

The Form and Content of Cannabis Products in the United States

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INTRODUCTION

Thirty states have legalized cannabis in some form. Cannabis potency is largely estimated from cannabis seized in drug raids and state-controlled producers. Little data exists about the tetrahydrocannabinol (THC) content and form of products commercially available.

Recreational states have defined potency thresholds in edibles, limiting THC to 50 or 100 mg per package and 5 or 10 mg per serving depending on the state. No clear limit exists on THC in other product forms. In addition, while recreational states prohibit false marketing claims and advertising aimed at children, no data exists on how well regulations are enforced.¹

We collected data on form, THC concentration, and associated marketing claims of products in dispensaries to better understand products available and marketing targeted at the public.

METHODS

We identified the top three dispensaries with the most consumer reviews as a metric of public interest, reviewing a total 65 dispensaries. Six states and DC do not allow dispensaries. We extracted data on all products available for the most reviewed dispensary in each state (8 recreational states, 15 medical states). We determined sample representativeness by comparing our data with two more randomly selected dispensaries from the original list. When no new products were identified in form or THC content, data collection was considered complete. Information on form, marketing and nutritional claims, and THC content was collected for each product. Data was summarized by medians and interquartile range of THC content.

RESULTS

We identified 2264 unique products, 710 (31.4%) in recreational states and 1546 (68.3%) in medical states (Table 1).

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Among those, 1294 (57%) listed THC by serving or package. In recreational states, THC content in edibles ranged from 5 to 7000 mg among packages. About 4.2% ($N=30$) of packages exceeded the 100 mg limit and 4.0% ($N=28$) of servings exceeded the 10 mg limit. Among all edibles, 8.1% ($n=183$) were in forms potentially attractive to children (e.g., candy). In recreational states, median THC in extracts was 1000 mg in packages and 100 mg in servings, with 65.9% ($N=81$) of packages exceeding 100 mg and 50.4% ($N=62$) of servings exceeding 10 mg.

Among all products, 473 (20.9%) claimed therapeutic efficacy, 34% ($N=160$) of which were identified in recreational states. Most common was pain management ($n=332$, 14.7%), anxiety ($n=188$, 8.3%), insomnia ($n=188$, 8.3%), depression ($n=156$, 6.9%), and stress ($n=117$, 5.2%). Other indications (e.g., seizures, PTSD) were less frequent ($n=28$, 1.3%). Fifteen (0.7%) made nutritional claims (e.g., “vitamin E”, “gluten-free, vegan”, “omega 3”). Nine (0.4%) warned of adverse effects (e.g., dry mouth).

DISCUSSION

Most edible products adhered to THC limits. However, the regulatory vacuum constraining THC content in other products has resulted in a proliferation of cannabis with high THC concentrations. We also found over 20% of products claimed therapeutic efficacy and 1 out of 12 edibles was potentially appealing to children.

The development of new products with high THC concentrations has outpaced safety data. A pooled analysis of 79 trials examining the efficacy of cannabis for several conditions reported severe adverse events including vomiting, diarrhea, disorientation, anxiety, confusion, dyspnea, seizures, psychosis, hallucination, and paranoia.² The median dose of THC in cannabinoid pharmaceuticals in these trials was 8 mg. High potency cannabis has also been linked to psychosis, rapid onset of paranoid delusions, and catatonia.³ These data raise concerns given the high THC content available in some recreational products.

We found 20% of products advertised therapeutic benefits. Benefits attributed to cannabis included conditions where there is limited data available or conditions that cannabis may worsen like anxiety and depression,^{4, 5} suggesting regulations are inadequately enforced. No regulations currently

Table 1 THC Levels Listed for the Cannabis Products with Reported THC Content (N=2264)

Recreational states		Product with reported THC Content	Form detail examples	THC mg/package					THC mg/serving				
Form				Min*	Q1	Med	Q3	Max	Min*	Q1	Med	Q3	Max
	710 (31.4%)			10	80	100	100	1000	5	10	10	10	80
Edibles	228 (32.1%)	Candy N=69	Berry gummy Lemon lollipop caramel hard candy Chocolate candy bar										
		Baked good N=33	Chocolate chip cookie Peanut butter brownie	20	46.25	70	100	100	5	10	10	40	70
		Sublingual N=44	Capsule/pill Lozenge Tinctures Spray	7	85	150	337.5	7000	1.69	5	8.38	10.5	70
		Drink N=24	Tea Coffee Soda Alcohol Water Syrup Butter Jam Peanut butter Honey	5	32.5	50	100	253	5	10	10	10	50
		Spread N=4	Butter Jam Peanut butter Honey	50	54.5	56	154.5	450	5	N/A	5	N/A	5
All edibles	123 (17.3%)	N=228 81 (65.9%)	As above Crumble Shatter Wax	5 500	57 500	100 1000	100 1000	7000 1000	1.69 5	7 5	10 100	10 100	80 100
Topical	38 (5.4%)	31 (81.6%)	Lavender lotions oils Bath salts Body balm	4	10	20	90	100	10	20	20	20	30
Vaginal	1 (0.1%)	1 (100%)	N/A	80	N/A	N/A	N/A	80	20	N/A	N/A	N/A	20
Bud or flower	320 (45.1%)	261 (81.6%)	Sativa Indica Hybrid	THC% in cannabis bud packages**					Median	Q3	Max		
				0.4		18		21		23.60		54	
Medical states		Product with reported THC Content	Form detail examples	THC mg/package					THC mg/serving				
Form				Min*	Q1	Med	Q3	Max	Min*	Q1	Med	Q3	Max
Edibles	692 (44.8%)	Candy N=163 (23.6%)	Berry gummy Lemon lollipop caramel hard candy Chocolate candy bar	2	70	150	225	1000	3.33	10	25	45	166
		Baked good N=104 (15.0%)	Chocolate chip cookie Peanut butter brownie	1	60	100	200	1000	<0.5	15	31	50	100
		Sublingual N=165 (23.8%)	Capsule/pill Lozenge Tinctures Spray	1.6	40	120	300	3000	0.023	4	10	20.96	201.9
		Drink N=71 (10.3%)	Tea Coffee Soda Alcohol Water Syrup Butter Jam Peanut butter Honey	5	75	100	300	1500	0.4	8.13	10	22.4	50
		Spread N=30 (4.3%)	Butter Jam Peanut butter Honey	5	56.8	190	345	1000	1.03	15	25	45	90
		Other N=25 (3.6%)	Gum Nuts Sugar cubes As above	4.99	40	100	125	500	3.4	5	10	11.9	40
All edibles	348 (22.5%)	692 (44.8%)	As above	1	50	120	250	3000	0.023	10	19.47	37.5	201.9
Extracts	254 (73.0%)	254 (73.0%)	Crumble Shatter Wax	5	500	500	1000	7000	0.4	1.25	1.6	1.81	1.87
Topical	97 (6.3%)	53 (54.6%)	Lavender lotions oils Bath Salts Body Balm	1.1	25	75	150	1500	1.6	3.3	5	15	25

(continued on next page)

Table 1. (continued)

Rectal or vaginal	3 (0.2%)	3 (100%)	N/A	75	157.5	240	345	450	60	N/A	N/A	N/A	60
Bud or flower	406 (26.3%)	271 (66.7%)	Sativa Indica Hybrid	THC% in cannabis bud packages**				Median	Q3	Max			
				Min		Q1		21.34	25.65				57.66
				0.2		14.13							

*Some products were Cannabidiol only products with minimal THC content

**THC is reported by percentage of weight only in bud/flower products

constrain product form or flavor and many edibles are in forms potentially appealing to children (e.g., candy, flavored drinks). This is of concern given the rise in pediatric poisoning with cannabis products.⁶

Our methods have several limitations. In absence of sales data, consumer reviews were used as a metric of dispensary interest. We also used websites to identify products and all products may not have been listed. Finally, some products did not provide THC content. While the sampling strategy had some limitations, it nonetheless provides a clear picture of products available to the public.

In conclusion, the proliferation of high THC cannabis products combined with inadequate marketing oversight may pose risks to public health. More regulatory oversight is needed.

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Compliance with Ethical Standards:

Conflict of Interest: The authors whose names are listed in this publication certify that they have NO affiliations with or involvement

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