Harnessing the Power of Social Media to Understand the Impact of COVID-19 on People Who Use Drugs During Lockdown and Social Distancing

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Objectives: This paper uses a social media platform, Reddit, to identify real-time experiences of people who use drugs during the COVID-19 lock-down.

Methods: Reddit is a popular and growing social media platform, providing a large, publicly available dataset necessary for high performance of machine learning and topic modeling techniques. We used opioid-related “subreddits,” communities where Reddit users engage in conversations about drug use, to examine COVID-19-related content of posts and comments from March to May 2020. This paper investigates the latent topics of users’ posts/comments using Latent Dirichlet Allocation, an unsupervised machine learning approach that uncovers the thematic structure of a document collection. We also examine how topics changed over time.

Results: The final dataset consists of 525 posts and 9284 comments, for a total of 9809 posts/comments in r/opiates, 1641 in r/OpiatesRecovery, 1203 in r/suboxone, and 3209 in r/Methadone) among 2342 unique individuals. There were 5256 posts/comments in March; 3185 in April; and 1368 in May (until May 22). Topics that appeared most frequently in COVID-19-related discussions included medication for opioid use disorder experiences and access issues (22.6%), recovery (24.2%), and drug withdrawal (20.2%).

Conclusions: During the first three months of the COVID-19 pandemic, people who use drugs were impacted in several ways, including forced or intentional withdrawal, confusion between withdrawal and COVID-19 symptoms, take-home medication for opioid use disorder issues, and barriers to recovery. As the pandemic progresses, providers and policymakers should consider these experiences among people who use drugs during the early stage of the pandemic.

Key Words: COVID-19, machine learning, opioid use disorder, social media, substance abuse

Over the past decade, an increasing number of social media platforms such as Facebook, Twitter, and Reddit have been used to understand public health epidemics, primarily due to the real-time nature of the data. Social media has been used by researchers to understand issues such as mental health self-disclosure, patient experiences with chronic diseases, the relationship between electronic cigarette use and mental illness, marijuana regulations, and suicide among youth. In this paper, we used Reddit, a publicly available social media platform that provides a worldwide network of communities based on people’s interests. Reddit communities, also known as “subreddits,” cover different topics and allow people to share news, content, or thoughts, and comment on other people’s posts anonymously, providing them the opportunity to openly discuss drug use without concerns of stigmatization or criminal repercussions. This anonymity eliminates biases that may arise from self-reported data, such as social desirability bias, which often limits research that uses other social media platforms, electronic health records, and public health surveillance data. Reddit is also an increasingly popular platform, providing a large dataset necessary for high performance of machine learning and topic modeling techniques. During the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) pandemic that causes coronavirus disease (COVID-19), people who use drugs have accessed opioid-related subreddits to communicate how COVID-19 has influenced their addiction experiences, such as availability of drugs, coping with withdrawal, and identifying information and support on obtaining drug treatment within this new environment.

Self-quarantine and social distancing orders, which have been widely implemented to prevent the spread of COVID-19, have limited the availability of essential services.
utilized by people who use drugs, such as access to medication for opioid use disorders (MOUD), syringe services, and treatment/recovery clinics.\textsuperscript{10,11} Social isolation, economic devastation, and disruptions to their licit and illicit drug supply during the pandemic have resulted in a surge of overdose deaths.\textsuperscript{12–14}

New regulatory guidelines were created by Substance Abuse and Mental Health Services Administration to reduce interruption of treatment and ensure people who use drugs during this ongoing public health crisis have access to care, particularly for individuals receiving MOUD such as methadone and buprenorphine. In the US, these new guidelines include expanded use of telemedicine.\textsuperscript{15} Telemedicine allows health-related services to be delivered remotely using telecommunications technology and audio-visual communication.\textsuperscript{16} To avoid disruption of addiction services during the COVID-19 pandemic, these guidelines have changed to allow in-home telemedicine visits for all patients, regardless of type of insurance or MOUD, and telemedicine no longer requires delivery via a HIPPA-compliant platform.\textsuperscript{15,17} The new guidelines for methadone dispensing permit a take-home dosage for 14 days for nonstable clients and 28 days for stable clients.\textsuperscript{18} This is a significant shift in medication management. Historically, staff supervised administration of daily doses of methadone to patients at the clinic site.

Despite new regulatory responses that improved prevention and treatment services for people who use drugs during the COVID-19 pandemic, little is known about how these individuals are managing their addiction and recovery and responding to the rapidly changing environment. This paper investigates the latent topics of users’ posts and comments using Latent Dirichlet Allocation (LDA),\textsuperscript{19} which is an unsupervised machine learning approach that uncovers the thematic structure of a document collection. We identified the topics people who misuse opioids were discussing on Reddit from March through May 2020 of the COVID-19 pandemic and how these topics have changed over time. We examined how people on the Reddit social media platform communicated about their experiences and concerns to cope with COVID-19 and social distancing. In our analysis of subreddits during these first 3 months of the lockdown, we identified and are reporting on 3 major overlapping topics: MOUD take-home experiences, withdrawal, and recovery-related conversations. This paper also provides several potential implications for continued access to treatment during the pandemic and adaptation of the new treatment guidelines for substance use services.

**METHODS**

**Data Source**

The analysis relied on nonidentifiable, public data and was exempted by the Columbia University Human Research Protections Office. We collected posts and comments from 4 opioid-related subreddits: r/opiates, r/OpiatesRecovery, r/suboxone, and r/Methadone from March 1st, 2020 to May 22nd, 2020. To filter out a subset of posts that are highly relevant to discussions around the COVID-19 pandemic, we built a search engine based on Elasticsearch\textsuperscript{20} for the collected opioid-related Reddit posts. We used a set of COVID-19-related keywords as queries (Appendix A, http://links.lww.com/JAM/A285) and returned a ranked list of relevant posts. To compute the ranking score with respect to the query term, we used the classical machine learning approach based on TF-IDF\textsuperscript{21} (term frequency-inverse document frequency) as the textual features for each post and used BM25 (Best Matching) similarity algorithm.\textsuperscript{22} We removed the posts whose ranking scores were below 10 (threshold determined empirically) and maintained the rest of the posts along with their comments as our dataset for further analysis in this study. The final dataset consists of 525 posts and 9284 comments, a total of 9809 posts/comments to analyze (3756 posts/comments in r/opiates, 1641 in r/OpiatesRecovery, 1203 in r/suboxone, and 3209 in r/Methadone). There were 5256 posts/comments in March; 3,185 in April; and 1368 in May (until May 22). The 9809 posts/comments analyzed in this study belonged to 2342 unique individuals.

**Topic Modeling for Content Analysis**

To discover the topics discussed in the posts and comments, we used a modified version of LDA,\textsuperscript{19} called LF-LDA,\textsuperscript{26} suitable to learn human-interpretable topics from a small corpus. Topic models such as LDA\textsuperscript{19} have seen wide application in biomedical text mining,\textsuperscript{23} political analysis,\textsuperscript{24} social media analysis\textsuperscript{25} for modeling document content by learning document-to-topic and topic-to-word distributions from the co-occurrence of words within documents. One drawback of the generic LDA models is that they require a large set of documents to properly learn the latent topics. Since our document collection is relatively small (ie, 9809 posts and comments), we used a modified version of LDA (LF-LDA\textsuperscript{26}) that is able to learn latent topics from small corpora by leveraging word embeddings learned from a large corpus. Word embeddings have become the de-facto representation for modeling word semantics in natural language processing tasks. To learn these word embeddings, we used Word2vec\textsuperscript{27} trained on Google News and fine-tuned on our opioid-related Reddit datasets. The LF-LDA replaces the topic-to-word Dirichlet multinomial component of LDA which generates the words from topics by a 2-component mixture of a Dirichlet multinomial component (regular LDA) and a word embedding component. A hyper-parameter (lambda) gives the probability of a word being generated by the word embedding topic-to-word model. We experimented with various values of lambda, and lambda = 0.6 (also recommended by the LF-LDA paper)\textsuperscript{26} gave us the best interpretable topics. This indicates that better word-topic distributions are produced when information from the large external corpus is combined with corpus-specific topic-word multinomials. To select the number of topics, we experimented with several values (3, 5, 10, 15, 20), and 10 was the number that gave us the most coherent topics as judged by 2 addiction scientists.

After 10 topics were identified using machine learning techniques, investigator judgment was used to interpret the themes. Specifically, a team of three addiction scientists examined each topic’s keywords and agreed on theme titles that best described each topic.
In addition, we identified the topics that appeared most frequently (over 20%) throughout all posts and comments and analyze how each topic change over time from March to May 2020. Since each posting can involve multiple topics, we used Jensen-Shannon divergence to quantify the relatedness between topics.

**RESULTS**

**Topics Discussed and Changes Over Time**

The 10 topics, 20 most frequent words in each topic, and the human-assigned labels are shown in Table 1. The LF-LDA model allowed us to interpret the following topics: topic 1 (supply shutdown), topic 2 (social words), topic 3 (drug names, dosage), topic 4 (asking for information; help), topic 5 (clinic/doctor), topic 6 (withdrawal), topic 7 (MOUD experiences and access issues), topic 8 (COVID symptoms), topic 9 (negative consequences of addiction), and topic 10 (recovery). The 4 topics that appeared most frequently (over 20% of all posts) included: topic 2 (24.9%), topic 6 (20.2%), topic 7 (22.6%), and topic 10 (24.2%). Because topic 2 (social words) was highly correlated with a majority of topics and did not identify information other than commonly used social interaction words (eg, “lol,” “dude,” “yeah,” etc), we chose not to include this topic in further analyses.

Figure 1 displays the strength of association between all topic combinations (we used 1-d as metric where d is the Jensen-Shannon divergence between topics). Looking at our most frequent topics, topic 7 (MOUD experiences and access issues) was correlated most strongly with posts containing topic 1 (supply shutdown; 0.58), topic 5 (clinic/doctor; 0.72), topic 9 (negative consequences of addiction; 0.58), and topic 10 (recovery; 0.57); topic 6 (withdrawal) was correlated most strongly with posts containing topic 3 (drug names; 0.83), topic 8 (COVID symptoms; 0.66), and topic 10 (recovery; 0.79); topic 10 (recovery) was correlated most strongly with topic 3 (drug names; 0.63), topic 6 (withdrawal; 0.79), and topic 9 (negative consequences of addiction; 0.76). Table 2 provides examples of topic modeling on posts containing COVID-19 related information concerning the topic associations described above.

Figure 2 shows how each of the 10 topics change over time, where the unit of analysis was a month (March, April, May), while Figure 3A to D show word frequency changes for our top frequent topics: topic 7 (MOUD experiences and access issues), topic 6 (withdrawal), and topic 10 (recovery), in addition to topic 3 (drug names).

Below, we will describe the conversations and word changes over time for the most frequently discussed topics: MOUD experiences and access issues (topic 7), withdrawal (topic 6), and recovery (topic 10), as well as their correlated topics. Conversations on topic 7 gradually decreased from March to May. Conversations on topic 1 decreased over time, conversations on topic 5 remained similar from March to May, and conversations on topic 9 increased over time, with specific words such as “people,” “use,” “drug,” and “die” increasing in May. Conversations on topic 6 remained stable from March to May.

**MOUD Experiences and Access Issues (Topic 7)**

Topic 7 (MOUD experiences and access issues) was correlated most strongly with topic 9 (negative consequences of addiction), topic 1 (supply shutdown), and topic 5 (clinic/doctor). Conversations on these topics included discussions about closed treatment centers, overcrowded methadone clinics, and problems obtaining extra medications. Individuals experienced the following challenges: (a) substance use treatment programs closures prevented individuals from

| Topic id | Representative Words for Each Topic | Topic Title Based on Human Interpretation | Percentage of Posts Containing the Topic |
|----------|---------------------------------|------------------------------------------|----------------------------------------|
| 1        | People hand state live money work close lot supply store area pay shut virus hard outside city home face | Supply, shutdown | 18.3% |
| 2        | Fuck shit lol money people bad happen good friend dope man let dude lose long run buy yeah pill sell | Social | 24.9% |
| 3        | Use dose methadone suboxone good sub high taper fent heroin pill opiate work long oxy withdrawal drug fentanyl kratom tolerance | Drug names, dose | 19.8% |
| 4        | Thank post use info question ask maybe check sure send information comment online sorry help link talk hear edit share | Asking for info; help | 17.2% |
| 5        | Doctor script pharmacy clinic pain patient doc sub appointment ask prescribe prescription med medication insurance suboxone able office state work | Clinic, doctor | 18.1% |
| 6        | Help use withdrawal good bad sleep taper anxiety kratom dose long symptom sub cold gabapentin | withdrawal symptoms | 20.2% |
| 7        | Clinic dose home people bottle takehomes patient methadone test counselor worth state wait extra phase covid sure line work long | MOUD experiences and access issues | 22.7% |
| 8        | Sick virus opiate symptom bad covid people hospital worry die risk immune flu doctor lol corona high cough case cause | COVID-19 symptoms | 14.9% |
| 9        | People methadone use drug addict help good help fuck shit bad treatment addiction life die point overdose post lot change person | Negative consequences of addiction | 19.2% |
| 10       | Good clean use life work stay hard help hope thank love luck recovery best friend people great addiction relapse family | Recovery | 24.2% |
receiving their MOUD and other essential services offered by these programs; (b) methadone clinic overcrowding at the clinics that were open during lockdown and social distancing, which made individuals concerned of catching COVID-19 at the clinic; (c) limited MOUD take-homes prevented people who rely on MOUD from securing take-home medications and many reported altering their dosage of MOUD (eg, using a lower dose than prescribed) and attempting to stockpile their medication to deal with the potential threat of running out; (d) switching MOUD from methadone to buprenorphine to avoid having to visit the methadone clinic, or from oral buprenorphine to the injectable version to avoid access barriers; and (e) financial barriers to accessing MOUD. People discussed losing their job during the pandemic and not having insurance to pay for MOUD. Contrastingly, people reported telemedicine as a helpful way to access services. Individuals reported receiving quick responses from providers linking them to treatment and many described it as a simple process.

Withdrawal Related Conversation (Topic 6)

Topic 6 (withdrawal) was correlated most strongly with posts containing topic 3 (drug names) and topic 8 (COVID-19 symptoms). Individuals discussed withdrawal from MOUD during the COVID-19 pandemic as well as illicit drugs used to get high (eg, heroin and fentanyl). Withdrawal often resulted in relapse or replacing their usual drug of choice (MOUD or illicit substance) with alternatives. Additionally, many individuals expressed confusion as to whether they were experiencing symptoms of withdrawal or symptoms of COVID-19 and were reluctant to visit healthcare settings for COVID-19 symptoms because they felt providers would stigmatize them for their drug use. The word “withdrawal” increased from March to April and then decreased in May, while “help” and “dose” increased gradually from March to May. The mention of drug names (topic 3) increased over time. Specifically, “use,” “fentanyl,” “heroin,” “pill,” and “opiate” gradually increased from March to May.
| Topic | COVID-19-related Example Posts/comments With Topic Modeling Percentage Rates | Representative COVID-Related Posts/Comments |
|-------|--------------------------------------------------------------------------|---------------------------------------------|
| Topic 7 (MOUD experiences) | (Topic 7 ->68.70%; Topic 1 ->18.70%;) My city is in lockdown with shelter in place orders I just started MAT about a month ago at my clinic As of right now I am still having to go in for my daily dose and the nurses informed me that they are stopping UA s as COVID can potentially spread through urine | (Topic 7 ->54.57%; Topic 6 ->37.43%; Topic 11 ->15.09%; Topic 13 ->7.82%) 
My city is in lockdown with shelter in place orders I just started MAT about a month ago at my clinic As of right now I am still having to go in for my daily dose and the nurses informed me that they are stopping UA s as COVID can potentially spread through urine 
fees so even though I have been clean I do not have the opportunity to prove that to them to work towards phasing up until the dust settles I spoke with my counselor today as I am a bit concerned since I live with several at risk people and I may be able to get takehomes because of this but I m not holding my breath and at the moment I will be going in for my daily dose indefinitely through the apocalypse Kinda upset about this but at least my clinic is still open and I am not completely fucked having to go without a dose at all Update went in this morning and they are giving everyone at least a week s worth of takehomes now they sent me off with takehomes and said they are probably going to give me weeks worth when I come in next week.

| Topic 5 (clinic, doctor) | (Topic 5 ->62.92%; Topic 7 ->21.25%;) I m going to see my doctor today to refill my oxy script I m due for a refill on 1 m going to ask if he ll let me fill it today so I don t have to go back out I don t have a car and I can only get to my appointment and pharmacy by subway which I really don t want again in 2 days off I don t have to I ve been working from home since last week just to not ride the train Had anyone asked for an early script due to the COVID outbreak What did your doctor say | Topic 5 (clinic, doctor) 
(Topic 5 ->62.92%; Topic 7 ->21.25%) I m going to see my doctor today to refill my oxy script I m due for a refill on 1 m going to ask if he ll let me fill it today so I don t have to go back out I don t have a car and I can only get to my appointment and pharmacy by subway which I really don t want again in 2 days off I don t have to I ve been working from home since last week just to not ride the train Had anyone asked for an early script due to the COVID outbreak What did your doctor say.

| Topic 9 (negative consequences) | (Topic 9 ->80.87%; Topic 7 ->18.37%) I disagree with what you re saying I do not think that just because some people shouldn t be trusted this should give methadone clinics the authority to decide who gets the privilege of when and how to take this medicine Even one case of abusing this power is not worth keeping the bad methadone patients from having takehomes in my opinion You say covid deaths are preventable with medical care like this is a burden and risk those who can t be trusted with takehomes shouldn t endure and just hope they either don t or can t but this is a public health crisis and life or death for some people things need to change Look at the amount of power and discretion some of these clinics have over people Human life that can be saved should be and just because there is a war on drugs attitude and enormous stigma against opioid addicts doesn t mean that this treatment that has saved lives and society much larger burdens should be treated the way that it is especially now. | Topic 9 (negative consequences) 
(Topic 9 ->80.87%; Topic 7 ->18.37%) I disagree with what you re saying I do not think that just because some people shouldn t be trusted this should give methadone clinics the authority to decide who gets the privilege of when and how to take this medicine Even one case of abusing this power is not worth keeping the bad methadone patients from having takehomes in my opinion You say covid deaths are preventable with medical care like this is a burden and risk those who can t be trusted with takehomes shouldn t endure and just hope they either don t or can t but this is a public health crisis and life or death for some people things need to change Look at the amount of power and discretion some of these clinics have over people Human life that can be saved should be and just because there is a war on drugs attitude and enormous stigma against opioid addicts doesn t mean that this treatment that has saved lives and society much larger burdens should be treated the way that it is especially now.

| Topic 6 (withdrawal) | (Topic 7 ->41.16%; Topic 3 ->25.66%; Topic 6 ->17.91%) I ran out of my methadone days ago and have really been struggling with withdrawal I ve been taking kratom along with any other type of opiate I could find None of them were really working not sure if the kratom was blocking them or I just wasn t taking enough but I took IR release morphine ER morphine hydrocodone and oxys the most being mgs of oxy at once Anyway I didn t feel any type of high I m not even sure it gave me any relief from the withdrawals I take mgs of methadone and I ve been doubling it for a few years so needless to say my tolerance is really high Anyway today I was able to score some oxy s laced with fentanyl I have never had fentanyl so I cut them in half and wow I gotta say they were great This is the first time I have been able to feel any pills since I started methadone yrs ago Not only did they get me high but they completely took my withdrawals away Anyway I like an idiot called my counselor on Wednesday and told her I had messed up somehow and ran out I had gotten days worth due to Covid I didn t know what to do and I was really sick and I really thought they d help me But they would not help me I had told her I had only ran out since Tuesday Monday being my last dose and I get my refills tomorrow on Friday so days but in reality I ran out the prior Tuesday today Thursday being days And they would not help me so me confessing was all in vain she said if it was getting really bad I d have to go to the ER cause they would not dose me sooner So two questions if anyone has experience with this is this typical or if I would of told her the truth that I had been out for days at the time would they have dosed me or would it have been the same outcome And also I m sure I will be drug tested tomorrow what will happen once I piss dirty for all of the above I mean what did they expect me to do they wouldn t help me and I was in hell She said my take homes would possibly be reduced to a weeks worth which I m sure that s only because of this COVID Does anyone know what the procedure is for my situation I m hoping and praying I don t lose my take homes forever or I don t think I will stay in treatment I ve never had any issues prior was a phase the highest phase they have I have maybe times in the years pissed dirty and lost my phase but than quickly got it back I just don t know what to expect tomorrow any info will be appreciated thx. | Topic 6 (withdrawal) 
(Topic 7 ->41.16%; Topic 3 ->25.66%; Topic 6 ->17.91%) I ran out of my methadone days ago and have really been struggling with withdrawal I ve been taking kratom along with any other type of opiate I could find None of them were really working not sure if the kratom was blocking them or I just wasn t taking enough but I took IR release morphine ER morphine hydrocodone and oxys the most being mgs of oxy at once Anyway I didn t feel any type of high I m not even sure it gave me any relief from the withdrawals I take mgs of methadone and I ve been doubling it for a few years so needless to say my tolerance is really high Anyway today I was able to score some oxy s laced with fentanyl I have never had fentanyl so I cut them in half and wow I gotta say they were great This is the first time I have been able to feel any pills since I started methadone yrs ago Not only did they get me high but they completely took my withdrawals away Anyway I like an idiot called my counselor on Wednesday and told her I had messed up somehow and ran out I had gotten days worth due to Covid I didn t know what to do and I was really sick and I really thought they d help me But they would not help me I had told her I had only ran out since Tuesday Monday being my last dose and I get my refills tomorrow on Friday so days but in reality I ran out the prior Tuesday today Thursday being days And they would not help me so me confessing was all in vain she said if it was getting really bad I d have to go to the ER cause they would not dose me sooner So two questions if anyone has experience with this is this typical or if I would of told her the truth that I had been out for days at the time would they have dosed me or would it have been the same outcome And also I m sure I will be drug tested tomorrow what will happen once I piss dirty for all of the above I mean what did they expect me to do they wouldn t help me and I was in hell She said my take homes would possibly be reduced to a weeks worth which I m sure that s only because of this COVID Does anyone know what the procedure is for my situation I m hoping and praying I don t lose my take homes forever or I don t think I will stay in treatment I ve never had any issues prior was a phase the highest phase they have I have maybe times in the years pissed dirty and lost my phase but than quickly got it back I just don t know what to expect tomorrow any info will be appreciated thx.

| Topic 8 (COVID) | (Topic 8 ->54.57%; Topic 6 ->37.43%) Mate I ve had the same thought I considered going out and trying to get infected I could go through withdrawal in hospital and it might not be so bad there Plus if I go on the ICU then they sedate you and maybe I d be so out of it I could just get through the withdrawal and not remember much of it I considered doing it even knowing the ICU is a fatality rate But I decided against it I didn t want to give more work to hospital staff and risk others etc Plus one of the girls I talk to on her caught coronavirus and ended up in hospital and she just got her partner to bring her the pills she needs in a sock So she didn t detox at all lol. | Topic 8 (COVID) 
(Topic 8 ->54.57%; Topic 6 ->37.43%) Mate I ve had the same thought I considered going out and trying to get infected I could go through withdrawal in hospital and it might not be so bad there Plus if I go on the ICU then they sedate you and maybe I d be so out of it I could just get through the withdrawal and not remember much of it I considered doing it even knowing the ICU is a fatality rate But I decided against it I didn t want to give more work to hospital staff and risk others etc Plus one of the girls I talk to on her caught coronavirus and ended up in hospital and she just got her partner to bring her the pills she needs in a sock So she didn t detox at all lol.

| Topic 10 (Recovery) | © 2021 American Society of Addiction Medicine | © 2021 American Society of Addiction Medicine |
“Suboxone” also increased substantially from March to May, while “methadone” decreased. Most COVID-related words gradually decreased from March to May, including “sick,” “virus,” “symptom,” “covid,” “worry,” “die,” and “risk.” Contrastingly, “hospital” gradually increased from March to May. Conversations related to withdrawal include: (a) withdrawal from illicit drugs taken to get high (eg, heroin and fentanyl). Due to availability and pricing changes in the illicit drug market, access to their drug of choice might be limited. People complained that social distancing orders prevented physical contact with drug suppliers. People also reported financial barriers to buying drugs due to job loss and intentional withdrawal (see “Recovery-Related Issues” below); (b) withdrawal from MOUD (eg, methadone, buprenorphine, suboxone) due to treatment center closures, limited take-home dosages, and issues accessing telemedicine, as discussed above. Many said this withdrawal resulted in relapse. (see “Recovery-Related Issues” below); (c) alternative illicit drug usage. Drug names were also correlated with withdrawal symptoms because many individuals described what they were replacing their unavailable preferred drugs (illicit or MOUD) with to help cope with withdrawal (“I ran out tramadol and need an alternative. I have three bottles of zoloft and tequila”). (d) confusion as to whether they were experiencing symptoms of withdrawal or COVID-19. Symptoms that individuals believed could be attributed to either condition included temperature fluctuations (hot/cold flashes), loss of appetite, runny nose, chills, vomiting, cough, headache, light cramping, shortness of breath, fever, sneezing, yawning, anxiety, insomnia, depression, and diarrhea. Many also reported experiencing anxiety and paranoia (“constantly afraid,” “pure panic,” “become a hypochondriac,” “absolutely freaking out,” “paranoid”) from not knowing whether they were experiencing withdrawal or COVID-19. Many also
reported that they have not been sick since taking opioids or methadone, and they worry that if they were to get COVID-19 that the opioids or methadone might mask the symptoms and they would be asymptomatic ("Well known fact that opioid addicts never suffer from minor illness (flu, colds) because the opioids mask any symptoms."); (e) stigmatization by healthcare providers. Withdrawal symptoms and COVID-19 symptoms were also mentioned together in discussions about feeling stigmatized by their healthcare provider for their drug use. Consequently, individuals feared not receiving appropriate treatment for either condition.

Recovery Related Conversation (Topic 10)

Topic 10 (recovery) was correlated most strongly with topic 3 (drug names), topic 6 (withdrawal), and topic 9 (negative consequences of addiction), with conversations centering around drug names and dosages being used to self-medicate withdrawal symptoms during self-quarantine. In general, conversations on topic 10 (recovery) increased over time from March to May. Regarding word frequencies, "clean," "help," "love," and "friend" increased in May. "Relapse" also increased in May. Recovery-related issues included: (a) self-medication to maintain recovery. They mentioned using prescription drugs (eg, Zoloft, Valium, Xanax, Gabapentin, Diazepam, Clonidine, Seroquel), alternative treatments such as THC/CBD and Kratom, and over-the-counter solutions (DayQuil, NyQuil, Imodium, vitamins). Many individuals discussed avoiding hospitals or clinics for fear of contracting COVID-19 or being stigmatized by doctors and instead discussed tips regarding self-medicating withdrawal symptoms; (b) home detox. Many individuals mentioned the potential benefits of self-quarantine on their recovery, such as using the time in quarantine as an opportunity to abstain from opioids, enter recovery in the comfort of their own homes, and change their lifestyles. Many individuals reported using this time to taper off their MOUD or quit "cold turkey." Nevertheless, others expressed concern and doubt regarding home detox during this time.

DISCUSSION

The purpose of this paper is to examine the topics and challenges people who use drugs were discussing on the social media platform Reddit during the first three months of the COVID-19 pandemic, while social distancing measures were implemented across the world. We also examined how the conversation topics changed over time during these 3 months. The findings show that the most highly discussed topics were related to take-home MOUD, drug withdrawal, and recovery.
FIGURE 3. Word Frequency for topics discussed over time, from March 1 to May 22, 2020, for (a) Topic 7: MOUD Experiences and Access Issues, (b) Topic 6: Withdrawal, (c) Topic 10: Recovery, and (d) Topic 3: Drug Names/Dose. Frequency of a word (w) for a topic (t) in a month (m) is computed by the total count of word w under topic t (each word in a post/comment is assigned to a topic) in month m, normalized by the total number of words in post/comments in month m.
The frequency of conversations about MOUD experiences and access issues were discussed less frequently over time, conversations about withdrawal remained stable over time, and discussions about recovery were more frequent over time. These results suggest that people either experienced fewer MOUD access issues over the course of the pandemic or they became accustomed to the challenges of receiving their medications and therefore discussed it less, and people either became more interested in recovery over time or faced increasing barriers to recovery. Further qualitative analyses are needed to better understand each individual topic identified in this study and why these discussion topics changed as the COVID-19 pandemic progressed.

We found several challenges that individuals in this study reported regarding take-home MOUD, withdrawal, and recovery. Regarding MOUD experiences and access issues, people discussed closed treatment centers, overcrowded methadone clinics, and problems obtaining extra MOUD dosages. Some people discussed losing their jobs and having no insurance to cover the cost of MOUD. Many individuals who were able to access telemedicine services discussed it as a helpful option, but a significant number were unsure about how to seek these services. Regarding withdrawal, individuals discussed withdrawing from MOUD as well as illicit drugs used for the purpose of getting high (eg, heroin and fentanyl). Withdrawal often resulted in relapse or replacing their usual drug of choice (MOUD or illicit substance) with alternatives. Additionally, many individuals expressed confusion as to whether they were experiencing symptoms of withdrawal or symptoms of COVID-19 and were concerned about being stigmatized by providers for their drug use, if they needed to access healthcare services. Individuals discussed prescription and nonprescription drug names and dosages that they were using to self-medicate withdrawal symptoms during self-quarantine. People also discussed using their time in quarantine as an opportunity to abstain from opioids and change their lifestyles, while also admitting fear of relapse due to the shutdown of recovery-related activities (eg, AA/NA meetings, gyms, social events).

Social media platforms such as Reddit can be used by addiction clinicians to learn about specific challenges and experiences of people who use drugs. Because Reddit users openly discuss and exchange dialog on stigmatized issues, this platform serves as a rich tool for clinicians to become better informed about people who use drugs. This study’s findings have important implications for providers treating people who use drugs as they apply the new guidelines for provision of MOUD access issues over the course of the pandemic or they became accustomed to the challenges of receiving their medications and therefore discussed it less, and people either became more interested in recovery over time or faced increasing barriers to recovery. Further qualitative analyses are needed to better understand each individual topic identified in this study and why these discussion topics changed as the COVID-19 pandemic progressed.

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