

Division of Overdose Prevention

STIMULANT GUIDE



Answers to Emerging Questions about Stimulants in the Context of the Overdose Epidemic in the United States

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Accessible version: <https://www.cdc.gov/drugoverdose/index.html>



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Disclaimers

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Table of Contents

Overview	1
How to use the stimulant guide	1
1. What is a stimulant overdose?	2
2. How is a stimulant overdose different from an opioid overdose?	3
3. How are stimulant “overdoses” responded to and what happens when is 911 called?	4
4. What could first responders and others expect to see when if someone has used stimulants?	5
5. Will naloxone reverse a stimulant overdose?	6
6. Would it benefit people who use stimulants to have naloxone nearby?	7
7. What can someone do to prevent a stimulant overdose in the first place?	7
8. Do people who use stimulants need to be worried about fentanyl in methamphetamine, powder cocaine, and crack cocaine?	9
9. What are other risks for people who use stimulants?	10
10. How can people who use stimulants be safer?	10
11. What treatment options are available for people living with stimulant use disorder?	12
12. What might first responders (police, fire, EMS) do to maintain safety at a scene where someone has used stimulants?	13
13. Are there health risks from occupational exposure when working with people who use stimulants or have stimulant products in their possession?	13
Other Resources.....	14
References.....	15

The Growing Problem

Stimulant-involved overdose deaths have risen in recent years; from 2013-2019, the psychostimulant-involved death rate increased 317%.¹ These increases are taking place in the context of a national overdose crisis, in which stimulants are increasingly involved.^{2,3} In turn, it is important that community service providers and members of the public have access to information about stimulants to increase awareness of the risks stimulants may pose, how to identify a stimulant overdose, and what resources exist to provide further support or education.



From 2013-2019
Psychostimulant-
involved death rate
increased **317%**

Overview of the Stimulant Guide

This guide will answer some common questions about stimulants, stimulant use, stimulant overdose, and stimulant overdose prevention strategies developed by harm reduction experts. Straightforward and concise answers are provided in an effort to convey the same key information to a variety of audiences. This document does not contain medical advice, nor should it be referred to in case of emergency. It is purely informational.

How to Use This Stimulant Guide

This FAQ is intended to assist people who may interact with people who use stimulants or have interest in understanding issues related to stimulants in their communities. While clinicians, first responders, and others who serve people who use stimulants may review this information, it is not meant to guide practice.

Please refer to state and local boards of practice, and your facility's policies to inform any medical or intervention actions. Because this FAQ aims to quell confusion about stimulant-involved overdose in the context of the surging drug overdose epidemic, this document will use the term stimulant overdose to refer to use of stimulants, alone or in combination with other substances, which produce harmful or even life-threatening effects, including death.^{2,4}

Purpose of the Frequently Asked Questions (FAQ) Guide

The intent of this FAQ guide is to solely provide information. The intent is **not** to provide clinical guidance, clinical recommendations, or treatment protocols, or to be interpreted as such. As described below, there are many types of stimulants. For several of the questions included in this FAQ, specific answers may depend on multiple factors such as the stimulant consumed, the quantity, and the route of administration.

What is a Stimulant Overdose?

In simple terms, a **stimulant overdose occurs when someone is experiencing effects of stimulants so severe that their health or safety may be at risk.**

Stimulants include methamphetamine, cocaine, crack cocaine, and amphetamines such as medications prescribed for the treatment of ADHD. The effects of stimulants on the human body can vary greatly based on multiple factors such as underlying health issues, type of stimulant, route of administration, and dose.^{8,9} Therefore, not all stimulant overdoses look the same.

Due to the variable nature of stimulant overdoses, some have referred to potentially life-threatening emergencies resulting from the use of stimulants as “stimulant toxicity” or as “overamping.”⁵⁻⁷ These terms refer to the same kinds of stimulant-related emergencies. This document refers to these experiences as “stimulant overdose” .

How long does it take to see or feel the effect of stimulants?

It varies. Generally, the time of symptom onset is quickest when people use drugs by smoking, snorting, or injecting them, compared to when drugs are consumed orally.⁸ Stimulant overdose can occur with any method of administration, including oral consumption.

What are the signs and symptoms of a stimulant overdose?

The effect of stimulants on the human body and brain can vary by how frequently they are used, how strong they are, how they are consumed, and the amount consumed. It is sometimes unpredictable, based on individual characteristics. As a consequence, it is hard to know how much is “too much” or harmful for any given person.^{5,9}

Not all stimulant overdoses are fatal, but even in non-fatal cases, they may be serious and need medical attention. Serious signs and symptoms of a stimulant overdose that need medical attention may include:⁹



Signs and symptoms of a stimulant overdose



- *Dilated pupils*
- *Dizziness*
- *Tremor*
- *Irritability*
- *Confusion*
- *Mood swings*
- *Nausea or vomiting*
- *Rapid breathing, fast heart rate or arrhythmia*
- *Overheating or excessive sweating*
- *Hypertension (high blood pressure)*
- *Chest pains or tightness*
- *Panic or extreme anxiety*
- *Hallucination^{10,11}*
- *Psychosis*

When does a stimulant overdose become deadly?

Despite this variability in what non-lethal stimulant overdose looks like, a stimulant-involved overdose that has reached the point of lethality often looks the same:

- blood pressure rises
- heart rate rises
- body temperature rapidly rises
- toxic delirium arises
- terminal seizures.⁹

How is a stimulant overdose different from an opioid overdose?

Opioid Versus Stimulant Overdose: Key Symptoms to Watch For

People experiencing stimulant overdose are often conscious and may be breathing quickly. They may need assistance in reducing overheating and overstimulation.²³

People experiencing an opioid overdose are difficult to rouse and typically suffer from dangerously slow or no breathing. If you observe that someone is experiencing these symptoms, call 911 for help. A bystander can administer naloxone and begin rescue breathing as soon as possible.²⁴

More than one dose of naloxone may be needed to reverse an overdose if the person does not respond within 2-3 minutes of administration. Detailed information on naloxone administration can be found at www.cdc.gov/stopoverdose/naloxone.

To a bystander, a stimulant overdose may look very different from an opioid overdose. **Stimulant overdose is commonly characterized by dangerous overheating, and often the individual experiencing the overdose remains conscious.**^{10,11,14} **Opioid overdose is typically characterized by severe difficulty breathing or not breathing at all; the person is nonresponsive and unconscious.**¹⁷ Both types of overdose can result in physical harms, neurological harms, or death.⁹

Stimulants and opioids both work on the body by speeding up or slowing down some of the body's natural processes. These two classes of drugs induce different effects in people, because they interact with different bodily processes.¹⁸



Overdose, Toxicity, Overamping: What's the Difference?

According to the National Harm Reduction Coalition, the word overdose is often associated with opioids like heroin and fentanyl. Due to this association, some people might argue that it is impossible to overdose on stimulants in the same way that one can overdose on opioids. Others point out that people have lost consciousness or had other scary complications arise when a stimulant experience turns bad. Isn't what they experienced an overdose?⁷

In fact, both statements are correct. The confusion is due, in part, from the use of the word "overdose," which may not always be the best way to describe the harmful effects of using stimulants, because the effects can change based on many factors, like sleep patterns, age and weight, the route of administration (i.e., injection versus snorting versus smoking), whether other medications or drugs were consumed, and where and under what circumstances the use is occurring.

To avoid this confusion, the National Harm Reduction Coalition and others refer to stimulant overdose interchangeably with stimulant toxicity or "overamping."¹²⁻¹⁶ Stimulant toxicity is an acute health condition that follows from stimulant intoxication, or the stage at which enough stimulants are consumed to experience an adverse effect.¹¹ Symptoms may become uncomfortable, in the same way "overamping" may be described.⁵ Because this document aims to quell confusion about stimulant-involved overdose in the context of the surging drug overdose epidemic, this document will use the term stimulant overdose to refer to use of stimulants, alone or in combination with other substances, which produce harmful or even life-threatening effects, including death.²⁴

How do stimulants affect the body?

Stimulants can increase the body's temperature and reduce the body's ability to dissipate that excess heat.²⁰ Central nervous system stimulants promote the release of dopamine, serotonin, and norepinephrine and block the re-uptake of dopamine.¹⁹ Increased levels of these neurotransmitters in the central nervous system can produce effects like increased energy, alertness, feelings of euphoria.¹⁸

Stimulant overdose can also produce varied and concerning mental health symptoms like extreme panic, paranoia, anxiety, hallucinations, or psychosis, which can be upsetting or frightening to the individual who consumed the stimulant and to bystanders.²⁸

Given the variable nature of stimulant overdose, it is important to seek medical help to assess the safety of the individual. In most states, Good Samaritan laws provide some immunity, which varies by jurisdiction, for those who provide assistance to people who are in danger, including as a result of illicit drug use.²¹

When responding to a stimulant overdose, any person may be able to*

- Administer naloxone if opioids could be involved
- Call 911
- Monitor the person carefully and stay with the individual until help arrives
- De-escalate the situation, by creating a safe place for observation and monitoring of the person in crisis and reducing external stimulation—like excessive noises and touching—to promote calm and recovery
- Help the individual avoid becoming overheated. Some ways this can be done is by providing water, a sports drink, or a cool washcloth.¹¹

How are the effect of opioids different from the effects of stimulants?

Opioids also interact with the central nervous system and other parts of the body, and they do so in very different ways from stimulants. Specifically, opioids interact with neurotransmitter receptors that regulate analgesia (pain relief), sedation, and respiratory depression.²² Opioids can promote these processes, which is why they are effective at treating pain, making people feel sleepy, or, if they overdose, dangerously slowing down or stopping breathing all together.

When responding to an opioid overdose, helping the individual breathe is key—through the administration of naloxone and rescue breathing.

*Additional information on responding to a stimulant overdose is provided in following FAQs.

How are stimulant overdoses responded to and what happens when 911 is called?

Stimulant-involved overdoses are on the rise and often present as and can become a medical emergency.²⁵ If you suspect someone is experiencing a stimulant overdose call 911. The risk of injury or death to someone experiencing stimulant overdose may be reduced when medical personnel can assess the situation and provide appropriate intervention. If there is any possibility opioids are involved, administer naloxone and start rescue breathing.

Contact 911 According to the National Office of Emergency Medical Services, 911 should be contacted during a medical emergency.

SIGNS THAT A PERSON MAY NEED IMMEDIATE MEDICAL ATTENTION INCLUDE (BUT ARE NOT LIMITED TO) THE ITEMS LISTED BELOW. ALWAYS CALL 911 IF SOMEONE:

- Loses consciousness
- Stops breathing or can't breathe effectively
- Has a high body temperature
- Has a seizure that lasts longer than 5 minutes
- Has difficulty breathing after experiencing a seizure
- Has multiple seizures in a row (see below for more information about seizures)
- Is known to experience a seizure for the very first time
- Has injuries that require medical attention
- Shows any sign of a stroke, including
 - o Numbness in the face, arms, or legs,
 - o Sudden and severe headaches,
 - o Blurred vision, or
 - o Sudden loss of coordination.
- Shows any sign of a heart attack or cardiac arrest, including
 - o Pain, pressure, or squeezing sensations in the center of the chest
 - o Discomfort in the neck, arms, jaw, back, or stomach, and
 - o Shortness of breath, lightheadedness, nausea, fatigue, or cold sweats.
- Asks you to call ^{911.4-7,26,27}

Most, but not all, states have enacted 911 Good Samaritan Laws, a strategy that can help communities prevent overdose, according to CDC.† These laws vary from state to state, but generally offer some immunity, varying by the jurisdiction, to the person experiencing a suspected overdose and to the person seeking emergency first response for that overdose from non-felony charges for drug or paraphernalia possession discovered by first responders while answering the overdose call-for-service.²⁸

What can be done while waiting for help to arrive?

High body temperature can contribute to deaths from cocaine overdose—so much so that studies have documented more cocaine-related deaths on hotter days with a higher ambient temperature.^{29,30} The body temperatures of individuals experiencing stimulant overdose may be lowered by helping ensure the person is hydrated or providing a cool wet washcloth. Monitor someone who is getting overheated and assess for worsening symptoms. Moving away from crowded settings or finding fresh air may also be helpful, though it is important to stay in the vicinity until emergency services arrive.

According to the North Carolina Harm Reduction Coalition[§], there are many ways to support someone experiencing psychological effects of a stimulant overdose. The person who has used stimulants may appreciate offers of food, water, or a place to sleep. Calming practices can include breathing or meditation exercises or accompanying them outside for fresh air or a walk.

Why call 911?

In clinical settings, the first-line medications most commonly used for treatment of stimulant overdose commonly include benzodiazepines administered by a health professional.¹¹ Healthcare professionals in emergency departments may also administer other medications in order to reduce accelerated heart rates,

lower elevated blood pressure, increase urinary output of stimulants and their metabolites, and protect the kidneys during these processes.¹¹ Healthcare professionals can administer other medications to control blood pressure, seizures, arrhythmias, symptoms of stroke or heart attack, or severe psychological effects should they appear.⁹ Active cooling strategies may be used, such as the use of fans, misting, and ice water or icepacks in medical settings.^{9,23}

For more information about seizures

- Call 911 if the seizure does not resolve within 5 minutes, if the person experiences multiple seizures in a row, if they have never had a seizure before or if they have difficulty breathing or waking up after the seizure.²⁷
- Remain calm and help the person in distress. Talk to them calmly to let them know what the person responding is doing.
- Help the person lie down safely without falling or hitting their head, if possible.
- Remove nearby objects, including eyeglasses, to reduce the risk of injury from sudden, involuntary movements.
- Do not put anything in their mouth or between their teeth.
- Do not try to restrain the person's movements.

What could first responders and others expect to see when someone has used stimulants?

Though stimulants are not all the same, they generally have similar effects on the body: stimulating the central nervous system and increasing levels of dopamine in the body and brain. Dosage, purity, tolerance, route of administration, and other drug interactions can all affect the type of feelings a person using stimulants may have and the behaviors they may display.⁹

Someone experiencing stimulant effects may present with one or more of the following behaviors or characteristics.

†National Office of Emergency Medical Services. Calling 911 | 911.gov .

‡Centers for Disease Control and Prevention (CDC). Drug Overdose Promising State Strategies. <https://www.cdc.gov/drugoverdose/strategies/>

§ North Carolina Harm Reduction Coalition. Speed Overdose (Overamping). <https://www.nchrc.org/naloxone-od-prevention-2/speed-overdose-overamping/>

- **People who have used stimulants may be physically unable to keep still.**
People who have used stimulants may be prone to excessive movements such as being extremely talkative or using exaggerated gestures while talking for expressive (not aggressive) purposes.^{31,32} The use of stimulants is also associated with involuntary bodily movements, muscle spasms, and repetitive tics (especially in the limbs, face, and neck).³³⁻³⁵ Such movement disorders have even been observed in children who are receiving treatment with stimulants for attention deficit hyperactivity disorder (ADHD).³⁶
- **People who have used stimulants may be physically unable to hear or follow direct orders.**
Confusion, memory impairments, and involuntary movements are all symptoms that can be induced by stimulant use. Someone who has used stimulants may be physically incapable of following direct orders, such as “sit down” or “come here” due to the inability to process that command, the inability to remember being given the command, or the inability to control their bodily movements.^{31,35,37}
- **People who have used stimulants may be confused or disoriented.**
Cognitive impairments may emerge as a result of stimulant use or as a result of sleep deprivation caused by stimulant use. Manifestations of cognitive impairment may include mild sensory hallucinations, disorientation to place and time, or challenges with memory and language processing.^{31,32,37}
- **People who have used stimulants may show signs of physical exertion.**
These signs may be seen even if someone has not been engaging in challenging physical activities. Symptoms may include sweating, accelerated heart rate, or heavy breathing.^{31,35}
- **People who have used stimulants may not be able to recall certain facts or events.**
Stimulants may impair memory as a result of sleep deprivation or simply from their transient neurological effects. Stimulants can negatively impact long term, episodic memory in particular.^{35,37}

- **People who have used stimulants may be agitated, irritable, or paranoid.**

This means that someone who has used stimulants may have a disproportionate reaction to what are broadly considered “ordinary” events, such as touch or noise. These effects of stimulant use may cause someone to panic and act impulsively out of fear or self-defense.^{38,39}

Will naloxone reverse a stimulant overdose?

No. Naloxone is an antidote to opioid overdose. It is an opioid antagonist that can reverse the effects of opioids.²⁴ Naloxone is not effective in treating a stimulant “overdose.”

However, if there is the potential that opioids have been consumed, either because someone is unconscious and not breathing, and whether drugs were mixed or unknowingly contaminated, naloxone may be lifesaving. Naloxone can reverse the effects of any opioid that might be involved. No harms will be caused by the naloxone if opioids are not involved.²⁴

Why doesn't naloxone reverse the effect of stimulants?

Brain cells can use chemicals to send messages to each other. Specifically, they can release chemicals called neurotransmitters that are received by other cells through neurotransmitter receptors.

Opioids affect the body by activating certain neurotransmitter receptors.²² Naloxone is able to reverse an opioid overdose because it attaches to and blocks those specific opioid receptors, preventing opioids from producing their typical effects.⁴⁰

Stimulants promote the release of certain neurotransmitters, like dopamine, serotonin, and norepinephrine and block the re-uptake of dopamine.¹⁰ Naloxone cannot reverse the effects of stimulants, because blocking opioid receptors does not interrupt the chemical processes that stimulants produce in the brain.

Would it benefit people who use stimulants to have naloxone nearby?

Yes. People who use stimulants may be exposed to opioids by choice or through contaminated or mislabeled stimulant products. People who use stimulants may also be bystanders to someone else experiencing an opioid overdose. In all of these instances, access to naloxone could save a life.

People who use stimulants might choose to use opioids

Stimulants and opioids can be used together through the combined mixture of stimulants and opioids (also called “speedballs” or “goofballs”) as well as co-use of stimulants and opioids (also called polysubstance use).^{9,41} Reasons for using drugs together vary and are not well studied. Reported reasons for regularly using both stimulants and opioids include: to mitigate symptoms of withdrawal, to mitigate the sedating effects of opioids, or to assist in reducing opioid use without medical support or supervision.^{42,43} Studies indicate that nearly one-third of people who use stimulants also use opioids or have co-occurring stimulant and opioid use disorders.^{44,45} The prevalence of polysubstance use and co-occurring substance use disorders may be even higher in areas where stimulant use has recently increased.⁴⁶

Anyone who uses opioids, regardless of whether they also use stimulants, could experience an opioid overdose. If an unintentional opioid overdose occurs, access to naloxone could save their life. For someone experiencing an opioid overdose who has also used stimulants, the signs of a stimulant overdose may only become apparent after naloxone has been administered.

People who use stimulants might be unknowingly exposed to opioids

The rate of fatal overdoses that involve both opioids and stimulants is growing. In 2017, half of all psychostimulant-involved fatal overdoses and nearly three-fourths of all cocaine-involved fatal overdoses in the United States also involved at least one kind of opioid.² In the first half of 2018, the number of fatal overdoses in 25 states that involved both illicitly manufactured fentanyl and cocaine increased by

14%; fatal overdoses involving illicitly manufactured fentanyl and methamphetamine increased by 31%.⁴⁷ These increases continued through 2019.⁴⁸ Some of these deaths could represent people who knowingly consumed both stimulants and opioids at the same time or at different times during the same day. However, evidence is growing that some people are unintentionally exposed to opioids through opioid-contaminated stimulants, mislabeled or incorrectly identified drugs, or counterfeit stimulant products.⁴⁹⁻⁵²

If someone experiences an overdose following unintentional exposure to opioids, naloxone could save their life.

People who use stimulants could save someone else's life

Nationwide, people who use drugs can and have contributed to community opioid overdose reversals with naloxone.⁵³ Further, higher rates of naloxone distribution to community members—especially to people who use drugs or with a history of drug use—are associated with significantly lower rates of opioid overdose.⁵⁴

Someone who uses stimulants, even if they do not use opioids, may be nearby during an opioid overdose and can be trained and equipped with naloxone to save a life.

What can someone do to prevent a stimulant overdose in the first place?

Reducing or eliminating stimulant use can prevent stimulant overdose. While there are currently no FDA-approved medications for stimulant use disorder, there are evidence-based interventions including motivational interviewing, contingency management, community reinforcement and cognitive behavioral therapy.⁹ Harm reduction programs such as syringe services programs, primary care doctors, and emergency rooms can help identify local treatment options. SAMHSA's treatment locator (findtreatment.gov) is also a helpful tool to use to access help. Most programs will accept people by self-referral.

While cessation of use is the most effective way to preventing stimulant overdose, for people who choose to use stimulants, or are not able to stop,

strategies to help reduce the risk of stimulant overdose and other kinds of overdose have been developed by community programs and harm reduction experts have been discussed in peer-reviewed literature.

[Those strategies are outlined here.](#)

Not using alone.

Having a trusted contact who is not using at the same time, to sit with, or check in with can help reduce risks. It can be lifesaving to have another person available to provide support, administer naloxone, or call 911 if a serious health emergency occurs^{55,56} This advice applies to the consumption of any substance, not just stimulants. Services that allow people to seek non-judgmental support over a phone or video connection when they are using drugs may also be helpful, if face-to-face support is not available. Never Use Alone (neverusealone.com) is a nation-wide service that connects callers to a trained volunteer who will gather basic information about the caller's location, stay on the line to support the caller if they plan to use substances alone, and alert 911 if the caller becomes unresponsive.

Consuming one substance at a time.

From 2019 to 2020, overdose deaths involving psychostimulants rose 50% and overdose deaths involving cocaine rose by 22% and, in 2020, one out of every five overdose deaths in the United States was cocaine-involved.²⁵ Though polysubstance use and co-use of different drugs have been observed for many decades,⁵⁷ changes in the illicit drug supply are making these combinations more deadly.^{49,50,58-60}

Taking care of overall health.

Dehydration is a potentially dangerous consequence of stimulant "overdose."⁶ Complications can arise if someone using stimulants isn't drinking water or eating enough food, especially if they plan to use or have been using stimulants for a day or more. Becoming hungry or dehydrated can weaken a person's body and worsen the negative effects of stimulants. Long periods of wakefulness or sleep deprivation can also contribute to overall weakness and mental distress. Getting some sleep can help reduce the risk of physical and mental distress.^{13,61} It can be helpful to find a clinic or physician that can be trusted to be honest with them about drug use. When seeing a provider, a person who uses stimulants can have their blood pressure and heart rhythm checked, as high blood pressure and cardiac arrhythmias may put them at higher risk of health problems when using stimulants.⁶²

Being cautious about how much substance is used.

There is a risk of overdose whenever a stimulant or opioid is used. That risk can be reduced—though not eliminated—when substances are consumed in smaller quantities. By minimizing the dose consumed, someone may be able to assess the purity or potency of stimulants, better understand how that stimulant will affect their body, and determine what dose may be less harmful to take, at their current tolerance.^{63,64}

Other harm reduction strategies for people who use stimulants that may reduce the risk of stimulant "overdose" include slowing use, injecting gradually, or consuming a test amount (i.e., a very small initial dose), before deciding whether to continue. This can help people planning to consume any substance, not just stimulants.^{64,65}

Knowing the risks of the substance being used.

Illicit stimulants are unregulated. As a result, dosage and purity are difficult to determine. 3,4-methylenedioxy-methamphetamine (MDMA), also called Molly or Ecstasy, is often mixed or "cut" with methamphetamine, cocaine, or synthetic cathinones when it is pressed as pills.⁶⁶ Cocaine may be mixed or "cut" with substances like levamisole, which can unpredictably increase the stimulant effects and cause skin and immune-system suppressing conditions.⁶⁷ Reports have also emerged describing stimulant products cross-contaminated with opioids.^{49,50} Prescription stimulants are produced under consumer safety regulations and have clearly marked dosages; however, counterfeit pills made by pressing illicit substances into a tablet that closely resembles prescription medications are increasingly common in the illicit drug market.⁶⁸

Testing for the presence of fentanyl.

Testing drugs and identifying the presence of fentanyl can reduce the risk of overdose, if a person takes risk reduction steps such as not using that drug, using less, or ensuring naloxone is nearby and someone is alerted to administer if needed, in response to test results.^{63,69,70} Where available, fentanyl test strips can detect the presence of fentanyl and many fentanyl analogs in a substance prior to use. Fentanyl test strips can be used to test opioids, stimulants, or prescription medications for fentanyl contamination. Fentanyl test strips are easy to use, require minimal training, and return a result within minutes. Armed with the knowledge that their drugs contain fentanyl, people can take steps to reduce their risk of opioid overdose.^{63,69,70}



Trailblazers: Virtual Connections To Save Lives

Some people may not be able to use in the presence of trusted peers. To help those who would otherwise be using alone, some harm reduction organizations have begun offering new services and technologies to provide support and ensure that emergency services will be called in the case of a suspected overdose. Smart phone apps can be used during a drug use episode and will automatically alert pre-designated persons if the app user becomes unresponsive. Some organizations allow known participants to call and remain on the phone with a trusted staff person during a drug use episode, knowing that 911 will be called to their location by the harm reductionist if they become unresponsive.

Never Use Alone (neverusealone.com) is a nation-wide service available to any person with a phone who is about to use substances alone. Never Use Alone connects the caller to a trained volunteer who will gather basic information about the caller's location, stay on the line for support during the drug use episode, and alert 911 if the caller becomes unresponsive.

Do people who use stimulants need to be worried about fentanyl in methamphetamine, powder cocaine, and crack cocaine?

Yes. Confirmed cases of fentanyl-contaminated stimulant products, usually cocaine and crack cocaine, have been recorded in major cities on the east and west coasts, meaning that people who use stimulants may be unknowingly exposed to opioids when consuming substances like cocaine and crack.^{50,71,72}

In 2018, 18 people in Philadelphia experienced an opioid overdose after smoking crack cocaine and subsequently tested positive for fentanyl.⁷³ Similar cases have been confirmed in New York City⁸⁰ involving powder cocaine and in British Columbia, Canada involving crack cocaine.⁸¹ Importantly, these cases show that people using stimulants are at risk of opioid overdose due to contaminated drugs and that smoking in lieu of injecting does not protect people who use stimulants from opioid overdose.

Fentanyl-contamination puts people who use stimulants at risk of opioid overdose, especially those who do not regularly consume opioids and have a lower opioid tolerance.⁷⁴

Community and harm reduction experts have developed the following messages to help prevent opioid overdose:

- **Use fentanyl test strips to determine whether or not fentanyl is present in stimulant products and share results with others.**^{75,76} Stimulants like methamphetamine, MDMA ("ecstasy"), and diphenhydramine (sold under the brand name Benadryl) can all trigger false positives on fentanyl test strips if not diluted to 1mg of drug or less per 1mL of water.⁷⁷ All drugs should be tested, even when purchased from someone known or 'trusted'. Fentanyl contamination can occur at many points along the drug supply chain.
- **Learn the signs and symptoms of opioid overdose.**
- **Keep naloxone nearby.**
- **Avoid using alone. Use when someone is present who could administer naloxone or call 911 if needed, or contact a trusted person to avoid using alone.**^{65,78} Never Use Alone (neverusealone.com) is a nation-wide service that connects callers to a trained volunteer who will gather basic information about the caller's location, stay on the line to support the caller if they plan to use substances alone, and alert 911 if the caller becomes unresponsive.
- **Be cautious about how much substance is used.** Begin by using a small amount to see if the drug produces unanticipated or adverse effects.^{64,65}

TESTING METHAMPHETAMINE FOR FENTANYL WITH FENTANYL TEST STRIPS

Suspected methamphetamine residue needs to be heavily diluted in water—more so than other drug products—to avoid producing a false positive with a fentanyl test strip.^{13,61} To avoid this, it is important that the solution be diluted to 1 mg of drug or less per 1 mL of water.⁷⁷ To accomplish this, the Drug Policy Alliance recommends diluting suspected methamphetamine residue in at least half a cup of water before testing.¹³

What are other risks for people who use stimulants?

The illicit drug market is unregulated.

This means that the potency, purity, and contamination levels of illicit stimulant products are unpredictable. Emerging evidence suggests that unpredictable drug supplies increase the risk of overdose.⁷⁹⁻⁸¹ During the COVID-19 pandemic and other highly disruptive emergencies, the market may be even more unpredictable.^{61,82}

Counterfeit medications are sold in the illicit drug market.

Prescription medications are more predictable than illicit drug products. Ingredients, quantities, and other safety information are clearly labeled on prescription medications, which might lead someone to choose diverted prescription stimulants (such as Dexedrine and Adderall) over illicitly manufactured stimulants (such as methamphetamine). However, products sold in the illicit drug market that appear to be prescription medications

could be counterfeit, and may contain unexpected substances like fentanyl, synthetic cannabinoids, and other psychoactive substances.⁸³⁻⁸⁵

Injection-related injury and infection

People who inject stimulants are at risk of injury or infection if they are unable to use new, sterile injection equipment every single time. Infection and injury associated with the re-use of syringes or other non-sterile injection practices include abscess, cellulitis, sepsis, and endocarditis.⁸⁶ The risk of abscess, which can cause sepsis and endocarditis if not properly managed, may be greater among individuals who inject cocaine products.⁸⁷ According to the Drug Policy Alliance, the risk of infection can be reduced by using sterile injecting equipment, rotating injection sites, allowing skin and veins time to heal before another use, and using a different route of administration.¹³

Infectious disease

Sharing injection equipment can result in the transmission of blood-borne infectious diseases, including HIV and hepatitis C. Globally, the injection of stimulants is estimated to be a major contributor to new HIV and hepatitis C infections.⁸⁸ People who smoke but do not inject stimulants are also at risk of hepatitis C infection, which can be transmitted by sharing smoking equipment with open mouth sores.⁸⁹

How can people who use stimulants be safer?

People who use stimulants need access to safer injection supplies, safer smoking and safer snorting supplies, safer sex supplies, stable housing, and safe, judgement-free healthcare and social support services.



Tailblazers: Drug User Health Van at Fenway Health

The Fenway Health (fenwayhealth.org) and mobile health van services in Boston and Cambridge, Massachusetts provide mobile harm reduction services and telehealth including buprenorphine care, via pre-paid cell phones and in-person to people in the Metropolitan areas. The Drug User Health van provides sterile syringes, naloxone, condoms, HIV testing and counseling, linkage to care, and other important sources for people experiencing homelessness and unstable housing. They specifically conduct prevention with people who use stimulants and offer safer smoking kits, “party packs” containing condoms and safer snorting materials, and present fentanyl test strip trainings and distribution for people using stimulants.⁹⁰

Sufficient quantities of safer injection equipment

Access to syringe services programs significantly reduces the risk of infectious disease, bacterial infection, injury, and overdose.⁷⁸ Syringe services programs (SSPs, also called syringe access programs or syringe exchanges) provide sterile injection equipment and many other essential services to people who use drugs. Many states have passed laws legalizing SSPs to reduce the risk of illness, overdose, and other harms among SSP participants. SSPs may also be legal in states where possession and distribution of syringes without a prescription is legal.⁹¹ The North American Syringe Exchange Network (NASEN) maintains on their website a comprehensive list of most organizations in the United States that provide access to syringes and other sterile injection equipment: <https://nasen.org/map/>.

In addition, many states permit the sale of nonprescription syringes at community pharmacies, which may provide a localized legal source of sterile syringes in places where SSPs are not authorized, where SSPs do not operate, or at a time of day when SSPs are not open.^{**92-95}

CDC supports a needs-based approach to syringe distribution, such that people who inject drugs access the number of syringes they need to ensure that a new, sterile syringe is available for each injection.⁹⁶ If people are unable to use a new syringe every time, they are at greater risk of infection, injury, and death.

Sufficient quantities of safer smoking and snorting equipment

Access to sterile smoking and snorting equipment also enables someone who uses stimulants to choose safer ways of smoking and snorting in lieu of injection. Smoking and snorting stimulants may confer less risk of disease and injury.⁹⁷ The North Carolina Harm Reduction Coalition recommends that safer smoking equipment include items like undamaged stems or pipes, mouth pieces, antiseptic wipes, antibiotic ointment, and screens or copper filters for smoking crack cocaine.⁹⁸ The People's Harm Reduction Alliance recommends that safer snorting equipment include items like clean, single use straws, plastic cutters or razorblades, saline spray, and vitamin E.⁹⁹

Fentanyl test strips and other drug checking tools

People who use stimulants may be at risk of opioid overdose due to polysubstance use and due to the growing contamination of stimulant products with fentanyl and other synthetic opioids.^{57,100} Fentanyl test strips are inexpensive, easy to use tools that are often able to detect even extremely small quantities of fentanyl in drug products.¹⁰¹ Testing methamphetamine residue with fentanyl test strips requires extra care. Other drug checking tools may also be useful where available, including community drug checking services that use portable spectrometers.^{85,101,102} As of April 7, 2021, SAMHSA and CDC grantees may use these funds to purchase drug checking equipment.¹⁰³

Safer sex supplies

Some people use methamphetamine to enhance the positive feelings of sex. Safer use of methamphetamine for sexual enhancement (a practice called "chemsex") requires not only safe and sterile administration equipment (syringes, pipes, etc.) but also safer sex supplies. The Drug Policy Alliance recommends that safer sex supplies for people who use stimulants include items like condoms, lubrication, and information about or access to safer sex services like regular screening and counselling for sexually transmitted infections.^{13,104}

Stable housing

Housing access is a major social determinant of health. People who experiencing homelessness are at greater risk for a variety of poor health and wellness outcomes. According to the Drug Policy Alliance, people who are experiencing homelessness who also use stimulants may face unique barriers to housing, such as drug testing mandates from housing programs that could bar them from supportive living situations, subsidized housing, or emergency shelters.¹⁰⁵ The San Francisco Methamphetamine Task Force, convened by the mayor in 2019 to investigate strategies for reducing the public harms of stimulant use, listed access to housing and the prioritization of people experiencing homelessness in treatment for substance use disorder among their key recommendations.¹⁰⁶

A safe and judgement-free place to discuss their needs and seek support

People who use stimulants may experience stigma from healthcare professionals, first responders, and other professionals with whom they interact.¹⁰⁷ Fear of stigma can serve as a barrier to healthcare and other essential services.¹⁰⁸ All service points, including primary health, specialized health, mental health, public health, or harm reduction, are key opportunities to address people who use stimulants with empathy, respect, and care.¹⁰⁹

** Per CDC, some pharmacies may sell needles and syringes without a prescription: <https://www.cdc.gov/hiv/basics/hiv-prevention/inject-drugs.html>. People who use drugs can familiarize themselves with state policies, which the National Harm Reduction Coalition outlines on their website: <https://harmreduction.org/issues/syringe-access/landscape-report/state-by-state/>.

What treatment options are available for people living with stimulant use disorder?

Unlike opioid use disorder, no medications have been approved by the Food and Drug Administration (FDA) for the treatment of stimulant use disorder. Numerous strategies for treating stimulant use disorders have been developed and studied. Some have been found to be moderately successful in some populations.¹⁰⁹

Psychosocial Treatments

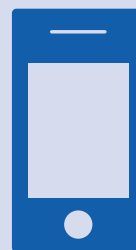
Currently, the strongest evidence supports the use of psychosocial treatments for stimulant use disorders. SAMHSA has deemed contingency management, the community reinforcement approach, motivational interviewing, and cognitive behavioral therapy to be psychosocial strategies supported by clinical evidence.⁹

Contingency management [See text box to the right] is the treatment strategy most widely supported by scientific evidence.¹⁰⁹⁻¹¹¹ Though it can take various forms, contingency management consists of providing meaningful (often, financial) rewards to individuals receiving treatment who are meeting certain treatment goals: treatment adherence, attendance at meetings and appointments, or negative urine drug screens.¹⁰⁹

Strategies that combine contingency management with cognitive behavioral therapy or a community reinforcement approach produce the best treatment outcomes in clinical studies.^{109,110,112}

Pharmacological Treatments

There are no approved, evidence-based effective pharmacological approaches for the treatment of stimulant use disorder at this time. The effects of certain medication in the treatment of stimulant use disorder are generally modest with some medications having been shown to improve treatment outcomes for some people. Although there have been some positive results for pharmacological therapy, more research is needed for FDA-approval of a medication to treat any stimulant use disorder.¹⁰⁹



IMPLEMENTING CONTINGENCY MANAGEMENT (CM)

Contingency management (CM) is an effective, evidence-based treatment for people with stimulant use disorder, according to several systematic reviews.¹⁰⁹⁻¹¹¹ Two studies suggest that new technologies and apps for implementing CM (e.g., Dynamicare, WeConnect, reSET) can reduce substance use and are available to help organize CM delivery and process participants' CM payments.^{113,114} Researchers have also proposed a variety of adaptations to facilitate CM delivery during the COVID-19 pandemic, such as implementing attendance-based incentives and the provision of incentives through pre-paid debit cards.¹¹⁵

What might first responders (police, fire, EMS) do to maintain safety at a scene where someone has used stimulants?

First responders may keep bystanders away from a person who appears to be using stimulants and is in crisis and call trained behavioral health partners to the scene.

People who have used stimulants may experience sleep deprivation or paranoia, leading to energetic or loud physical behaviors that could be interpreted as aggressive.⁹ These behavioral disturbances can be managed through rehydration, cooling, and other strategies by medical professionals to reduce the symptoms of stimulant use.¹¹⁶

Without support of behavioral health or medical support, first responders may stay alert and attempt to keep the scene from escalating until further support arrives.

Physical conflict that may cause injury or death may be avoided by:¹¹⁷

- Respecting personal space of any person who has used stimulants
- Talking calmly and concisely to identify what a person who has used stimulants wants and needs
- Avoiding provocative or threatening behaviors being mindful that nonverbal cues can escalate the situation
- Calling behavioral health or medical professionals who are trained and experienced in de-escalating and responding to people who have used stimulants

It may be very difficult or impossible for someone who has used stimulants to keep still, control their talking or movements, hear commands, or follow direct orders from a first responder.^{31-33,35} Therefore, failing to follow orders from law enforcement officers or other emergency personnel may not be signs of aggression or willful non-compliance. The person may be temporarily incapable of responding to commands.

Attempting to physically engage or physically restrain may increase the risk of injury to officers and civilians alike. Two small studies suggest people who have used

stimulants are more likely to be met by potentially lethal use of force compared to people who have not used stimulants.^{118,119} It was shown that many restraint-related deaths following police restraint were among people who used stimulants, cathinones, or synthetic cannabinoids.¹²⁰ Police, in particular, can increase their awareness of stimulant overdose symptoms and when to call EMS for medical intervention among people using stimulants who have been taken into custody to avoid these adverse effects.¹²¹

Are there health risks from occupational exposure when working with people who use stimulants or have stimulant products in their possession?

Very unlikely. Stimulant products are very unlikely to affect individuals who interact in a professional capacity with people who use stimulants or with the stimulants themselves. A study conducted among personnel from the Naval Criminal Investigation Service who regularly handle quantities of methamphetamine up to 500g for training drug detection dogs found that occupational exposure to the drug was occasionally detectable via urinalysis, but, when detected, extremely low.¹²²

Gaseous methamphetamine can accumulate in clothing, which may result in absorption of the drug through the skin; however, this scenario aligns with contexts in which methamphetamines are being produced, such as illicit laboratories, not contexts in which a person has been consuming a methamphetamine product.¹²³

Taking standard precautions (including wearing nitrile gloves, not touching one's face or eyes, and washing hands thoroughly) when handling unknown substances can help alleviate risks.¹²⁴

First responders may, however, experience other negative effects from repeated response to drug and overdose-related calls. These include increased stress and burnout.¹²⁵

Other Resources

Harm Reduction for People Who Use Stimulants

1. COVID-19, Stimulant Use, and Harm Reduction
<https://nhchc.org/wp-content/uploads/2020/05/COVID19StimulantUseHarmReduction-1.pdf>
 Guidance assembled by Vital Strategies, the National Harm Reduction Coalition, Higher Grounds Harm Reduction, and Reynolds Health Strategies on harm reduction strategies for people who use stimulants, with special focus on emergent needs during the COVID-19 pandemic.
2. What Are Harm Reduction Strategies for Methamphetamine Use?
<https://drugpolicy.org/drug-facts/harm-reduction-meth>
 Guidance from the Drug Policy Alliance that details numerous strategies for preventing stimulant overdose when using methamphetamine.
3. How To Reduce The Harms Associated with Using Cocaine
<https://drugpolicy.org/drug-facts/cocaine/reduce-harms>
 Guidance from the Drug Policy Alliance that details numerous strategies for preventing stimulant overdose when using cocaine.
4. Get Poison Control Help
<https://www.poison.org/>
 The National Capital Poison Center's website provides several resources to reduce potential harms of stimulant use, such as a pill identification tool, an online help portal, and confidential hotline information.
5. Safer Smoking
<https://www.nchrc.org/harm-reduction/crack-use/>
 The North Carolina Harm Reduction Coalition describes the supplies that they make available in a safer smoking kit. These supplies, which include a mouthpiece, rubber bands, triple antibiotic ointment, and screens, can be found elsewhere, including many local harm reduction organizations.
6. Safer Injecting
<https://harmreduction.org/issues/safer-drug-use/injection-safety-manual/preparing-equipment/>
 The National Harm Reduction Coalition provides instructions for safer injection drug use. For each type of equipment (e.g., syringes, needles, sterile water source, cooker, filter, tourniquet, and alcohol and antiseptic wipes), various options are discussed.
7. Safer Snorting
<https://drugpolicy.org/drug-facts/cocaine/reduce-harms>
 The Drug Policy Alliance lists supplies needed for safer snorting of cocaine, which are applicable for snorting of any drug.
8. Safer Sex
<https://www.cdc.gov/condomeffectiveness/index.html>
 CDC's Condom Effectiveness website describe types of and use instructions for safer sex supplies (i.e., condoms, lubricants, and dental dams).

Recognizing and Responding to Stimulant overdose (or Overamping)

1. Responding to Stimulant Overamping
<https://harmreduction.org/issues/overdose-prevention/overview/stimulant-overamping-basics/responding-to-stimulant-overamping/>
 Guidance from the National Harm Reduction Coalition on how to prevent, recognize, and respond to stimulant "overdose," with special focus on needs related to polysubstance use.

Treating Stimulant Use Disorders

1. Treatment of Stimulant Use Disorders.
https://store.samhsa.gov/sites/default/files/SAMHSA_Digital_Download/PEP21-02-01-004.pdf
 Guidance from the U.S. Substance Abuse and Mental Health Services Administration on available and emerging treatments for stimulant use disorder.
2. What are Treatment Options for People with Stimulant Use Disorder who specifically use methamphetamine?
<https://drugpolicy.org/drug-facts/meth-use-disorder-treatment>
 Guidance from the Drug Policy Alliance detailing established non-pharmacological treatments for methamphetamine use disorder.
3. What Options are Available to Treat Stimulant Use Disorder among people who specifically use Cocaine?
<https://drugpolicy.org/drug-facts/cocaine/treatment-options-cocaine-addiction>
 Guidance from the Drug Policy Alliance detailing established non-pharmacological treatments for cocaine use disorder.

Resources for First Responders

1. Preventing Emergency Responders' Exposures to Illicit Drugs.
<https://www.cdc.gov/niosh/topics/fentanyl/risk.html>
 Guidance from the U.S. Centers for Disease Control and Prevention and the National Institution of Occupational Safety and Health on basic precautions and standard safe operating procedures in the field.

References:

- Mattson CL, Tanz LJ, Quinn K, Kariisa M, Patel P, Davis NL. Trends and Geographic Patterns in Drug and Synthetic Opioid Overdose Deaths – United States, 2013–2019. *MMWR – Morbidity & Mortality Weekly Report*. 2021;70(6):202–207.
- Kariisa M, Scholl L, Wilson N, Seth P, Hoots B. Drug Overdose Deaths Involving Cocaine and Psychostimulants with Abuse Potential — United States, 2003–2017. *MMWR Morb Mortal Wkly Rep*. 2019/05/03 2019;68(17):388–395. doi:10.15585/mmwr.mm6817a3
- Hoots B, Vivolo-Kantor A, Seth P. The rise in non-fatal and fatal overdoses involving stimulants with and without opioids in the United States. *Addiction*. 2020/05 2020;115(5):946–958.
- National Institute on Drug Abuse. Prescription Stimulants DrugFacts. National Institute on Drug Abuse 2018.
- Ciccarone D. Stimulant Abuse: Pharmacology, Cocaine, Methamphetamine, Treatment, Attempts at Pharmacotherapy. *Prim Care*. 2011/03 2011;38(1):41–58. doi:10.1016/j.pop.2010.11.004
- Vasan S, Olango GJ. Amphetamine Toxicity. *StatPearls*. 2021.
- Freye E. Cocaine Intoxication: Strategy for Treatment. In: Freye E, Freye E, eds. *Pharmacology and Abuse of Cocaine, Amphetamines, Ecstasy and Related Designer Drugs: A comprehensive review on their mode of action, treatment of abuse and intoxication*. 2010:65–68.
- Strang J, Bearn J, Farrell M, et al. Route of drug use and its implications for drug effect, risk of dependence and health consequences. *Drug and Alcohol Review*. 1998 1998;17(2):197–211. doi:10.1080/09595239800187001
- Substance Abuse Mental Health Services Administration. Treatment of Stimulant Use Disorders. 2021. Treatment Improvement Protocol (TIP) Series 33. SAMHSA Publication No. PEP21-02-01-004. 2021. Accessed 2021/02/18. https://store.samhsa.gov/sites/default/files/SAMHSA_Digital_Download/PEP21-02-01-004.pdf
- Richards JR, Laurin EG. Methamphetamine Toxicity. *StatPearls*. 2020.
- Richards JR, Le JK. Cocaine Toxicity. *StatPearls*. 2021.
- National Harm Reduction Coalition. What is Overamping? Stimulant Overamping Basics 2020.
- Drug Policy Alliance. What are harm reduction strategies for meth use? Drug Policy Alliance 2021.
- Martin D, Le JK. Amphetamine. *StatPearls*. 2021.
- Kramer JC. Introduction to Amphetamine Abuse. *Journal of Psychedelic Drugs*. 2012/08/02 2012;
- Massachusetts Department of Public Health BoHCSQ. The Care of Residents with Opioid and Stimulant Use Disorders in Long-Term Care Settings. 2021. 2021. Accessed 2021/12/26. <https://www.mass.gov/doc/tip-1-understanding-opioid-use-disorder/download>
- U. S. Substance Abuse Mental Health Services Administration. Opioid Overdose. <https://www.samhsa.gov/medication-assisted-treatment/medications-counseling-related-conditions/opioid-overdose>
- Badiani A, Belin D, Epstein D, Calu D, Shaham Y. Opiate versus psychostimulant addiction: the differences do matter. *Nat Rev Neurosci*. 2011/10/05 2011;12(11):685–700. doi:10.1038/nrn3104
- Kaleta E. Chapter 14 – Central nervous system stimulants. In: Ketha H, Garg U, eds. *Toxicology Cases for the Clinical and Forensic Laboratory*. Academic Press; 2020:227–238.
- Matsumoto RR, Seminerio MJ, Turner RC, et al. Methamphetamine-induced toxicity: an updated review on issues related to hyperthermia. *Pharmacol Ther*. 2014/10 2014;144(1):28–40. doi:10.1016/j.pharmthera.2014.05.001
- United States Government Accountability Office. Drug Misuse: Most states have Good Samaritan Laws and research indicates they have positive effects. 2021. <https://www.gao.gov/assets/gao-21-248.pdf>
- Trescot AM, Datta S, Lee M, Hansen H. Opioid pharmacology. *Pain Physician*. 2008/03 2008;11(2 Suppl):S133–153.
- Laskowski LK, Landry A, Vassallo SU, Hoffman RS. Ice water submersion for rapid cooling in severe drug-induced hyperthermia. *Clin Toxicol (Phila)*. 2015/03 2015;53(3):181–184. doi:10.3109/15563650.2015.1009994
- U. S. Substance Abuse Mental Health Services Administration. SAMHSA Opioid Overdose Prevention Toolkit. 2018. HHS Publication No. (SMA) 18-4742. 2018. Accessed 2021/12/23. <https://store.samhsa.gov/sites/default/files/d7/priv/sma18-4742.pdf>
- Hedegaard H, Minino AM, Spencer MR, Warner M. Drug overdose deaths in the United States, 1999–2020. Vol. 428. 2021. NCHS Data Brief.
- National Institute on Drug Abuse. What are the short-term effects of cocaine use? National Institute on Drug Abuse 2016.
- U. S. Centers for Disease Control Prevention. Seizure First Aid. 2020.
- The Network for Public Health Law. Legal Interventions to Reduce Overdose Mortality: Naloxone Access and Overdose Good Samaritan Laws. 2018.
- Auger N, Bilodeau-Bertrand M, Labesse ME, Kosatsky T. Association of elevated ambient temperature with death from cocaine overdose. *Drug and Alcohol Dependence*. 2017 2017;178:101–105. doi:10.1016/j.drugalcdep.2017.04.019
- Bohnert ASB, Prescott MR, Vlahov D, Tardiff KJ, Galea S. Ambient temperature and risk of death from accidental drug overdose in New York City, 1990–2006. *Addiction*. 2010/06 2010;105(6):1049–1054. doi:10.1111/j.1360-0443.2009.02887.x
- Moszczynska A. Neurobiology and Clinical Manifestations of Methamphetamine Neurotoxicity. *Psychiatr Times*. 2016/09 2016;33(9):16–18.
- Ghaffari-Nejad A, Ziaadini H, Saffari-Zadeha S, Kheradmand A, Pouya F. A Study of the Phenomenology of Psychosis Induced by Methamphetamine: A Preliminary Research. *Addict Health*. 2014 2014;6(3-4):105–111.
- Rusyniak DE. Neurologic Manifestations of Chronic Methamphetamine Abuse. *Psychiatr Clin North Am*. 2013/06 2013;36(2):261–275. doi:10.1016/j.psc.2013.02.005
- Bartzokis G, Beckson M, Wirshing DA, Lu PH, Foster JA, Mintz J. Choreoathetoid movements in cocaine dependence. *Biol Psychiatry*. 1999/06/15 1999;45(12):1630–1635. doi:10.1016/s0006-3223(98)00238-8
- Asser A, Taba P. Psychostimulants and Movement Disorders. *Front Neurol*. 2015/04/20 2015;6doi:10.3389/fneur.2015.00075
- Morgan JC, Winter WC, Wooten GF. Amphetamine-induced chorea in attention deficit-hyperactivity disorder. *Mov Disord*. 2004/07 2004;19(7):840–842. doi:10.1002/mds.20081
- Tau GZ, Marsh R, Wang Z, et al. Neural correlates of reward-based spatial learning in persons with cocaine dependence. *Neuropsychopharmacology*. 2014/02 2014;39(3):545–555. doi:10.1038/npp.2013.189
- Hoffman WF, Jacobs MB, Dennis LE, et al. Psychopathy and corticostriatal connectivity: the link to criminal behavior in methamphetamine dependence. *Frontiers in psychiatry*. 2020;11:90.

39. Spronk DB, van Wel JH, Ramaekers JG, Verkes RJ. Characterizing the cognitive effects of cocaine: a comprehensive review. *Neuroscience & Biobehavioral Reviews*. 2013;37(8):1838-1859.
40. Brownstein MJ. A brief history of opiates, opioid peptides, and opioid receptors. *Proc Natl Acad Sci U S A*. 1993/06/15 1993;90(12):5391-5393. doi:10.1073/pnas.90.12.5391
41. Cicero TJ, Ellis MS, Kasper ZA. Polysubstance Use: A Broader Understanding of Substance Use During the Opioid Crisis. *Am J Public Health*. 2020 2020;110(2):244-250. doi:10.2105/AJPH.2019.305412
42. Lopez AM, Dhatt Z, Howe M, et al. Co-use of methamphetamine and opioids among people in treatment in Oregon: A qualitative examination of interrelated structural, community, and individual-level factors. *The International Journal on Drug Policy*. 2021/01/18 2021;91:103098. doi:10.1016/j.drugpo.2020.103098
43. McNeil R, Puri N, Boyd J, Mayer S, Hayashi K, Small W. Understanding concurrent stimulant use among people on methadone: A qualitative study. *Drug and Alcohol Review*. 2020/03 2020;39(3):209-215. doi:10.1111/dar.13049
44. Timko C, Han X, Woodhead E, Shelley A, Cucciare MA. Polysubstance Use by Stimulant Users: Health Outcomes Over Three Years. *J Stud Alcohol Drugs*. 2018/09 2018;79(5):799-807.
45. Lin LA, Bohnert ASB, Blow FC, et al. Polysubstance use and association with opioid use disorder treatment in the US Veterans Health Administration. *Addiction*. 2021/01 2021;116(1):96-104. doi:10.1111/add.15116
46. Jarlenski MP, Paul NC, Krans EE. Polysubstance Use Among Pregnant Women With Opioid Use Disorder in the United States, 2007–2016. *Obstetrics & Gynecology*. 2020/09 2020;136(3):556–564. doi:10.1097/AOG.00000000000003907
47. Gladden RM, O'Donnell J, Mattson CL, Seth P. Changes in Opioid-Involved Overdose Deaths by Opioid Type and Presence of Benzodiazepines, Cocaine, and Methamphetamine — 25 States, July–December 2017 to January–June 2018. *MMWR Morb Mortal Wkly Rep*. 2019/08/30 2019;68(34):737-744. doi:10.15585/mmwr.mm6834a2
48. Kariisa M, Seth P, Scholl L, Wilson N, Davis NL. Drug overdose deaths involving cocaine and psychostimulants with abuse potential among racial and ethnic groups – United States, 2004–2019. *Drug and Alcohol Dependence*. 2021/10/01/ 2021;227:109001. doi:https://doi.org/10.1016/j.drugalcdep.2021.109001
49. San Francisco Department of Public Health. Health Advisory: Possible Fentanyl Overdose Deaths Due to Stimulant Use in San Francisco. 2018. 2018. Accessed 2021/03/30. https://www.sfcdep.org/wp-content/uploads/2018/02/FentanylAdvisory_02.2018.pdf
50. San Francisco Department of Public Health. Health Advisory: Opioid Overdoses in San Francisco Due to Fentanyl-Containing “Crack Cocaine.”. 2017. 2017. Accessed 2021/03/30. https://www.sfcdep.org/wp-content/uploads/2018/01/Overdose_publichealthadvisory_05082017-id1176.pdf
51. Baker R, Leichtling G, Hildebran C, et al. “Like Yin and Yang”: Perceptions of Methamphetamine Benefits and Consequences Among People Who Use Opioids in Rural Communities. *J Addict Med*. 2021/02/01 2021;15(1):34-39. doi:10.1097/ADM.0000000000000669
52. McCrae K, Tobias S, Tupper K, et al. Drug checking services at music festivals and events in a Canadian setting. *Drug and Alcohol Dependence*. 2019/12/01 2019;205:107589. doi:10.1016/j.drugalcdep.2019.107589
53. Wheeler E, Jones TS, Gilbert MK, Davidson PJ, Centers for Disease C, Prevention. Opioid Overdose Prevention Programs Providing Naloxone to Laypersons – United States, 2014. *MMWR Morbidity and mortality weekly report*. 2015/06/19 2015;64(23):631-635.
54. Naumann RB, Durrance CP, Ranapurwala SI, et al. Impact of a community-based naloxone distribution program on opioid overdose death rates. *Drug and Alcohol Dependence*. 2019/11/01 2019;204:107536. doi:10.1016/j.drugalcdep.2019.06.038
55. Perri M, Kaminski N, Bonn M, et al. A qualitative study on overdose response in the era of COVID-19 and beyond: how to spot someone so they never have to use alone. *Harm Reduction Journal*. 2021/08/05 2021;18(1):85. doi:10.1186/s12954-021-00530-3
56. Neira-León M, Barrio G, Bravo MJ, et al. Infrequent opioid overdose risk reduction behaviours among young adult heroin users in cities with wide coverage of HIV prevention programmes. *The International Journal on Drug Policy*. 2011/01 2011;22(1):16-25. doi:10.1016/j.drugpo.2010.06.003
57. Peppin JF, Raffa RB, Schatman ME. The Polysubstance Overdose-Death Crisis. *J Pain Res*. 2020 2020;13:3405-3408. doi:10.2147/JPR.S295715
58. National Center for Health Statistics. Vital Statistics Rapid Release – Provisional Drug Overdose Data. Centers for Disease Control and Prevention 2021.
59. Stam NC, Gerostamoulos D, Gerstner-Stevens J, et al. Determining the effective dose of street-level heroin: A new way to consider fluctuations in heroin purity, mass and potential contribution to overdose. *Forensic Sci Int*. 2018/09 2018;290:219-226. doi:10.1016/j.forsciint.2018.07.009
60. Schiller EY, Goyal A, Mechanic OJ. Opioid Overdose. *StatPearls*. 2021.
61. Strategies V, Coalition NHR, Reduction HGH, Strategies RH. COVID-19, Stimulant Use, and Harm Reduction. 2020. 2020. Accessed 2021/04/19. <https://nhhc.org/wp-content/uploads/2020/05/COVID19StimulantUseHarmReduction-1.pdf>
62. Humbolt Area Center for Harm Reduction. Overamping Overdose Prevention. 2018.
63. Peiper NC, Clarke SD, Vincent LB, Ciccarone D, Kral AH, Zibbell JE. Fentanyl test strips as an opioid overdose prevention strategy: Findings from a syringe services program in the Southeastern United States. *International Journal of Drug Policy*. 2019/01/01 2019;63:122-128. doi:10.1016/j.drugpo.2018.08.007
64. Desmon S. Go Slow: Using Harm-Reduction Messages to Save Lives in Baltimore. Johns Hopkins Center for Communication Programs 2018.
65. Center for Drug Use and HIV Research. Preventing Unintentional Drug Overdose (Research for Implementation Brief #6). 2019.
66. National Institute on Drug Abuse. MDMA (Ecstasy/Molly) DrugFacts. 2020. National Institute on Drug Abuse. 2020/06/15. Accessed 2021/09/15. <https://www.drugabuse.gov/publications/drugfacts/mdma-ecstasymolly>
67. Solomon N, Hayes J. Levamisole: A High Performance Cutting Agent. *Acad Forensic Pathol*. 2017/09 2017;7(3):469-476. doi:10.23907/2017.039
68. Han Y, Yan W, Zheng Y, Khan MZ, Yuan K, Lu L. The rising crisis of illicit fentanyl use, overdose, and potential therapeutic strategies. *Transl Psychiatry*. 2019/11/11 2019;9(1):282. doi:10.1038/s41398-019-0625-0
69. Park JN, Frankel S, Morris M, et al. Evaluation of fentanyl test strip distribution in two Mid-Atlantic syringe services programs. *The International Journal on Drug Policy*. 2021/08 2021;94:103196. doi:10.1016/j.drugpo.2021.103196

70. Park JN, Tomko C, Silberzahn BE, Haney K, Marshall BDL, Sherman SG. A fentanyl test strip intervention to reduce overdose risk among female sex workers who use drugs in Baltimore: Results from a pilot study. *Addictive Behaviors*. 2020/11 2020;110:106529. doi:10.1016/j.addbeh.2020.106529
71. Armenian P. Notes from the Field: Unintentional Fentanyl Overdoses Among Persons Who Thought They Were Snorting Cocaine — Fresno, California, January 7, 2019. *MMWR Morbidity and Mortality Weekly Report*. 2019 2019;68doi:10.15585/mmwr.mm6831a2
72. Canning P, Doyon S, Ali S, et al. Using Surveillance With Near-Real-Time Alerts During a Cluster of Overdoses From Fentanyl-Contaminated Crack Cocaine, Connecticut, June 2019. *Public Health Rep*. 2021/12 2021;136(1_suppl):185-235. doi:10.1177/00333549211015662
73. Khatri UG, Viner K, Perrone J. Lethal Fentanyl and Cocaine Intoxication. *New England Journal of Medicine*. 2018/10/31 2018;doi:10.1056/NEJMc1809521
74. Hughto JMW, Gordon LK, Stopka TJ, et al. Understanding opioid overdose risk and response preparedness among people who use cocaine and other drugs: Mixed-methods findings from a large, multi-city study. *Subst Abus*. 2021/07/06 2021;1-14. doi:10.1080/08897077.2021.1946893
75. Krieger MS, Goedel WC, Buxton JA, et al. Use of rapid fentanyl test strips among young adults who use drugs. *The International Journal on Drug Policy*. 2018/10/12 2018;e-pub ahead of printdoi:10.1016/j.drugpo.2018.09.009
76. Rouhani S, Park JN, Morales KB, Green TC, Sherman SG. Harm reduction measures employed by people using opioids with suspected fentanyl exposure in Boston, Baltimore, and Providence. *Harm Reduction Journal*. 2019/06/24 2019;16(1):39. doi:10.1186/s12954-019-0311-9
77. Lockwood T-LE, Vervoordt A, Lieberman M. High Concentrations of Illicit Stimulants and Cutting Agents Cause False Positives on Fentanyl Test Strips. *Harm Reduction Journal*. doi:10.21203/rs.3.rs-91530/v1
78. Carroll JJ, Green TC, Noonan RK. Evidence-Based Strategies for Prevention Opioid Overdose: What's Working in the United States. 2018.
79. Carroll JJ, Rich JD, Green TC. The protective effect of trusted dealers against opioid overdose in the U.S. *International Journal of Drug Policy*. 2020/04/01 2020;78:102695. doi:10.1016/j.drugpo.2020.102695
80. Ataiants J, Roth AM, Mazzella S, Lankenau SE. Circumstances of Overdose Among Street-Involved, Opioid-Injecting Women: Drug, Set, and Setting. *The International journal on drug policy*. 2020/04 2020;78:102691. doi:10.1016/j.drugpo.2020.102691
81. Zibbell JE, Aldridge AP, Cauchon D, DeFiore-Hyrmer J, Conway KP. Association of Law Enforcement Seizures of Heroin, Fentanyl, and Carfentanil With Opioid Overdose Deaths in Ohio, 2014-2017. *JAMA Netw Open*. 2019/11/01 2019;2(11):e1914666. doi:10.1001/jamanetworkopen.2019.14666
82. Ali F, Russell C, Nafeh F, Rehm J, LeBlanc S, Elton-Marshall T. Changes in substance supply and use characteristics among people who use drugs (PWUD) during the COVID-19 global pandemic: A national qualitative assessment in Canada. *The International Journal on Drug Policy*. 2021/07 2021;93:103237. doi:10.1016/j.drugpo.2021.103237
83. Carroll County Health Department. Alert: Counterfeit Street Pills and Fentanyl-related Overdoses in Carroll County. 2016.
84. Lavitt J. Fentanyl-Laced Counterfeit Pills Are Infiltrating Drug Market, DEA Warns. *The Fix*2016.
85. Tobias S, Shapiro AM, Grant CJ, Patel P, Lysyshyn M, Ti L. Drug checking identifies counterfeit alprazolam tablets. *Drug and Alcohol Dependence*. 2021/01/01 2021;218:108300. doi:10.1016/j.drugalcdep.2020.108300
86. Larney S, Peacock A, Mathers BM, Hickman M, Degenhardt L. A systematic review of injecting-related injury and disease among people who inject drugs. *Drug and Alcohol Dependence*. 2017/02/01 2017;171:39-49. doi:10.1016/j.drugalcdep.2016.11.029
87. Lloyd-Smith E, Kerr T, Hogg RS, Li K, Montaner JSG, Wood E. Prevalence and correlates of abscesses among a cohort of injection drug users. *Harm Reduction Journal*. 2005/11/10 2005;2(1):24. doi:10.1186/1477-7517-2-24
88. Cepeda JA, Vickerman P, Bruneau J, et al. Estimating the contribution of stimulant injection to HIV and HCV epidemics among people who inject drugs and implications for harm reduction: A modeling analysis. *Drug and Alcohol Dependence*. 2020/06/24 2020;213:108135. doi:10.1016/j.drugalcdep.2020.108135
89. Shannon K, Rusch M, Morgan R, Oleson M, Kerr T, Tyndall MW. HIV and HCV Prevalence and Gender-Specific Risk Profiles of Crack Cocaine Smokers and Dual Users of Injection Drugs. *Substance Use & Misuse*. 2008/01/01 2008;43(3-4):521-534. doi:10.1080/10826080701772355
90. Fenway Health. Access: Drug User Health Program Goes Mobile During Pandemic – Fenway Health: Health Care Is A Right, Not A Privilege. 2020.
91. U. S. Centers for Disease Control Prevention. Syringe Services Programs (SSPs) FAQs. Centers for Disease Control and Prevention2019.
92. U. S. Centers for Disease Control Prevention. Laws Related to the Retail Sale of Syringes/Needles. *Viral Hepatitis*2017.
93. Crawford ND, Amesty S, Rivera AV, HARRIPERSAUD K, Turner A, Fuller CM. Community Impact of Pharmacy-Randomized Intervention to Improve Access to Syringes and Services for Injection Drug Users. *Health Educ Behav*. 2014/08 2014;41(4):397-405. doi:10.1177/1090198114529131
94. Fuller CM, Ahern J, Vadnai L, et al. Impact of increased syringe access: preliminary findings on injection drug user syringe source, disposal, and pharmacy sales in Harlem, New York. *J Am Pharm Assoc (Wash)*. 2002/12 2002;42(6 Suppl 2):S77-82. doi:10.1331/1086-5802.42.0.s77.fuller
95. Green TC, Stopka T, Xuan Z, et al. Examining nonprescription syringe sales in Massachusetts and Rhode Island community pharmacies. *Journal of the American Pharmacists Association*. 2021/07/01 2021;61(4):e237-e241. doi:10.1016/j.japh.2021.03.004
96. U. S. Centers for Disease Control Prevention. Needs-Based Distribution at Syringe Services Programs. 2020.
97. Kral AH, Lambdin BH, Browne EN, et al. Transition from injecting opioids to smoking fentanyl in San Francisco, California. *Drug and Alcohol Dependence*. 2021/10/01/ 2021;227:109003. doi:https://doi.org/10.1016/j.drugalcdep.2021.109003
98. North Carolina Harm Reduction Coalition. Safer Crack Use. *NC Harm Reduction Coalition*2021.
99. Jaywork C. Harm Reduction Advocates Are Now Giving Out Snort Kits. *Seattle Weekly*2016.
100. DiSalvo P, Cooper G, Tsao J, et al. Fentanyl-contaminated cocaine outbreak with laboratory confirmation in New York City in 2019. *Am J Emerg Med*. 2021/02 2021;40:103-105. doi:10.1016/j.ajem.2020.12.002

101. Green TC, Park JN, Gilbert M, et al. An assessment of the limits of detection, sensitivity and specificity of three devices for public health-based drug checking of fentanyl in street-acquired samples. *International Journal of Drug Policy*. 2020/03/01 2020;77:102661. doi:10.1016/j.drugpo.2020.102661
102. Ti L, Tobias S, Lysyshyn M, et al. Detecting fentanyl using point-of-care drug checking technologies: A validation study. *Drug & Alcohol Dependence*. 2020 2020;212:108006.
103. U. S. Substance Abuse Mental Health Services Administration. Federal Grantees May Now Use Funds to Purchase Fentanyl Test Strips. 2021.
104. Belani H, Chorba T, Fletcher F, et al. Integrated prevention services for HIV infection, viral hepatitis, sexually transmitted diseases, and tuberculosis for persons who use drugs illicitly: summary guidance from CDC and the US Department of Health and Human Services. *Morbidity and Mortality Weekly Report: Recommendations and Reports*. 2012;61(5):1-43.
105. Drug Policy Alliance. Stimulant Use: Harm Reduction, Treatment, and Future Directions: Conference Report. 2017. 2017. Accessed 2021/04/19. https://drugpolicy.org/sites/default/files/dpa_report_stimulant_harm_reduction_0.pdf
106. San Francisco Methamphetamine Task Force. San Francisco Methamphetamine Task Force Final Report 2019. 2019. 2019. Accessed 2021/04/19. https://www.sfdph.org/dph/files/MethTaskForce/Meth%20Task%20Force%20Final%20Report_FULL.pdf
107. Woodhead EL, Timko C, Han X, Cucciare MA. Stigma, Treatment, and Health among Stimulant Users: Life Stage as a Moderator. *J Appl Dev Psychol*. 2019/02 2019;60:96-104. doi:10.1016/j.appdev.2018.11.005
108. Adams JM, Volkow ND. Ethical Imperatives to Overcome Stigma Against People With Substance Use Disorders. *AMA J Ethics*. 2020/08/01 2020;22(1):E702-708. doi:10.1001/amajethics.2020.702
109. Ronsley C, Nolan S, Knight R, et al. Treatment of stimulant use disorder: A systematic review of reviews. *PLoS One*. 2020 2020;15(6):e0234809. doi:10.1371/journal.pone.0234809
110. De Crescenzo F, Ciabattini M, D'Alò GL, et al. Comparative efficacy and acceptability of psychosocial interventions for individuals with cocaine and amphetamine addiction: A systematic review and network meta-analysis. *PLoS Med*. 2018/12/26 2018;15(12) doi:10.1371/journal.pmed.1002715
111. Brown HD, DeFulio A. Contingency management for the treatment of methamphetamine use disorder: A systematic review. *Drug and Alcohol Dependence*. 2020/11/01 2020;216:108307. doi:10.1016/j.drugalcdep.2020.108307
112. AshaRani PV, Hombali A, Seow E, Ong WJ, Tan JH, Subramaniam M. Non-pharmacological interventions for methamphetamine use disorder: a systematic review. *Drug and Alcohol Dependence*. 2020/07/01 2020;212:108060. doi:10.1016/j.drugalcdep.2020.108060
113. DeFulio A, Rzeszutek MJ, Furgeson J, Ryan S, Rezania S. A smartphone-smartcard platform for contingency management in an inner-city substance use disorder outpatient program. *J Subst Abuse Treat*. 2021/01 2021;120:108188. doi:10.1016/j.jsat.2020.108188
114. Dallery J, Stinson L, Bolívar H, et al. mMotiv8: A smartphone-based contingency management intervention to promote smoking cessation. *J Appl Behav Anal*. 2021/01 2021;54(1):38-53. doi:10.1002/jaba.800
115. Zastepa E, Sun JC, Clune J, Mathew N. Adaptation of contingency management for stimulant use disorder during the COVID-19 pandemic. *J Subst Abuse Treat*. 2020/11 2020;118:108102. doi:10.1016/j.jsat.2020.108102
116. Isoardi KZ, Ayles SF, Harris K, Finch CJ, Page CB. Methamphetamine presentations to an emergency department: Management and complications. *Emerg Med Australas*. 2019/08 2019;31(4):593-599. doi:10.1111/1742-6723.13219
117. Richmond JS, Berlin JS, Fishkind AB, et al. Verbal de-escalation of the agitated patient: consensus statement of the American Association for Emergency Psychiatry Project BETA De-escalation Workgroup. *Western Journal of Emergency Medicine*. 2012;13(1):17.
118. Bailey CA, Smock WS, Melendez AM, El-Mallakh RS. Conducted-Energy Device (Taser) Usage in Subjects With Mental Illness. *Journal of the American Academy of Psychiatry and the Law Online*. 2016/06/01 2016;44(2):213-217.
119. Strote J, Walsh M, Auerbach D, Burns T, Maher P. Medical conditions and restraint in patients experiencing excited delirium. *Am J Emerg Med*. 2014/09 2014;32(9):1093-1096. doi:10.1016/j.ajem.2014.05.023
120. Karch SB. The problem of police-related cardiac arrest. *J Forensic Leg Med*. 2016/07 2016;41:36-41. doi:10.1016/j.jflm.2016.04.008
121. Saito T, Takeichi S, Nakajima Y, Yukawa N, Osawa M. Fatal methamphetamine poisoning in police custody. *J Clin Forensic Med*. 1996/12 1996;3(4):183-185. doi:10.1016/s1353-1131(96)90025-5
122. Stout PR, Horn CK, Klette KL, Given J. Occupational exposure to methamphetamine in workers preparing training AIDS for drug detection dogs. *J Anal Toxicol*. 2006/10 2006;30(8):551-553. doi:10.1093/jat/30.8.551
123. Morrison G, Shakila NV, Parker K. Accumulation of gas-phase methamphetamine on clothing, toy fabrics, and skin oil. *Indoor Air*. 2015/08 2015;25(4):405-414. doi:10.1111/ina.12159
124. U. S. Centers for Disease Control Prevention. Preventing Emergency Responders' Exposures to Illicit Drugs. Illicit Dugs, Including Fentanyl 2020.
125. Pike E, Tillson M, Webster JM, Staton M. A mixed-methods assessment of the impact of the opioid epidemic on first responder burnout. *Drug and Alcohol Dependence*. 2019/12/01/ 2019;205:107620. doi:https://doi.org/10.1016/j.drugalcdep.2019.107620

