RESEARCH ARTICLE

A qualitative content analysis of cannabis-related discussions on Reddit during the COVID-19 pandemic

Hannah Reygaerts[1], **Sidney Smith**[2], **Lynette M. Renner**[3], **Yumary Ruiz**[2], **Laura M. Schwab-Reese**[2]*

1 Department of Health Promotion and Behavioral Sciences, UTHealth Houston School of Public Health, Houston, Texas, United States of America, **2** Department of Public Health, Purdue University, West Lafayette, Indiana, United States of America, **3** School of Social Work, University of Minnesota-Twin Cities, Saint Paul, Minnesota, United States of America

* lschwabr@purdue.edu

Abstract

Social media has become an increasingly important way to seek and share experiences, support, knowledge, and advice during the COVID-19 pandemic. Reddit, a pseudonymous social media platform, was one way that young people interacted during the pandemic. Our study goals were two-fold: (1) to categorize information sought and provided by users of r/saplings, a subreddit devoted to cannabis use and is often used by young people, and (2) to examine if conversations changed during the COVID-19 pandemic. We extracted 213 randomly selected posts and 2,546 related comments across four time periods (before the pandemic, during the first wave, summer, and next fall). We assessed the volume of posts and comments throughout our study period and conducted a qualitative content analysis. Quantitatively, the findings demonstrated an increase in the number of posts and comments throughout the study period. Given the substantial growth in subreddit activity throughout our study period, Reddit may play an increasingly important role in youth socialization related to cannabis. From the content analysis, we identified three major themes: how to acquire cannabis, how to use cannabis, and associated consequences. Reddit-users prioritized certain content in their posts at different stages of the pandemic. 'Places to acquire' and 'future use' were most common at the beginning of the pandemic, while the theme of 'consequences' and the topic of 'tolerance' became more prominent during the summer months. The comments to these posts were generally thorough and responsive to the post. Nearly all the information came from opinions or personal experiences. Firstly, our findings suggest that young people viewed Reddit as a viable outlet for conversations about cannabis. Secondly, due to the nature of the peer comments and lack of verifiable information being exchanged, misinformation may still circulate and inadvertently worsen the efforts to reduce cannabis-related harm. Interventions that provide understandable and accurate cannabis-related information in accessible formats may increase young people's ability to access and practice harm reduction.

Introduction

For many people, the various COVID-19 safety measures and subsequent disruptions to daily life led to increased psychological distress (e.g., anxiety, depression) [1–9] and maladaptive coping behaviors (e.g., substance use) [10–12]. Some of the disruptions experienced by children and youth included social isolation, school closures, and loss of routine and healthy outlets [13–16]. In June 2020, approximately 25% of individuals aged 18–24 in the United States reported initiating or increasing substance use to cope with pandemic-related stress or emotions [10], which is consistent with prior research following man-made and natural emergencies in various populations [17–22].

Due to limited in-person social opportunities, many adolescents turned to social media to cope with feelings of loneliness and reconnect with like-minded individuals [23–25]. Social media offers a means to interact with others and to seek and share experiences, support, knowledge, and advice [26, 27]. Specifically, pseudonymous media platforms allow users to control self-presentation and self-disclosure, reducing the likelihood of offline harm [27, 28]. These features likely enhance users' comfort when discussing sensitive topics, such as drug use and mental health [25–27]. Many users share their experiences via social media to seek support, while others ask for advice or share experiences to establish credibility [29]. Thus, these spaces provide a window into people's experiences and perceptions of these topics [30, 31].

Despite its popularity and users' reliance on it for information and support, social media has been found to be a primary source of misinformation and unsubstantiated claims on health topics [32]. Recent policy changes in several countries, including the United States, have loosened restrictions on cannabis, making it easier to access and use. While cannabis-users report using it for fun and experimentation, individuals who are new to cannabis may want to use it for various other reasons, such as alleviating anxiety, depression, insomnia, or chronic pain [33]. These individuals may have a plethora of questions regarding the substance, ways to use it, dosing, and more. Because some negativity surrounding cannabis use persists regardless of policy changes [34], individuals may use pseudonymous social media platforms as a primary source to address their questions [35].

Even though cannabis use on its own is not directly associated with death [36], its use is associated with adverse health effects such as increased risk of cardiovascular disease mortality, reduced cognitive function, and increased neuropsychiatric effects, especially among those who are underage [37, 38]. Furthermore, cannabis may also interact with other medications. As with any substance, it generates concerns such as driving under the influence and dependency. Cannabis use disorder is a particular concern among youth with mood disorders as it has been associated with heightened risk of nonfatal self-harm, homicide, death by unintentional overdose, and all-cause mortality [39]. The misinformation posted to social media may also perpetuate positive health claims about cannabis and the denial of associated dangers to cannabis use, which can further harm young people.

Reddit (https://www.reddit.com/) is one social media platform used by young people. On Reddit, users create pseudonymous usernames and interact with others by creating or commenting on posts within topic-driven communities called "subreddits." Researchers have utilized Reddit to understand users' experiences with mental health and substance use [29, 40–47]. Recently, several studies have demonstrated that subreddits without age restrictions (i.e., forums not specifically encouraging or forbidding minors) are a rich source of information and discussion on sobriety, harm reduction, and other substance use-related topics. For example, one recent study demonstrated that people experiencing substance use-related stigma seek support on Reddit [48]. Fentanyl, a synthetic opioid that increases the risk of overdose and mortality, is also commonly studied on Reddit. One study found that Reddit was used to

discuss harm reduction strategies and anxieties related to fentanyl-contaminated oxycodone [48, 49], while a second focused on a fentanyl-specific subreddit that found that quality of life impairment, polysubstance use, and tolerance/dependence/withdrawal were the most commonly discussed topics [50]. One study specifically focused on how Reddit could provide insight into the lived experiences of substance use during the pandemic [51]. They found across four substance use-related subreddits that pandemic-specific stressors, limited formal support, disruptions to coping strategies, and access to illicit and prescription drugs were commonly discussed [51].

Adolescents have been shown to post on mental health-related subreddits more often during the COVID-19 pandemic events compared to prior to these events [25]. However, few studies have focused on adolescents' Reddit use for substance use information and help-seeking, and those that have were primarily focused on e-cigarette use [52–54]. Questions remain about what information young people seek pertaining to cannabis via Reddit and whether the type of information sought changed due to the COVID-19 pandemic.

Thus, we sought to understand if and how people use r/saplings, an adolescent-focused subreddit, to discuss cannabis. The study goals were two-fold: (1) to categorize information sought and provided by users of r/saplings and (2) to examine if r/sapling conversations changed during the COVID-19 pandemic. Because many in-person interactions were restricted throughout the COVID-19 pandemic, social media may play a more prominent role in young people's cannabis-related socialization. Thus, this study may provide important insights into the type of information sought and provided by young people about cannabis. Further, we identify if these interactions changed throughout the pandemic, which may provide additional insights into how young people coped with pandemic-related stressors.

Material and methods

Data collection and sample

In December 2020, we extracted all posts (N = 6,584) and comments (N = 63,269) from r/saplings from October 1, 2019, to October 31, 2020. We obtained our data using Pushshift API, a software interface that archives all posts and comments at the time of submission to Reddit [55]. We chose r/saplings due to its connection with the subreddit r/trees. r/trees is a large, active subreddit surrounding cannabis discussion. This subreddit enforces a set of rules to protect their community and includes a rule that prohibits posting by minors (18 years and younger) (https://www.reddit.com/r/trees/) [56]. From r/trees' Rules, minors are directed to post on r/saplings instead, a subreddit described as "a place to learn about cannabis use and culture" (https://www.reddit.com/r/saplings/). It is estimated that r/saplings had 53,000 members in October 2019 and 62,000 members in October 2020, as listed on the r/saplings page.

To identify a feasible sample for content analysis, we randomly selected one post per day during four different times: 1) Pre-pandemic (October 1, 2019, to October 31, 2019, and February 1, 2020, to February 29, 2020) to capture posts prior to the pandemic; 2) First Wave (March 1, 2020, to April 30, 2020) to capture posts when lockdown was in place for most countries; 3) Summer (June 1, 2020, to July 31, 2020) to capture posts as lockdown orders were being lifted; and 4) Next School Year (October 1, 2020, to October 31, 2020) to capture posts when young people were returning to school with some COVID-19 safety measures implemented at many institutions. This timeframe was determined according to a couple of deciding factors. In 2020, most Reddit website traffic came from the United States (U.S.) [57]. Therefore, COVID-19 events as they unfolded in the U.S. and were reported by the World Health Organization (WHO) were used to pinpoint which months related to which phases of

the pandemic [58]. Since not all major pandemic-related events happened within the same day for some countries, additional months were selected to capture possible variation.

Furthermore, we examined the conventional school schedules of the top ten countries that visited Reddit.com in 2020 to identify which months most often correspond to active school sessions. Since data was collected in December 2020, only October 2020 was selected for 'Next School Year', allowing for potential comparison between 'Pre-pandemic' and 'Next School Year.' This approach yielded a total of 213 posts and all related comments. Posts and comments removed by Reddit moderators or posters before data collection were not replaced.

Data analysis

First, we plotted the overall number of posts and comments made each month to identify how the number of posts and comments changed during our study period. Then, using the randomly selected dataset described in the Sample section, we conducted a qualitative content analysis using an adaptation of grounded theory to develop the codebook [59]. First, three coders (all of whom are co-authors) independently reviewed all content from the 213 posts and related comments (n = 2,546) from r/saplings. Then, we discussed potential patterns during a second review, concentrating on recurring themes and areas of divergence across conversations to draft the initial codebook. After finalizing this draft, we applied the codes to 10% of the dataset and compared the results. We refined the codebook to increase intercoder reliability and ensure the representation of relevant materials. We repeated this process until we reached 90% agreement across all coders and then coded the entire dataset.

To analyze the coded materials, we conducted bivariate analyses to examine changes in the quantity and content of posts and comments across the four time periods. Although we considered applying statistical inference tests, the nuance within our coding structure created very small cell sizes, substantially reducing the tests' power and interpretability. We also reviewed the materials within each code to identify representative quotes. We paraphrased these quotes, which is in line with ethical guidance and recent conventions when using Reddit data which are in place to reduce the risk of reverse identification [60].

Ethical issues

We only used publicly available information in this study and complied with the terms and conditions during data collection. Reddit is a pseudonymous platform, meaning individuals may be identified across time through usernames, but their true identity is unknown. The Purdue University Institutional Review Board determined this work was exempt from informed consent, which is consistent with generally accepted ethical guidelines [61, 62].

Results

The number of posts and comments on r/saplings increased substantially throughout the study period (Fig 1). Posters generally sought advice about cannabis, although some shared their experiences or asked about the experiences of others (Table 1). Eighty-five percent of comments were made by users other than the original poster or the user who created the initial post. Most comments contained detailed, relevant information or follow-up questions.

We identified three broadly defined themes among posts: (1) how to acquire cannabis, (2) using cannabis, and (3) related consequences (Table 2). Within the theme of 'acquiring', users posted content focused on people (e.g., dealers, friends, family), places (e.g., physical locations) (n = 31), and means (e.g., buying, receiving as a gift, stealing) for obtaining cannabis (n = 21), and few posters asked about growing cannabis. The majority of posts involved using cannabis (i.e., the 'using' theme) (n = 212), and many posters shared or asked for advice about past
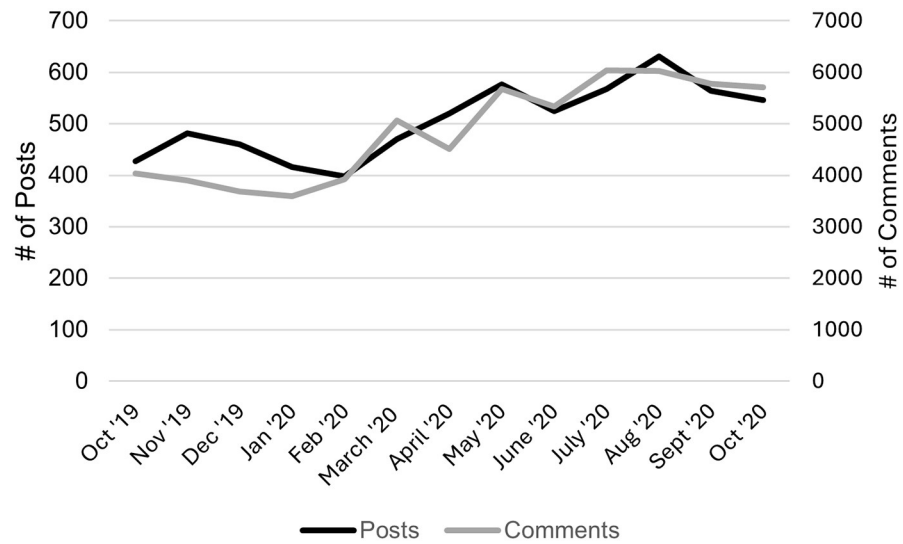
Fig 1. Number of posts and comments on r/saplings during the study period.

https://doi.org/10.1371/journal.pone.0304336.g001

(n = 64) or future experiences (n = 83). They often wanted to know if their experiences while high were normal. Posters who recently began using or changed their method of use (e.g., changing from edibles to vaping) inquired about dosage and how to increase the intensity of their high. Others had questions about equipment, the appearance of cannabis, or tolerance. Additionally, some posters shared or asked advice on consequences (i.e., the 'consequences' theme), such as cannabis's effects on health and safety, employment, eviction, or getting in trouble with parents at 48 posts out of 213. Health questions were often related to early age initiation or combining cannabis with prescription medication (e.g., anxiety medications). Sometimes, users specifically discussed how the pandemic was influencing their cannabis use ('*my parents are staying home due to COVID-19 which sucks because I can't smoke now*)'. Pandemic-

Table 1. Characteristics of posts (n = 213) and comments (*n* = 2,546) in the sample.

	n (%)
Purpose of the Post	
Seeking Advice	146 (68.5)
Sharing Own Experiences	54 (25.4)
Seeking Others' Experiences	3 (14.1)
Other	11 (5.2)
Comment Respondent Role	
Original Poster	391 (15.9)
Other Respondent	2,063 (84.0)
Type of Comment[a]	
Detailed/Engaged	2,190 (86.0)
Irrelevant	380 (14.9)
Follow-Up to Prior Comment	303 (11.8)
Brief	53 (2.1)
Deleted	53 (2.1)

[a] Categories are not mutually exclusive, so percentages sum to greater than 100.

https://doi.org/10.1371/journal.pone.0304336.t001

Table 2. Frequency and content of posts to r/saplings before and during the COVID-19 pandemic.

	Total	Before Pandemic (n = 60)	First wave (n = 61)	Summer (n = 61)	Next Fall (n = 31)	Example Quote
	n	*n* (col %)	*n* (col %)	*n* (col %)	*n* (col%)	
Acquiring Cannabis						
Places to Acquire	31	4 (6.7)	12 (19.7)	6 (9.8)	9 (29.0)	*Where can I buy prefilled disposable pens online?*
Ways to Acquire	21	3 (5.0)	8 (13.1)	6 (9.8)	4 (12.9)	*I got some edibles from my aunt. . .*
Growing Cannabis	8	5 (8.3)	1 (1.6)	2 (3.2)	0 (0.0)	*Is my plant a hermaphrodite?*
Using Cannabis						
Future Use	83	21 (35.0)	26 (42.6)	20 (32.8)	16 (51.6)	*I have a bunch of different strains on me.. . . Which one should I choose to use while gaming games with my friends?*
Past Experiences	64	18 (30.0)	13 (21.3)	23 (37.7)	10 (32.3)	*Last night I smoked a specific strain of marijuana and had a bad experience.*
						I couldn't walk, and my hands were shaking. . .
Equipment	32	6 (10.0)	11 (18.3)	7 (11.5)	8 (25.8)	*I looked at herb vaporizers but how do I load them? Does anyone have any vape recommendations?*
Cannabis Appearance	20	10 (16.7)	4 (6.6)	4 (6.6)	2 (6.5)	*How does this look? It's been in the jar for a few weeks.*
Tolerance	13	4 (6.7)	2 (3.3)	6 (9.8)	1 (3.2)	*Reverse Tolerance: Any reason why I'm getting way higher than normal with the usual weed/amount?*
Consequences	48	11 (18.3)	11 (18.3)	20 (32.8)	6 (19.4)	*Is using a plastic water bottle bong unsafe?*

Note: Categories are not mutually exclusive, so percentages do not sum to 100.

focused posts were most common in the conversations about acquiring cannabis (i.e., previously bought at school or public places), although they also came out in conversations about cannabis use.

Users were responsive to posts, with an average of 12.0 (*sd* = 20.2) comments per post. One post received over 200 comments, and only 25 (11.7%) posts received no comments. Generally, comments were thorough and responsive to the materials shared in the post. Most often, the comments were based on opinions or personal experiences. Although rare, some referenced or directed individuals to other sources (e.g., YouTube, websites); of these, only two comments referenced a credible source (e.g., public health department).

The types of posts and comments remained relatively stable over time (Tables 2 and 3). However, there were some meaningful changes. Almost 10% of pre-pandemic posts referenced growing cannabis, compared with less than 3% during other periods. Conversely, posts about possible sources and ways to acquire cannabis became far more common during the pandemic. This increase was especially noticeable between the pre-pandemic and first wave time points (e.g., 4 versus 12 posts for places to acquire, and 3 versus 8 posts for ways to acquire). Discussing places to acquire and future use was common across all periods but was particularly prominent during the first wave of the pandemic and the fall of 2020. Tolerance-related conversations were highest during the summer with six posts, and lowest during the first wave and the fall with 4 and 1 post. Consequences also became the focus among posts in the summer months.

Discussion

Our first aim was to categorize information sought and provided by Reddit users on r/saplings and identified three broadly defined themes among posts: (1) how to acquire cannabis, (2)

Table 3. Average frequency per post and content of comments to r/saplings before and during the COVID-19 pandemic.

	Overall	Before Pandemic	First wave	Summer	Next Fall	Example Quote
	mean (SD)	mean (SD)	mean (SD)	mean (SD)	mean (SD)	
Personal Experiences	2.5 (4.8)	2.0 (3.3)	2.2 (4.6)	3.4 (6.0)	2.2 (5.0)	*As someone who kept both my boyfriend's and my stash and ended up consuming two-thirds of it on my own.. separate that stuffs*
Opinion	7.3 (13.9)	8.4 (20.1)	6.7 (11.2)	6.0 (7.7)	8.3 (14.1)	*I agree with some of the stuff being said about age and waiting, I can't tell you what to do with your life.*
Credible Sources	0.0 (0.1)	0	0.1 (0.2)	0	0	*According to the state's dep. Of health, "Cancer, human immunodeficiency virus (HIV), multiple sclerosis, epilepsy or other seizure disorder, or spasticity disorders." are qualifying conditions.*
Other Sources	0.2 (0.6)	0.2 (0.4)	0.3 (0.9)	0.2 (0.4)	0.2 (0.5)	*Some people I know said that they failed the first test and had to go for a second one.*
Directing to Other Resources	0.2 (0.6)	0.2 (0.5)	0.5 (0.9)	0.2 (0.5)	0.3 (0.6)	*I recommend checking out CG Kid on YouTube.*
Brief Support for Earlier Comment	0.2 (0.5)	0.2 (0.5)	0.1 (0.4)	0.1 (0.2)	0.4 (0.8)	*I agree with everything*
Brief Opposition to Earlier Comment	0.1 (0.2)	0.1 (0.3)	0.1 (0.1)	0.1 (0.2)	0	*Absolutely not. Next question.*

using cannabis, and (3) related consequences (Table 2). Throughout the study period, users discussed various aspects of acquiring, using cannabis, and consequences of using marijuana. Typically, they received detailed, on-topic responses to their questions, indicating a level of social support. Some of our findings in r/Saplings are similar to the work of Costello[29] on r/trees, a subreddit meant for older individuals and cannabis. Users tended to disclose various information about their Cannabis use (e.g., dosage, ways to use cannabis), and while they discussed 'tolerance,' we also did not encounter 'addiction' as a topic. Lastly, most comments included advice and instructions similar to r/trees. A proportion of comments were in the form of follow-up questions in order to tailor responses, though most of the advice and instruction came from personal experiences and opinions. While some banter was present, which was coded as 'Other,' commenters ultimately formed a sense of camaraderie by providing support in the comments. Other prior work has similarly demonstrated that young people use social media as an important source of information and support about sensitive topics [27–29, 47, 63]. Given the increase in subreddit activity and engagement, Reddit may play an increasingly important role in socialization related to cannabis.

Our second aim was to assess the impact of the COVID-19 on Reddit conversation topics and whether certain themes were prioritized. Places to Acquire, Ways to Acquire, Future use, and Equipment related topics rose in volume by the first wave of the pandemic compared to before the pandemic. At this time, only the theme of consequences remained the same, and the remaining topics declined in volume. 'Places to acquire' and 'future use' were most frequently discussed during the first wave. The first wave includes the timeframe in which stringent COVID-19 mitigation measures such as stay-at-home orders and closures were put in place. In addition, national data found that youth's substance use declined during the pandemic. Therefore, our findings suggest that adolescents seemingly struggled to locate cannabis and find in-person resources, thus turning to social media platforms such as Reddit. Our work also supports this latter statement quantitively. The number of posts and comments on r/saplings increased during our study period, from before the COVID-19 pandemic until after its onset. This finding is consistent with prior research, which found increased social media use among youth during the pandemic [23–25]. Altogether, our findings suggest that users turned to

social media, including Reddit, and viewed Reddit as a viable outlet for conversations and resource about cannabis.

The theme of Consequences and tolerance became much more prominent during the summer months. During this time, most posts focused on maximizing the pleasant experience while minimizing negative consequences. Although some explicitly framed the conversations around safety (e.g., medication interactions, safe dose), others discussed safety more implicitly (e.g., tolerance issues, avoiding panic attacks). Notably, as of early June, COVID-19 restrictions eased due to available testing, news on vaccination circulated, 'bubble arrangements' were endorsed, quarantine requirements were less stringent, and some countries opened their borders [64, 65]. Even prior to the pandemic, our findings demonstrated that users wanted information and support on how to use cannabis safely.

Other studies have similarly demonstrated that social media is not only a valuable source of information but also provides support for harm reduction and recovery [66, 67]. Nevertheless, r/saplings may not always be an adequate source of confirmable information on cannabis. Although several posts specifically asked for 'experts,' nearly all information provided was based on opinion or personal expertise, which could still have been rooted in misinformation regarding cannabis use. Most users provided support via leaving detailed and engaged comments, however, commenters without medical backgrounds may unintentionally spread misinformation (e.g., inaccurate medical information, provide information from unidentifiable online sources) and potentially leave detrimental opinions (e.g., original poster worried about drug interactions should 'give it a try' and 'see what happens'). Thus, while there is still great value in lived peer experience within the realm of harm reduction [68], this type of information exchange may result in users not always receiving accurate and verifiable harm reduction information and may lead to worse unintended consequences. Interventions that provide understandable and accurate information in accessible formats may increase young people's ability to access and consequently practice harm reduction strategies. Due to Reddit's pseudonymous nature and format, it may be one possible tool in such interventions.

There are limitations to consider when interpreting our work. Reddit is pseudonymous, so we do not know who is using r/saplings or their demographic information. Additionally, even though directed to minors, users who are not minors can still post and comment on r/saplings. As such, our findings may not be confined to only represent posts and comments made by people aged 18 or younger. Further, as a qualitative content analysis, all posts and comments could not be incorporated. Although we randomly selected posts to increase the sample's representativeness, computational analyses of all conversations may identify additional information. Another limitation is 'chatbots' and third-party influences, as both can manipulate online conversations and skew perceptions. However, their influence was limited in our data set since obvious bot-content was coded as 'Other.' Our data may still be subject to influence from individuals involved third parties promoting cannabis products. Despite these limitations, our work contributes to the small body of work about young people's discussions about cannabis during COVID-19. Our findings suggest that young people want to reduce harms associated with cannabis use and may be open to harm reduction information if shared on platforms with like-minded individuals in an easily accessible format.

Acknowledgments

Author Contributions

Conceptualization: Yumary Ruiz, Laura M. Schwab-Reese.

Data curation: Hannah Reygaerts, Sidney Smith, Yumary Ruiz.

Formal analysis: Hannah Reygaerts, Sidney Smith, Laura M. Schwab-Reese.

Supervision: Laura M. Schwab-Reese.

Validation: Lynette M. Renner, Laura M. Schwab-Reese.

Writing – original draft: Hannah Reygaerts, Sidney Smith, Yumary Ruiz, Laura M. Schwab-Reese.

Writing – review & editing: Hannah Reygaerts, Sidney Smith, Lynette M. Renner, Yumary Ruiz, Laura M. Schwab-Reese.

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