

Understanding British Columbia's opioid-related public interest during the crisis: A Google Trends-based exploration of online health information-seeking behaviour

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Introduction

Over the past two decades, opioid-related morbidity and mortality have escalated to a public health emergency (Ayers, Ribisl, & Browstien, 2011). Canada has the second highest per capita opioid consumption in the world (British Columbia Drug Overdose & Alert Partnership Report, 2014). In Canada, non-prescription opioids are the second most commonly misused substance among adolescents and adults, following cannabis (Burritt, 2015). As of 2016, the opioid-related death rates in Alberta and British Columbia were more than 14 per 100,000 population, higher than homicides, suicides, breast and colon cancers (Busse, Craigie, Juurlink, Buckley, Wang, Couban, et al. 2017). The Canadian guidelines for opioid use were updated in 2017 to reflect concerns over opioid use (Canadian Pharmacists Association, 2017). In response to increasing overdoses, provincial governments have taken to increasing naloxone access. Alberta, Ontario, Nova Scotia, the Northwest Territories and the Yukon have made naloxone free and accessible to all at pharmacies or community distribution sites (CCENDU, 2016; Fischer, Kurdyak, Goldner, Tyndall, & Rehm, 2016). Healthcare professionals, such as emergency department staff, are searching for information to address the escalating crisis.

Introducing Google Trends

In addition to providing information on opioid-related morbidity and mortality, and access to take-home naloxone programs in Canada, the internet search engine Google provides relevant data for analysis by emergency department personnel. Google Trends has previously been used to monitor the public's health-seeking behaviour (Fischer, Murphy, Rudzinski, & MacPherson, 2016). Furthermore, Google search data has been used to describe present and future behaviour (Goel, Hofman, Lahaie, Pennock, & Watts, 2010). Examples include tracking communicable disease outbreaks and, more recently, examining the popularity of electronic nicotine delivery systems and illicit mephedrone use across the United States (Health Canada, 2018; International Narcotics Control Board, 2017).

The aim of this paper is to describe how Google Trends can be used by emergency department personnel to explore important health-related phenomena. Our exploration includes i) an analysis of internet search and news queries related to fentanyl and naloxone, as well as ii) a basic correlational analysis of queries for fentanyl and naloxone with British Columbian mortality data. We hope to demonstrate how open data can augment surveillance initiatives, describe the public's interest in health-related topics and their knowledge-seeking behaviour.

Methods

Data sources

Data were obtained from Google Trends (www.google.ca/trends), a real-time, cost-free database. Google Trends web and news search data related to fentanyl and naloxone were accessed on September 1, 2017. Data were extracted from January 2012 to the end of July 2017 and limited to British Columbia search volume. Mortality data from 2012 to 2017 were obtained from the report issued by the Coroner's Office of British Columbia (COBC) for the number of deaths in which fentanyl was i) detected, or ii) implicated as a sole cause of death between 2014 and 2017 (<http://www2.gov.bc.ca/gov/content/safety/public-safety/death-investigation/statistical-reports>).

Search strategy and data format

Search data output from Google Trends is provided as a relative search volume (RSV) that is scaled to the period of highest search volume in the requested time period (RSV 100). All other search volumes are reported as a relative volume of the reported maximum (for example, 50% of maximum search proportion would appear as 50). The data category "health" was selected, and fentanyl- and naloxone-related searches were compared simultaneously on the same RSV scale. The generic name of each drug was used as a search term in combination with search term modifiers suggested by Google. Related search terms were automatically generated by Google Trends and included in this analysis for both web and news searches.

Statistical analysis

Google Trends data were downloaded for basic statistical analysis (including Pearson's correlations) using Microsoft Excel (Redmond, Washington, USA). An exemption from institutional ethics review was obtained due to the open source nature of the data used for analysis.

Results

Fentanyl web search results

From January 2012 to August 2014, fentanyl was infrequently searched, with an RSV of less than 10. Searches for fentanyl rose to an RSV of 27 in March 2015. Fentanyl web search volume peaked in August 2015, indicating the highest relative proportion of searches for fentanyl, or naloxone, from January 2012 to July 2017. The RSV for fentanyl remained elevated but stable (fluctuating between an RSV of 15 to 37) from September 2015 to August 2016 and then jumped to an RSV

of 81 in September 2016. The British Columbian cities with the highest fentanyl search volumes from January 2012 to the end of July 2017 were Maple Ridge (RSV of 100), followed by Delta (RSV of 84), Kamloops (RSV of 81), and Kelowna (RSV of 81). See Figure 1 for a graph of fentanyl versus naloxone search volume.

Fentanyl news search results

News searches related to fentanyl remained low (mean RSV of four) from Jan 2012 to July 2015, with a single spike to an RSV of 13 between July and December 2013. In August 2015, there was a spike in fentanyl-related news searches to an RSV of 100. Since then, fentanyl-related news search volumes have remained consistently elevated (RSV from 11 to 72, mean of 32, an increase of 889%) from September 2015 through July 2017. See Figure 2 for a graph of fentanyl versus naloxone news search volume.

Naloxone web search results

Search results for naloxone were low from February 2012 to January 2016. From January 2016 to July 2017 the mean RSV for naloxone searches was nine and the RSV did not drop below four.

Search volume for naloxone has remained elevated from January 2016 to July 2017. The cities with the highest search volumes for naloxone were Kelowna (RSV of 100), Vancouver (RSV of 65), Surrey (RSV of 55) and Victoria (RSV of 54).

Naloxone news search results

News searches for naloxone remained consistently low (RSV of three) over the search period. It was not possible to analyze news search data for naloxone by location due to low search volumes.

Related search terms

Google Trends data output includes a list of related search terms that are searched in conjunction with the chosen key word. Related search terms for both fentanyl and naloxone included spelling variations, queries on effects, side effects and addiction. The top related searches for fentanyl included 'fentanyl patch' (RSV of 10), 'fentanyl overdose' (RSV of 10), 'Vancouver fentanyl' (RSV of 10), 'what is fentanyl' (RSV of five), and 'fentanyl effects' (RSV of five). Interestingly other related terms reported by Google included 'fentanyl in weed', 'fentanyl laced weed', 'fentanyl in marijuana', 'fentanyl abuse' and 'carfentanil'. Related search terms suggested for naloxone over the same period include 'narcan' (RSV of 60), 'naloxone kit' (RSV of 20), 'fentanyl' (RSV of 10), and 'narcan kit' (RSV of five).

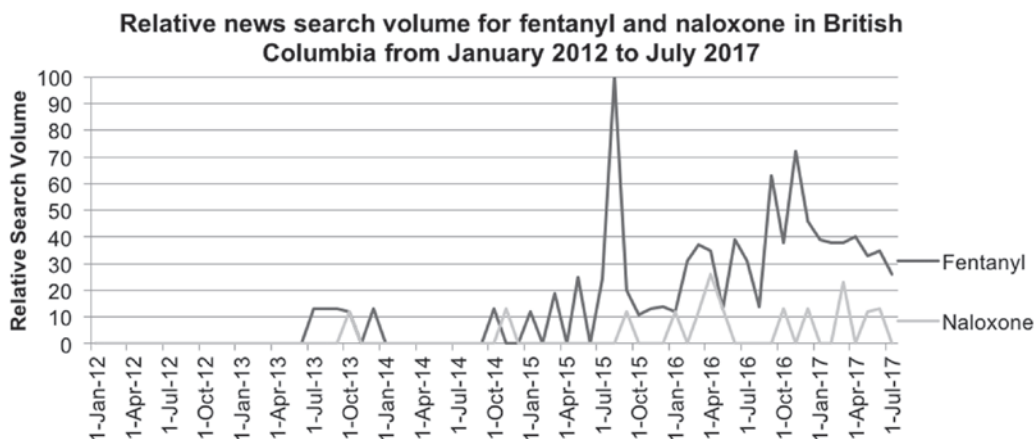


Figure 1: Relative web search volumes for fentanyl, oxycodone, and naloxone from Jan. 1, 2012, to July 1, 2017. Data source: Google Trends (www.google.com/trends)

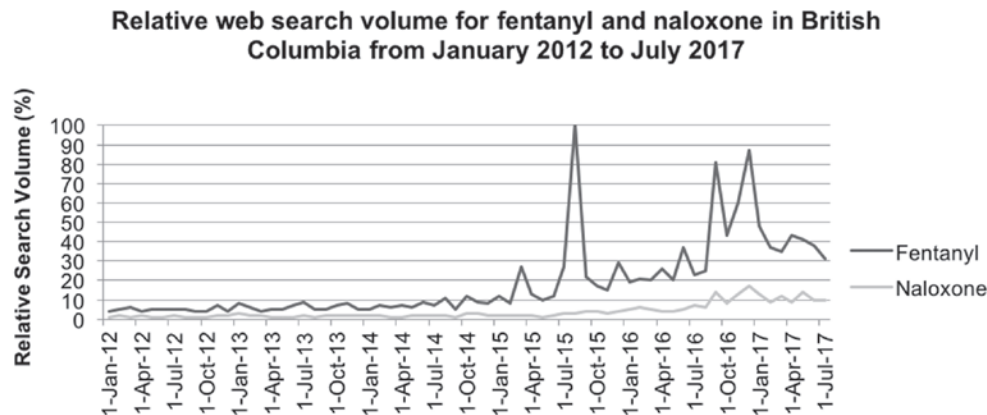


Figure 2: Relative news search volumes for fentanyl, oxycodone, and naloxone from Jan. 1, 2012, to July 1, 2017. Data source: Google Trends (www.google.com/trends)

Fentanyl, naloxone and BCCO data exploration

The number of deaths in which fentanyl was either the sole cause, or was detected on toxicology screening in combination with other drugs has been increasing steadily from 2008. However, a lack of reliable standardized data across the country makes fentanyl mortality difficult to comment on. Data from 2012 to 2016 are available from Saskatchewan, Alberta, and British Columbia. However, only British Columbia has reported mortality rates monthly (see Table 1 for data).

Google web and news search volumes for fentanyl were strongly correlated (Pearson 0.92). Naloxone-related web search volumes and BCCO mortality data are also strongly correlational (Pearson 0.92). However, Google web and news search volumes for fentanyl and naloxone were only moderately linearly correlated to BCCO mortality data from January 2012 to July 2017 (Pearson 0.7 and 0.67, respectively). There was minimal correlation between web and news search volumes for naloxone (Pearson 0.40).

Discussion

Web and news search results

Internet search queries for fentanyl did not increase significantly until August 2015. This information, along with the high correlation (Pearson 0.96) between RSVs for fentanyl in web searches and news, and the lower correlation between fentanyl-associated mortality and web searches (0.70), may suggest that internet searches for fentanyl may be driven more by news output from media than mortality rates. The increase in web searches for naloxone from August 2015 to July 2017 was not associated

with a rise in news searches. The strong correlation between web searches for naloxone and increases in mortality (Pearson 0.92) over the study period, and the evident interest in naloxone despite an absence of media attention, may represent increase in health information-seeking behaviour and not a response to news and media. However, this is conjecture on our part and requires validation.

The August 2015 spike in fentanyl-related search volume coincides with well-publicized and tragic deaths. These include 17-year-old Jack Bodie (King, Fraser, Boikos, Richardson, & Harper, 2014) and young parents Hardy and Amelia Leighton who orphaned their two-year-old child after a toxic ingestion of fentanyl (Sienuid & Woo, 2015). High-profile deaths have previously been shown to influence health-related news and internet searches (Waszak & Kawalec, 2017). These events require sensitivity, but also represent an important opportunity for timing health promotion campaigns and fundraising, when public interest is highest.

Related search terms

The British Columbia Centres for Disease Control report that prior to 2014, fentanyl patches were the most common source of misused fentanyl and that the extraction of patch contents for intravenous injection, the most common route of administration.(16) This may explain 'fentanyl patch' being one of the most commonly used related search terms. Additional search terms, 'fentanyl overdose', 'fentanyl laced weed' and 'carfentanil' represent poignant topics for health care professionals to address in their patient teaching and programming. The related search terms for naloxone (including 'narcane dose' and 'narcane kit'), suggest searchers are likely seeking information on reversing opioid overdose.

Fentanyl, naloxone and BCCO data explorations

The strong linear correlation between Google web and news search volumes for fentanyl may represent the seriousness and news-worthiness of the fentanyl crisis. The equally strong relationship between naloxone web search volumes and BCCO fentanyl-related mortality data is a noteworthy finding of our exploratory research. Logically one may conclude that, as more deaths occurred, interest in preventing additional deaths increased, but the statistical testing performed cannot add weight to this claim. This is an interesting hypothesis that requires further testing.

Limitations

This paper has significant limitations, as all Google Trends data are generated as a proportion of total search volume, meaning there is a lack of concrete data on the number of searches conducted, limiting the comparisons that can be drawn. Additionally, the lack of standardized data on fentanyl-related mortality across provinces severely limits the conclusions that can be drawn. Finally, as web searches still generate some media content, it is difficult to fully differentiate between news-seeking and health-seeking behaviour solely through Google Trends. Our exploratory research is limited to being descriptive and hypothesis generating.

Date	2012	2013	2014	2015	2016	2017
Jan	0	5	5	20	46	102
Feb	0	3	5	8	29	101
Mar	0	6	9	8	48	112
Apr	1	8	8	12	48	117
May	1	3	8	8	37	106
Jun	1	2	6	11	43	95
Jul	0	1	3	14	40	73
Aug	1	4	8	15	37	
Sept	1	2	9	15	41	
Oct	0	4	13	16	53	
Nov	4	6	6	12	106	
Dec	3	6	11	12	129	
Total	12	50	91	151	657	706

Conclusions

In conclusion, although the scope of this study was limited, it has demonstrated how Google Trends can be used to access up-to-date search volume data. Interest in fentanyl and naloxone was described. Finally, there is potential to improve health-seeking utility of Google web queries by including information on fentanyl overdose first aid with searches for fentanyl or naloxone.

About the authors



Christine Patterson is a third-year medical student at the University of Alberta with interests in addictions and emergency medicine. She completed a BSc in Pharmacology at the University of Alberta in 2014 and previously worked in addiction recovery. She is currently focused on completing her third year of medical school as an Integrated Community Clerkship in Whitecourt, AB.

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