



IS WEED LEGALIZATION AS LIT AS IT SOUNDS?

The effect of recreational
marijuana legalization on drug use

Authors: Gabrielle Bioteau, Mia Ginsberg, Justin Hong, Shriya Karam, Rachael Tamakloe





TABLE OF CONTENTS

INTRODUCTION

01

MODEL
IMPLEMENTATION

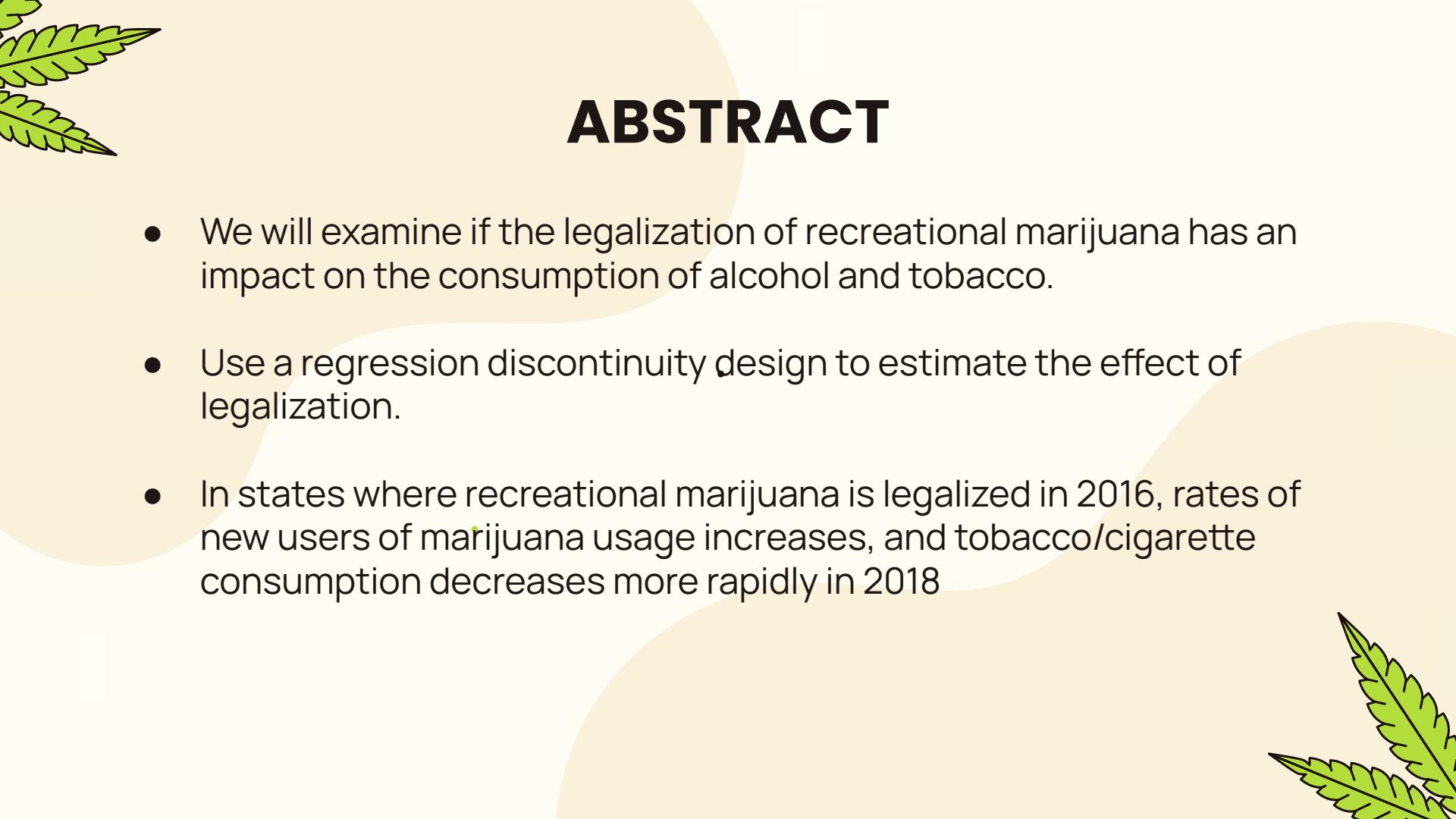
03

02 DATA
EXPLORATION

04 DISCUSSION



ABSTRACT



- We will examine if the legalization of recreational marijuana has an impact on the consumption of alcohol and tobacco.
 - Use a regression discontinuity design to estimate the effect of legalization.
 - In states where recreational marijuana is legalized in 2016, rates of new users of marijuana usage increases, and tobacco/cigarette consumption decreases more rapidly in 2018
- 



01

Introduction



BACKGROUND

- 5% of the world's adult population have an alcohol use disorder
- 22% of the world's adult population regularly use tobacco products (Gowing, 2015)
- Recreational marijuana was introduced in 1910, but its legality has been debated since the 1980s (U of GA, 2020)
- According to the CDC, 18% of Americans used marijuana at least once in 2019



MOTIVATION

Marijuana has been proven to be significantly safer than alcohol and tobacco. It could serve as an alternate drug, lowering the usage of alcohol and tobacco.

Our study could help advise legislation deciding on the legalization of marijuana.

LONG-TERM SYMPTOMS

Alcohol

- Stomach ulcers
- Heart diseases
- Obesity
- Cancer
- Liver cirrhosis

Tobacco

- Cancer
- Heart diseases
- Diabetes
- COPD
- Rheumatoid arthritis

Marijuana

- Memory issues
- Anxiety
- Depression
- Lung Damage
- Heart diseases



02

DATA EXPLORATION



LOADING THE DATA

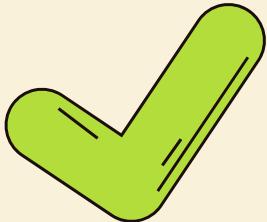
CORGIS Dataset: Drugs

- NSDUH conducted voluntary, compensated surveys from 2002-2018.
- ~70k individuals ages 12+ in the US participate annually.
- *NSDUH does not survey homeless persons that do not use shelters and persons in jails and hospitals.*



NSDUH

NATIONAL SURVEY ON DRUG USE AND HEALTH



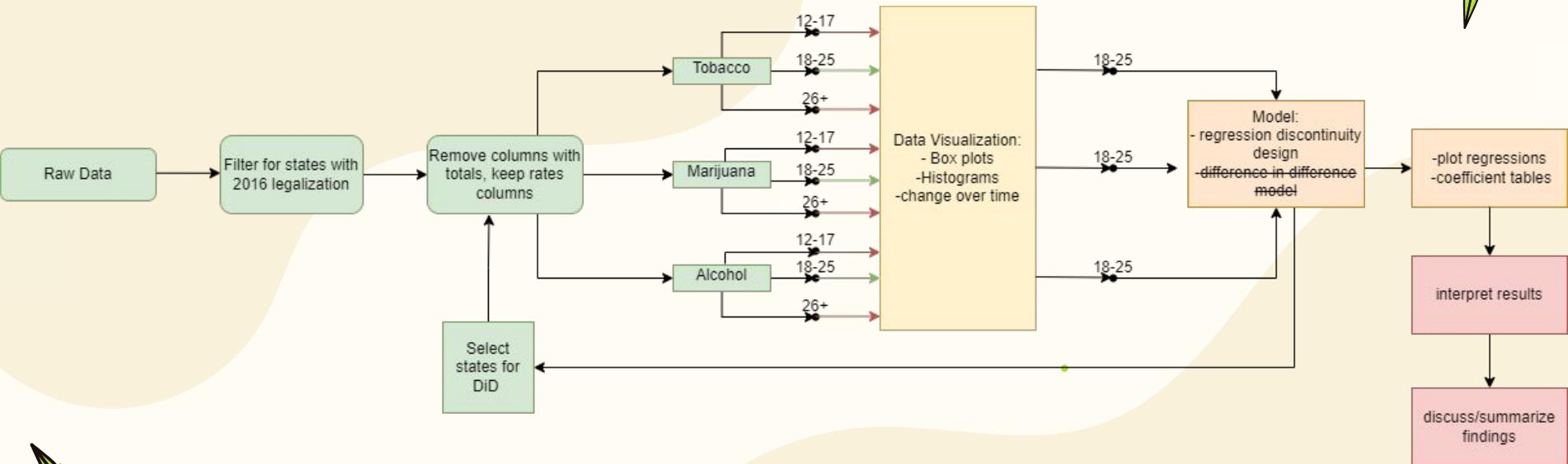
DATA PROCESSING



- 17 relevant data points for each of the 4 states that legalized marijuana in 2016.
- Used drug usage rates instead of absolute totals to remove the effect of population and interstate migration.
- Excluded cocaine usage because of its national illegality, its status as a hard drug, & our dataset's exclusion of prisoners.

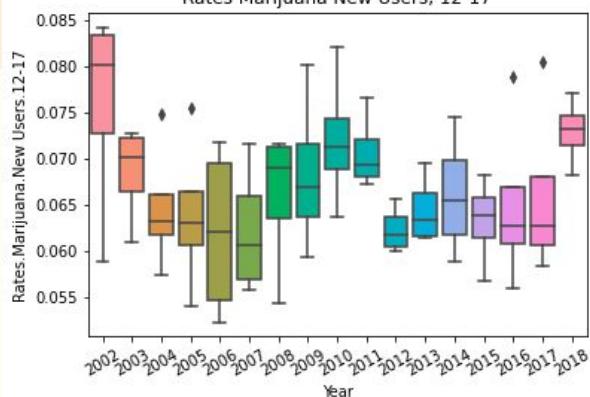
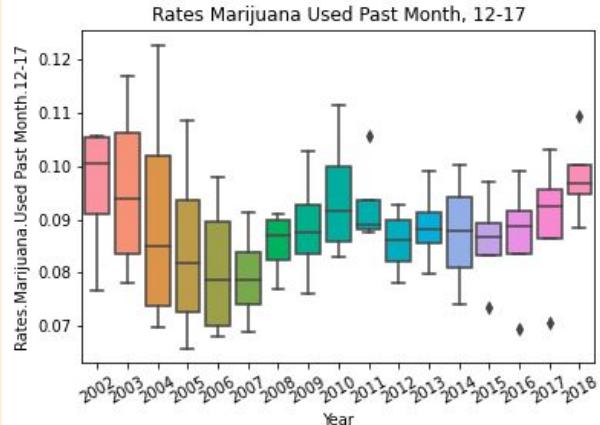


DATA PIPELINE

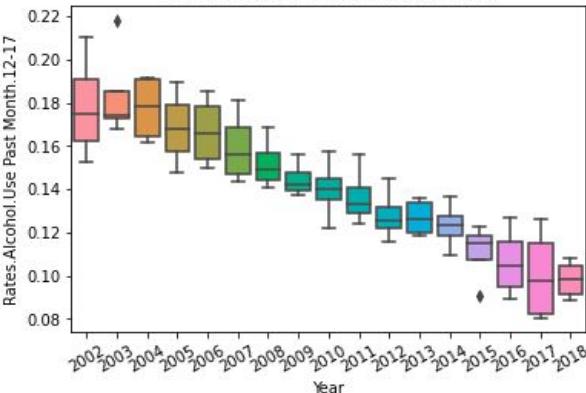
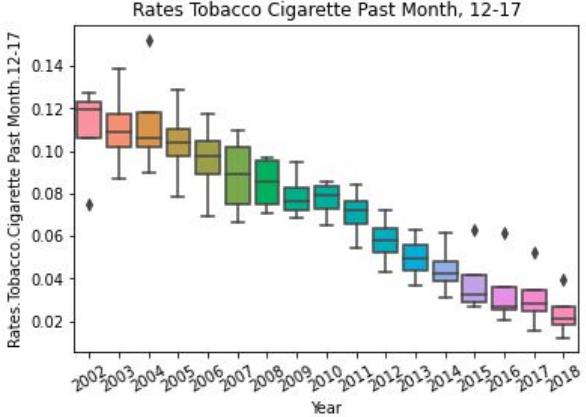


Marijuana, Alcohol, & Tobacco Usage Rates

Drug usage rates in the past month for the 12-17 age group

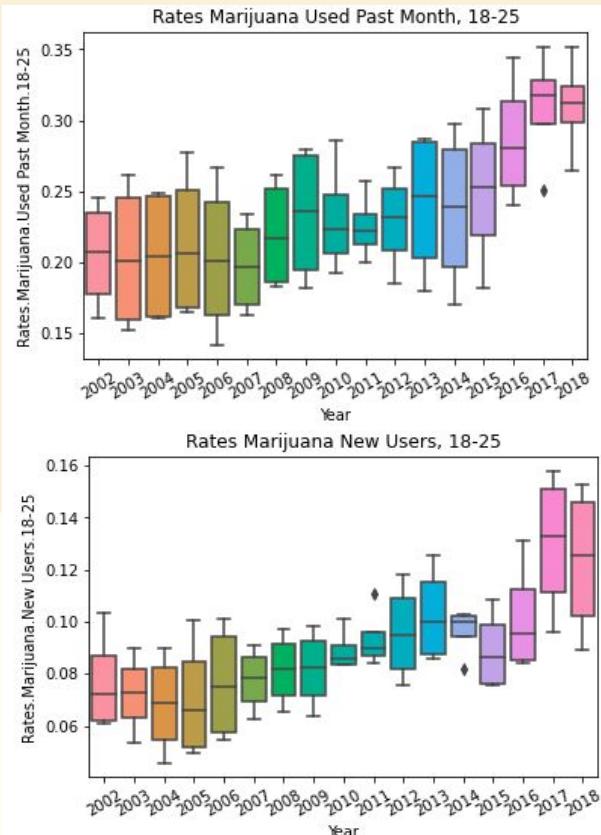


Decided against the 12-17 group because of legality and other confounding issues associated with the young age group.

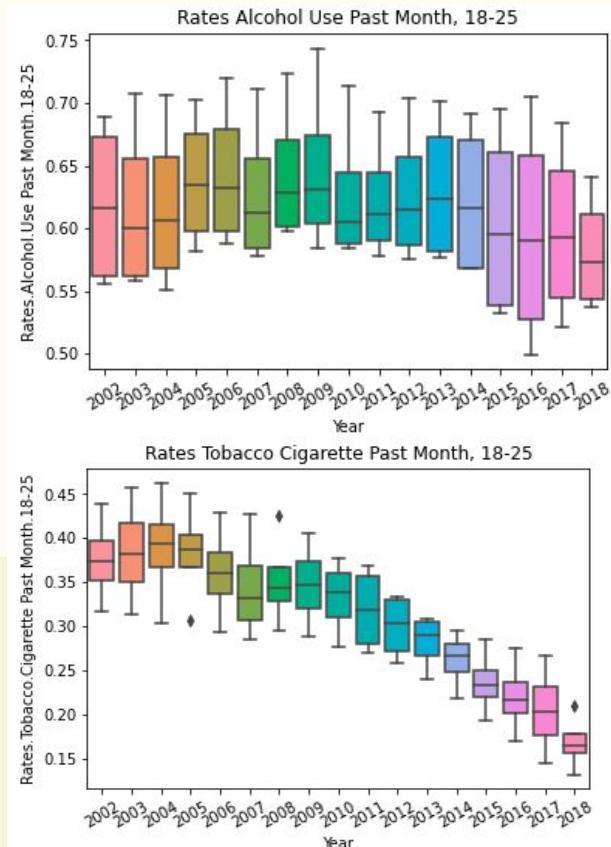


Marijuana, Alcohol, & Tobacco Usage Rates

Drug usage rates in the past month for the 18- 25 age group

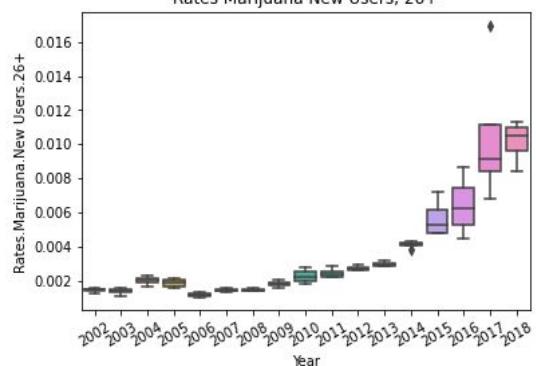
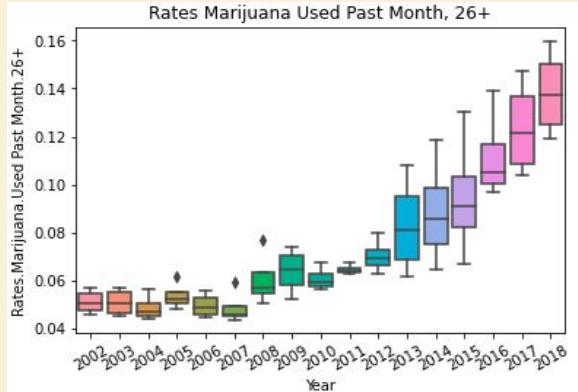


For the usage rates of marijuana and new users, we see greater trends associated with the legalization in 2016 for the age group of 18-25.

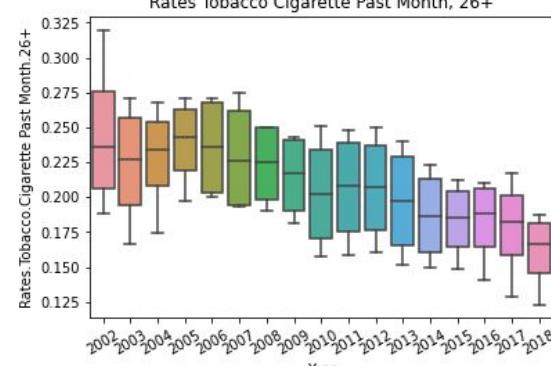
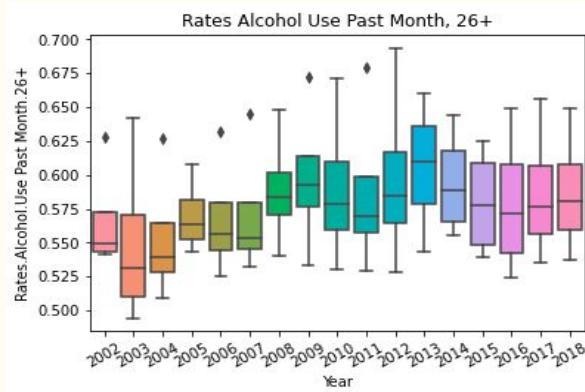


Marijuana, Alcohol, & Tobacco Usage Rates

Drug usage rates in the past month for the 26+ age group



People aged 26+ are more likely to not exhibit strong trends in how their drug usage changes because they are more fixed in their usage patterns





ASSUMPTIONS

- The number/group of survey participants is the same from 2002 to 2018.
- Ignored distinction of medical vs. recreational usage prior to recreational legalization.





03

Model Implementation

Regression Discontinuity Design

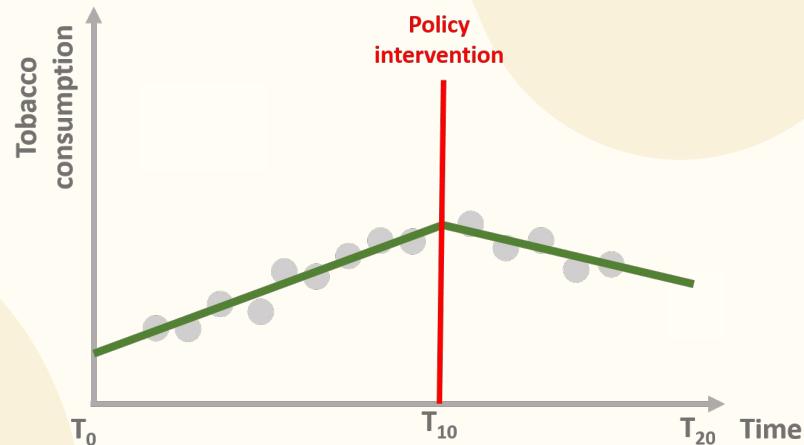


$$y = \alpha * \text{time} + \beta * \text{treatment} + \gamma * (\text{time} \times \text{treatment}) \\ + \epsilon * \text{stateCalifornia} + \zeta * \text{stateMaine} \\ + \delta * \text{stateMassachusetts} + \rho * \text{stateNevada}$$

Model estimated coefficients

Coefficient t-statistic

Predicted model output

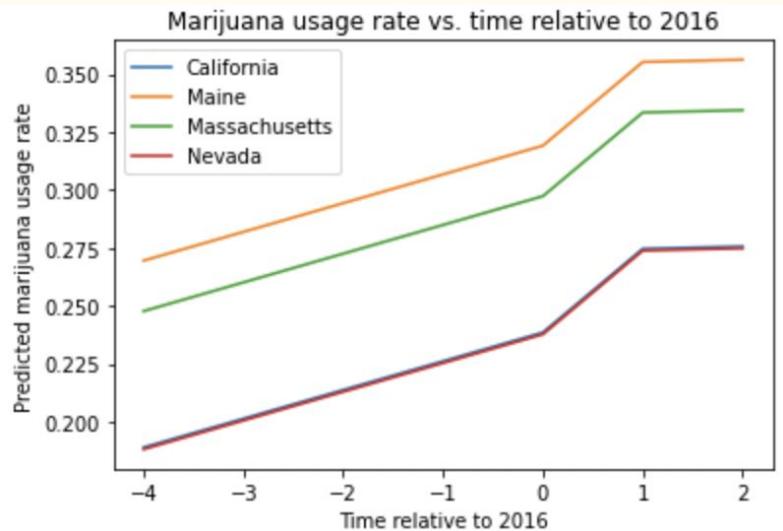


RDD for Marijuana Usage



=====
Dep. Variable: Rates.Marijuana.Used Past Month.18-25
Model: OLS
Method: Least Squares
=====

	coef	std err	t
const	0.2186	0.008	28.046
state_California	0.0200	0.008	2.368
state_Maine	0.1006	0.008	11.893
state_Massachusetts	0.0788	0.008	9.308
state_Nevada	0.0192	0.008	2.265
time	0.0124	0.004	3.121
treatment	0.0351	0.030	1.179
interaction	-0.0114	0.018	-0.628



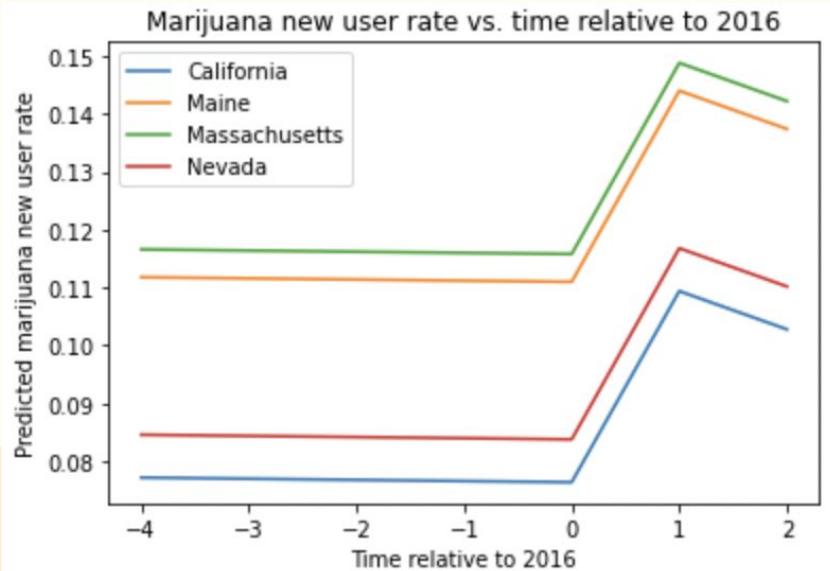
Regression coefficient table (L) and model predicted marijuana usage rate for each state (R)



RDD for New Users of Marijuana Rate



=====			
Dep. Variable: Rates.Marijuana.New Users.18-25			
Model: OLS			
Method: Least Squares			
	coef	std err	t
const	0.0774	0.003	23.547
state_California	-0.0010	0.004	-0.274
state_Maine	0.0336	0.004	9.410
state_Massachusetts	0.0384	0.004	10.773
state_Nevada	0.0064	0.004	1.781
time	-0.0002	0.002	-0.107
treatment	0.0396	0.013	3.157
interaction	-0.0064	0.008	-0.838

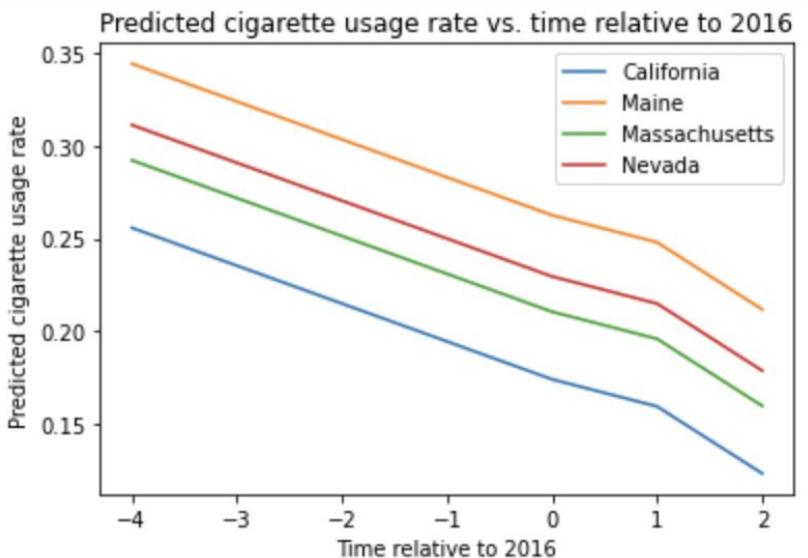


Regression coefficient table (L) and model predicted marijuana usage rate for new users for each state (R)



RDD for Cigarette Usage

Dep. Variable: Rates.Tobacco.Cigarette Past Month.18-25			
Model: OLS			
Method: Least Squares			
	coef	std err	t
const	0.1754	0.004	47.322
state_California	-0.0012	0.004	-0.289
state_Maine	0.0872	0.004	21.662
state_Massachusetts	0.0352	0.004	8.743
state_Nevada	0.0542	0.004	13.473
time	-0.0204	0.002	-10.800
treatment	0.0215	0.014	1.516
interaction	-0.0157	0.009	-1.807

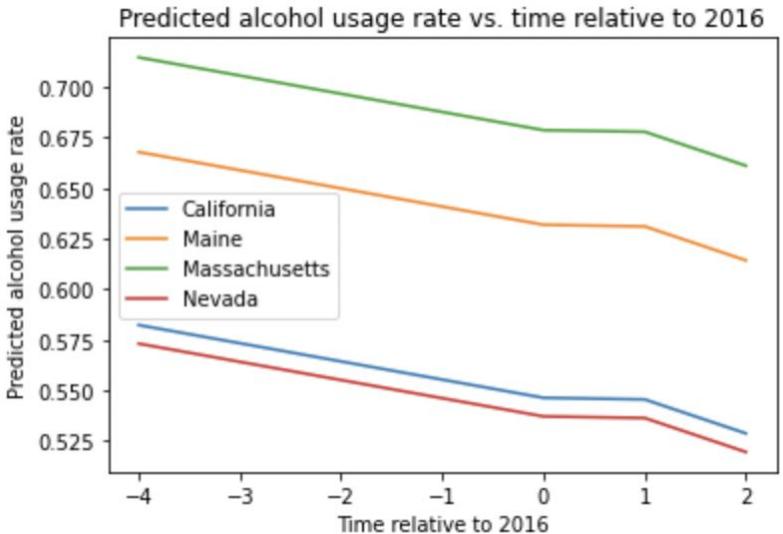


Regression coefficient table (L) and model predicted cigarette usage rate for new users for each state (R)

RDD for Alcohol Usage



Dep. Variable: Rates.Alcohol.Use Past Month.18-25			
Model: OLS			
Method: Least Squares			
	coef	std err	t
const	0.4788	0.005	89.126
state_California	0.0675	0.006	11.576
state_Maine	0.1531	0.006	26.249
state_Massachusetts	0.1999	0.006	34.272
state_Nevada	0.0583	0.006	10.000
time	-0.0090	0.003	-3.268
treatment	0.0160	0.021	0.779
interaction	-0.0078	0.013	-0.624



Regression coefficient table (L) and model predicted alcohol usage rate for new users for each state (R)

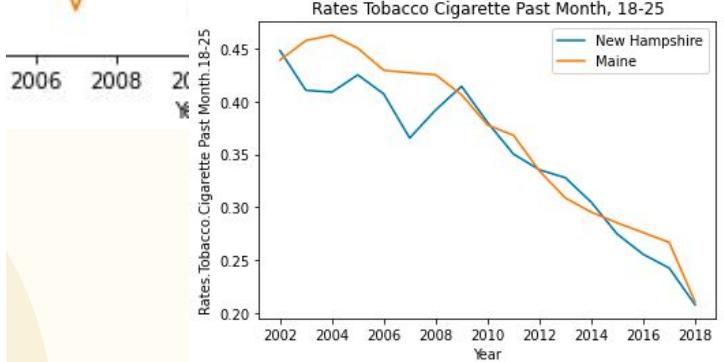
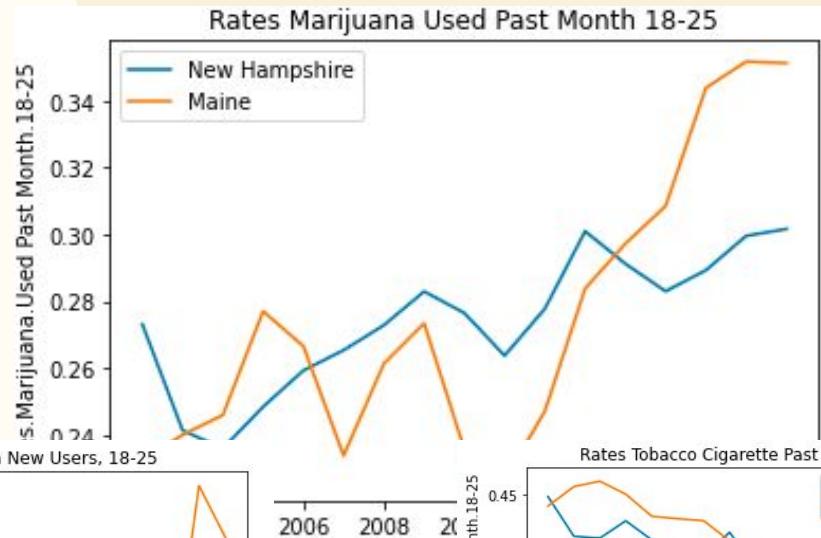
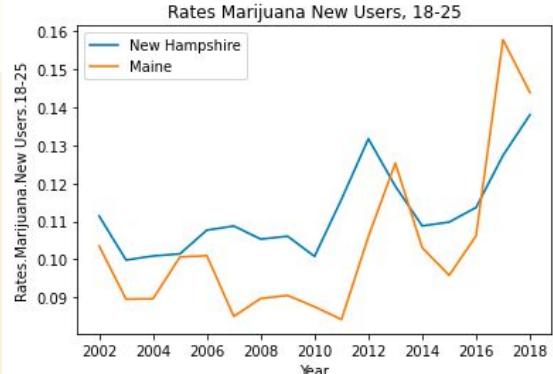


Difference in Difference Model



National factors besides the legalization of marijuana may influence drug usage.

Compare our model to states that did not legalize marijuana in 2002-2018.





04

DISCUSSION



SUMMARY OF FINDINGS

- Statistically significant treatment effect in the rates of new users of marijuana for 18-25 year olds
- Strong state-level effect on drug usage rate metrics for 18-25 year olds
- Decline in cigarette usage from 2017 to 2018, however not statistically significant



LIMITATIONS

- Included only 4/50 states and individuals age 18-25
 - 4 was the maximal amount of states which legalized marijuana in the same year
- Limited amount of data points pre and post legalization due to the dataset.
- Survey data was collected voluntarily.
- With RDD, we can not state a causal relationship due to outside variables that are not accounted for.



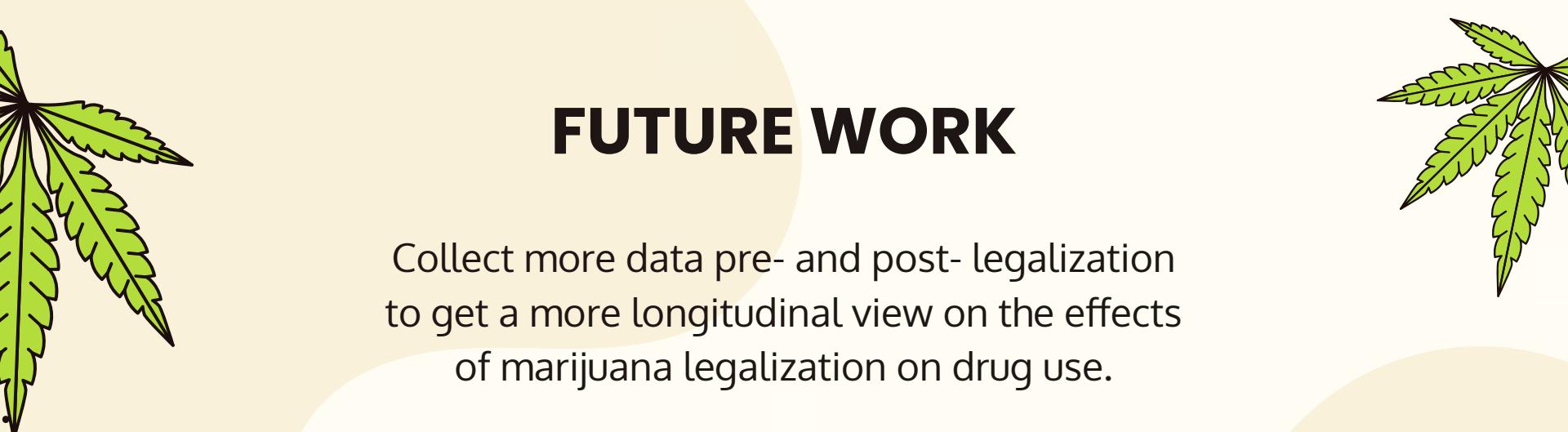


IMPACTS OF FINDINGS

Creates motivating or demotivating reasons for marijuana legalization in other states.

Can be used as a predictive measure for rehabilitation capacity requirements for alcohol and tobacco post-legalization of marijuana





FUTURE WORK

Collect more data pre- and post- legalization to get a more longitudinal view on the effects of marijuana legalization on drug use.

Collect data via experimental testing and include the homeless/imprisoned for more accurate results.

REFERENCES

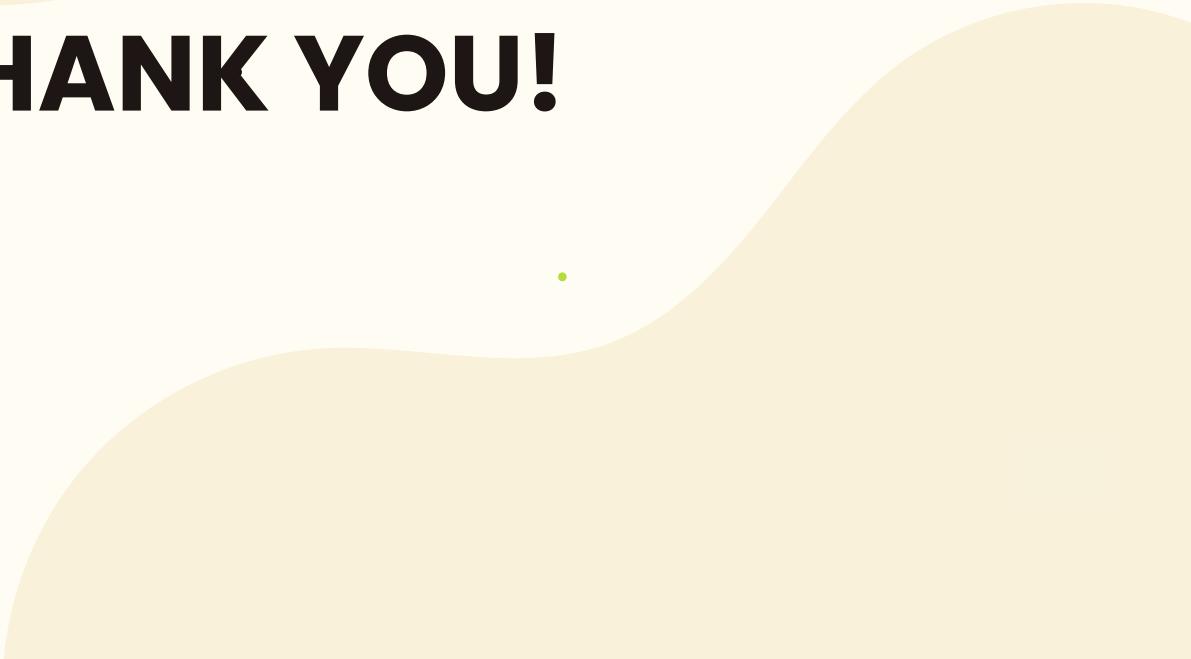
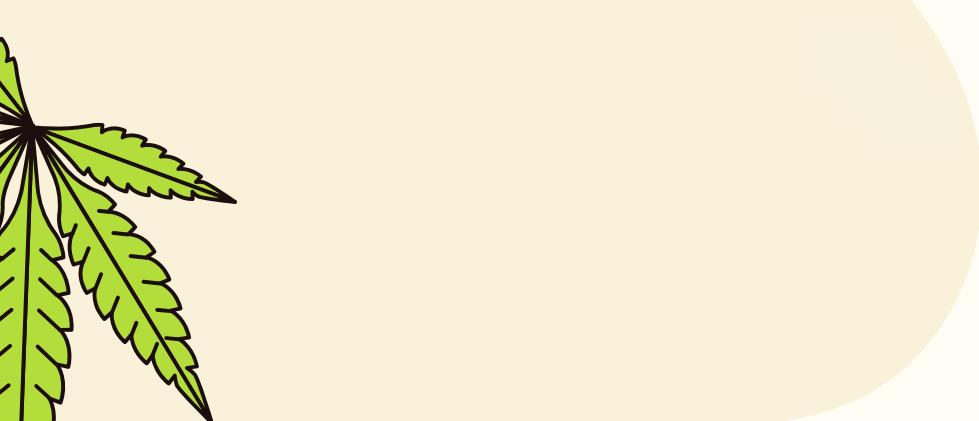
National Survey on Drug Use and Health (NSDUH). CMS. (2021, December 1). Retrieved April 14, 2022, from

<https://www.cms.gov/About-CMS/Agency-Information/OMH/resource-center/hcps-and-researchers/data-tools/sgm-clearinghouse/nsduh#:~:text=NSDUH%20collects%20information%20from%20residents,bases%2C%20ages%2012%20and%20older>

Comparative risk assessment of alcohol, tobacco, cannabis and other illicit drugs using the margin of exposure approach. Nature. (2015 January 30). Retrieved April 18, 2022, from <https://www.nature.com/articles/srep08126>

Global statistics on addictive behaviours: 2014 status report. Addiction. (2015, May 11). Retrieved April 18, 2022, from <https://onlinelibrary.wiley.com/doi/full/10.1111/add.12899>

Survey of Marijuana Law in the United States: History of Marijuana Regulation in the United States. University of Georgia School of Law. (2020, September 8). Retrieved April 18, 2022, from <https://libguides.law.uga.edu/c.php?g=522835&p=3575350#:~:text=In%20the%20late%2019th%20Century,the%20recreational%20use%20of%20marijuana>.



THANK YOU!

