

A Content Analysis of Cannabis Company Adherence to Marketing Requirements in Four States

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ABSTRACT. Objective: Marketing messages can influence adolescents' attitudes and behaviors toward alcohol and tobacco. In the era of legalized cannabis use, retail cannabis companies often use social media marketing on platforms popular among youth. The purpose of this study was to evaluate adherence to state-based regulations for restricted and required content across social media from recreational cannabis businesses. **Method:** A retrospective content analysis was used to evaluate one year of publicly displayed posts by retail cannabis companies on Facebook and Instagram from four states in which recreational cannabis use is legal (Alaska, Colorado, Oregon, and Washington State). We evaluated restricted content including the following: (a) business practices, such as avoiding discounts/promotions or promoting branded products; (b) modeling cannabis use or overconsumption; (c) youth-

focused messaging; and (d) health benefits. We evaluated required content including three types of warnings: (a) limiting cannabis use to those age 21 and over, (b) avoiding impaired driving, and (c) describing health risks. **Results:** A total of 2,660 posts were evaluated from 14 businesses. In the area of restricted content, discounts/promotions were present in approximately 35% of all posts. Another common category was overconsumption, found in 12% of posts. Required content regarding warnings was present in less than half of all social media posts. **Conclusions:** Despite state-based advertising restrictions, recreational cannabis business pages use messages with youth appeal. Required safety message adherence is not typical on social media business pages. (*J. Stud. Alcohol Drugs*, 83, 27–36, 2022)

IN NOVEMBER 2012, Washington State passed Initiative Measure No. 502 (I-502) and Colorado passed Amendment 64, both of which legalized recreational, non-medical cannabis use for persons ages 21 and over. As of 2021, a total of 17 states have passed legislation allowing adult non-medical use of cannabis (National Conference of State Legislatures, 2021). Laws such as I-502 have led to concern about increased youth exposure and access to cannabis, which may be an unintended consequence of expanding adult access. Adolescents are a crucial at-risk population for cannabis use: rates of use among adolescents are approximately 15% for past-30-day use and 30% for lifetime use (Johnston et al., 2018). Consequences of adolescent cannabis use include academic difficulties such as dropping out of school, psychiatric impairment including memory loss, and progression to other drugs (Buckner et al., 2010; Green et al., 2010, 2017; Scott et al., 2018).

Previous work has illustrated that youth are susceptible to persuasive alcohol messaging in media (Austin et al., 2006; McClure et al., 2018; Sargent et al., 2020). More than 25

longitudinal studies of youth exposure to alcohol marketing have found associations with subsequent use, and progression from experimentation to binge and heavy use (Anderson et al., 2009; Jernigan et al., 2017). In the world of digital media, researchers have hypothesized that the engagement and interaction that can occur with businesses via social media influences how marketing effects progress from awareness to encouraging behavior (McClure et al., 2016). A 2020 systematic review concluded that engagement with digital marketing is positively associated with increased alcohol consumption as well as binge drinking behavior (Noel et al., 2020).

Given the substantial possibility that marketing and promotions can affect the trajectory of youth cannabis use, the development, application, and enforcement of policies designed to prevent underage cannabis use are essential elements to include with the legalization of recreational use. Each new state that legalizes recreational cannabis use is charged with developing new policies to protect youth. Faced with this task, many states are modeling their policies after existing states' work. Thus, we are now at a critical juncture in which an understanding of the current status of cannabis advertising policies and compliance with them on social media is important and timely.

Although direct advertising of cannabis on social media remains illegal, cannabis companies can create promotional profiles called "business pages" on social media platforms, such as Facebook and Instagram. Business pages establish a continuous presence on social media at no cost to the com-

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pany. Cannabis companies can use social media business pages to reach potential consumers who are able to engage with the business page by becoming a “follower.” Thus, cannabis companies can utilize engagement with individuals on social media to achieve ongoing exposure to cannabis messages. Further, cannabis messages on social media may exert influence through interactive strategies, such as being able to like, comment, or share content from a retail cannabis company. An article in *Forbes* described how cannabis companies can use strategies to build online communities by using hashtags and visual media toward “redefining the stoner stereotype” (Weed, 2017). However, the content of cannabis company social media business pages remains unexplored. The purpose of this study was to evaluate adherence to state-based regulations for restricted and required content across social media business pages from cannabis companies marketing for recreational (non-medical) use in four states.

Method

This study used retrospective content analysis to evaluate social media posts on public Facebook and Instagram pages of recreational cannabis companies.

We selected four states for evaluation in which adult recreational cannabis use was legal, and pilot data revealed that there was a significant retail recreational cannabis business presence on social media. These states were Alaska, Colorado, Oregon, and Washington. Evaluation of social media was conducted over one calendar year between June 1, 2017, and May 31, 2018. This study was determined to be exempt by the relevant institutional review board as a review of publicly available information.

Profile identification

Data for this study were obtained from two social media sites, Facebook and Instagram. We selected Facebook and Instagram for evaluation based on previous work in which Facebook and Instagram were noted to be common platforms used by retail businesses, including cannabis businesses (Moreno et al., 2018b). Further, business publications and websites frequently list Facebook and Instagram as the most effective marketing tools for businesses (Kuligowski, 2021; Thompson, 2021). Finally, these platforms were among the most popular social media sites for both youth and businesses using social media at the time of this study (Anderson & Jiang, 2018; Lenhart, 2015).

We initially identified potential retail cannabis companies through a search on Facebook using the search terms [retail cannabis + state name] under Pages and Local Business or Place. The “About” section or company name was evaluated to confirm that the business focused on retail recreational cannabis sales. We then determined whether the company was present on both Facebook and Instagram. If so, we evaluated

further inclusion criteria: company location in the appropriate state, content in English, posting at least twice within the past 2 months to ensure the profile was actively used, and having maintained both social media profiles since June 2017 so that a full year of content was available for evaluation. Of the companies that met inclusion criteria, the top five most popular business pages were selected for each state based on number of total followers on Facebook and Instagram.

We identified 80 recreational cannabis companies in Oregon, Colorado, Alaska, or Washington State with a social media presence on Facebook. Exclusions were as follows: only maintained a Facebook account (39 companies), did not post twice within the previous 2 months (10 companies), did not have a full year of content available (5 companies), or did not fall within the top 5 most popular for their state (10 companies). Of the 16 companies that met inclusion criteria, 5 were respectively from Oregon, Colorado, and Washington State, and 1 was from Alaska. Two companies deleted their Facebook or Instagram pages after selection and before coding: 1 from Colorado and 1 from Washington. Each company was assigned a letter (e.g., Company A, Company B) to represent it in our data collection and reporting.

Codebook development

The codebook was adapted from a previous Facebook cannabis content analysis study focused on Washington State. We evaluated the codebook to ensure applicability for the setting of Instagram and to use across several states (Moreno et al., 2018b). From cannabis business pages not included in these study data, we conducted pilot coding to test and refine the codebook. A total of three rounds of pilot coding followed by codebook revision or clarification were conducted.

Online cannabis advertising regulations were reviewed from each of the four states included in this study. These regulations included restricted and required content. Restrictions fell into four main categories: (a) restrictions on business practices, such as avoiding discounts/promotions or promoting branded products; (b) restrictions on modeling cannabis use or overconsumption; (c) restrictions on youth-focused messaging, including pop culture references and youth appeal messages or underage models; and (d) restrictions on health benefits. Required content included three types of warnings: (a) limiting cannabis use to those age 21 and over, (b) avoiding impaired driving, and (c) describing health risks. Our codebook included all regulations to facilitate comparisons across states with and without specific regulations.

Data collection

We evaluated social media content distributed across a full year in order to capture different seasons, events, and holidays that may influence marketing and promotional mes-

saging. The purpose of this data-collection approach was to collect a random sample of posts from a variety of different time points across one year. Pilot coding demonstrated that the number of monthly posts varied by business page; thus, we adapted our approach to collect equal numbers of posts across business pages and avoid overrepresentation of particular companies in our sample.

Based on a previous study (Moreno et al., 2018b), our data-collection approach was designed to achieve a sample of up to 15 posts per month for each business page. For months with 15 or fewer posts, all posts were coded; for months with between 16 and 30 posts, every other post was coded; and for months with 31 or more posts, the final post on the day of even-numbered days of the month was coded.

Multimedia content on Facebook and Instagram profiles was coded including text, photographs, and images (e.g., memes and downloaded icons). Data from each post were recorded using a typed description including verbatim text quotes and written descriptions of images. The content within a single post could be coded as representative of more than one codebook construct. Data were recorded in a customized, password-protected FileMaker database by four trained coders. To assess coder agreement, all coders assessed a 10% subsample of posts. Interrater agreement for study variables ranged between 91% (overconsumption) and 98% (modeled use of cannabis).

Codebook variables

The coding schema based on online cannabis advertising regulations is described in Table 1. Restrictions on content included all four categories of restrictions listed above. Required content included any of the three warning types enumerated above. Descriptive variables for each cannabis business page included the company name, geographic location, and number of followers. We evaluated the population of the city in which each company was located using the official city website and classified each company as located in an urban or rural setting using U.S. Census categories (Bureau of the Census, 2002).

Analysis

Descriptive statistics were used to characterize recreational cannabis social media business pages. For each regulation category, we calculated the frequency of posts representing that category in our overall sample. Likelihood ratio chi-square tests were used to compare regulation categories across states by each type of restriction or requirement.

Results

A total of 14 companies' business pages were evaluated to generate our sample of 2,660 posts from Facebook and

Instagram. The number of followers for each page ranged from 161 to 11,129 on Facebook and from 644 to 9,897 on Instagram. Table 2 provides descriptive information about the cannabis companies.

Restricted content

There were several areas in which content in violation of state-based regulations was frequently present on retail cannabis business social media pages. First, posts describing discounts/promotions were common, present in 922 social media posts (34.7% of all posts). Two states, Alaska and Washington, specified restrictions on this type of content. Content describing discounts and promotions was present within 2.7% of social media posts from businesses in Alaska and 39.7% in Washington, where the restriction was present, compared with a high of 51.1% of posts from businesses in Oregon, where the restriction was not present. However, overall, there were no differences across the four states in likelihood of this type of restricted content based on state regulations ($p = .21$). Frequency of types of post by category and by state is included in Table 3. Examples of these types of posts included describing "happy hour" discounts. One example of a post describing a discount stated: "Daily Specials: Monday: All 1/8ths on specials . . . Tuesday: 10% off topicals . . . Wednesday: 10% off concentrates and cartridges . . . Thursday: 10% off edibles . . . and Friday: discount joint with purchase."

Within this first category for restriction on business practices was promoting branded products featuring the company name or cannabis brand name. This type of message was less common, present in 164 posts (6.2% of all posts). Washington was the only state with this restriction, and businesses in this state were less likely to display social media posts about branded products than the three states that did not have such restrictions (1.7% vs. 0%–10%, $p < .0001$). Branded products typically included T-shirts or hats. One post advertised a discount if a customer wore the branded shirt: "Need a T-shirt? ♥ Represent & get 10% off your purchase."

The second category of restricted content included modeling cannabis use. Social media posts describing individual cannabis use were uncommon, present in 62 posts (2.3%). Only Oregon had restrictions on content depicting individual cannabis use, and Oregon businesses were less likely to post this type of content on social media than those from other states (1.4% vs. 0%–3%, $p = .03$). Frequency of types of post by category and by state is included in Table 3. Examples of this type of post included photographs showing individual people using cannabis, or text describing an individual's experience using cannabis.

Within this second category of restricted content, we found that messages that promoted overconsumption were present on 324 social media posts by retail cannabis businesses (12.2% of all posts). Alaska, Oregon, and Washington

TABLE 1. Descriptions of codebook variables linked to state restrictions on cannabis advertising constructs



Coding category	Coding definition	Regulation	States with restriction	Social media post examples
Restrictions on content				
Restrictions on business practices				
Discounts/ promotions	Specials or deals on cannabis products - Includes bans on giving away free samples or coupons for discounts	Alaska Alcohol and Marijuana Control Office AS 17.38; Washington Administrative Code (WAC) 314-55-155	Alaska, Washington	<i>Memorial Day Specials All Weekend!</i> <i>Come in for our Friday specials all day! 10% off select products</i>
Branded products	Store-branded merchandise that is not paraphernalia or cannabis - Includes shirts, hats	WAC 314-55-155	Washington	<p>We're doing it again!!! This time, we're giving away a locally blown bubbler by our very own David! We're also gonna be giving away another one of our "LEGAL" design T-Shirts!</p> <p>All you have to do to enter to win this one is to like, share and comment on this post and on June 21st, we'll announce the winners!!! #recreationalrelaxation</p>  <p>A GRAND PRIZE OF THIS RAD LOCALLY BLOWN (bubbler) OR "LEGAL" DESIGN T-SHIRT. JUST LIKE AND SHARE THIS POST TO BE ENTERED. GET IN IT TO WIN IT!</p> <p>Like Comment Share</p> <p>29 Most Relevant</p> <p>38 Shares</p>
Restrictions on modeling cannabis use or overconsumption				
Modeled use of cannabis	Image(s) of person(s) actively using or preparing cannabis for use	Oregon Liquor Control Commission (OLCC) Division 25 Recreational Cannabis Rules	Oregon	<p>We always here the stories, but rarely get a good look at the numbers. These scientists share their research! #recreationalrelaxation</p>  <p>HERB.CO</p> <p>We Talked To Leading Scientists About Whether Cannabis Actually Cures Cancer</p> <p>1 Share</p>
Over-consumption	Promotes heavy or consistent consumption of cannabis	Alaska Alcohol and Marijuana Control Office AS 17.38; OLCC Division 25 Recreational Marijuana Rules; WAC 314-55-155	Alaska, Oregon, Washington	<i>#staylit #stoner #420everyday #smokeweedeveryday</i>

Table continued

TABLE 1. Continued




Coding category	Coding definition	Regulation	States with restriction	Social media post examples
Restrictions on youth-focused messaging				
Pop culture	Popular media such as movies, music, or TV - Includes celebrities or characters in media	OLCC Division 25 Recreational Cannabis Rules	Oregon	 <p>C21 January 3 · 🌐 Get lit like Rick! #recreationalrelaxation</p> <p>HERB CO Fictional drugs from the Rick and Morty multiverse that Earth desperately needs</p> <p>Like Comment Share</p>
Youth appeal	Objects that suggest the presence of a child or appeal to people under 21 years old	Alaska Alcohol and Marijuana Control Office AS 17.38; Code of Colorado Regulations CCR 212-2, OLCC Division 25 Recreational Marijuana Rules; WAC 314-55-155	Alaska, Colorado, Oregon, Washington	 <p>YOU ARE GONNA SMOKE WEED WITH ME AND YOU ARE GONNA LIKE IT!</p> <p>denverkushclub · Follow denverkushclub · Its 1:58h · day · View in Come in. jerkid011221 @denLarso24</p> <p>74 likes</p>
Underage model	Image(s) of model(s) that appear(s) to be under 21 years old	OLCC Division 25 Recreational Marijuana Rules	Oregon	 <p>C21 October 13, 2017 · 🌐 Turns out that our endocannabinoid system is like totally a natural part of the body and responds to cannabinoids that don't come from cannabis. #themoreyouknow</p> <p>HERB CO Babies Need Cannabinoids To Grow Into Productive Citizens Research has found that cannabinoids are crucial in the earliest stages of...</p> <p>Like Comment Share</p> <p>homegrownapothecar Portland, Oregon homegrownapothecar Haha probably #organic #betterhigh #dogofcannabis #weedhumor #dogofinstagram #haha #furf #weedmemes #stonerhumor # #moodboost #laugh #snoggy #scarcion #stims #memes #fuf #pdx #portland takealoughdaily Visit our page laugh 🤔🤔🤔</p> <p>48 likes</p>

Table continued

TABLE 1. *Continued*

Coding category	Coding definition	Regulation	States with restriction	Social media post examples
Restrictions on health claims				
Health benefits	Represents the use of cannabis as having curative or therapeutic effects	Alaska Alcohol and Marijuana Control Office AS 17.38; OLCC Division 25 Recreational Marijuana Rules; WAC 314-55-155	Alaska, Oregon, Washington	<i>Have you nourished your Endocannabinoid System (ECS) today!? If not, head over to [store name] in Portland and pick up any one of our CBD Master Blends that suits your need. #Replaceyourpharmaceuticals #wellness #cannabiscurescancer #sexualhealth</i>
Requirements for content to be present on posts				
Limiting use to those age 21 and older	Indicates that cannabis is not for the use of anyone under 21 years old	Alaska Alcohol and Marijuana Control Office AS 17.38; OLCC Division 25 Recreational Marijuana Rules; WAC 314-55-155	Alaska, Oregon, Washington	<i>For use only by adults twenty-one and older. Keep out of the reach of children.</i>
Avoiding impaired driving	Warns against operating a vehicle or machinery under the influence	Alaska Alcohol and Marijuana Control Office AS 17.38; OLCC Division 25 Recreational Marijuana Rules; WAC 314-55-155	Alaska, Oregon, Washington	<i>Do not operate a vehicle or machinery while under the influence of this drug.</i>
Describing health risks	Warns of (a) intoxicating effects; (b) habit forming; (c) impaired concentration, coordination, and judgment; and (d) there may be health risks associated	Alaska Alcohol and Marijuana Control Office AS 17.38; WAC 314-55-155	Alaska, Washington	<i>Marijuana can have intoxicating effects and may be habit forming. Marijuana can impair concentration, coordination, and judgment. There may be health risks associated with consumption of this product.</i>

Note: AS = Alaska Statute.

restricted this type of content. Companies in states that had specific restrictions preventing overconsumption posts were more likely to have this type of content present on social media compared with the state that did not (9.3%–15.6% vs. 7.7%, $p < .0001$). Example terms encouraging overconsumption included “get high” and “go higher.”

For the third coding category, related to youth-focused messaging—pop culture references, youth appeal messages, and underage models—we found that all three of these elements were uncommon. The most common of the three was pop culture references, which were present within 10.8% of posts on Colorado business pages. Pop culture references were only restricted in Oregon; there were no significant differences in proportion of pop culture references in restricted compared with unrestricted states ($p = .45$). Youth appeal was restricted in all states but was present in between 2.7% and 9.9% of posts across the four states. Use of young-looking models was restricted in Oregon, but again there were not statistically significant differences in posts from that state compared with unrestricted states (1% vs. 0%–1.6%, $p = .35$).

Finally, messages describing health benefits were present in 219 (8.2%) social media posts across our sample. The frequency of these posts ranged from 1.3% of posts from

the Alaska business to 13% across businesses from Oregon. State-based advertisement regulations regarding the promotion of health benefits were present in three of the four states, but there were no significant differences comparing these restricted states and Colorado, the unrestricted state ($p = .18$). Positive health claims included: “Cannabis saves people from dying from opioids. It literally saves lives. Period end.”

Required content

Required content included three types of warnings: limiting cannabis use to those age 21 and over, avoiding impaired driving, and describing health risks. First, across the total sample, these warnings were present within less than half of the posts. Companies in states with policies that included advertising warnings were more likely to have warnings present in their social media posts ($p < .0001$).

Second, two states had all three warnings as requirements: Alaska and Washington. For these two states, more than half of the social media posts had all three warning requirements included in the state law.

Third, one state (Oregon) regulations required two warnings: avoiding impaired driving and limiting use to those

TABLE 2. Descriptive information for recreational cannabis business profiles on Instagram and Facebook

Company	Instagram followers	Facebook followers	Location	City population	City setting classification ^a
Company A	644	286	Sitka, AK	8,626	Rural
Company B	3,467	5,351	Boulder, CO	104,000	Urban
Company C	4,459	11,129	Denver, CO	2,900,000	Urban
Company D	5,456	2,868	Denver, CO	2,900,000	Urban
Company E	6,741	5,747	Denver, CO	2,900,000	Urban
Company F	1,129	161	Scappoose, OR	6,592	Rural
Company G	1,191	1,232	Eugene, OR	166,000	Urban
Company H	1,650	652	Portland, OR	632,309	Urban
Company I	1,755	1,484	Bend, OR	94,520	Urban
Company J	9,897	1,913	Portland, OR	632,309	Urban
Company K	850	1,923	Mount Vernon, WA	35,051	Rural
Company L	898	421	Spokane, WA	95,810	Urban
Company M	1,060	452	Seattle, WA	659,000	Urban
Company N	1,333	1,664	Aberdeen, WA	16,462	Rural

^aCity classification derived from U.S. Census categories.

TABLE 3. Restricted and required content for cannabis social media pages by state and state-based regulations on cannabis company social media business pages

Coding category	Total sample	Alaska	Colorado	Oregon	Washington	<i>p</i> value ^a comparing states with and without this regulation
Number of posts	(<i>n</i> = 2,660)	(<i>n</i> = 75)	(<i>n</i> = 1,032)	(<i>n</i> = 795)	(<i>n</i> = 758)	
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Restrictions on content						
Discount/promotion	922 (34.7)	2 (2.7)	213 (20.6)	406 (51.1)	301 (39.7)	.21
Branded products	164 (6.2)	0 (0.0)	107 (10.4)	44 (5.5)	13 (1.7)	<.0001
Modeled use of cannabis	62 (2.3)	0 (0.0)	31 (3.0)	11 (1.4)	20 (2.6)	.03
Overconsumption	324 (12.2)	7 (9.3)	79 (7.7)	124 (15.6)	114 (15.0)	<.0001
Pop culture	192 (7.2)	0 (0.0)	111 (10.8)	62 (7.8)	19 (2.5)	.45
Youth appeal	145 (5.5)	2 (2.7)	34 (3.3)	79 (9.9)	30 (4.0)	N.A.
Underage model	35 (1.3)	0 (0.0)	16 (1.6)	8 (1.0)	11 (1.5)	.35
Health benefits	219 (8.2)	1 (1.3)	90 (8.7)	103 (13.0)	24 (3.2)	.18
Requirements for content to be present on posts						
Limiting cannabis use to those age 21 and older	700 (26.3)	39 (52.0)	10 (1.0)	263 (33.1)	388 (51.2)	<.0001
Avoiding impaired driving	695 (26.1)	39 (52.0)	5 (0.5)	256 (32.2)	396 (52.2)	<.0001
Describing health risks	466 (17.5)	39 (52.0)	12 (1.2)	18 (2.3)	397 (52.4)	<.0001

Notes: Shaded cells indicate the state has that restriction or requirement. N.A. = not applicable. ^a*p* value obtained using chi-squared tests.

age 21 and over. Posts from Oregon businesses included warnings regarding limiting use to those age 21 and over and avoiding impaired driving about a third of the time. Health risks were not specified in Oregon’s regulations, and information about health risks was present in approximately 2% of posts from businesses in this state.

Finally, Colorado did not have any of these three types of required content regulations. Warnings of any of the three types were present in less than 1.2% of social media posts for businesses from this state.

Discussion

This study conducted a content analysis on social media business pages from retail cannabis companies in four states with legalized recreational cannabis. We will review findings by state and relevant regulations.

First, Alaska cannabis businesses generated a lower number of posts (*n* = 75), whereas the other three states contributed more than 500 posts each to our data set. Alaska’s regulations on cannabis marketing content included restric-

tions on promoting discount/promotions, overconsumption, youth appeal, and health benefits. Other than posts describing overconsumption, which were present on almost 10% of posts, the other categories had less than 3% of posts with these content categories. However, Alaska also had requirements for all three warnings to be present on posts, and half of posts in our sample had these warnings present.

Second, Colorado cannabis businesses had a prolific number of posts; more than 1,000 were present in our sample. Youth appeal was restricted for Colorado cannabis businesses, and approximately 3% of business posts had this content. For content categories that lacked restrictions, Colorado cannabis business posts included 20% describing a discount/promotion and almost 10% promoting health benefits. Given these findings, it is possible that regulations discouraged businesses from posting content in restricted categories on a frequent basis. Further, as no requirements for warnings were present, warnings were present on a very limited number of posts, around 1% or less. This finding suggests that without a requirement to post warnings, businesses in Colorado are unlikely to include such content.

Third, Oregon businesses had many categories of restricted content, and the adherence by cannabis businesses for their social media posts varied from rare posts with underage-appearing models (1%) to some posts promoting overconsumption (15.6%). It is interesting to note that in one area in which Oregon did not restrict content, discount/promotion, almost half of the posts in our sample included this content. This is a particularly important finding as studies have shown that discounts and promotions are closely tied to purchasing behaviors (Luk & Yip, 2008; Osman et al., 2011). Because youth are typically price-sensitive in their purchasing behaviors, these types of social media posts may be particularly influential for them. Thus, Oregon may benefit from restrictions on this type of content for cannabis businesses.

Finally, Washington cannabis regulations also included several categories of restricted content. Discount/promotion content was restricted, although almost 40% of posts by Washington cannabis businesses featured these messages. Further, overconsumption messages were also restricted but present on 15% of posts. It is interesting to note that the frequency of posts in restricted categories was often higher than in unrestricted categories; unrestricted content categories included modeled use of cannabis (2.6% of posts), pop culture (2.5% of posts), and underage models (1.5% of posts). Similar to Alaska, Washington had requirements for all three warnings to be present on posts, and only approximately half of their posts had these warnings present.

Overall, this study illustrates that the types of content youth are exposed to via cannabis companies' social media pages includes content designed to appeal to youth's budget restrictions, as well as to encourage cannabis overconsumption and normalization. Strong evidence supports that ex-

posure to digital marketing can increase alcohol use as well as problematic consumption (Noel et al., 2020). Evidence is emerging that exposure to cannabis marketing on social media is positively associated with increasing cannabis use for underage youth. One recent study found that liking or following cannabis promotions on Facebook was associated with almost 6 times the odds of high-intensity cannabis use for adolescents (Trangenstein et al., 2021). Another study found that exposure to cannabis marketing on Facebook, Twitter, or Instagram was reported by almost 80% of underage youth in the sample, and this exposure was associated with increased odds of past-year cannabis use (Whitehill et al., 2020).

Study findings suggest that state efforts to enact and enforce conditions for restrictions on cannabis promotions when applied to social media are inadequate and in need of improvement. Such regulation requires regular and active monitoring alongside swift and public enforcement if it is to succeed as a deterrent (Ross, 1984). Based on our study findings, a first recommendation is to advocate that current language around regulations be strengthened and made consistent among legalizing states. Ideally, laws would clarify their application to any marketing or promotional environment, including social media, recognizing that social media transcends state borders.

A second recommendation is to enhance efforts around surveillance of cannabis marketing and promotions on social media, preferably by an independent and impartial third party (i.e., not the cannabis industry itself). It is possible that funds from tax revenues related to retail cannabis sales could support regular and ongoing monitoring of industry compliance. Further, some of the posts identified in our sample, including some examples in our tables, include content that may represent copyright infringement, such as pictures of characters like SpongeBob and Snoopy. These violations may increase others' interest in surveillance and regulation.

Challenges to monitoring social media content include its potentially ephemeral nature, as well as the ability in social media to target content behaviorally, geographically, and temporally (Jernigan & Rushman, 2014). Our study illustrates that it is possible to create a sampling strategy to evaluate posts over time and to develop a codebook to identify content and achieve interrater reliability for such content. It is possible that incorporating input from youth themselves into surveillance approaches may be of benefit. As youth are often described as digital natives, their comfort and experience with social media may provide them unique insights. Previous work has illustrated processes to incorporate youth into civic planning (Freeman & Aitken-Rose, 2005), patient advisory boards (Angel et al., 2015), and educational environments (Clark, 2010). Future studies should describe and document successful processes in these areas so that other states can learn from early experiences.

A third recommendation is to consider age-gating access

to cannabis social media pages, thus at least in principle ensuring that youth cannot access cannabis social media business pages unless their social media profile indicates they are age 21 or over. The age-gating approach is currently used by alcohol companies on Facebook, and youth are supportive of applying this restriction to cannabis business pages on social media (Moreno et al., 2018a).

A final consideration, and stronger approach, is to consider banning cannabis companies from the use of social media pages as part of a comprehensive approach to protecting youth. With ample other marketing channels available to cannabis businesses, and with cannabis still illegal under federal law and thus the federal First Amendment protections not applicable (although state constitutions may have similar provisions), states could test the limits of their own regulatory powers much more than they have to date in the interests of protecting young people.

Limitations to our study include our focus on businesses that maintained both a Facebook and an Instagram page, and having social media content present since 2016, which likely led to a selection of businesses that had been in existence longer and may have had greater social media experience and expertise. Thus, it is possible that our findings over-represent compliance with regulations. Further, our sample included only one business from Alaska, and given that our sample was not selected based on city, businesses were not equally distributed within states. This study only captured publicly available content on Facebook and Instagram, and business pages were identified with a limited range of keywords. It is possible that a larger variety of keywords may have identified additional or alternative business pages. Finally, we did not capture other marketing strategies promoted in lay press publications, such as private Facebook groups and direct messaging with consumers to build rapport (Cannabis Editorial Team, 2017; Weed, 2017). Because this content is private, it is unclear how it may differ from the findings in this study.

Despite these limitations, our study has important implications. Cannabis legalization is a relatively recent phenomenon, and policies around appropriate messaging for these products are still developing. This study provides information that can be used, at this critical time, to shape policies to prevent youth exposure to cannabis messaging.

Conflict-of-Interest Statement

No authors have conflicts of interest to report.

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