

Spring 3-27-2019

Mining Twitter to Assess the Opioid Crisis

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Recommended Citation

Nasrallah, Tareq; El-Gayar, Omar; and Wang, Yong, "Mining Twitter to Assess the Opioid Crisis" (2019). *Annual Research Symposium*. 10.
<https://scholar.dsu.edu/research-symposium/10>

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Abstract

Opioid addiction is one of the largest and deadliest epidemics in the United States. This research investigates opioids' epidemic by analyzing recent tweets data for users who are addicted or have been addicted to opioids. Automatically analyzing social media users' posts of opioids addicted users using machine learning tools can help understand the themes and topics that exist in the up-to-date discussions of online users of social media networks. Through the analysis period from 01/01/2016 to 02/25/2019, we were able to identify 571 self-identified Twitter users. We collected a total of 20,609 English-language tweets that belong to the self-identified users. Overall, we identify the different recovery approaches, illicit drug use and user seeking for help. This study helps elicit how the daily posts and activities of online social media users can provide a better understanding of the opioid crisis strengthen the public health data reporting and collection for opioids epidemic.

Background

Using machine learning tools to automatically analyzing the daily tweets of opioid addicted users can help understand different themes. These include the way that leads them to be addicted, the illicit ways that they get opioids, how they manage their addiction if they do, what kind of medications they use to recover, what other drugs they take or are addicted to.

This research studies the perceptions of opioid addicted users. The key implication for practice, first, it can help understand the common concerns of opioid-addicted users. Second, it can address the most discussed topics on social media for the opioid addicted users. Third, it can help get insights about the daily lifestyle of opioid addicted users by analyzing their daily posts on social media to help provide better opioid prevention, treatment, and recovery strategies. Finally, it can strengthen the public health data reporting and collection through the reports of the collected data and analysis results.

Literature Review

Social media users' posts were used to better understand providers' attitude toward using recovery drugs such as 'naloxone' to treat opioid addictions (Haug et al. 2016). Several studies have used social media as a source of input data to identify individuals amenable to drug recovery interventions (Eshleman, Jha, and Singh 2017) and use text mining to examine and compare discussion topics of social media communities to discover the thematic similarity, difference, and membership in online mental health communities (Park, Conway, and Chen 2018). Glowacki, Glowacki, & Wilcox (2017) have utilized text mining to analyze the public's reactions to the opioid crisis. The authors identified the public's reactions by identifying the most popular topics tweeted by users.

The aforementioned research affirms the potential for analyzing users' posts on social media as a mechanism to better understand their needs and perceptions toward drug addiction and more specific opioid prescription medication abuse. In this research we emphasize the population of the study to the users who self-identified themselves as they are addicted to opioids.

Conclusions

From a theoretical perspective, this research highlights the importance of further developing and adapting text mining techniques to social media for drug abuse. Such media represents inherent challenges for text mining given the amount of noise and distortion in the data. Of particular

significance is the emphasis on developing methods for improving the discovery and identification of topics in social media domains characterized by a plethora of highly diverse terms and a lack of commonly available dictionary/language by the community such as in the opioid and drug abuse case.

From a practical perspective, automatically analyzing social media users' posts using machine learning tools can help understand the users' themes and topics that exist in the up-to-date discussions of online users of social media networks. Addressing the most discussed topics on social media that relate to drug abuse can help understand the problem dimensions and create the proper strategies.

Methodology

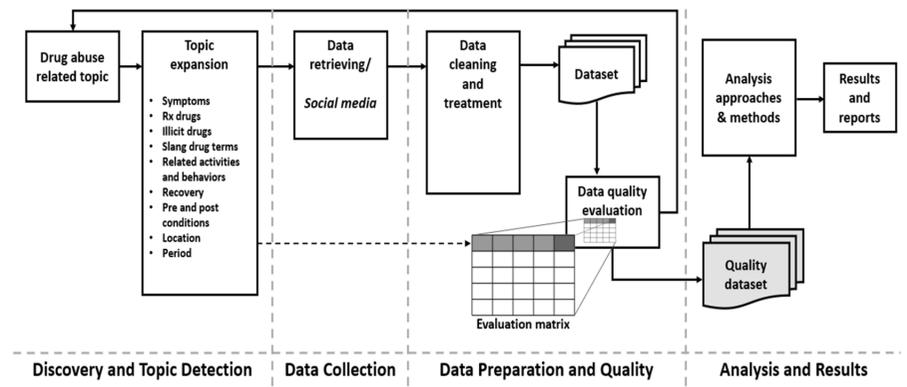


Figure 1: Drug Abuse Text Mining Framework on Social Media

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    ("I am addicted" OR "I was addicted" OR "I am addict" OR "I addict" OR "I addicted" OR "I have been addicted")
    AND
    (Opioid OR Opioids OR Opiate OR Opiates OR Codeine OR Naloxone OR Propoxyphene OR
    Hydrocodone OR Vicodin OR Oxycodone OR OxyContin OR Oxy OR Oxys OR Percocet OR Oxymorphone OR Opana OR Morphine OR
    Hydromorphone OR Tramadol OR Fentanyl OR Duragesic OR Actiq OR Subsys))-2

    AND -
    (http OR https OR RT)
  
```

Figure 2. Search query for the opioid addicted users

```

    (
    Opioid OR Opioids OR Opiate OR Opiates
    OR
    Heroin OR Kratom OR Marijuana OR Hashish OR Weed OR Opium OR cannabis OR Cocaine OR Crack
    OR
    Codeine OR Naloxone OR Propoxyphene OR Hydrocodone OR Vicodin OR Oxycodone OR OxyContin OR Oxy OR Oxys OR Percocet OR Oxymorphone OR Opana OR
    Morphine OR Hydromorphone OR Tramadol OR Fentanyl OR Duragesic OR Actiq OR Subsys OR Recovery_Drugs OR Methadone OR Dolophine OR
    Methadose OR Diskets OR Naltrexone OR Revia OR Vivitrol OR Buprenorphine OR Probuphine OR Subutex OR Suboxone
    OR
    (
    (addict OR pain OR overdose OR overdoses OR high OR cough OR misuse OR
    pharmacy OR pharma OR friend OR Friends OR Dealer OR doctor)
    OR
    (self-medication OR pain OR "severe pain" OR withdrawal OR high OR cough OR surgery OR
    intranasal OR smoking OR injection OR plugging OR oral OR snore OR sniff OR
    milligram OR bags OR pills OR pill OR millilitre OR bottles OR bottle)) AND (Opioid OR Opioids OR Opiate OR Opiates
    OR
    Heroin OR Kratom OR Marijuana OR Hashish OR Weed OR Opium OR cannabis OR Cocaine OR Crack)
    OR
    #opioid OR #kratom OR #opioidcrisis OR #chronicpain OR #fentanyl OR #OpioidEpidemic OR #overdose OR #opioidhysteria OR #iamkratom OR #opioids
    )
    )

    AND -
    (http OR https OR RT)
  
```

Figure 3. Search query for the addicted users' tweets

Results and Discussion

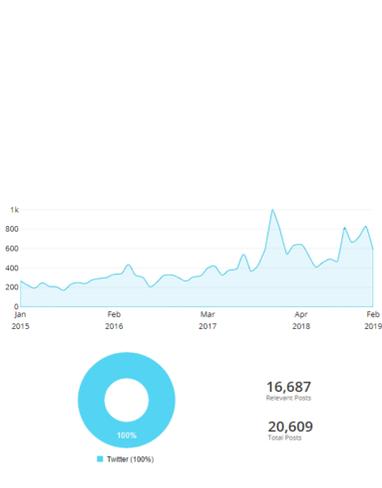


Figure 4. Data volume over the period

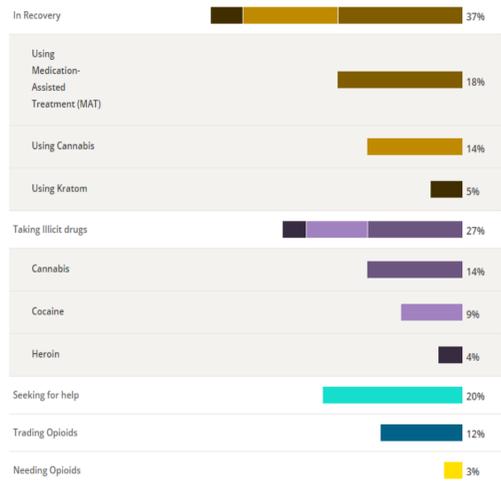


Figure 5. Proportion of tweets by category

Overall, the identified categories in the analysis results show the different recovery approaches that the opioid addicted users take to manage their misuse and addiction, the other illicit drugs that they are taking, and they may addict to. Also, the results show the users need for help and information during their health management.

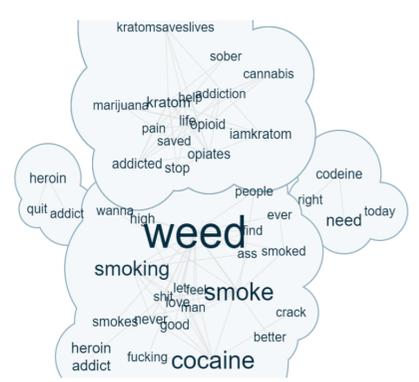


Figure 6. Cluster of key words from all tweets