

# Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

## **eMethods. Additional details on data source and participants, measures, and analysis.**

### **Data Source and Participants**

The current study uses data from the 2023 Monitoring the Future study (MTF), an annual cross-sectional nationally representative classroom-based survey of US youth that uses a complex multistage sampling design. In 2023, there were 11,282 total 12th grade students enrolled at participating MTF schools, of which 9,619 students were expected for participation because their classroom was selected to take part in the study. Among the 7,604 non-absent survey completers (79.1% response rate), 2,533 were randomly assigned to receive delta-8-THC use questions. After excluding 347 students with past-12-month delta-8-THC or marijuana use missing data, the final analytic sample had 2,186 students (see eFigure 2).

### **Measures**

Participants reported the number of occasions they used delta-8-THC and marijuana in the past 12-months in separate questions with forced choice response options (0, 1-2, 3-5, 10-19, 20-39, and 40+ occasions); questions were based on MTF assessments of past-year use of other substances that have been successfully used extensively in prior MTF years. As this was the first time MTF assessed delta-8-THC, students were randomly assigned 1:1 to receive one of two delta-8-THC questions, asking on how many occasions they had taken, "...delta 8 THC to get high?" or "...delta-8 to get high? It comes from hemp and is put in gummies or is vaped." Because prevalence estimates for the two questions did not significantly differ (11.0%[95%CI:7.8 to 14.2] and 11.7%[95%CI:8.4 to 15.0], respectively), the two random subsamples of the overall analytic sample of 2,186 students were combined for analyses.

Demographic factors were measured using separate self-report items with forced choice response options assessing sex (male, female, other sex or prefer not to answer), race/ethnicity (Hispanic [Chicano, Cuban, Puerto Rican, other Hispanic], Asian American, White, Multiracial [more than one race/ethnicity selected], and all other race/ethnicities [American Indian, Native Hawaiian, Middle Eastern]), and parental education (college education, no college education). Census region (West, South, Northeast, Midwest) and cannabis policy variables were classified for each student based on the state where their school was located. State-level delta-8-THC policies were coded as having regulations (i.e., state has regulations that either ban or restrict the sale of delta-8-THC products in some form) vs. no delta-8-THC legislation at all. State-level policies for adult-use marijuana were coded as legal vs. not legal. Policy exposure variables were classified as of January 1<sup>st</sup>, 2023 (6 weeks before data collection commenced). Cannabis policies were identified based on information available from state government agency websites (e.g., health departments and cannabis control bureaus), including legislative text and government memorandums; eTable 1 provides details on state policy classifications and eTable 2 provides sources used to derive classifications.

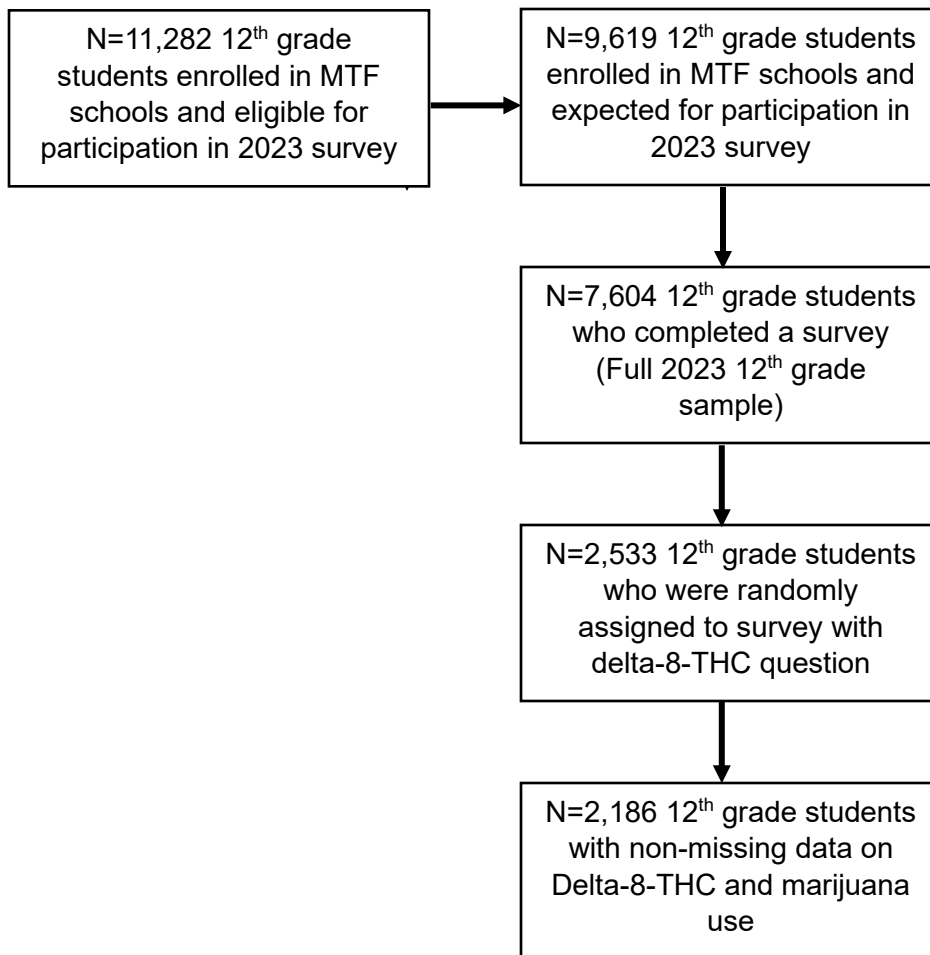
### **Analysis**

When examining the association of each correlate (sex, race/ethnicity, parental education, census region, state-level delta-8-THC policies, state-level marijuana legalization) with delta-8-THC and marijuana use, we used the category with the largest N as the reference group. Models adjusted for individual-level sociodemographic factors (sex, race/ethnicity, and parental education). We did not mutually adjust for census region, state-level delta-8-THC policies, and state-level cannabis legalization in the same models given high collinearity. For categorical exposure variables with 3+ groups, we also identified cases in which a paring of two non-referent groups from the initial analysis differed based on outcome prevalence estimates with non-overlapping 95% CIs.

eFigure 1. Images of Example Delta-8-THC Products and Marketing



**eFigure 2. Consort Diagram**



**eTable 1. State-Level Policy Classifications for Delta-8-THC and Adult-Use Marijuana Legalization**

State	Delta-8 Regulation as of 1/1/23 <sup>a</sup>	Delta-8 Regulation as of 1/1/22 <sup>b</sup>	Adult-Use Marijuana as of 1/1/23 <sup>a</sup>	Adult-Use Marijuana as of 1/1/22 <sup>b</sup>	Included in 2023 MTF Survey <sup>c</sup>	Census-Region
Alabama	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Alaska	Banned	Banned	Legal	Legal	No	West
Arizona	Not Regulated	Not Regulated	Legal	Legal	Yes	West
Arkansas	Not Regulated	Not Regulated	Not Legal	Not Legal	No	South
California	Regulated	Regulated	Legal	Legal	Yes	West
Colorado	Banned	Banned	Legal	Legal	No	West
Connecticut	Regulated	Regulated	Legal	Legal	No	Northeast
Delaware	Banned	Banned	Not Legal	Not Legal	No	Northeast
Florida	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Georgia	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Hawaii	Banned	Regulated	Not Legal	Not Legal	No	West
Idaho	Banned	Banned	Not Legal	Not Legal	No	West
Illinois	Not Regulated	Not Regulated	Legal	Legal	Yes	Midwest
Indiana	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	Midwest
Iowa	Regulated	Regulated	Not Legal	Not Legal	No	Midwest
Kansas	Regulated	Regulated	Not Legal	Not Legal	No	Midwest
Kentucky	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Louisiana	Regulated	Regulated	Not Legal	Not Legal	Yes	South
Maine	Not Regulated	Not Regulated	Legal	Legal	Yes	Northeast
Maryland	Regulated	Not Regulated	Not Legal	Not Legal	No	South
Massachusetts	Banned	Not Regulated	Legal	Legal	No	Northeast
Michigan	Regulated	Regulated	Legal	Legal	Yes	Midwest
Minnesota	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	Midwest
Mississippi	Not Regulated	Not Regulated	Not Legal	Not Legal	No	South
Missouri	Not Regulated	Not Regulated	Legal	Not Legal	Yes	Midwest
Montana	Banned	Banned	Legal	Legal	Yes	West
Nebraska	Not Regulated	Not Regulated	Not Legal	Not Legal	No	Midwest
Nevada	Banned	Banned	Legal	Legal	No	West
New Hampshire	Not Regulated	Not Regulated	Not Legal	Not Legal	No	Northeast
New Jersey	Not Regulated	Not Regulated	Legal	Legal	No	Northeast
New Mexico	Not Regulated	Not Regulated	Legal	Legal	No	West
New York	Banned	Banned	Legal	Legal	Yes	Northeast
North Carolina	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
North Dakota	Banned	Banned	Not Legal	Not Legal	No	Midwest
Ohio	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	Midwest
Oklahoma	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Oregon	Banned	Not Regulated	Legal	Legal	Yes	West
Pennsylvania	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	Northeast
Rhode Island	Banned	Banned	Legal	Not Legal	No	Northeast

<b>State</b>	<b>Delta-8 Regulation as of 1/1/23<sup>a</sup></b>	<b>Delta-8 Regulation as of 1/1/22<sup>b</sup></b>	<b>Adult-Use Marijuana as of 1/1/23<sup>a</sup></b>	<b>Adult-Use Marijuana as of 1/1/22<sup>b</sup></b>	<b>Included in 2023 MTF Survey<sup>c</sup></b>	<b>Census-Region</b>
South Carolina	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
South Dakota	Regulated	Not Regulated	Not Legal	Not Legal	No	Midwest
Tennessee	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Texas	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Utah	Banned	Banned	Not Legal	Not Legal	No	West
Vermont	Banned	Banned	Legal	Legal	Yes	Northeast
Virginia	Regulated	Not Regulated	Legal	Legal	No	South
Washington	Banned	Banned	Legal	Legal	Yes	West
Washington, D.C.	Not Regulated	Not Regulated	Legal	Legal	No	South
West Virginia	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	South
Wisconsin	Not Regulated	Not Regulated	Not Legal	Not Legal	Yes	Midwest
Wyoming	Not Regulated	Not Regulated	Not Legal	Not Legal	No	West

<sup>a</sup>States with regulations prior to January 1, 2023 were included in the primary analysis.

<sup>b</sup>States with regulations prior to January 1, 2022 were included in the sensitivity analysis.

<sup>c</sup>Reports whether state was included in 2023 MTF survey (and thus included in the current study).

**eTable 2. Sources of State Policy Classifications for States with Delta-8-THC and/or Adult-Use Marijuana Legalization by January 1<sup>st</sup>, 2023**

State	Delta-8-THC Policy Source <sup>a</sup>	Marijuana Legalization Source <sup>b</sup>
Alaska	<a href="#">Senate Bill 27</a>	<a href="#">Ballot Measure 2 (FAQ from Div. of Public Health)</a>
Arizona	n/a	<a href="#">Proposition 207</a>
California	<a href="#">Assembly Bill 45</a>	<a href="#">Proposition 64</a>
Colorado	<a href="#">Memo from Dept. of Health</a>	<a href="#">Amendment 64</a>
Connecticut	<a href="#">Attorney General Press Release</a>	<a href="#">Senate Bill 1201</a>
Delaware	<a href="#">Title 16</a>	n/a
Hawaii	<a href="#">Dept. of Health Rules Chapter 11-850</a>	n/a
Idaho	<a href="#">House Bill 126</a>	n/a
Illinois	n/a	<a href="#">House Bill 1438</a>
Iowa	<a href="#">Dept. of Health and Human Services Consumable Hemp Program</a> <a href="#">Iowa Code Chapter 204</a> <a href="#">Iowa Administrative Code 641, Chapter 156</a>	n/a
Kansas	<a href="#">Attorney General opinion</a>	n/a
Louisiana	<a href="#">House Bill 640</a> <a href="#">House Bill 758</a>	n/a
Maine	n/a	<a href="#">LD 1719</a>
Maryland	<a href="#">Senate Bill 788</a>	n/a
Massachusetts	<a href="#">Memo from Dept. of Agriculture</a>	<a href="#">Cannabis Control Commission Legislation</a>
Michigan	<a href="#">House Bill 4517</a> <a href="#">Statement Cannabis Regulatory Agency</a>	<a href="#">Michigan Regulation and Taxation of Marihuana Act</a>
Missouri	n/a	<a href="#">FAQs from Dept. of Health</a>
Montana	<a href="#">State Controlled Substances List</a>	<a href="#">FAQs from Cannabis Control Division</a>
Nevada	<a href="#">Senate Bill 49</a>	<a href="#">Recreational Marijuana in Nevada Fact Sheet</a>
New Jersey	n/a	<a href="#">Cannabis Regulatory Commission Information</a>
New Mexico	n/a	<a href="#">Cannabis Regulation Act</a>
New York	<a href="#">Press Release Office of Cannabis Management</a>	<a href="#">Marihuana Regulation &amp; Taxation Act</a>
North Dakota	<a href="#">House Bill 1045</a>	n/a
Oregon	<a href="#">House Bill 3000</a>	<a href="#">Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act</a>
Rhode Island	<a href="#">House Bill 5151</a>	<a href="#">Rhode Island Cannabis Act</a>
South Dakota	<a href="#">House Bill 1292</a>	n/a
Utah	<a href="#">Senate Bill 105</a>	n/a
Vermont	<a href="#">Statement from Agency of Agriculture Food and Markets</a>	<a href="#">H.511</a> <a href="#">S.54</a> <a href="#">Cannabis Control Board Laws, Rules, and Regulations</a>
Virginia	<a href="#">Press Release from Dept. of Agriculture and Consumer Services</a>	<a href="#">Virginia Cannabis Control Authority FAQ</a>
Washington	<a href="#">Policy Statement Liquor and Cannabis Board</a>	<a href="#">Initiative 501 Information from the Liquor and Cannabis Board</a>
Washington, D.C.	n/a	<a href="#">Initiative 71</a>

<sup>a</sup>Cross-checked with <https://cbdoracle.com/news/policy/delta-8-thc-legal/> <sup>b</sup>Cross-checked with <https://www.ncsl.org/civil-and-criminal-justice/cannabis-overview> and <https://alcoholpolicy.niaaa.nih.gov/cannabis-policy-topics/recreational-use-of-cannabis-volume-1/104>

**eTable 3. Distribution of number of occasions used delta-8-THC and marijuana use among youth who reported past 12-month use**

<b>Number of Occasions Used in Past 12-months</b>	<b>Delta-8-THC Use Column % (95%CI)<sup>a</sup></b>	<b>Marijuana Use Column % (95%CI)<sup>b</sup></b>
1 to 2 times	31.9 (24.6 to 39.2)	28.3 (23.9 to 32.6)
3 to 5 times	21.9 (16.1 to 27.7)	13.4 (16.9 to 3.5)
6 to 9 times	10.8 (5.7 to 16.0)	8.7 (6.4 to 11.0)
10 to 19 times	10.5 (5.4 to 15.5)	12.5 (7.4 to 17.6)
20 to 39 times	8.1 (4.5 to 11.6)	9.0 (6.4 to 11.7)
40+ times	16.8 (11.0 to 22.6)	28.0 (24.4 to 31.7)

<sup>a</sup>Includes n=295 participants who reported using delta-8-THC at least once in the past 12 months

<sup>b</sup>Includes n=651 participants who reported using marijuana use at least once in the past 12 months



**eTable 4. Policy Correlates of Delta-8-THC and Marijuana Use in US 12<sup>th</sup> Graders in 2023: Stricter Cutoff for Date of Regulation (n=2,186)**

	Past 12-month Delta-8 Use		Past 12-month Marijuana Use	
	Row % (95%CI) (weighted)	Risk Difference (95%CI)	Row % (95%CI) (weighted)	Risk Difference (95%CI)
<b>Legal Status of Adult-Use Marijuana</b>				
Marijuana not legal	14.1 (10.5 to 17.7)	Reference	29.4 (25.5 to 33.3)	Reference
Marijuana legal <sup>a</sup>	7.3 (4.4 to 10.1)	-6.9 (-11.5 to -2.3)	32.0 (24 to 39.9)	2.6 (6.3 to 11.5)
<b>Legal Status of Delta-8-THC</b>				
Delta-8-THC regulated <sup>b</sup>	5.7 (2.9 to 8.5)	-8.5 (-12.7 to -4.2)	30.8 (22.2 to 39.4)	0.6 (-8.9 to 10.1)
No delta-8-THC legislation	14.2 (11.0 to 17.4)	Reference	30.2 (26.1 to 34.3)	Reference

<sup>a</sup>States with adult-use marijuana legalization prior to January 1<sup>st</sup>, 2022: Arizona, California, Illinois, Maine, Michigan, Montana, New York, Oregon, Vermont, Washington

<sup>b</sup>States where Delta-8-THC was regulated prior to January 1<sup>st</sup>, 2022: California, Louisiana, Michigan, Montana, New York, Vermont, Washington

**eTable 5. Association of Delta-8-THC Policy with Delta-8-THC and Marijuana Use in US 12th Graders in 2023: Three-level policy variable (n=2,186)**

	Past 12-month Delta-8 Use		Past 12-month Marijuana Use	
	Row % (95%CI) (weighted)	Risk Difference (95%CI)	Row % (95%CI) (weighted)	Risk Difference (95%CI)
<b>Legal Status of Delta-8-THC</b>				
Banned <sup>a</sup>	5.3 (0.4 to 10.2)	-9.1 (-15.0 to -3.2)	34.9 (25.6 to 44.2)	4.6 (-5.6 to 14.8)
Restricted <sup>b</sup>	6.1 (2.8 to 9.3)	-8.3 (-12.3 to -3.6)	27.6 (17.6 to 37.5)	-2.7 (-13.5 to 8.1)
No Legislation <sup>c</sup>	14.4 (11.1 to 17.6)	Reference	30.3 (26.1 to 34.5)	Reference

<sup>a</sup>MTF-included states where delta-8-THC was banned prior to January 1<sup>st</sup>, 2023: Montana, New York, Oregon, Vermont, Washington; includes 14.5%(95%CI: 2.1-26.9) of full sample.

<sup>b</sup>MTF-included states where delta-8-THC was restricted prior to January 1<sup>st</sup>, 2023: California, Louisiana, Michigan; includes 20.3%(95%CI: 3.3-37.3) of full sample.

<sup>c</sup>MTF-included states with no delta-8-THC legislation prior to January 1<sup>st</sup>, 2023: Alabama, Arizona, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maine, Minnesota, Missouri, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, West Virginia, Wisconsin; includes 65.2%(95%CI: 49.5-81.0) of full sample.