



Pennsylvania Overdose Reduction
Technical Assistance Center (TAC) ▲

Impact of Stimulants



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FUNDED BY:
Pennsylvania Commission on Crime and Delinquency

BACKGROUND

Purpose

This working group report aims to provide initial data analysis results pertaining to the impact of illicit stimulant drugs in Pennsylvania. The Pennsylvania Overdose Reduction Technical Assistance Center (TAC) began receiving anecdotal reports early in 2019 that stimulant misuse, primarily methamphetamine and cocaine, was becoming more prevalent in communities across the Commonwealth. To better understand the current condition, TAC team members compiled overdose death toxicology data and National Forensic Laboratory Information System (NFLIS) data to look for any trends indicating a rise in stimulant presence. This report provides initial findings about drug seizures and drug-related overdose deaths between 2015 and 2018 in Pennsylvania.

Drugs of Interest

According to the TAC's statewide database, methamphetamine and cocaine are the two stimulants most frequently reported in overdose death toxicology reports in Pennsylvania, and therefore have the greatest potential impact on public health. For comparison to a high threat drug that has significantly increased over the past four years, fentanyl was also included in both overdose death and seizure data analyses. Additionally, there have been anecdotal reports of methamphetamine being combined with fentanyl, so these combinations were also included in overdose death data analysis.

Methamphetamine

Methamphetamine is a stimulant drug that causes psychiatric, central nervous system, and cardiovascular clinical effects such as euphoria, increased wakefulness and energy, tachycardia or arrhythmia, and increased blood pressure. Methamphetamine acts by facilitating the release, and inhibiting the re-uptake, of dopamine, serotonin, and noradrenaline. As a result, there is a higher than normal concentration of these neurotransmitters

Methamphetamine has a longer duration of action than cocaine, which means that it remains in the brain longer and therefore has a longer stimulant effect.^{1,2} After use, methamphetamine will metabolize into amphetamine; therefore, unless specifically indicated as methamphetamine on the toxicology report, it cannot be distinguished as to whether an amphetamine result is from an ADHD medication or from methamphetamine use.

Cocaine

Cocaine is a central nervous system stimulant and a local anesthetic. Cocaine produces clinical effects such as euphoria, increased wakefulness and energy, sensitivity to light and sound, irritability, paranoia, and numbness (if injected or topically applied to specific parts of the body). Cocaine acts as a stimulant by inhibiting re-uptake of dopamine, serotonin, and norepinephrine in the brain, and acts as an anesthetic by inhibiting the initiation and conduction of peripheral nerve impulses. Unlike methamphetamine, cocaine is almost fully metabolized in the body, and thus has a shorter duration of action and a shorter stimulant effect.^{1,2}

Fentanyl

Fentanyl is an opioid agonist that has central nervous system anesthetic and analgesic effects such as euphoria, drowsiness and sedation, confusion, dysphoria, and difficulty breathing. Fentanyl acts by reducing the release of neurotransmitters such as GABA, dopamine, noradrenaline, and acetylcholine in the brain, resulting in inhibited nerve activity. Fentanyl is about 50 to 100 times more potent than prescription opioids and heroin. Similar to cocaine, fentanyl has a shorter effect duration; however, because of its potency, it has a much higher risk of overdose.^{1,2}

Overdose Deaths

The overdose death data available for this analysis included all drug-related overdose deaths in Pennsylvania ruled as an accidental, undetermined, or homicide manner

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of death from 2015 to 2018³. For this report, these deaths will be referred to as accidental overdose deaths, as the majority of reports each year are accidental manners. Table 1 displays the total number of accidental overdose deaths in Pennsylvania by year.

Year	Overdose Deaths
2015	3311
2016	4642
2017	5456
2018	4491

Table 1. Overdose Deaths by Year

Stimulant vs. Non-Stimulant Overdose Deaths

Stimulants were indicated in toxicology reports for 6,082 (34%) of the 17,900 accidental overdose deaths in Pennsylvania from 2015 to 2018. The proportion of overdose deaths involving stimulants has changed over time, with the percentage of accidental overdose deaths involving stimulants increasing from 26% in 2015 to 40% in 2018. The increased presence of stimulants strongly correlated ($r=0.89$) with the increase in total accidental overdose deaths. Figure 1 displays the yearly distribution of stimulant and non-stimulant related overdose deaths.

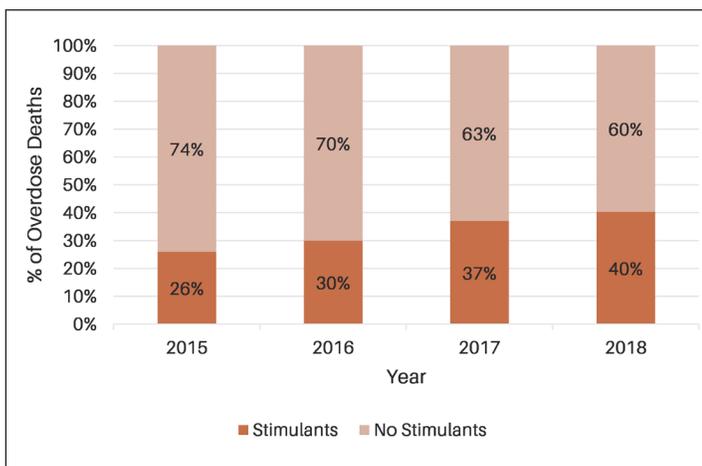


Figure 1. Percent of Overdose Deaths with and without Stimulants

Drug Presence in Overdose Deaths

Methamphetamine was detected in 1,055 (6%) of the accidental overdose deaths from 2015 to 2018, while cocaine was reported in 5,289 (30%) deaths and fentanyl in 9,825 (55%) deaths. Figure 2 displays the yearly percentage of accidental overdose deaths in which each drug was reported. While the presence of methamphetamine and cocaine has increased since 2015, the rate of increase pales in comparison to the increase in fentanyl detection that occurred during this same period. Additionally, the increase of both cocaine and methamphetamine were not statistically significant ($p > .05$). It is important to note that these findings are not unique records. A single accidental overdose death could involve all three of these or none drugs. Therefore, it is important to look into single substance accidental overdose deaths.

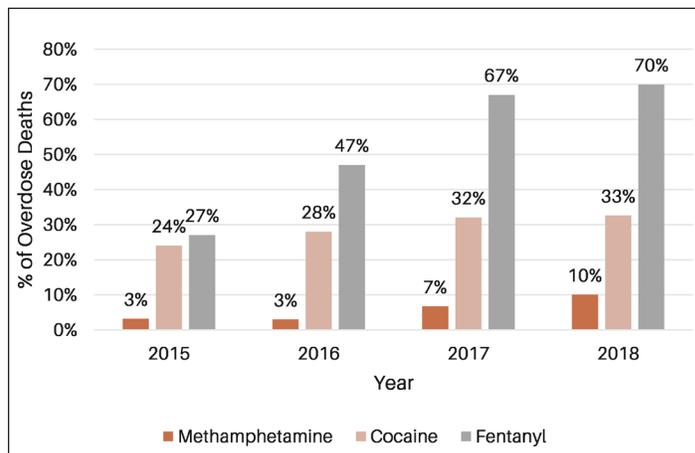


Figure 2. Percent of Overdose Deaths, by Drug

Single Substance Toxicity

To better understand the lethality of stimulants, single substance toxicity cases were analyzed for both cocaine and methamphetamine. From 2015 to 2018, methamphetamine was the only drug reported for 71 accidental overdose deaths, while cocaine was the sole contributing drug found in 282 deaths. Table 2 displays the yearly percentage of accidental overdose deaths resulting solely from cocaine or methamphetamine toxicity. While all of these accidental overdose deaths are important and

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should be prevented in the future, neither drug by itself represents a substantial risk of accidental overdose fatality when compared to the opioids misused in Pennsylvania (i.e., fentanyl and heroin). However, accidental overdose deaths often result from polysubstance use, which poses an additional risk to the misuse of stimulants combined with opioids.

Single Substance Overdose Deaths		
Year	Methamphetamine	Cocaine
2015	0.27%	1.33%
2016	0.11%	1.98%
2017	0.53%	1.41%
2018	0.62%	1.54%

Table 2. Single Substance, Percentage of Overdose Deaths

Combined Substance Toxicity

The TAC received anecdotal reports from county coalitions and local law enforcement that stimulants were found or reported in combination with fentanyl. The combination of heroin and cocaine, known as a “speedball,” has been common in the United States for decades, but the introduction of fentanyl into the drug supply poses an additional risk.^{4,5} While the prevalence of speedball use varies, it is important to investigate the impact of stimulants when found in combination with an opioid as potent and widely available as fentanyl.^{4,5}

Cocaine was detected in combination with fentanyl in 3,163 (18%) of the accidental overdose deaths between 2015 and 2018. Methamphetamine was detected in combination with fentanyl in 669 (4%) of accidental overdose deaths during this same period. It is important to note that these two groupings are not unique, so there may be incidents in which methamphetamine, cocaine, and fentanyl were all present. Table 3 provides yearly percentages of accidental overdose deaths involving each of these drug combinations.

Drug Combinations in All Overdose Deaths		
Year	Methamphetamine & Fentanyl	Cocaine & Fentanyl
2015	0.76%	6.04%
2016	1.44%	13.40%
2017	4.69%	22.62%
2018	7.15%	24.65%

Table 3. Drug Combination, Percentage of Overdose Deaths

Drug Seizures

The NFLIS data available for this analysis included all drug seizures between January 1, 2015 and October 31, 2018⁶. In total, 139,792 drug seizures were reported to NFLIS during this period. Of those, 10,714 (8%) included methamphetamine and 44,481 (32%) included cocaine. Figure 3 shows the yearly percentage of seizures involving each of these drugs, as well as fentanyl seizures. While the percentage of cocaine and methamphetamine seizures both increased from 2015 to 2018, neither change was found to be significant ($p > .05$). Therefore, the percentage of seizures for these drugs does not reflect a significant change in the availability of either drug in Pennsylvania.

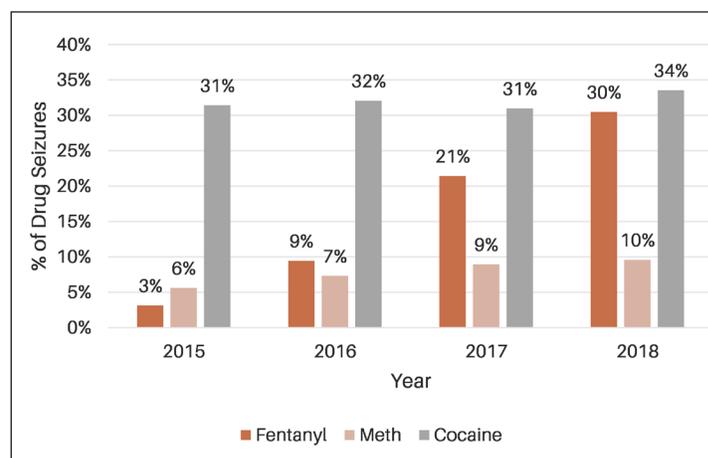


Figure 3. Percent of Drug Seizures, by Drug

DISCUSSION

Discussion

This working group's findings demonstrated a significant increase in stimulant-related overdose deaths between 2015 and 2018 in Pennsylvania ($r=0.89$). This suggests that as total accidental overdose deaths increase, accidental overdose deaths involving stimulants increase as well. Similar correlation was found when analyzing 2018 data in isolation ($r=0.82$). The slightly weaker correlation suggests an explanation for the proportion of total accidental overdose deaths involving stimulants increasing to 40% in 2018.

While the total number of accidental overdose deaths and the number of accidental overdose deaths with stimulants both decreased from 2017 to 2018, the total accidental overdose deaths decreased to a greater degree, thus increasing the percentage of total accidental overdose deaths involving stimulants. It is difficult to infer the availability of stimulants through overdose death data, as single substance toxicity cases involving methamphetamine or cocaine only accounted for 353 overdose deaths between 2015 and 2018. Therefore, drug seizure data and other sources should be given preference when assessing availability, rather than the lethality of stimulants.

Drug seizure data indicated no significant difference ($p >.05$) in the number of drug seizures involving methamphetamine or cocaine between January 1, 2015 and October 31, 2018. Additionally, there was no significant difference ($p >.05$) when comparing stimulant seizures between April 2017 and June 2018 to stimulant seizures between January 2015 and March 2017. These results differ from the Northeast regional findings presented in the NFLIS-Drug Midyear Report 2018⁷, which demonstrated a significant increase in methamphetamine seizures in the Northeast region between June 2017 and June 2018. This report also indicated a significant increase in cocaine seizures in the Northeast during the same time frame.⁷ The Northeast region in the NFLIS report included

Pennsylvania, New York, New Hampshire, Maine, Vermont, New Jersey, Connecticut, Massachusetts, and Rhode Island. The difference between state and regional analysis results may suggest a small increase in cocaine and methamphetamine availability that is not reflected on the micro level.

This drug seizure data has several limitations. First, drugs seized by law enforcement are not always sent for analysis, and are therefore not always submitted to NFLIS. Additionally, many laboratories will only analyze seized drug samples if the case is going to court. Therefore, the data are not fully reflective of the seizures made by law enforcement. Regarding timeliness, the NFLIS data analyzed for this report included samples submitted until October 31, 2018. This reflects the most current data available to the working group in August 2019.

This report provides an overview of stimulant trends across Pennsylvania. The danger of and risk associated with stimulant use increase with polysubstance use involving fentanyl. However, more research and analyses are necessary to assess regional trends and to investigate other data sources that may provide additional insight into the current condition of stimulant misuse in Pennsylvania. This working group intends to begin regional stimulant assessments, with distribution intended for October 2019.

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