

Use of Drug-Checking Technologies in Community-based Programming to Support Harm Reduction and Reduce Overdose

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Background

The current overdose epidemic in the United States is largely driven by the saturation of fentanyl in the illicit opioid market.¹ Fentanyl, a substance added to heroin that decreases its purity, has recently been found in other illicit drugs as well, including as a contaminant to stimulants (e.g., cocaine and methamphetamine) and counterfeit prescription pills (e.g., benzodiazepines or opioids).^{2,3} Other novel, dangerous substances have also begun appearing in illicit market supplies. For instance, many areas of the country have reported finding xylazine (or “tranq dope”), a strong sedative typically used for horses or cattle in illicit drug supplies.⁴ In addition, “wasps” (or “wasp dope”), a methamphetamine look-alike made by electrocuting Raid or other wasp sprays, are increasingly being sold or used as methamphetamine.⁵ These rapid changes to the potency and purity of the illicit drug supply increase the risk of fatal and nonfatal overdoses and of other drug-related harms (e.g., abscesses, infectious disease). To reduce drug-related harms, people who use illicit substances are engaging in strategies to better navigate a rapidly changing drug supply.^{6,7} One such strategy is drug checking—the use of technologies that help people who use illicit substances determine the contents, purity, and sometimes potency of their drugs.

Drug-checking technologies present the opportunity for people who use illicit substances to make better-informed decisions. While many different entities use drug-checking technologies (e.g., law enforcement), this publication focuses on the use of drug-checking technologies among community-based organizations.

How Drug Checking Affects Behavior

Across qualitative and quantitative studies, people who use illicit substances consistently report that they want access to drug-checking services and that drug checking makes them feel more protected against overdose (Peiper et al., 2019,⁸ and Duhart Clarke et al., 2022⁹). Most U.S. studies on how drug checking affects people’s behavior have centered around the use of fentanyl test strips (FTSs). (The use of FTSs for community drug checking were discussed in more detail in a 2021 webinar, which can be viewed [here](#)). These studies show that when people who use illicit substances use FTSs, they not only feel that they are better able to protect themselves from overdose but also are more likely to change their drug use behavior—when engaging in drug checking with FTSs, people are more likely to engage in safer use strategies like using less of the drug than usual; performing a “tester shot”; ensuring that someone is around to administer naloxone, if necessary; and telling their peers or even the person

who sold them the drugs that the drugs tested positive for fentanyl.^{10, 11, 12, 13, 14, 15} Furthermore, people who use illicit substances report engaging in many of these behaviors even when the FTS result is negative, demonstrating that the act of drug checking can encourage the person to pause, think about their drug use, and increase the likelihood of engaging in safer use strategies.¹⁶

Not only can drug checking serve as a harm reduction strategy by directly informing people who use illicit substances about the contents of their drugs, it also can inform people's own abilities to discern what is in their drugs through visual inspection.^{17, 18, 19} The process of drug checking can help individuals better recognize properties specific to certain substances (e.g., color, texture) and thus recognize their presence in their drug supplies and adjust their behavior accordingly.^{20, 21} People's abilities to discern what is in their drugs is especially important when drug checking services may not be available to them.

It should be noted that many studies on FTS use and people's perceptions of FTSs were conducted 5 or more years ago, when fentanyl was first being introduced to the drug market on a large scale. As fentanyl has saturated the illicit market, many people who use illicit drugs have either learned to identify the presence of fentanyl in their drugs or expect that fentanyl will regularly be present in any illicit opioids that they buy. Thus, some people who use illicit drugs no longer see the utility of FTSs. Community-based organizations that are considering implementing a drug-checking program might first conduct an assessment among the clientele they serve to determine which test strips would be most helpful.

Types of Drug-Checking Technologies

Test Strips

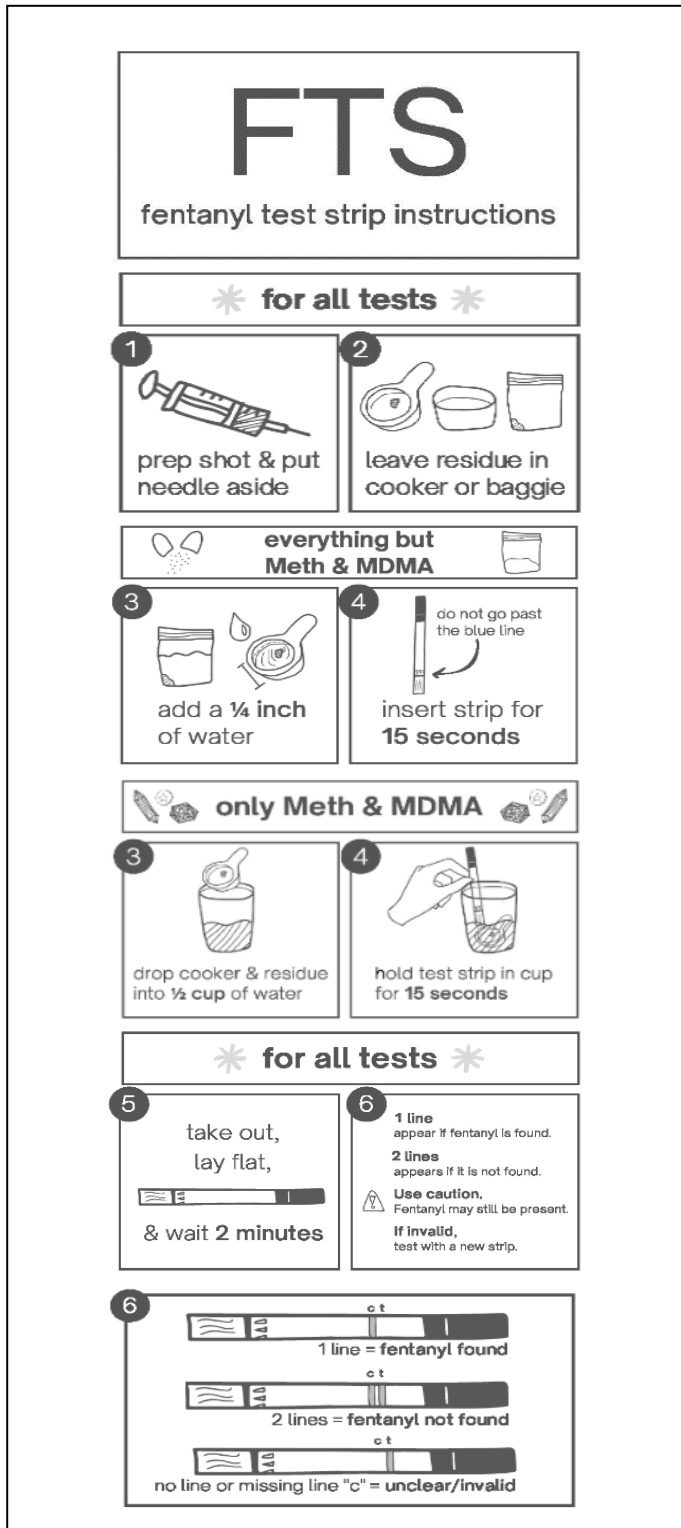
Currently, test strips are one of the most popular drug-checking tools in the country. Although test strips for many types of substances (e.g., heroin, methamphetamine) are available, FTSs are the most widely used. As the illicit drug supply continues to radically fluctuate, it is likely that more places will

consider distributing test strips for substances other than fentanyl. For example, as xylazine is increasingly being found as a contaminant to illicit drugs across the United States, more places are implementing xylazine test strip distribution in their community-based programming. In addition, many people use heroin test strips, methamphetamine test strips (MTSs), and other types of test strips to confirm that their drugs are what they think they are, rather than just testing for the presence of unwanted contaminants. For example, in areas where "wasp dope" is sometimes being sold as methamphetamine, MTSs may help people determine whether their drugs are actually methamphetamine and not crystalized wasp spray.

Test strips check for the presence or absence of a certain substance. Figure 1 shows illustrated instructions for using FTSs. To use the FTS, the person must first prepare the drugs to be tested by obtaining a small sample of the drug or drug residue, separating it from the rest of the drug supply, and diluting it with a certain amount of water. It is important to separate the sample from the rest of the drug supply, as the drug should not be used after it has come into contact with a test strip. The test strip is dipped into the drug and then laid flat for up to 2 minutes. To read the result, the person looks at how many lines appear on the strip.

The most substantial limitation of test strips is that they only detect the presence or absence of a substance; they do not indicate the amount or potency of the substance. As noted above, many people who use illicit drugs report that they already anticipate the presence of fentanyl in their drugs; what they really need to know is how much and what kind, as drugs can contain varying levels of fentanyl (e.g., a drug sold as heroin could be completely fentanyl, or it could be heroin contaminated with fentanyl) and knowing the amount of fentanyl present in their drugs can better inform decisions.^{22, 23} Another limitation of the use of FTSs specifically is the phenomenon of "chocolate chipping," which refers to the way in which fentanyl molecules bind to each other.

Figure 1. Instructions for Using Fentanyl Test Strips



When this happens, it can create “pockets” of fentanyl in the drug, similar to pockets of chocolate in chocolate chip cookies. If the tested sample of the drug does not contain a pocket of fentanyl, a false negative result is more likely from the FTS. In addition, certain drugs have a higher likelihood of false positives. For example, drugs containing methamphetamine can chemically interact with the FTS to create a positive result when fentanyl is not actually present. One way to alleviate the issue of false positives with methamphetamine is to test with slightly more water (see figure 1).

Mass Spectrometry

Mass spectrometry is often referred to as the “gold standard” of drug checking, as it provides the most complete description of a drug’s contents and potency. A sample of the drug is put into a spectrometer, which measures precise molecular mass to determine all substances present and the amount or proportion of each one. Mass spectrometry is currently the only drug-checking technology that can provide this high level of detail for the contents of a drug sample.

Programs that want to provide mass spectrometry drug-checking services must buy a mass spectrometer and engage a specialist available to operate it. Mass spectrometers typically cost \$3,000–\$100,000, a barrier for many organizations. In addition, many organizations (especially smaller grassroots organizations) do not have a mass spectrometry specialist on staff and would have to hire or partner with someone who can operate the machine. Mass spectrometry also requires that the drug checking occur in a static location, as the machine is not easy to move. Thus, this method poses logistical limitations, as people either need to physically bring their drug samples to a specific location for testing or they need to wait for their results after sending in their sample for testing.

Example From the Field: Philadelphia, Pennsylvania

In Philadelphia, Pennsylvania, multiple organizations have come together to provide drug-checking services to the local community. Initial drug-checking services began with FTSS when fentanyl first started entering the illicit market on a wide scale as an adulterant to heroin. Based on initial findings and feedback from the community, additional test strips to check for other synthetic substances (e.g., xylazine, benzodiazepines) were distributed to people who use drugs. These initial test strip distribution efforts aimed to combat the increased number of poisonings in the city, as more and more of the drug supply became contaminated with unfamiliar synthetic substances. Eventually, the Southeastern Pennsylvania Transit Authority reached out to the team providing test strips to offer access to its mass spectrometry (FTIR) machine. Transit police had acquired the machine in the early 2000s as part of efforts to prevent anthrax poisoning but decided to offer it as a drug-checking device after witnessing increases in drug poisonings on public transit systems.

Between 2019 and 2021, the Center for Forensic Science, the Philadelphia Department of Health, and the Pennsylvania Harm Reduction Network came together to implement a more widescale mass spectrometry pilot program throughout Philadelphia. This program now operates with three main goals: (1) to facilitate regional test strip distribution that is tailored for each county to provide the test strips that would be most helpful for the drug market in that area; (2) to provide quantitative drug-checking data to the local medical community, public health officials, and harm reduction workers to inform withdrawal management, field efforts, and other services for people who use drugs; and (3) to employ anticipatory intelligence of the drug market to lessen the impact of tainted drugs, mitigate the risk of overdose, and educate community members and leaders on appropriate responses to the current drug crisis. To accomplish this, the program partners with multiple local organizations, including syringe services programs, hospitals, emergency response services, public safety, health agencies, and people who use drugs. Program leadership indicates that these partnerships are essential for getting sufficient drug samples to understand the local drug market and to inform local efforts to reduce harms associated with illicit drug use.

For more information about the Philadelphia drug-checking program, [click here](#) for the COSSUP-hosted webinar conducted in May 2023.

Resources and Recommendations for Next Steps

Community-based organizations interested in implementing drug-checking programming may benefit from training and technical assistance (TTA), including general harm reduction training for organizations not yet familiar with providing harm reduction services. [The National Harm Reduction Technical Assistance Center](#), hosted by the Centers for Disease Control and Prevention (CDC) and the Substance Abuse and Mental Health Services Administration (SAMHSA), provides free technical assistance to entities who are currently providing, or are planning to provide, harm reduction services to their communities. In addition, the [National Harm Reduction Coalition](#) is a national nonprofit organization that has been providing harm reduction TTA for more than three decades. Its website contains online resources for understanding and implementing drug-checking services, as well as for responding to requests for TTA; resources to find other harm reduction programs; and ongoing updates to best practices in harm reduction. For information about FTSS specifically, and for information more tailored for Comprehensive Opioid, Stimulant, and Substance Use Program (COSSUP) grantees, the COSSUP resource page includes [this compilation of resources](#) about FTSS. Finally, for a quick web-based resource on drug-checking technologies, Interior Health Canada provides a [one-page fact sheet](#) on the difference between Fourier transform infrared (FTIR) spectroscopy and FTSS.

Another aspect that community-based organizations interested in using drug-checking technologies may consider concerns local policies around drug checking and paraphernalia. One barrier to implementing FTSS, specifically (as well as drug checking, generally), is paraphernalia laws, which can classify drug-checking equipment as paraphernalia. However, as the body of evidence for the utility of drug-checking services builds, more jurisdictions are modifying their paraphernalia laws to allow for the distribution, possession, or use of drug-checking tools. The [Legislative Analysis and Public Policy Association's report on FTSS](#) provides more information

on the current legal landscape for FTS distribution in the United States.

Prior to implementing drug-checking programming, community-based organizations might reach out to harm reduction organizations in their areas to learn what drug-checking services are already available. If drug-checking programming is already available in the area and is already providing services to the targeted population(s), organizations may consider collaborating with existing programs to expand services rather than starting another local drug-checking program.

Endnotes

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Visit the Comprehensive Opioid, Stimulant, and Substance Use Program (COSSUP) Resource Center at www.cossup.org.

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