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Circumstances of Overdose Among Street-Involved, Opioid-Injecting Women: Drug, Set, and Setting

Janna Ataiants[a,*], **Alexis M. Roth**[a], **Silvana Mazzella**[b], **Stephen E. Lankenau**[a]

[a]Department of Community Health and Prevention, Dornsife School of Public Health, Drexel University, 3215 Market St, Philadelphia, PA 19104, USA

[b]Prevention Point Philadelphia, 2913 Kensington Ave, Philadelphia, PA 19134, USA

Abstract

Introduction: Current discourses about the causes of the overdose crisis largely focus on the harmful effects of drugs. Prior research, however, indicates that drug use experience is shaped by complex interactions of drugs with physiological and mental "sets" of people who use drugs and the wider social and physical "setting." Zinberg's "drug, set, and setting" theoretical framework was applied to identify patterns in circumstances leading up to women's overdose.

Methods: In-depth semi-structured interviews were conducted with 29 opioid-injecting street-involved women, clients of a Philadelphia harm reduction program. Qualitative analysis with deductive and inductive coding was utilized to examine transcripts for theory-driven and emerging themes.

Results: Ten out of 29 women attributed their overdose to "drugs," reporting the unpredictable quality of street opioids, concurrent use of benzodiazepines, or chasing the "high." Thirteen women reported "set" as a type of circumstance where their emotional states were affected by a "good" or "bad" day, leading them to unusual drug consumption practices. Six women described "setting" type of circumstances where their overdose was preceded by a recent change in context, such as release from prison, which prompted unsafe drug use to address physiological or psychological dependence on drugs.

Conclusion: While all overdoses result from the pharmacological action of drugs, some overdoses were triggered by circumstances occurring in women's set or setting. Overdose prevention policies should embrace not only individual-level behavioral interventions, but also structural measures to address stress, social isolation, and risky drug use contexts that plague the lives of street-involved women who inject opioids.

[*]Corresponding author (J. Ataiants) at: Department of Community Health and Prevention, Dornsife School of Public Health, Drexel University, 3215 Market St, Philadelphia, PA 19104, USA, ja633@drexel.edu.

Ethical approval

The study was approved by Drexel University IRB (protocol 1512004051).

Conflict of interest

All authors [Ataiants, Roth, Mazzella, Lankenau] declare no conflicts of interest.

Keywords

Overdose; opioids; injection; women; circumstances; drug; set; setting

Introduction

The public discourse about overdose in the U.S. has focused mainly on the biomedical side, particularly the harmful effect of illicit and prescription opioids. These concerns have been justified by epidemiological research showing that out of 70,000 drug overdose deaths in the U.S. in 2017, more than two thirds (68%) were attributed to opioids (Centers for Disease Control and Prevention, 2018). Due to the unprecedented magnitude and increase of overdose deaths, mainly involving heroin and synthetic opioids, such as fentanyl and its analogs (O'Donnell, Gladden, & Seth, 2017; O'Donnell, Halpin, Mattson, Goldberger, & Gladden, 2017), but also stimulants and polysubstance use (Hedegaard, Bastian, Trinidad, Spencer, & Warner, 2018a; Seth, Scholl, Rudd, & Bacon, 2018), the U.S. government declared the current opioid crisis a "public health emergency" (U.S. Department of Health and Human Services, 2017).

Yet, a singular focus on opioids as a cause of overdose crisis, particularly due to over-prescribing (see, for example, Madras, 2017; Rummans, Burton, & Dawson, 2018), overshadows the role of contextual and psychological factors contributing to drug overdose. Previous studies of the contextual factors of overdose overwhelmingly relied on Rhodes' "risk environment" framework (2002; 2009), which emphasized the structural origins of drug-related harms beyond individual behaviors. Following this line, research has shown that overdose tends to concentrate in deindustrialized areas lacking economic opportunity (Dasgupta, Beletsky, & Ciccarone, 2018; McLean, 2016; Monnat, 2018; Rigg, Monnat, & Chavez, 2018), and that risks increase for individuals who transition from drug-free contexts, such as incarceration (Binswanger, Blatchford, Mueller, & Stern, 2013; Bukten et al., 2017) or inpatient drug treatment (Ravndal & Amundsen, 2010; Whines, Saitz, Horton, Lloyd-Travaglini, & Samet, 2007) into regular drug use environments. Moreover, overdose is exacerbated by social marginalisation, including homelessness (Baggett et al., 2013), and stressful events, such as death of someone close, relationship breakdown, or accommodation problems (Neale & Robertson, 2005).

Despite the growing evidence on risky contexts and emotional distress as distal contributors to overdose, research is limited as to how those factors operate in real time to produce an overdose. Examination of overdose precipitating circumstances has largely focused on risky drug use practices (Frank et al., 2015; Sergeev, Karpets, Sarang, & Tikhonov, 2003; Zador, Sunjic, & McLennan, 2001), and only a handful of studies also linked overdose to proximal nondrug factors, such as a risky place (Dietze, Jolley, Fry, & Bammer, 2005; McLean, 2016; Moore, 2004).

While women use and respond to drugs differently than men (National Institute on Drug Abuse, 2019), no prior study has focused on circumstances surrounding women's overdose. Yet, epidemiological data indicate a rapid increase in overdose mortality among women, from 3.9 deaths per 100,000 population in 1999 to 14.4 in 2017 (Hedegaard, Miniño, &

Warner, 2018b). While absolute count remains higher among men, overdose death rates among women aged 35-64 years are approaching those of men (VanHouten, Rudd, Ballesteros, & Mack, 2019). Furthermore, gender-based drug use patterns make women uniquely vulnerable to overdose. Research shows women may experience more pain than men (Pieretti et al., 2016) and therefore are more likely to misuse opioid pain relievers (Mack, Jones, & Paulozzi, 2013). Also, compared to men, opioid-dependent women have higher rates of comorbid mood and anxiety disorders (Grella, Karno, Warda, Niv, & Moore, 2009). Hence, opioid-dependent women are more likely than men to misuse benzodiazepines and other sedatives to cope with anxiety (Hearon et al, 2011) or use prescription opioids to address not only pain, but also negative affect (McHugh et al., 2013). At the same time, the concurrent opioid and benzodiazepine use has been found to multiple the risk of opioid-involved overdose (Hernandez, He, Brooks, & Zhang, 2018). Additionally, evidence suggest a host of non-pharmacological factors of women's overdose. Namely, women who require help injecting or use drugs in the context of intimate relationship often exercise little agency over drug use logistics, including drug preparation and actual injection (Bourgois, Prince, & Moss, 2004; Tompkins, Sheard, Wright, Jones, & Howes, 2006; Wagner, Jackson Bloom, Hathazi, Sanders, & Lankenau, 2013). Hence, the social context of drug use increases overdose risks among women as they may unknowingly consume the excessive quantities or harmful combinations of drugs.

Noting the lack of rich data on proximal, nondrug-related contributors to women's overdose, this study aimed to examine patterns in circumstances leading up to overdose among street-involved opioid-injecting women. We used a "drug, set, and setting" framework by Zinberg (1984), a complimentary concept to the "risk environment" as it shifts the research lens back to the interpersonal level of overdose. We sought to understand the role of proximal factors in the production of overdose, including "drugs" and nondrug factors, such as the user's physiological or mental state ("set"), and social or physical micro-contexts ("setting").

Methods

Local context

This analysis is derived from data collected for a larger study examining women's overdose in Philadelphia - a U.S. city experiencing significant burden of drug overdoses. In 2017 (the latest year for which complete nationwide data are available), the city's overdose death rate of 77 per 100,000 (Drug Enforcement Administration Philadelphia Division & the University of Pittsburgh, 2018) was more than triple the national rate of 21.7 per 100,000 (Hedegaard et al., 2018b). In 2018, 84% of 1,116 drug overdose deaths in Philadelphia involved opioids and in the majority of opioid-related deaths (84%) fentanyl was present (Philadelphia Department of Public Health, 2019).

The majority of participants were recruited from the Kensington section of North Philadelphia. Once a prosperous textile neighborhood, Kensington became one of the most distressed and impoverished U.S. communities due to post-industrial decline (Fairbanks, 2011). The area is marked by vacant lots, disused factories, and abandoned houses (Percy, 2018). Importantly, Kensington is home to the largest U.S. open-air drug market for heroin on the East Coast (Mars et al., 2015; Percy, 2018) and, along with an adjacent neighborhood,

had the highest density for opioid-related overdose deaths in 2017 (Philadelphia Department of Public Health, 2018).

Sampling

The larger study utilized a mixed-methods framework and focused on different aspects of overdose among women using illicit drugs, including violence as a risk factor for multiple personal overdoses, differences in overdose responses between women trained and untrained in overdose prevention, and factors precipitating women's personal overdose (the present study). The first author (JA), who was experienced in field work with people who use drugs and trained in overdose prevention, was solely responsible for screening, recruitment, and interviewing for the larger study. Recruitment was conducted among women who approached services provided by Prevention Point Philadelphia (PPP), a local syringe and multi-service center based in Kensington. For the larger survey study, 220 women were recruited and surveyed at various PPP sites from January 2016 to January 2017. Recruitment criteria included: adult age (18 or older), being nonpregnant, an ability to read, and living in Philadelphia area.

Qualitative participants were sampled from the pool of survey participants from January 2016 to January 2017. Purposive, homogeneous sampling (Maxwell, 2005) was utilized to identify women with a similar profile of increased vulnerability to overdose. To be eligible for a qualitative interview, a participant had to have at least one opioid injection (heroin or prescription opioids) in the past 30 days and be recently street-involved. The definition of "street-involved" can include not only unstable housing, but also involvement in certain aspects of street economy (DeMatteo et al., 1999), therefore, for the purpose of this analysis, we defined recent street involvement as having at least one of the following: past 12 month unstable housing, past 12 month survival sex, or past 30 day drug use or sales in public places. Additionally, all participants of qualitative interviews had to witness an overdose in the past 12 months since one of the larger study's aims was analyzing women's responses to an overdose through a mixed methods framework. If a survey participant was eligible and interested in participating in a qualitative interview, she was verbally consented and offered a copy of the consent form.

Forty-two women were enrolled in the qualitative part of the larger study; of them, 32 survived at least one overdose. The present analysis uses data from a subsample of 29 women who were able to recall the circumstances of their most recent overdose.

Data collection

Interviews were held in the PPP office in Kensington by the first author (JA). In accordance to the interview guide, participants were asked open-ended questions about their present living situation, typical day or previous day, life trajectory, health, social circle, drug use practices, as well as personal and witnessed overdose. The major question related to personal overdose and used in this analysis was the following: "Please describe the circumstances of your most recent overdose." The question was followed with probes asking about events of the day (or prior 24 hours) on which overdose took place, overdose setting, as well as people and drugs involved. Additional questions asked about the experience of

their first overdose and any other memorable overdose experiences. The definition of an overdose was not restricted to the particular class of drugs, such as opioids, since the sample was mainly comprised of polysubstance users (see Table 1). Interviews lasted up to 90 minutes and participants were compensated with $25 in cash for their time. Following the interview, the first author took notes about the most illuminating or unexpected interview moments.

Theoretical framework

The analysis was guided by the "drug, set, and setting" theoretical framework. The original concept of "set and setting" was developed by Timothy Leary in 1960s based on psychedelic research (Hartogsohn, 2017; Leary, Metzner, & Alpert, 1995). The concept postulated that a person's response to psychedelic drugs, such as LSD, is largely determined by personality and psychology (set), as well as physical and social environment (setting) rather than substances themselves. In 1984, Norman Zinberg extended the concept, adding the third component of "drug" (Zinberg, 1984). While it is one of the most comprehensive theories of drug use experience, this theory is somewhat underutilized in drug use research (exceptions include, for example, Moore, 1993, and Lankenau, Sanders, Bloom, & Hathazi, 2008). To the best of our knowledge, it has never been applied to the circumstances of drug overdose. Significantly, the framework did not structure the original interview guide but emerged as a relevant theory during data analysis.

Data analysis

Interviews were digitally recorded on a voice-recorder and transcribed by a transcription agency. Transcripts were converted into Microsoft Word documents and exported to MAXQDA 2018 (VERBI Software, 2017). Thematic analysis (Braun & Clarke, 2006) was used to interpret data. Analytical process involved two stages: deductive coding, with a priori template of codes (Crabtree & Miller, 1999), and inductive coding of emergent themes (Boyatzis, 1998). The coding was conducted by the first author (JA). Initially, a priori codes were developed using the interview guide and pretested with the involvement of a second coder. Then, excerpts with a priori code "the most recent overdose" were deductively coded as "drug," "set," or "setting" type of overdose circumstances, in accordance to the theoretical framework. Subsequently, the excerpts were organized into the three groups and coded inductively to identify patterns of overdose circumstances within each group. Additionally, to recognize common themes in participants' current living situation, inductive coding was applied to excerpts with a priori codes "Life summary" and "Typical day or yesterday." The assignment of "drug," "set," or "setting" codes was discussed between the first author (JA) and senior author (SEL), and differences were resolved in favor of a component that was mutually agreed upon as the most crucial in the occurrence of an overdose. The results were finalized in the iterative way and checked against interview notes.

To assess the trustworthiness of the data analysis and theoretical framework, we conducted stakeholder checks (Thomas, 2006) with PPP staff and clients. First, PPP staff were presented with the study findings and asked to discuss how the results related to their clients' experiences. Subsequently, five PPP female clients who resembled the original participants

on key enrollment criteria, such as being a recent opioid injector and street-involved, participated in 20-30-minute informal conversations. The women were briefed on the study aims and were asked to compare the "drug, set, and setting" framework to their own overdose experiences. Ultimately, the stakeholder checks with staff and clients confirmed the applicability of the "drug, set, and setting" framework to overdose experiences of PPP female clients.

Social, demographic, and drug use characteristics of participants presented in Table 1 were drawn from the quantitative part of the larger study and analyzed using IBM SPSS Statistics for Windows, version 25 (IBM Corp., 2017).

Results

Sociodemographics and living situation

Women ranged in age from 22 to 54 years and the majority (65.5%) identified as White. Slightly less than a half (48.3%) lived with a husband or intimate partner. Twenty-two women (75.9%) were mothers, but one in three had her parental rights terminated or suspended. Twenty-one participants (72.4%) had a history of incarceration. In the past year, almost 70% sold sex to survive and 90% were unstably housed (Table 1).

All participants were currently living in the Kensington area of Philadelphia. Women characterized it as a dangerous place, overwhelmed with gun violence, street crime, and a heavy presence of drug distributors:

> It's bad here. Every corner is a drug corner, and, and there's shootings all the time, all the time. You can hear it, you can…it's horrible. I, I…it's horrible, it's bad, it's a bad neighborhood. (White, 46)

When asked about their current living situation, women frequently discussed being drug dependent, homeless, and engaging in survival sex; some felt 'trapped' in their current situation. The majority slept in abandoned houses or on the streets. Almost all of participants were cut off from their children and family. Many said they felt very lonely and used heroin to cope with depression. A typical current living situation was described as follows:

> I'm on the street. I'm addicted to drugs. And I just… haven't any support from… anybody – my family, my friends. Nobody will answer the phone. Nobody. (White, 31)

A typical day revolved around acquiring and consuming drugs; one participant characterized it as "24/7 day a week job." This process was characterized by a lot of anxiety, including doubts over one's ability to "get high" the next time, procure enough money to "get high," or avoid an encounter with the police (many had an outstanding arrest warrant for a probation violation).

Opioids were injected several times a day, sometimes supplemented by cocaine through injection or smoking. Participants also commonly used benzodiazepine pills (usually, Xanax or Klonopin) to address anxiety and depression. Many women complained about the unpredictable quality of heroin. They were also aware of "bad bags" or "bad batches" –

dealers intentionally lacing heroin with other potent substances, including fentanyl and xylazine, to attract customers seeking stronger heroin for their money:

> Before I got locked up last month, I just did two bags of "heroin." I had no heroin in my system. I had horse tranquilizer [xylazine], PCP, oxycodone and painkillers. That's what I was shooting. There was no heroin. (White, 47)

Participants also talked about a common practice within the local drug user community to actively seek out potent heroin ("good dope") despite the danger of encountering a "bad batch:"

> Everybody was talking about how good this heroin was, right, and everybody was saying how strong it was. You know most people when they hear that, they want to go get it, you know. I know it sounds crazy, but… (White, 37)

Overall, a "collective set and setting" (Hartogsohn, 2017), as well as collective "drug" emerged as women reflected on their living circumstances. The prevailing "set" was affected by the daily stress of managing drug dependence on the streets and lacking social support. "Setting" was characterized by deprivation, widespread violence, and easy access to drugs. "Drugs" represented substances, such as heroin, but whose quality could not be trusted.

Circumstances of the most recent overdose

Applying Zinberg's framework classified circumstances leading up to the most recent overdose into the three groups: 1) primarily caused by the pharmacological effect of "drug"; 2) triggered by the emotionally disturbed "set"; and 3) mainly related to the change of "setting." The following narrative compares and contrasts overdose experiences as influenced by each of these concepts.

1) "Drug" type—In Zinberg's (1984) "drug, set, and setting" triad, the drug represented "the pharmacological action of the substance itself' (p.5) – i.e. effect produced by a combination of the drug's quantity, potency, and the mode of administration. The most recent overdose was classified to be primarily affected by "drug" type when both "set" and "setting" were described as usual or predictable, but the effect of the drug substantially differed from what was expected.

About a third of interviewees (10 women, including 80% White and 20% non-White) linked their most recent overdose primarily to "drug," experiencing an unexpected pharmacological effect of the consumed substance. Participants in this group commonly described the day of the overdose as uneventful ("normal"), with no emotionally disturbing experience (set) or change in physical environment (setting):

> I remember the day like it was yesterday… Nothing bad, it's just like I said – I didn't set out to purposely do it [overdose], you know. I just wanted to get high. (White, 46)

The most typical overdose scenario in this group involved taking the usual dosage of one or two bags of heroin, but encountering a "bad batch," i.e. adulterated heroin or unknown substances sold as heroin:

> It's just that apparently the batch that I bought was a bad batch. And they said it was…fentanyl, it had fentanyl in it. And— I did two bags, and it was too much for me. (White, 35)

Overdoses that happened due to a "bad batch" were perceived as inevitable and reflected a lack of control over the quality of drugs bought on the streets. Yet, in one case, a respondent was able to recognize a "bad bag" by its unusual appearance that warned her not to use the entire amount. By using half the bag, she experienced an overdose nonetheless:

> The bag was so big and I should have known. And it was different - like an off color, but I did half of it… So, if I had done the whole bag, I would have probably died. (Non-White, 26)

Other overdose scenarios referred to the over-consumption of heroin due to confusion over quantity needed to achieve the desired euphoric effect, which could be attributed to the lack of consistency in the potency of street heroin, as well as, the frequency of encountering "bad batches:"

> It was always very, like, normal days. It was always, like, days that I… I would never think that that amount would be enough. […] I went upstairs, and… I thought I had four bags, and I only had three. And I was, like, really mad that… I couldn't find my fourth one, I wanted to do all four, so I— it was like, "Whatever," and I did the three, and I remember standing there and being, like, "See, I knew I needed four," and that was the last thing I remember. (White, 23)

Finally, polysubstance use was another path to a "drug" type of an overdose. Different substances were mixed to amply the effect or used sequentially to reverse the effect from another substance. This is exemplified by a case of a woman who overdosed after sequential use of three substances in a span of 24 hours: first, consuming crack cocaine in binges, then taking a large quantity of benzodiazepine (Klonopin) to stabilize her mood, and finally using a usual dose of heroin:

> The night before …I had been smoking crack and then all that day before. And then, I wanted to calm down…it would bring me down from… crack… 'cause I was really hyper and… So, I took that [10 Klonopin pills] to calm down, a little bit to calm down, so I won't be… so paranoid… I took the Klonopins and then I made my way up here and got the dope. (Non-White, 26)

In these examples, overdoses caused by "drugs" cannot be truly isolated from women's "set" or "setting." Still, the effect of substances that caused an overdose was perceived as the only uncontrolled part of an otherwise normal day and environment.

2) "Set" type—Zinberg (1984) identified "set" as an "attitude of the person at the time of use, including personality structure" (p. 5). This term includes personality traits, early life experiences and current relationship with family, as well as physiological and emotional aspects of drugs use, including motives for use (Zinberg, 1984). In this sample, the "set" type of overdoses represented those primarily triggered by a change in women's emotional state, when "setting" remained largely the same. Slightly less than a half of the sample (13

women, including 77% White and 23% non-White) fell into this category, reporting that their most recent overdose was precipitated by an unusually good or bad day.

Five women described the day of the most recent overdose as being better than ordinary and having extra money was the most common reason for a “good” day. It meant that the participant could procure more expensive drugs in addition to heroin or experiment with new substances to celebrate the moment. A typical celebration involved buying cocaine (“coke”) and using it on top of heroin, i.e. doing a “speedball,” to get an intense rush from the effect of both drugs. This combination of a stimulant and a sedative was often followed by an overdose:

> I just remember - I did, we did the card that day [selling an in-store gift card, obtained upon the return of previously stolen items]. I did a card for Target. I got $240. I got a bundle of dope. And like five rocks, five bags of coke. And I was doing a speedball when I overdosed. So, it was the coke and the heroin. (White, 27)

> We have to buy dope to stay well, but when we have extra money we try to get, like, coke or something that’s just gonna actually give us a buzz, and so we just bought a lot of this bath salt powder stuff [cathinones], and… hung out, and… The consistency’s never the same, and so…you never know, like…one day you can do a whole bag and— and nothing much really happens, then the next day it can just knock you over. […] It was actually just a good day, and… and we were just getting…doing too many drugs. (White, 54)

A distinct group of overdoses happened on a “bad” day, most frequently following a traumatic event, such as an argument with a partner or family member or the loss of a loved one. As a result, some women engaged in unsafe drug consumption practices to cope. This can be illustrated by the case of a homeless woman who was sexually abused as a child, married early and had three children, but later moved to Kensington where she lived a lonely life, sleeping in abandoned houses and engaging in survival sex to buy heroin. On the day of her only overdose, she had a disturbing phone talk with her son – an event that prompted her, then a methadone patient, to use several pills of benzodiazepine [Xanax] to overcome emotional pain.

> I had a bad day… I was trying to talk to my older son… my 26-year-old. And he said some things to me, which were all true. Um, I was a bad mom, you know, that type of stuff… um, which kind of made me sad, and um… I kinda got to fuck this, to get high, you know, so I don’t have to feel this shit, and… I knew that because of the methadone I couldn’t shoot dope. But I knew if I took a benzo, I would feel like I shot dope, and I just took too many… I just didn’t wanna feel the pain…of the wreckage of what drugs has done to my life. So, I wanted to numb myself. (Non-White, 43)

A young woman who used to live with an abusive alcoholic boyfriend described how her partner’s assault prompted her into unsafe drug use. She did not change her usual mode of drug administration, i.e. being injected by others, but increased her dose to two bags of heroin and asked a friend, who sold her the drug, to help with injection.

> We were fighting, you know… He [ex-boyfriend] was spitting on me, slapped me…so… I went out to my friend in Delaware County, went to his house. He shot me up with two bags of heroin, and the last I remember is… walking out the bathroom after he shot me up, and my vision went blurry. (White, 24)

In most cases, participants described an overdose that followed a traumatic event as accidental. In one case, however, a 27-year old woman reflected on a traumatic situation that prompted her to attempt an intentional heroin overdose; it was her second suicidal attempt after she tried to poison herself with Benadryl at the age of 16.

> While we were in that [discharge] session, my father said… "Her friend just died from this shit," y'know, … and I was, like, "Whoa, whoa, whoa," I was, like, "Who died? Sheila's dead?" And my mom said, "Not Sheila." And I said, "Well, and who's dead, like, you mean, like, who died?" And she said, "Claire died." And it was just like… I just started crying, that was crazy shit. And… I just don't understand why they didn't tell me, like, "Why wouldn't you tell me… that my best friend died?" Y'know what I mean, that was the only person… that I was ever friends with, my whole entire life. … I was in Kirkbright [an inpatient rehabilitation center in Philadelphia]. You can get a day pass to go to a fucking funeral, like, I'm not gonna leave, like… they thought that if they told me, I would leave rehab. But I just wanted to go to her funeral, y'know I mean, like, I couldn't understand why they didn't tell me. Like, and… then I got out of rehab, and… I tried to kill myself [overdose on heroin] after that… And… I didn't die. (White, 27)

Sometimes, overdoses on a "bad" day resulted from a long period of depression, typically related to unpredictability, social isolation, and a general lack of hope. For example, one participant used an unsafe mode of drug administration (injecting herself in the neck) to cope with depression and anxiety resulting from the extended period of unstable housing.

> I did the whole…nick bag [of cocaine], which is a five-dollar bag in my neck, and …it just hit me so strong and so fast…I don't even remember […]. And I was just really depressed and upset 'cause we were just living in hotels and motels every day, and we finally, we got to this place, but didn't know this was gonna be our, our new home… And I was just so depressed, didn't know where I was gonna be to lay my head every night, you know…and then …I did that. (White, 22)

While overdoses are always the result of the pharmacological effect of drugs, "set" type disturbed emotional states led women to atypical drug use behaviors. Within "set" type circumstances, women consciously opted for mixing drugs or using larger quantities, whereas within "drug" type circumstances the effect of the drug was often unexpected.

3) "Setting" type—Zinberg (1984) regarded "setting" as "the influence of the physical and social setting within which the use occurs" (p.5). This concept involves both structural contexts, for example, living in neighborhoods where drugs are easily accessible, and social contexts, such as the influence of peers and socially approved norms of drug use. In the "setting" type of overdose circumstances, a chain of events leading up to the overdose started from the apparent change in the participant's physical or social environment. Overdoses among six women (17% White and 83% non-White) fell into this category.

Four women overdosed upon returning home from drug-free contexts, i.e. jail or halfway house. This change in setting was met with drug cravings, i.e. the intense desire to resume drug use, which was sometimes justified by the need to reward oneself after a stressful experience. However, unrealistic expectations were placed on the amount of drugs that could safely be consumed after several months of abstinence:

> When I was released [from jail], I… thought that I could just…do one bag and, you know, that'll be OK, and… They say you have to do…opiates, well, heroin three times to catch a habit, and I thought— no, well, if I just do just one time, then I'd be OK, I won't catch no habit and… I could get my children, and I could show my mom, you know, that I'm doing the right thing… I had… used the syringe [with heroin] and injected it in me, and when I was breaking the needle and putting the cap on… I didn't even get a chance to throw…the syringe away… I had… hit the ground. (Non-White, 33)

In one case, a return from the stressful context of jail was followed by entering into another stressful situation – demeaning housing arrangements – which induced significant strain and led to the consumption of the large amount of heroin:

> I had just come out of jail and I was living with my sister and I was sleeping in her closet. She had me sleeping in her walk-in closet on the floor and I was kind of stressed. And I went and used and I used too much. I used too much and it was in an abandoned house.… I felt like I didn't want to sleep on the floor. (Non-White, 42)

In two other cases, a change in the regular setting was caused or followed by symptoms of withdrawal. One woman, who started on a methadone program, was put on an overly low dose of methadone that resulted in withdrawal and consumed six bags of heroin along with benzodiazepine pills. Another case illustrates the influence of the social setting (drug-using peers) in producing an overdose. A woman was already going through withdrawal when a person from her drug-using circle offered help: free drugs to be used in front of drug dealers, who wanted to observe the immediate effect of their free "sample." Since she could not quickly inject herself, she engaged in a very unsafe mode of drug administration and was not able to control the amount she was given:

> I was feeling kinda sick… Somebody I know came over to me and asked, you know, how I was feeling, and I told him I feel like crap. And he told me we're about to do a sample, that it was gonna be me, and probably one or two other people, and it was like a three-bag shot, it was a very big shot. And I didn't know, and they went at my neck… I'm not very good at hitting myself…and I just kinda went to sleep, that was it. (Non-White, 33)

Notably, almost all overdoses of the "setting" type of circumstances were closely linked to psychological (cravings) or physiological (withdrawal) aspects of drug dependence. This is in contrast to the "set" type of circumstances, which originated in emotional stressors not directly related to drug use. Overall, the "setting" type of circumstances demonstrated how overdoses become almost inevitable upon the disturbance of all components in the drug-set-setting triad.

Discussion

This is the first analysis that applied the "drug, set, and setting" framework to document circumstances leading to an overdose among marginalized opioid-injecting women. We found that in the majority of cases (19 out of 29), the most recent overdose was triggered by women's "set" or "setting" rather than solely resulting from "drugs." The analysis also showed how almost each overdose - even when it was attributed to "drugs" – was enabled by a neighborhood characterized by concentrated poverty, unsafe streets, and easy access to drugs. These findings suggest that strategies to reduce overdose deaths among street-involved women cannot be limited to individual-level education about safe drug use and should also address women's risky social and drug use contexts.

The finding that certain overdoses occurred because of unforeseen pharmacological effects of drugs fits with previous research (Frank et al., 2015) and was anticipated, especially given the growing availability of fentanyl in U.S. drug markets, sold as heroin or mixed into heroin supply (Ciccarone, 2017). Notably, only 10 out of 29 recent overdoses – i.e. less than a half – were classified purely as "drug"-related. Overdoses of this type were not only linked to illicit, unregulated drug markets, but also reflected the practice of seeking out the strongest, most potent opioid, which increasingly became fentanyl over the course of this study. Mars et al. (2015) explained the phenomenon of pursuing "overdose-implicated" heroin in Philadelphia by the structural features of the local open-air drug market, where buyers can quickly obtain information about heroin potency, and sellers have to compete on potency given fixed heroin price ($10 per bag).

A considerable number of recent overdoses (13 of 29) stemmed from an atypical emotional "set." Participants attributed their "set" to having either a "bad" or "good" day – a finding that has not been reported in prior overdose research. There is plenty of evidence that marginalized women who use drugs are widely exposed to traumatic/adverse events (Gearon, Kaltman, Brown, & Bellack, 2003), various forms of interpersonal violence (Bourgois et al., 2004; Gilbert et al., 2017; Epele, 2002), and depression (Illangasekare, Burke, Chander, & Gielen, 2014). This study showed that such traumatic experiences and deleterious mental states can prompt risky drug use on a "bad" day as accessible and reliable mechanism of coping resulting in overdose. Similar conclusions – about emotional distress as a trigger of an overdose – were made by Moore (2004); additionally, a quantitative study by Niele and Robertson (2005) reported a range of traumatic events preceding a recent overdose among heroin users. An unexpected finding was that not only a "bad" day, i.e. adverse experiences, but also a "good" day, i.e. celebrating a moment, precipitated an overdose. A "good" day, which had an unconventional meaning for this group, often marked rare moments of possessing an extra-supply of money or drugs. This abundance enabled women to deviate from typical drug use routines and consume more expensive drugs or experiment with new drugs or drug combinations. In other words, a "good" day provided women with an opportunity to exert some agency over their otherwise chaotic lives – and at the same time, exacerbated the risk of overdose.

A smaller proportion of recent overdoses (6 out of 29) were classified under the "setting" type. This finding confirmed and contextualized the results of previous research showing

that release from drug-free environments (Binswanger et al., 2007; Binswanger et al., 2013; Bukten et al., 2017; Ravndal & Amundsen, 2010; Wines et al., 2007) elevates the risk of overdose due to the loss of tolerance to heroin. Furthermore, we found that transition in the opposite direction – i.e. entering into a "drug-free" setting - can also result in cravings, relapse, and consequent overdose, as was illustrated by the case of the women who was put on an overly low methadone induction dosage. Importantly, the first two weeks of setting-related transitions, such as release from prison (Binswanger et al., 2007) or entry into a methadone program (Buster, Brussel, & Brink, 2002; Cousins et al., 2011) have been identified as a high-risk period for mortality from opioid overdose. Overall, overdoses of the "setting" type indicated that women were highly vulnerable to any disruption in their regular drug use environment. Siegel (2016) came to a similar conclusion stating that drug administration in the presence of novel environmental cues represented a critical yet overlooked overdose risk factor, whereby the disruption of a conditional response to the anticipatory effect of drugs (through the change of an environment) causes a loss of long-term tolerance resulting in overdose.

Additionally, results indicate some racial differences in the distribution of drug, set, and setting types of overdoses. While White women represented most of "drug" and "set" types of overdose, non-White women comprised the majority of "setting" overdose cases. This may indicate greater vulnerability to post-release overdose (representing half of the "setting" cases) among minority women, particularly African-Americans, due to stress from institutional mistreatment in the U.S. prison settings (Isaac, Lockhart, & Williams, 2001). Alternatively, such disproportion may result from the overrepresentation of African-American women in the criminal-justice system due to overpolicing and racialized drug laws (Gross, 2015; Roberts, 2012). Still, the sample, especially the "setting" segment of overdoses (only 6 women), is too small to make definitive conclusions. To gain a better understanding of overdoses attributed to setting, future research should study a larger sample, including people who had been recently released from various drug-free settings, such as jail/prison or inpatient treatment, as well as examine racial differences in diverse setting types.

Taken together, these findings point to the narrowness of the current biomedical narrative for the overdose crisis, also identified as a "vector model of drug related harm" (Dasgupta et al., 2018), - with solutions focused on controlling access to opioids and interventions emphasizing individual-level safer drug use. While substances are ultimately involved in every overdose, this analysis demonstrates that the "drug" is often the last chain in a sequence of micro- or macro-events ending in an overdose.

There is often inextricable overlap between the theoretical constructs of "drug" "set" and "setting" in regard to overdose circumstances. As noted earlier, no overdose could have occurred in the absence of "drug" and all overdoses were facilitated by the "setting" of easily accessible drugs with unknown potency. Moreover, drug- and setting-type overdoses were often linked to a specific "set" of cravings, withdrawal, or mental distress. In other words, the typology of overdose circumstances presented in this analysis only emphasized the relative salience of one component of the triad drug-set-setting at a time, leaving the other two less "visible."

An important contribution of this study to the field of overdose prevention is the use of the "drug, set, and setting" framework as an analytical tool in the examination of drug overdose. Zinberg's model overlaps with a risk environment approach (Rhodes, 2002; 2009) through the component of "setting." Yet, Zinberg's framework may facilitate a more comprehensive view of overdose at the micro-level as it affirms the prominence of not only an environment, but also two other proximal contributors to overdose, such as the user's personality and "drugs" themselves. Future studies can test the applicability of Zinberg's framework to the realities of men's overdose and compare circumstances preceding an overdose in a gender-mixed sample. The framework can also be utilized in the longitudinal analysis of how and whether circumstances of overdose change over time.

This study bears certain implications for overdose policies and interventions. Overdose avoidance messages targeting potential victims are focused on safer drug use, for example, "use one drug at a time," "use less after any period of abstinence or decreased use", or "test the strength of the drug before you do the whole amount" (see, for example, Harm Reduction Coalition, 2012, pp. 53-54). Given these results, however, such messages may be irrelevant for the "set" and "setting" types of overdose circumstances, when women have a diminished capacity or even desire to control their drug intake. Furthermore, safer use messages may be hard to follow even to avoid the drug-type overdoses – if drugs are used in a generally unsafe setting like Kensington and by unstably housed people, who often have to use in public spaces. Therefore, results from this analysis are in agreement with Moore (2004) who argued about the mismatch between the 'neo-liberal' types of overdose prevention interventions, emphasizing rational and individually-determined choices of safer drug use, and realities facing street-based people who use drugs.

Therefore, these findings call for policy-level changes to alleviate the overdose crisis. For instance, while it might be unfeasible to intervene with street drug markets offering adulterated heroin or street culture that is not conductive to safe drug use, overdoses attributed to "drugs" could be addressed by other structural-level interventions, such as supervised injection rooms (Marshall, Milloy, Wood, Montaner, & Kerr, 2011) or provision of heroin-assisted treatment (Rehm et al., 2005). Potential also exists for drug-checking services, a harm reduction intervention for people who use street drugs, when samples of illicit drugs are tested against the presence of unexpected adulterants or dangerous substances, such as fentanyl (Bardwell & Kerr, 2018; Tupper, McCrae, Garber, Lysyshyn, & Wood, 2018). The "setting" type of overdoses, could be at least partially prevented by modifying environments commonly linked to overdose. Interventions need to precede transitional periods, such as prison release (Bird, McAuley, Perry, & Hunter, 2016) or methadone induction (Walley et al, 2013) and include take-home naloxone and overdose avoidance education focusing on risks of solitary use. Furthermore, in neighborhoods with an open-air drug market, such as Philadelphia's Kensington, overdoses of the "setting" type can be addressed by saturating the community with naloxone (Tobin, Edwards, Davey-Rothwell, & Latkin, 2018) so that it's readily available for residents, businesses, and in public places.

Overdose circumstances of the "set" type, involving emotional triggers, are more difficult to address, yet, some degree of prevention could be achieved with community-based treatments

that have shown promise for reducing trauma among women who use drugs (Hien et al., 2009). Moreover, other upstream measures – provision of street-based women with housing, assistance with re-connecting with their families and children, employment assistance – though not explicitly targeting an overdose, can be highly effective for the overall normalisation of women's lives and reduction of unsafe drug use.

These results should be considered in light of several limitations. First, overdose experiences described by this study are heavily grounded in the realities of Philadelphia's unique drug scene. Particularly, "drug"-involved overdose circumstances may not be fully translated to urban contexts with closed drug markets where heroin potency is more closely linked to price (Mars et al., 2015). Second, the sample was restricted to participants of a harm reduction program who could potentially have more knowledge about overdose prevention than their counterparts not exposed to harm reduction services. This feature of the sample, however, may not be crucial since none of the interviewees attempted to apply a recommended overdose avoidance strategy (for example, testing or titrating a dose) before they experienced the most recent overdose. Third, though the assignment of overdose cases into "drug," "set," or "setting" types was discussed between two co-authors, no inter-rater reliability between the coders was conducted. Fourth, the validity of narrative data could be affected by the memory of interviewees who might not accurately remember events preceding their overdose. However, we tried to mitigate possible recall bias by supplementing leading interview questions with detailed probes and analyzing only recent overdose experiences. Additionally, since only the most recent overdoses were examined, the results are not necessarily representative of the full range of overdose experiences within each woman in the sample. Finally, though the "drug, set, and setting" framework was instrumental in organizing and analyzing the data, the specific proportions of overdoses attributed to "drugs," "set," or "setting" should be considered with caution as they may be a function of this women-only sample. In particular, future studies should investigate whether a high proportion of participants would attribute their most recent overdose to "set" in a mixed-gender or male-only group of participants. Nevertheless, the study aimed to document various patterns of circumstances preceding an overdose rather than establish the relative share of each pattern.

In conclusion, this study revealed the substantial utility of the "drug, set, and setting" framework in understanding circumstances surrounding women's overdose. This research contributes to the overdose literature by showing that overdose is not an inevitable part of drug use experience, but a highly contextualized phenomenon grounded in specific circumstances; otherwise, people who use drugs, such as the women in this study, would overdose every day. In order to be successful, overdose prevention policies should take into account both drug- and nondrug-related factors amplifying overdose risks. Most importantly, overdose prevention efforts should embrace not only individual-level behavioral interventions, but also structural measures to address the overall stress, social isolation, and risky drug use contexts that plague the lives of street-involved women who inject opioids.

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Table 1.

Social, demographic, and drug use characteristics of interviewees (N=29)

Characteristic	Total, % (n)
Age	
Mean (range)	35.7 (22-54)
Race	
White	65.5 (19)
Non-White *:	34.5 (10)
African-American	17.2 (5)
Hispanic	3.4 (1)
Native American	3.4 (1)
Mixed race	10.3 (3)
Education	
High school graduate/GED or above	75.9 (22)
Sexual orientation	
Sexual minority (homosexual or bisexual) (n=28)	35.7 (10)
Family situation	
Living with a partner	48.3 (14)
Having children	75.9 (22)
Parental rights ever terminated or suspended (n=21)	33.3 (7)
Recent street involvement	
Survival sex, past 12 months	69.0 (20)
Unstable housing, past 12 months	89.7 (26)
Drug use in public places, past 30 days	89.7 (26)
Drug sales in public places, past 30 days	27.6 (8)
Incarceration (prison or jail)	
Lifetime	72.4 (21)
Past 12 months	44.8 (13)
Drug use profile	
Age at first injection, mean (range)	26.1 (14-45)
Past 30-day use:	
Heroin	100.0 (29)
Prescription opioids	44.8 (13)
Cocaine or crack	96.6 (28)
Benzodiazepines	44.8 (13)
Cannabis	44.8 (13)
Mixing heroin with cocaine/crack (“Speedballs”)	65.5 (19)
Mixing heroin with any benzodiazepine	27.6 (8)

[*] To increase confidentiality, participants were described as “Non-white” throughout the paper.