High THC cannabis products

CONSUMER USE, ADVERSE OUTCOMES, AND IMPLICATIONS FOR POLICY

International Cannabis Policy Study

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CONSULTANT / PAID SPEAKER / ADVISORY COMMITTEES

- Regulatory agencies e.g., Canada, Australia, UK, EC, US CDC, etc.
- Non-governmental associations e.g., CCSA, CCS, Heart & Stroke Foundation
- International public health authorities e.g., WHO

PAID EXPERT TESTIMONY - PUBLIC HEALTH LITIGATION

**Tobacco**
- Canada, Norway, Australia, UK, Ireland, Uruguay, Uganda, NB, AB, Class actions

**Vaping**
- US States, Canada

**Cannabis**
- Quebec, Canada

**Food & beverage**
- San Francisco

⚠️ NO INDUSTRY FUNDING OR INTERESTS TO DECLARE.
CANNABIS POLICY

Public health impact depends on how cannabis is regulated in legal markets.
What is the optimal regulatory framework?
Product standards

Vermont Lawmakers At Odds Over THC Limit on Cannabis Concentrates

Some members of the Vermont state Senate are upset over a 60% cap proposed by their colleagues in the House.
Product labeling & warnings

Washington

California

Colorado

Contains Marijuana. Keep away from children.

Mass. & Maine

Michigan

Oregon

Contains THC

Contains THC
Canada
OCTOBER 2018

HAPPY MAGICAL
4TH BIRTHDAY
• **Detailed** population-based data
• Policy-specific measures
• Same methods, multiple time points, multiple jurisdictions
Methods

• Repeat cross-sectional surveys
• Annual data collection 2018-2022...
• Ages 16-65
• Same methodology across jurisdictions
Sample

- Nielsen commercial panel
- Fall (Sept-Oct)
- Data integrity checks
- Weighted on sex, age, region, race, smoking, education

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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‘Legal’ states over-sampled
## Washington sample

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<tr>
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<th>2019</th>
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<td>16-25</td>
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<td>56-65</td>
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<td>Asian</td>
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<td>Native Hawaiian or Pac Islander</td>
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<td><strong>Income adequacy</strong></td>
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<td>Very difficult</td>
<td>113</td>
<td>256</td>
<td>167</td>
<td>161</td>
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<tr>
<td>Difficult</td>
<td>240</td>
<td>551</td>
<td>356</td>
<td>336</td>
</tr>
<tr>
<td>Neither easy nor difficult</td>
<td>379</td>
<td>736</td>
<td>634</td>
<td>578</td>
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<tr>
<td>Easy</td>
<td>248</td>
<td>471</td>
<td>452</td>
<td>392</td>
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<tr>
<td>Very easy</td>
<td>146</td>
<td>276</td>
<td>301</td>
<td>264</td>
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</table>
Detailed measure on consumption and use.

On the last day you used dried herb, how much did you use over the ENTIRE DAY?

- 1/8 (one eighth) gram or less
- 1/4 (one quarter) gram
- 1/2 (half) gram
- 1 (one) gram
- 2 grams
- 1/4 (quarter) ounce (7 g)
- 1/4 (three quarters) gram
- 1/8 (eighth) ounce (3.5 g)
- 1/2 (half) ounce (14 g)
- 1 ounce (28 g)
- More than 1/4 (quarter) ounce (7 g)
- More than one ounce (>28 g)
Please choose the joint that is closest to the size you normally smoke

PAST 12-MONTH USERS OF DRIED HERB WHO REPORTED IN JOINTS

1.2 g
1.0 g
0.8 g
0.6 g
0.5 g
0.4 g
0.2 g
Problematic Use Indicators

TYPE OF USER
• Early age initiation of cannabis use
• During pregnancy
• Susceptibility to psychosis

TYPE OF USE
• Daily or near-daily use
• High THC or THC:CBD ratio
• Synthetic cannabinoids
• Smoke inhalation

SETTING
• Cannabis-impaired driving
• Workplace

Policy-specific measures

- Advertising & promotion
- Price & taxation
- Retail & commercial environment
- Legal vs. illegal market indicators
- Product standards
- Public education
- Labelling & health warnings
‘Objective’ of cannabis policies.

Restrictions on cannabis marketing in states with ‘legal’ cannabis laws

JUNE 2022

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<thead>
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<th>IL</th>
<th>MI</th>
<th>AK</th>
<th>NV</th>
<th>WA</th>
<th>NM</th>
<th>OR</th>
<th>CA</th>
<th>NJ</th>
<th>VT</th>
<th>AZ</th>
<th>CO</th>
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<tr>
<td>Email/social media</td>
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<td>Outside stores</td>
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<td>TOTAL SCORE</td>
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Outline

1. Patterns of use
2. Adverse events
3. Product labelling & warnings
4. Product standards
How are patterns of cannabis use changing?
Patterns of cannabis use

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journal homepage: www.elsevier.com/locate/drugpo

Research Paper

Trends in the use of cannabis products in Canada and the USA, 2018 – 2020: Findings from the International Cannabis Policy Study

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Consumption
Canada
USA
Marijuana
Substance policy

ABSTRACT

Background and Aims: There is little information on consumption patterns across the diverse range of cannabis product types. This paper examines trends in consumption patterns in Canada and the United States (US) between 2018-2020.

Design: Repeat cross-sectional surveys were conducted as part of the International Cannabis Policy Study online survey in 2018 (n=27,024), 2019 (n=45,426), and 2020 (n=45,180).

Setting: Respondents were recruited from commercial panels in Canada and US states that had and had not legalized non-medical cannabis (US ‘Legal’ and ‘Illegal’ states, respectively).

Participants: Respondents were male and female participants aged 16-65 years.

Measurements: Data on frequency and consumption amounts were collected for nine types of cannabis products, including dried flower and processed products (e.g., oils and concentrates). Consumers were also asked about using cannabis with tobacco, cannabis and alcohol, and cannabis and non-cannabis medication.
Product use
PAST 12-MONTH CONSUMERS
ALL US, 2021 n=107,572

DRIED FLOWER
- 2018: 80%
- 2019: 77%
- 2020: 75%
- 2021: 73%

EDIBLES
- 2018: 41%
- 2019: 45%
- 2020: 50%
- 2021: 54%

VAPE OILS
- 2018: 33%
- 2019: 30%
- 2020: 30%
- 2021: 31%

ORAL OILS
- 2018: 21%
- 2019: 24%
- 2020: 25%
- 2021: 24%

HASH CONCENTRATES
- 2018: 19%
- 2019: 19%
- 2020: 23%
- 2021: 23%

TOPICALS
- 2018: 14%
- 2019: 14%
- 2020: 16%
- 2021: 16%

DRINKS
- 2018: 11%
- 2019: 14%
- 2020: 17%
- 2021: 17%

TINCTURES
- 2018: 8%
- 2019: 14%
- 2020: 16%
- 2021: 16%
Most consumers use more than one type of product.

Number of products used
U.S. PAST 12-MONTH CONSUMERS, 2021 (N=10,154)

- One product: 25.3%
- Two products: 24.7%
- Three products: 19.8%
- Four products: 17.0%
- Five products: 13.2%
US consumers report more poly product use than in other countries.

Number of products used
US PAST 12-MONTH CONSUMERS, 2021

United States: 25% 
Canada: 32%
New Zealand: 43%
Australia: 42%
Exclusive use of ‘extracts’ is very rare.

Percentage of consumers that exclusively use each product
US PAST 12-MONTH CONSUMERS, 2021

<table>
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<tr>
<th>Product</th>
<th>Percentage</th>
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<tr>
<td>Concentrate</td>
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</tr>
<tr>
<td>Oral</td>
<td>1.3%</td>
</tr>
<tr>
<td>Vape</td>
<td>1.4%</td>
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<tr>
<td>Edible</td>
<td>6.7%</td>
</tr>
<tr>
<td>Flower</td>
<td>15.2%</td>
</tr>
</tbody>
</table>
Edibles are popular, but used less often.

**Prevalence of daily use**
AMONG PAST 12-MONTH CONSUMERS IN US, 2021 =10,361

- Oral liquids: 3.8%
- Edibles: 4.9%
- Concentrates: 5.1%
- Vape liquids: 8.3%
- Flower: 24.5%
Little data on consumption amounts.

Usual amount (g) of dried flower consumed per day, on days used
2020 AMONG DRIED FLOWER CONSUMERS IN PAST 12 MONTHS, N=6,671

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<th>All consumers</th>
<th>1.4 g</th>
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<tr>
<td>&lt;Monthly</td>
<td>0.7 g</td>
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<tr>
<td>Weekly</td>
<td>1.0 g</td>
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<tr>
<td>Monthly</td>
<td>1.1 g</td>
</tr>
<tr>
<td>Daily*</td>
<td>2.0 g</td>
</tr>
</tbody>
</table>

* ≥5 days / week
Daily consumers account for vast majority of consumption.

Percentage of all dried flower consumption – By frequency of use
2020 AMONG CONSUMERS IN PAST 12 MONTHS, N=6,671

- Daily*: 87.0%
- Weekly: 9.7%
- Monthly: 3.0%
- <Monthly: 0.3%

* ≥5 days / week
Little data on consumption amounts for products other than dried flower.

Usual daily consumption of ‘solid concentrates’, on days used
2020 AMONG CONSUMERS IN PAST 12 MONTHS, N=1,453

1.2 grams
ON DAYS USED
Summary 1.0

- Wide diversity of products
- ‘Poly’ product use is the norm
- Steady ‘shift’ towards extracts
- Consumption data lacking
How do product trends differ by legal status?
Differences between jurisdictions have narrowed over time.

Use among past 12-month consumers
% used in past 21-months, 2021

Edibles

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<th>US</th>
<th>US illegal</th>
<th>US medical</th>
<th>US legal</th>
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<tr>
<td>64%</td>
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Dried herb

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<th>US medical</th>
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<tbody>
<tr>
<td>71%</td>
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</table>

73%

73%

73%

74%
Differences between jurisdictions have narrowed over time.

Use among past 12-month consumers
% used in past 21-months, 2021

Drops or capsules

<table>
<thead>
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<th>US</th>
<th>US illegal</th>
<th>US medical</th>
<th>US legal</th>
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Vape oils

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<tbody>
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<td>44%</td>
<td>43%</td>
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<td></td>
</tr>
<tr>
<td>US medical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US legal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Differences between jurisdictions have narrowed over time.

Use among past 12-month consumers
% USED IN PAST 21-MONTHS, 2021

Solid concentrates

Drinks
Who is using each product type?
Medical consumers more likely to use ‘extracts’.

Cannabis products used in past 12 months
% Used in past 12-months, among past 12-month consumers, 2021

- Oral liquids
  - Non-medical: 31%
  - Medical: 56%
- Edibles
  - Non-medical: 61%
  - Medical: 74%
- Concentrates
  - Non-medical: 33%
  - Medical: 52%
- Vape liquids
  - Non-medical: 42%
  - Medical: 56%
- Flower
  - Non-medical: 72%
  - Medical: 73%

ICPS
Modest sex differences in product types.

Cannabis products used in past 12 months
% used in past 12-months, among past 12-month consumers, 2021

- Oral liquids: Female 31%, Male 38%
- Edibles: Female 64%, Male 61%
- Concentrates: Female 30%, Male 41%
- Vape liquids: Female 42%, Male 46%
- Flower: Female 72%, Male 74%
‘Extracts’ more popular among younger consumers.

Cannabis products used in past 12 months
% USED IN PAST 12-MONTHS, AMONG PAST 12-MONTH CONSUMERS, 2021

- Oral liquids
- Edibles
- Concentrates
- Vape
- Flower

Consumer Age

ICPS
Recent trends in product use
Choose the joint closest to the size you normally smoke

PAST 12-MONTH DRIED FLOWER CONSUMERS WHO REPORTED IN JOINTS 2021 (n=4,869)

<table>
<thead>
<tr>
<th>Joint Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 g</td>
<td>15%</td>
</tr>
<tr>
<td>1.0 g</td>
<td>25%</td>
</tr>
<tr>
<td>0.8 g</td>
<td>12%</td>
</tr>
<tr>
<td>0.6 g</td>
<td>12%</td>
</tr>
<tr>
<td>0.5 g</td>
<td>11%</td>
</tr>
<tr>
<td>0.4 g</td>
<td>12%</td>
</tr>
<tr>
<td>0.2 g</td>
<td>14%</td>
</tr>
</tbody>
</table>

Joints are getting bigger...
Increase in ‘processed’ flower products.
34% flower bought as pre-roll at ‘last purchase’

Illegal: 25%
Medical: 26%
Adult legal: 38%

The last time you bought dried herb, was it a pre-rolled joint (i.e., rolled into a joint before purchase)?
2021, CONSUMERS THAT PURCHASED FLOWER IN PAST 12-MONTHS N=5,626
25% pre-rolls at last purchase that were ‘infused’ products

Dried herb dipped in high-potency oil or mixed with concentrate (e.g., moonrockets)

2021, AMONG PURCHASERS OF DRIED FLOWER IN PAST 12-MONTHS N=432
Use of ‘CBD only’ products is prevalent.

27.7%

USE IN PAST 12-MONTHS
2021, N=29,927
Delta-8 THC
THC is responsible for the “high” in marijuana. Have you heard of products that contain the following?

<table>
<thead>
<tr>
<th>% 'YES', ALL RESPONDENTS, 2021, n=30,081</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Delta-4 THC</th>
<th>US total</th>
<th>Illegal states</th>
<th>Medical states</th>
<th>Legal states</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta-8 THC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta-9 THC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta-10 THC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Have you ever used a DELTA-8 THC product?

ALL RESPONDENTS, 2021, n=3,645

3% of all respondents report ‘ever’ using a Delta-8 THC product.
Adverse events from cannabis products
ADVERSE EVENTS

Population-based self report vs. administrative health care data
Adverse events from cannabis use are commonly reported.

30.8% reported an adverse event in past 12 months
In the past 12 months, has anyone in your household accidentally consumed marijuana?

% ‘YES’ PAST 12-MONTH CONSUMERS, N=33,999

- Illegal states
- Medical states
- Legal states

2018: 5%, 7%, 6%
2019: 7%, 8%, 7%
2020: 8%, 9%, 9%
2021: 9%, 10%, 10%
Adverse events from cannabis use are commonly reported.

Sources of assistance among consumers who sought medical help for adverse effects among those who sought medical help.

<table>
<thead>
<tr>
<th>Source</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency department</td>
<td>63%</td>
<td>71%</td>
<td>74%</td>
</tr>
<tr>
<td>Walk-in clinic</td>
<td>36%</td>
<td>35%</td>
<td>34%</td>
</tr>
<tr>
<td>Doctor or health professional</td>
<td>38%</td>
<td>39%</td>
<td>38%</td>
</tr>
<tr>
<td>Poison centre</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone helpline</td>
<td>20%</td>
<td>24%</td>
<td>25%</td>
</tr>
<tr>
<td>Addiction support service</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Most adverse events are NOT from edibles.

When you experienced the negative health effects, what type or form of marijuana were you using?

Among those who reported adverse event in past 12-months:

- Flower: 44%
- Capsules: 17%
- Liquids/drops: 17%
- Vape liquids: 14%
- Edibles: 10%
- Drinks: 8%
- Concentrates: 7%
- Hash: 6%
Similar likelihood of adverse events across users of each product type.

Percentage of consumers who report experience adverse events – by product used

% REPORTING ADVERSE EVENT IN PAST 12-MONTHS

- Oral liquids: 37%
- Edibles: 33%
- Concentrates: 39%
- Vape liquids: 33%
- Flower: 28%
Consumer ‘THC literacy’ is low.
Do you consider this a marijuana product?

% ‘YES’, ALL RESPONDENTS ASSIGNED TO THIS EXPERIMENT, n=1,457

65% 46% 74%
Can this product get someone ‘high’?

% ‘YES’, ALL RESPONDENTS ASSIGNED TO THIS EXPERIMENT, n=1,457

42% 12% 41%
Do you know the amount/number of THC of the dried herb you used last?

% ‘YES

<table>
<thead>
<tr>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>All consumers</td>
<td>25%</td>
</tr>
<tr>
<td>&lt; Monthly</td>
<td>12%</td>
</tr>
<tr>
<td>Monthly</td>
<td>26%</td>
</tr>
<tr>
<td>Weekly</td>
<td>26%</td>
</tr>
<tr>
<td>Daily</td>
<td>31%</td>
</tr>
</tbody>
</table>
What are the THC levels in the dried herb you usually use?

UNIVERSE: DRIED HERB USERS WHO REPORTED KNOWING THC, 2020 (N=1469)

38% THC

<Monthly 38%
Monthly 40%
Weekly 36%
Daily 37%
Is 30% THC a low, medium, high amount for dried herb?

UNIVERSE: PAST 12-MONTH CANNABIS CONSUMERS 2020, n=13,540
Standard THC units

ADDICTION OPINION AND DEBATE
doi:10.1111/adb.14842

‘Standard THC units’: a proposal to standardize dose across all cannabis products and methods of administration

Tom P. Freeman¹,²,³ Id & Valentina Lorenzetti⁴ Id

Addiction and Mental Health Group (AIM), Department of Psychology, University of Bath, Bath, UK.¹ National Addiction Centre, King’s College London, London, UK.² Clinical Psychopharmacology Unit, University College London, London, UK.³ and School of Behavioural and Health Sciences, Australian Catholic University, Fitzroy, VIC, Australia.⁴

ABSTRACT

Background and Aims Cannabis products are becoming increasingly diverse, and vary considerably in concentrations of ⁹-tetrahydrocannabinol (THC) and cannabidiol (CBD). Higher doses of THC can increase the risk of harm from cannabis, while CBD may partially offset some of these effects. Lower Risk Cannabis Use Guidelines currently lack recommendations based on quantity of use, and could be improved by implementing standard units. However, there is currently no consensus on how units should be measured or standardized among different cannabis products or methods of administration.

Argument Existing proposals for standard cannabis units have been based on specific methods of administration (e.g. joints) and these may not capture other methods, including pipes, bongs, blunts, dabbing, vaporizers, vape pens, edibles, etc.
Would standard amounts or serving sizes of THC help people decide how much of an edible to consume?

ALL US RESPONDENTS 2020, n=29,742

Yes 61%  
No 14%  
Don't know 26%  
Consumers: 70% “Yes”
Should packaging for other cannabis products display standard amounts or serving sizes of THC?

ALL US RESPONDENTS 2020, n=29,711

- Yes: 69%
- No: 11%
- Don’t know: 20%

Consumers: 76% “Yes”
Summary 2.0

- Adverse events are common
- ...across all product forms
- THC literacy is very low
- Consumers want easy to understand THC / ‘strength’ labelling
Product labelling & health warnings
To what extent do consumers notice & use health warnings?
Exposure to health warnings

Noticing cannabis health warnings on packages

AMONG PAST 12-MONTH CONSUMERS
CANADA

More comprehensive health warnings and labelling regulations than any US state.
In the past 12 months, have you seen health warnings on marijuana products or packages?

AMONG PAST 12-MONTH CONSUMERS
Labelling regulations are associated with greater message recall.

Recall is highest among consumers who purchase from legal sources.

HEALTH WARNING

Experimental studies

No warning  US states  Canada
EXPERIMENT

Canadian warning design increase message recall vs. US-style warnings.

GOODMAN S, RYNARD V, IRANIPARAST M, HAMMOND D. PREVENTIVE MEDICINE 2021; SEP 7:106788.
Do you support or oppose government health warnings on marijuana products?

ALL RESPONDENTS 2021

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support</td>
<td>66%</td>
<td>59%</td>
</tr>
<tr>
<td>Neutral</td>
<td>28%</td>
<td>32%</td>
</tr>
<tr>
<td>Oppose</td>
<td>6%</td>
<td>9%</td>
</tr>
</tbody>
</table>

*Excluding ‘Don’t Know’
Limits on brand imagery reduce appeal and increase efficacy of health warnings.
Summary 3.0

- Mandated warnings are a low-cost, sustainable means of communicating with consumers.

- More comprehensive warnings are more effective.

- ‘Spill-over’ effects into ‘illegal’ markets.
REGULATIONS

Product standards
Product standards in legal market

Leafly.

World’s largest THC-infused brownie weighs in at 850 pounds

20,000 mg of THC

Quebec – Product standards

• No candy, dessert, chocolate or any other product attractive to persons under 21 years of age.

• THC limit of 30%, including concentrates
Restricted products

Edibles

Bouchées Cannelle et Cassis

Size: 2 units

SOURCE: HTTPS://WWW.SQDC.CA/EN-CA/P-BOUCHEES-CANNELLE-ET-CASSIS/826966012709-P/826966012709
Product use
CANADA
PAST 12-MONTH CONSUMERS

- **TINCTURES**
  - 2018: 9%
  - 2019: 11%
  - 2020: 14%
  - 2021: 8%

- **DRIED FLOWER**
  - 2018: 81%
  - 2019: 76%
  - 2020: 73%
  - 2021: 72%

- **EDIBLES**
  - 2018: 38%
  - 2019: 31%
  - 2020: 34%
  - 2021: 35%

- **HASH**
  - 2018: 25%
  - 2019: 23%
  - 2020: 26%
  - 2021: 30%

- **ORAL OILS**
  - 2018: 22%
  - 2019: 22%
  - 2020: 24%
  - 2021: 23%

- **VAPE OILS**
  - 2018: 21%
  - 2019: 17%
  - 2020: 18%
  - 2021: 19%

- **CONCENTRATES**
  - 2018: 17%
  - 2019: 13%
  - 2020: 16%
  - 2021: 17%

- **TOPICALS**
  - 2018: 9%
  - 2019: 11%
  - 2020: 15%
  - 2021: 14%

- **DRINKS**
  - 2018: 8%
  - 2019: 8%
  - 2020: 15%
  - 2021: 14%
Product regulations

PRODUCT USE AMONG PAST 12-MONTH CONSUMERS 2021

QUEBEC ‘LEGAL’ SALES

- Dried flower

QUEBEC ‘RESTRICTED’ SALES

- Edibles
- Hash or kief
- Vape oils
Similar trends for products legally available in Quebec vs. rest of Canada.
Lower use of prohibited products in Quebec vs. rest of Canada.

Vape liquids
PAST 12-MONTH USE

Solid concentrates
PAST 12-MONTH USE
Lower use of prohibited products in Quebec vs. rest of Canada.
Do product standards sustain illicit trade?

THC caps in Vermont could keep black market alive

By Lex Merrell, Vermont News & Media  jun 19, 2022

MONTPELIER — The amount of THC — the cannabinoid that produces the high sensation after consumption of cannabis, commonly referred to as marijuana — in concentrates has been capped in Vermont, but some worry that cap could cause the illegal cannabis market to thrive.

Act 158, signed by Gov. Phil Scott at the end of May, states that cannabis concentrates cannot surpass 60 percent THC, a cap backed by science due to concern over the negative effects of highly concentrated cannabis.

Dr. Catherine Antley, a pathologist at Copley Hospital in South Burlington, said, "These are not products used by the 'casual' cannabis consumer." In the 1990s, the average THC content of cannabis in flower form was less than 4 percent. Today, she said, it's about 15 percent.
Illegal cannabis purchases are similar between Quebec and other provinces.

Mean percentage of all cannabis products purchased in last 12-months from a legal retail source among past 12-months consumers

<table>
<thead>
<tr>
<th>Province</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>79%</td>
<td>72%</td>
<td>61%</td>
</tr>
<tr>
<td>BC</td>
<td>72%</td>
<td>75%</td>
<td>72%</td>
</tr>
<tr>
<td>AB</td>
<td>74%</td>
<td>68%</td>
<td>74%</td>
</tr>
<tr>
<td>SK</td>
<td>83%</td>
<td>70%</td>
<td>63%</td>
</tr>
<tr>
<td>MB</td>
<td>86%</td>
<td>80%</td>
<td>71%</td>
</tr>
<tr>
<td>ON</td>
<td>80%</td>
<td>78%</td>
<td>59%</td>
</tr>
<tr>
<td>QC</td>
<td>58%</td>
<td>74%</td>
<td>80%</td>
</tr>
<tr>
<td>ATL</td>
<td>77%</td>
<td>72%</td>
<td>71%</td>
</tr>
</tbody>
</table>
Reasons for purchasing from ‘illegal’ sources

“Legal sources don’t sell products I want”

AMONG CONSUMERS WHO REPORT PURCHASING FROM ILLEGAL SOURCE IN PAST 12 MONTHS
Compared to other provinces, Quebec consumers...

↑ ‘illegal’ purchases for vape oils and edibles

↓ ‘illegal’ purchases for dried flower and orals
Edible consumers in Quebec less likely to source from legal stores.

In the past 12 months, how did you get the edible(s) you ate?

2021, N=3,329

<table>
<thead>
<tr>
<th>Method</th>
<th>Quebec</th>
<th>Other provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Made my own</td>
<td>13.3</td>
<td>9.5</td>
</tr>
<tr>
<td>Family/friends</td>
<td>32.6</td>
<td>36.1</td>
</tr>
<tr>
<td>Dealer</td>
<td>12.0</td>
<td>6.7</td>
</tr>
<tr>
<td>Delivery</td>
<td>18.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Store</td>
<td>26.7</td>
<td>43.3</td>
</tr>
</tbody>
</table>
Likelihood of ‘illegal’ edibles is higher among edible consumers in Quebec

But....

Overall number of who source illegal edibles is lower in Quebec.
(Because Quebec has ~half the number of edible consumers.)
Do adverse events differ in Quebec vs. the rest of Canada?
Similar profile of adverse events.

AMONG CONSUMERS
PAST 12-MONTH USERS

<table>
<thead>
<tr>
<th></th>
<th>Quebec</th>
<th>Other provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any adverse event</td>
<td>28.6%</td>
<td>29.5%</td>
</tr>
<tr>
<td>Sought medical help</td>
<td>5.5%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

ALL RESPONDENTS

<table>
<thead>
<tr>
<th></th>
<th>Quebec</th>
<th>Other provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any adverse event</td>
<td>8.5%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Sought medical help</td>
<td>1.6%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

ICPS
Adverse events attributed to different products.

When you experienced the negative health effects, what type or form of marijuana were you using?

AMONG THOSE WHO EXPERIENCED ADVERSE EVENT IN PAST 12-MONTHS

<table>
<thead>
<tr>
<th>Product</th>
<th>Quebec</th>
<th>Other provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower</td>
<td>51%</td>
<td>54%</td>
</tr>
<tr>
<td>Capsules</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td>Liquids/drops</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>Vape liquids</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Edibels</td>
<td>2%</td>
<td>14%</td>
</tr>
<tr>
<td>Drinks</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>Concentrates</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Hash</td>
<td>9%</td>
<td>6%</td>
</tr>
</tbody>
</table>

ICPS
Pediatric cannabis hospitalizations
Greater increases in other provinces vs. Quebec

TO THE EDITOR: Unintentional cannabis poisoning in children may be a consequence of legalizing cannabis for adult use, although the effect of legalization with or without the sale of cannabis edibles on cases of ingestion in children is unclear. In October 2018, Canada legalized the sale of dried cannabis flower to adults for non-medical use. Starting in January 2020, the sale of edible products (e.g., gummies, chocolates, and baked goods) with tetrahydrocannabinol (THC) was approved. Although all provinces were required to allow the sale of cannabis flower, each province could choose to restrict sales of edibles. Alberta, British Columbia, and Ontario (combined population, 24.3 million) allowed cannabis edibles until September 2021. Details of our methods are provided in the Supplementary Appendix, available with the full text of this letter at NEJM.org.

During the 7-year study period, there were 581 hospitalizations for cannabis poisoning in children (53.9% in boys; mean age, 3.6 years). Details on the representativeness of our study population and the generalizability of our findings are provided in Table S1 in the Supplementary Appendix. Before legalization, hospitalization rates were similar across provinces (0.95 per 100,000 person-years in exposed provinces vs. 0.93 per 100,000 person-years in the control province (Fig. 1). Hospitalization rates in the
No clear difference in accidental ingestion between jurisdictions.

When you experienced the negative health effects, what type or form of marijuana were you using?

AMONG THOSE WHO EXPERIENCED ADVERSE EVENT IN PAST 12-MONTHS 2021
THC limits
Edibles
10mg / package
US consumers more likely to report adverse events.

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage of Consumers Seeking Medical Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illegal states</td>
<td>7.6%</td>
</tr>
<tr>
<td>Medical states</td>
<td>9.3%</td>
</tr>
<tr>
<td>Legal states</td>
<td>9.4%</td>
</tr>
<tr>
<td>Canada</td>
<td>4.7%</td>
</tr>
</tbody>
</table>

Percentage of consumers who sought medical help for adverse effects caused by cannabis use among past 12-month consumers, 2021.
US consumers more likely to report accidental consumption.

In the past 12 months, has anyone in your household accidentally consumed marijuana?

% ‘YES’ AMONG PAST 12-MONTH CONSUMERS, 2021, N=33,999

US consumers more likely to report accidental consumption.
Summary 4.0

- Product standards resulted in lower use for prohibited products in Quebec.
- Similar or lower levels of illegal purchasing at population-level.
- No clear impact on adverse events in either direction.
- Broad need for additional evidence.
Price and purchase sources
THC-based taxes

- Weight-based for flower
- THC-based for extracts: 1 cent per mg

\[ \text{\$44.95 / cartridge} \]

\[ \text{~ \$8.00 tax per vape cartridge} \]
Variable prices across jurisdictions.

**Price of dried flower**
SALES WEIGHTED PRICE-PER-GRAM OF DRIED FLOWER AT LAST PURCHASE, 2021

- US total: $9.17
- Illegal states: $9.94
- Medical states: $9.18
- Legal states: $8.75
Major price differences between ‘legal’ markets.

<table>
<thead>
<tr>
<th>State</th>
<th>Price per Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>$6.25</td>
</tr>
<tr>
<td>WA</td>
<td>$7.38</td>
</tr>
<tr>
<td>AK</td>
<td>$9.09</td>
</tr>
<tr>
<td>OR</td>
<td>$5.56</td>
</tr>
<tr>
<td>MA</td>
<td>$11.87</td>
</tr>
<tr>
<td>IL</td>
<td>$11.19</td>
</tr>
<tr>
<td>NJ</td>
<td>$9.65</td>
</tr>
</tbody>
</table>
Summary

• Rapid evolution of cannabis market.

• Increase in more highly processed products.

• National US market reaching a tipping point—narrowing differences across jurisdictions?
Summary

• Product standards can shift consumer consumption, not just retail source.

• Behavioral compensation at the ‘individual’ and ‘population’ level?

• Integration of biomarker and product collection in population studies desirable.

• Potential of ‘natural experiments’ comparing jurisdictions with different regulations.
ICPS reports

United States
2021 CANNABIS REPORT
JUNE 2022

Washington
2021 CANNABIS REPORT
MAY 2022
www.cannabisproject.ca

A new international study on cannabis legalization and public health.

Learn More
Research team

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Samantha Goodman Canada
Elle Wadsworth Canada
Christian Boudreau Canada
Pete Driezen Canada

Julia Dilley United States
Tom Freeman United Kingdom
Wayne Hall Australia
Beau Kilmer United States
Rosalie Pacula United States
Gillian Schauer United States
Chris Wilkins New Zealand
Thank you.

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