

# The Association Between State Medical and Recreational Cannabis Laws and Cannabis Poisoning in Employer-Sponsored Health Insurance

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## Introduction

By the end of 2021, about 69.4% of the US residents live in a state where medical cannabis is legalized, and 43.6% live in a state where recreational cannabis is legal.

More people are using cannabis both for recreational purposes and to address pain-related medical conditions in place of or in combination with opioids.

As a result, quarterly rates of cannabis poisoning across the nation have been steadily rising between 2010 and 2021, from 0.5 to 2 per 100,000 population.

## Data

We used Merative MarketScan Commercial Claims and Encounters Database from 2011 to 2019.

**Table 1: Summary statistics, 2011-2019**

Variable	Mean	SD
<b>Cannabis laws</b>		
Initial MCL effective	0.38	(0.49)
MCL active dispensary	0.26	(0.44)
MCL home cultivation	0.25	(0.43)
RCL	0.06	(0.23)
<b>Concurrent policies</b>		
Medicaid expansion	0.27	(0.44)
PDMP mandate	0.20	(0.40)
PDMP program	0.83	(0.38)
Good Samaritan laws	0.47	(0.50)
Pill Mill laws	0.29	(0.45)
Naloxone access	0.42	(0.49)
Naloxone co-prescription mandate	0.01	(0.10)
Naloxone co-prescription offer	0.02	(0.14)
<b>Economic conditions and other demographic variables</b>		
state employment rate	0.93	(0.02)
state median household income (log)	10.60	(0.14)
state poverty level	0.15	(0.03)
state population (log)	16.12	(0.85)
state female population percentage	0.51	(0.01)
state black population percentage	0.14	(0.08)
state beer tax rate	0.30	(0.27)
state health uninsured rate	0.13	(0.05)
<b>Outcome measures</b>		
Cannabis poisoning diagnoses per 100,000 enrollees	0.87	(0.67)
Cannabis usage disorder diagnoses per 100,000 enrollees	69.49	(36.43)

Note: All means are weighted by the number of enrollees. Mean policy values refer to the enrollee percentage over the sample period subject to those policies.

## New Difference-in-differences

We used a robust heterogenous-effects differences-in-differences (DiD) regression approach:

$$Y_{st} = \beta_0 + \beta_{1st}MCL_{st} + \beta_{2st}MCD_{st} + \beta_{3st}HC-MC_{st} + \beta_{4st}RCL_{st} + \gamma X_{st} + \delta_s + \eta_t + \epsilon_{st}$$

Different from the classic DiD, the actual treatment effects  $\beta_{1st} - \beta_{4st}$  can vary across states  $s$  and time  $t$ .

The average treatment effect is  $E[\beta_{1st}|MCL_{st}=1]$ .

## Results

**Table 2: Effects of MCLs and RCLs on cannabis poisoning per 100,000 enrollees per quarter**

	Gardner	Gardner	Gardner	Gardner	two-way fixed-effects
	(1)	(2)	(3)	(4)	(5)
MCL effective	0.728*** (0.109)	-	-	-	0.011 (0.097)
MCL dispensary	-	-0.074 (0.183)	-	-	0.123 (0.089)
MCL home cultivation	-	-	0.277 (0.246)	-	0.046 (0.151)
RCL	-	-	-	0.483*** (0.106)	0.593*** (0.074)
Baseline predicted mean	0.704	0.867	0.791	0.952	0.704
R <sup>2</sup>	-	-	-	-	0.5320
Observation	1,224	1,728	1,332	1,836	1,836

\*P value < 0.05, \*\*P value < 0.01, and \*\*\*P value < 0.001.

➤ State implementation of MCLs was associated with an increase of 0.728 cannabis poisoning diagnoses per 100,000 enrollees per quarter (95%CI, 0.513 to 0.943; P<0.001), which is a 103% relative increase in cannabis poisonings.

➤ The implementation of RCLs was associated with an increase of 0.483 (95%CI, 0.274 to 0.692; P<0.001) cannabis poisoning diagnoses per 100,000 enrollees per quarter, which is equivalent to a 50.7% relative increase in cannabis poisonings.

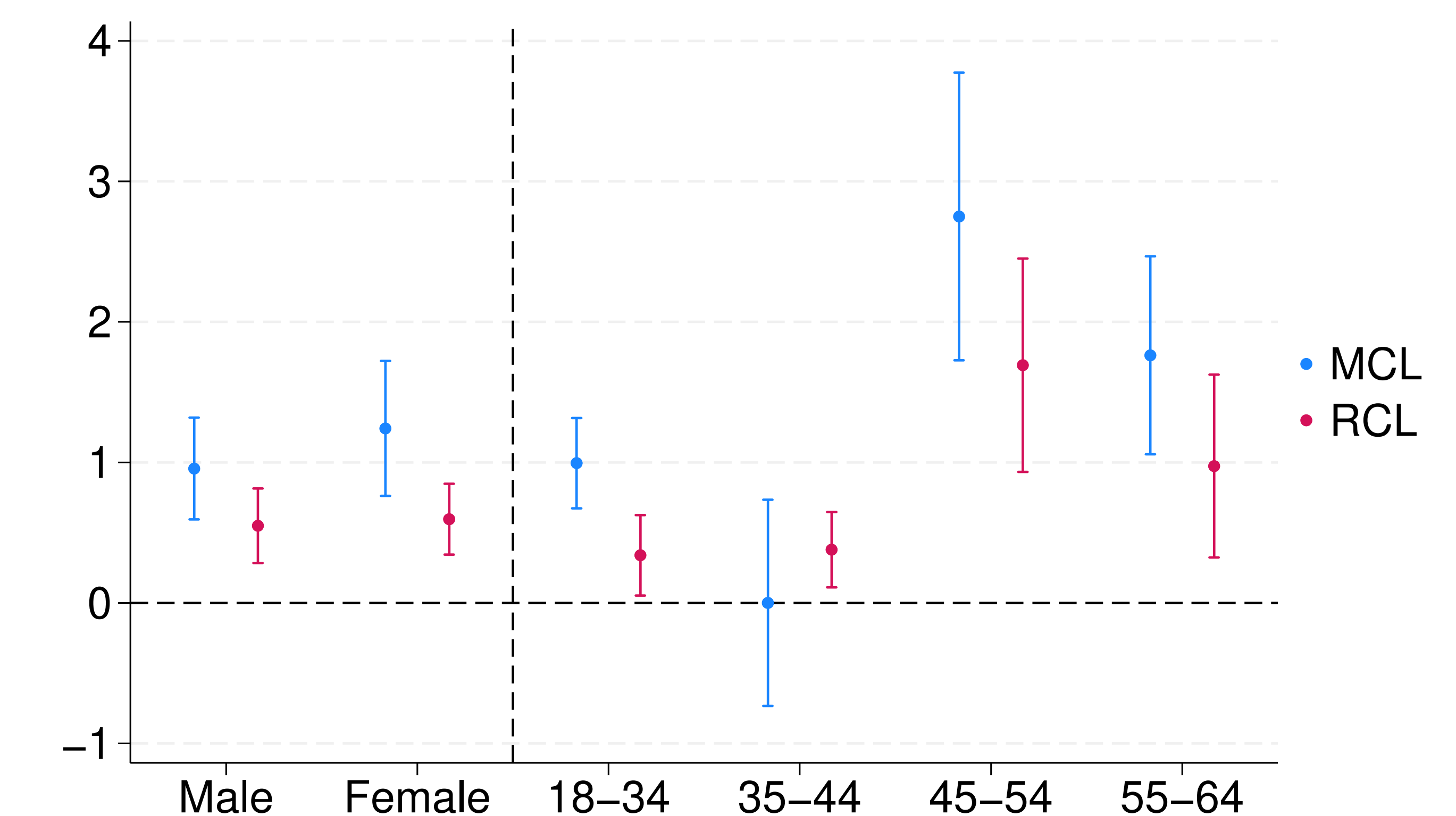
➤ Additionally, the MCLs were associated with 22.59 (95% CI, 12.42 to 32.76; P<0.001) additional CUD diagnoses, indicating an increase of 27.3% in CUD diagnoses due to MCL.

## Acknowledgements

The research was supported by the NIH National Center for Advancing Translational Sciences through grant number UL1TR001998. Any opinion, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NIH.

## Results by sex and age groups

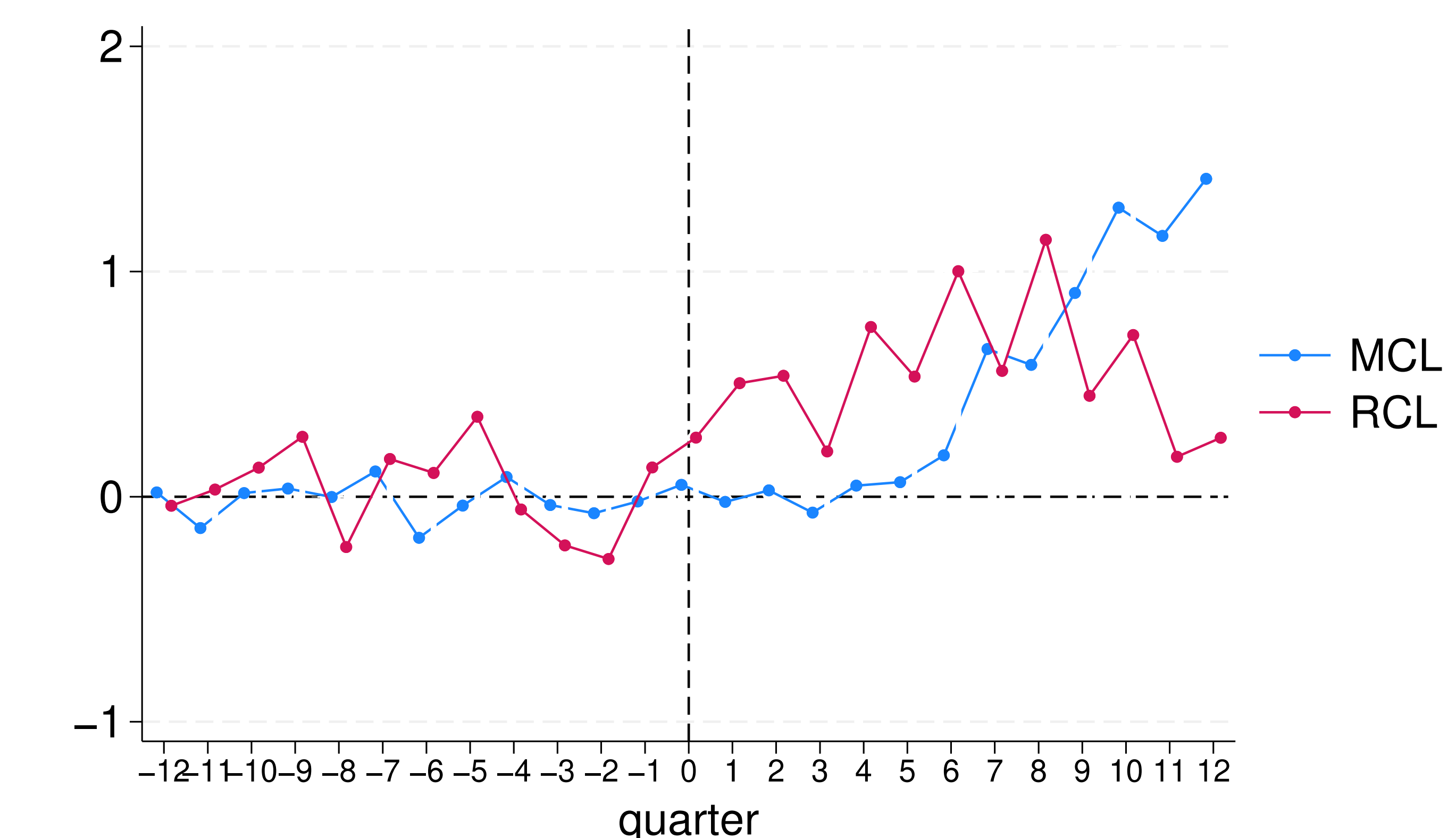
**Figure 1: The relative % impact on cannabis poisoning by sex and age groups**



The increase associated with MCLs and RCLs is larger for males than females, and largest for the population age 45-54 among working age.

## Event study

**Figure 2: Event study on cannabis poisoning per 100,000 enrollees, quarter-specific effect relative to policy adoption**



RCLs had an immediate effect on cannabis poisoning after policy adoption, while MCLs had a lagged effect 4 quarters after the adoption, which only became stronger over time.

## Reference

Jialin Hou, Jeffery C. Talbert, Patricia Freeman, and Jayani Jayawardhana. The association between state medical and recreational cannabis laws and cannabis poisoning in employer-sponsored health insurance. 2024. Working Paper