

Pennsylvania Overdose Reduction  
Technical Assistance Center (TAC) ▲

# Impact of Stimulants

## North Central Pennsylvania



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## Purpose

This working group report provides initial data analysis results on the impact of illicit stimulant drugs in the North Central District of Pennsylvania (Bradford, Cameron, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga, and Union 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 North Central 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 North Central 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.<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 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.<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 poses 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 North Central Pennsylvania ruled as an accidental or undetermined manner of death from 2015 to 2018.<sup>3</sup> 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 North Central Pennsylvania by year.

Table 1. Accidental Overdose Deaths by Year

Year	North Central	Statewide
2015	91	3311
2016	150	4642
2017	143	5456
2018	141	4491
<b>Total</b>	<b>525</b>	<b>17,900</b>

## Stimulant vs. Non-Stimulant Overdose Deaths

Stimulants were indicated in toxicology reports for 142 (27%) of the 525 accidental overdose deaths in North Central 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 9% in 2015 to 37% in 2018. The increased presence of stimulants is moderately correlated ( $r=0.61$ ) with the increase in total accidental overdose deaths. Figure 1 displays the yearly distribution of stimulant and non-stimulant related overdose deaths.

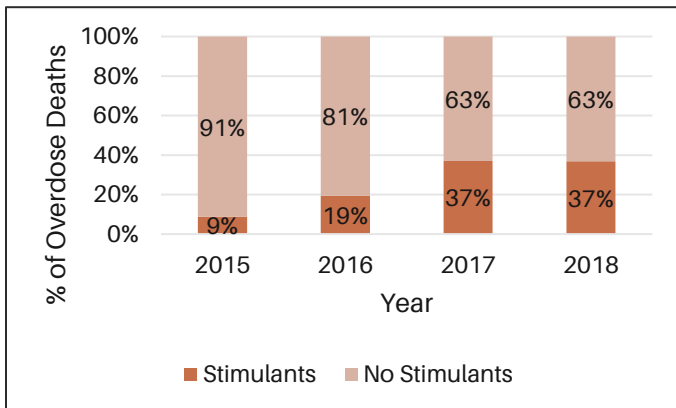


Figure 1. Percent of Overdose Deaths with and without Stimulants

## Drug Presence in Overdose Deaths

Methamphetamine was detected in 73 (14%) of the accidental overdose deaths from 2015 to 2018, while cocaine was reported in 81 (15%) deaths and fentanyl in 230 (44%) deaths. The presence of methamphetamine in overdose deaths significantly increased from 4 (4%) cases in 2015 to 28 (20%) cases in 2018 ( $p=0.003$ ). Cocaine presence in overdose deaths also significantly increased from 5 (5%) cases to 30 (21%) cases in this same period ( $p=0.003$ ). These increases in proportion pale in comparison to the increase in fentanyl detection that occurred during this same period. Fentanyl presence in

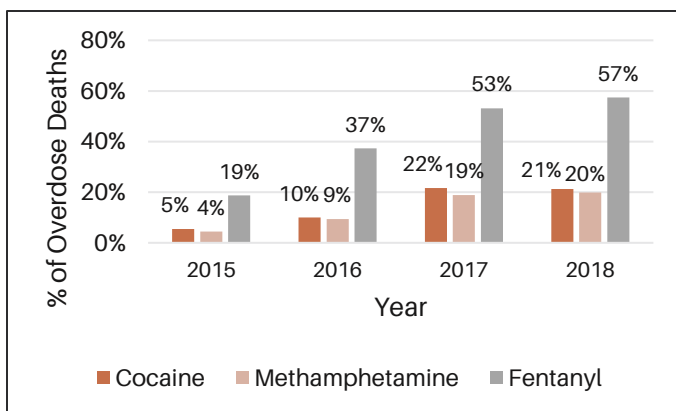


Figure 2. Percent of Overdose Deaths, by Drug

overdose deaths significantly increased from 17 (19%) cases in 2015 to 81 (57%) cases in 2018 ( $p=0.006$ ). 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 7 accidental overdose deaths, while cocaine was the sole contributing drug found in 3 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 North Central 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	0.0%	0.0%
2016	0.7%	0.0%
2017	2.8%	0.7%
2018	1.4%	1.4%

## Combined Substance Toxicity

In 2019, the TAC received anecdotal reports from at least three counties in North Central 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 46 (9%) of the accidental overdose deaths between 2015 and 2018. Methamphetamine was detected in combination with fentanyl in 38 (7%) of the 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	0.0%	1.1%
2016	2.0%	2.7%
2017	11.9%	14.7%
2018	12.8%	14.2%

## Drug Seizures

The NFLIS data available for this analysis included all drug seizures between January 1, 2015 and June 30, 2018.<sup>8</sup> In total, 4,380 drug seizures were reported to NFLIS during this period. Of those, 879 (20%) included methamphetamine and 1,033 (24%) included cocaine. While the percentages of methamphetamine and cocaine seizures both increased from 2015 to 2018, neither change was found to be significant ( $p > 0.05$ ). Therefore, the percentage of seizures for these drugs does not reflect a significant change in the availability of either drug in North Central Pennsylvania. Figure 3 shows the yearly percentage of seizures involving methamphetamine, cocaine, and fentanyl.

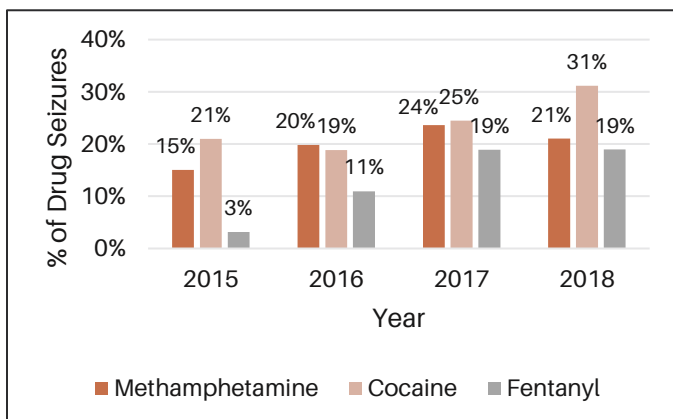


Figure 3. Drug Seizures, Percentage of Total

## Discussion

This working group's findings demonstrated moderate correlation between stimulant-related and total overdose deaths between 2015 and 2018 in North Central Pennsylvania ( $r=0.61$ ). This suggests that as total accidental overdose deaths increase, accidental overdose deaths involving stimulants increase as well. Additionally, the increase in stimulant-related overdose deaths from 2015 to 2018 was statistically significantly ( $p < 0.001$ ).

While both the total number of accidental overdose deaths and the number of deaths involving stimulants increased from 2015 to 2018, the total accidental overdose deaths decreased to a lesser 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 10 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 no significant difference when comparing stimulant seizures between April 2017 and June 2018 to seizures between January 2015 and March 2017 ( $p > 0.05$ ). These results differ from the U.S. Northeast regional findings presented in the NFLIS-Drug Midyear Report 2018, which demonstrated a significant increase in methamphetamine and cocaine seizures in the Northeast region between June 2017 and June 2018.<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 North Central Pennsylvania.

This report provides an overview of stimulant trends across North Central 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 North Central 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.