



Pennsylvania Overdose Reduction
Technical Assistance Center (TAC) ▲

Impact of Stimulants

Southeast Pennsylvania



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Purpose

This working group report provides initial data analysis results on the impact of illicit stimulant drugs in the Southeast District of Pennsylvania (Berks, Bucks, Chester, Delaware, Lancaster, Montgomery, Philadelphia, and Schuylkill Counties). 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 in drug seizures and overdose deaths, either singularly or in conjunction with other drugs. This report provides initial findings about drug seizures and drug-related overdose deaths between 2015 and 2018 in Southeast 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 Southeast Pennsylvania, and therefore have the most significant potential impact on public health. For comparison of lethality and availability of a high threat drug that has significantly increased over the past four years, fentanyl was included in both overdose death and seizure data analyses. Additionally, there have been anecdotal reports of methamphetamine combined with fentanyl, so this combination was also included in overdose death data analysis.

Methamphetamine

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

Methamphetamine has a longer duration of action than cocaine, which means that it remains in the brain longer and therefore has a more prolonged stimulant effect.^{1,2} After use, methamphetamine metabolizes into amphetamine, a drug found in multiple prescription medications; therefore, unless both amphetamine and methamphetamine are indicated on a toxicology report, it cannot be determined whether an amphetamine result is from a prescription 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 the reuptake 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, sedation, confusion, dysphoria, and difficulty breathing. Fentanyl acts by reducing the release of neurotransmitters such as gamma-aminobutyric acid (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. Like cocaine, fentanyl has a shorter effect duration; however, because of its potency, it poses 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 Southeast Pennsylvania ruled as an accidental or undetermined manner of death from 2015 to 2018.³ Data were also included from three counties in the district which reported overdose deaths as homicides. For this report, these deaths will be referred to as accidental overdose deaths, as the majority of deaths reported to the TAC each year are caused by accident. Table 1 displays the total number of accidental overdose deaths in Southeast Pennsylvania by year.

Table 1. Accidental Overdose Deaths by Year

Year	Southeast District	Statewide
2015	1,369	3,311
2016	1,896	4,642
2017	2,388	5,456
2018	2,116	4,491
Total	7,769	17,900

Stimulant vs. Non-Stimulant Overdose Deaths

Stimulants were indicated in toxicology reports for 3,084 (40%) of the 7,769 accidental overdose deaths in Southeast 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 34% in 2015 to 45% in 2018. The increased presence of stimulants strongly correlated ($r=0.96$) with the increase in total accidental overdose deaths. Figure 1 displays the yearly distribution of stimulant and non-stimulant related overdose deaths.

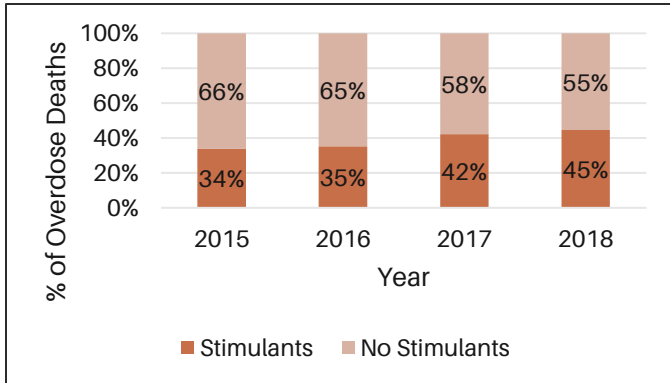


Figure 1. Percent of Overdose Deaths with and without Stimulants

Drug Presence in Overdose Deaths

Methamphetamine was detected in 549 (7%) of the accidental overdose deaths from 2015 to 2018, while cocaine was reported in 2,692 (35%) deaths and fentanyl in 4,272 (55%) deaths. The presence of methamphetamine in overdose deaths significantly increased ($p<0.001$) from 55 (4%) cases in 2015 to 215 (10%) cases in 2018. Cocaine presence in overdose deaths also significantly increased ($p<0.001$) from 422 (31%) cases to 785 (37%) cases in this same period. These increases in proportion pale in comparison to the increase in fentanyl detection that occurred during this same period. Fentanyl presence in overdose deaths

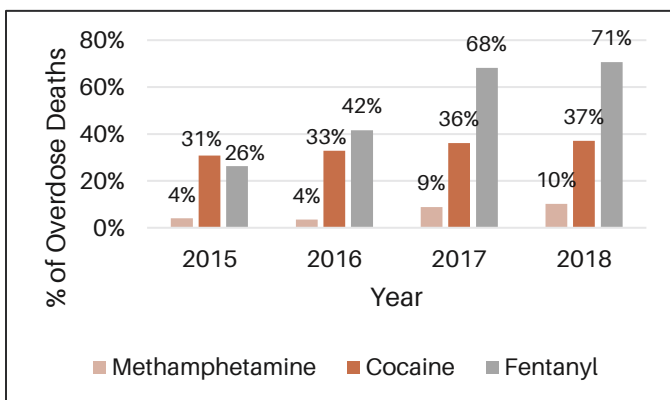


Figure 2. Percent of Overdose Deaths, by Drug

significantly increased ($p<0.001$) from 360 (26%) cases in 2015 to 1,496 (71%) cases in 2018. It is important to note that these findings are not unique records. A single accidental overdose death could involve all or only one of these drugs. While fatal overdoses involving cocaine and methamphetamine have increased, this may be the result of a combination with fentanyl.^{4,5} Therefore, it is important to investigate single substance accidental overdose deaths to better understand the lethality of each drug of interest. Figure 2 displays the yearly percentage of accidental overdose deaths in which each drug was reported.

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 28 accidental overdose deaths, while cocaine was the sole contributing drug found in 145 deaths. While all of these accidental overdose deaths are important and 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 Southeast 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. Table 2 displays the yearly percentage of accidental overdose deaths resulting solely from cocaine or methamphetamine toxicity.

Table 2. Single Substance, Percentage of Overdose Deaths

Year	Methamphetamine	Cocaine
2015	0.3%	1.6%
2016	0.1%	2.5%
2017	0.6%	1.6%
2018	0.4%	1.7%

Combined Substance Toxicity

In 2019, the TAC received anecdotal reports from at least two counties in Southeast Pennsylvania indicating stimulants 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 a newer and additional overdose risk.^{6,7} While the prevalence of speedball use varies, it is important to investigate the impact of stimulants found in combination with an opioid as potent and widely available as fentanyl.^{6,7}

Cocaine was detected in combination with fentanyl in 1,545 (20%) of the accidental overdose deaths between 2015 and 2018. Methamphetamine was detected in combination with fentanyl in 367 (5%) 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.

Table 3. Drug Combination, Percentage of Overdose Deaths

Year	Methamphetamine and Fentanyl	Cocaine and Fentanyl
2015	1.0%	7.7%
2016	1.7%	13.3%
2017	6.6%	25.7%
2018	7.7%	27.1%

Drug Seizures

The NFLIS data available for this analysis included drug seizures between January 1, 2015 and June 30, 2018.⁸ In total, 71,240 drug seizures were reported to NFLIS during this period. Of those, 3,993 (6%) included methamphetamine and 26,604 (37%) included cocaine. While the percentage cocaine seizures significantly decreased ($p=0.04$) from 2015 to 2018, the percentage of methamphetamine seizures significantly increased ($p=0.01$). Therefore, the percentage of seizures reflect a significant change in the availability of both of these drugs in Southeast Pennsylvania. Figure 3 shows the yearly percentage of seizures involving methamphetamine, cocaine, and fentanyl.

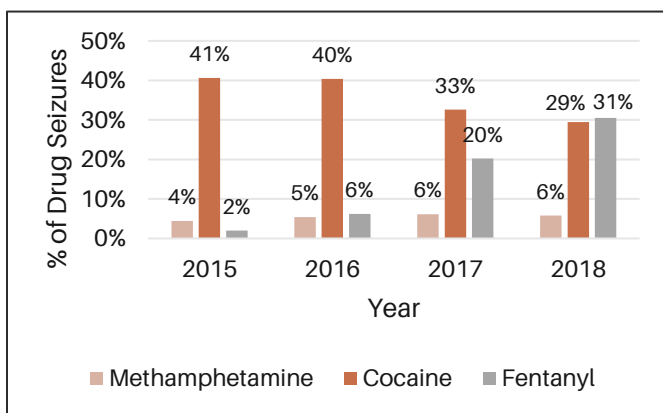


Figure 3. Drug Seizures, Percentage of Total

Discussion

This working group's findings demonstrated a significant increase in stimulant-related overdose deaths between 2015 and 2018 in Southeast Pennsylvania ($p<0.001$) that correlated strongly ($r=0.96$) with the increase in total overdose deaths during this time period. This suggests that as total accidental overdose deaths increase, accidental overdose deaths involving stimulants increase as well.

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 173 overdose deaths between 2015 and 2018. The lower number of single substance toxicity cases for cocaine and methamphetamine suggests these drugs require a higher dose to cause a fatal overdose in the absence of other substances.^{9,10} Therefore, drug seizure data and other sources should be given preference when assessing availability, rather than the lethality of stimulants.

There was a significant difference when comparing stimulant seizures between April 2017 and June 2018 to stimulant seizures between January 2015 and March 2017, with methamphetamine seizures increasing ($p=0.01$) and cocaine seizures decreasing ($p=0.04$). Southeast Pennsylvania was the only district in the state to exhibit a significant decrease in seizures of either drug from 2015 to 2018. The methamphetamine seizure results align with the U.S. Northeast regional findings presented in the NFLIS-Drug Midyear Report 2018, 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.¹¹ The Northeast region in the NFLIS report included Pennsylvania, New York, New Hampshire, Maine, Vermont, New Jersey, Connecticut, Massachusetts, and Rhode Island.

The drug seizure data used for this analysis has several limitations. First, drugs seized by law enforcement are not always sent for analysis and therefore are not always submitted to NFLIS. The drugs submitted also may be restricted to the first controlled substance recorded during the seizure. 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. The NFLIS data

analyzed for this report included samples submitted until June 30, 2018. This reflects the most current data available to the working group in September 2019.

The overdose death data analyzed for this report has additional limitations. Coroners across Pennsylvania do not follow standardized protocols in terms of toxicology, autopsy, and reporting procedures. This may create inaccuracies in the overdose death data. For example, some coroners only report demographic data without drug information, making it impossible to determine which drugs contributed to the death. However, the aggregation of statewide overdose death data is rare in the United States and reflects a significant step forward in data quality. Additionally, low values represented in some districts of Pennsylvania caused issues with statistical significance testing. Small sample sizes may skew results and indicate small changes in values as statistically significant. However, the trends indicated in this report provide useful insight into Southeast Pennsylvania.

This report provides an overview of stimulant trends across Southeast Pennsylvania. The danger 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, such as National Household Survey and law enforcement arrest data, that may provide additional insight into the current condition of stimulant misuse in Southeast Pennsylvania.

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