

Pennsylvania Overdose Reduction  
Technical Assistance Center (TAC) ▲

# Impact of Stimulants

## Northeast Pennsylvania



FUNDED BY:

Pennsylvania Commission on Crime and Delinquency

## Purpose

This working group report provides initial data analysis results on the impact of illicit stimulant drugs in the Northeast District of Pennsylvania (Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Susquehanna, Pike, Wayne, and Wyoming 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 Northeast 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 Northeast Pennsylvania, and therefore have the most significant potential impact on public health. For comparison to the 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.<sup>1,2</sup> 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 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.<sup>1,2</sup>

### 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 has a much higher risk of overdose.<sup>1,2</sup>

## Overdose Deaths

The overdose death data available for this analysis included all drug-related overdose deaths in Northeast Pennsylvania ruled as an accidental or undetermined manner of death from 2015 to 2018.<sup>3</sup> Data was also included from one county 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 Northeast Pennsylvania by year.

Table 1. Accidental Overdose Deaths by Year

Year	Northeast	Statewide
2015	472	3311
2016	528	4642
2017	639	5456
2018	629	4491
<b>Total</b>	<b>2,268</b>	<b>17,900</b>

## Stimulant vs. Non-Stimulant Overdose Deaths

Stimulants were indicated in toxicology reports for 644 (28%) of the 2,268 accidental overdose deaths in Northeast 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 24% in 2015 to 32% in 2018. The increased presence of stimulants strongly correlated ( $r=0.88$ ) with the increase in total accidental overdose deaths. Figure 1 displays the yearly distribution of stimulant and non-stimulant related overdose deaths.

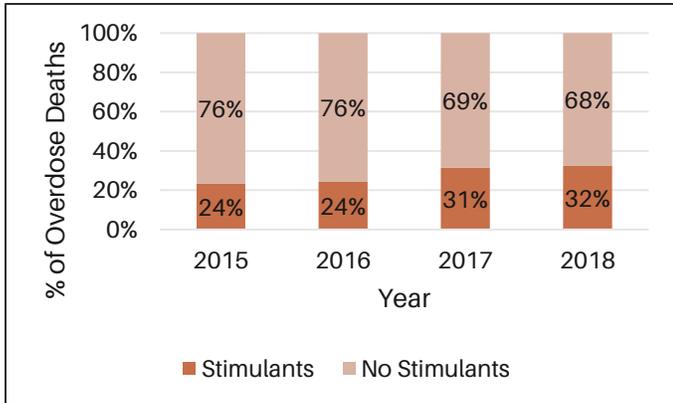


Figure 1. Percent of Overdose Deaths with and without Stimulants

## Drug Presence in Overdose Deaths

Methamphetamine was detected in 211 (9%) of the accidental overdose deaths from 2015 to 2018, while cocaine was reported in 471 (21%) deaths and fentanyl in 1,080 (48%) deaths. The presence of methamphetamine in overdose deaths significantly increased from 30 (6%) cases in 2015 to 98 (16%) cases in 2018 ( $p=0.004$ ). Cocaine presence in overdose deaths also significantly increased from 90 (19%) cases to 118 (19%) cases in this same period ( $p=0.024$ ). These increases in proportion pale in comparison to the increase in fentanyl detection that occurred during this same period. Fentanyl

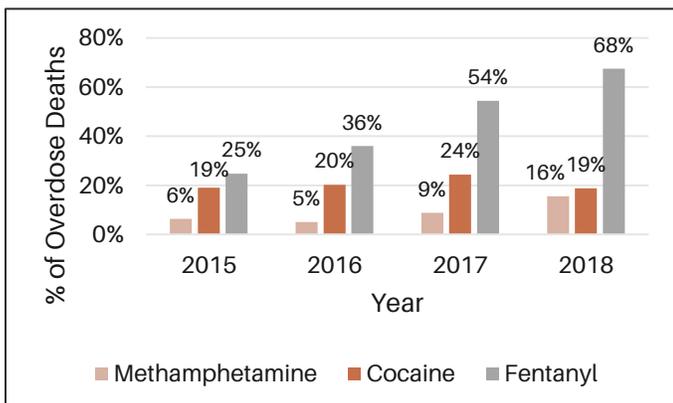


Figure 2. Percent of Overdose Deaths, by Drug

presence in overdose deaths significantly increased from 117 (25%) cases in 2015 to 425 (68%) cases in 2018 ( $p<0.001$ ). 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.<sup>4,5</sup> 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 16 accidental overdose deaths, while cocaine was the sole contributing drug found in 33 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 Northeast 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	0.8%	1.3%
2016	0.2%	1.7%
2017	0.8%	1.7%
2018	1.0%	1.1%

## Combined Substance Toxicity

In 2019, the TAC received anecdotal reports from at least two counties in Northeast 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.<sup>6,7</sup> 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.<sup>6,7</sup>

Cocaine was detected in combination with fentanyl in 226 (10%) of the accidental overdose deaths between 2015 and 2018. Methamphetamine was detected in combination with fentanyl in 129 (6%) 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 & Fentanyl	Cocaine & Fentanyl
2015	1.9%	2.8%
2016	3.0%	6.4%
2017	5.3%	13.6%
2018	11.1%	14.6%

## Drug Seizures

The NFLIS data available for this analysis included drug seizures between January 1, 2015 and June 30, 2018.<sup>8</sup> In total, 11,640 drug seizures in Northeast Pennsylvania were reported to NFLIS during this period. Of those, 1,718 (15%) included methamphetamine and 2,819 (24%) included cocaine. While the percentage of methamphetamine seizures significantly increased ( $p=0.018$ ) from 2015 to 2018, the percentage of cocaine seizures did not ( $p>0.05$ ). Therefore, the percentage of seizures for these drugs reflect a significant change in the availability of methamphetamine, but not cocaine, in Northeast Pennsylvania. Figure 3 shows the yearly percentage of seizures involving methamphetamine, cocaine, and fentanyl seizures.

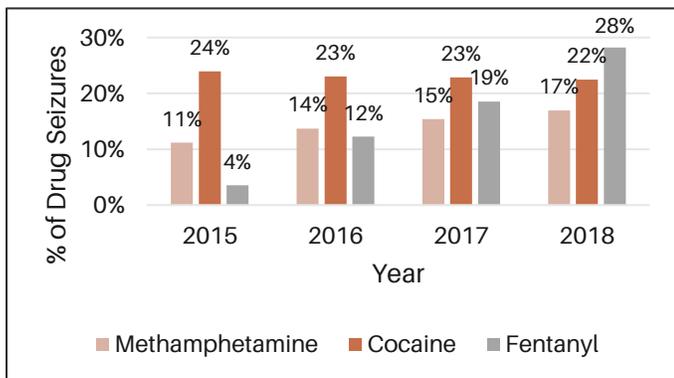


Figure 3. Drug Seizures, Percentage of Total

## Discussion

This working group’s findings demonstrated a significant increase ( $p<0.001$ ) in stimulant-related overdose deaths between 2015 and 2018 in Northeast Pennsylvania that correlated strongly with the increase in total overdose deaths in this time period ( $r=0.88$ ). 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 decreased from 2017 to 2018, the number of deaths involving stimulants increased, 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 49 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.<sup>9,10</sup> 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 methamphetamine seizures ( $p=0.018$ ) but not cocaine seizures ( $p>0.05$ ) between April 2017 and June 2018 to stimulant seizures between January 2015 and March 2017. These 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.<sup>11</sup> 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 Northeast Pennsylvania.

This report provides an overview of stimulant trends across Northeast 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 Northeast Pennsylvania.

## References

1. PubChem. (n.d.). Retrieved August 1, 2019, from <https://pubchem.ncbi.nlm.nih.gov/>.
2. National Institute on Drug Abuse. (n.d.). National Institute on Drug Abuse (NIDA). Retrieved August 1, 2019, from <http://www.drugabuse.gov/>.
3. Pennsylvania Overdose Reduction Technical Assistance Center. (n.d.). Pennsylvania Overdose Death Data Retrieved July 29, 2019.
4. Nolan, M. L., Shamasunder, S., Colon-Berezin, C., Kunins, H.V., & Paone, D. (2019). Increased presence of fentanyl in cocaine-involved fatal overdoses: Implications for prevention. *Journal of Urban Health*, 96(1), 49-54.
5. Wood, E., Lai, C., Marshall, B., & Kerr, T. (2009). Increase in fatal methamphetamine overdoses in a Canadian setting. *The American Journal on Addictions*, 18, 248-249.
6. Park, J. N., Weir, B. W., Allen, S. T., Chaulk, P., & Sherman, S. G. (2018). Fentanyl-contaminated drugs and non-fatal overdose among people who inject drugs in Baltimore, MD. *Harm Reduction Journal*, 15(1), 34. doi:10.1186/s12954-018-0240-z.
7. Leri, F., Stewart, J., Tremblay, A., & Bruneau, J. (2004). Heroin and cocaine co-use in a group of injection drug users in Montréal. *Journal of Psychiatry and Neuroscience: JPN*, 29(1), 40-47.
8. DEA Diversion Control Division. October 31, 2018, Item Detail Query in NFLIS.
9. Hanson, G. R., Jensen, M., Johnson, M. H., & White, S. (1999). Distinct features of seizures induced by cocaine and amphetamine analogs. *European Journal of Pharmacology* 377, 167-173.
10. Jones, C. M., Baldwin, G. T., & Compton, W. M. (2017). Recent increases in cocaine-related overdose deaths and the role of opioids. *American Journal of Public Health* 107(3), 430-432.
11. U.S. Drug Enforcement Administration, Diversion Control Division. (2019). National forensic laboratory information system: NFLIS-drug midyear report 2018. Springfield, VA: U.S. Drug Enforcement Administration.