

Vermont Cannabis Control Board

Report to the General Assembly
Pursuant to Section 22 of Act 158 (2022)

December 30, 2022



Overview

- **Background and Requirements**
- **Key Findings**
- **What are Solid Concentrates?**
- **Survey of States**
- **Dosing and Equivalency**
- **Survey of the Research**
- **Estimate of the Market**
- **Recommendations**

Background and Requirements

- Cannabis Control Board
- Consultant
- Requirements of the Report
- Vermont's Potency Limits

Cannabis Control Board

The three-member Cannabis Control Board (CCB) was established through Act 164 of 2020 for the purpose of safely, equitably implementing and administering the laws and rules regulating adult-use cannabis (marijuana) in Vermont. It is responsible for establishing, administering, and regulating a cannabis regulatory system for commercial cannabis cultivators, wholesalers, product manufacturers, retailers and testing laboratories.



James Pepper (Chair)



Kyle Harris



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Requirements of the Report

Act 158 (2022), Section 22 states:

“On or before December 1, 2022, the Cannabis Control Board shall report to the General Assembly with a summary of the regulated market share for solid concentrates above 60% THC and the status of the illicit market for those products in other states with a regulated adult-use cannabis market.”

7 V.S.A. Ch. 33, Sec. 868 states:

- (a) The following are prohibited products and may not be cultivated, produced or sold pursuant to a license issued under this chapter:
- (1) Cannabis flower with greater than 30 percent tetrahydrocannabinol
 - (2) Solid concentrate cannabis products with greater than 60 percent tetrahydrocannabinol

Key Findings

- Top Takeaways from the Research
- Main Recommendation

Top Takeaways from the Research

- Few states currently impose a percentage-based THC limit on solid concentrate products.
- The current research suffers from limits created by federal prohibition and no scientific consensus has emerged on the potential mental health effects of using high-potency solid concentrates.
- Other states such as Massachusetts and Colorado have concluded that the existing literature on the use of high-potency products is not suitable to drawing accurate, reliable conclusions.

Top Takeaways from the Research (Cont.)

- Creating low-potency solid concentrates would necessitate incorporating filler into the products, which could have negative health consequences, as seen with the EVALI crisis.
- Consumer education is key to ensuring safe dosing and proper serving sizes.
- Solid concentrates make up a small, but significant portion of the existing Vermont illicit market, representing an estimated 4%-8% of consumption and an estimates \$12,720,000 to \$25,440,000 in revenue.
- A prohibition on solid concentrates with THC percentage greater than 60% is likely to keep all solid concentrate sales in the illicit market.

Main Recommendation – A Four Part Plan to Promote Public Safety Regarding Concentrates

- 1. Remove the potency cap for solid concentrates.**
- 2. Authorize consumer education campaigns and youth prevention programs.**
- 3. Use a portion of the revenue at the Department of Health for substance misuse prevention programs to fund these education programs.**
- 4. Make public health information, including safe dosage information, readily available.**

What are Solid Concentrates?

- What are Solid Concentrates?
- How are Solid Concentrates Made?
- How to Produce a “Low-Potency” Concentrate
- Dangers of Using Filler to Dilute Concentrate

What are Solid Concentrates?

- Solid concentrates are products that are THC-rich, hold a variety of cannabinoids and terpenes, and do not contain plant material.
- They are designed to be heated and inhaled.
- Concentrates are created by using some form of extraction.
- Some common names for cannabis concentrate products are dabs, shatter, wax, and bubble hash.

How are Solid Concentrates Made?

- There are three main methods manufacturers utilize to produce cannabis concentrates:
 - Solvent-based extraction
 - Solventless extraction
 - CO2 extraction
- All three methods will produce a final product that is cannabis-concentrate well above 60% THC potency.

Solvent-based extraction

- Solvent-based production primarily uses hydrocarbons – most often butane or propane – or ethanol to extract cannabinoids, terpenes, and other biomolecules from cannabis flower.
- The output of this production is a liquid mixture of cannabis compounds and residual solvents.
- The residual solvents are then removed from the product through a purge process until they exist only in acceptably low levels, as determined by testing regulations.

Solventless extraction

- There are a variety of solventless methods to produce cannabis concentrates, but the methods most seen are heat and pressure, as well as water-based extraction.
- As there is no solvent utilized in this process, no purge process is needed.
- Solventless production is the most commonly utilized extraction method in home-environments, as solvent-based extraction methods present chemical hazards.

CO2 extraction

- CO2 extraction is the most versatile extraction method for extractors and product manufacturers.
- CO2 can be used to facilitate extraction of specific cannabinoids.
- CO2 is often used in a supercritical state, and manufacturers will manipulate its pressure and density to pull out the desired cannabinoids.

How to Produce a “Low-Potency” Concentrate

- All concentrates will be higher than 60% THC potency at the time they are created.
- The only way to lower that potency level would be to dilute the concentrate with some sort of filler material after the extraction process is complete.
- Filler is mostly widely known in the cannabis industry for being added to oil in vape cartridges, often to create consistency which facilitates being placed in the cartridge or to add flavor, where allowed.
- For solid concentrates, there would be no reason to add filler other than to dilute the product to meet potency thresholds.

Potential fillers to be used

- There is no knowing for certain what manufacturers would use for filler if forced to dilute their products to meet potency limits.
- Options would include non-cannabis derived products such as fats and oils and cannabis derived products like terpenes or other cannabinoids.
- Most likely, manufacturers will just not make concentrates if subject to a potency limit and all sales will remain in the illicit market.

Dangers of Using Filler to Dilute Concentrate

- Adulterating the cannabis product to reduce potency disrupts the natural composition of the cannabis product and could potentially lead to unintended, negative health consequences.
- For example, even if manufacturers utilize a natural, cannabis-derived product like terpenes as filler, there is still inadequate research on the effect that heating and inhaling such a large percentage of terpenes will have on the body and the lungs.
- The dangers of using filler in cannabis products has been most clearly demonstrated through the EVALI crisis discussed in slides 52-53.
- Consumers are likely better off consuming a “full spectrum” product that accurately reflects the composition of the cannabis plant with the various terpenes, cannabinoids, and biomolecules in their natural ratios.

Survey of States

- Data Limitations
- Percentage-based Potency Limits in the U.S.
- States Prefer Total THC Limits to Percentage-based Limits
- State Potency Limits for Edible Products
- Regulating Potency in Canada – Excluding Quebec
- Quebec is the Exception

Data Limitations

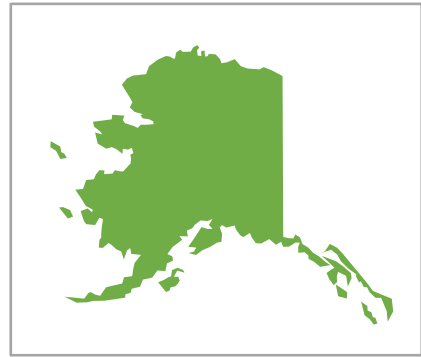
- When it comes to imposing potency limits, Vermont is an outlier. Only a few states have imposed potency limits on flower or solid concentrates.
- Data from the illicit market is very difficult to quantify or validate.
- In states that track concentrate sales, there is often no breakdown between liquid concentrates and solid concentrates.
- There is also no breakdown between solid concentrates with greater than 60% THC versus those below 60% THC, but solid concentrate products with less than 60% THC are not normally commercially available in the United States.

Percentage-based Potency Limits in the U.S.

 No percentage-based potency limits

 Percentage-based potency limit on flower only

 Percentage-based potency limit on flower and concentrates



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P.R.



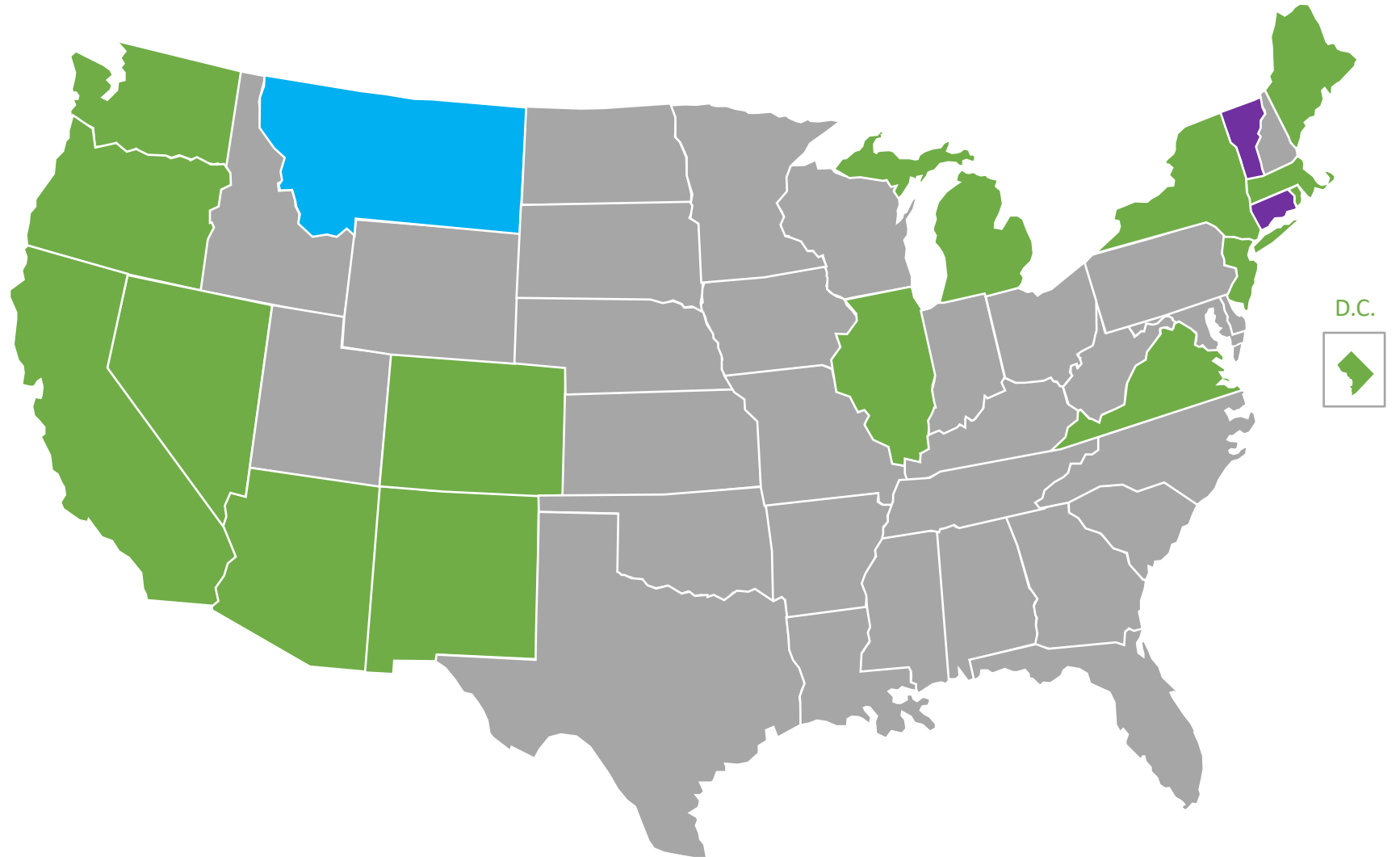
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Guam



U.S.V.I.



Percentage-based Potency Limits in the U.S. (Cont.)

State	Flower % Limit	Concentrate % Limit
Alaska	None	None
Arizona	None	None
California	None	None
Colorado	None	None
Conn.	30%	60%
Illinois	None	None
Maine	None	None
Mass.	None	None
Michigan	None	None
Montana	35%	None

State	Flower % Limit	Concentrate % Limit
Nevada	None	None
N.J.	None	None
N.M.	None	None
New York*	None	None
Oregon	None	None
R.I.*	None	None
Vermont	30%	60% for solid concentrates
Virginia	None	None
Wash.	None	None

* None in statute. Regulations not released at time of producing this report.

States Prefer Total THC Limits to Percentage-based Limits

- States have adopted per-milligram THC limits for edible products, but other than Connecticut, Montana, and Vermont they have not adopted percentage-based THC limits for inhalable products. This is because of the onset effects and delays associated with edibles.
- Other states have debated the concept of imposing percentage-based potency restrictions, but thus far they have all rejected such proposals.
- Proposals to impose potency restrictions have been filed and debated in states around the country, but none of them have passed. Notable examples include:
 - Colorado HB 1317 (2021) passed with a study requirement (see slide 45) but not potency limits
 - Florida HB 1455/SB 1958 (2021)
 - Massachusetts saw several filed during the 21-22 session, including H 152, H 153, H 154, and S 74
 - New York A 8123 (2021)
 - Washington HB 1463 (2021)

States Prefer Total THC Limits to Percentage-based Limits (Cont.)

- Only Vermont and Connecticut have chosen to limit concentrate potency by imposing a maximum percentage of THC, and only Vermont, Connecticut, and Montana have imposed a percentage-based potency limit on flower.
- Rather than imposing percentage-based potency limits, other states seek to encourage responsible consumption of cannabis products through consumer education, purchase limits, serving size limits, and limits on total THC per package.
- This approach is based on lessons learned from decades of ineffective prohibition policies. Prohibiting cannabis products does not prevent consumers from finding and consuming them; it results in consumers finding and consuming unregulated, untested products that pose much greater risks. States around the country, including Vermont, have recognized that a combination of regulation and education produces better public safety outcomes than prohibition.

State Potency Limits for Edible Products

State	THC Limit per Serving	THC Limit per Package
Alaska	10 mg	100 mg
Arizona	10 mg	100 mg
California	10 mg	100 mg
Colorado	10 mg	100 mg
Conn.	5 mg	100 mg
Illinois	10 mg	100 mg
Maine	10 mg	100 mg
Mass.	5 mg	100 mg
Michigan	10 mg	100 mg
Montana	10 mg	100 mg

State	THC Limit per Serving	THC Limit per Package
Nevada	10 mg	100 mg
N.J.	10 mg	100 mg
N.M.	None	None
New York*	None	None
Oregon	10 mg	100 mg
R.I.	10 mg	100 mg
Vermont	5 mg	50 mg
Virginia	5 mg	50 mg
Wash.	10 mg	100 mg

* None in statute. Regulations not released at time of drafting this report.

Regulating Potency in Canada – Excluding Quebec

- **General**

- Canada approaches potency in the same way most states do.
- It does not impose any percentage-based potency limits at the federal level.
- Most provinces do not impose any percentage-based potency limits. Quebec is the exception, which is discussed on the following slide.

- **Edible Potency Limitation**

- Canadian edible products are subject to a total package limit of 10 mg of THC.

- **Concentrate Potency Limitation**

- Canadian concentrates are subject to a total package limit of 1,000 mg of THC.

Quebec is the Exception

- Quebec does impose a percentage-based potency limit of 30% on concentrates.
- This has led to an effective ban of regulated solid concentrates, as the state-run stores that are the exclusive retailers in the province do not carry concentrates.
- Solid concentrate usage in Quebec:
 - From surveys, it appears that usage of solid concentrates is higher in Quebec than in Vermont, despite the effective ban on their sale.
 - About 9% of cannabis users report using solid concentrates, this amount was higher among 15–17-year-olds (16%).

So rather than providing consumers tested, legal, lower-potency concentrates, the Quebec policy has effectively pushed consumers to the illicit market, where many, particularly young people, continue to use higher potency products.

Dosing and Equivalency

- State Efforts to Regulate Solid Concentrates
- Copy of the Colorado Consumer Handout
- Cannabis Equivalency in Existing Markets
- Colorado Department of Revenue – Marijuana Equivalency in Portion and Dosage
- Alcohol Product Equivalency

State Efforts to Regulate Solid Concentrates

- **Colorado HB 1317**

- Passed in early 2022.
- Mandated dispensaries give consumers a four-page educational handout when purchasing a concentrate.

The pamphlet includes information regarding:

- Examples of serving size
- Risks and precautions
- Labeling requirements
- Public health resources.

- **California SB1097**

- Introduced in February of 2022. Moved to inactive file in August.
- Would have added additional warning labels, including one concerning adverse effects from high potency products. Was eventually amended out of the bill.
- Would have required dispensaries to give consumers a one-page pamphlet on dosage and cannabis information.

Copy of the Colorado Consumer Handout

DR 8515 (10/29/21)



COLORADO
Department of Revenue
Marijuana Enforcement Division

USE OF REGULATED MARIJUANA CONCENTRATE

Medical and Retail Marijuana Stores are required to provide this resource to individuals purchasing Regulated Marijuana Concentrate.


EXAMPLES OF A SERVING SIZE FOR EACH TYPE OF CONCENTRATE

Regulated Marijuana Stores offer various categories of marijuana concentrates. Stores may refer to marijuana concentrates using different names, including but not limited to terms like shatter, wax, butter, sugar, hash, resin, and rosin.

Start Low. Go Slow.

Vaping: Vaporizers heat marijuana concentrate to release THC for inhalation. The serving size should not exceed **1 inhalation** lasting **2 seconds** per serving.

1



**Concentrate
Serving Size:**

RISKS AND PRECAUTIONS

WARNING:

Use of Marijuana Concentrate may lead to:¹

1. Psychotic symptoms and/or Psychotic disorder (delusions, hallucinations, or difficulty distinguishing reality);
2. Mental Health Symptoms/Problems²;
3. Cannabis Hyperemesis Syndrome (CHS) (uncontrolled and repetitive vomiting);
4. Cannabis use disorder / dependence, including physical and psychological dependence.

Consuming concentrate via inhalation will cause immediate effects.

Marijuana concentrates ARE NOT recommended for inexperienced marijuana users. THC concentration (% THC), amount of concentrate consumed, and frequency of use can result in both short and long-term effects. There is moderate evidence that individuals who use marijuana with THC concentration greater than 10% are more likely than non-users to be diagnosed with a psychotic disorder, such as schizophrenia.

Marijuana concentrate is not approved by the FDA and claims of medical benefits are not supported by the FDA.

Marijuana concentrates ARE NOT recommended for anyone under age 25, except if recommended by a doctor. People 25 and under may be at greater risk of potential harm because the brain is not fully developed.

Regulated Marijuana Stores cannot provide medical advice. Any questions related to the health or safety of marijuana concentrates should be discussed with a patient's recommending physician or an adult consumer's primary care physician.

¹ These risks are based on CDPHE evidence statements where there is either moderate or substantial evidence. Where moderate means strong scientific findings that support the outcome, but these findings have some limitations and substantial means robust scientific findings that support the outcome with no credible opposing scientific evidence. <https://marijuanahealthinfo.colorado.gov/glossary>

² When associated with other risk factors, including psychiatric history.

³ When associated with other risk factors, including psychiatric history.

2

OTHER STATUTORY & REGULATORY LABELING REQUIREMENTS

The following warning statements must be included on every Container of Regulated Marijuana:

- "Keep away from Children."
- "This product was produced without regulatory oversight for health, safety, or efficacy."
- "There may be long term physical or mental health risks from use of marijuana including additional risks for women who are or may become pregnant or are breastfeeding. Use of marijuana may impair your ability to drive a car or operate machinery."

Universal Symbol - Caution Symbol for Regulated Marijuana THC

All Regulated Marijuana must be sold in a Container that displays the Universal Symbol to caution that the product contains THC.



PENALTIES

The sale, transfer, or dispensing of marijuana in violation of Colorado law is a felony punishable by a prison sentence up to 32 years and/or fines up to \$1,000,000.00.

A felony conviction can have serious consequences including the inability to vote while incarcerated, prohibition on obtaining a passport which is required to travel internationally, disqualification for employment, the inability to obtain housing and other serious consequences.

Inhaling more than 10 mg of THC within 10 minutes can lead to a blood THC level above 5 ng which can be used to support a conviction for driving under the influence.

3

ADDITIONAL RESOURCES:

Colorado Poison Center helpline:
1-800-222-1222

Safe2Tell:
877-542-SAFE (7233)

National Suicide Prevention Lifeline:
800-273-8255

CO Crisis Services:
1-844-493-8255

Rocky Mountain Poison & Drug Center:
1-800-222-1222 MED:

(central telephone number for consumers to report adverse use and product effects)

Colorado Department of
Public Health Resources:

Youth and Marijuana:

<https://cannabis.colorado.gov/health-effects/effects-on-youth>

Monitoring Health Concerns Related to Marijuana in Colorado:
2020 and THC Concentrates in Colorado Report (2020):

<https://marijuanahealthinfo.colorado.gov/reports-and-summaries>

Monitoring Health Concerns Related to Marijuana in Colorado:
Literature Review:

<https://marijuanahealthinfo.colorado.gov/literature-review>

Health Care Provider Resources:

<https://cdphe.colorado.gov/marijuana-health-care-provider-resources>

Responsibility Grows Here:

<https://responsibilitygrowshere.com/>

Forward Together Campaign from CDPHE/CDHS:

<https://forwardtogetherco.com>

4

Cannabis Equivalency in Existing Markets

State	Flower	Concentrate	Infused Product
Alaska	1 oz	7g	N/A
Arizona	1 oz	5g	N/A
Colorado	1 oz	8g	800mg
Connecticut	1.5 oz	7.5g	750mg
Massachusetts	1 oz	5g	500mg
Michigan	2.5oz	15g	16oz/36 fl oz

Colorado Department of Revenue – Marijuana Equivalency in Portion and Dosage

- A report published by Colorado Department of Revenue in 2015 looks at product equivalency in three ways: physical, dosing, and price. The report was published after Colorado passed HB 14-1361, which required the state to conduct a study to establish product equivalency.
 - “The physical equivalencies in Table ES-1 show that between 347 and 413 edibles of 10mg strength can be produced from an ounce of marijuana, depending on the solvent type and production method. For concentrates, between 3.10 and 5.50 grams of concentrate are equivalent to an ounce of flower marijuana.”
 - “Pharmacokinetic equivalencies indicate that 83 ten-milligram infused edible products is equivalent to one ounce of marijuana flower in Colorado. About 7.72 grams of concentrate is equivalent to an ounce of flower marijuana.”
 - “Using the THC prices, the edibles to flower price ratio is 3.03 (edible THC per flower THC) for the 100mg edible product, 3.00 for the 80mg product, and 4.24 for the 40mg product. The 10mg single-serving ratio is 8.00, which we believe reflects a minimum price for small portions. The ratio for wax/shatter is 1.03 for a 1-gram container, and 2.28 for a 500mg vaporizer cartridge. The higher price ratio for vaporizing equipment may reflect higher packaging costs.”

Table ES-1. One Ounce Equivalents by Solvent Type

	1-Ounce Flower Equivalents			
	Physical Equivalency		THC Equivalency	
	Amount	Amount	Amount	Amount
	Edibles	Concentrate (g)	Edibles	Concentrate (g)
Solvent Type	(10mg)	(Avg. Potency)	(10mg)	(Avg. Potency)
Butane	391.07	5.46	434.35	6.91
CO2	346.96	4.84	434.35	8.07
Butter/Lipid	413.49	N/A	434.35	N/A
Ethanol	N/A	5.44	N/A	7.37
Water	N/A	3.10	N/A	8.50

Table ES-2. Pharmacokinetic Dosage Equivalency

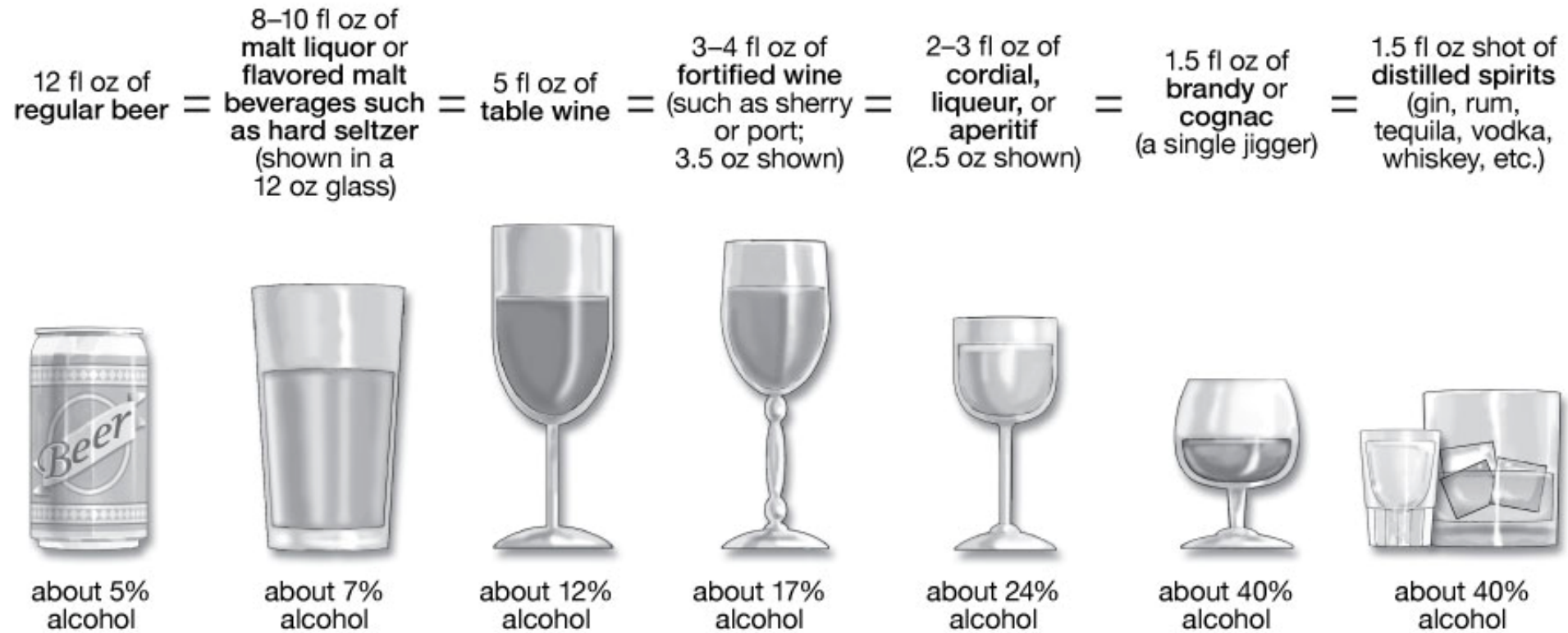
	Average THC Potency	Effective Uptake Ratio	1 Gram Equivalent	1 Ounce Equivalent
Buds/Flower	17.1%	1.00	1 Gram	1 Ounce
Edibles	N/A	5.71	3 Servings	83 Servings
Concentrates	62.1%	1.00	0.28 Grams	7.72 Grams

Colorado Department of Revenue – Marijuana Equivalency in Portion and Dosage (Cont.)

Table ES-3. THC Market Price Equivalencies

THC Market Price Ratios in Colorado					
Indicative Prices by Weight (\$)					
		1 Gram	1/8 Oz	1/4 Oz	1 Ounce
Buds/Flower	Most Common	\$14.03	\$41.27	\$82.54	\$264.14
	Discounted	\$12.38	\$33.03	\$66.06	\$239.43
Edibles		100 MG	80 MG	40 MG	10 MG
	Edible Variety	\$24.99	\$19.81	\$14.00	\$6.60
Concentrates		1 Gram	500 MG	250 MG	
	Wax / Shatter	\$55.00	--	--	--
	Vape Cartridge	--	\$66.00	\$46.00	--
Equivalent Market Price (Cents per MG THC)					
		1 Gram	1/8 Oz	1/4 Oz	1 Ounce
Buds/Flower	Most Common	8.25	6.94	6.94	6.10
	Discounted	7.28	5.55	5.55	5.53
Edibles		100 MG	80 MG	40 MG	10 MG
	Edible Variety	24.99	24.76	35.00	66.00
Concentrates		1 Gram	500 MG	250 MG	
	Wax / Shatter	8.46	--	--	--
	Vape Cartridge	--	18.86	26.29	--
THC Market Price Equivalencies (Price Ratios in THC Units)					
		1 Gram	1/8 Oz	1/4 Oz	1 Ounce
Buds/Flower	Most Common	1.00	1.00	1.00	1.00
		100 MG	80 MG	40 MG	10 MG
Edibles	Edible Variety	3.03	3.00	4.24	8.00
	Concentrates		1 Gram	500 MG	250 MG
Wax / Shatter		1.03	--	--	--
Vape Cartridge		--	2.28	3.19	--

Alcohol Product Equivalency



Each drink shown above represents one U.S. standard drink and has an equivalent amount (0.6 fluid ounces) of "pure" ethanol.

Cannabis consumers, like alcohol consumers, understand that products do not have an equal dose. Much like how alcohol consumers would not drink equal ounces of whiskey as a light beer, cannabis consumers would not consume the same grams of flower as a concentrate.

Survey of the Research

- Data Limitations
- Legislatively Mandated Reports – Conclusions Difficult to Make
- Medical Reports on Cannabis Potency – Incomplete Data
- General Takeaways from the Scientific Literature
- Consequences of Erring on the Side of Prohibition
- Case Study – Massachusetts' Experience with the EVALI Crisis

Data Limitations

- Federal prohibition has greatly limited research, making it difficult to draw accurate conclusions on risks and safety.
- A Massachusetts Cannabis Control Commission report (see slides 42-44) highlighted several barriers to potency research:
 - “There are major political and practical barriers to conducting research with cannabis products.”
 - “Much of the English-language literature base, to date, uses cannabis with low THC, which does not reflect most products sold in legal markets in the United States.”
 - “Current English-language literature lacks standardization, making cross-study comparisons challenging.”

Legislatively Mandated Reports – Conclusions Difficult to Make

- Vermont is not the first state in which concerns have been expressed about high-potency products.
- Massachusetts and Colorado both mandated reports that attempted to evaluate existing research to determine whether their regulatory agencies should impose potency restrictions.
 - After extensive review, both concluded that the existing literature on the use of high-potency products is not suitable to drawing accurate, reliable conclusions.

Massachusetts Cannabis Control Commission: High Tetrahydrocannabinol (THC) Cannabis and Effects on the Human Body (Hoffman et al., 2021)

- “Commission staff find that evidence is not sufficient to recommend a specific concentration cap at this time.”
- “As a result of the gaps in the research, we do not draw a conclusion regarding the effects of high-THC medical cannabis on the human body.”
- “Instead, staff offer considerations to increase research capacity for evidence-based decisions regarding THC limits in the future. Non-medical use of high THC products and greater doses of cannabis products by some populations appear associated with greater health and public safety risks than lower dose use; however, additional research is needed.”
- “Based on current finding, THC use presents some health risks for youth, and risks appear greater for youth using high-THC cannabis products.”

Massachusetts Cannabis Control Commission: High Tetrahydrocannabinol (THC) Cannabis and Effects on the Human Body (Hoffman et al., 2021)

- “A reassessment may be warranted as the scientific evidence basis matures in the future as additional research is conducted.”
- “Researchers and clinicians could develop guidelines on how to administer medical cannabis of varying concentration, including indicators of potential side effects, and effectiveness for specified conditions. It is also important to consider the labeling and packaging of products to ensure that patients understand the concentration dosage of their prescription. This would assist medical providers to be able to guide patients in more safe and effective ways to consume cannabis for medicinal treatment.”
- “Research shows that most cannabis consumers do not fully understand labeling and what constitutes high THC concentration products. To increase understanding, the Commission could create additional public awareness materials or build upon its campaign, ‘More About Marijuana,’ to educate consumers on what constitutes high-THC concentration cannabis.”

Massachusetts Cannabis Control Commission: High Tetrahydrocannabinol (THC) Cannabis and Effects on the Human Body (Hoffman et al., 2021)

- Conclusion:

“Evidence is insufficient to recommend a THC potency limitation (“cap”) at this time. More work is needed to understand potential unintended consequences of limits, including potential impacts on equity, and how other components of the cannabis plant work to enhance or reduce the effects of THC in humans.”

- [Link to full report](#)

Colorado School of Public Health: Health Effects of High-Potency Cannabis Products (Bero et al., 2021)

- This report started by screening 46,004 reports before narrowing in the 489 studies that were most concerned with the effects of products with high concentrations
- **Key takeaway:** A noticeable problem with many of these studies was the federal requirement “to use low concentration cannabis obtained from the University of Mississippi. This material is not reflective of the current marketplace. Overall, when THC concentrations used in a study could be extracted from an article, it was below concentrations currently found in the marketplace.”
- Unlike the Massachusetts report, this report did not come to a full conclusion. A follow-up report with more details is scheduled for release.
- [Link to full report](#)

Institute of Medicine, January 2017 (NASEM, 2017) – Key Recommendations

- “Unfortunately, the literature remains unclear on the association or developmental link between varying levels of cannabis use and the development of “problem” cannabis use or cannabis use disorder, particularly at different age groups (e.g., 12 years or older).”
- “There is substantial evidence for a statistical association between increases in cannabis use frequency and the progression to developing problem cannabis use.”
- “There are specific regulatory barriers, including the classification of cannabis as a Schedule I substance, that impede the advancement of cannabis and cannabinoid research.”
- “It is often difficult for researchers to gain access to the quantity, quality, and type of cannabis product necessary to address specific research questions on the health effects of cannabis use.”
- “A diverse network of funders is needed to support cannabis and cannabinoid research that explores the harmful and beneficial health effects of cannabis use.”
- “To develop conclusive evidence for the effects of cannabis use on short- and long-term health outcomes, improvements and standardization in research methodology (including those used in controlled trials and observational studies) are needed.”

Colorado Department of Public Health and Environment, July 2020 (Holdman et al., 2020) – Key Recommendations

- “Increase awareness, education and understanding of THC concentration.”
- “Increase adult consumer awareness and education about the risks of mental health effects from using marijuana products with high THC concentration.”
- “Encourage use of the term THC concentration in place of potency.”
- “Monitor rates of adverse events stratified by product type.”
- “Monitor THC concentration among marijuana products available on the regulated retail market in Colorado.”
- “In Colorado, almost all retail marijuana products contain high THC concentration, rarely containing less than 10% THC. Evidence is moderate to strong concerning THC concentration and the association with mental health effects in adolescents, young adults and adults. When examining specific types of marijuana products and the impact on blood THC levels, the evidence is strong for marijuana flower, moderate for both edibles and vaporized products and limited for THC concentrate products.”

Washington State Prevention Research Subcommittee, November 2020 (Haggerty et al., 2020) – Key Recommendations

- “Research available to date documents that THC content in cannabis products contributes to adverse health effects in a dose-response manner. This increased risk imposed from using higher potency cannabis products is particularly concerning for young users and those with certain pre-existing mental health conditions. To further our understanding on the impact of high-THC content cannabis products, more research is needed.”
- “People who report low socio-economic status, being of Latinx descent, and poor mental health are more likely do dab in Washington.”
- “Manufactured cannabis products such as high potency concentrates are more likely to contain residues and contaminants due to the extra steps needed for their production, including solvent-base extraction and additives. The health effects of exposing human lungs to possible residues are still not fully known.”
- “Poison Centers nationally are receiving more calls about manufactured cannabis products including edibles, concentrates, and vaping liquids. Manufactured products are more likely than plant products to be the only substance involved in the case. Children may be at greater risk for exposure. More serious health outcomes were observed for vape liquid exposures during late 2019, possibly associated with the vape-related EVALI outbreak during this time”
- “No consensus has been achieved on the relationship between THC blood levels and levels of impairment. As such, there is a great need for additional research on THC concentration and driving performance.”

Medical Reports on Cannabis Potency – Incomplete Data

- Medical journals and researchers, like governments, have been closely examining the relationship between high-potency cannabis products and mental health issues.
- In July 2022, The Lancet published a systematic review of much of this literature:

Association of cannabis potency with mental ill health and addiction: a systematic review. The Lancet Psychiatry. Petrilli, K., et al. (2022). [Link to article summary](#)

- Like many of the government reports, the researchers found some data points that suggest consumers of high-potency cannabis products experience worse outcomes than consumers of lower-potency cannabis products. They also recognized that more research is needed to strengthen the evidence of any such correlation.

Medical Reports on Cannabis Potency – Incomplete Data (Cont.)

- Key findings and information from the systematic review published by The Lancet Psychiatry (Petrilli, et al., 2022):
 - A screening of 4,171 articles revealed 20 studies that met the eligibility criteria. The paper provided a systematic review of those studies related to use of high potency THC and incidence of psychosis, anxiety, cannabis use disorder, and depression.
 - There appears to be a dose-dependent relationship between use of high potency THC and development of cannabis use disorder.
 - A correlation was found between use of high-potency THC and later diagnosis of psychosis and/or occurrence of psychotic episodes.
 - Less prominent associations were found between high-potency THC and anxiety and depression, as the evidence found varied.
 - None of the studies in the review were assessed by the author to be “good” or better than “good” based on the author’s determination of the risks of bias in how they were conducted.

General Takeaways from the Scientific Literature

- There is significant need for additional unbiased research into the effects of high-potency cannabis.
 - The limitations of the current research make it difficult to draw evidence-based conclusions regarding cannabis potency limits.
- Some studies have found a correlation between high-potency cannabis product usage and increased risk of negative health effects, particularly in young people.
 - This correlation may be the result of individuals with underlying mental health issues being more likely to use high-potency products.
 - High-potency cannabis products have not been causally linked to the genesis of significant health problems, but they may exacerbate or trigger pre-existing problems.
- Public policy should be revised as the scientific research develops.

Consequences of Erring on the Side of Prohibition

- Some may suggest Vermont exercise caution by preemptively prohibiting high-potency concentrates until the evidence develops and a more informed decision can be made, but this approach can lead to substantially worse outcomes.
- Prohibiting high-potency concentrates in the legal market will not eliminate demand for such products in Vermont. People will turn to the unregulated illicit market, purchase products in other states, or create their own products using potentially dangerous extraction processes.
- Contaminants, additives, and other impurities present in unregulated products could create health impacts that greatly outweigh any benefit resulting from a prohibition on high-potency concentrates.
- Massachusetts' experience with the EVALI crisis illustrates the potential dangers of removing products from the regulated market and pushing consumers to the illicit market.

Case Study – Massachusetts' Experience with the EVALI Crisis

- In 2019, there was an outbreak of e-cigarette or vaping-associated lung injuries (EVALI) [that hospitalized or killed 2807 individuals, including 68 confirmed deaths.](#)
- The CDC determined that tetrahydrocannabinol (THC)-containing e-cigarette, or vaping, products, particularly from informal sources like friends, family, or in-person or online dealers, are linked to most EVALI cases and play a major role in the outbreak.
- A [Science Direct study](#) found that states with adult-use cannabis programs had a 42% lower incidence rate of EVALI (Friedman & Morean, 2021)
- The major outlier among adult-use states was Massachusetts, where the governor issued a broad ban on legal cannabis vape products at the beginning of the crisis, when the cause of EVALI was still unknown.
- This pushed consumers to the illicit market, where unregulated vape products were being produced with additives that are not permitted in legal, regulated products. These additives were later determined to be the likely cause of the crisis.

Estimate of the Market

- Data Limitations
- Estimates of the Vermont Concentrate Market Size
- Concentrates Sales in New England States
- Other States with Complete Data
- Consumption Trends from Colorado

Data Limitations

- Data from the illicit market is very difficult to quantify or validate. It is likely that the illicit market for concentrates in states with adult-use sales has likely decreased at a similar rate to the overall illicit market.
- Adult-use states that track sales by product category often group all concentrate products together, including vape cartridges, which are not subject to potency restrictions in Vermont.
- In states that track solid concentrate sales, there is often no way to determine what portion of sales involved products over 60% potency and what portion involved products below 60% potency. But all the products in this category would likely exceed Vermont's current potency limit.
- Nearby states taking different approaches to cannabis concentrates, such as Connecticut, have not begun sales at the time this report was produced.

Estimates of the Vermont Concentrates Market Size – Illicit Market

- While estimates of the illicit market, including consumption method, are always difficult to confirm, there are a few recent data points from the Vermont Department of Health that are illustrative.
 - In a 2019 survey of cannabis consumers, they found that 2% of adults and 8% of high school students said dabbing was their primary consumption method
 - In 2020, a survey found that 4% of adult cannabis consumers in Vermont listed “dabbed or used in some other way”
- This range fits in with what is seen in the Vermont medical market (4% of sales are solid concentrates, see slide 60) and other states that breakdown sales by category type (e.g. About 6% in Massachusetts, see slide 66)

Estimates of the Vermont Concentrates Market Size – Total Illicit Market Size

By using the data from these surveys and estimating the total size of the Vermont cannabis market, we can make a rough estimate of the size of the illicit solid concentrate market.

We estimate that in 2022, prior to the state of adult-use sales, Vermont's unregulated adult-use cannabis market was valued at approximately **\$318 million**.

- This is based on 130,087 Vermont resident (non-patient) past month adult cannabis consumers.
- Based on data from the National Survey on Drug Use and Health for use frequency, we estimate the average Vermont consumer uses approximately 28.85 grams per month (just over an ounce) in cannabis flower and equivalent products.
- We calculated the total value by assuming an average price of \$200 per ounce of cannabis flower and equivalent.
- The beginning of adult-use sales should not affect this estimate as it is unlikely that solid concentrates that meet the existing potency threshold will be available for sale.

Estimates of the Vermont Concentrates Market Size – Concentrate Market Estimate

Given a total estimated illicit market size of about \$318 million and estimating 4% to 8% prevalence of dabbing as the consumption method, we can make a rough estimate that the size of the solid concentrate illicit market is:

\$12,720,000 to \$25,440,000 annually

Again, this is only an estimate based off the best assumptions we can make. The actual figure is difficult to know due to the nature of the illicit market.

Estimates of the Vermont Concentrates Market Size – Anecdotal Evidence

- In addition to the surveys noted above, anecdotally we know such a market exists in Vermont and that high-potency concentrate products are readily available.
 - With little effort, it is possible to find such products being sold online through the existing market.
 - Some Vermont consumers near the southern border are likely purchasing high-potency solid concentrate products from Massachusetts retail locations.
 - Consumers and illicit commercial actors are producing these products in homes and other unregulated environments, using potentially dangerous processes.

Estimates of the Vermont Concentrates Market Size – Medical Sales by Product Type

Product Type	Percent of Market	Monthly Expenditures per Patient
Flower	45%	\$126
Pre-rolls	3%	\$8
Concentrates	4%	\$11
Vaporizer Pens	22%	\$62
Edible Products	23%	\$64
Topical Products	2%	\$6
Other Accessories	1%	\$3

Estimates of the Vermont Concentrates Market Size – Adult-use Projections

Product Type	2022	2023	2024	2025	2026
Flower	\$2,809,716	\$41,537,146	\$101,591,694	\$115,152,200	\$102,756,066
Pre-rolls	\$401,351	\$4,687,510	\$10,887,347	\$12,281,674	\$10,936,544
Concentrates	\$721,451	\$5,305,021	\$10,876,645	\$12,568,267	\$11,442,237
Vaporizer Pens	\$3,554,827	\$26,530,207	\$54,860,742	\$63,145,050	\$57,500,665
Edible Products	\$1,505,863	\$12,418,045	\$27,003,459	\$31,566,522	\$28,499,068
Topical Products	\$450,321	\$3,288,194	\$6,734,638	\$7,891,630	\$7,124,767
Other Accessories	\$1,122,023	\$4,319,493	\$5,316,885	\$5,261,087	\$4,749,845
Total Retail Sales	\$10,565,553	\$98,085,616	\$217,271,409	\$247,866,431	\$223,009,193

- We anticipate a small but significant portion of total sales in the Vermont adult-use market would be affected by the percentage-based potency limit on solid concentrate products.
- Based on our medical market, adult-use market projections, and data from other states, we estimate that 4%–8% of the total market would be impacted.

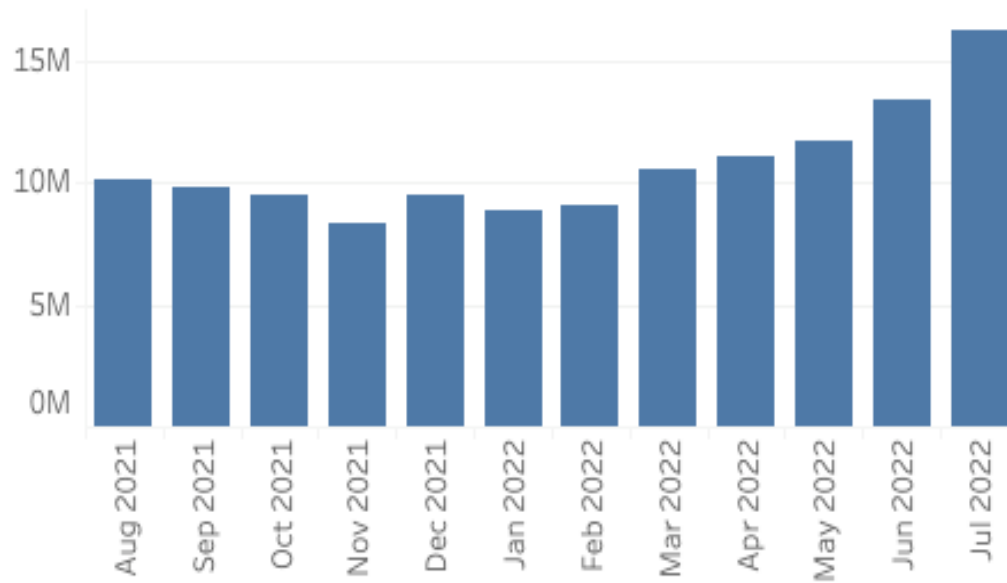
Concentrates Sales in New England States – Maine

- In Maine, through July, there have been \$18,849,684.55 in concentrates sales in 2022. This is out of total year-to-date sales of \$81,247,518, meaning concentrate products have accounted for 23.2% of retail sales.
- The percentage of Vermont sales involving high-potency solid concentrates would be significantly lower because Maine sales data does not differentiate between different products containing concentrates.

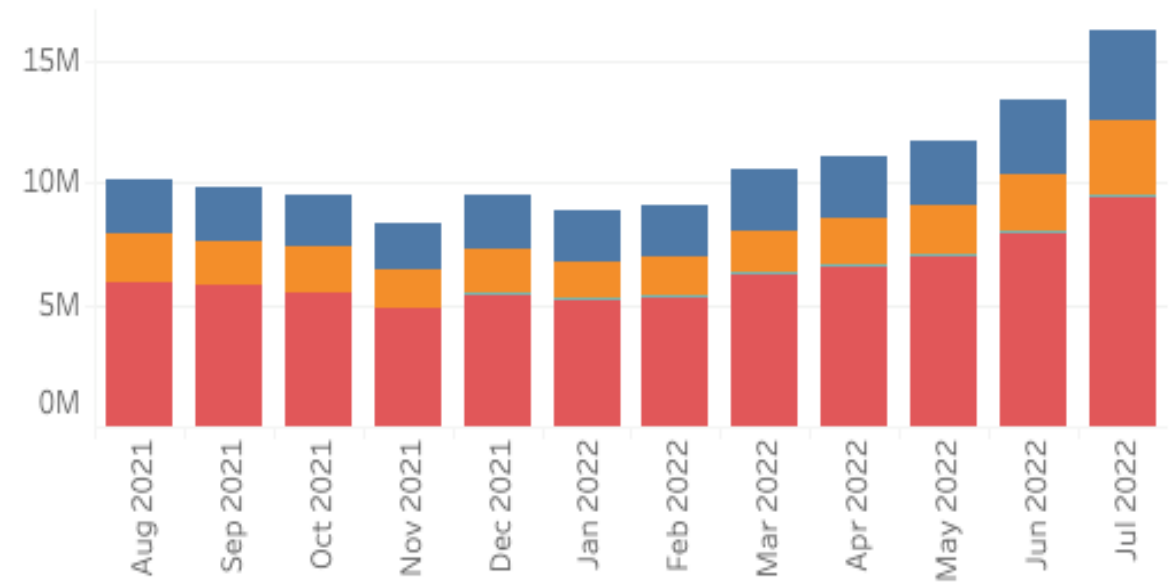
Concentrates Sales in New England States – Maine (Cont.)

Retail Sales - Previous 12 Months

Sales amount



Sales amount - By Product Category



Footnotes:

- 1) Data is preliminary and subject to revisions and/or adjustments.
- 2) Transaction means number of receipts or overall purchases in a single customer transaction.
- 3) Sales Transactions by Product Category represents all line items on a receipt.

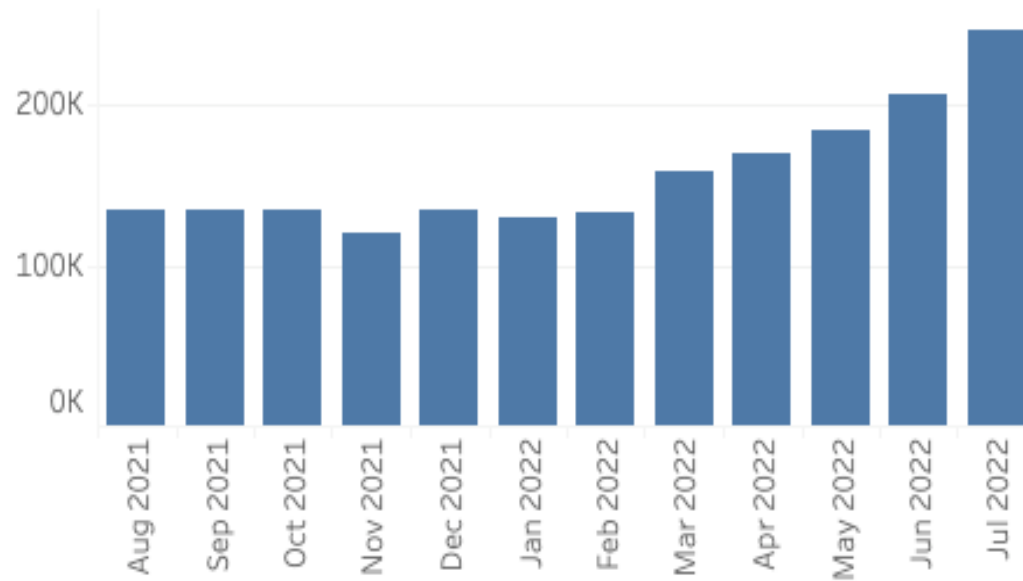
Item Category

- Concentrate
- Infused Product
- Plants
- Usable Marijuana

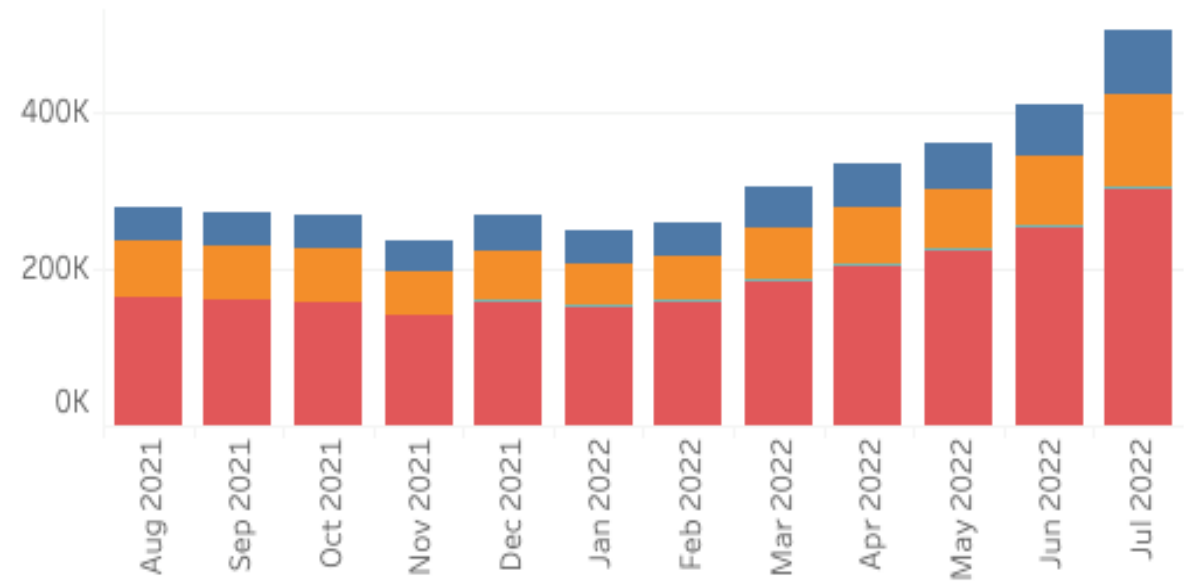
Concentrates Sales in New England States – Maine (Cont.)

Retail Sales - Previous 12 Months

Number of sales transactions



Number of sales transactions - By Product Category



Footnotes:

- 1) Data is preliminary and subject to revisions and/or adjustments.
- 2) Transaction means number of receipts or overall purchases in a single customer transaction.
- 3) Sales Transactions by Product Category represents all line items on a receipt.

Item Category

- Concentrate
- Infused Product
- Plants
- Usable Marijuana

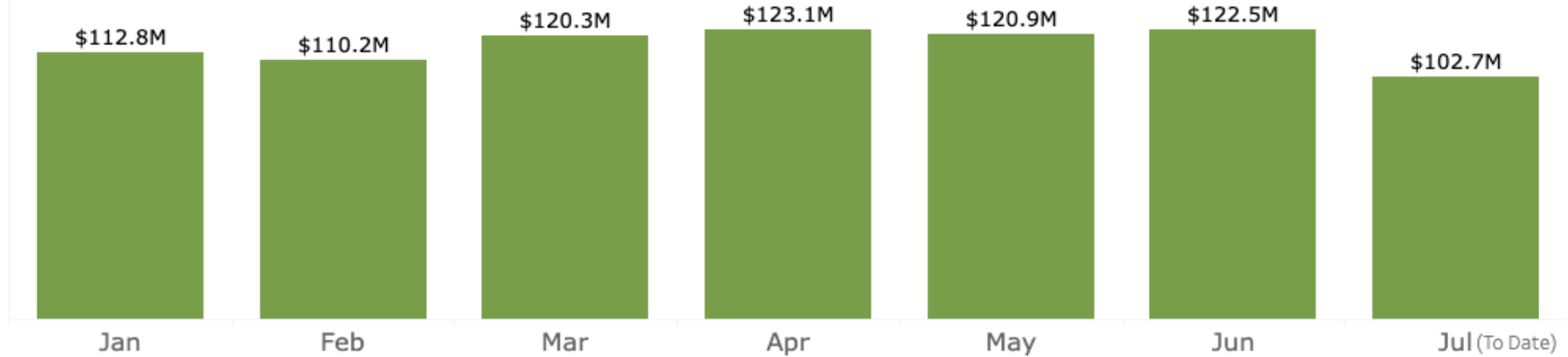
Concentrates Sales in New England States – Massachusetts

- Massachusetts' breakdown of product types includes a breakdown of different concentrate products, making it the best comparison for our purposes.
- Through July 24, there have been \$47,982,699 in solid concentrate sales in 2022. This is out of total year-to-date sales of \$812,700,000, meaning concentrate products have accounted for 5.9% of retail sales.
- During the same time period, vape products accounted for 21.43% of sales, infused pre-rolls accounted for 1.01% of sales, and kief accounted for 0.11% of sales.

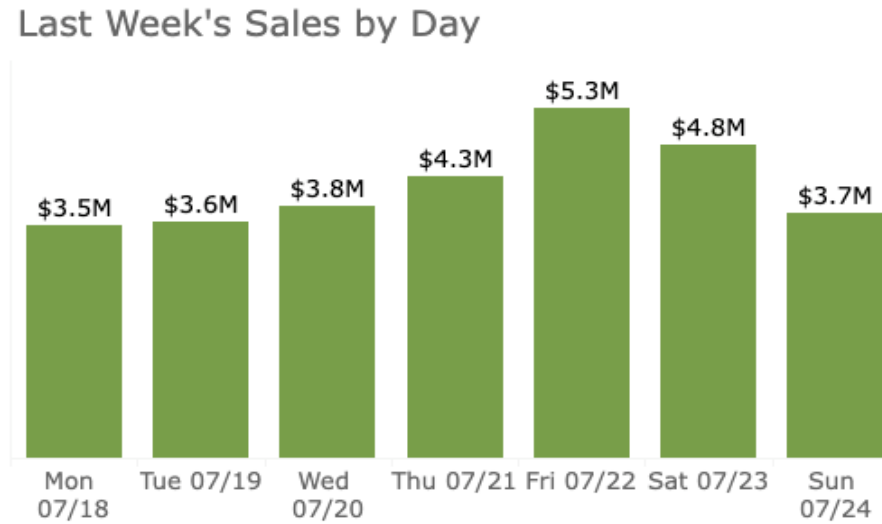
Concentrates Sales in New England States – Massachusetts (Cont.)

Adult-use Marijuana Retailer Sales

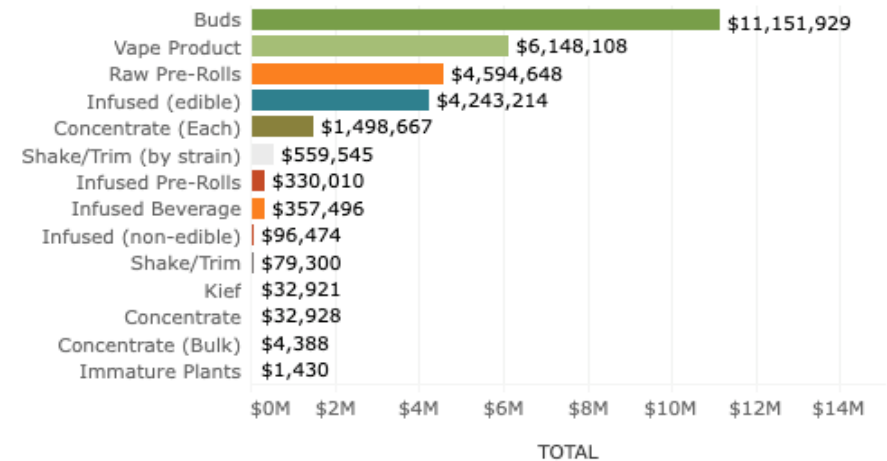
Year to Date Adult-use Marijuana Retailer
1/1/2022-7/24/2022 (YTD)
\$812.7M



Adult-use Marijuana Retailer Last Week's Sales
7/18/2022-7/24/2022 (YTD)
\$29.1M

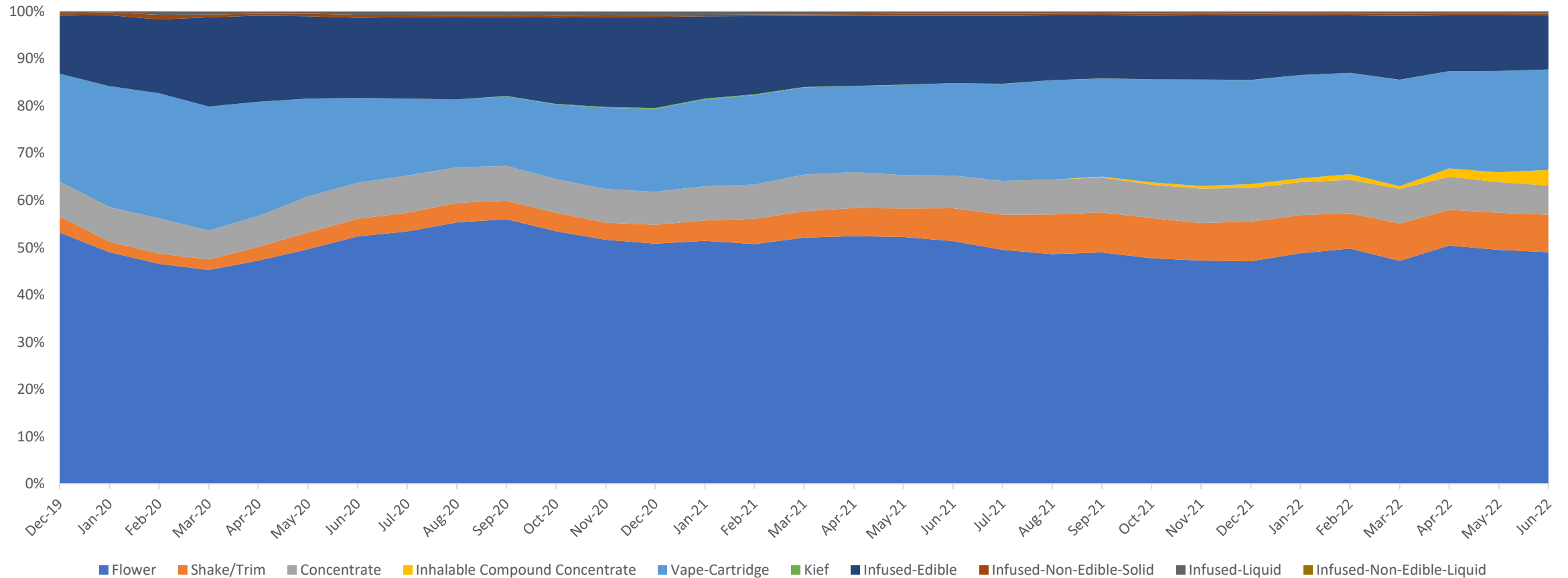


Last Week's Sales by Product Categories



Other States With Complete Data – Michigan

Michigan Adult-use Product Market Share by Product Category



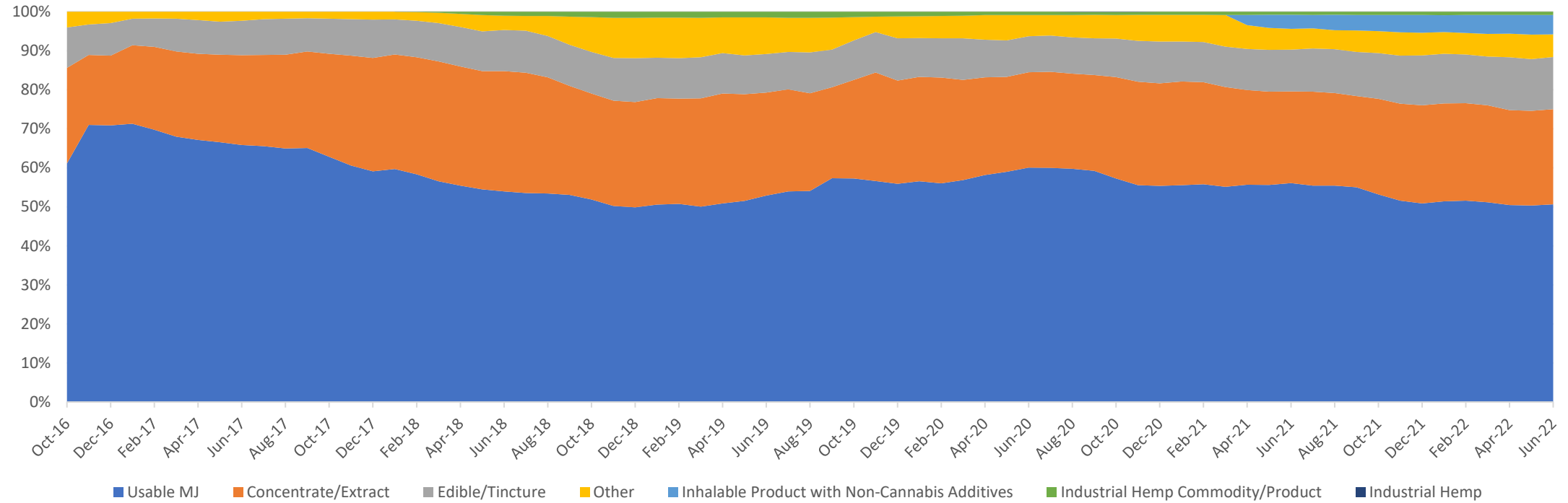
Other States with Complete Data – Michigan (Cont.)

Product Type	June 2020	June 2021	June 2022
Flower	52.41%	51.40%	49.05%
Shake/Trim	3.70%	6.92%	7.94%
Concentrate	7.63%	6.96%	6.17%
Inhalable Compound Concentrate	n/a	n/a	3.28%
Vape-Cartridge	17.98%	19.56%	21.32%
Kief	n/a	0.01%	0.01%
Infused-Edible	16.97%	14.25%	11.48%
Infused-Non-Edible-Solid	0.61%	0.39%	0.30%
Infused-Liquid	0.62%	0.44%	0.43%
Infused-Non-Edible-Liquid	0.08%	0.08%	0.02%

This snapshot of monthly totals is intended to help visualize total percentages and trends. Categories that were not tracked at the time are marked “n/a”.

Other States with Complete Data – Oregon

Oregon Adult-use Product Market Share by Product Category



Other States with Complete Data – Oregon (Cont.)

Product Type	June 2017	June 2018	June 2019	June 2020	June 2021	June 2022
Usable Marijuana	66%	54%	53%	60%	56%	51%
Concentrate/Extract	23%	31%	26%	24%	24%	24%
Edible/Tincture	9%	11%	10%	9%	11%	13%
Other	2%	4%	9%	5%	5%	6%
Inhalable Product with Non-Cannabis Additives	0%	0%	0%	0%	4%	5%
Industrial Hemp Commodity/Product	0%	1%	1%	1%	1%	1%
Industrial Hemp	0%	0%	0%	0%	0%	0%

This snapshot of monthly totals is intended to help visualize total percentages and trends. Note that unlike Michigan, Oregon did differentiate between different types of products using concentrates/extracts.

Consumption Trends from Colorado

- A couple of surveys in Colorado show prevalence of consumption method over time.
- Colorado appears to start from a higher percentage of consumers using solid concentrate products than Vermont, but the trend can be illustrative.
- After an increase in usage rates last decade, usage rates for adults and high school students seem to have leveled off.

Consumption Trends from Colorado (Cont.)

Methods of marijuana use among adult marijuana consumers in Colorado from 2015 to 2021
Data from the Behavioral Risk Factor Surveillance System (BRFSS)

Consumption method	2015	2016	2017	2018	2019	2020	2021
Smoked	82.9%	87.2%	84.3%	81.8%	76.1%	73.7%	71.5%
Ate or drank	35.6%	35.2%	40.4%	39.9%	43.0%	43.1%	46.8%
Vaporized	32.4%	22.9%	29.1%	29.4%	32.0%	21.7%	27.5%
Dabbed	17.7%	16.8%	21.1%	23.5%	19.6%	17.4%	20.7%
Some other way	7.3%	6.3%	7.5%	8.2%	11.7%	4.4%	5.0%

Among students who used marijuana, the percentage who dabbed
Data from the Healthy Kids Colorado Survey Dashboard

2015	2017	2019	2021
28.0%	34.4%	52.0%	49.2%

Recommendations

- Four-part Plan to Promote Public Safety Regarding Concentrates
 - Guiding Principle: Education Works Better Than Prohibition
 - Part 1: Remove the Potency Cap for Solid Concentrates
 - Part 2: Authorize Consumer Education and Youth Prevention Programs
 - Part 3: Use Revenue Generated by Adult-use Sales to Fund the Education Program
 - Part 4: Make Public Health Information, Including Safe Dosage Information, Readily Available
- Other Recommendations

Four-part Plan to Promote Public Safety Regarding Concentrates

- 1. Remove the potency cap for solid concentrates.**
- 2. Authorize consumer education campaigns and youth prevention programs.**
- 3. Use a portion of the revenue at the Department of Health for substance misuse prevention programs to fund these education programs.**
- 4. Make public health information, including safe dosage information, readily available.**

Guiding Principle: Education Works Better Than Prohibition

- Prohibition will not eliminate the demand or supply of high-potency products, and it could be counterproductive when it comes to protecting public safety.
 - Such products are readily available in the illicit market and in neighboring states.
 - A statewide prohibition will drive production and sales into the underground market, where they create more potential safety risks for consumers and the broader community.
 - 7 V.S.A. § 904a sets out the intent of the General Assembly: “to move as much of the illegal cannabis market as possible into the regulated market for the purposes of consumer protection and public safety.”
- Current scientific evidence is inconclusive and does not justify a prohibition.
 - If the science was clear that higher potency products cause a significant impact on mental health outcomes, prohibiting the products may be justified. But the research has not been conclusive.

Guiding Principle: Education Works Better Than Prohibition (Cont.)

- History has demonstrated that regulation and education are more likely to lead to safer outcomes for Vermont cannabis consumers, as well as the broader community.
 - An educated consumer of a tested product is in a safer position than an uneducated consumer of an unregulated product.
- Vermont recognized the failure of prohibition and chose to replace it with a system that allows adults to safely and legally access regulated, tested products that come with warning labels and other educational materials.
 - These principles should be extended to high-potency solid concentrates, especially since they have recently grown in popularity and consumers may not be as familiar with their effects and potential risks.

Part 1: Remove the Potency Cap for Solid Concentrates

- Vermont should allow the production and sale of high-potency solid concentrates.
- Such products should be highly regulated and tested like other adult-use cannabis products.
- The legislature should amend 7 V.S.A. Ch 33 by striking Section 868(2).

Part 2: Authorize Consumer Education Campaigns and Youth Prevention Programs

- Since evidence-based education approaches are more effective than prohibition, we recommend accompanying the allowance of high-potency solid concentrate products with two separate educational campaigns:
 - Consumer education for adults, which should focus on safe consumption methods and general information about the products, their effects, and potential risks.
 - Youth prevention efforts, which should focus on reducing youth use and access to concentrates.
- Well designed and properly funded public education campaigns have expansive reach and can help both adults and minors make better decisions concerning cannabis consumption.

Part 3: Fund the Education Efforts Using Existing Revenue

- The Department of Health is entitled to up to 30% of the cannabis excise tax revenue (up to \$10 million) to fund substance misuse prevention programs.
- A portion of this funding should be used to cover the costs associated with a robust education program surrounding solid concentrates.
- As mentioned above, this should cover both youth prevention efforts and safe consumption efforts for adults. Although the evidence is inconclusive, some data suggests higher-potency cannabis products may be more likely than other products to contribute to or exacerbate existing mental health problems.

Part 4: Make Public Health Information, Including Safe Dosage Information, Readily Available

- The state should prioritize consumer education and public awareness around high-potency cannabis products so that consumers understand what these products are, how their effects and potential risks differ from other cannabis products, and how to consume them safely.
- We recommend requiring important public safety information be made available through multiple channels:
 - Information should be provided on the Cannabis Control Board's website.
 - All retail outlets selling high-potency products should be required to have handouts available for customers.
 - All high-potency solid concentrate products should include a QR code with additional public health information, see next slide for more details.
- The information provided in each location should include safe dosing information, including a visual representation of what a serving size entails.
- Some states, like Colorado, require paper handouts to be distributed with each purchase of high-potency concentrates. We do not recommend such a practice for both efficacy and environmental reasons. It greatly increases the amount of paper used, and consumers often quickly dispose of materials handed to them at checkout. Ensuring the information is available on product labels and the internet, as well as in paper form for those who desire it, is the best way of ensuring access.

The labeling dilemma

- More is not always better when it comes to labeling and warnings.
- While it is important to ensure consumers have all the relevant information, including too much directly on the label of cannabis product can make it less readable and understandable.
- A better practice is to ensure that the most essential information is easily readable on the label or package with all the other information available to consumers in an easily accessible form elsewhere.
- The most convenient way to present much of this information on the label is through a QR code that allows consumers to directly access up to date information right on their phone. With their increased usage for during the Covid-19 pandemic, consumers are generally quite comfortable using them to access information.

Other Recommendations

- **Advocate for more research:** Vermont should encourage its federal partners to allow for additional research, particularly on high-potency products, and to allow for research that uses actual products available commercially in state-legal adult-use and medical programs.
- **Clarify that cannabis products are not subject to the Tobacco Products Tax:** Cannabis and tobacco are two different products, and the taxation on them should reflect the different challenges the state faces in regulating each product. The Legislature should clarify that cannabis products are not subject to the state's 92% tax rate on electronic cigarettes. Cannabis faces competition from a very robust, untaxed illicit market. Such high taxes will steer consumers toward illicit products that pose greater health risks, as evidenced by the EVALI crisis.