Drug Testing Data Analysis and Trend Insights

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Introduction

This report presents the key findings and insights obtained through the RAPID (Real-time Alert Platform for Informed Decisions) dashboard. The primary goal is to identify significant trends and patterns in drug testing data. Understanding these patterns is vital for public health and safety, as it enables the identification of the prevalence of adulterated substances and helps assess the impact of policies on drug safety.

Data

Data collected from the British Columbia Centre on Substance Use & UBC MDS Drugsense and Get Your Drugs Tested websites provided a total of 98,252 drug test results, from November 28th, 2018, to July 13th, 2024.

Criteria

Two types of alerts were employed in this report: 'Alert' and 'Stimulant-Benzo Uncertain Interaction Alert'. The following are the details of the alerts and their criteria:

Alert: The tested drug does not meet the criteria and is flagged as bad.

- Depressant (Fentanyl, Benzodiazepine, Heroin, and Morphine):
  If the expected drug (e.g., Fentanyl) is tested negative.
  If tested positive for xylazine, nitazene, or both.
- Stimulant (Cocaine, Methamphetamine and Amphetamine):
  If the expected drug (e.g., Cocaine) is tested negative.
  If tested positive for fentanyl, benzodiazepine, or both.
  If tested positive for levamisole.

Stimulant-Benzo Uncertain Interaction Alert: The tested drug has unspecified issues.

- If benzodiazepine and/or fentanyl are tested as 'unspecified' for stimulant drugs, they are flagged as 'Uncertain Alert'.

Drug Testing Data Analysis

The analysis of drug testing data reveals significant concerns about the prevalence of adulterated and harmful substances across various drug categories. Of the 98,252 drugs tested, 3,509 were identified as bad batches, and an additional 11,584 were flagged with uncertain stimulant-benzodiazepine interactions, accounting for 15% of all tested drugs.

Among depressants, fentanyl was the most frequently tested, with 14,083 samples examined and 675 alerts issued, indicating that 5% of tested fentanyl samples were flagged. Notably, 80% of these did not contain any fentanyl, and 20% of these had harmful substances like xylazine or nitazene. Overall, when considering all drugs containing fentanyl, the alert rate rises to 6%. Benzodiazepines showed a high alert rate of 19%, with 43 out of 227 tests revealing potentially harmful results. All 43 flagged samples were absent of benzodiazepine, and two of these contained xylazine or nitazene. Heroin exhibited an alarming 44% alert rate, with 829 out of 1,874 samples being flagged as bad batches; notably, 99.8% of flagged samples did not contain heroin. Morphine had a 52% alert rate, with all 57 flagged samples lacking morphine entirely.

Among stimulants, the presence of fentanyl, levamisole, benzodiazepines, or the absence of the expected drug were common reasons for bad batches. In total, there were 3,509 alerts and 11,584 uncertain alerts. Cocaine, with 7,421 samples tested, had a remarkably high 94% alert rate, with 663 alerts and 6,298 uncertain alerts driven primarily by the absence of cocaine in 43% of the samples. Methamphetamine showed a 75% alert rate, with 563 alerts and 3,339 uncertain alerts among its 5,221 tested samples. The primary issues were the presence of fentanyl in 46.2% of the alerts and the absence of methamphetamine in 32.6%. Amphetamine tests revealed an 87% alert rate, with the absence of amphetamine being the primary concerns.

Harmful Adulterants Trend

This analysis aims to determine whether the changes of alerts are influenced by the number of tested drugs or other external factors. The initial step involves visualizing the number of tested drugs and the number of alerts over time. The figures below illustrate the trends from November 1, 2018, to July 22, 2024. From these graphs, it appears that the number of tests and the number of alerts tend to move in tandem.

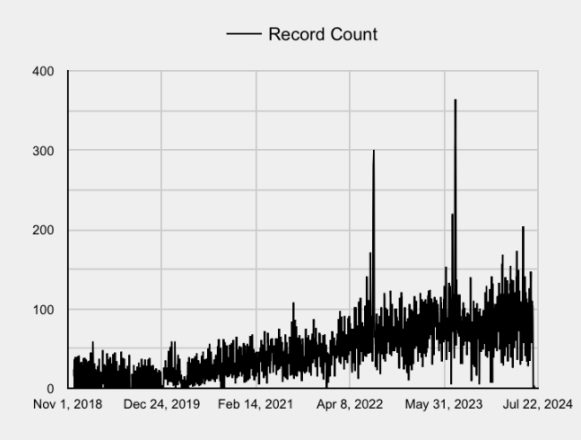

Figure 1: Number of Tests

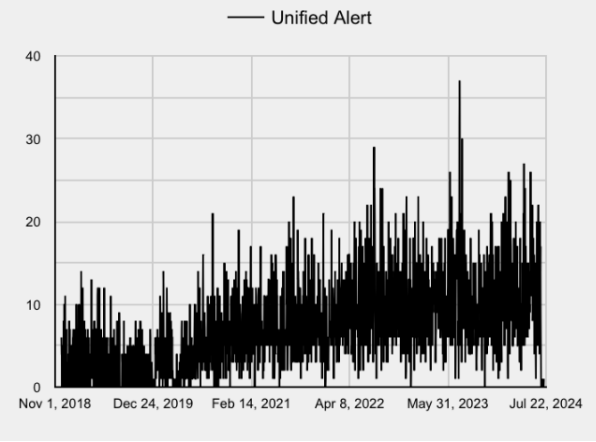

Figure 2: Number of Alerts

To further investigate the relationship between the number of tested drugs and the number of alerts, a scatter plot was created, and a correlation test was performed.

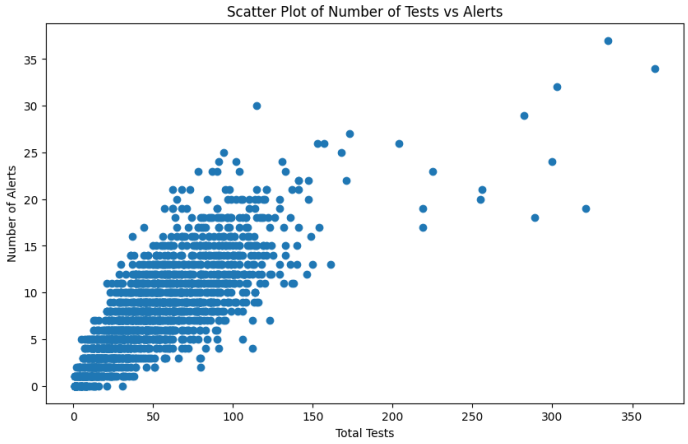

Figure 3: Scatter Plot of Number of Tests vs Alerts

The scatter plot shows a positive correlation between the number of tested drugs and the number of alerts. A correlation coefficient of 0.783 was found, indicating a strong positive relationship.

Given the strong correlation between the number of tested drugs and the number of alerts, an analysis of the alert rate over time was conducted.

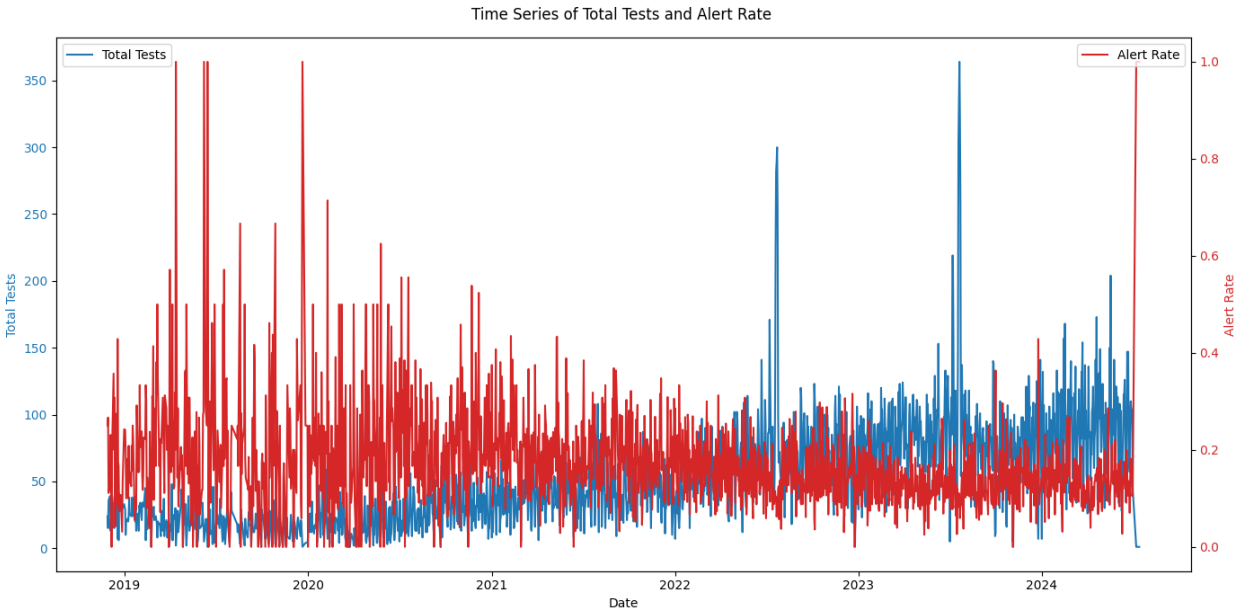

Figure 4: Time Series of Number of Tests and Alert Rate

Unlike the relationship between number of tests and alerts, the figure above suggests there is a different relationship between the alert rate and the number of tests; they do not move in tandem. To quantify this difference in relationship, a correlation test was conducted, yielding a correlation coefficient of -0.279, indicating a weak negative relationship. Additionally, there appears to be a noticeable change around January 2022. Before this date, the alert rate was higher and more fluctuating, while the number of tests

was smaller. After January 1, 2022, the number of tests increased, but the alert rate was lower and more stable.

To statistically confirm this observation, a paired samples T-test was performed to determine if there is a significant difference in the alert rate before and after January 1, 2022.

H_0: The mean values of the alert rates for the two time periods are the same.
H_A: The mean values of the alert rates for the two time periods are not the same.

T-test Results

- T-statistic: 12.73
- P-value: 1.13e-35

The T-test results indicate a significant difference in the proportion of alerts before and after January 1, 2022. The T-statistic of 12.73 and the extremely low P-value (1.13e-35) suggest that the difference in alert rates is not due to random chance. Therefore, it can be concluded that the alert rate significantly decreased after January 1, 2022, and identifying the reasons behind this decrease would be valuable.

Conclusion

Based on the findings, the following recommendations are proposed:

- **Investigate External Factors:** Investigate the external factors or policy changes around early 2022 that may have contributed to the decrease of alert rate.
- **Addressing Testing Gaps:** Determine why benzodiazepine strip results are absent. Investigate possible reasons, such as testing protocol differences or specific testing equipment issues.
- **Mitigating Risks of Heroin and Morphine:** Both heroin and morphine have been identified as highly dangerous drugs. Immediate measures are required to address their associated risks.

These steps will help improve the understanding and management of drug safety, ultimately contributing to better public health outcomes.