Impacts of City Medical Marijuana Regulations on Adolescent Marijuana Use

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Background

Dynamic Marijuana Policy

- Access in California has continued to expand in the 20 years since medical marijuana became legal in 1996 and with the enactment of the Adult Use Marijuana Act in 2017 that legalized recreational use.

- Studies with alcohol and other drugs have shown that addition to their direct impact on behavior, local policies regulating substance use shape attitudes about the social acceptability of drug and alcohol misuse and abuse (Holder, 1999, 2002).

- A chief concern among public health professionals is that increased availability and social acceptance of marijuana will lead to more youth use (CA Blue Ribbon Commission on Marijuana Policy, 2015).

Adolescent Substance Use

- Although experimenting with alcohol and drugs and many other risk behaviors is normal during adolescence (Spear, 2000), adolescence is also the crucial intervention point for prevention of harm from substance use.

- Substance use among adolescents is a problem, due to its impact on brain development (Volkow, Wang, Fowler, & Tomasi, 2015), associated health risks (Volkow, 2014), and its negative impacts on future prospects for education and employment (Bachman, 2008; Weiss, 2012).

Adolescent Marijuana Use

- Adolescents are a special case when it comes to marijuana.
- Endocannabinoids, the nuerotransmitters that marijuana compounds mimic, are specifically involved in many crucial processes of brain development.
- In adolescents and children, displacing them with “exogenous” cannabinoids from marijuana disrupts these processes.
- Research shows that adults recover from the cognitive effects of marijuana when they stop using (Crean, Crane, & Mason, 2011), but longitudinal studies suggest that cognitive impacts from marijuana use persist well into adulthood among adolescents who begin regular use as adolescents (Crean et al., 2011, Meier et al., 2012; Wagner and Anthony, 2002).

How will marijuana policies that regulate adult access impact youth?

- Adolescents primarily access marijuana through social sources and the black market (King, Merianos, & Vidourek, 2016), so policy changes allowing greater legal access for adults may or may not impact *direct* youth access to marijuana, but we need to consider indirect effects as well.
- Decades of alcohol and tobacco research show that youth use of legal substances is higher in places where there is easier access for adults, despite age restrictions (Bryden et al., 2012).
- An unknown portion of medical marijuana intended for adults is known to get into the hands of children and adolescents. For example, a study of adolescents in drug treatment found that 75% had used someone else's medical marijuana within the previous year (Salomonsen-Sautel, 2012).

Research Question

Do city policies that allow marijuana dispensaries impact recent marijuana use among the city's students?

Hypothesis 2

I expect that students attending schools in a city that allows dispensaries will report more lifetime and recent use of marijuana.

Data Sources

Municipal Codes: City Marijuana Policies

California Healthy Kids Survey: Student Marijuana Use

Data: City Policies

- The 88 cities in Los Angeles County.
- Each city's policy regulating medical marijuana dispensaries was abstracted from municipal codes.
- Noted the LA County policy for schools that are located in unincorporated LA County.
- Data collection started in August 2014 and is ongoing.

Data: California Healthy Kids Survey (CHKS)

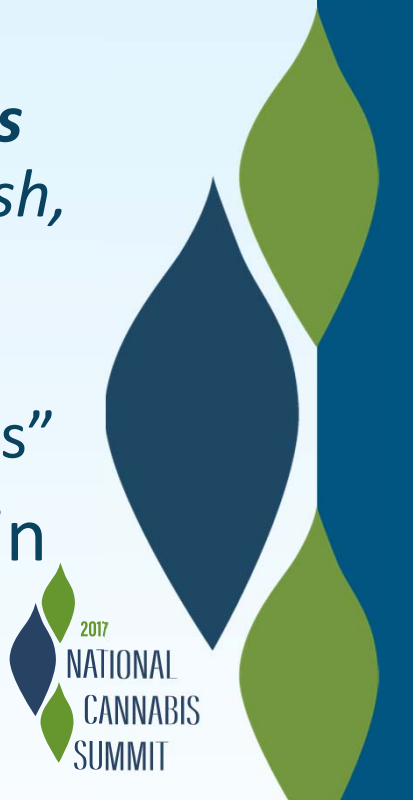
- Self report
- Conducted at public schools throughout California
- Administered anonymously each year
- Designed to monitor trends in student health behavior
- Representative survey of 7th-, 9th-, and 11th-grade students for each school district
  - Smaller districts asked every student in every school to complete
  - Larger districts used a stratified random sampling plan

Study Population

- All CHKS respondents in LA County from school year 2014 – 2015
- High school only
- Sample: 46,028 respondents
  - Excluded 1,285 students with missing data for marijuana use.
  - Excluded 137 students who were younger than 13.

Outcome Variable 1: Recent Use

- Frequency of Recent Marijuana Use:
  - *"During the past **30 days**, on how many **days** did you use marijuana (pot, weed, grass, hash, bud)?"* (emphasis in the original).
  - Response categories: "0 days", "1 day", "2 days", "3-9 days", "10-19 days", "20 – 30 days"
- Dichotomized to any marijuana use within the previous 30 days (yes/no).



Outcome Variable 2: Lifetime Use

- Frequency of Lifetime Marijuana Use:
  - *"During your life, how many times have you used the following substances? "* (emphasis in the original).
  - Response categories: "0 times", "1 time", "2 times", "3 times", "4-6 times", "7 or more times"
- Dichotomized to ever having used marijuana use (yes/no).

Predictor Variable: City Policies Allowing Marijuana Dispensaries

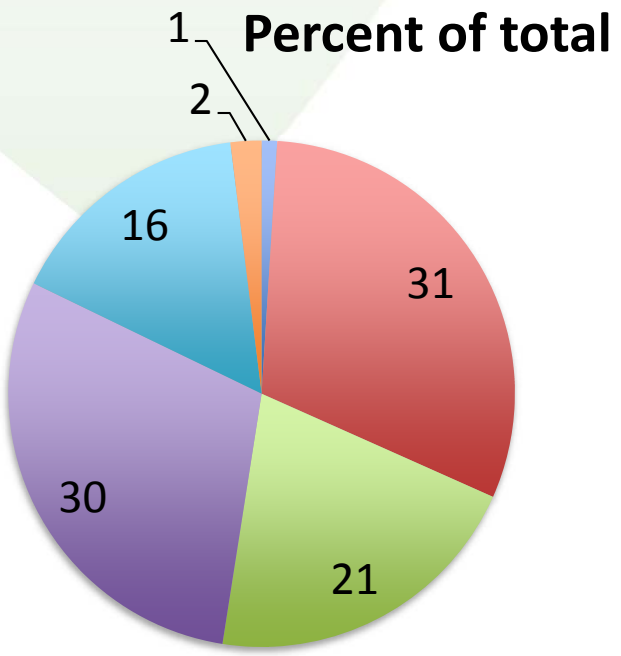
- "Allowed" includes cities that explicitly allow and regulate storefront dispensaries.
- As of August 2014 and through August 2015, this included 4 cities in Los Angeles County.

Results

Descriptive Statistics

Exploratory Bivariate Analyses

Age Distribution



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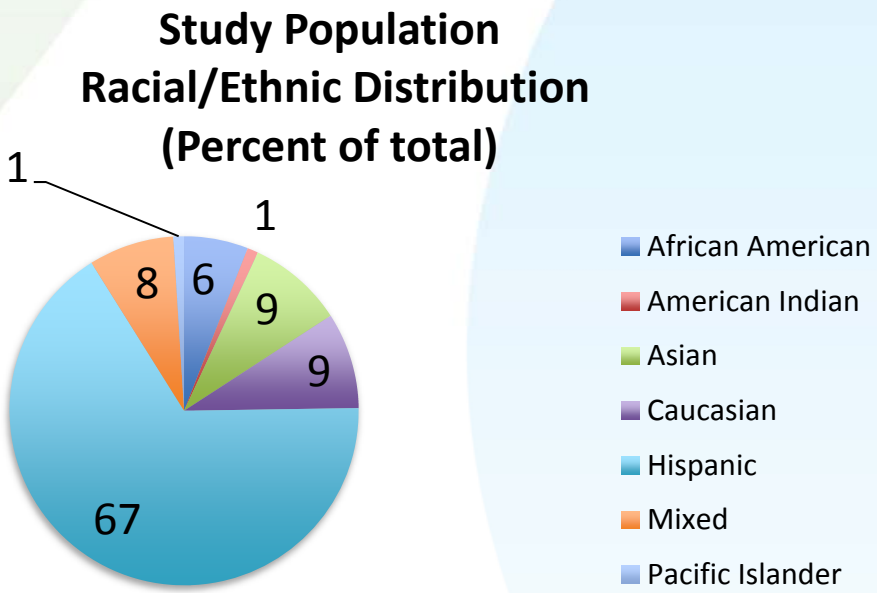
Race/Ethnicity: Study Population



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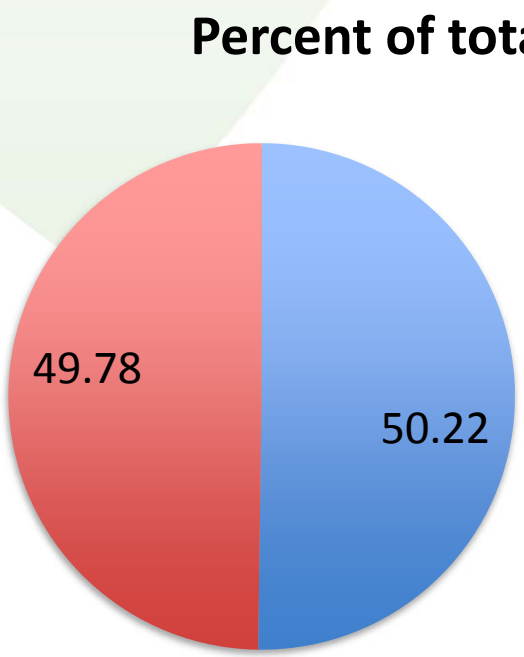
Gender



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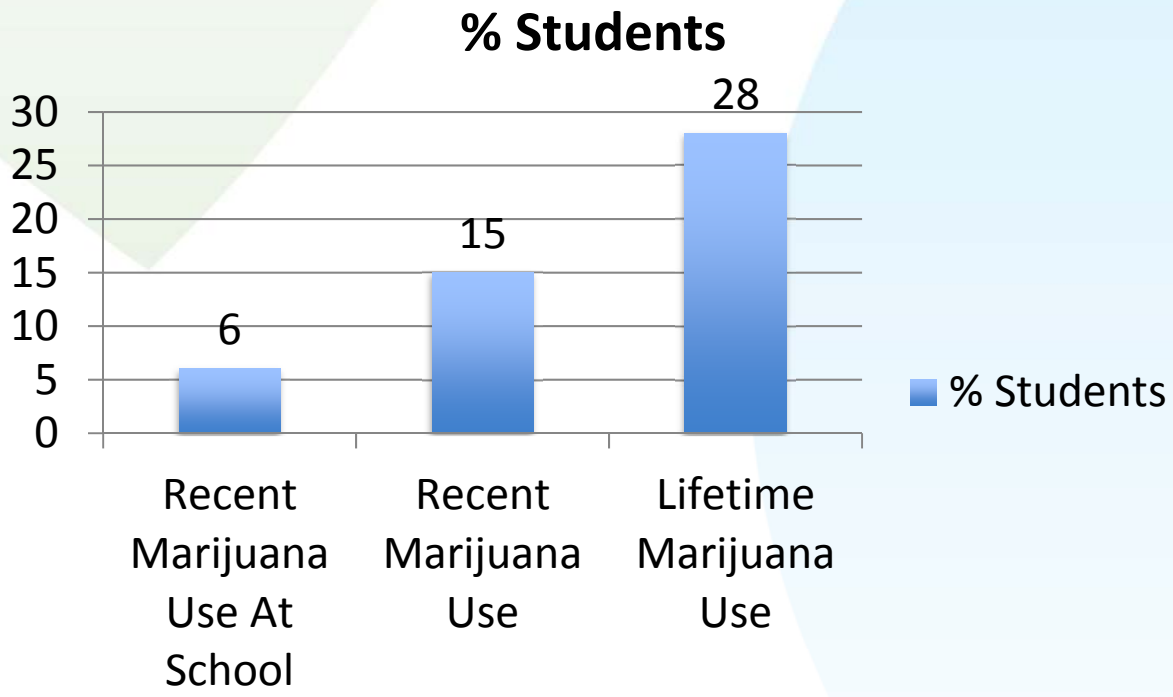
Student Marijuana Use



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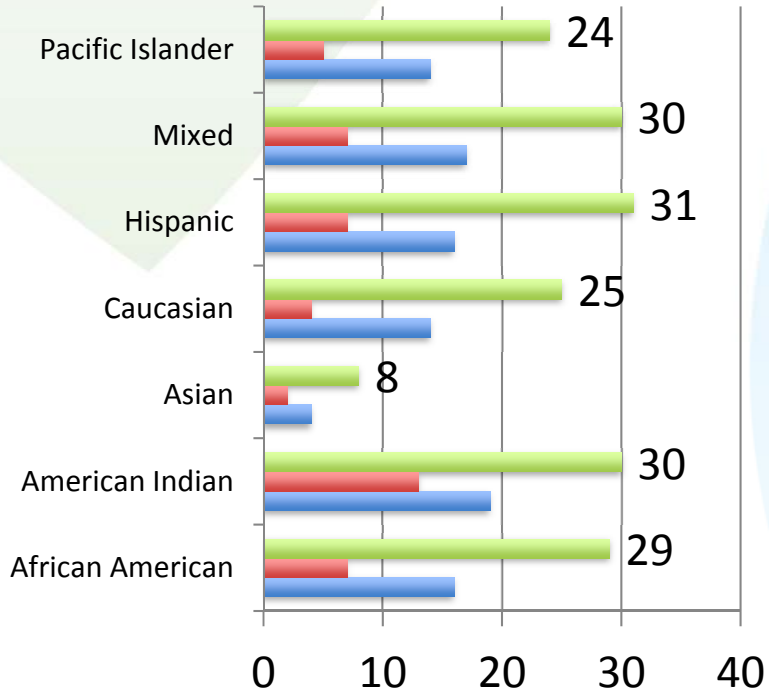
Student Marijuana Use by Race/Ethnicity



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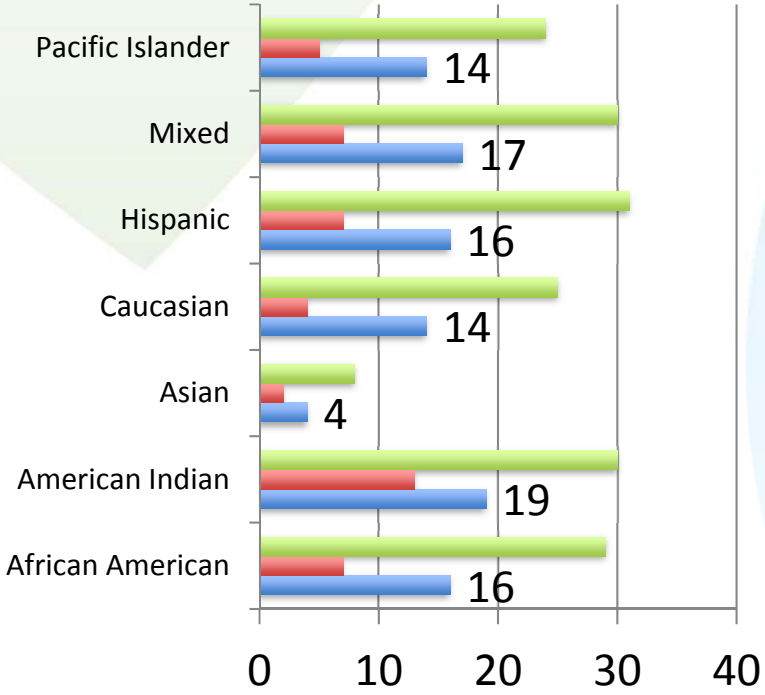

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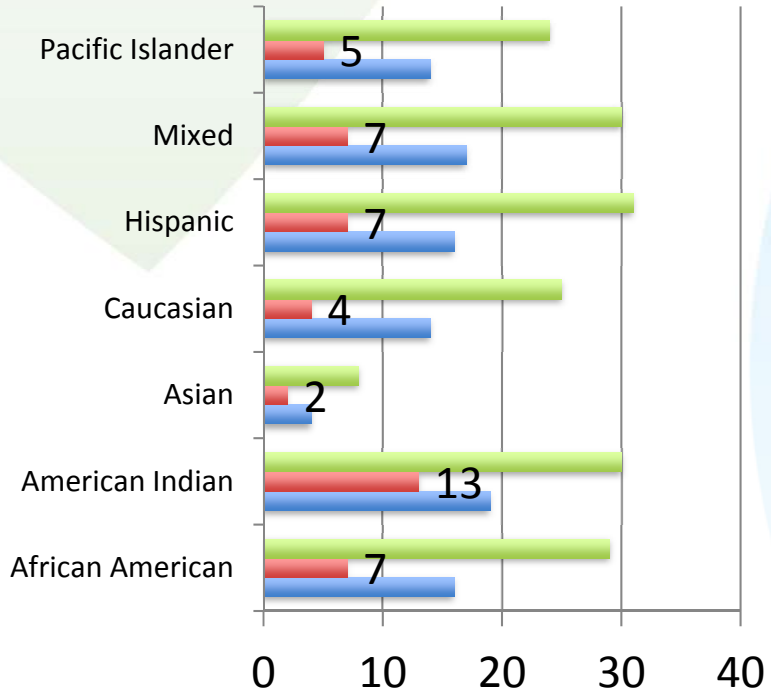

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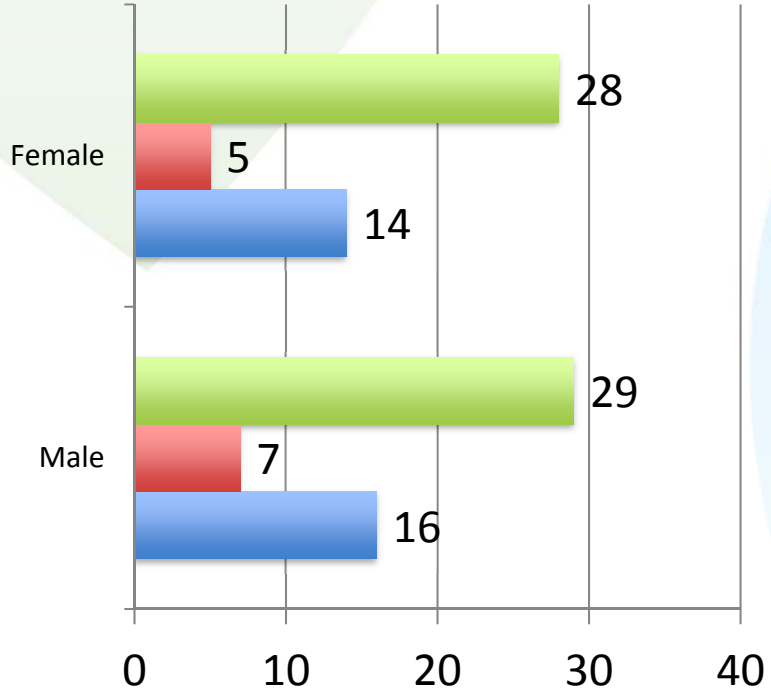
Student Marijuana Use by Gender



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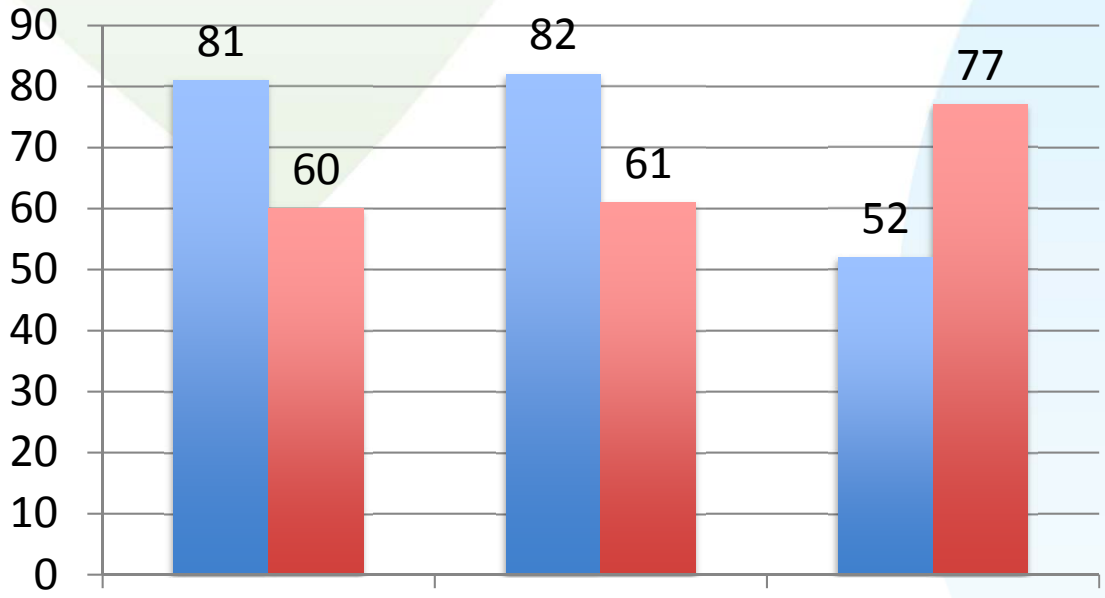
Do Students' Perceptions Predict Recent Marijuana Use?



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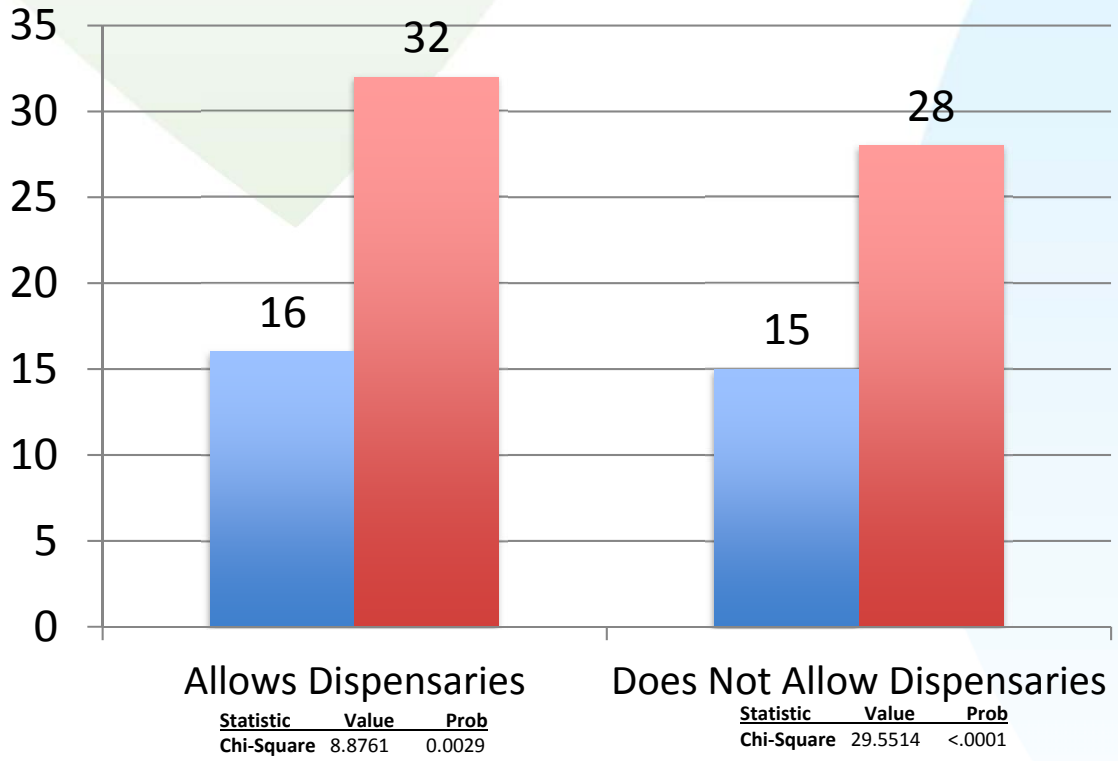
Do City Policies Predict Whether a Student Has Ever Used Marijuana?



Statistic	Value	Prob
Chi-Square	8.8761	0.0029

Statistic	Value	Prob
Chi-Square	29.5514	<.0001

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Hypotheses

- **Focal relationship:** City policies allowing marijuana dispensaries are associated with greater marijuana use among students attending school in that city.
- **Mediation Hypothesis 1:** City policies allowing marijuana dispensaries act on student marijuana use by reducing students' perceptions of the risk of marijuana use.
- **Mediation Hypothesis 2:** City policies allowing marijuana dispensaries act on student marijuana use by increasing their perceptions of the accessibility of marijuana.

Multilevel Analysis of Recent and Lifetime Marijuana Use by City Policy

- Non-significant relationship between students having recently used marijuana and whether their city allows marijuana storefronts (OR 1.191, p = 0.0989).
- Significant relationship between students having *ever* used marijuana and whether their city allows marijuana storefronts (OR 1.263, p = 0.0357).
- Hypothesized focal relationship is upheld only for lifetime marijuana use.

Allowing Dispensaries Impact on Youth Perceiving it Easy to Get Marijuana

- Non-significant relationship between policies allowing dispensaries and students perceptions of how easy it is to get marijuana (OR 0.965, p = 0.6457).
- Hypothesized relationship between city policies and perceptions of ease of access *is not supported*.

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Allowing Dispensaries Impacts on Youth Perceptions of the Risk of Marijuana Use

- Focal relationship remained statistically significant (OR 1.267, p = .0284) and is almost unchanged compared to when perception of risk was not accounted for (OR 1.263, p = 0.0357).
- Hypothesis that city policies act on student marijuana use by reducing their perception of the risk of marijuana use *is not supported*.

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Multilevel Analyses

Multilevel Logistic Regression

Analytical Approach

- Logistic regression.
- 2-level models to account for clustering in schools.
- Construct a final logistic model to assess relative influence of student characteristics, school characteristics, student perceptions, and students marijuana use.

Multilevel Model

- Logistic regression model accounts for students being clustered in schools.
  - Level 1 = student
  - Level 2 = school

Final Regression Model

Assess the relative contribution of demographic characteristics, student perceptions of risk and availability and the school norm for marijuana use to the relationship between city policies and lifetime marijuana use among students.

Empty Model

Measures the association of which school a student attends on students' lifetime marijuana use.

Fit Statistic	Value
-2 Log Likelihood	48297.09

Solutions for Fixed Effects								
Effect	**Estimate**	**Standard Error**	**DF**	**t Value**	**Pf > |t|**	**Alpha**	**Lower**	**Upper**
Intercept	-0.990	0.5304	91	-18.66	<.0001	0.05	-1.0954	-0.8846

Intraclass Correlation Coefficient	**0.06510**

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Focal Relationship

City policy allowing dispensaries effect on students' lifetime marijuana use, accounting for clustering in schools.

Odds Ratio Estimates				
Comparison	**Estimate**	**DF**	**95% Confidence Limits**	
Unit Change of Allowing Dispensaries from Mean	1.293	41484	1.044	1.601

The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure.

OR = 1 Exposure does not effect the odds of outcome
OR>1 Exposure associated with higher odds of outcome
OR<1 Exposure associated with lower odds of outcome.

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Focal Relationship + Students' Perceptions

City policy allowing dispensaries effect on students' lifetime marijuana use, accounting for clustering in schools and for student perceptions.

Odds Ratio Estimates				
Comparison	**Estimate**	**DF**	**95% Confidence Limits**	
Allowing Dispensaries	1.312	41476	1.078	1.595
Perceiving Access as "Easy"	3.598	41476	3.423	3.783
Perceiving Any Risk from Occasional Marijuana Use	0.388	41476	0.368	0.408

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Focal Relationship + Students' Perceptions + Student Characteristics

Odds Ratio Estimates				
Comparison	**Estimate**	**DF**	**95% Confidence Limits**	
Allow Dispensaries	1.351	40711	1.138	1.604
Perceive Easy Access	3.441	40711	3.269	3.623
Perceive Any Risk	0.394	40711	0.373	0.415
Hispanic	1.300	40711	1.228	1.377
Age	1.278	40711	1.251	1.304
Male	1.071	40711	1.021	1.122

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Focal Relationship + Students' Perceptions + Student Characteristics + School Norm

Odds Ratio Estimates				
Comparison	**Estimate**	**DF**	**95% Confidence Limits**	
Allow Dispensaries	1.198	40711	1.038	1.383
Perceive Easy Access	3.441	40711	3.269	3.623
Perceive Any Risk	0.0394	40711	0.0373	0.415
Hispanic	1.305	40711	1.233	1.382
Age (per year)	1.275	40711	1.249	1.301
Male	1.071	40711	1.022	1.122
High Marijuana Use School	1.691	40711	1.467	1.950

Findings

- City marijuana policies only had a significant influence on lifetime use.
  - Experimenting with or occasionally using marijuana carries lower risk of health harms than using monthly or more frequently.
  - There may not be much difference in a students' ability to get marijuana frequently or reliably between cities that allow dispensaries and cities that don't.
  - Rather, there may be easier opportunistic access to marijuana in cities that allow dispensaries, where it may be more likely for marijuana to be available for students to experiment with or use occasionally, but not more likely for them to have a reliable source.

Findings: Perceived Risk

- City marijuana policies that allow dispensaries did not significantly influence students' perceptions of the health risk of marijuana use.
  - Although perceptions of the health risk of marijuana use were associated with significantly lower odds of lifetime marijuana use, these perceptions are not influenced by city policies allowing dispensaries.
  - Years of changing attitudes toward marijuana in our society and increasing liberal state laws across the US are more likely factors to influence young people's perceptions of the risks of marijuana than city policies.
  - Future research should explore what students' perceptions of risk are based on, e.g., personal experience, having learned about marijuana from prevention programs in their school, etc.

Findings: Perceived Accessibility

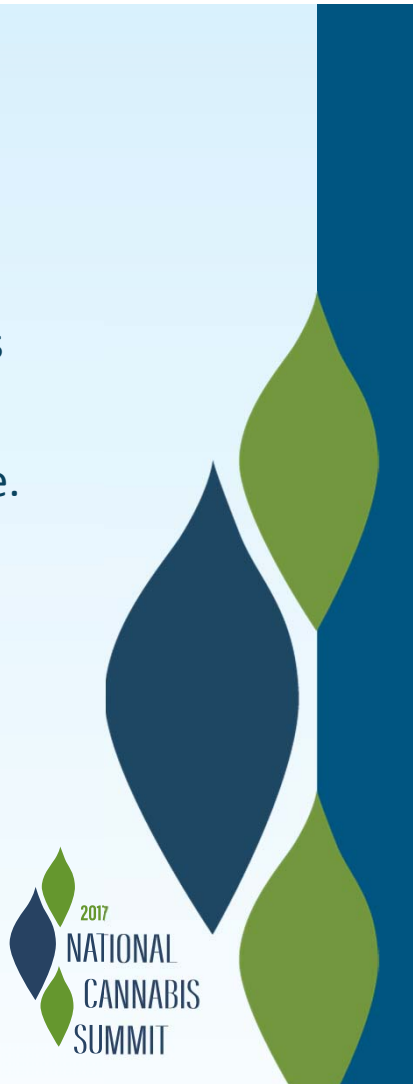
- Perceiving access to marijuana as easy was highly influential on students' marijuana use although perceptions of access were not tied to whether a city allows dispensaries.
  - Consistent with research indicating that adolescents obtain marijuana from social and black market sources.
  - Contrasts with research on youth use of alcohol and tobacco research findings that youth use is higher where adult access is easier (e.g., where there is a greater density of alcohol outlets).
  - Although perceiving easy access is influential on whether a student uses marijuana, other (unmeasured) factors determine whether a student will use marijuana or not :
    - Even though over half (55%) of the students perceived it to be easy to access marijuana, only 15% had used within the previous month and only 28% had ever used in their lifetime.

Recommendations

- Preventing direct youth access to marijuana from dispensaries looks to have been more successful than preventing diversion after sale. Limiting diversion of legally obtained marijuana to the black market and through social sources should be a priority to prevent youth use.

- Ongoing research is needed into the best approaches to limit youth access through social sources. E.g., could social host ordinances be amended to include marijuana?

- More research should be carried out on the factors that influence student's perceptions of the health risk of marijuana use, such as whether these perceptions are related to exposure to prevention programs or media campaigns.



Limitations and Strengths

- Limitations :
  - CHKS data is self-report and not intended to be representative of all California students but of each district.
  - Compliance with city policies varies.
    - E.g., dispensaries are found in cities and areas where they are banned.

- Strengths:
  - CHKS data is high quality and able to assess trends in youth marijuana use at the city level.
  - Fills a need for empirical evidence to support policy approaches to prevent youth marijuana use.
  - Immediate relevance to regulations under development for both medical and recreational marijuana.

Thank You!

Questions?

Contact: kbranson@ucla.edu