

# Fentanyl Overdose Reduction Checking Analysis Study

FORECAST

FEBRUARY 6, 2018

### **Johns Hopkins Bloomberg School of Public Health**

Susan G. Sherman, PhD MPH, Principal Investigator  
Ju Nyeong Park, MHS, Study Director  
Jennifer Glick, PhD MPH, Qualitative Researcher  
Tricia Christensen, MPP, Field Supervisor  
Kenneth Morales, BA, Data Manager

### **Rhode Island Hospital**

Traci C. Green, PhD MSc, Co-Principal Investigator  
Michelle McKenzie, MPH, Project Manager

### **Collaborating Organizations**

*Baltimore City Police Department*  
*Boston Public Health Commission*  
*Bruker Corporation*  
*BTNX*  
*Providence Police Department*  
*Rhode Island Department of Health*  
*Rhode Island State Public Health Laboratory, Drug Chemistry Unit*  
*ThermoFisher Scientific*

Suggested citation: Sherman, S.G., Park, J.N., Glick, J., McKenzie, M., Morales, K., Christensen, T., Green, T.C. (2018)  
FORECAST Study Summary Report. Johns Hopkins Bloomberg School of Public Health.

# Acknowledgements

We are grateful to the collaboration of Baltimore Police Department, the Rhode Island Department of Health and the Public Health Laboratory, the Providence Police Department, ThermoFisher Scientific, and Bruker Corporation, without whom, this project would not have been possible.

We are especially grateful to Josh Sharfstein, Michelle Spencer, Dori Henry, Joseph Moy, Ewa King, Leslie Nolan, Robin Fortunati, Eric Struth, Shankar Gautam, Bill Clark, Robert Heimer, Michael Gilbert, Steven O'Dell, Ken Jones, Rachel Lucas, Meghan Melnyk, Lindsay Armstrong, Mike Nagle, Kerstin Barr, and Fred Morris.

We are also grateful to the field team: Aubri Esters, Kimberly Pognon, Katie Clark, Sherri-Chanelle Brighthaupt, Chantal Clough, Katherine Haney, Meredith Kerr and Brad Silberzahn.

We also thank Brandon Marshall, William Matthews and Tino Fuentes for their important contributions to how and what we asked people who use drugs around fentanyl use.

## BACKGROUND

# The Fentanyl Crisis



Life expectancy in the United States has declined for two years in a row, largely driven by the opioid epidemic. Overdoses claimed more than 64,000 lives in 2016 and all indications are that the impact of the crisis in 2017 will be even greater. Fentanyl, a synthetic opioid that is 50 to 100 times more potent than morphine, is the primary cause of the rapid increase in overdose deaths. Fentanyl and its associated analogues (including carfentanyl, furanyl fentanyl, and acetyl fentanyl) have been found mixed with heroin, cocaine and pressed into counterfeit prescription drugs. In 2015, the Drug Enforcement Agency issued a nationwide alert calling fentanyl a “threat to health and public safety.” Recently, the Centers for Disease Control and Prevention reported that fentanyl and associated analogues were associated with over half of the opioid overdoses in ten states during the second half of 2016.

The potential of death from even small amounts of fentanyl has changed the landscape of opioid use in the United States. Evidence to date suggests that people who use drugs often do not know whether fentanyl is present in what they are about to consume. A recent study among 242 heroin users across 17 sites in British Columbia, Canada, found that 29% tested positive for fentanyl, 73% of whom did not report knowingly using fentanyl.

To explore the viability of a public health response to the fentanyl crisis, the Bloomberg American Health Initiative awarded funding to support the Fentanyl Overdose Reduction Checking Analysis Study (FORECAST). This study aimed to examine the accuracy of three technologies in identifying the presence of fentanyl in samples of illicit drugs. It also aimed to gauge whether people who use drugs and other stakeholders would be interested in using such technology as part of harm reduction programs.

---

<sup>1</sup>U.S. Drug Enforcement Agency. DEA issues nationwide alert on fentanyl as threat to health and public safety. 18 March 2015. Accessed January 18, 2018 online at <https://www.dea.gov/divisions/hq/2015/hq031815.shtml>

<sup>2</sup>Centers for Disease Control and Prevention. Fentanyl involved in over half of opioid deaths in 10 states. 27 October 2017. Accessed January 18, 2018 online at <https://www.cdc.gov/media/releases/2017/s1027-fentanyl-deaths.html>.

<sup>3</sup>Amlani A, McKee G, Khamis N, Raghukumar G, Tsang E, Buxton JA. Why the FUSS (Fentanyl Urine Screen Study)? A cross-sectional survey to characterize an emerging threat to people who use drugs in British Columbia, Canada. *Harm Reduct J*. 2015 Nov 14;12:54.



# The Concept of “Drug Checking”

“Drug checking” is a service that chemically analyzes drug samples and provides results to people who use drugs so that they can take steps to protect themselves. The results are also available to organizations or agencies to inform understanding of the drug supply. In some cases, the chemical analysis is on-site with immediate results; in other cases, people who use drugs leave a small sample of drugs for testing and retrieve the results online or by phone using a code; other variations provide training to people who use drugs and hand out simple testing materials to use on their own. The use of drug checking in the United States has been limited primarily to event-based field testing for MDMA and other synthetics commonly associated with raves or similar events.

The inconsistency of the drug supply and the lethality of fentanyl have increased interest in drug checking. Recently, several syringe services programs in the United States, as well as Insite, the supervised injection facility in Vancouver, B.C., have distributed one form of drug checking, fentanyl testing strips, to people who use drugs. This technology was originally developed to test the presence of fentanyl in urine samples; data on the accuracy of testing of drug samples for personal quantities of drugs are lacking, hindering broader scale-up as part of a public health response to the opioid crisis.

# The FORECAST Study

FORECAST had three phases, conducted between April 2017 and November 2017: (1) evaluating drug checking technologies; (2) interviewing people who use drugs; and (3) interviewing key informants from organizations that work with people who use drugs.

# Phase 1

In the study's first phase, we tested the ability of three technologies to assess for the presence of fentanyl in street drug samples, compared to a gold standard for this type of analysis, a Gas Chromatograph/Mass Spectrometer. These technologies were:

- The BTNX fentanyl testing strips. These strips are based on an immunoassay to detect the presence or absence of fentanyl. An immunoassay utilizes the bonding of an antibody with an antigen to signal the presence of a substance. The strips are simple to use, with the results easy to read.
- The TruNarc machine. This machine uses Raman Spectroscopy and can provide results on the presence of fentanyl in a sample. Raman Spectroscopy detects molecular vibrations to determine the chemical makeup of a substance. This machine was tested with and without a Surface Enhanced Raman Spectroscopy (SERS) kit to improve detection. The TruNarc can detect many controlled substances and cutting agents, based on the library to which it matches scanned results.
- The Bruker Alpha machine. This machine uses Fourier-transform infrared spectroscopy (FTIR) and can provide results about the quantity of fentanyl and other components in a sample. FTIR Spectroscopy uses infrared light to determine the properties of a substance. We tested the Bruker Alpha using libraries specific to controlled substance and cutting agents, to compare scans. The performance may improve with the addition of other libraries or as additional substances are added to existing libraries. When used for drug checking, the Bruker Alpha can detect the main components, differentiates drug mixtures, and gives the percent composition of the substance, based on the libraries to which it matches scanned results.

For each technology, we determined the lowest concentration (or percent amount for the Bruker Alpha) that could be detected (known as the detection limit), as well as the ability to detect fentanyl when it was present (sensitivity) and when it was not present (specificity) in street drug samples provided for this research study by the Baltimore and Providence Police Departments. The BTNX fentanyl testing strips and TruNarc were tested in Baltimore at the Baltimore City Police Department Forensic Laboratory against 52 known positive and 52 known negative samples. These technologies as well as the Bruker Alpha II were tested in Rhode Island at the Rhode Island State Public Health Laboratory, Drug Chemistry Unit, against 54 known positive and 52 known negative samples.

## FINDING 1

Fentanyl testing strips had the lowest detection limit and the highest sensitivity and specificity for fentanyl of the technologies assessed.

TECHNOLOGY	DETECTION LIMIT	SENSITIVITY		SPECIFICITY	
		Rhode Island Lab	Baltimore Lab	Rhode Island Lab	Baltimore Lab
BTNX Fentanyl Testing Strips (immunoassay)	0.13 micrograms/ml	96%	100%	90%	98%
TruNarc (Raman Spectroscopy)	25 micrograms/ml	4% (61% with SERS kit)	4% (39% with SERS kit)	100% (92% with SERS kit)	98% (92% with SERS kit)
Bruker Alpha (FTIR Spectroscopy)	3-4% weight, which is comparable to TruNarc	83%		90%	

In addition to testing for the presence or absence of fentanyl, we conducted an initial assessment of whether the devices would recognize fentanyl analogues (2 acetyl fentanyl alone, 1 furanyl fentanyl alone, and 1 furanyl fentanyl in combination with heroin). On all 4 samples, the BTNX fentanyl testing strips detected the presence of fentanyl. The TruNarc with the SERS kit and the Bruker Alpha detected three of the four fentanyl analogs.

## Phase 2

In the study's second phase, we conducted interviews with 335 people who use drugs recruited in communities in Baltimore, Boston, and Providence. People who use drugs were invited to complete an anonymous survey on drug use history, experiences with fentanyl, and overdose history, among other topics. In addition to interest in drug checking services, this phase examined socio-demographic characteristics, drug use and overdose histories, fentanyl knowledge and experiences, and currently employed harm reduction strategies. This phase was approved by the Johns Hopkins Bloomberg School of Public Health and the Rhode Island Hospital Institutional Review Boards. The sample included 59% men, had a median age of 43 years, and were 45% white and 41% African-American. The majority reported having used heroin (89%) or cocaine (94%) in the past 6 months. A high percentage reported ever having experiencing homelessness (68%), nearly two-thirds (64%) reported having ever experienced an overdose, and more than two in five (42%) reported having ever witnessing a fatal overdose.

### **FINDING 2**

The vast majority of people who use drugs have a high degree of concern about fentanyl in the drug supply.

84% of respondents were concerned about the drugs they use having fentanyl in them. Of 256 respondents who thought they had consumed fentanyl, 85% said they wished they had known beforehand. Contradicting the idea that people who use drugs are actively looking for fentanyl, only about one in four (26%) stated a preference for drugs with fentanyl.



Of all respondents, 85% desired to know about the presence of fentanyl before using drugs, with 73% expressing moderate to high interest. Drug checking was viewed as an important means of overdose prevention, with 89% agreeing that it would make them feel better about protecting themselves from overdose. Interest in drug checking was associated with having witnessed an overdose and recently using a drug thought to contain fentanyl. In addition to the presence or absence of fentanyl, a large majority of respondents were interested in knowing the amount of fentanyl (86%) and the presence of other substances (87%).

### **FINDING 3**

The vast majority of people who use drugs are interested in fentanyl checking as a product safety measure.

### **FINDING 4**

The majority of people who use drugs would modify their drug use behaviors if their drugs tested positive for fentanyl.

Across all sites, 70% of respondents reported that knowing that their drugs contained fentanyl would lead them to modify their behavior. This could include not using the drugs, using the drugs more slowly, or using the drugs with others who have naloxone. It could also include changing their purchasing behaviors.

## Phase 3

In the study's third phase, we interviewed 32 key informants from organizations that work with people who use drugs, to explore their interest in implementing drug checking services in their organization and potential barriers to doing so. Key informants represented a range of service providers at health departments, treatment facilities and community-based organizations and leaders of peer groups and family advocacy organizations. This phase was approved by the Johns Hopkins Bloomberg School of Public Health and the Rhode Island Hospital Institutional Review Boards.

### FINDING 5

Key informants support the concept of drug checking with the goals of providing needed information to people who use drugs and serving as a point for greater engagement in services, including syringe services programs and treatment for substance use disorder.

Service providers supported drug checking as a way to connect with people who use drugs, provide education, and potentially engage them in other services, including syringe services programs and treatment for substance use disorder. They were enthusiastic about the ease of use of the test strips, the potential for incorporating drug checking into existing harm reduction services, and even allowing people who use drugs to use the strips themselves.

For example, one informant, an executive director of a harm reduction organization said: "Any education is education, and just the fact that people who use drugs are able to use a strip by themselves or be trained and then use a strip by themselves is empowering, and I think that's really a lot of what we were trying to do. And it's humanizing."

In addition to support for the test strips, some key informants expressed the view that more detailed information about the nature of the drugs beyond the presence or absence of fentanyl would be helpful to individuals, such as the cutting agents and quantity of drug it contained, which could be provided by the Bruker Alpha.

## FINDING 6

Key informants have questions about the legality and logistics of drug checking.

Key informants identified additional issues about the implementation of drug checking services, including the potential legal liability and possible security risks of performing the drug checking (such as attracting law enforcement), especially at the point of service.



# Recommendations

The initial results of this study provide support for drug checking as a public health approach to the fentanyl crisis. Drug checking strategies are reliable, practical and very much desired by those at greatest risk of overdose. Drug checking services have the potential to facilitate access to treatment for substance use disorders and other essential services, as well as provide real-time data about local drug supplies for public health surveillance. Our results inform several recommendations:

## Recommendation 1

Public health and harm reduction agencies should address logistical questions and implement anonymous drug checking as part of a public health strategy to save lives from fentanyl.

Most service agencies should be able to distribute or deploy fentanyl testing strips, using them in a supervised setting or providing access to these materials for people who use drugs in an outreach context. Fentanyl testing strips require minimal training to use properly and can be worked into drug preparation rituals and processes. Another drug checking approach could involve community access to a Bruker Alpha machine at a fixed or a secured mobile location where trained personnel are on hand to assist in using the machine and interpreting its results.

## Recommendation 2

Harm reduction counseling, health education and connection to services including treatment for substance use disorder should be part of any drug checking program.

It is critical that all who engage with drug checking services understand the limitation of these testing mechanisms: there still can be false positive and false negative results, and the presence of other toxic contaminants may go undetected. Other key safety messages include being prepared to call for help or 911, the importance of using drugs in the presence of others, always keeping several doses of naloxone on hand (especially as more than one dose may be needed to reverse a fentanyl-involved overdose) and using drugs slowly by pacing consumption or taking smaller test amounts to understand the potency of the product being consumed. These drug checking services should engage people with lived experiences in their planning and implementation. Where possible, drug checking services should provide supportive opportunities for individuals to access effective, evidence-based services including naloxone, syringe services, treatment for substance use disorders and naloxone.

## Recommendation 3

Research, philanthropic, syringe service programs and overdose prevention agencies should support pilot programs seeking to test, evaluate and scale-up drug checking services as part of a comprehensive approach to addressing the opioid and overdose epidemic.

## **Recommendation 4**

Entities in the private sector should continue to develop mobile technologies for effective drug checking.

There is a need for durable, easy-to-use, portable testing instruments to detect and quantify drugs, including fentanyl and fentanyl analogs, in small quantities and when mixed with other substances.

## **Recommendation 5**

Public health surveillance efforts should include information about local trends in the drug supply, such as those available through drug checking, to inform timely and accurate responses.

Beyond the utility of drug checking to individuals who use drugs, real-time information on trends in the drug supply at the population-level gathered through drug checking can inform greater understanding and more timely and effective responses to the fentanyl crisis.