Published in final edited form as:

Int J Drug Policy. 2018 October ; 60: 82–88. doi:10.1016/j.drugpo.2018.08.004.

Being “hooked up” during a sharp increase in the availability of illicitly manufactured fentanyl: Adaptations of drug using practices among people who use drugs (PWUD) in New York City

C. McKnight* and D.C. Des Jarlais

New York University, College of Global Public Health, 665 Broadway, 8th floor, New York, NY 10012, United States

Abstract

Illicitly manufactured fentanyl (IMF), a category of synthetic opioids 50–100 times more potent than morphine, is increasingly being added to heroin and other drugs in the United States (US). Persons who use drugs (PWUD) are frequently unaware of the presence of fentanyl in drugs. Use of heroin and other drugs containing fentanyl has been linked to sharp increases in opioid mortality. In New York City (NYC), opioid-related mortality increased from 8.2 per 100,000 residents in 2010 to 19.9 per 100,000 residents in 2016; and, in 2016, fentanyl accounted for 44% of NYC overdose deaths. Little is known about how PWUD are adapting to the increase in fentanyl and overdose mortality. This study explores PWUDs’ adaptations to drug using practices due to fentanyl. In-depth qualitative interviews were conducted with 55 PWUD at three NYC syringe services programs (SSP) about perceptions of fentanyl, overdose experiences and adaptations of drug using practices.

PWUD utilized test shots, a consistent drug dealer, fentanyl test strips, naloxone, getting high with or near others and reducing drug use to protect from overdose. Consistent application of these methods was often negated by structural level factors such as stigma, poverty and homelessness. To address these, multi-level overdose prevention approaches should be implemented in order to reduce the continuing increase in opioid mortality.

Keywords

Fentanyl; Heroin; Harm reduction; Overdose

Background

Illicitly manufactured fentanyl (IMF), a category of short-acting opioids containing non-pharmaceutical fentanyl and non-pharmaceutical fentanyl analogs, ranges in potency from

*Corresponding author at: New York University, College of Global Public Health, 665 Broadway, 8th floor, New York, NY 10012, United States. courtney.mcknight@nyu.edu (C. McKnight).

Conflicts of interest
None.

Declarations of interest
None.

50 to 100 times that of morphine (Suzuki & El-Haddad, 2017). IMF (henceforth referred to as fentanyl) is increasingly being used as an additive to heroin and other drugs in the United States (US), (Administration & Division, 2016; CDC Health Action Network, 2016; CDC Health Alert Network, 2015; Ciccarone, 2017; Prekupec, Mansky, & Baumann, 2017; Sutter et al., 2017; Tomassoni et al., 2017). In 2014, fentanyl represented 4% of the opioids submitted to the Drug Enforcement Administration (DEA) laboratory system (Drug Enforcement Administration, 2015), compared to 66% in 2017 (Drug Enforcement Administration Special Testing & Research Laboratory, 2017b) and 74% in the first quarter of 2018 (Drug Enforcement Administration Special Testing & Research Laboratory, 2018). Further, in some illicit drug markets in the US, fentanyl is believed to be replacing heroin altogether (U.S. Department of Justice Drug Enforcement Administration, 2017).

In addition to heroin, fentanyl has also been detected as an additive in other drugs, including cocaine (Drug Enforcement Administration Special Testing & Research Laboratory, 2017a; New York City Department of Health & Mental Hygiene, 2017a; Tomassoni et al., 2017), methamphetamine (New York City Department of Health & Mental Hygiene, 2017b), ketamine (New York City Department of Health & Mental Hygiene, 2017b) and counterfeit opioid analgesics (CDC Health Action Network, 2016; Drug Enforcement Administration Special Testing & Research Laboratory, 2017a; Drug Enforcement Administration, 2016; New York City Department of Health & Mental Hygiene, 2017b; Sutter et al., 2017; Tomassoni et al., 2017) and benzodiazepines (New York City Department of Health & Mental Hygiene, 2017b). These data suggest that fentanyl may be reaching opioid naïve PWUD, which could further increase overdose risk.

Between 2015–2016, seventeen different fentanyl analogs were identified in the US through drug seizures (Drug Enforcement Administration & Control Division, 2017). These analogs ranged in potency from 1.5 to 10,000 times that of morphine (Prekupec et al., 2017; Suzuki & El-Haddad, 2017). Primarily manufactured in labs in China and brought into the US via mail or smuggled from Mexico (U.S. Department of Justice Drug Enforcement Administration, 2017), fentanyl and its analogs are visually indiscernible from one another, making it difficult to detect differences between them without thorough laboratory testing (Suzuki & El-Haddad, 2017). Persons who use drugs (PWUD) are often unaware when drugs are “cut”, or mixed with fentanyl (Carroll, Marshall, Rich, & Green, 2017; Macmadu, Carroll, Hadland, Green, & Marshall, 2017; Mars, Ondocsin, & Ciccarone, 2017; Spies et al., 2016; Stogner, 2014). Consequently, use of drugs containing fentanyl have been linked to sharp increases in rates of opioid morbidity and mortality (Centers for Disease Control & Prevention, 2017; Daniulaityte et al., 2017; Katz, 2017; Marshall et al., 2017; O'Donnell, Halpin, Mattson, Goldberger, & Gladden, 2017; Rudd, Aleshire, Zibbell, & Gladden, 2016; Rudd, Seth, David, & Scholl, 2016; Slavova et al., 2017).

In New York City (NYC), despite the implementation of a multipronged approach to stem the tide of opioid mortality, including increasing the availability of buprenorphine treatment, expansion of naloxone distribution, reducing opioid prescribing, a citywide public awareness campaign, a rapid response investigation of overdose “outbreaks” and a peer-based non-fatal overdose response system to prevent future overdoses, the rate of opioid mortality remains unabated (The City of New York Office of the Mayor, 2017). Between 2010–2016, opioid

mortality rose from 8.2 per 100,000 residents to 19.9 per 100,000 residents in NYC, largely due to fentanyl (Goodman, 2018; Paone, Tuazon, Nolan, & Mantha, 2016). Prior to 2015, fentanyl accounted for less than 3% of NYC overdose deaths annually, increasing to 16% in 2015 and 44% in 2016 (Paone & Kunins, 2016). While the majority of overdose deaths involving fentanyl in NYC were mixed with heroin (61%) in 2016, 37% were a combination of cocaine and fentanyl, without heroin, an increase from 11% in 2015 (Press Release: Health Department Warns New Yorkers about Cocaine Laced with Fentanyl; Occasional Users at High Risk for Overdose, 2017). Finally, data collected from illicit drug seizures, compiled by the National Forensic Laboratory Information System (NFLIS), also indicate a sharp increase in the prevalence of fentanyl in drug seizures in NYC. Between 2015–2016, fentanyl seizures in NYC increased from 214 to 1,699, representing a 694% increase in just one year (Press Release: Health Department Warns New Yorkers about Cocaine Laced with Fentanyl; Occasional Users at High Risk for Overdose, 2017).

As opioid-related mortality has increased, many harm reduction, drug treatment and other public health programs have provided layperson overdose prevention trainings, including education about risk factors, practical tools for responding to an overdose, such as training on naloxone administration, and harm reduction strategies PWUD can employ to lower overdose risk (Wheeler, Jones, Gilbert, Davidson, & Centers for Disease Control and Prevention (CDC), 2015). Some of the strategies recommended include: use one drug at a time, test the potency of the drug by using a small amount, and use with another person in case of emergency (Wheeler, Burk, McQuie, & Stancliff, 2012). A limited number of harm reduction programs in the US have also begun to distribute fentanyl test strips (FTS) to PWUD. Designed for urinalysis testing, FTS are being used off-label to test for the presence of fentanyl in drug solutions. While FTS have been found to possess a high degree of sensitivity and specificity, detecting very low concentrations of fentanyl (Sherman & Green, 2018), some have expressed concern that the high sensitivity of the test could lead to complacency if users of FTS repeatedly receive positive results with no associated effect (McGowan, Harris, Platt, Hope, & Rhodes, 2018).

Research regarding potential changes in PWUDs' drug using behaviors due to the increased prevalence of fentanyl is scant. In an investigation of the changing landscape of heroin in Baltimore, including the emergence of fentanyl, Mars et al found that some PWUD were using test shots, or smaller doses of drugs to gauge potency, and others were carrying naloxone and/or using in the company of others in order to prevent fatal overdose (Mars et al., 2017). Similarly, in a study of persons who inject drugs (PWID) in Baltimore, Chicago, Massachusetts, New Hampshire and San Francisco, Mars et al found that PWID utilized a variety of drug sampling methods to gauge heroin potency, including snorting and tasting, test shots, half dose shots and following friends' assessment of the potency and amount of heroin to use (Mars, Ondocsin, & Ciccarone, 2018). In an investigation of perceptions of fentanyl in Providence, RI, Carroll et al found that PWUD were employing a variety of methods to reduce their risk of overdose, including using test shots, relying on a trusted drug dealer in order to ensure a more predictable high, using prescription opioids instead of heroin, snorting drugs instead of injecting them and initiating buprenorphine treatment to stop drug use altogether (Carroll et al., 2017). This paper presents findings from an in-depth

qualitative study of the ways in which PWUD who are “hooked up”, or physically dependent on opioids, are adapting to the ongoing increase in fentanyl and opioid mortality in NYC.

Methods

People who use drugs were recruited from three New York City (NYC) syringe services programs (SSP) to take part in a study about their experiences with fentanyl. SSP were located in three NYC neighborhoods: (1) South Bronx, (2) Brighton Beach, Brooklyn and (3) Downtown Brooklyn. Potential study participants were identified by SSP staff via convenience sampling, based on staff knowledge about their experiences with fentanyl. Individuals were then referred to the researcher to verify study eligibility (i.e., individuals with personal experience with fentanyl, or suspected fentanyl; or individuals that have witnessed another individual using fentanyl, or suspected fentanyl; 18 years of age; and fluent English speakers), and provide study consent. The researcher administered a short, quantitative questionnaire about demographics, drug use history and experiences with overdose, followed by a longer, semi-structured interview that was audio-recorded for the purpose of transcription. Topics for the semi-structured interview included: current drug use, perceptions of fentanyl, experiences with fentanyl and adaptations of drug using practices due to fentanyl and overdose. Interviews lasted between 20–40 min and participants were compensated \$15 for their time. The study was approved by the Mount Sinai Institutional Review Board and a Federal Certificate of Confidentiality was obtained to provide further confidentiality protections. Pseudonyms have been used throughout this paper to protect the identity of study participants.

Descriptive statistics of demographic variables collected in the quantitative survey were calculated using SAS Statistical Software, version 9.4. Transcription of qualitative interviews was provided by a third party service and interviews were coded by the lead researcher using Atlas.ti software, version 8.0. Exploratory interview methods were utilized to capture the breadth of PWUDs’ experiences with fentanyl, and inductive, thematic analysis was conducted to categorize them (Guest, MacQueen, & Namey, 2012). These methods allowed for both the investigation of a priori questions, as well as discussion and identification of emergent ideas and patterns.

Results

Between February–August 2017, fifty-five PWUD were interviewed for this study. As described in Table 1, slightly more than half of the sample was recruited from the Bronx. The mean age of participants was 47, and two-thirds were male. Study participants could identify by race and/or ethnicity. Half of the sample identified as Hispanic, close to one-third White and a quarter Black. The average age of first drug use was 16 years, first opioid use was 21 and first injection was 24. Most study participants’ first drug used was marijuana (62%), and an overwhelming majority currently injected drugs (85%). Heroin via injection was the most commonly used drug and administration route. The majority of participants had witnessed an overdose at some point in their lives (89%); however, less than half had ever overdosed (40%).

How PWUD are adapting to the increase in fentanyl and overdose

Most PWUD in this study attended at least one overdose prevention training and were familiar with the risk factors for overdose and ways to respond. However, as the prevalence of fentanyl has increased in NYC, PWUD report becoming more circumspect, modifying their drug using practices to include harm reduction methods such as test shots, using the same dealer, using fentanyl test strips, reducing drug use, carrying naloxone and getting high with at least one other person or where others are present in order to prevent overdose.

Test shots

...instead of doing a bag you're just going to use a little bit. You know, less than half of the bag and just do that That's what you call a test shot And if it's bad, it won't hit you as bad as doing a whole bag you know? You probably will survive.

(Terrence, 56 year old man, injecting heroin for 12 years)

A handful of PWUD reported using test shots every time they injected heroin or fentanyl, whereas others only reported using them if something about their drugs looked different, or if they were warned by a dealer or someone else that the heroin was new or potent. For Marcus, a 48 year old man who has been injecting heroin for 27 years, a recent overdose on what he suspects was fentanyl has led him to be more cautious: "...so what I do right now you know, since that happened, like see that day I used it all at once. You know, so now what I'm trying to practice is when I do do it at home and I'm in my room or in the bathroom, what I do is you know, when I do draw it up what I do is put a little bit. You know, I leave it in my arm. And I'll push a little bit after I get the blood, I push it in. And I leave it. I might take a five, you know, and then I put it in and see how I react. See how it's going in my arm, cause that day like I said it started with my arm. So I see how it is. If it's bothering my arm, if it's heating up I'll take it out."

Similarly, Jim, a 43 year old man who has been injecting heroin for 22 years and recently had a frightening experience with heroin that he suspects contained fentanyl, describes how he usually tests his drugs when injecting: "I try to – when I do it, I'll only put a little bit at a time. I don't just run the whole needle. I'll put a little bit in and see if it's all right. I always get high with my brother, so I get high first, and I'll tell him it's all right. Then he'll get high." Jim reports using test shots regularly, whereas Elizabeth, a 47 year old woman who has been injecting heroin for 30 years and never overdosed, only uses test shots when she suspects that something is different about her heroin:

CM: So have you always done a test shot or did you start doing that like...

Elizabeth: No, no. Like I do it if I see the funny, I see the funny, then I do a test shot.

CM: But back in the day were you doing that if you saw...

Elizabeth: No.

CM: So when did you start doing that?

Elizabeth: When people started to fall out with the fentanyl. You know, like about six months ago. Because I've been clean for a minute, I'm just starting. I can't just go zoom, because I can catch an overdose, so I do little by little. And that's how I progress myself to getting high.

Similar to Elizabeth, Suzanne, a 55 year old woman who has been injecting heroin since she was 14 and has never overdosed, uses test shots intermittently, usually when her dealer warns her that his heroin is from a new package. Here Suzanne describes how, in such a case, she and her partner get high one after the other and use test shots: "If it's something new, we always do a little bit at a time, one at a time, first, always. He always goes first, and then I go."

Among PWUD who reported using test shots, most were using them sporadically rather than each time they injected, often because of noticeable differences in the texture or color of heroin, or information provided by their dealer about a change in the potency of heroin.

Use the same dealer

When you shoot dope, you'd better know your dealer.

(Gabriel, 62 year old man, injecting heroin for 35 years)

Some PWUD reported using the same dealer because their dealer will warn them about potent heroin or heroin containing fentanyl. For some PWUD, they believed these warnings kept them safe; however, for others, dealers' warnings were not enough to prepare them for the increased potency of the drug.

Bill, a 50 year old man who has been injecting heroin for 20 years and using the same dealer throughout, explains his loyalty to his dealer, "he does the heroin himself too so he makes sure he gets the same stuff all the time. I'll wait for him. If he can't get it for a day or two, I mean, I'll take off work and stay home sick waiting for him to get. He won't buy from no one but his connect because he knows it's not cut with pills or nothing and you know what I mean, this is the type of person. That's why I've been dealing with him so long. This is how these other guys I hang out with...they'll run to someone new and they'll end up ODing, this and that."

While Bill believes using the same dealer is the reason he has never overdosed, Kim, a 42 year old woman who has been injecting heroin for 7 years and tries to only use one dealer, describes how variation in the cut and potency of her dealer's heroin caused her to overdose: "So we went to go and buy the bag, and I was hearing people talk about the fentanyl and how people was overdosing. But I figured that because I go to his place all the time that I didn't never thought they would cut it up with fentanyl, you know, because I never had problems you know, buying their product. [...] So I go, and I buy two bags for me and I buy my husband two bags. I just thank god that I didn't do the two bags. Cause I don't think it would have been no coming back. I think I just actually would have just died. So I did one bag before my husband even did his. So I went into the overdose first."

Similarly, Mary, a 42 year old woman who has been injecting heroin for 21 years, described how even though her dealer warned her about having a new package of heroin, the variation in potency led to her partner's overdose:

CM: And did you buy it from someone you normally buy from?

Mary: Yeah, yeah. Someone I go to every day. They didn't know.

CM: Was it stamped?

Mary: Uh-huh.

CM: Okay. And was it a stamp you've used before?

Mary: For a long time.

CM: Oh, really?

Mary: Yeah. But it was a new batch.

While some PWUD believe that using the same dealer will result in open communication, a more consistent high and potential protection from overdose, others put little faith in dealers. Terrence, a 56 year old man who has been injecting heroin for 12 years, describes his skepticism, "You can know your dealer, but you don't know what's in the bag. Okay? So and that's why there's so many overdoses. Because people don't know what they're buying."

Fentanyl test strips (FTS)

...in about a two-week period, we had four overdoses; two in the office, and two very close to the office. They were all participants. I think it shook everybody. [...]
So a lot more people started – hey give me some test strips.

(Danielle, 41 year old woman, injecting heroin for 6 years)

At the time of data collection, only one site included in this study provided FTS to participants¹. A handful of PWUD reported trying them, oftentimes after experiencing a different sensation when getting high. While most study participants at this site reported that FTS might help prevent future overdoses by warning PWUD about potent heroin, two study participants reported receiving positive results without any associated effect from the presence of fentanyl in their drugs.

Hector, a 36 year old who has been injecting heroin since he was 18, believes that FTS might be helpful in reducing overdose, an issue that he thinks needs increased attention: "It can happen to anybody, you know what I'm saying? Be careful what you buy. Make sure you don't get fentanyl...Ask the person if they're selling fentanyl, straight up. If not, test it, with the strips. I believe they should get more of those strips to people so they can test the drugs".

¹One other NYC syringe exchange program was using FTS at the time of this study, but they were not a recruitment site.

Danielle, who educates PWUD about FTS and believes they provide useful information for PWUD about their drugs, describes that after seeing drugs other than heroin test positive for fentanyl, she decided to start testing her cocaine:

So that was really the first time that I was like, well, just let me check it. Also, too, I would have thought that if what I was using was cut with fentanyl, I would feel something. [...] I didn't feel anything. So obviously it's cut with fentanyl, but I don't think to a high extreme. But because of that, even just testing positive once, I've been taking more precautions and testing more frequently. Like I said, I've never tested it, over the last four or five months, and had it come up negative.

Even though Danielle's cocaine consistently tested positive for fentanyl, she never experienced any opioid-like effects, which led her to hypothesize that the amount of fentanyl in her drugs was likely insignificant. Regardless, Danielle reported using her drugs more cautiously, which is the intended effect of FTS. For Brian, a 43 year old man who has been injecting heroin for 22 years and whose heroin frequently tested positive for fentanyl, with little to no change in the high he experienced, the lack of information that FTS provided was frustrating: "So that's why my biggest thing with the fentanyl test strips and all this – I'm like, yes, it's positive; but how much? That's what I really – how much of it is? Give me a percentage, because I honestly think it's very low. I really do."

Reducing or stopping drug use

I'm scared to do a bag. Some days because of the fentanyl, it brings a lot of overdoses, a lot Especially in 2016, a lot of people died on overdoses, a lot That's why my using went down a lot.

(Sam, 32 year old man, injecting heroin for 11 years)

A handful of PWUD reported that changes in the cut of heroin and negative experiences with fentanyl caused them to reduce their drug use or stop it altogether. For Sam, who used to use drugs every day, fear about overdose due to the increased potency of heroin led him to reduce his drug use to about once a week. Marcus, a 48 year old male who has been injecting heroin for 27 years, describes a similar motivation for reducing his drug use, "I'm trying to use less. I'm trying to just stop completely. Because heroin is not heroin anymore, you know, so I'm scared of that right now."

For other PWUD, negative experiences with overdose led them to stop using heroin altogether. Kim, a 42 year old woman who overdosed five months prior to being interviewed, and whose husband overdosed in the same manner the next day, described how those experiences have impacted her, "I haven't done heroin since...I have grandkids and everything. And that's a scary thing for me. I really don't want to die that way. And I know drugs ain't right, whatever, but sometimes people don't understand how hard it is to get off." For Frank, a 38 year old man who has been injecting heroin for 5 years and never overdosed, but has revived others using naloxone, the prevalence of fentanyl has also caused him to stop using heroin. Here Frank describes the impact that seeing people overdose and knowing fentanyl is around is having on him, "I don't want to use no more. I don't want to take up that wrong bag. I don't want to buy a couple bags thinking it's good. It might be fentanyl mixed

in with some coke and end up dying. So yeah, I changed. It changed my whole way of thinking. I'm not using no more."

Using with or near others

...that fentanyl is not good; it's not – it doesn't make the drug pure. What it is it makes the drug potent And so if you don't know what you're doing and you don't practice the buddy system, you might not come back from that.

(Edwin, 48 year old man, injecting heroin for 35 years)

Public health messaging regarding overdose prevention has emphasized that PWUD use drugs in the company of others or where others are present. While PWUD acknowledge this message, some report that they still prefer to use alone. Regardless, for some PWUD, their living situation dictates where they use drugs, and in some cases, the way they respond to an overdose. For more stably housed PWUD, using drugs at home is often preferred, although it can increase the risk of a fatal overdose if no one is present to administer naloxone and/or call 911. Ken, a 35 year old man who has been injecting heroin for 9 years, lives alone but takes precautions when using at home. Here Ken describes how he gave naloxone to his neighbor in case he overdoses: "I gave it to my neighbor. If I intend to do a bag I haven't done, a stamp I haven't done before, I'll be like, can you check on me in five minutes or something, you know." For other PWUD, using near others, often in more public places, rather than home alone has become a safer alternative. Robert, a 49 year old man who has been injecting heroin for 10 years, lives alone and used to primarily get high at home. However, after recently blacking out while high on heroin at home, Robert now occasionally gets high in a restroom at a social service program:

CM: Do you get nervous about using by yourself, like because of that?

Robert: At times maybe. That's why I come here, at times. They don't know – there's nobody over there to save me if something happens. If I get something, I say let me go try it over there, because if something happens you know, they're monitoring the bathroom all the time.

For homeless PWUD, using in public locations is often the only option. Mary, a 42 year old woman who has been injecting heroin for 21 years and is currently homeless, also prefers to get high in the restroom at social service programs because she knows people will check on her. Anna, a 41 year old woman who has been injecting heroin for 6 years and lives in a family shelter with her husband, prefers to get high in her room, but explains that after a recent overdose in her room, she feared she would lose her housing because the paramedics came:

Anna: They were like, "You just had an overdose. We had to hit you with Narcan." They wanted me to go to the hospital, but I told them no. They were going to want to investigate what happened, so I was like, "No, I'm not going to the hospital."

CM: Were you in the shelter when it happened?

Anna: Yeah. You see the shelter we're at? It's a room. There are still people – like the super. There are staff that come in that could find out. They see me coming out on a stretcher, they're going to investigate what happened. I didn't go because I wasn't worried about myself; I didn't go because I was afraid we were going to lose our room.

While some PWUD preferred to use their drugs at home and take precautions such as asking others to check in on them, other PWUD, including those with stable housing, chose to use in more public locations to increase the likelihood that someone would call 911 or administer naloxone if they overdosed. For other PWUD with less stable housing, responding to an overdose by calling 911 was a significant risk, as it could potentially lead to eviction.

Carry naloxone

At least if we have the naloxone, it will help.

(Suzanne, 55 year old woman, injecting heroin for 41 years)

Experience with naloxone was widespread among PWUD in this study. Over two-thirds reported carrying naloxone with them at least half of the time and several people reported being revived with it or using it on others. While most PWUD carried naloxone in case they needed to use it on others, or for someone to use on them, Jim, whose younger brother lives at their parents' house, shares his naloxone with his parents: "I actually have a younger brother. He had OD'd, so I had to bring the Narcan that I had – bring it to my mom – so she has it, and show her how to use it; and my dad."

Having naloxone accessible provided a sense of security for many PWUD. Marcus, who overdosed twice in the previous four months on heroin he suspects contained fentanyl, describes how although he prefers to use alone in his room at the shelter, he takes precautions by keeping naloxone accessible for his roommate: "I put it right on my mattress where I stay at. So I put my Narcan kit right there. He knows about it. [...] So yeah, he knows how to use it. So if he goes to the bathroom and I'm out he can just grab it from the bed, and just do what he has to do."

For other PWUD living in the shelter system, carrying naloxone can bring unwanted attention and stigma. Mike, for example, describes why he does not carry naloxone:

Mike: I can't do it. I cannot bring that in my shelter. Or if I do bring it, they know, they say, oh, this guys [sic] does heroin, because of that. So they label you because – so I avoid being labeled.

CM: Would the shelter allow you to bring the Narcan in?

Mike: No, that's the thing. They don't allow you. Especially if they got the needle on it.

Even though training on naloxone administration was widespread and the majority of study participants carried it with them, for some PWUD like Mike, consistent availability and use of naloxone was complicated by stigma and shelter restrictions. Similarly, Sara, who also

lives in a shelter with her partner, describes how restrictions regarding the injectable naloxone formulation led to her naloxone being taken: “The Narcan is in a syringe in there. The last bag was taken from me, out of the shelter. So they took it from me, but now that it’s the nose I don’t have a problem with it.”

Discussion

This study describes the ways in which PWUD are adapting their drug using practices in response to an increase in fentanyl and opioid mortality and considers the consequences of the variable application of these adaptations. Test shots were commonly used by PWUD to reduce overdose risk, similar to PWUD in other US cities (Carroll et al., 2017; Mars, Ondocsin, & Ciccarone, 2018, 2017), but most PWUD in this study were not using test shots consistently. Use of naloxone was also common among PWUD; however, similar to PWUD in Baltimore, naloxone availability was irregular (Mars et al., 2017). Among homeless PWUD, difficulty carrying naloxone due to shelter policies and concern about judgment from others was reported by some, complicating widespread use of naloxone for PWUD living in shelters.

FTS were relatively new at the time of data collection, but most PWUD expressed interest and some reported using them. Previous research indicates an overall willingness by PWUD to use them, potentially leading to a reduction in the amount of drugs used if they test positive for fentanyl (Kennedy et al., 2018; Krieger et al., 2018; Sherman & Green, 2018). Two PWUD in this study reported receiving multiple positive results from FTS, without any associated effect, leading them to conclude that their drugs contained a small concentration of fentanyl. While it is difficult to know, given the sensitivity of the strips, it is plausible that the amount of fentanyl in their drugs was small. Regardless, these reports raise concern that PWUD who experience multiple positive test results with no associated physical effect may falsely conclude that they can tolerate fentanyl. Given the highly variable and unregulated nature of the illicit drug trade, it is likely that there will be inconsistency in both the amount and type of fentanyl used to cut heroin or other drugs (Ciccarone, Ondocsin, & Mars, 2017; Darke, Hall, Weatherburn, & Lind, 1999; Fairbairn, Coffin, & Walley, 2017), potentially resulting in differential effects for PWUD, just as some PWUD reported in this study. Because of this, it is critical that PWUD understand the importance of using FTS alongside other overdose prevention methods, such as test shots, to protect against the inherent variability of heroin and/or fentanyl.

Similar to PWUD in Rhode Island (Carroll et al., 2017), using a reliable and consistent dealer was a method that PWUD in this study implemented or were advised to implement to further reduce overdose risk. Few PWUD in this study had such an arrangement, and for some that did, this approach did not always ensure consistency or protection from overdose. While it remains unclear the extent to which street-level dealers are aware of the cut of the drugs they are selling, reducing overdose is in their short and long-term economic interests. Because of this, it may be worthwhile for future research to explore drug dealers’ perceptions of the opioid crisis, specifically regarding the increased rate of mortality among their clientele due to fentanyl, as well as ways to potentially reduce this risk.

Reducing or ceasing drug use due to fentanyl was reported by a handful of PWUDs in this study and in Rhode Island; however unlike PWUD in Rhode Island, no participants in this study reported initiating treatment as a result of the increase in fentanyl and/or overdose mortality (Carroll et al., 2017). This may be due, in part, to the fact that several PWUD were already enrolled in methadone maintenance treatment programs, and a handful in buprenorphine treatment. PWUD in Rhode Island also reported using prescription opioids as a way to avoid exposure to fentanyl, or using other routes of administration, such as snorting, to reduce the likelihood of overdose if exposed to fentanyl (Carroll et al., 2017). Neither of these approaches were reported by PWUD in this study. Future research utilizing quantitative methods with larger samples of PWUD may help provide a better understanding of the extent to which the adaptations of drug using practices reported here and in previous research are being utilized.

While nearly all PWUD in this study possessed a high degree of knowledge about minimizing risk for overdose, and many reported using a variety of methods to reduce their risk, for most, application was inconsistent. In NYC, where the estimated number of PWUD is over 100,000 (Tempalski et al., 2013), inconsistent application of overdose prevention methods in an environment with opioids of increased potency demonstrates important limitations to the effectiveness of these methods in changing the course of this epidemic. As our findings indicate, universal utilization of overdose prevention methods was often complicated by structural factors such as stigma, poverty and homelessness, which were further complicated by dependence and the increased prevalence of fentanyl. In order to adequately address these impediments and reduce the rate of opioid mortality, additional structural level interventions must be implemented. Safer Consumption Spaces (SCS) offer safer injection education and equipment in a medically-supervised space where PWUD can use drugs safely, with readily available naloxone, and referrals to substance use treatment (European Monitoring Centre for Drugs & Drug Addiction, 2017; Potier, Laprévote, Dubois-Arber, Cottencin, & Rolland, 2014). While SCS will not provide a magic bullet, implementation of SCS alongside expansion of existing efforts such as naloxone distribution, medication assisted treatment and responsible opioid prescribing may begin to reduce persistent opioid-related mortality.

The findings from this study are based on a convenience sample of PWUD recruited from SSP and therefore may not reflect the experiences of non-SSP PWUD. Similarly, because the prevalence of fentanyl in illicit drug markets varies, often by geography, PWUD in cities with more or less fentanyl and/or mortality than NYC may have different perceptions of the drug and may be adapting to it differently. However, while existing research on PWUDs' experiences with fentanyl and drug using adaptations is scant, the findings in this study generally correspond to those of prior studies. Future research investigating the ways in which PWUD are adapting to fentanyl, particularly over time, is critical to increasing understanding of fentanyl and mortality. While further and more in-depth investigations may help direct the design of future evidence-based interventions, it is imperative that cities such as NYC take swift action to reduce unacceptably high rates of opioid mortality.

Acknowledgements

Funding for this study was provided through a Pilot Project Award from the Center for Drug Use and HIV Research (CDUHR) at the NYU School of Nursing. Funding for CDUHR is provided by US NIH/NIDA, Grant P30 DA011041. Support for Dr. Des Jarlais was provided by US NIH/NIDA, Grant 5R01DA003574-34. A special thanks to Janie Simmons for assistance with project development and to the three NYC SSP that served as recruitment sites. Finally, we are incredibly grateful for the individuals who participated in the study, particularly for their wisdom, generosity and patience.

References

- Administration, U. S. D. E., & Division, D. C. (2016). NFLIS brief: Fentanyl and Fentanyl-related substances reported in NFLIS, 2015 – 2016, 2015–2016.
- Carroll JJ, Marshall BDL, Rich JD, & Green TC (2017). Exposure to fentanyl-contaminated heroin and overdose risk among illicit opioid users in Rhode Island: A mixed methods study. *The International Journal on Drug Policy*, 46, 136–145. 10.1016/j.drugpo.2017.05.023. [PubMed: 28578864]
- CDC Health Action Network (2016). Influx of fentanyl-laced counterfeit pills and toxic fentanyl-related compounds further increases risk of fentanyl-related overdose and fatalities. Atlanta Retrieved from <https://emergency.cdc.gov/han/han00395.asp>.
- CDC Health Alert Network (2015). Increases in fentanyl drug confiscations and fentanyl-related overdose fatalities. Retrieved from https://emergency.cdc.gov/han/han00384.asp#_edn1.
- Centers for Disease Control and Prevention (2017). Opioid data analysis | drug overdose | CDC injury center. Retrieved 2 27, 2018, from <https://www.cdc.gov/drugoverdose/data/analysis.html>.
- Ciccarone D (2017). Fentanyl in the US heroin supply: A rapidly changing risk environment. *The International Journal on Drug Policy*, 46, 107–111. 10.1016/j.drugpo.2017.06.010. [PubMed: 28735776]
- Ciccarone D, Ondocsin J, & Mars SG (2017). Heroin uncertainties: Exploring users' perceptions of fentanyl-adulterated and -substituted 'heroin.'. *The International Journal on Drug Policy*, 46, 146–155. 10.1016/j.drugpo.2017.06.004. [PubMed: 28735775]
- Daniulaityte R, Juhascik MP, Strayer KE, Sizemore IE, Harshbarger KE, Antonides HM, et al. (2017). Overdose deaths related to fentanyl and its analogs - Ohio, January-February 2017. *MMWR Morbidity and Mortality Weekly Report*, 66(34), 904–908. 10.15585/mmwr.mm6634a3. [PubMed: 28859050]
- Darke S, Hall W, Weatherburn D, & Lind B (1999). Fluctuations in heroin purity and the incidence of fatal heroin overdose. *Drug and Alcohol Dependence*, 54(2), 155–161. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10217555>. [PubMed: 10217555]
- Drug Enforcement Administration (2015). National forensic laboratory information system special report: Opiates and related drugs reported in NFLIS, 2009–2014 Washington D.C. Retrieved from https://www.deadiversion.usdoj.gov/nflis/spec_rpt_opioids_2014.pdf.
- Drug Enforcement Administration (2016). Counterfeit prescription pills containing fentanyls: A global threat Washington Retrieved from. *Prescription Pills.pdf* <https://www.dea.gov/docs/Counterfeit>.
- Drug Enforcement Administration, U., & Control Division, D. (2017). Fentanyl and fentanyl-related substances reported in NFLIS, 2015–2016 Washington Retrieved from https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/11350_R1_NFLIS_Research_Brief_Fentanyl.pdf.
- Drug Enforcement Administration Special Testing and Research Laboratory (2018). Emerging threat Report-1st quarter 2018 Retrieved from <https://ndews.umd.edu/sites/ndews.umd.edu/files/dea-emerging-threat-report-2018-quarter-1.pdf>.
- Drug Enforcement Administration Special Testing and Research Laboratory (2017a). Emerging threat report-annual 2017.
- Drug Enforcement Administration Special Testing and Research Laboratory (2017b). Emerging threat report-annual 2017 Retrieved from <https://ndews.umd.edu/sites/ndews.umd.edu/files/dea-emerging-threat-report-2017-annual.pdf>.

- European Monitoring Centre for Drugs and Drug Addiction (2017). Drug consumption rooms: An overview of provision and evidence. Lisbon Retrieved from. consumption rooms.pdf http://www.emcdda.europa.eu/system/files/publications/2734/POD_Drug
- Fairbairn N, Coffin PO, & Walley AY (2017). Naloxone for heroin, prescription opioid, and illicitly made fentanyl overdoses: Challenges and innovations responding to a dynamic epidemic. *The International Journal on Drug Policy*, 46, 172–179. 10.1016/j.drugpo.2017.06.005. [PubMed: 28687187]
- Goodman JD (2018). (2 19). City officials see progress in effort to curb opioid deaths - the New York Times. Retrieved from New York: New York Times. <https://www.nytimes.com/2018/02/19/nyregion/opioid-overdose-heroin-deaths-new-york.html>.
- Guest G, MacQueen KM, & Namey EE (2012). Applied thematic analysis. Retrieved from Sage Publications <https://us.sagepub.com/en-us/nam/applied-thematic-analysis/book233379>.
- Katz J (2017). (9 2). The first count of fentanyl deaths in 2016: Up 540% in three years. Retrieved from New York: New York Times, <https://www.nytimes.com/interactive/2017/09/02/upshot/fentanyl-drug-overdose-deaths.html>.
- Kennedy MC, Scheim A, Rachlis B, Mitra S, Bardwell G, Rourke S, et al. (2018). Willingness to use drug checking within future supervised injection services among people who inject drugs in a mid-sized Canadian city. *Drug and Alcohol Dependence*, 185(2), 248–252. 10.1016/j.drugalcdep.2017.12.026. [PubMed: 29475198]
- Krieger MS, Yedinak JL, Buxton JA, Lysyshyn M, Bernstein E, Rich JD, et al. (2018). High willingness to use rapid fentanyl test strips among young adults who use drugs. *Harm Reduction Journal* 15(1), 1–9. 10.1186/s12954-018-0213-2. [PubMed: 29304871]
- Macmadu A, Carroll JJ, Hadland SE, Green TC, & Marshall BDL (2017). Prevalence and correlates of fentanyl-contaminated heroin exposure among young adults who use prescription opioids non-medically. *Addictive Behaviors*, 68, 35–38. 10.1016/j.addbeh.2017.01.014. [PubMed: 28088741]
- Mars SG, Ondocsin J, & Ciccarone D (2017). Sold as heroin: Perceptions and use of an evolving drug in Baltimore, MD. *Journal of Psychoactive Drugs*, 1–10. 10.1080/02791072.2017.1394508. [PubMed: 27918874]
- Mars SG, Ondocsin J, & Ciccarone D (2018a). Toots, tastes and tester shots: User accounts of drug sampling methods for gauging heroin potency. *Harm Reduction Journal* 15 10.1186/s12954-018-0232-z.
- Mars SG, Ondocsin J, & Ciccarone D (2018b). Toots, tastes and tester shots: User accounts of drug sampling methods for gauging heroin potency. *Harm Reduction Journal* 15 10.1186/s12954-018-0232-z.
- Marshall BDL, Krieger MS, Yedinak JL, Ogera P, Banerjee P, Alexander-Scott NE, et al. (2017). Epidemiology of fentanyl-involved drug overdose deaths: A geospatial retrospective study in Rhode Island, USA. *The International Journal on Drug Policy*, 46, 130–135. 10.1016/j.drugpo.2017.05.029. [PubMed: 28601512]
- McGowan CR, Harris M, Platt L, Hope V, & Rhodes T (2018). Fentanyl self-testing outside supervised injection settings to prevent opioid overdose: Do we know enough to promote it? *The International Journal on Drug Policy*, 58, 31–36. 10.1016/j.drugpo.2018.04.017. [PubMed: 29758542]
- New York City Department of Health and Mental Hygiene (2017a). NYCDOHMH Health Advisory: Presence of fentanyl in cocaine contributing to increase in drug overdose deaths. New York Retrieved from <https://www1.nyc.gov/assets/doh/downloads/pdf/han/advisory/fentanyl-advisory10.pdf>.
- New York City Department of Health and Mental Hygiene (2017b). NYCDOHMH Health Advisory: Presence of fentanyl in cocaine contributing to increase in drug overdose deaths. New York.
- O'Donnell JK, Halpin J, Mattson CL, Goldberger BA, & Gladden RM (2017). Deaths involving fentanyl, fentanyl analogs, and U-47700 — 10 states, July–December 2016. *MMWR Morbidity and Mortality Weekly Report*, 66(43), 1197–1202. 10.15585/mmwr.mm6643e1. [PubMed: 29095804]
- Paone D, & Kunins HV (2016). Increase in drug overdose deaths and increased presence of fentanyl in New York City-2016, Advisory #8. New York, NY.

- Paone D, Tuazon E, Nolan M, & Mantha S (2016). Unintentional drug poisoning (Overdose) deaths involving heroin and/or fentanyl in New York City, 2000–2015. New York, NY Retrieved from <http://www1.nyc.gov/assets/doh/downloads/pdf/epi/databrief74.pdf>.
- Potier C, Laprévote V, Dubois-Arber F, Cottencin O, & Rolland B (2014). Supervised injection services: What has been demonstrated? A systematic literature review. *Drug and Alcohol Dependence*, 145, 48–68. 10.1016/j.drugalcdep.2014.10.012. [PubMed: 25456324]
- Prekupec MP, Mansky PA, & Baumann MH (2017). Misuse of novel synthetic opioids: A deadly new trend. *Journal of Addiction Medicine*, 11(4), 256–265. 10.1097/ADM.0000000000000324. [PubMed: 28590391]
- Press Release: Health Department Warns New Yorkers about Cocaine Laced with Fentanyl; Occasional Users at High Risk for Overdose (2017). New York.
- Rudd RA, Aleshire N, Zibbell JE, & Gladden RM (2016). Increases in drug and opioid overdose deaths—United States, 2000–2014. *MMWR Morbidity and Mortality Weekly Report*, 64, 50–51. 10.15585/mmwr.mm6450a3. 1378–82
- Rudd RA, Seth P, David F, & Scholl L (2016). Increases in drug and opioid-involved overdose deaths - United States, 2010-2015. *MMWR Morbidity and Mortality Weekly Report*, 65(5051), 1445–1452. 10.15585/mmwr.mm655051e1. [PubMed: 28033313]
- Sherman S, & Green T (2018). Fentanyl overdose reduction checking analysis study (FORECAST) Baltimore Retrieved from http://americanhealth.jhu.edu/assets/pdfs/FORECAST_Summary_Report.pdf.
- Slavova S, Costich JF, Bunn TL, Luu H, Singleton M, Hargrove SL, et al. (2017). Heroin and fentanyl overdoses in Kentucky: Epidemiology and surveillance. *The International Journal on Drug Policy*, 46, 120–129. 10.1016/j.drugpo.2017.05.051. [PubMed: 28735777]
- Spies E, Peterson A, Garcia-Williams A, Halpin J, Gladden M, Zibbell J, et al. (2016). Undetermined risk factors for fentanyl-related overdose deaths-Ohio, 2015.
- Stogner JM (2014). The potential threat of acetyl fentanyl: Legal issues, contaminated heroin, and acetyl fentanyl “disguised” as other opioids. *Annals of Emergency Medicine*, 64(6), 637–639. 10.1016/j.annemergmed.2014.07.017. [PubMed: 25153008]
- Sutter ME, Geron RR, Davis MT, Roche BM, Colby DK, Chenoweth JA, et al. (2017). Fatal fentanyl: One pill can kill. *Academic Emergency Medicine*, 24(1), 106–113. 10.1111/acem.13034. [PubMed: 27322591]
- Suzuki J, & El-Haddad S (2017). A review: Fentanyl and non-pharmaceutical fentanyls. *Drug and Alcohol Dependence*, 171, 107–116. 10.1016/j.drugalcdep.2016.11.033. [PubMed: 28068563]
- Tempalski B, Pouget ER, Cleland CM, Brady JE, Cooper HLF, Hall HI, et al. (2013). Trends in the population prevalence of people who inject drugs in US metropolitan areas 1992-2007. *PloS One*, 8(6), e64789 10.1371/journal.pone.0064789. [PubMed: 23755143]
- The City of New York Office of the Mayor (2017). Healing NYC-Preventing overdoses, saving lives New York. Retrieved from <http://www1.nyc.gov/assets/home/downloads/pdf/reports/2017/HealingNYC-Report.pdf>.
- Tomassoni AJ, Hawk KF, Jubanyik K, Nogee DP, Durant T, Lynch KL, et al. (2017). Multiple fentanyl overdoses - New Haven, Connecticut, June 23, 2016. *MMWR Morbidity and Mortality Weekly Report*, 66(4), 107–111. 10.15585/mm6604a4. [PubMed: 28151928]
- U.S. Department of Justice Drug Enforcement Administration (2017). 2017 national drug threat assessment Washington, DC.
- Wheeler E, Burk K, McQuie H, & Stancliff S (2012). Guide to developing and managing overdose prevention and take-home naloxone projects. New York Retrieved from <http://harmreduction.org/wp-content/uploads/2012/11/od-manual-final-links.pdf>.
- Wheeler E, Jones TS, Gilbert MK, Davidson PJ, & Centers for Disease Control and Prevention (CDC) (2015). Opioid overdose prevention programs providing naloxone to laypersons - United States, 2014. *MMWR Morbidity and Mortality Weekly Report*, 64(23), 631–635. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/26086633>. [PubMed: 26086633]

Table 1

Demographic Characteristics of Study Sample, N = 55.

Recruitment Site	
Bronx	29 (53%)
Brooklyn	26 (47%)
Age	Mean=46.7; Median=47; Range=26-63
Gender	
Male	37 (67%)
Female	17 (31%)
Transgender	1 (2%)
Race/Ethnicity (some PWUD identified as both Hispanic and White or Black)	
Hispanic	28 (51%)
White	17 (31%)
Black	14 (25%)
Age 1 st Used Drugs	Mean=16.2; Median=15; Range=8-35
Age 1 st Used Opioids	Mean=21.4; Median=19; Range=13-48
Age 1 st Injected Any Drug	Mean=24.3; Median=23; Range=13-44
Age 1 st Injected An Opioid	Mean=25.4; Median=23; Range=13-48
1 st Drug Used	
Marijuana	34 (62%)
Heroin	9 (16%)
Cocaine	6 (11%)
Crack	2 (4%)
Hallucinogens/Ecstasy	2 (4%)
PCP/Angel Dust	1 (2%)
Valium	1 (2%)
Drug Use – Last 6 Months (Admin. Route)	
Heroin (Injection)	38 (69%)
Marijuana	26 (47%)
Fentanyl (Injection)	24 (44%)
Speedball (Injection)	23 (42%)
Cocaine (Injection)	21 (38%)
Opioid Analgesics (Oral)	19 (35%)
Crack (Smoke)	16 (29%)
Heroin (Sniffing)	10 (18%)
Cocaine (Sniffing)	10 (18%)
Methadone (Illegal)	10 (18%)
Fentanyl (Sniffing)	9 (16%)
Suboxone (Illegal)	6 (11%)

PWIDs	47 (85%)
Ever OD	22 (40%)
Ever Witnessed OD	49 (89%)
Frequency of Carrying Naloxone	
Never	12 (22%)
Sometimes	5 (9%)
About Half the time	10 (18%)
Most of the time	11 (20%)
Always	17 (31%)