**Supplementary Digital Methodology Content for**

**Temporal Trends in Online Posts about Vaping of Cannabis Products**

**Data Source**

We analyzed publicly available media from Reddit, the largest forum messaging site, which has been estimated to be up to the 3rd most visited website in the United States (<https://www.digitaltrends.com/computing/reddit-more-popular-than-facebook-in-2018/>). Public posts about various topics on Reddit are posted to “subreddits”, which are message boards or channels formed around a particular topic of interest. We identified a list of 245 drug and vaping related subreddits using public lists of such subreddits housed on the platform (<https://www.reddit.com/r/Drugs/wiki/subreddits>) and supplemented by manual qualitative review of links on the platform.

**Data Collection**

Historic Reddit data is publicly available from multiple sources, including the Google BigQuery repository (<https://bigquery.cloud.google.com/>) and the Pushshift Reddit repository (<https://pushshift.io/>). We collected data for each of the subreddits of interest via the Application Programming Interface (API) on pushshift.io and analyzed data for the period January 1st, 2015, through June 31st, 2019 (prior to widespread public discussion about the lung injury outbreak associated with vaping product use). Our analysis focused on original posts made to the subreddits (known as “submissions”). As a sensitivity analysis we did also conduct an analysis including responses to original posts, known as “comments,” and noted no change in trends.

**Data Analysis**

To plot trends of substances mentioned in the context of vaping we first compiled a list of words to identify vaping-related posts and then specific substances being mentioned in such posts. We built these keyword lists through a two-step process combining natural language processing with manual review by each of the coauthors, who have subject matter expertise in substance use. First, we processed the text into unigrams (single words) and commonly occurring bigrams (two consecutive words). Next, employing the Word2vec algorithm developed by researchers at Google (Mikolov, T. et al. Distributed representations of words and phrases and their compositionality. *Advances in neural information processing systems*. 2013), we applied this neural network based model to the entire corpus of all messages from the 245 drug and vaping related subreddits. Training a neural network model over a large volume of text, such as this, is used to construct “word embeddings,” which are numerical representations of text (i.e., each word is assigned a multi-digit number that informs where each word exists in semantic space). These numerical representations of text, or word embeddings, can then be used in mathematical calculations to identify words with the greatest semantic similarity, as similar words cluster together in the mathematically represented semantic space. Word2vec is particularly helpful in identifying spelling variants or colloquialisms that are commonly used that even an expert may not detect. Using a list of seed words for each substance of interest we identified up to the 50 most semantically similar words for each seed word based on cosine similarity and concatenated and de-duplicated these lists; lists then underwent subsequent manual human review and cleaning by experts in substance use research to compile a final list for each category. Lists of keywords used are listed below in Supplementary Table 1.

All vaping related posts were first identified using keywords in the “Vaping” column. Keywords selected included terms describing the act of vaping (e.g., vaped, dabbing, juuling, etc) and/or devices/products used in the act of vaping (e.g., e-cig, dab pen, juul, etc). From this subset of posts about vaping, the percentage of posts mentioning a keyword from each of the drug-specific categories [THC/marijuana, CBD, and synthetic cannabinoids] was calculated). Trends for these categories were plotted over time.

 **Supplementary Table 1: Keywords used to identify posts related to vaping and cannabis use.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Vaping** | **All (Cannabis and Synthetics)** | **THC/Marijuana** | **CBD** | **Synthetic Cannabindoids** |
| aio | bedrolite | bho | bedrolite | jwh |
| banger | bho | bud | cannabadiol | jwh\_18 |
| baping | bud | canabanoids | cannabidio | k2 |
| blu | canabanoids | canabinoid | cannabidiol | k2\_mk7 |
| blu\_e | canabinoid | canabinoids | cannabidiol\_cbd | k2\_spice |
| blu\_ecig | canabinoids | canabis | cannabidiols | salvia |
| box\_mod | canabis | cananbis | cbd | spice |
| calliburn | cananbis | canibis | cbd\_cannabidiol | spice\_k2 |
| chain\_vape | canibis | cannabanoid | cbd\_cbda | spice\_synthetic |
| cigalike | cannabadiol | cannabanoids | cbd\_cbg | synth\_cannabinoids |
| cigalikes | cannabanoid | cannabinoid | cbd\_cbn | synthetic\_cannabanoid |
| cjuice | cannabanoids | cannabinoids | cbd\_dominant | synthetic\_cannabanoids |
| cloud\_chasing | cannabidio | cannabinol | cbd\_gummies | synthetic\_cannabinoid |
| dab | cannabidiol | cannabis | cbd\_hemp | synthetic\_cannabinoids |
| dab\_pen | cannabidiol\_cbd | cannaboids | cbd\_isolate | synthetic\_cannaboids |
| dab\_pens | cannabidiols | cannatonic | cbd\_isolates | synthetic\_cannibanoids |
| dab\_rig | cannabinoid | cannbis | cbd\_oil | synthetic\_noids |
| dabbed | cannabinoids | cannibanoids | cbd\_oils |   |
| dabbin | cannabinol | cannibas | cbd\_salve |   |
| dabbing | cannabis | cannibinoid | cbd\_tincture |   |
| dabing | cannaboids | cannibinoids | cbd\_tinctures |   |
| dabpens | cannatonic | cannibis | cbd\_topicals |   |
| dabs | cannbis | cannibus | cbda |   |
| disposable\_cigalike | cannibanoids | cbdz | cbdistillery |   |
| disposable\_ecig | cannibas | cbn | cbds |   |
| dtl | cannibinoid | concentrate | cbdz |   |
| e\_cig | cannibinoids | concentrates | cbg |   |
| e\_cigarette | cannibis | d9\_thc | cbg\_isolate |   |
| e\_cigg | cannibus | d9thc | cdb |   |
| e\_cigs | cbd | dab | cdb\_oil |  |
| e\_nail | cbd\_cannabidiol | dabbed | charlottes\_web |   |
| ecig | cbd\_cbda | dabber | cwhemp |   |
| ecigarette | cbd\_cbg | dabbing | greenmountain |   |
| ecigarettes | cbd\_cbn | dabs | greenroads |   |
| ecigarrette | cbd\_dominant | dank | hemp |   |
| ecigg | cbd\_gummies | delta\_8 | hemp\_derived |   |
| ecigs | cbd\_hemp | delta\_9 | hemp\_flower |   |
| egic | cbd\_isolate | delta\_9thc | hemp\_flowers |   |
| ego\_aio | cbd\_isolates | delta9\_thc |   |   |
| ego\_ce4 | cbd\_oil | delta9thc |   |   |
| ego\_evod | cbd\_oils | devils\_lettuce |   |   |
| ehookah | cbd\_salve | ditchweed |   |   |
| ejoint | cbd\_tincture | erb |   |   |
| ejuice | cbd\_tinctures | errl |   |   |
| electronic\_cigarettes | cbd\_topicals | fat\_glob |   |   |
| epen | cbda | ganj |   |   |
| estick | cbdistillery | ganja |   |   |
| exig | cbds | glob |   |   |
| herb\_vaporizer | cbdz | globs |   |   |
| infinex | cbg | harlequin |   |   |
| iqos | cbg\_isolate | hash |   |   |
| julling | cbn | hash\_oil |   |   |
| juul | cdb | herb |   |   |
| juuling | cdb\_oil | indica |   |   |
| liquipods | charlottes\_web | indica\_strains |   |   |
| mii\_pod | concentrate | live\_resin |   |   |
| mjulner | concentrates | maijuana |   |   |
| mod | cwhemp | mairjuana |   |   |
| mtl | d9\_thc | maraijuana |   |   |
| mtl\_setup | d9thc | marajuana |   |   |
| nectar\_collector | dab | marihuana |   |   |
| njoy | dabbed | marijana |   |   |
| oil\_pens | dabber | marijauana |   |   |
| orionq | dabbing | marijauna |   |   |
| pen\_style | dabs | marijiana |   |   |
| pod\_system | dank | marijijuana |   |   |
| podmod | delta\_8 | marijiuana |   |   |
| quartz\_banger | delta\_9 | marijuana |   |   |
| quartz\_nail | delta\_9thc | marijuanna |   |   |
| sauron\_air | delta9\_thc | marijuna |   |   |
| smok\_infinex | delta9thc | marijunana |   |   |
| squanks | devils\_lettuce | marinuana |   |   |
| sub\_ohm | ditchweed | mariujana |   |   |
| sub\_ohming | erb | marjiana |   |   |
| subohm | errl | marjiuana |   |   |
| subohming | fat\_glob | marjuana |   |   |
| ti\_nail | ganj | marrijuana |   |   |
| titanium\_nail | ganja | marujuana |   |   |
| vaing | glob | mary\_j |   |   |
| valing | globs | maurijuana |   |   |
| vaoe | greenmountain | medical\_marijuana |   |   |
| vaoing | greenroads | medicinal\_marijuana |   |   |
| vap | harlequin | merijuana |   |   |
| vape | hash | mexi\_brick |   |   |
| vape\_pen | hash\_oil | mexican\_brick |   |   |
| vape\_pens | hemp | mexican\_schwag |   |   |
| vaped | hemp\_derived | mexischwag |   |   |
| vapeing | hemp\_flower | mids |   |   |
| vapepen | hemp\_flowers | mirijuana |   |   |
| vaper | herb | mj |   |   |
| vapers | indica | mmj |   |   |
| vapes | indica\_strains | pot |   |   |
| vapibg | jwh | recreational\_marijuana |   |   |
| vapig | jwh\_18 | reefer |   |   |
| vapign | k2 | reggie |   |   |
| vapiing | k2\_mk7 | rosin |   |   |
| vapimg | k2\_spice | rso |   |   |
| vaping | live\_resin | sativa |   |   |
| vapng | maijuana | schwag |   |   |
| vapnig | mairjuana | shatter |   |   |
| vapong | maraijuana | shwag |   |   |
| vapor | marajuana | slappies |   |   |
| vaporiser | marihuana | tch |   |   |
| vaporising | marijana | temp\_dabs |   |   |
| vaporization | marijauana | thc |   |   |
| vaporizer | marijauna | thc\_cooh |   |   |
| vaporizers | marijiana | thc\_distillate |   |   |
| vaporizing | marijijuana | thc\_percentage |   |   |
| vaporizor | marijiuana | thca |   |   |
| vapourizing | marijuana | thca\_thca |   |   |
| vapping | marijuanna | thcv |   |   |
| vgod\_stig | marijuna | wax |   |   |
| vpaing | marijunana | wax\_shatter |   |   |
| vsping | marinuana | weed |   |   |
| vuse | mariujana | weeds |   |   |
| wax\_pen | marjiana | weeed |   |   |
| wax\_pens | marjiuana | weef |   |   |
|   | marjuana |   |   |   |
|   | marrijuana |   |   |   |
|   | marujuana |   |   |   |
|   | mary\_j |   |   |   |
|   | maurijuana |   |   |   |
|   | medical\_marijuana |   |   |   |
|   | medicinal\_marijuana |   |   |   |
|   | merijuana |   |   |   |
|   | mexi\_brick |   |   |   |
|   | mexican\_brick |   |   |   |
|   | mexican\_schwag |   |   |   |
|   | mexischwag |   |   |   |
|   | mids |   |   |   |
|   | mirijuana |   |   |   |
|   | mj |   |   |   |
|   | mmj |   |   |   |
|   | myrcene |   |   |   |
|   | pot |   |   |   |
|   | recreational\_marijuana |   |   |   |
|   | reefer |   |   |   |
|   | reggie |   |   |   |
|   | rosin |   |   |   |
|   | rso |   |   |   |
|   | salvia |   |   |   |
|   | sativa |   |   |   |
|   | schwag |   |   |   |
|   | shatter |   |   |   |
|   | shwag |   |   |   |
|   | slappies |   |   |   |
|   | spice |   |   |   |
|   | spice\_k2 |   |   |   |
|   | spice\_synthetic |   |   |   |
|   | synth\_cannabinoids |   |   |   |
|   | synthetic\_cannabanoid |   |   |   |
|   | synthetic\_cannabanoids |   |   |   |
|   | synthetic\_cannabinoid |   |   |   |
|   | synthetic\_cannabinoids |   |   |   |
|   | synthetic\_cannaboids |   |   |   |
|   | synthetic\_cannibanoids |   |   |   |
|   | synthetic\_noids |   |   |   |
|   | tch |   |   |   |
|   | temp\_dabs |   |   |   |
|   | terpene |   |   |   |
|   | terpenes |   |   |   |
|   | terps |   |   |   |
|   | thc |   |   |   |
|   | thc\_cooh |   |   |   |
|   | thc\_distillate |   |   |   |
|   | thc\_percentage |   |   |   |
|   | thca |   |   |   |
|   | thca\_thca |   |   |   |
|   | thcv |   |   |   |
|   | wax |   |   |   |
|   | wax\_shatter |   |   |   |
|   | weed |   |   |   |
|   | weeds |   |   |   |
|   | weeed |   |   |   |
|   | weef |   |   |   |

Note: an underscore connects two consecutive words for the bigrams used.