US Cannabis Legalization Contexts 2015–2021:

Cannabis Use by Edible, Smoking, Vaping and Perceived Risks Among Adolescents

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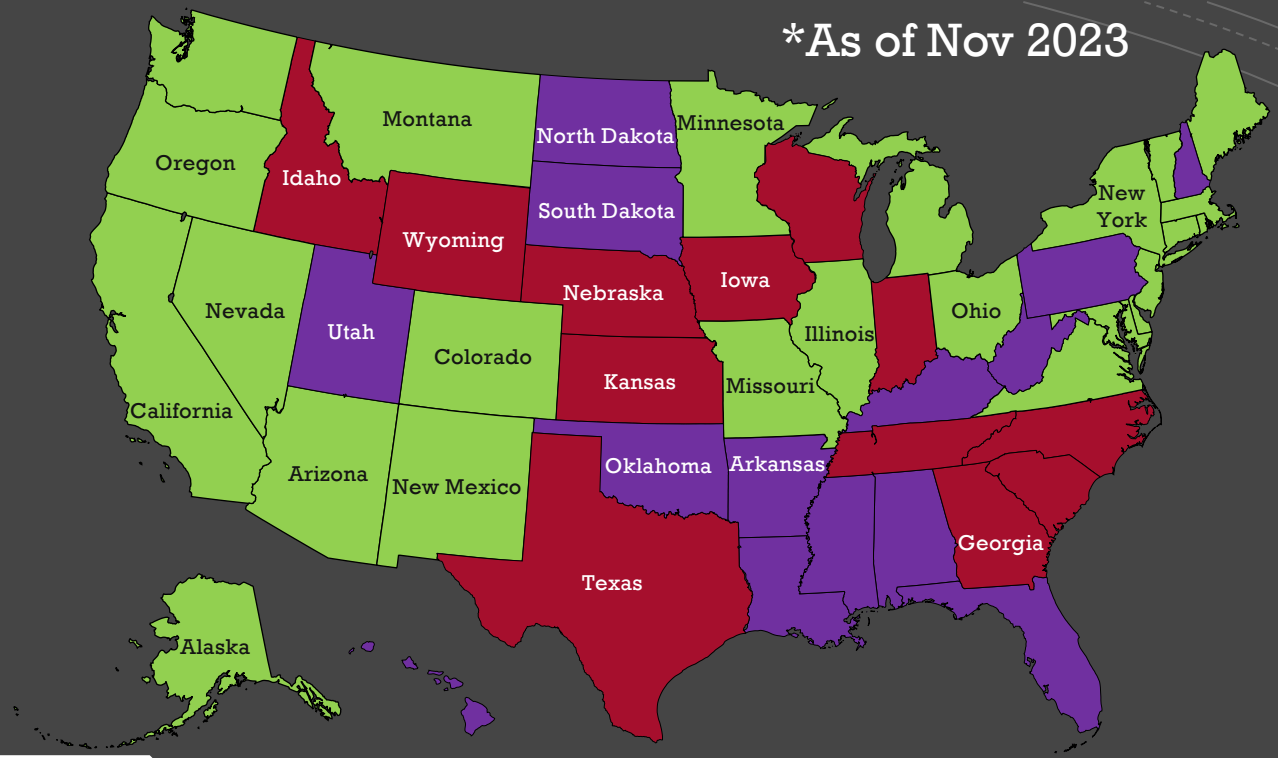
Medical-only(15)

Adult Use(23)

Prohibited(12)



Introduction

Cannabis Techniques → Edibles → Smoking → Vaping

Literature Review

Medical Legalization and Adolescent Use

- Research on *medical-only* legalization indicates
  - little to no change for cannabis use (Coley et al. 2019; Johnson et al. 2021; Keyes et al. 2016; Sarvet, Wall, Fink, et al. 2018); and
  - decreases among younger rather than older adolescents (e.g., 8th versus 12th graders) (Johnson et al. 2021; Keyes et al. 2016).

Adult Use Legalization and Adolescent Use

- Research on *medical-only* legalization indicates
  - no difference in use (Cerdá et al. 2017; Goodman et al. 2020; Midgette and Reuter 2020; Smart and Pacula 2019); and
  - some even found decreases for adolescents in these contexts (Anderson et al. 2019; Dilley et al. 2019; Midgette and Reuter 2020).
  - But see Borodovsky et al. (2017) and Cerdá et al. (2017).

Cannabis Legalization and Consumption Techniques

- In legal contexts, researchers have found increases in edible and vape use
  - in one's lifetime (Borodovsky et al. 2017;Nicksic et al. 2020; and
  - in the past year (Maynard and Schwartz 2023).

Cannabis Legalization and Perceived Risks

- Along with every other age group, compared to their earlier counterparts adolescents perceived cannabis as less risky (Cerdá et al. 2017; Fleming et al. 2016; Miech, Johnston, and O'Malley 2017; Sarvet, Wall, Fink, et al. 2018; Waddell 2022).
- Until recently, among adolescents, trends in cannabis use and associated risks paralleled one another. However, these trends diverged in the late 2000s (Fleming et al. 2016; Miech et al. 2017; Sarvet, Wall, Keyes, et al. 2018).

Research Question:

What is the relationship between legal cannabis contexts and alternative use techniques (edibles or vaping)?

In the previous year, compared to high school seniors attending school in prohibited contexts, those in legal contexts will be more likely to have:

- H1: vaped cannabis
- H2: used edibles
- H3: used cannabis via two or more techniques.
- H4: perceived fewer risks

Methodology [Data, Sample]

Data:

- Monitoring the Future (MTF): A Continuing Study of American Youth
  - Nationally representative survey on youth
  - Years: 2015-2021
  - Restricted use (included identifiers)

Sample Characteristics

- Population
  - US 12th graders
    - Survey for seniors provided more comprehensive questions regarding techniques used to consume cannabis

Survey Structure

- Core
  - Questions included were asked of all adolescents
- Appended Form 1
  - One of six possible forms appended to the core questionnaire
  - Each contain a subset of additional questions
  - Randomly distributed

Dep. Variables

- *Edible Use*
- *Smoking*
- *Vaping*
- *Multi-Technique Use(2+)*
- Dichotomized (0, 1) for any past-year use

Ind. Variables

Legal Context

- *Prohibited**
- *Medical-only*
- *Adult use*

Perceived Risk

- *None**
- *Slight*
- *Moderate*
- *Great*

Ctl. Variables

Sex

- Male*
- Female

Race

- White*
- Black
- Latinx
- Other/Multi

Methodology [Variables]

- * Indicates reference category in analysis

Data Analysis

Output produced

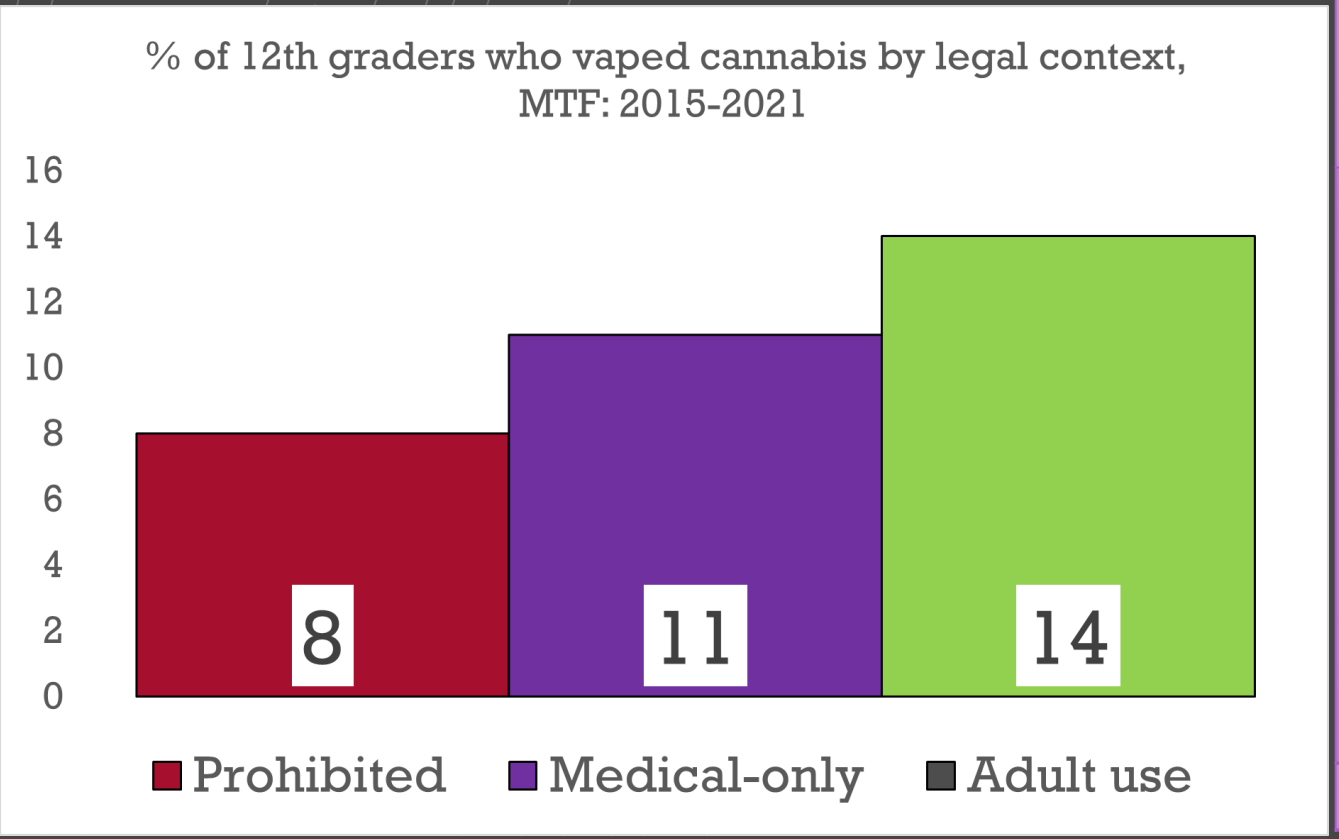
- Frequencies
- Cross-tabulations
  - Z-tests to detect significant differences across legal contexts

Logistic Regression

- Assessed multivariate associations between variables
- Used individual sampling and strata weights

Hypothesis 1 Result:

Compared to 12th graders in prohibited contexts, those in legal cannabis contexts were more likely to vape cannabis in the previous year.

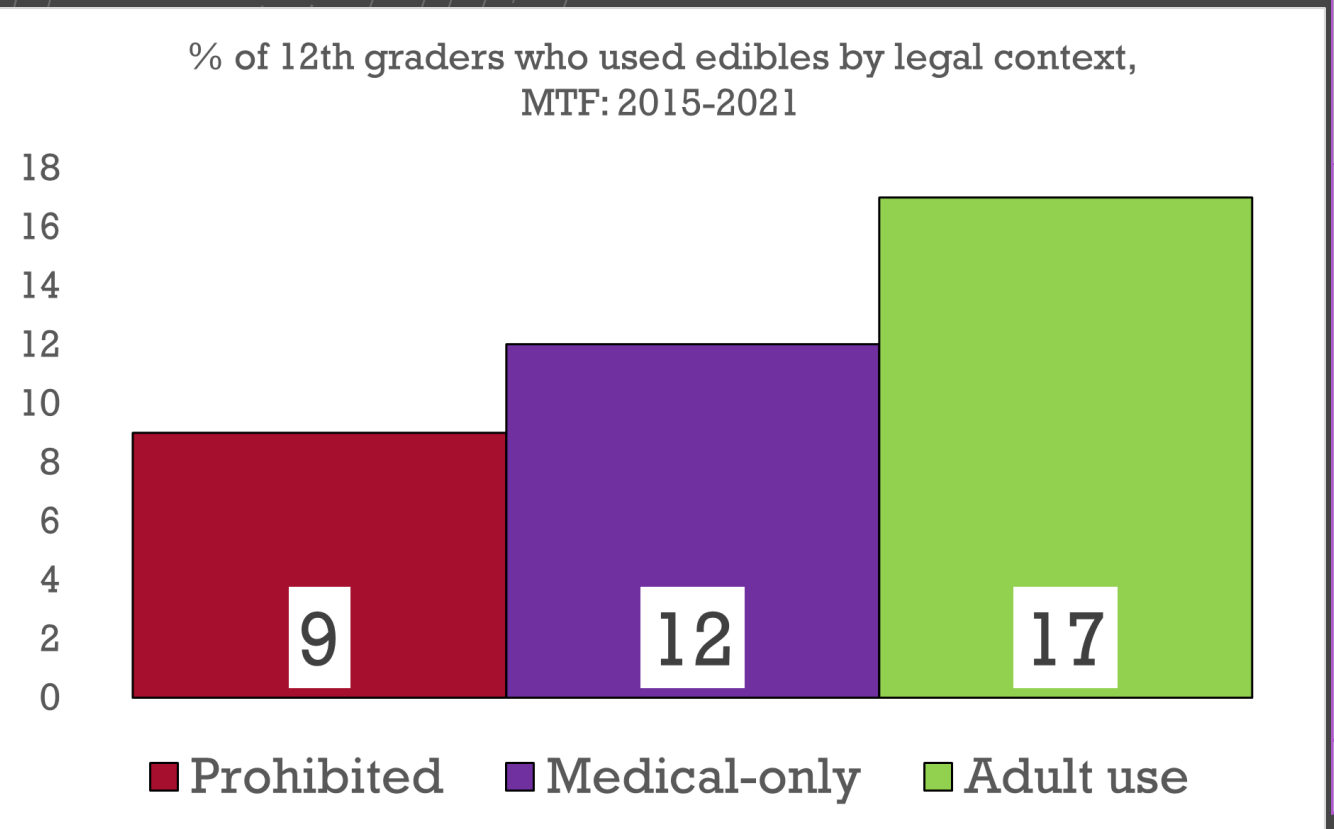


Logistic Regression Odds Ratio (standard errors and p-values)for Past Year Cannabis **Vaping** Based on Legal Context, Perceived Risk, and Controls (sex, race)

Table Key: Odds (Std. Err) • p<0.05, **p<0.01, ***p<0.00 • Note: controls omitted to save space	M1	M2
Legal Context (ref. Prohibited) Medical-Only	**1.28*** (0.14)	**1.25*** (0.14)
Adult-Use	**1.97***** (0.28)	**1.94***** (0.28)
Perceived Risk Reg Use (ref. No Risk) Slight	--	**0.77**** (0.07)
Moderate	--	**0.41***** (0.04)
Great	--	**0.2***** (0.03)
N	10133	10133

Hypothesis 2 Result:

Compared to 12th graders in prohibited contexts, those in legal cannabis contexts were more likely to use edibles in the previous year.

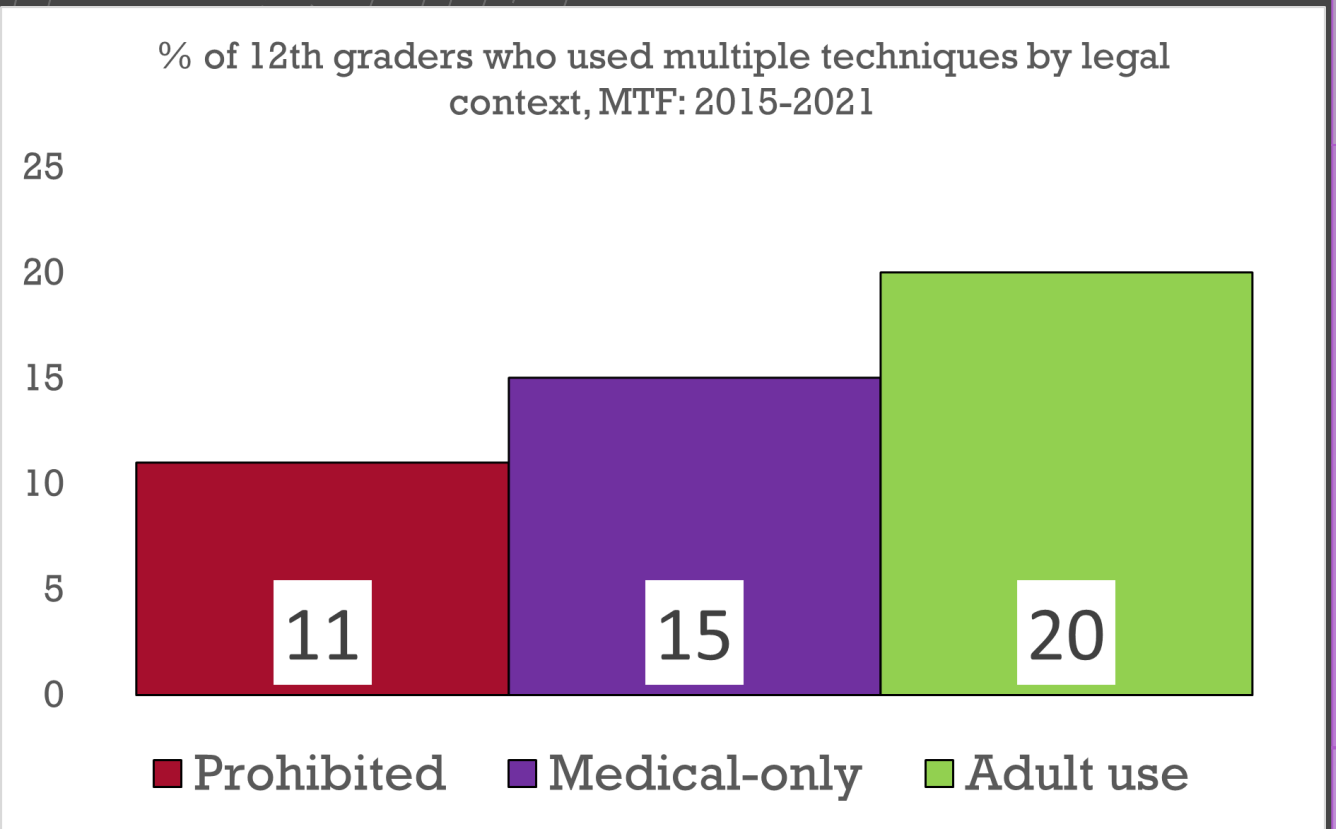


Logistic Regression Odds Ratio (standard errors and p-values) for Past Year Edible Use Based on Legal Context, Perceived Risk, and Controls (sex, race)

Table Key: Odds (Std. Err) • p<0.05, **p<0.01, ***p<0.00 • Note: controls omitted to save space	M1	M2
Legal Context (ref. Prohibited) Medical-Only	**1.48***** (0.17)	**1.47***** (0.17)
Adult-Use	**2.32***** (0.29)	**2.33***** (0.29)
Perceived Risk Reg Use (ref. No Risk) Slight	--	**0.77**** (0.07)
Moderate	--	**0.34***** (0.04)
Great	--	**0.13***** (0.07)
N	10133	10133

Hypothesis 3 Result:

Compared to 12th graders in prohibited contexts, those in legal cannabis contexts were more likely to use two or more techniques in the previous year.

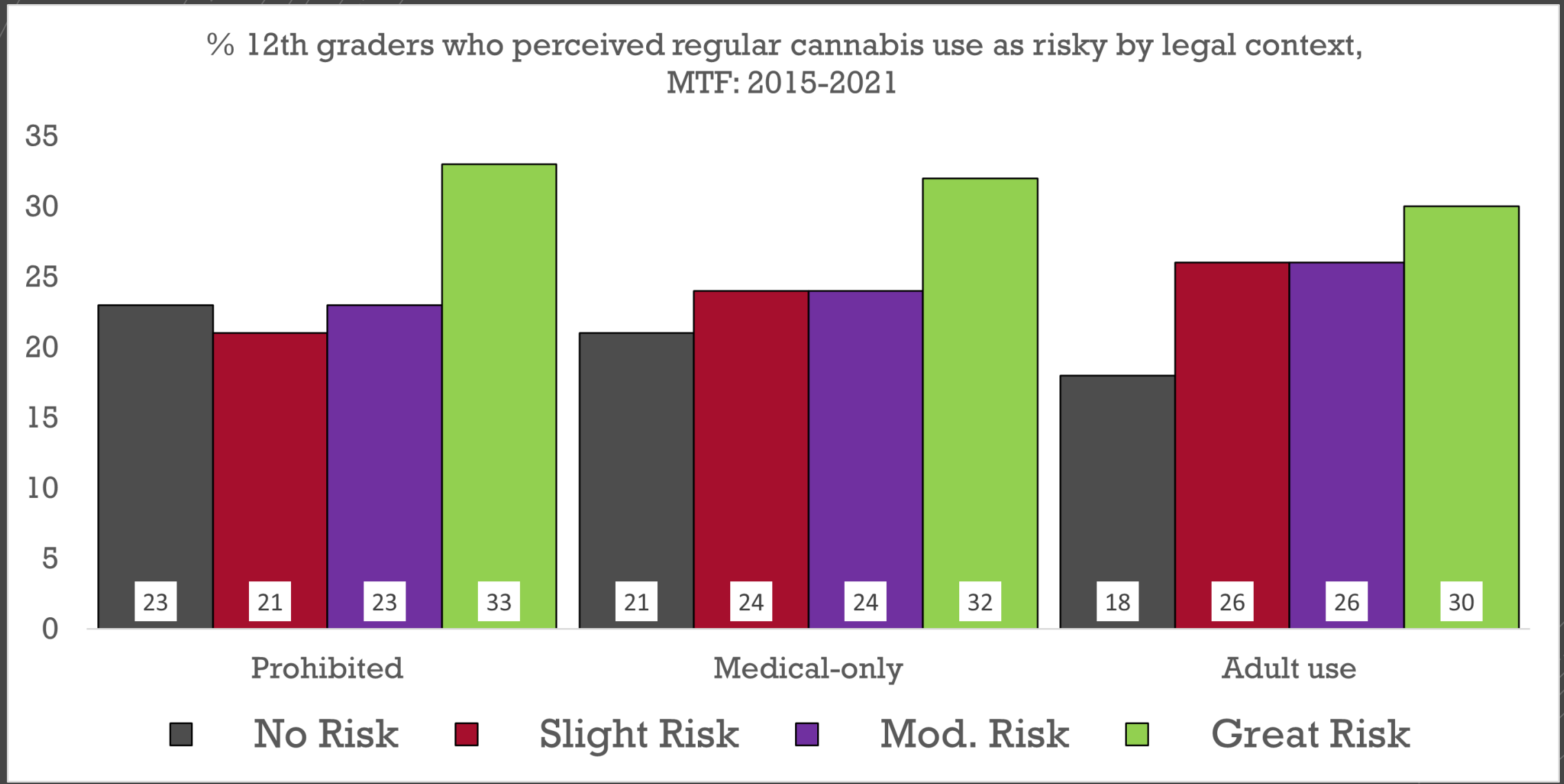


Logistic Regression Odds Ratio (standard errors and p-values) for Past Year Multi-Technique Based on Legal Context, Perceived Risk, and Controls (sex, race)

Table Key: Odds (Std. Err) • P<0.1 Bold-only, p<0.05, **p<0.01, ***p<0.00 • Note: controls omitted to save space	M1	M2
Legal Context (ref. Prohibited)		
Medical-Only	**1.38*** (0.14)	**1.37*** (0.14)
Adult-Use	**1.99*** (0.23)	**1.97*** (0.22)
Perceived Risk Reg Use (ref. No Risk)		
Slight	--	**0.85** (0.08)
Moderate	--	**0.36*** (0.04)
Great	--	0.14*** (0.02)
N	10133	10133

Hypothesis 4 Result:

Compared to 12th graders in prohibited contexts, those within legal contexts perceived more moderate risk with regular cannabis use



Discussion and Conclusion [1/2]

Findings

- In the previous year, compared to high school seniors attending school in prohibited contexts, those in legal contexts were more likely to have:

H1: vaped cannabis

- Like Borodovsky et al.'s (2017) and Nicksic et al. (2020), we found that compared to those in prohibited contexts, individuals in a legal context were more likely to vape cannabis.

H2: used edibles

- Like Borodovsky et al. (2017), we note that adolescents were more likely to consume edibles in legal contexts. Effect sizes were larger for the likelihood of using an edible compared to the likelihood of vaping.

H3: used cannabis via two or more techniques.

- To my knowledge, there is limited research on US adolescents regarding using multiple techniques by legal contexts; however, findings on Canadian youth suggest that eating and vaping cannabis may be more common in legal contexts (see Doggett et al. 2019).

H4: perceived moderate risks

- Within legal contexts, we found that responses gravitated towards central tendency responses (slight or moderate risk); however, within prohibited contexts, responses polarized (no risk, great risk).

Discussion and Conclusion [2/2]

Limitations

- Cannot generalize to populations other than:
  - 12th graders in 2015-2021
- Causal inferences cannot be made
  - Cross-sectional dataset
- Question wording for *perceived risk* (Dillman, Smyth, and Christian 2014)
  - Asked about "smoking" regularly
    - Individuals may ascribe different levels of risks (or stigma) to the same drug based on the technique used (Zinberg 1986)

Future Research

- These analyses did not account for the operation of dispensaries.
  - FR: Include a measurement for whether certain provisions, such as commercial sales or cultivation were permitted
    - While states legalized cannabis use, many of these states took several years to commence commercial sales for *medical-only* and *adult use* consumers (Marijuana Policy Project 2021). Further, storefronts act as a pivotal part of cannabis legalization, likely spurring awareness through marketing (Wexler 2023).

Thank You

Questions?

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