

COVID-19 Impact on US National Overdose Crisis

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OVERVIEW:

The Washington/Baltimore High Intensity Drug Trafficking Area (W/B HIDTA) is housed within the University of Baltimore Center for Drug Policy and Enforcement (CDPE). It developed and maintains the Overdose Detection Mapping Application Program (ODMAP), a syndromic surveillance system that provides near real-time suspected overdose data nationally.

The ODMAP team continues to evaluate and analyze overdose data to better understand patterns and alert public health and safety partners of drug overdose trends. This study is an attempt to better understand the impact of COVID-19 on overdoses, and specifically looks at ODMAP submissions since the inception of state-implemented stay-at-home orders (see Figure 1).

The analysis indicates the following:

- After March 19, 2020, 61.84 percent of participating counties experienced an increase in overdose submissions;
- There was a 17.59 percent increase in suspected overdose submissions when comparing the weeks prior to and following the commencement of state-mandated stay-at-home orders;
- Detected overdose clusters have shifted from traditional centralized, urban locations to adjacent and surrounding suburban and rural areas; and
- The number of spike alerts and the duration of overdose spikes have increased nationally.

Analysis:

On May 13, 2020, the ODMAP team released a study applying the Autoregressive Integrated Moving Average (ARIMA) model to the ODMAP submission dataset. The ARIMA model has been used to forecast COVID-19 instances nationally, to evaluate incidence of both infectious and non-infectious diseases, and to identify and estimate significant temporal clusters in overdose surveillance. **Based on historic data, the ARIMA model predicted a dataset for March through May of 2020 that was much lower than actual overdoses reported in the system. According to a comparison of 30-day rolling means between 2019 and 2020, there was a 16.56% increase in the actual number of overdoses.**

This analysis also correlated with reports from ODMAP stakeholders, who had reported uncharacteristic, elevated concentrations of suspected overdoses.¹ Several counties began reporting increases in overdoses beginning March 2020, when social distancing behavior was encouraged and implementation of stay-at-home-orders commenced. Figure 1 displays the succession of stay-at-home order implementation dates by state.

¹ <http://odmap.org/Content/docs/news/2020/ODMAP-Report-May-2020.pdf>

To further validate these findings, ODMAP staff evaluated and analyzed ODMAP-generated spike alerts for the same time period and found:

- The number of spike alerts generated by the ODMAP system increased 30 percent in the post stay-at-home order time period;
- The number of ODMAP-participating US counties experiencing at least one spike alert per week increased by over 20 percent during the same time period; and
- The system-generated thresholds of incident counts required to trigger a spike alert increased by approximately four percent, as did the number of hours each jurisdiction spent in a state of alert, illustrating that the intensity of spike alerts has increased since the onset of COVID-19.

Space-Time Permutation Model of SaTScan

Analysis to detect unusual spatiotemporal clustering of overdose cases was conducted using SaTScan software, an open-source program widely used in public health for over 20 years to detect emerging geographic case patterns. We used the space-time permutation model, using date, location, and case count data for each reported incident to determine the expected spatial distribution. Application of this model to ODMAP submissions was intended to show variations in cluster locations pre- and post- stay-at-home orders to determine changes in geographic patterns for suspected overdoses.

Historically, ODMAP submissions have been reported in mostly densely-populated urban areas, which CDC has also reported as experiencing more drug overdose deaths than rural areas.³ However, since the commencement of stay-at-home orders on March 19th, 2020, several geographic areas have experienced levels of ODMAP submissions that would not have been expected based on historic data. A sample of five states chosen for their historical data quality and consistency in ODMAP have shown a shift in overdose clusters from traditionally centralized, urban locations, to adjacent and surrounding suburban and rural areas. This observed shift was noted in each state, and results from multiple clustering analyses using SaTScan models. The analysis shows that these anomalous clusters contain an average increase of six overdoses, or an increase of 500 percent, over levels expected from modeling with historical data. The W/B HIDTA, in partnership with The Johns Hopkins Applied Physics Laboratory, continues to derive parameters for the SaTScan space-time permutation model for optimal detection of anomalous clustering of suspected overdose submissions in geography and time.

CONCLUSIONS

The analysis presented above yielded the following:

- In the time following March 19, 2020, 61.84 percent of participating counties experienced an increase in overdose submissions with an observed 17.59 percent increase in suspected overdose submissions when comparing the weeks prior to and following the commencement of state-mandated stay-at-home orders.

³ <https://www.cdc.gov/nchs/data/databriefs/db345-h.pdf>

- The number of spike alerts generated by the ODMAP system have increased as well as the number of counties experiencing a spike and the duration in days of observed spikes.
- Detected overdose clusters have shifted from traditional centralized, urban locations to adjacent and surrounding suburban and rural areas.

The United States is facing two concurrent national public health emergencies. Given this rare occurrence, combined with the rapidly-evolving qualitative and quantitative factors, several factors could account for the findings above. Some of these factors, which present challenges in analyzing overdose trends since the onset of COVID-19, are:

- **Lack of non-fatal historical data.**
 - Historically, many county and state governments have captured only fatal overdoses. Non-fatal overdoses are equally significant to understanding the full extent of a county's and/or state's drug overdose epidemic.
- **Prevalence of naloxone use by non-medical staff.**
 - The deployment of naloxone to laypeople has avoided many overdose fatalities and thus increased non-fatal overdose counts. A large and unspecified number of bystander naloxone rescues are not recorded in ODMAP data. This data gap increases the difficulty of tracking non-fatal overdoses.
- **Seasonality.**
 - Many public health threats, both infectious (respiratory and foodborne infections) and non-infectious (severe weather-related illness) have known seasonal patterns. Given the lack of historical data noted above for non-fatal overdoses, correlations of overdose counts with seasonality are being evaluated. The role of seasonality in the overdose increases reported from many counties since the onset of COVID-19 and implementation of stay-at-home orders is unclear. Many research groups are working to understand effects of climate on COVID-19, and similar work on overdose seasonality will also be important as ODMAP and other data evidence continue to grow.
- **Unemployment rates & Economic Factors:**
 - Recent research has found associations between unemployment and/or non-labor participation and the risk of drug overdose.⁴
- **Evolution of Drug Trends:**
 - Both non-fatal and fatal overdoses involving stimulants with and without opioids are increasing⁵. Since there is no antidote like naloxone for stimulant overdoses, there may be under-reported depending on how state and local officials capture and define suspected overdose data.

⁴ <https://pubmed.ncbi.nlm.nih.gov/32332222/>

⁵ <https://pubmed.ncbi.nlm.nih.gov/31912625/>

While the factors above are being evaluated, counties are reporting overdose increases in agreement with the findings of this study. ODMAP is the only national surveillance platform for the collection of both fatal and non-fatal suspected overdoses; this analysis presents the most relevant evaluation of overdose patterns since the implementation of stay-at-home orders. Priority and perseverance from all levels of the government must persist in order to protect population health.

Below are a few reminders of the unique intricacies that exist surrounding overdose data, ODMAP submissions, and COVID-19 data:

- Many state and local governments have never captured non-fatal suspected overdose data previously eliminating a control data set;
- Drug trends are continually evolving due to the rapid introduction of synthetic analogs, which complicates the use of historical data as a predictor of future overdose trends;
- ODMAP defers to state and local agencies in the definition of "suspected overdose," and variations in this definition impact data consistency across jurisdictional boundaries;
- Some participating regions either fail to report or are inconsistent in reporting suspected overdoses to ODMAP;
- The impact of COVID-19 is still unknown due to delays in both testing and test results; and
- Correlation does not imply causation.