

# Utilizing the Internet as a Public Health Surveillance Medium: Outcomes from the RADARS® System Web Monitoring Program

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## Introduction

- Approximately 65% of American adults overall (18+) and 90% of young adults (18-29) use the internet for social media, making it an ideal medium for public health surveillance.

## Methods

- The RADARS® System Web Monitoring Program collects real-time web content related to the discussion about and use of opioids from over 150 million websites and distills it into analyzable variables of interest.
- Data concerning the abuse, misuse, addiction, overdose, and death were coded for the following opioids: fentanyl, hydrocodone, oxycodone, and oxymorphone between 01 January 2015 through 31 December 2018.
- A stratified random sample without replacement was taken from the population of identified posts. The sample size for each opioid was determined based on an expected proportion of 0.05 and precision of 0.015. Estimates of the frequency and odds ratio of outcomes were calculated using sampling weights from this scheme.
- Sample sizes are selected such that 95% of all confidence intervals of the proportion, calculated from the hypergeometric distribution, obtain the desired precision.
- The strata include both the week the post was published and the media provider (social media or blogs/forums) from which the posts were obtained.

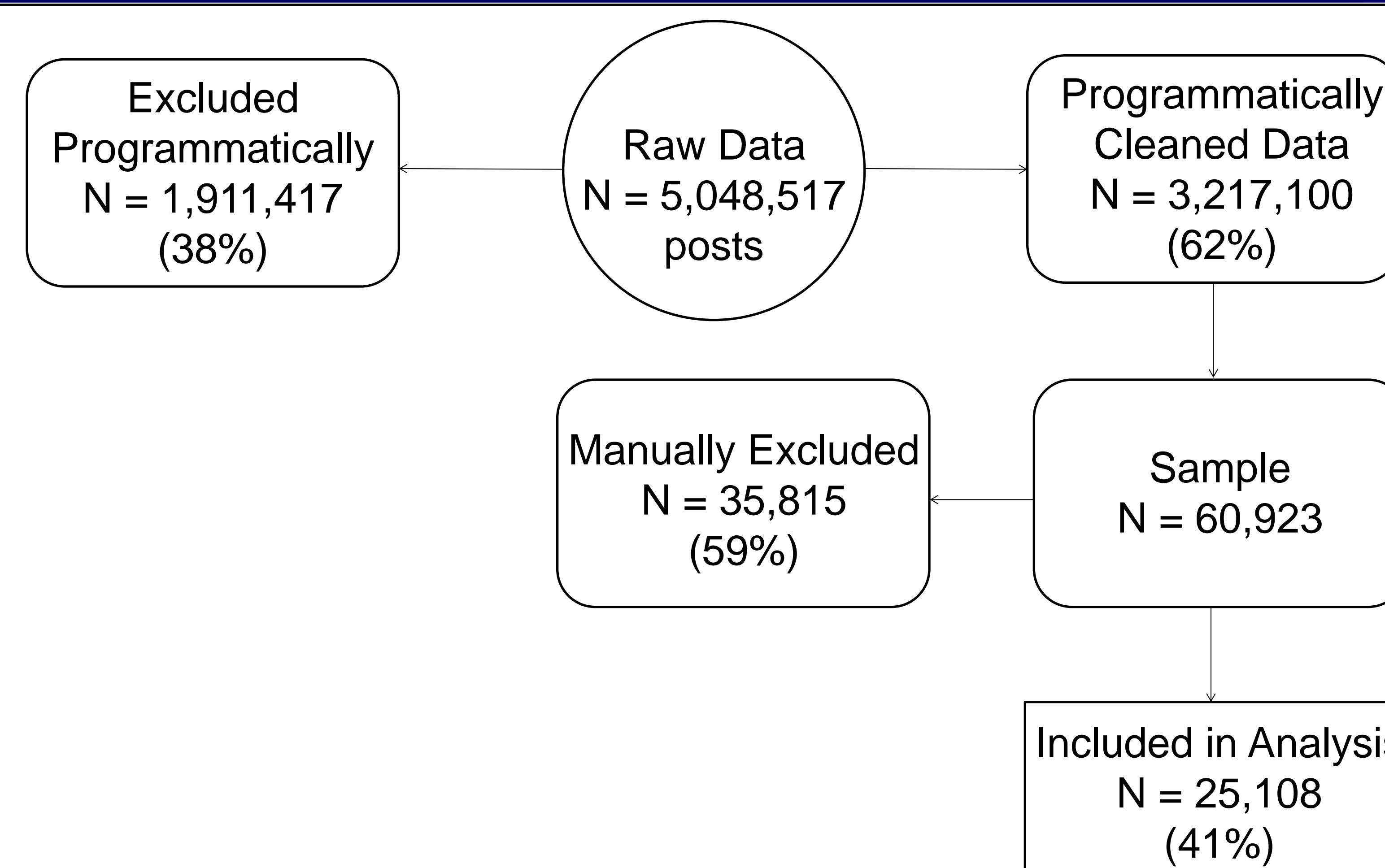
## Results

- Approximately 5 million posts were collected, nearly 61 thousand were sampled, and 25 thousand were analyzed in order to identify emerging trends from 2015Q1 through 2018Q4.
- Fentanyl had the highest number of misuse-, overdose-, and death-related mentions (41,808, 42,659, and 94,169 respectively), while oxycodone had the most abuse- and addiction- related mentions (3,548 and 12,679, respectively).
- The odds of discussing fentanyl overdose and death were higher for social media (4.315 and 5.045 respectively), while the odds of discussing fentanyl abuse and addiction were higher for blogs/forums (0.096 and 0.235 respectively).
- Analyses were also sensitive enough to detect spikes in online discussion surrounding negative outcomes that aligned with events in popular culture related to the opioids.
  - Fentanyl Overdose Spike in 2016Q2 [Overdose of singer Prince]
  - Oxycodone Overdose Spike in 2016Q2 [Overdose of singer Prince]
  - Fentanyl Death Spike in 2016Q2 [Death of singer Prince]
  - Oxycodone Death Spike in 2018Q4 [Rapper Riff Raff urging followers to avoid drugs in light of rapper Lil Peep's overdose death]

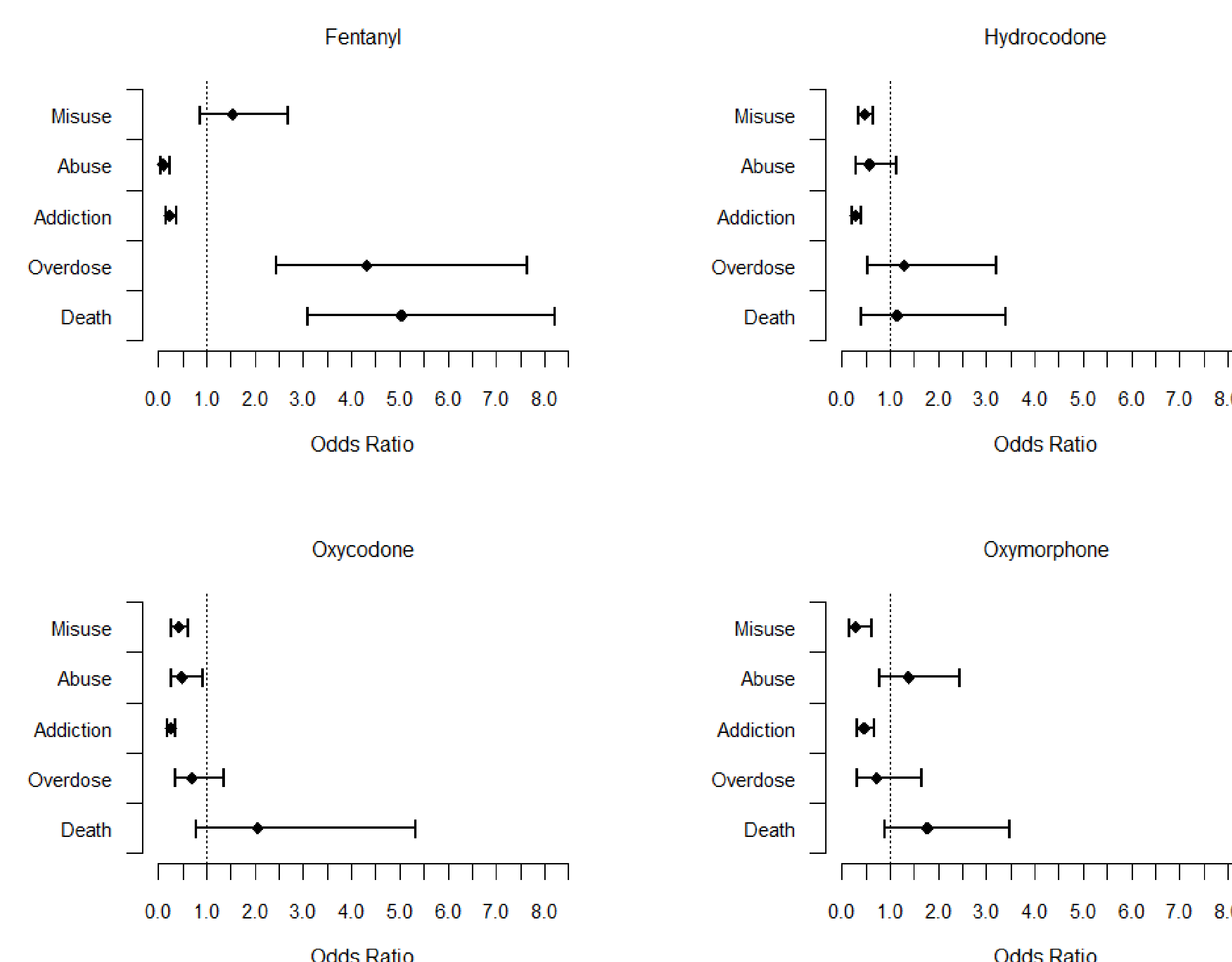
## Conclusions

- Use of the Internet provides a unique perspective (i.e. anonymity and the unsolicited nature of these data) to the opioid epidemic that is not present in traditional surveillance systems and can be a gateway to understanding qualitative aspects of drug use such as motives, reasons and sentiments.
- Web Monitoring data can quantify specific motives, reasons, and sentiments into analyzable outcomes that align with traditional surveillance systems (i.e. abuse, misuse, addiction, overdose and death).
- The online discussion of these opioids can be impacted from events in popular culture or policy. Such considerations are essential when developing targeted intervention therapies.

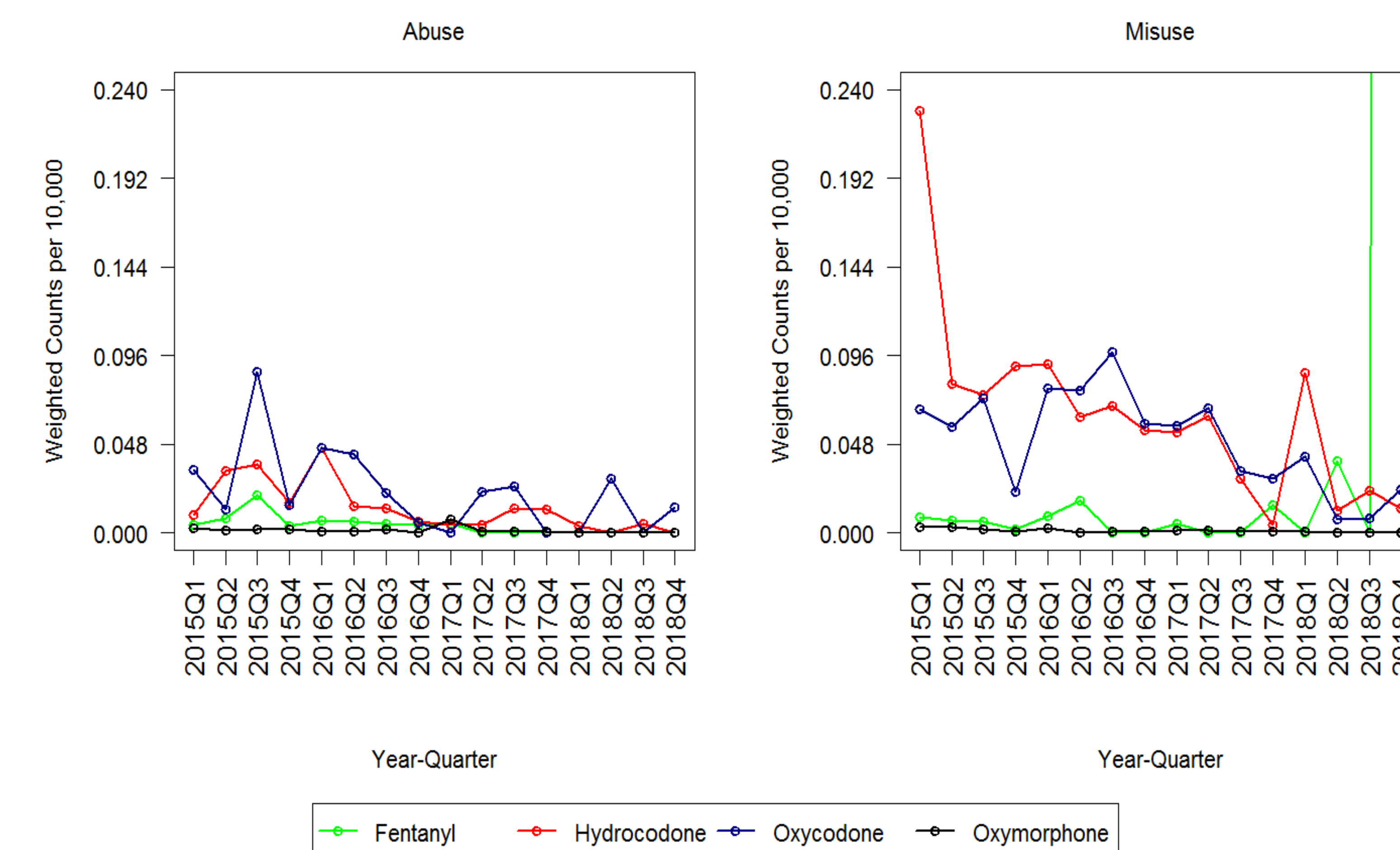
## Figure 1. Flow Chart of Data Cleaning



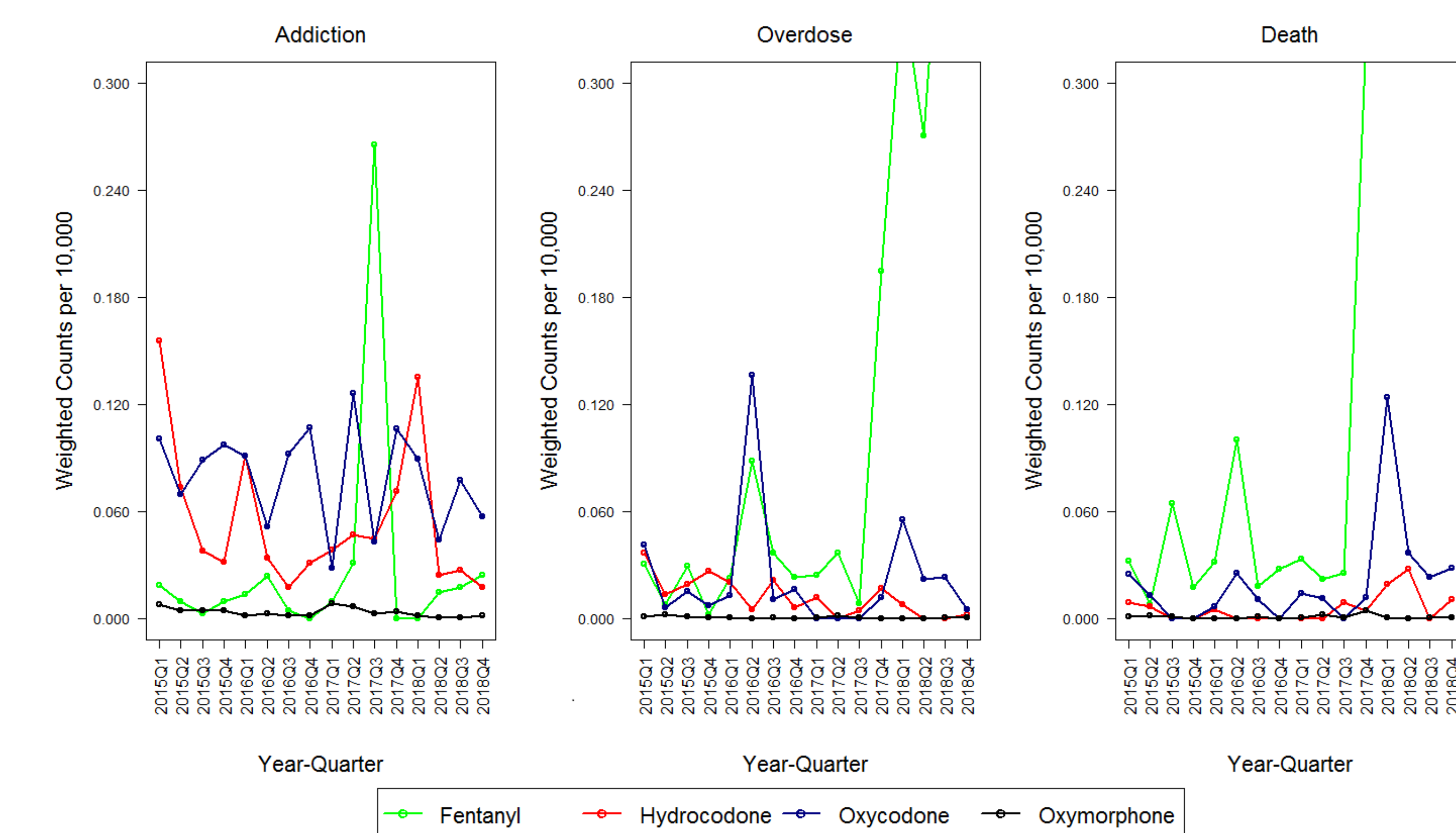
## Figure 2. Forest Plot of Odds Ratios



## Figure 3. Abuse and Misuse Weighted Counts per 10,000



## Figure 4. Addiction, Overdose and Death Weighted Counts per 10,000



## Limitations

- The population under study is only publicly available websites. A wealth of unique information likely exists on websites with policies that prevent public scraping (e.g. Facebook or Bluelight).
- The unstructured nature of the raw data and the potential ambiguity associated with manually coding outcomes, despite meetings to reach a consensus on the meaning of these ambiguous posts and an interrater reliability to assess consistency across the coders.