Published in final edited form as:
J Adolesc Health. 2015 February ; 56(2): 139–145. doi:10.1016/j.jadohealth.2014.10.270.

Twitter Chatter about Marijuana

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Abstract

Purpose—We sought to examine the sentiment and themes of marijuana-related chatter on Twitter sent by influential Twitter users, and to describe the demographics of these Twitter users.

Methods—We assessed the sentiment and themes of a random sample (n=7000) of influential marijuana-related Tweets (sent from 2/5 – 3/5/2014). Demographics of the users Tweeting about marijuana were inferred using a social media analytics company (DemographicsPro for Twitter).

Results—Most marijuana-related tweets reflected a positive sentiment towards marijuana use, with pro-marijuana Tweets outnumbering anti-marijuana Tweets by a factor of over 15. The most common theme of pro-marijuana Tweets included the Tweeter stating that he/she wants/plans to use marijuana, followed by Tweeting about frequent/heavy/or regular marijuana use and stating that marijuana has health benefits and/or should be legalized. Tweeters of marijuana-related content were younger and a greater proportion was African American compared to the Twitter average.

Conclusions—Marijuana Twitter chatter sent by influential Twitter users tends to be pro-marijuana and popular among African Americans and youth/young adults. Marijuana-related harms may afflict some individuals; therefore, our findings should be used to inform online and offline prevention efforts that work to target individuals who are most at-risk for harms associated with marijuana use.

Keywords

Marijuana; Social Media; Youth

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Conflicts of Interest Dr. Bierut is listed as an inventor on Issued U.S. Patent 8,080,371,"Markers for Addiction" covering the use of certain SNPs in determining the diagnosis, prognosis, and treatment of addiction.

Implications and Contribution Twitter is a popular social media platform among young people. Results from this study highlight the pervasiveness of pro-marijuana Twitter chatter particularly among youth and African Americans and stress the need for more online marijuana prevention messages to target individuals who are most at-risk for marijuana use-associated harms.

Twitter is a free-to-use social media platform that has become very popular among young people in recent years [1,2]. Twitter users can easily and instantly connect to a mass audience via Tweets that are 140 characters or less [3]. The ability to engage with unknown persons is a unique and appealing feature of Twitter that helps drive its popularity among young people [4]. A 2013 survey found that Twitter was viewed as "the most important social media service" among teens [5] and nearly half of the 240 million Twitter users [4] are under the age of 34.

Twitter users can engage with adverse Tweets that glamorize harmful substance use behaviors. In our own research, we identified a popular pro-marijuana Twitter handle (@stillblazingtho) that sends an average of 11 Tweets per day which primarily promote recreational marijuana use behaviors; this handle has approximately 1 million followers and most are predicted to be youth and young adults [6]. Related studies have found that young Twitter users could easily view Tweets that promote alcohol use [7,8]. Similarly, underage youth were able to view and post Tweets that promoted trendy tobacco products like hookah and e-cigarettes [9].

In the present study, we examine marijuana-related Twitter chatter. The liberalizing of marijuana policies has prompted increasing media attention in recent years and discussions about this hot topic may occur on Twitter. We therefore hypothesize that the bulk of Twitter chatter about marijuana is favorable towards marijuana. Because Twitter is commonly used among young people and marijuana is a relatively popular substance among teens and young adults, [10] we additionally hypothesize that the Tweeters who are sending marijuana-related messages are youth and young adults.

Methods

The Twitter data in our study are public and our research was deemed exempt from human subjects review.

Marijuana-related Tweets

Marijuana-related Tweets in the English language were collected from February 5 – March 5, 2014 using Simply Measured, a company that provides social media analytics and measurement [11]. Simply Measured has access to the Twitter "firehose" (100% of Tweets) via Gnip, a licensed company that can retrieve the full Twitter data stream [11].

All Tweets that contained one or more of specific marijuana-related terms were pulled. To compile an inclusive list of marijuana-related terms, members from our research team initially composed a list of search terms that reflected common terms for marijuana. Additionally, urbandictionary.com and marijuana-related Tweets on Topsy.com were also utilized. Simply Measured garnered all Tweets that included one or more of the terms listed in Table 1.

Once the marijuana-related Tweets were collected from Simply Measured, the research team scanned the data, including popular retweets, to exclude irrelevant Tweets from analysis. See footnotes of Table 1 for a complete list of exclusion/inclusion terms.

Tweet sentiment

We randomly sampled 7,000 Tweets from those whose handles were in the top 25th percentile for both number of followers and Klout score. Klout score considers the extent to which the user's content is "acted upon" by being clicked, replied, and/or retweeted [12]. Klout score is utilized as a measure of influence versus number of followers, which is a measure of popularity. We restricted our sample to these Tweets because of the potentially higher impact these Tweets have compared to Tweets from individuals who have fewer followers. Tweets that were direct @replies were excluded from analysis because often the original Tweets would also need to be reviewed in order to understand the context.

Tweets (along with the content of any links) were coded for sentiment. Pro-marijuana Tweets relate positive experiences with using marijuana and/or encourage others to use marijuana. Anti-marijuana Tweets relay unpleasant experiences with marijuana and/or discourage others to use marijuana. We established sentiment codes on a Likert scale: 1=strongly against marijuana use, 2=slightly against marijuana use, 3=neutral/unknown, 4=slightly for (pro) marijuana use, 5=strongly for (pro) marijuana use. Non-discernible Tweets were excluded from further analysis.

Themes and source of Tweets

The content of Tweets was coded to summarize their main themes. Two members of the research team with expertise in substance use research scanned 300 random marijuana-related Tweets. Different sets of themes were distinguished between pro-marijuana Tweets versus anti-marijuana Tweets. The presence of themes was coded as yes/no.

For pro-marijuana Tweets, ten themes were identified: (1) intent to use or craving marijuana, (2) frequent, regular, or heavy use of marijuana, (3) medical and/or recreational marijuana use has benefits and/or should be legalized, (4) marijuana use in relation to sex/romance, attractiveness (e.g., sexy stoner girls), or helping to facilitate friendships, (5) currently using marijuana or is high, (6) marijuana helps you to feel good or relieve stress, (7) others should use marijuana, (8) a celebrity or song is linked to marijuana use, (9) using marijuana with alcohol, tobacco, or other drugs, and (10) marijuana use is harmless.

Sentiment of the Tweets was first determined by Crowd Flower contributors (described in detail below) and then two members of the research team reviewed the anti-marijuana Tweets (n=317) to refine and code the themes. Seven themes were identified: (1) marijuana users are losers or unproductive, (2) smoking marijuana is unattractive or gross, (3) marijuana use is harmful and/or Tweeter wants to quit smoking marijuana, (4) Tweeter does not personally use marijuana and/or has no interest in using or trying marijuana, (5) against marijuana legalization, (6) a celebrity or song is linked to marijuana use, and (7) criminal or legal consequences of marijuana use.

The source of the Tweet was coded as celebrity, health or government organization, news media, marijuana-focused handle (includes reference to marijuana in handle name), ordinary person/non-celebrity, or can't tell.

Coding of the Tweets

We used crowd sourcing to code the Tweets with the services of Crowd Flower [13]. Crowd sourcing involves using a large network of online (i.e., virtual) workers to complete micro-tasks. Kim et al. also used crowd sourcing via Crowd Flower to analyze sentiment of Tweets about U.S. healthcare reform and found high level of agreement between trained coders from the research team and crowd sourced coders (82.4% for positive sentiment, 100% for negative sentiment) [14]. Members of the research team uploaded the sample of 7,000 Tweets to be analyzed onto the online Crowd Flower platform for Crowd Flower contributors to code. Instructions about the job, a codebook, and example Tweets for the Crowd Flower contributors to study prior to starting the job were also uploaded to the Crowd Flower platform. A set of 295 Tweets (from the total 7,000 Tweets) coded by two trained members of the research team was used as test Tweets for the Crowd Flower contributors. Before Crowd Flower contributors could begin coding they were required to master five test Tweets with predefined answers that were created by the research team.

Test Tweets were unidentified (i.e., hidden from contributors) and also interspersed throughout the full sample of Tweets to ensure that the Crowd Flower contributors responded to tasks with a high standard. Crowd Flower contributors who maintained at least 70% accuracy on test questions were considered “trusted” coders. If a contributor’s Trust Score fell below this preset threshold, they became “untrusted” (i.e., they were dropped from the project) and all prior codes from those coders were discarded; new coders were assigned in their place.

Each Tweet was coded by at least three Crowd Flower contributors and the contributors were allowed to code a maximum of 1,000 Tweets. Because Tweets were coded by multiple coders, the numeric values for sentiment coding were first averaged and then collapsed into anti-marijuana (values 1 to 2.4), neutral/unknown (values 2.5 to 3.4), and pro-marijuana (3.5 to 5.0). For the presence of topics/themes of interest (coded as yes/no), the response with the highest confidence score is chosen. Confidence score describes the level of agreement between multiple contributors, is weighted by the contributors’ trust scores, and indicates “confidence” in the validity of the result [15].

Responses to approximately half of the test Tweets (n=140) were used to assess inter-rater reliability. Overall level of agreement for the subsample of test Tweets was good. Intraclass correlation ICC (2,1) for sentiment (anti-marijuana, neutral, pro-marijuana) was 0.86. Percent agreement was 90% for source of the tweet (Cohen’s kappa 0.74), and among the 100 pro-marijuana Tweets, percent agreement for topic codes ranged from 86% to 100% (Cohen’s kappa 0.54 to 1.0, except for heavy use where kappa was 0.16).

A total of 934 Tweets (13% of the 7,000) did not have a working html link and could not be viewed and coded by the Crowd Flower contributors. This tended to occur with deleted Tweets or Tweets that were posted by a private Twitter profile. Two teams of two coders on the research team coded these Tweets since the text and source of these Tweets could still be viewed using a Microsoft Excel program.

Demographic characteristics of the Tweeters

DemographicsPro was used to infer the demographic characteristics (age, gender, race/ethnicity, marital status, income, occupation, and common Twitter handles that are being followed) of the individuals who Tweeted the randomly sampled 7,000 Tweets that were examined [16]. DemographicsPro uses a series of proprietary algorithms to estimate or infer likely demographic characteristics of Twitter handles based on Twitter behavior/usage. Their predictions rely on multiple data signals from networks (signals imparted by the nature and strength of ties between individuals on Twitter), consumption (consumption of information on Twitter revealed by accounts followed and real-world consumption revealed by Twitter usage), and language (words and phrases used in Tweets and bios).

DemographicsPro has used their methodology to profile some 300 million Twitter users to date and requires confidence of 95% or above to make an estimate of a single demographic characteristic [16]. For example, if 10,000 predictions were made, 9500 would need to be correct in order to accept the methodology used to make the prediction. The success of the DemographicsPro analytic predictions relies on the relatively low covariance of multiple amplified signals. Iterative evaluation testing the methodologies on training sets of established samples of Twitter users with verified demographics allows the calibration of balance between depth of coverage (the number of demographic predictions made) and required accuracy. The size of these established samples of Twitter users with verified demographics varies from 10,000 to 200,000 people depending on the specific demographic characteristic to be inferred.

In order to descriptively compare the inferred demographics of Twitter users with high influence who Tweeted about pro-marijuana sentiment with typical Twitter users with a high influence, Demographics Pro also provided the inferred demographic characteristics across a sample of 20,000 randomly selected English-language Twitter users in the U.S. and Canada who had ≥1,000 followers.

Results

A total of 7,653,738 Tweets were collected from 2/5 – 3/5/2014 using our marijuana-related keywords. The most commonly used keyword was weed (3,390,851 Tweets), followed by blunt (1,338,057 Tweets), and marijuana (986,200 Tweets) (Table 1). In general, Twitter users are sending approximately 500 million Tweets per day, which is about 15 billion Tweets per month; therefore, our results suggest that approximately 1 out of 2,000 Tweets being sent on Twitter are about marijuana.

Among the senders of the 7,653,738 marijuana-related Tweets, the median number of followers was 360 (inter-quartile range 164 – 768), and the median Klout score was 39.7 (inter-quartile range 32.8 – 43.8). Nearly one million of the over 7 million Tweets were in the top 25th percentile of both followers and Klout score (≥775 followers and ≥44 for Klout score, n=915,259). We then randomly selected 7,000 Tweets from the nearly one million Tweets with high Klout score and following. Among this sample of 7,000 Tweets, we confirmed that 6,620 (95%) were about marijuana. Only 380 Tweets (5%) were not discernibly about marijuana and were excluded from further analysis.

Sentiment and reach of marijuana Tweets

Among the 6,620 marijuana-related Tweets, 5,109 (77%) were for (or pro) marijuana, 317 (5%) were against (or anti) marijuana, and 1,194 (18%) had a sentiment that was either neutral or unknown. The potential reach of the pro-marijuana Tweets (sum of the followers of the Tweets, 50,463,820) was approximately 12 times higher than the reach of the anti-marijuana Tweets (4,218,627). This does not take into account the extended audience of these Tweets (e.g., followers' followers and their followers), which would make the potential reach of these Tweets even greater.

The most common theme among the pro-marijuana Tweets (n=5109, 77%) included intent to use or craving marijuana (n=1630, 32%), followed by frequent/heavy/or regular use of marijuana (n=854, 17%). Other popular themes included marijuana-related health benefits and/or pro-legalization (n=641, 13%), marijuana in relation to sex/romance, attractiveness or helping to facilitate friendships (n=615, 12%), and Tweeter is currently using and/or high (n=531, 10%). Table 2 has additional details.

In our random sample of Tweets with high Klout score and number of followers, the most common sources of pro-marijuana Tweets were from Twitter users that appeared to be ordinary people/non-celebrities (n=3934, 77%) or from a marijuana-related handle (e.g., Weed Tweets™ @iwakenbaked, Marijuana Posts™; n=780, 15%). Pro-marijuana Tweets that came from a health organization, celebrity or an unidentifiable source were ≤ 5%.

The most common themes among the anti-marijuana Tweets (n=317, 5%) are marijuana users are losers or unproductive (n=82, 26%) and marijuana use is unattractive or gross (n=71, 22%). Anti-marijuana Tweeters stressed marijuana use is harmful and/or he/she wants to quit smoking marijuana (n=65, 21%), does not personally use marijuana and/or has no interest in using or trying marijuana (n=34, 11%), and he/she is against marijuana legalization (n=31, 10%). Details are presented in Table 3.

Among the 317 anti-marijuana Tweets, 268 (85%) appeared to be from ordinary people/non-celebrities followed by Tweets, the media (n=19, 6%), or an unidentifiable source (n=17, 5%). Anti-marijuana Tweets that came from a health organization, marijuana-related handle, or a celebrity were ≤ 5%.

The coders identified 1,194 neutral Tweets (18% of the sample), which often linked media articles or were non-discernable Tweets. The most common sources of neutral/unknown Tweets appeared to be from ordinary people (n=815, 68%), the media (n=183, 15%), or were unidentifiable (n=113, n=9%). Neutral/unknown Tweets from a health organization, celebrity, or a marijuana-related handle were ≤ 5%.

Demographics of Tweeters

Table 4 presents the inferred characteristics of Twitter users (with high Klout score and followers) who Tweeted the pro-, anti-, neutral/unknown marijuana-related Tweets (n=7,000) versus the inferred demographics of 20,000 English-language Twitter users randomly selected from those with a high following (≥1000 followers). Tweeters with high Klout score and number of followers who Tweeted about marijuana-related content

(irrespective of type of sentiment) were in general pretty similar to the randomly selected Twitter users who also have a high following. Notably, over half (59%) of the pro-marijuana Tweeters were under the age of 20; the proportion of Tweeters under the age of 20 was somewhat higher among the average Twitter user with a high following (70%). In addition, most of the Tweeters in our sample were African American (range 52%–78%) versus the Twitter median average, which was 54% African American. African American Tweeters who sent pro-marijuana messages were over-represented among individuals who Tweeted about marijuana-related content versus the Twitter median average (78% versus 51%). Also, the percentage of African Americans was considerably higher for Tweeters who sent pro-marijuana messages (78%) versus Tweeters who sent anti-marijuana messages (62%) or neutral/unknown-marijuana messages (52%).

Discussion

Twitter is a fast growing social networking platform that can have a profound reach to millions of individuals. In the present study, we examined marijuana-related chatter occurring on Twitter over the course of one month's time and found over 7 million marijuana-related Tweets. This suggests that approximately 1 out of every 2,000 Tweets are about marijuana and implies that Twitter is a social media platform that facilitates chatter about marijuana. Our analysis of Tweets' content from influential Twitter users identified a majority of pro-marijuana Tweets and many individuals Tweeted about their intent to use marijuana and their frequent or heavy marijuana use behaviors. Tweets against marijuana use were comparatively low.

Individuals Tweeting pro-marijuana messages were teens and young adults, and the amount of pro-marijuana Tweeters dropped considerably with increasing age. In fact, only 11% of those who Tweeted pro-marijuana messages were age 25 or older. Epidemiological data on marijuana use behaviors also shows that marijuana users begin using at around 18 years of age and a peak in marijuana use behaviors occurs during adolescence and young adulthood [11,17]. With increasing age, marijuana use behaviors decrease substantially for many individuals, even heavy users [18]. Specifically, 50% of individuals who were using marijuana often (i.e., near daily) in their mid-twenties stopped doing so by their mid-thirties [17,19]. Also, by their mid-30s, only about 20% of lifetime marijuana users still report past year marijuana use [19]. Thus, our age-related findings on pro-marijuana Tweeters parallel the relatively quick shifts in marijuana use trends in the general population.

The concern that we have about pro-marijuana Twitter chatter is the potential for social contagion and increased marijuana use in adolescents. It is important to recognize that for some individuals, marijuana use is not inconsequential [20]. About 8% of individuals develop marijuana dependence within 10 years of first marijuana use [21]. When individuals start using marijuana as teenagers the likelihood for developing dependence increases to about 1 in 6 [22]. Repeated marijuana use during adolescence is also harmful on the developing brain and can have long-term impacts on educational, professional, and social achievements [23, 24]. Additionally, the intoxication effects of marijuana use can impact cognitive and motor functioning thereby increasing the chances for motor-vehicle accidents. In 2011, marijuana contributed to over 455,000 visits to the emergency department in the

U.S.; 13% of these patients were between the ages of 12 and 17 [25]. Continued research should therefore work towards understanding how Twitter may a conduit promoting marijuana use as well as an opportunity for identifying and/or targeting prevention efforts at the individuals who are most at-risk for marijuana use-associated harms.

Accordingly, we found that Tweeters who sent pro-marijuana messages were likely to be African American. African American youth are more likely than their Caucasian counterparts to encounter neighborhood disorder, exposure to community violence, and experiences with racial discrimination [26–28]. Moreover, there are barriers in workplaces, schools, and communities that disproportionately affect African Americans and African Americans are more likely to be incarcerated for drug use. We must view marijuana use and marijuana chatter on Twitter in the context of these social and environmental factors [26–29].

Our findings pose important future research questions. First, it is critical to understand more about motives for Tweeting about marijuana. Drawing from social learning theory, young people use substances in response to peer expectations and reinforcements for such behaviors [30–31]. Peer pressure does not have to be overt; even the mere perception that one will gain peer approval increases risk for substance use [30]. It is therefore quite possible that young people boast about their marijuana use behaviors on Twitter in order to gain approval from peer groups and/or increase their social status within a circle of friends who socially value marijuana use behaviors [32]. It may also be that young people Tweet about marijuana use because marijuana policy reform is currently a hot topic and marijuana use is increasingly becoming more tolerated in our society. Second, we cannot verify the degree to which Tweets correspond with marijuana use. Even so, offline and online social networks influence the spread of health behaviors, up to three degrees of separation [33–35]. As such, there is also potential for pro-marijuana Tweets to facilitate the marijuana use behaviors for the receivers of these Tweets. Given the widespread use of Twitter among young people and its ability to connect a mass number of individuals across varied geographic regions, continued research on the impact of exposure to pro-marijuana Tweets is warranted.

Our findings are based on a random sample of marijuana-related Tweets sent over the course of one month’s time from influential Twitter users; thus, an evaluation of all the marijuana-related Tweets streamed over a more extended period of time (e.g., a year) would be more comprehensive. Our list of marijuana terms used to acquire Tweets did not include all of the terms that are synonymous with marijuana and hence some marijuana-related Tweets were missed. Finally, for demographic comparisons, the group of typical Twitter users did not exactly match the sample from which the pro-marijuana Tweeters were drawn. Klout score was not available for the random sample of typical Twitter users and the only cutoff available for followers was ≥1,000. However, this comparison group should be relatively close to the sample from which the pro-marijuana Tweeters were drawn (≥ nearly 700 followers with a higher Klout score).

Our results present a novel perspective into the marijuana-related messages being streamed on Twitter. We identified that most of the marijuana-related messages on Twitter that come

from influential Twitter users (i.e., high Klout scores and high number of followers) are pro-marijuana and most of the Tweeters are young people and African-Americans. Our results should be used to help inform online and offline prevention messages that target individuals who are most at-risk for marijuana use-associated harms.

ACKNOWLEDGEMENTS

Role of funding source

This publication was made possible by NIDA, R01 DA032843 and NIDA, R01 DA039455 awarded to Dr. Cavazos-Rehg and an NIH Midcareer Investigator Award awarded to Dr. Bierut (K02 DA021237), R01 DA031288 awarded to Dr. Grucza.

Abbreviations

MPM Media Practice Model

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Table 1

Marijuana-related Tweets by keyword, 2/5–3/5/2014 (N=7,653,738)

Keywords	Number of Tweets [a]
weed or #weed	3,390,851
blunt or #blunt [b]	1,338,057
marijuana or #marijuana	986,200
stoner or #stoner	477,605
kush or #kush	407,198
stoned or #stoned	354,706
bong or #bong [c]	297,047
pot or #pot [d]	202,297
cannabis or #cannabis	201,384
joint or #joint [e]	137,209
ganja or #ganja	54,018
pothead or #pothead	39,703
sativa or #sativa	18,000
indica or #indica	13,603
#mmot [f]	13,004

[a] Sum does not equal the total of 7,653,738 Tweets because some Tweets contain more than one term.

[b] Excluded Tweets with “Emily Blunt”, “James Blunt”, “blunt object”, “blunt people”, “so blunt”, “too blunt”, “be blunt”, “Sagittarius”, “#Virgo”, “#Leo”, “#Aries”, or “#Taurus”.

[c] Excluded Tweets with “beer bong” or “beerbong” and Tweets/retweets from Big Ben @big_ben_clock or other clocks tweeting “BONG BONG…”, “bing-bong”, or “Kim Keun Bong”.

[d] Only includes Tweets with “smoke”, “smoking”, “smokin”, “head”, “legal”, “shops”, “high”, or “legalize”.

[e] Only includes Tweets with “smok”, “roll”, “high”, or “light”, and excludes Tweets with “highlight”.

[f] #mmot means “Marijuana Movement on Twitter”.

Table 2

Pro-marijuana Tweets (n = 5,109 or 77% of the 6,620 marijuana-related Tweets)

Themes	N (%)	Example Tweets
Tweeter wants, needs, or plans to use marijuana.	1630 (32%)	* *Good weed is all I'll need.* * *Gonna smoke me some pot today……i deserve it.* * *All i wanna do is smoke some marijuana.*
Frequent, regular, or heavy use of bmarijuana.	854 (17%)	* *I just wanna be stoned. All the time.* * *Smoke a lot of kush, thinking I can blow away some pain.* * *I smoke a lot of weed to keep them bitches off my mind.*
Medical and/or recreational marijuana use has benefits and/or should be legalized.	641 (13%)	* Government is slowly losing the war on legalizing weed * Doctors give it to us… Why can't we give it to ourselves? #cannabis #marijuana * Weed being illegal makes no sense to me
Tweets that mentioned marijuana in relation to sex/ romance, attractiveness or helping to facilitate friendships	615 (12%)	* *Boys that share their weed are the boys who get laid.* * *I just want a girl I can kick it with. Smoke weed and bullshit with.* * *Smoking weed with good friends, is always a good time.*
Tweeter is using marijuana or high at the moment.	531 (10%)	* So high I'm droppin da blunt lol * All this weed got me drowsy * I really should a had somebody to smoke this blunt with; I really can't finish it
Marijuana helps you to feel good or relieve stress.	384 (8%)	* A blunt a day, keeps the drama away. * Going to bed stoned is the most peaceful thing * *About to take some rips from the bong, i need to relax.*
Tweeter tells others they should use marijuana.	326 (6%)	* Don't let shit get to you, Smoke Weed! * I don't see why everyone doesn't smoke. Weed is of the earth. It's our gift from god * Homie pass the weed let's get high!
A celebrity or song is mentioned/linked to marijuana use.	289 (6%)	* *I love Miley cause she's a stoner & she doesn't care what people think, I know we'd get along.* * *Susan Sarandon Admits she's been Stoned 'at most Hollywood events.* * Whoever says you can't smoke weed and be successful, watch me. Watch Wiz Khalifa
Using marijuana with alcohol, tobacco, or other drugs.	193 (4%)	* There's no such thing as "too many" shots, or "too much" weed. Gimme all you got * *I talk about sex, smoking weed, drinking but I have a big heart & I am a respectful person.* * Perfect day: bong rips, beer, sex then blunts on the way to taco bell then cuddles and sleep

Themes	N (%)	Example Tweets
Marijuana use does not have serious physical or social consequences.	147 (3%)	* *Alcohol kills, cannabis chills.* * *Just because someone smokes weed, doesn't mean they have no life or no goals.* * *I'm a stoner with more motivation and ambition than all the assholes that hate 'potheads'.*

Table 3

Anti-marijuana Tweets (n = 317 or 5% of the 6,620 marijuana-related Tweets)

Themes	N (%)	Example Tweets
People who smoke weed are losers or unproductive.	82 (26%)	* *Weed, drugs, clothes, and "swag" does NOT make you a boss. Diplomas, degrees, and jobs do.* * *You just sit and get stoned with thirty year olds and you think you've made it.* * *People who constantly have to rely on drinks/weed to have a good time are just sad..*
Smoking marijuana is unattractive or gross.	71 (22%)	* *It's a turn off when a female smell like weed.* * *Y'all gotta stop trying to make smoking sexy. Weed isn't cute. Somebody is smoking weed in the bathroom and it smells like shit.*
Tweeter acknowledges harm in using marijuana and/or wants to quit smoking marijuana.	65 (21%)	* *Shes gone of the molly i'm gone off the weed.* * *Weed slows me down so I rather not do it for a while.* * *I seen female go from classy to trashy all from weed lol smh.*
Tweeter does not personally use marijuana and/or has no interest in using or trying marijuana.	34 (11%)	* *If you smoke weed or drink, that's cool. If you tweet about it and how fun it is, that's fine you do but don't try to offer the shit to me.* * *I would rather cry over a celebrity than sit and smoke weed 24/7.* * *I do not smoke weed, so stop asking me to smoke with you after a show.*
Against marijuana legalization	31 (10%)	* *Many of the same people applauding #CVS for not selling tobacco are ok with making it easier to buy and smoke pot. #makesnosense.* * *Legalising non-medical #cannabis would pose a grave danger to public health and well-being.* * Please don't let them legalize marijuana here
A celebrity or song is mentioned/linked to marijuana use	26 (8%)	* *Justin Bieber caught smoking weed again?! He needs to chill.* * *Bob Marley has done so much more than just support marijuana, it's sad that's what he is most remembered for..* * *I hate weed; you know this. But Miley's weed outfit was so cool.*
Criminal or legal consequences of marijuana use	22 (7%)	* *Driver jailed for allowing middle school students smoke pot on bus…* http://goo.gl/fb/D03h9 * *People who smoke weed complain about getting caught smoking weed, yet they expose it all over a Social Network.* * *DEA Deputy: Same organizations that traffic marijuana, traffic other drugs. They will not be broken up if we legalize marijuana.*

Table 4

Demographic characteristics of Tweeters

Pro-marijuana (n=5,109 Tweets)[a]		Anti-marijuana (n=317 Tweets)[a]	Neutral/unknown (n=1,194 Tweets)[a]	Random sample of 20,000 Twitter users with ≥1000 followers [a]
Age, years				
≤16	7%	12%	9%	16%
17–19	52%	41%	34%	54%
20–24	30%	28%	23%	18%
25–29	5%	5%	8%	3%
30–39	2%	2%	10%	4%
+40	4%	12%	16%	6%
Gender				
Male	41%	42%	49%	35%
Female	59%	58%	51%	65%
Race				
Caucasian	18%	31%	43%	44%
African American	78%	62%	52%	51%
Hispanic	5%	7%	4%	5%
Income				
< $10,000	28%	26%	24%	36%
$10,000–19,999	45%	39%	28%	38%
$20,000–29,999	16%	16%	14%	11%
$30,000–39,999	5%	5%	8%	5%
$40,000–49,999	3%	3%	8%	3%
≥ $50,000	3%	11%	18%	7%
Marital status				
Single	62%	60%	45%	63%
Married	38%	40%	55%	37%
Top Occupation				
Musicians	17%	15%	7%	10%
Students	14%	13%	9%	15%
Authors/writers	7%	8%	13%	8%
Following on Twitter				
Drake	31%	24%	24%	13%
Wiz Khalifa	35%	20%	23%	11%
Nicki Minaj	27%	25%	19%	11%
Barack Obama	19%	21%	27%	12%

[a] Randomly selected from English-language Twitter users in the U.S. and Canada who had ≥1,000 followers.