

BCTOX's Public Interest in Toxicology Surveillance System in BC
 Shifting public interest in Fentanyl – June 2013 – to June 2018

Reza Afshari*, Environmental Health Services, BC Centre for Disease Control, BC. Reza.Afshari@bccdc.ca
 Public health surveillance is “the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice” according to [WHO](#). The graphs could be predictive indices for what are going to come next month! Surging in public interest have been “co-inside” with popularizing the related news and also “lagged” as confirmatory indices.

In addition, in three occasions, public interest was different from the number of deaths (see the graph). Do these mean that public interest is a “predictor index” as well?

BCTOX is reporting the trends of public interest (Public-&Professional searches) for major toxicology related issues in BC as a new surveillance system using google trends as surrogates of public attitude. BCTOX is hopeful that this initiative will draw attention of public health professionals to changing pattern of Public interest in toxicology related issues.

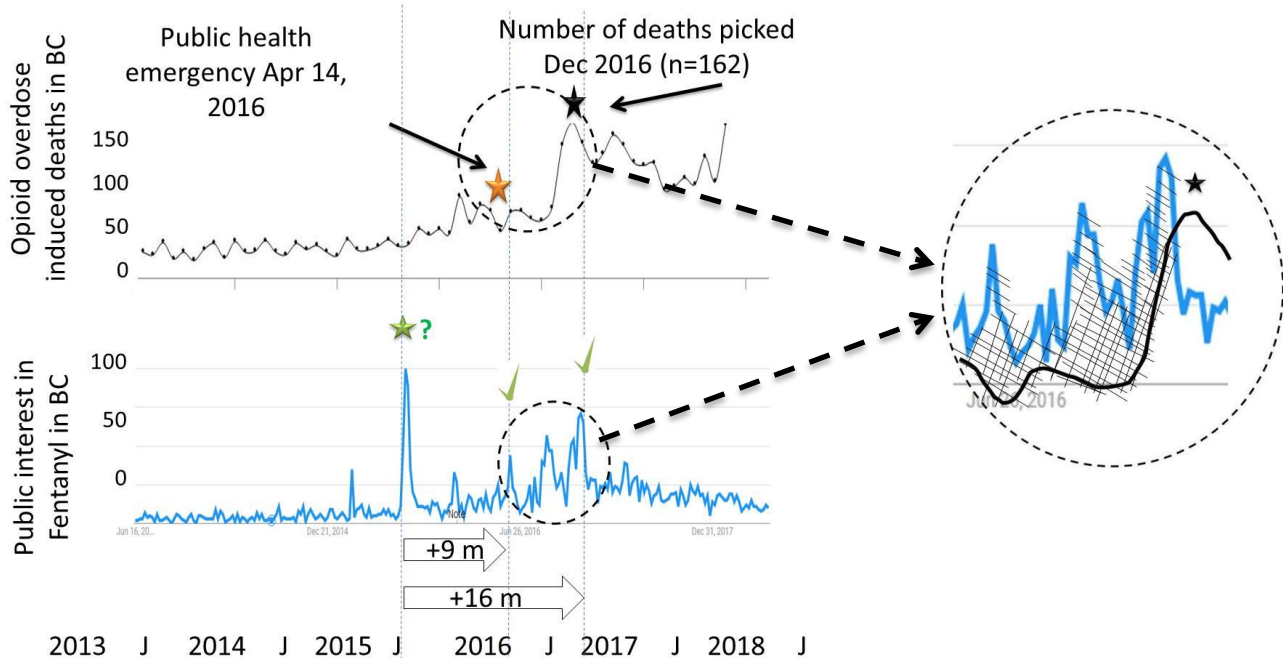


Figure 1. Shifting public interest (June 2013 to June 2018) as compared to the number of opioid overdose induced deaths in the same period in British Columbia. * Data points (obtained from Google Trends) are relative to the maximum search in two week periods.

- ✓ **Trends in public interest in fentanyl**
 - Public interest in fentanyl has increased dramatically and with fluctuations since mid-2015.
 - The pattern is relatively and consistently downward since early 2017.
 - “Prior” to the sharp increase in the number of deaths in December 2017, public interest increased (superimposed and magnified in the right).
- ✓ **Peaks in public interest in fentanyl**
 - A sharp increase of public interest in fentanyl in late Jul & early Aug 2015
 - Public health emergency Apr 14, 2016
 - Number of deaths picked Dec 2016 (n=162)
- ✓ **What were the potential reasons for a sharp increase of public interest in fentanyl observed in late Jul & early Aug 2015 in BC (16 months prior to the sharp increase in the number of deaths in December 2017)?**

According to BCTOX focus group:

- Reports of deaths in “teenagers” and due to “recreational use” of fentanyl was popularised that time.
- Media started reporting on “middle class people dying of overdoses in Vancouver”. --- The population at risk has widened.
- ✓ **Why the pattern of the number of opioid induced deaths (rather stable) and public interest (downward) are not similar in 2017 and 2018?**

(A) Real sense of security

- ✓ Similar to bond yields in economy, public is predicting that the probability or severity of opioid overdose epidemic is declining

In terms of risk management;

- ✓ This is good news!
- ✓ Risk management strategies are working
- ✓ --- We have to wait to see if their perception is correct

(B) False sense of security

- ✓ Public incorrectly lean to believe the probability or severity of the risk have been initially oversold to them
- ✓ Public believes the risk exists but is no longer concerns them (they are not the population at risk)
- ✓ Media reports on the issue is no longer attractive (public lost interest, fatigue), etc.

In terms of risk management

- ✓ Public engagement strategies should be modified, wider range of external stakeholders should be focused, certain population at higher risk to be targeted, publicizing well known figures who are affected with fentanyl according to the BCTOX focus group.

BCTOX's Public Interest in Toxicology Surveillance System in BC

Shifting public interest in Cannabis – June 2013 – to June 2018

BCTOX is reporting the trends of public interest (Public-&-Professional searches) for major toxicology related issues in BC as a new surveillance system using google trends as surrogates of public attitude.

The following graphs show the proxy frequency of searches for the keywords from Feb 2017 to Jan 2018. Each variable is compared with itself (the highest frequency of searches over a two week period in 2017 serves as the baseline (highest)). As just the trends (but not the actual numbers) are important and feasible, no values are given for the vertical axis.

In summary public interest, estimated from the relative number of searches from June 2004 to June 2018 in "Cannabis" in BC is constantly increasing since 2014. However, public interest in fentanyl increased and then decreased since 2017, and for "Heroin" and "Cocaine" remained rather stable.

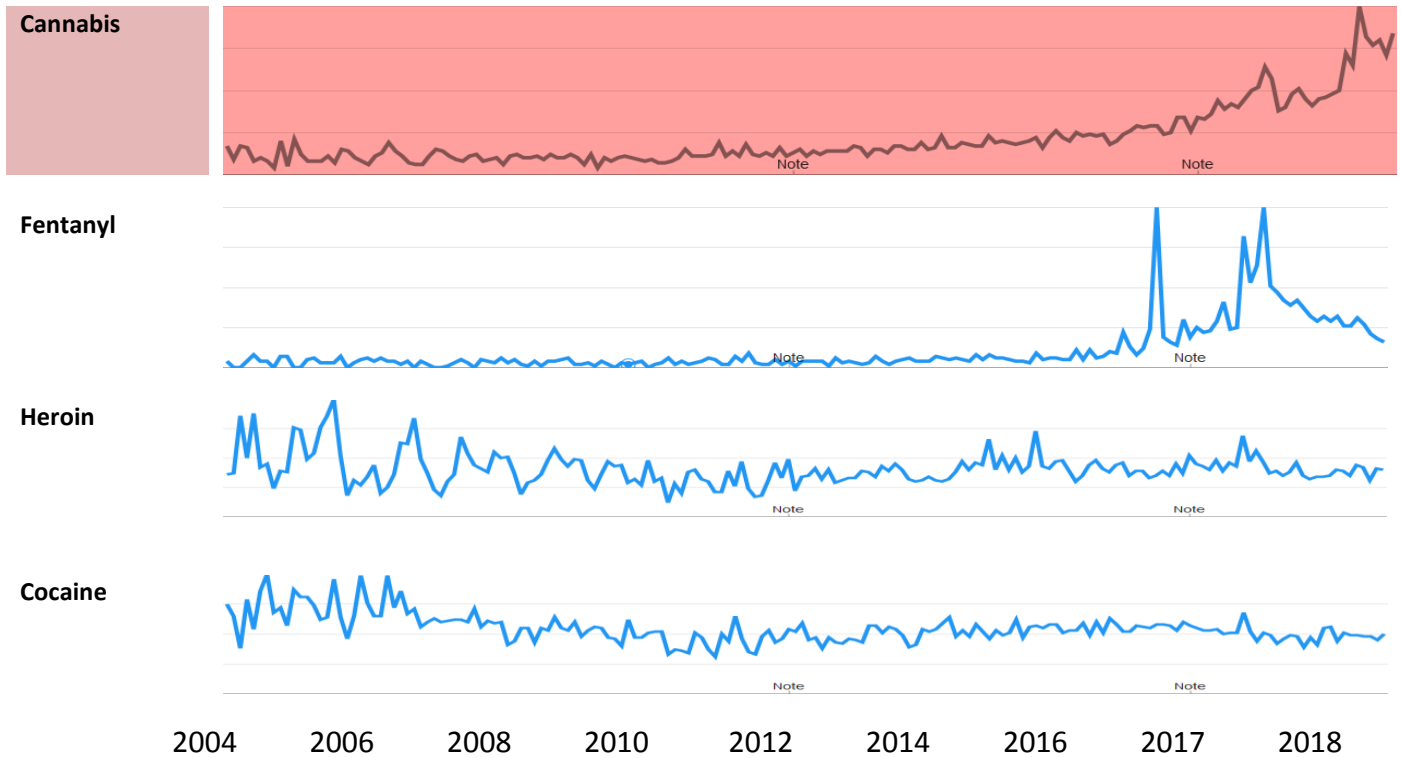
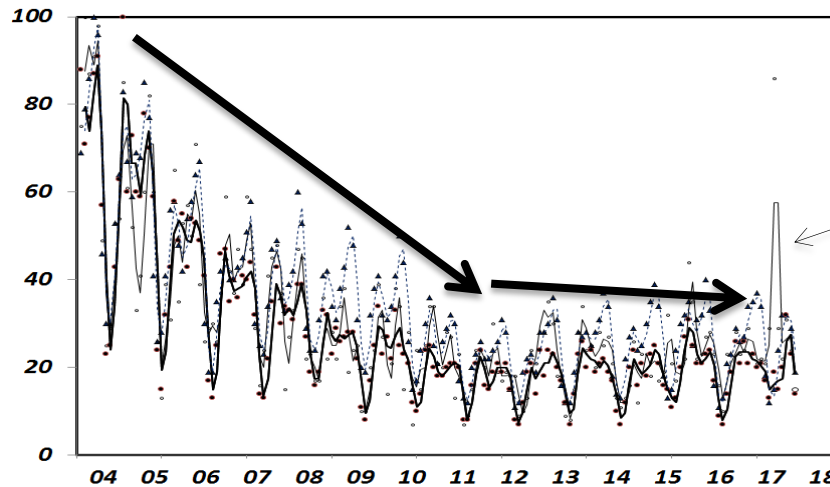


Figure 2. Pattern of public interest, estimated from the relative number of searches from June 2004 to June 2018 (data from Google Trends).

BCTOX's Public Interest in Toxicology Surveillance System in BC
 Shifting public interest in Air pollution– 2004 to June 2018

Air pollution



Pattern of public interest, estimated from the relative number of searches from 2004 to 2017, a comparison of British Columbia (—○—), Canada (—●—) and United States (—▲—).

*** --- Vertical axis are a relative popularity search ranges from 0 (less than 1%) to 100 (highest volume of searches) in the period of study for individual geographical regions. No absolute numbers are given. Three separate graphs are superimposed. Trend of each one should be compared by the maximum of the same one.

--- **Why the public interest in air pollution has declined (Downward trend)?**

(A) Real sense of security

- ✓ Air quality has improved in general.
 - Risk management strategies are working

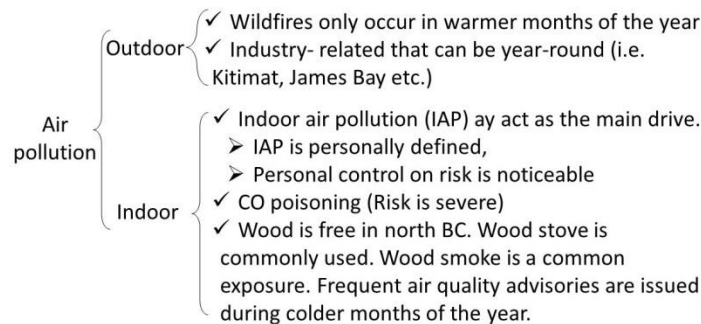
(B) False sense of security

- ✓ Public incorrectly lean to believe the probability or severity of the risk has been initially oversold to them or is no longer high
- ✓ Public believes the risk exists but is no longer concerns them (they are not the population at risk)
- ✓ Media reports on the issue is no longer attractive (lost interest, fatigue)
 - Air pollution in general isn't personally defined
 - Personal control on risk management is limited (individual cannot take effective actions)
 - Public perception of risk, with the exception of critical days e.g. forest wildfires is not acute or tangible, and is not dramatic.
 - ...

(C) Methodological design problem

--- **Seasonality**

Searches for air pollution are consistently more popular in colder months of the year. [?!]

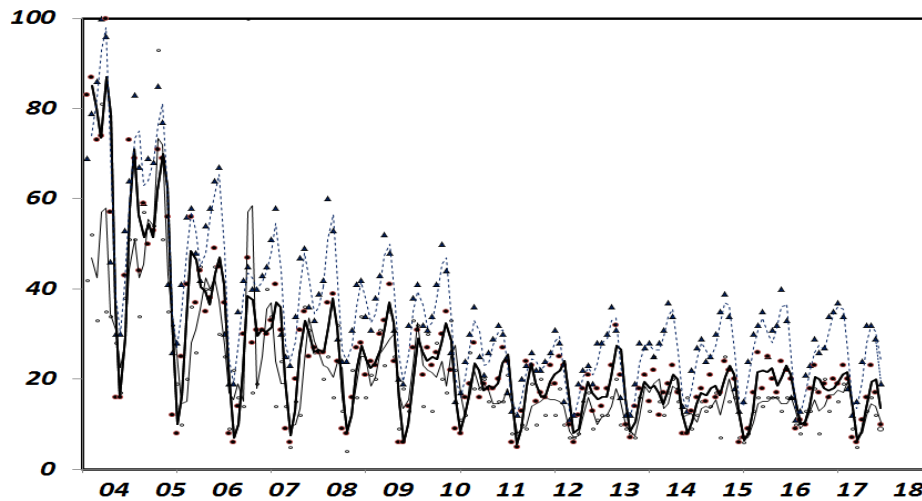


--- **Anomaly**

Summer of 2017 co-insides with the worst wildfire in BC.

BCTOX's Public Interest in Toxicology Surveillance System in BC
Shifting public interest in Water pollution/contamination – 2004 to June 2018

Water pollution/contamination



Pattern of public interest, estimated from the relative number of searches from 2004 to 2017, a comparison of British Columbia (—○—), Canada (—●—) and United States (---▲---).

--- Vertical axis are a relative popularity search ranges from 0 (less than 1%) to 100 (highest volume of searches) in the period of study for individual geographical regions. No absolute numbers are given. Three separate graphs are superimposed. Trend of each one should be compared by the maximum of the same one.

Why the public interest in water pollution has declined (Downward trend)?

(A) Real sense of security

- ✓ Water quality has improved in general.
 - Risk management strategies are working

(B) False sense of security

- ✓ Impact of water pollution is not personally defined
- ✓ Personal control on risk management is limited
- ✓ Public perception of risk is not dramatic.
- ✓ Risk is not acute or tangible.
- ✓ Public believes the risk exists but is no longer concerns them (they are not the population at risk)
- ✓ Media reports on the issue is no longer attractive (lost interest, fatigue)
- ✓ ...

(C) Methodological design (?)

- ✓ Concerns are mostly related to communities with sub-standard drinking water treatment systems using surface water and their inability to deal with turbidity during the freshet.

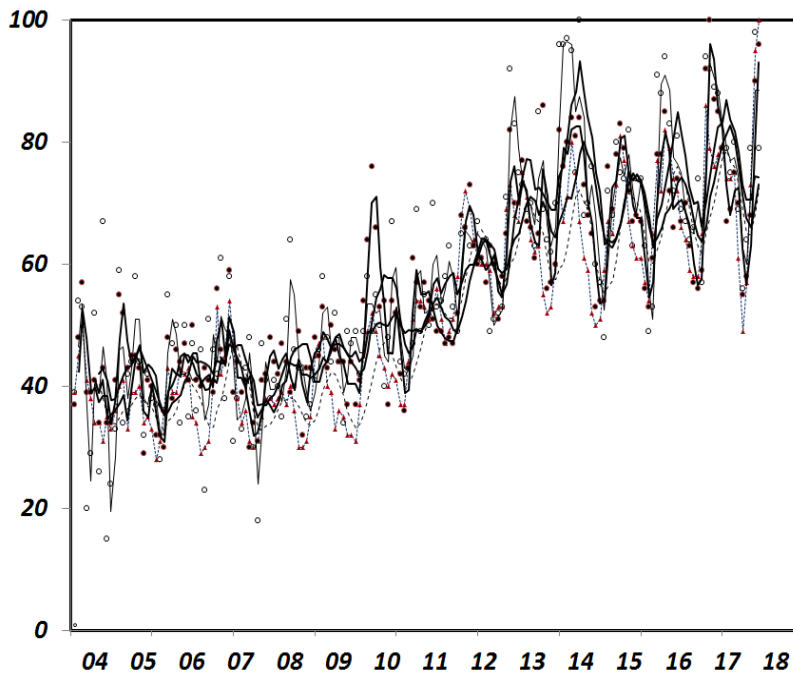
--- **Seasonality**

- ✓ Searches for water pollution is consistently more popular in warmer months of the year.
- ✓ Water as a whole (quantity, quality and contamination is more of an issue in summer)

--- **Anomaly**

- ✓ US in recent years have shown a relatively more interest in water pollution. --- Could be the impact of Flint Water Crisis

BCTOX's Public Interest in Toxicology Surveillance System in BC
Shifting public interest in Food poisoning – 2004 to June 2018



Pattern of public interest, estimated from the relative number of searches from 2004 to 2017, a comparison of British Columbia (—○—), Canada (—●—) and United States (---▲---).

--- Vertical axis are a relative popularity search ranges from 0 (less than 1%) to 100 (highest volume of searches) in the period of study for individual geographical regions. No absolute numbers are given. Three separate graphs are superimposed. Trend of each one should be compared by the maximum of the same one.

Why the public interest in Food poisoning has increased (upward trend)?

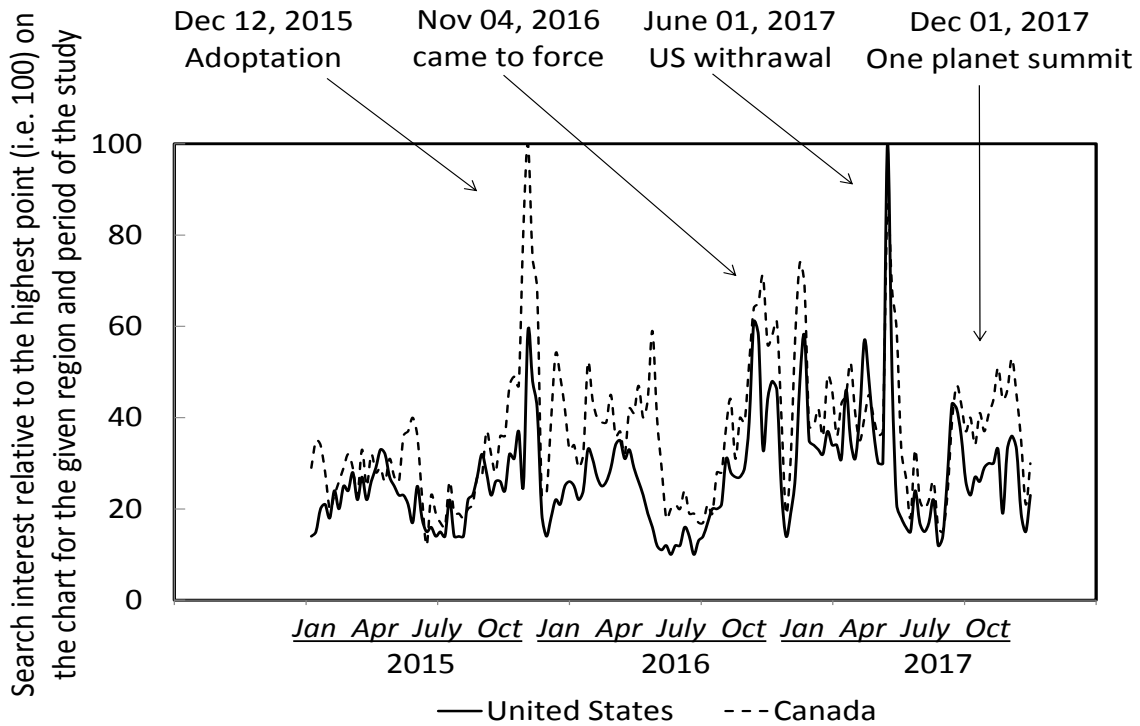
Real sense of insecurity, & outrage OR False sense of outrage

- ✓ Food poisoning has (?) increased.
- ✓ Case findings are increased (--- self limited)
- ✓ Public has developed a greater awareness of food in general
- ✓ Risk management strategies are (?) working
- ✓ More Media driven, and reports has increased. Trendy foods & certain food diets (organic, ready to eat) are more publicised (popularity of the TV shows e.g. MasterChef)
- ✓ Internet has made it easier to find out about outbreaks
- ✓ Food poisonings tend to be quite specific, food recalls are more publicized
- ✓ Impact of food poisoning is personally defined with a higher personal control on risk management (suing the food companies as an incentive)
- ✓ Public perception of risk is acute and dramatic
- ✓ Public believes the risk exists and concerns them (they are the population at risk)
- ✓ Media reports including food recalls on the issue is attractive, evolving and new (avoiding public fatigue) ...

Methodological design (?)

BCTOX's Public Interest in Toxicology Surveillance System in BC
Shifting public interest in Climate change – 2015 to June 2017

Climate change



Pattern of public interest, estimated from the relative number of searches from 2004 to 2017, a comparison Canada () and United States ().

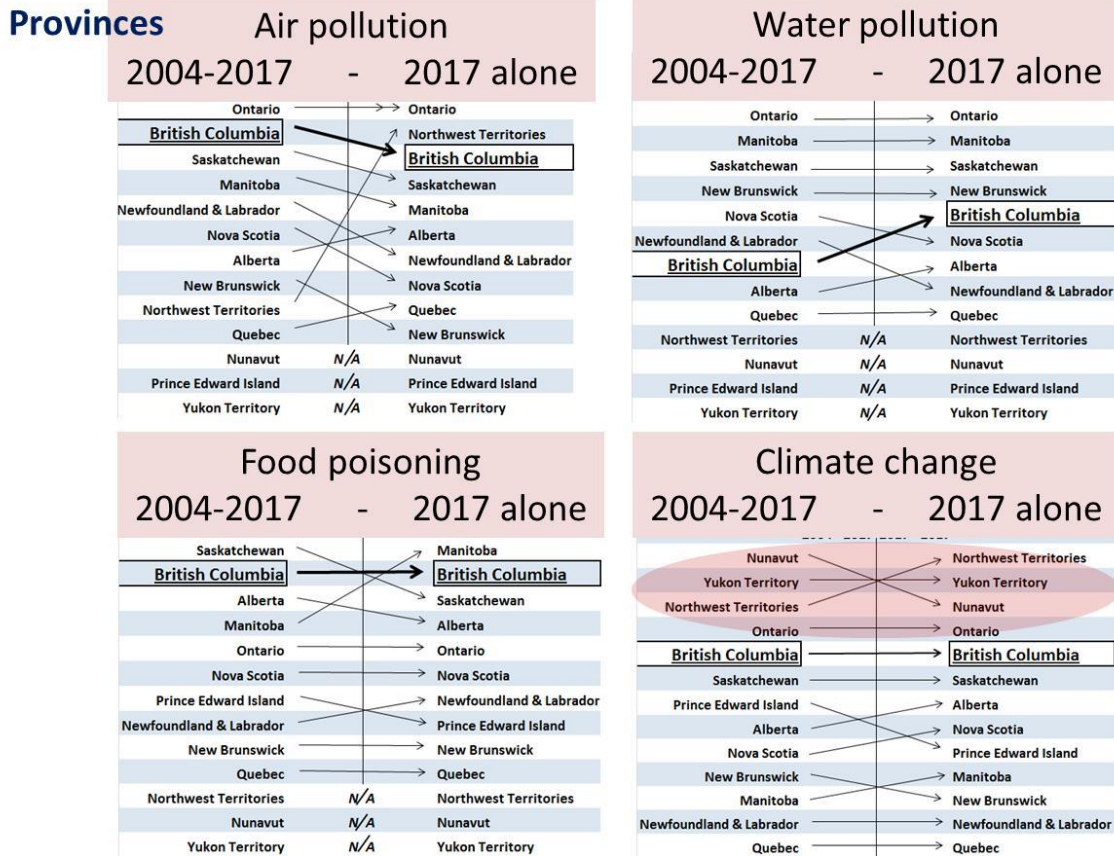
--- Vertical axis are a relative popularity search ranges from 0 (less than 1%) to 100 (highest volume of searches) in the period of study for individual geographical regions. No absolute numbers are given. --- Three separate graphs are superimposed. Trend of each one should be compared by the maximum of the same one.

Pattern of interest Despite major political changes, no consistent longitudinal shift for public engagement with climate change was observed.

Seasonality Graphical data display seasonal no consistent variations in the search queries for climate change.

BCTOX's Public Interest in Toxicology Surveillance System in BC
 Shifting public interest in Defferent provinces – 2015 to June 2017

Climate change



Relatively speaking BC residents among other provinces are:

- ✓ More concern of
 - Air pollution
 - Food poisoning
- ✓ Moderate concern of
 - Water pollution
 - Climate change

Northern territories

- ✓ Climate change was relatively more important in Northern territories including Nunavut, Yukon Territory and Northwest Territories

BCTOX's Toxicology Surveillance in BC

Shifting public interest - Fentanyl, Heroin, Cocaine and Cannabis - 2017 alone

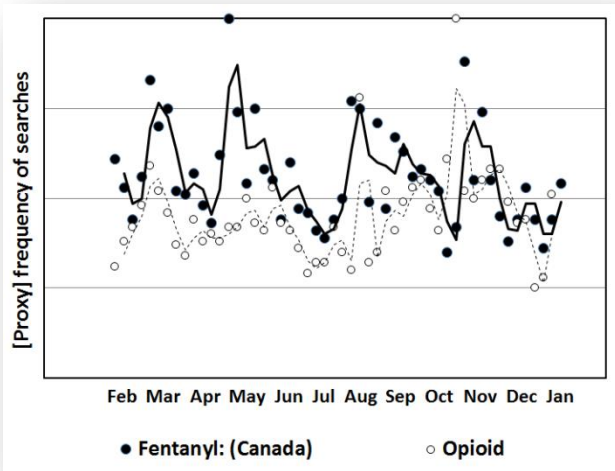
BCTOX is reporting the trends of public interest (Public-&Professional searches) for major toxicology related issues in BC as a new surveillance system using google trends as surrogates of public attitude. The following graphs show the proxy frequency of searches for the keywords from Feb 2017 to Jan 2018. Each variable is compared with itself (the highest frequency of searches over a two week period in 2017 serves as the baseline (highest)). As just the trends (but not the actual numbers) are important and feasible, no values are given for the vertical axis. --- For clarity of the message, the regression lines are presented as moving averages with period of 2.

As can be seen, the public relative interests in "fentanyl" as compared to search term "opioids" are similarly shifted in both Canada and BC (figure A -1 and A-2)[left side].

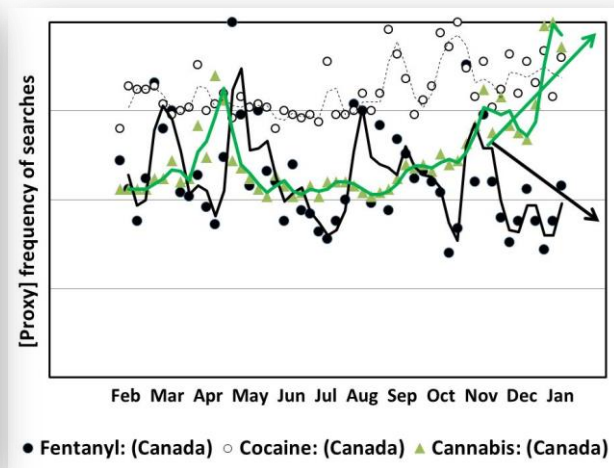
These findings are also not consistent when fentanyl searches are compared to "cannabis" and "cocaine" (figure B-1 and B-2)[right side]. This is despite the fact that fentanyl overdose induced deaths have remained relatively high, and as we are approaching the cannabis legalization.

This finding has public health relevance in the province. Measures should be taken to keep engaged public (or avoid social fatigue) regarding the relative importance of "fentanyl" and in the influence of the process of Cannabis legalization.

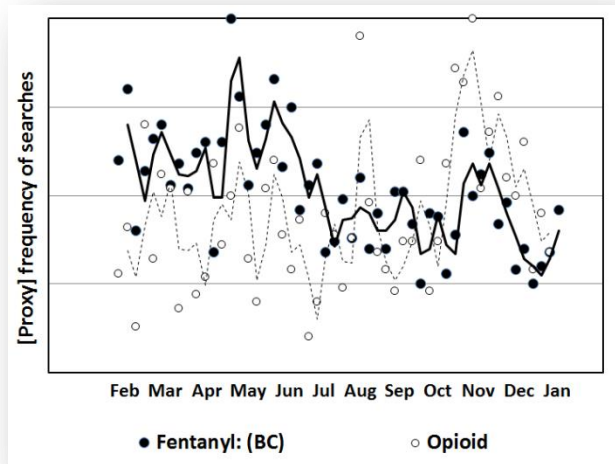
--- Public searches for "fentanyl" (Fu-F) (less potent) and carfentanyl (more potent) analogs of fentanyl were not included.



A-1. Canada

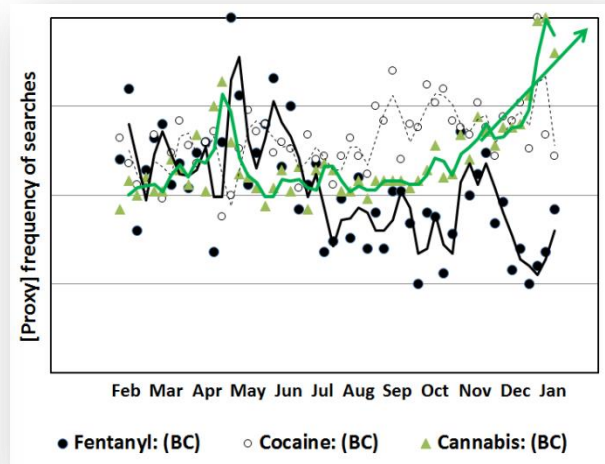


B-1. Canada



A-2. British Columbia

"Fentanyl" public searches as compared to "opioids" as a whole (Past 12 month to Jan 22, 2018)



B-2. British Columbia

"Fentanyl" public searches as compared to "Cannabis" and "Cocaine" (Past 12 month to Jan 22, 2018)

BCTOX's Toxicology Surveillance in BC

Shifting public interest - CO, Mushroom, Plant, bites, and air, water, soil and food poisoning or pollution – 2017 alone

Figure C shows that public was more concern of carbon monoxide poisoning during colder months of the year.

Figure D suggests that public searches start earlier for plant poisoning as compared to bites and stings followed by mushroom. "Plant" and Mushroom" was used as surrogates for "plant poisoning" and "mushroom poisoning".

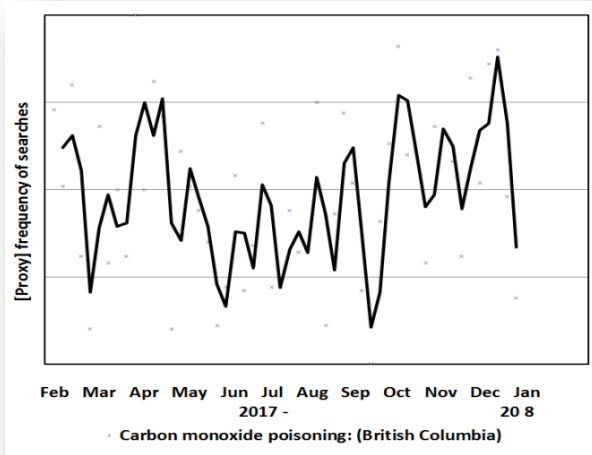


Fig C. Public interest in carbon monoxide poisoning during the past 12 months) (frequency of searches from Feb 2017 to Jan 2018)

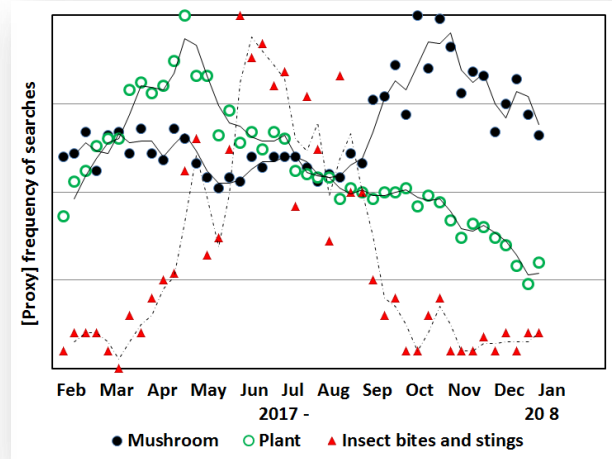
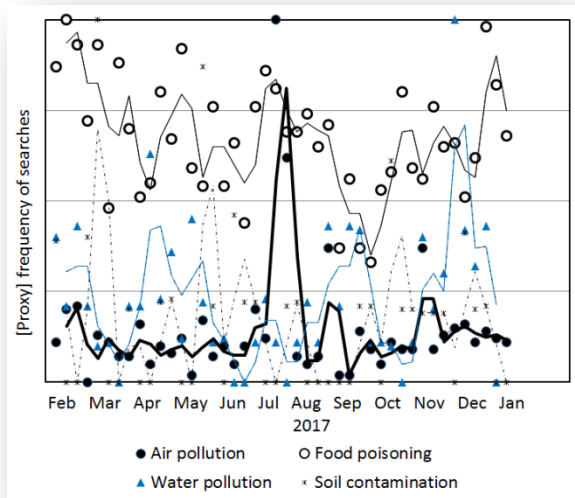


Fig D. Public interest in "Bites or stings" as compared to "plants" and "mushroom" (frequency of searches from Feb 2017 to Jan 2018)



The pattern of public interest for "air pollution" was disrupted in July and August, which coincide with forest wildfires (figure E).

Fig E. "Air pollution" as compared to other routes of exposure to contaminants (frequency of searches from Feb 2017 to Jan 2018)

Lessens

- ✓ Public is often interested in
- ✓ What is associated with acute illnesses,
- ✓ What could be serious or lethal,
- ✓ What is personally defined and individual can take action*,
- ✓ New news (Media coverage is related to sensations. Food recall or outbreak is still something you can make it a sensation, but not air and water contamination that are old news),

* Food has multiple sources, you can select which one you will eat and with more information you may get safer food. Air and water are from single sources.