with Disruptive Mental or Physical Health Problems




Panel (b): Fair or Poor General Health




Panel (c): Any Exercise in Past Month




Notes: The graphs contain coefficient estimates with 95% confidence intervals for years before and after the change in RML, derived using Sun and Abraham's (2021) dynamic treatment effect estimator to account for timing-induced bias. The regressions control for all covariates, state and time fixed effects, and are weighted by state population. Standard errors are clustered at the state level. Data are from the 2002-2023 BRFSS and include all employed observations aged 18-64.

# 7 Discussion

This study documents some of the first causal estimates to show a negative impact of recreational marijuana legalization on employment outcomes. First, using NSDUH data, I show that the rollout of recreational dispensaries significantly increases marijuana use beyond what is observed under medical marijuana laws and decriminalization. Specifically, I find that state adoption of RMLs with recreational dispensaries leads to an approximate 50% increase in the prevalence of self-reported marijuana consumption over the control group mean. These results are similar to recent literature (Dave et al., 2023; Sabia et al., 2024).

Next, the main analysis shows that state RML adoption with operational dispensaries significantly increases rates of workplace absence. Among the employed population aged 18-64, I find an overall increase of 0.27 percentage points in the self-reported incidence of prior-week absence from work, a 9% increase over the control group mean. An extensive set of sensitivity analyses indicate that these results are not driven by Covid-19 or childcare needs. Dynamic event study estimates, which adjust for staggered policy implementation, support a causal interpretation of these results. Supplemental analyses using BRFSS data support a potential health-based mechanism, showing that dispensary openings modestly increase self-reported physical and mental health problems and reduce physical activity.

These findings suggest that increased marijuana use following recreational legalization may contribute to higher rates of workplace absenteeism. As such, they represent one potential consequence of expanding recreational marijuana access through state policy. However, this analysis focuses specifically on short-term absences reported in the prior week and should not be interpreted generally as evidence that marijuana negatively impacts employment outcomes. Recent studies have found that marijuana has no, or a slightly positive, impact on other employment outcomes (Anderson & Rees, 2023; Dave et al., 2022). While this work does expose a negative outcome, further study may be necessary to interpret the long-term effects of increased absence on employee welfare.

# Appendix

**Table A1**: State Marijuana Policy Timeline

| State | MML Effective Date | RML Effective Date | Recreational Sales Allowed |
|---|---|---|---|
| Alaska | 03/04/1999 | 02/24/2015 | 10/29/2016 |
| Arkansas | 11/09/2016 | - | - |
| Arizona | 04/14/2011 | 11/30/2020 | **01/22/2021** |
| California | 11/06/1996 | 11/09/2016 | 01/01/2018 |
| Colorado | 06/01/2001 | 12/10/2012 | 01/01/2014 |
| Connecticut | 08/20/2014 | 07/01/2021 | - |
| Delaware | 06/26/2015 | - | - |
| District of Columbia | 07/30/2013 | 02/26/2015 | 02/26/2015 |
| Florida | 07/26/2016 | - | - |
| Hawaii | 12/28/2000 | - | - |
| Illinois | 11/09/2015 | 01/01/2020 | 01/01/2020 |
| Louisiana | 08/06/2019 | - | - |
| Maine | 12/22/1999 | 01/31/2017 | **10/09/2020** |
| Maryland | 12/02/2017 | - | - |
| Massachusetts | 01/01/2013 | 12/15/2016 | 11/20/2018 |
| Michigan | 12/04/2008 | 12/06/2018 | 12/01/2019 |
| Minnesota | 07/01/2015 | - | - |
| Mississippi | **02/02/2022** | - | - |
| Missouri | 10/17/2020 | **12/08/2022** | - |
| Montana | 11/02/2004 | 01/01/2021 | **01/01/2022** |
| Nevada | 10/01/2001 | 01/01/2017 | 07/01/2017 |
| New Hampshire | 05/01/2016 | - | - |
| New Jersey | 12/06/2012 | 02/22/2021 | **04/21/2022** |
| New Mexico | 07/01/2007 | 06/29/2021 | **04/01/2022** |
| New York | 01/08/2016 | 03/31/2021 | **12/29/2022** |
| North Dakota | 03/01/2019 | - | - |
| Ohio | 01/16/201 | - | - |
| Oklahoma | 07/26/2018 | - | - |
| Oregon | 12/03/1998 | 07/01/2015 | 10/01/2015 |
| Pennsylvania | 01/17/2018 | - | - |
| Rhode Island | 01/03/2006 | **5/25/2022** | **12/01/2022** |
| South Dakota | **07/01/2021** | - | - |
| Utah | 03/02/2020 | - | - |
| Vermont | 07/01/2004 | 07/01/2018 | **10/01/2022** |
| Virginia | 10/17/2020 | 07/01/2021 | - |
| Washington | 11/03/1998 | 12/06/2012 | 07/08/2014 |
| West Virginia | 08/22/2017 | - | - |

Notes: all original policy dates are drawn directly from (Anderson & Rees, 2023). Updated dates, in bold print, are drawn from the author's research into legislative changes.

**Table A2**: Types of Non-layoff Absences
CPS ASEC (2002-2023), Ages 18-64

| | Count | Share | Included in Main Analysis |
|---|---|---|---|
| **Reason for Workplace Absence** | | | |
| *Vacation or Personal Days* | 29,604 | 41.4% | Yes |
| *Own Illness, Injury, or Medical Problems* | 16,428 | 22.3% | Yes |
| *Other Personal Obligation* | 4,447 | 6.22% | Yes |
| *Weather Affected Job* | 2,944 | 4.12% | Yes |
| *School or Training* | 1,747 | 2.44% | Yes |
| *Other* | 11,388 | 15.92% | Yes |
| *Maternity or Paternity Leave*[1] | 4,454 | 6.23% | No |
| *Child Care Problems*[2] | 467 | 0.65% | No |
| *Labor Dispute* | 94 | 0.14% | No |
| *Civic or Military Duty* | 130 | 0.18% | No |
| **Total Count** | 71,523 | | |

[1] I exclude observations reporting maternity or paternity leave as the reason for work absence from the main analysis. These types of absences are typically pre-planned and documented, and are thus unlikely to be influenced by marijuana liberalization. Additionally, access to parental leave and childcare may vary systematically across states, particularly between those that adopted RMLs and those that did not.

[2] Absences due to childcare problems are also excluded to mitigate potential confounding from cross-state variation in childcare availability and parental leave policies between treatment and control units.

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