



## Editor's choice

## Drug use behaviors, trauma, and emotional affect following the overdose of a social network member: A qualitative investigation



Alexandria Macmadu<sup>a</sup>, Lisa Frueh<sup>b</sup>, Alexandra B. Collins<sup>a</sup>, Roxxanne Newman<sup>a</sup>, Nancy P. Barnett<sup>c</sup>, Josiah D. Rich<sup>d</sup>, Melissa A. Clark<sup>e</sup>, Brandon D.L. Marshall<sup>a,\*</sup>

<sup>a</sup> Department of Epidemiology, Brown University School of Public Health, 121 South Main Street, Providence, RI, USA

<sup>b</sup> Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA, USA

<sup>c</sup> Department of Behavioral and Social Sciences, Brown University School of Public Health, 121 South Main Street, Providence, RI, USA

<sup>d</sup> The Center for Health + Justice Transformation, The Miriam Hospital, 1125 North Main Street, Providence, RI, USA

<sup>e</sup> Department of Health Services, Policy & Practice, Brown University School of Public Health, 121 South Main Street, Providence, RI, USA

## ARTICLE INFO

## Keywords:

Overdose  
Drug use behaviors  
Social networks  
Social influence

## ABSTRACT

**Background:** Scant research has examined the influence of overdoses occurring in social networks (i.e., knowing someone who has overdosed) on individual overdose risk. We sought to characterize drug use behaviors of individuals following the overdose of someone in their social network.

**Methods:** We conducted semi-structured interviews with 25 people who use drugs and knew someone who overdosed in the prior 90 days. All interviews were conducted in person in Rhode Island from July to October 2021. Data were stratified by drug use behaviors following the overdose of a network member (i.e., risk behaviors, protective behaviors, no change; selected *a priori*) and analyzed using a thematic analysis variation to identify salient themes.

**Results:** We identified variation in the effect of knowing someone who overdosed on subsequent drug use behaviors and emotional affect. Several participants described increasing their drug use or using more types of drugs than usual to manage feelings of bereavement and trauma, and a subset of these participants described increased drug use with suicidal intention and increased suicidal ideations following the overdose event. Other participants described reducing their drug use and engaging in protective behaviors in response to heightened perceived overdose risk, protection motivation (i.e., increased motivation to protect oneself), and concern for others. Additionally, some participants reported no change in drug use behaviors, and these participants described already engaging in harm reduction practices, feeling desensitized due to frequent or repeated exposure to overdose, and ambivalence about living.

**Conclusions:** Findings suggest a need for enhanced investment in network-based overdose prevention interventions, as well as more robust integration of bereavement support and mental health services in settings that serve people who use drugs. The findings also suggest a need for future research to identify mediators of the effect of overdose occurring in social networks on individual overdose risk.

## Introduction

The overdose crisis in the United States (US) has reached unprecedented levels. Provisional drug overdose death counts indicate that over 100,000 overdose deaths occurred in the US in 2021 alone (Ahmad et al., 2020), which is greater than the number of deaths attributable to motor vehicle accidents and firearms combined (Rabin, 2021). The rising rates of overdose in the US over the past three decades has been described as a four-wave epidemic (Ciccarone, 2021; Jenkins, 2021), which began iatrogenically with increased availability of prescription opioid painkillers

(Kolodny et al., 2015; Madras, 2017; Van Zee, 2009). Subsequent waves have been characterized by a market-based shift to heroin use (Cicero et al., 2014; Unick et al., 2013), increased dominance of illicitly-manufactured fentanyl in street-based drug supplies (Ciccarone, 2017; Frank & Pollack, 2017), and increasing opioid-stimulant combination deaths (Ciccarone, 2021; Jenkins, 2021; Townsend et al., 2022).

Beyond these supply-based drivers of the overdose crisis, additional research has documented that features of social networks can influence overdose risk (Havens et al., 2011; Latkin et al., 2004). In this analysis, social networks are defined as the plexus of individuals' social

\* Corresponding author.

E-mail address: [brandon\\_marshall@brown.edu](mailto:brandon_marshall@brown.edu) (B.D.L. Marshall).

interactions and personal relationships (Perry et al., 2018); these networks are composed of friends, sexual partners, family members, people who sell drugs, acquaintances, and other social actors (e.g., outreach workers). Prior research has found that witnessing a greater number of overdoses is associated with greater overdose risk (Bohnert et al., 2012; Havens et al., 2011; Man et al., 2002); however, the mechanisms by which overdoses occurring in social networks—both witnessed and non-witnessed—may affect individual overdose risk remain poorly understood. To the authors' knowledge, no prior research has examined the influence of overdose occurring in social networks (i.e., knowing someone who has overdosed) on individual drug use behaviors. For example, knowing someone who has overdosed may encourage greater caution in drug use practices in some individuals (Moallem et al., 2019), thereby conferring protective benefits. Conversely, knowing someone who has overdosed may engender grief and drug use-oriented coping behaviors (Wong et al., 2013), thereby exacerbating overdose risk in others.

Given this gap in the literature, we sought to explore the experiences of people who use drugs following the fatal or nonfatal overdose of someone they knew. The objective of this study was to characterize drug use behaviors and emotional affect following the overdose of a social network member. Our analysis draws on protection motivation theory, which posits that in response to threatening health information (i.e., in this case, knowing someone who has overdosed), individuals may choose to engage in protective health behaviors or risk behaviors, which is referred to as the coping mode (Rogers, 1975). One's coping mode is informed by a cognitive mediating process that comprises threat appraisal (i.e., perceived severity of risk) and coping appraisal (i.e., one's response to the threat) (Latkin et al., 2019a; Rogers, 1975).

## Methods

Between July and October 2021, persons enrolled in the Rhode Island Prescription and Illicit Drug Study (RAPIDS) were invited to participate in the present study. RAPIDS is an ongoing clinical trial assessing the efficacy of a fentanyl test strip intervention in a prospective cohort of people who use drugs, which is described in detail elsewhere (Jacka et al., 2020). RAPIDS participants are recruited from Rhode Island, a state with heightened and sustained overdose rates since 2014 (Prevent Overdose RI, 2022), using field-based recruitment strategies, Internet based advertising, and statewide advertisements on public transportation. Research assistants provided informational flyers to prospective participants following their completion of RAPIDS baseline and follow-up assessments. Prospective participants were then referred to the lead author for additional information and eligibility screening.

The present study employed the same eligibility criteria as RAPIDS, which included being a 18 to 65 years of age, a resident of Rhode Island, able to complete interviews in English, able to provide informed consent, and reporting prior 30-day use of heroin, illicit stimulants, counterfeit prescription pills, or any drug by injection (Jacka et al., 2020). An additional inclusion criterion for the present study was knowing someone who experienced an overdose in the prior 90 days. No additional sampling restrictions were applied; however, after enrolling 15 men, we sought to purposively sample women (transgender inclusive) to achieve representativeness by gender (Substance Abuse and Mental Health Services Administration, 2021).

In-person, semi-structured interviews were facilitated using an interview guide to elicit detailed information about the overdose event, including the circumstances of the overdose (e.g., whether the participant was present when the overdose occurred or learned details about the overdose event after) and participants' relationship to the person who overdosed. In this analysis, we applied a broad definition of social networks that included both close (e.g., family members, close friends) and distal (e.g., acquaintances, strangers) social ties. Participants' relationship to the person who overdosed is presented alongside narratives to contextualize these experiences. Interviews also sought to explore participants' drug use practices and emotional affect in re-

sponse to the overdose event. A short, interviewer-administered questionnaire was used to capture self-reported sociodemographic characteristics and drug use patterns. Specific characteristics assessed included: age, sex at birth (categorized: male; female), current gender identity (categorized: male; female; transgender; genderqueer or non-binary; other), race (categorized: American Indian or Alaska Native; Asian; Black, African, Haitian, or Cape Verdean; Native Hawaiian or other Pacific Islander; white; biracial or multi-racial/mixed race; other), ethnicity, defined as Hispanic or Latino descent (yes vs. no), and sexual orientation (categorized: straight; gay or lesbian; bisexual; queer; other).

Interviews were conducted in private offices at the Brown University School of Public Health, which is located a short distance (i.e., a five-minute walk) from the state's largest hub for bus transit and is highly accessible to participants. After obtaining written informed consent, interviews averaged 35 minutes in duration. All interviews were audio-recorded and professionally transcribed verbatim with identifying information removed to protect confidentiality. All participants were remunerated \$30 USD in cash for their time.

All interviews were facilitated by the lead author, who has been trained in conducting trauma-informed research and has extensive experience conducting interviews with people who use drugs. Given the sensitive nature of interview topics, study consent materials and the interview guide outlined the risks of emotional discomfort. Participants were informed throughout the interview that they could discontinue at any time without forfeiting compensation and that they could skip any questions that they felt uncomfortable answering. No participants exhibited imminent risk of harm; however, protocols were in place to cease study procedures and contact the study's licensed medical provider if needed. Participants were provided a packet of mental health, harm reduction, and other resources and were given a verbal explanation of these available resources.

Pseudonyms were assigned to all participants. Participant demographics (e.g., age, race/ethnicity, gender) are included alongside pseudonyms to contextualize participants' narratives and the variegated, socially situated experiences of people who use drugs (Collins et al., 2019a, 2019b). Racial and ethnic identities are specifically denoted because Black and Hispanic/Latinx populations in the US are increasingly and disproportionately affected by the overdose crisis (Townsend et al., 2022), which is due in large part to the pernicious effects of structural racism. This study was approved by the Brown University Institutional Review Board.

De-identified transcripts were imported into Dedoose 9.0.46 for analysis. Dedoose is a secure, web-based application for qualitative and mixed methods research, and the application is operated and developed by researchers from the University of California, Los Angeles (UCLA) (Salmona et al., 2019). Functionally, Dedoose is comparable to traditional qualitative data analysis software such as NVivo for the purposes of qualitative data management, coding, and analysis. We selected Dedoose for this analysis because the web-based configuration enabled real-time collaboration among coders without a need to download or merge multiple project files, and the application provides robust data security and privacy protections (Salmona et al., 2019). Two members of the study team (AM and LF) analyzed transcripts using inductive and deductive approaches (Fereday & Muir-Cochrane, 2006), and a 'codebook' thematic analysis variation was used (Braun & Clarke, 2021). Initial codes were generated inductively through line-by-line review of eight initial transcripts, as well as deductively through the lens of protection motivation theory (Latkin, 2019a; Rogers, 1975). All data were coded by two members of the research team who independently applied the codebook (i.e., coding framework) to five initial transcripts to assess fit to the data and enhance inter-rater reliability. Codes were then refined, expanded, and merged as needed. Discrepancies in coding were discussed and resolved by consensus in weekly meetings of the coders, and the codebook was periodically refined as initial themes were generated (Fereday & Muir-Cochrane, 2006; MacQueen et al., 1998).

**Table 1**

Sociodemographic characteristics and drug use patterns of 25 people who use drugs and knew someone who overdosed in the prior 90 days in Rhode Island from July to October 2021.

Characteristic		Overall (N=25)
<b>Sociodemographics</b>		
Age	Median (IQR)	38 (33, 50)
Sex at birth	Male	15 (60%)
	Female	10 (40%)
Gender	Cisgender	25 (100%)
Race	Black <sup>a</sup>	3 (12%)
	White	20 (80%)
	Biracial or multi-racial	2 (8%)
Ethnicity	Hispanic or Latinx	2 (8%)
Sexual orientation	Straight	22 (88%)
	Bisexual	3 (12%)
<b>Drug use: Prior week</b>		
Heroin	Any	13 (52%)
Fentanyl	Any	14 (56%)
Prescription opioids	Any	9 (36%)
Prescription stimulants	Any	2 (8%)
Powder cocaine	Any	11 (44%)
Crack cocaine	Any	19 (76%)
Benzodiazepines	Any	12 (48%)
Crystal methamphetamine	Any	6 (24%)
Club drugs (e.g., Ecstasy)	Any	3 (12%)
Psychedelics (e.g., acid)	Any	1 (4%)
Marijuana	Any	13 (52%)
<b>Drug use: Lifetime</b>		
Heroin	Any	24 (96%)
Fentanyl	Any	21 (84%)
Prescription opioids	Any	25 (100%)
Prescription stimulants	Any	20 (80%)
Powder cocaine	Any	25 (100%)
Crack cocaine	Any	25 (100%)
Benzodiazepines	Any	23 (92%)
Crystal methamphetamine	Any	18 (72%)
Club drugs (e.g., Ecstasy)	Any	21 (84%)
Psychedelics (e.g., acid)	Any	16 (64%)
Marijuana	Any	25 (100%)
Overdose experience, prior 12 months <sup>b</sup>	Any	14 (56%)
Overdose exposures, prior 12 months <sup>c</sup>	Median (IQR)	8 (3, 12)
Overdose exposures, prior 3 months <sup>c</sup>	Median (IQR)	3 (2, 4)

<sup>a</sup> Includes self-identified African, Haitian, and Cape Verdean ancestry.

<sup>b</sup> Refers to having personally overdosed.

<sup>c</sup> Refers to the number of people whom the participant knew to have overdosed.

During analysis, transcripts were stratified by drug use behaviors following the overdose of someone they knew, including (a) risk behaviors, (b) protective behaviors, and (c) no change. These strata were selected *a priori*, and the lead author organized coded text fragments to identify salient themes and subthemes within each stratum. Within each stratum of drug use behaviors, we identified salient themes of participants' drug use practices and emotional affect following the overdose. Included excerpts were reviewed by the lead author for accuracy.

Notably, in addition to describing the most recent overdose of someone they knew, some participants also described their response to other recent overdoses. In some cases, responses to these overdose events differed within participants (e.g., risk behaviors following the overdose of a close friend, no change following the overdose of an acquaintance). To enhance variability, all experiences were coded and included in this analysis. As a result, the sum of participants included in each stratum slightly exceeds the total number of participants.

## Results

Among 25 people who use drugs and knew someone who overdosed either fatally or nonfatally in the prior 90 days, the majority were men (n=15, 60%), white (n=20, 80%), and cisgender (n=25, 100%), and the median age was 38 (interquartile range [IQR]: 33, 50) (see Table 1).

All participants had lifetime experience with prescription opioids, powder cocaine, crack cocaine, and marijuana, and nearly all (n=24, 96%) had lifetime experience with heroin. The most frequently reported drugs used in the week prior to the interview were crack cocaine (n=18, 76%), fentanyl (n=14, 56%), heroin (n=13, 52%), and marijuana (n=13, 52%). Over half (n=14, 56%) reported having personally overdosed in the 12 months prior to interview. The median number of people whom participants knew to have overdosed was 8 (IQR: 3, 12) in the prior 12 months and 3 (IQR: 2, 4) in the prior 3 months.

In the subsequent sections, we characterize the experiences of participants who described engaging in increased risk behaviors following the overdose of someone they knew (e.g., increased drug use or using more types of drugs). We also explore the central theme of drug use to manage feelings of bereavement and trauma, as well as subthemes pertaining to increased drug use with suicidal intentions and suicidal ideations. Next, we describe the experiences of those who described engaging in increased protective behaviors following the overdose of someone they knew (e.g., using less drugs, using fentanyl test strips), and we explore the themes of heightened perceived risk of overdose, greater protection motivation, and enhanced concern for others. Finally, we describe the sentiments of those who reported no change in drug use behaviors, and we explore the themes of already engaging in harm reduction practices, feeling desensitized due to repeated exposure to overdose, and ambivalence about living.

### Increased risk behaviors

Several participants (n=7) described engaging in increased risk behaviors following the overdose of someone they knew. Specifically, participants described either increasing their drug use or using more types of drugs than usual following the overdose of someone they knew, which was commonly someone close to them. 'Ellen' (a 47-year-old white woman) described learning about the fatal overdose of a close friend. After this overdose, she explained that she both purchased and used more crack cocaine than is typical for her: "I *definitely used more. When I had found out like, I usually only buy like a 20 at a time, or a 40 at a time. And when I found out about his overdose, I think I bought a hundred dollar piece.*"

Other participants described using more types of drugs following the overdose of someone close to them. 'Anthony' (a 21-year-old multiracial man) described finding a close friend who had overdosed fatally. After this event, 'Anthony' explained "I *started using more. [...] I started using more and more benzos, like, um, like Xans [Xanax] and Klonopins, and then when they weren't doing enough, then I started doing the fatty ones, the fentanyl Percs [Percocet].*" 'Ellen', 'Anthony', and other participants described engaging in behaviors that increased their risk of overdose following the overdose of someone they knew.

### Increased risk behaviors to manage feelings of bereavement and trauma

Some participants described increasing their drug use to manage feelings of bereavement and trauma following the overdose of someone they knew. Importantly, both witnessed and non-witnessed overdoses were described by participants as influential, particularly when the individual who overdosed was someone emotionally close to the participant, such as a family member, partner, or close friend. 'Ellen' (a 47-year-old white woman) described her experiences after learning about the fatal overdose of a close friend:

*I cried. Probably for a good hour when I first heard about it. And then after that, I just-I had a couple breakdowns after that. I wasn't able to go to the memorial service that they had at the house [...] So it was kind of fucked up. I couldn't even say goodbye at all.*

Nonfatal overdoses were also described as influential, particularly when these events were witnessed, and for some participants, witnessed overdose events were described as highly traumatic. One participant, 'Chris' (a 29-year-old white man) described responding to the nonfatal

overdose of a close friend. When asked whether he felt that this experience affected his drug use, he explained:

*Oh yeah, absolutely, it affected my drug use. 'Cause, you know, it just gave me-it just messes with my PTSD [post-traumatic stress disorder] more, you know? And I use to get away from fucking my demons, you know? I use to get away from everything. Like, I've been shot. I've been stabbed. I was molested as a kid for six years. So, you know what I mean? And I just use to get away from everything, you know? So, at the end of the day, that just adds more to it, you know?*

Moreover, in a subset of participants, losing a friend led to increased drug use with what they described as suicidal intention. As 'George' (a 51-year-old white man) explained:

*[It] just made me, I just wanted to get more and numb myself, and so I'll just do something else and a mixture and, you know. I tried to commit suicide, so I overdosed and, um, someone found me. But, um, so yeah, it's just the different kind of drugs and all that stuff, it's just seems-being so depressed it's just from losing somebody from, um, you know, um, incidental [sic] overdose.*

Similarly, 'Chris' (a 29-year-old white man) explained that losing multiple friends to overdose had precipitated suicidal ideations:

*I think sometimes, like, maybe I can just fucking, maybe I can just go and be with [friend] and [friend] and-and, um, you know, [friend] and just everybody. I've lost almost 30 friends to fucking fentanyl. 30 people. Literally, I've lost, like, 30 friends. And sometimes I just think, like, fucking maybe I can just go be with them, you know?*

While increased drug use with suicidal intention and suicidal ideations were described by only two participants, these narratives illustrate the profound influence that overdoses occurring in social networks can have on mental health and life-threatening behaviors. In particular, the narrative from 'Chris' suggests that for some, losing multiple people to overdose may have a cumulative effect, with increasing exposure to overdose culminating in greater grief, trauma, and heightened risk of increasing drug use to manage these feelings.

#### *Increased protective behaviors*

Many participants (n=11) described engaging in what we characterized as protective behaviors following the overdose of someone they knew. 'Laura' (a 47-year-old white woman) described reversing her partner's overdose. When asked whether this experience affected her own drug use, she explained, "I had an opportunity to do some heroin, uh, last night. And I wouldn't. So I am not going to touch that anymore. I-I just can't."

While some participants, like 'Laura', described reducing their drug use, others described using fentanyl test strips, taking a "tester" (i.e., a small amount of drug) before using a larger dose to gauge strength, and implementing other strategies to reduce their risk of overdose. For example, 'Jack' (a 31-year-old white man) recounted that since learning about the fatal overdose of a close friend, he now takes care to unlock the public restroom door promptly after he injects to allow someone to render aid should he overdose: "[It has] just made me a little bit more responsible. Like, you know, I used to lock the door and be in a bathroom, do my shot, and then whatever. Now, like I said, I make sure everything's ready to go. So as soon as I do that shot, I cap it and I'm right out the door. I, you know, hit the door handle so it unlocks." Like 'Laura' and others, 'Jack' described implementing new strategies to protect himself from fatal overdose following the overdose of someone he knew.

#### *Increased protective behaviors due to heightened perceived risk of overdose*

Among participants who described engaging in protective behaviors following the overdose of someone they knew, heightened perceived risk of overdose was a recurring theme. 'Nick' (a 35-year-old white man) described reducing his drug use after learning about the nonfatal overdose of an acquaintance:

*[It's] just eye opening that you may want to cut down and not do drugs because it could happen. And it's a lot more frequent that you're hearing people are overdosing. [...] Just, you don't wanna overdose. You don't wanna risk having that happen to you.*

Similarly, 'David' (a 24-year-old white man) described using more carefully after witnessing the overdose of a family member. When asked why this experience affected his drug use, he explained:

*[The overdose] didn't, actually, look comfortable. Like, some people say overdosing is, like, peaceful, but he did not look like... He was, like, he was convulsing. When he woke up, he was, like, moaning in pain and stuff. Partially because of his hip, too, probably. It just doesn't seem like a pleasant experience to me. You know, definitely something I'd rather avoid.*

'Nick', 'David', and other participants who engaged in increased protective behaviors described experiencing a heightened perceived risk of overdose following the overdose of someone they knew.

#### *Increased protective behaviors due to greater protection motivation*

Increased motivation to protect oneself from overdose was also reiterated among participants who engaged in protective behaviors after an overdose of someone they knew. 'Jack' (a 31-year-old white man) described learning about the fatal overdose of a close friend. When asked whether this experience affected his own drug use, he explained:

*I don't use- I try not to use as much now. You know? That was a wakeup call. Seeing him-somebody that close to me, you know, die. Well, not seeing 'cause I didn't see him die, but now you know, he's dead, so it was a wakeup call. You know? So I mean, I haven't had one hit that close to home.*

Similarly, 'Daniel' (a 32-year-old Hispanic Black man) described witnessing the nonfatal overdose of an acquaintance. When asked how this experience affected him, he explained:

*It motivates me more to, uh, to change my life and just go back to the person I was [...] It just motivates me more to stop doing it. 'Cause it's either that life that I'm looking at, or go live the better life, take care of your family like I'm supposed to be doing, you know?*

Like other participants who implemented new strategies to protect themselves from overdose, 'Jack' and 'Daniel' described experiencing an increased motivation to protect themselves from overdose.

#### *Increased protective behaviors due to enhanced concern for others*

A few participants explained that knowing someone who overdosed has fostered a greater concern for loved ones who would be affected by their overdose. 'Jack' (a 31-year-old white man) described learning about the fatal overdose of a close friend, stating:

*Now I'm like, you know, starting to realize that wow like I don't want to hurt somebody. If I'm gone, that person's gonna be hurting. They're gonna be upset. They're gonna be distraught. You know what I mean? I don't wanna put my mother through that. You know what I mean? ...I don't want to put anybody through that. You know what I'm saying? My family. Whatever.*

Similarly, 'Laura' (a 47-year-old white woman) described avoiding heroin after reversing her partner's overdose. When asked why that experience affected her drug use, she explained:

*It's too much for me. Like I just- I've got so much stuff going on in my life and I can't use, you know what I mean? And my kids, if something happened and I die, I couldn't imagine how my kids would be.*

'Jack', 'Laura', and others who engaged in increased protective behaviors described experiencing an enhanced concern for others following the overdose of someone they knew.



### No change in drug use behaviors

Many participants (n=10) described experiencing no change in their drug use behaviors following the overdose of someone they knew. Among these, several participants expressed a heightened desire to reduce or discontinue their drug use after these events but noted that the experience ultimately had no effect on their drug use behaviors. 'Scott' (a 34-year-old white man), described reversing the overdose of a close friend. When asked whether that experience affected his drug use in any way, he explained:

*No. I don't do no more, no less. I still do the same amount every day. Um, it hasn't impacted my usage, no. I mean, I don't wanna be usin'. I wanna have a better life. [...] But, no, it hasn't impacted my usage.*

Similarly, 'Nicole' (a 33-year-old white woman) described reversing the overdose of an acquaintance. When asked whether the experience affected her drug use, she explained:

*Um... Not like I could see. Obviously, it should've. Or, I could- I don't know. I go to this one person. They have the same stuff all the time. And I'm always using with other people. [...] I guess it probably like, made me want to stop again. But, I don't think in the end it affected it.*

'Scott', 'Nicole', and other participants explained that knowing someone who overdosed did not affect their drug use behaviors, although some participants described an increased desire to reduce or discontinue their use following the overdose of someone they knew.

### Already engaging in harm reduction practices

Among participants who described no change in their drug use behaviors, many recounted that the overdose event had no effect on their drug use practices because they already engage in harm reduction practices. 'Victoria' (a 30-year-old white woman) described reversing the overdose of an acquaintance. When asked whether that experience affected her own drug use, she replied:

*Not really. 'Cause I still use how I use. I am always cautious about what I use, you know. [...] I've been doing drugs for so long. I have my method. No one will ever change my method of how I use. My method is do a tiny bit. You know, because you can always put more in, you can't take out.*

'Beth' (a 51-year-old white woman) described learning about the fatal overdose of an acquaintance. Much like 'Victoria', when asked whether that experience affected her drug use, 'Beth' explained:

*No, I'm just um, I'm very careful when I use, like I said, we always have naloxone, we always use together, one uses before the other, you know? Uh, if we have to, we'll call the emergency. But um, so it hasn't really. Like I still take the precautions I- we normally do.*

These participants, and others, explained that knowing someone who overdosed recently did not affect their drug use behaviors because they already engage in harm reduction practices.

### Desensitized due to repeated exposure to overdose

Many participants explained that knowing someone who overdosed did not affect their drug use because they feel desensitized after having known many people who overdosed. 'Victoria' (a 30-year-old white woman) described reversing the overdose of an acquaintance, and she recounted that the experienced did not affect her. When asked why she felt that this experience did not affect her drug use, she explained:

*It's just 'cause it didn't. Because I've seen so many overdoses. [...] I'm not fucked up that someone almost died in front of me because people have died in front of me. So, the almost doesn't count 'cause I had people that have died, been shot in front of me, have died from an overdose in front of me. So, the almost people don't count because I've already seen death before. You see... do you kind of understand what I'm saying? Like, so I've seen death before.*

'Victoria' described emotional numbness and desensitization in response to these recurring traumas. Unlike 'Victoria', who described this emotional numbness in the context of reversing the overdose of an acquaintance, 'Rob' (a 37-year-old multiracial man) described reversing the overdose of a close friend. When asked why he believed that experience did not affect his drug use, he replied:

*Just desensitized, I guess. You know, like if you watch too much violence on TV, then it's like, you know. It's just I've seen so much. Um, and like I'm growing like numb to it.*

'Victoria', 'Rob', and others described being unaffected by the overdoses of people they knew because they feel desensitized after repeated exposures to overdose and other traumatic experiences.

### Ambivalence about living

Some participants shared sentiments of ambivalence about living when explaining why knowing someone who overdosed did not affect their drug use. 'Scott' (a 34-year-old white man) described reversing the overdose of a close friend. When asked why he felt that this experience did not impact his drug use, he explained:

*Well, why it hasn't impacted me? Um... Prob... Uh, probably 'cause I... Probably 'cause I don't care [...] I don't have no family anymore anyway, so, I mean, whatever happens, happens, I guess. But that's the drugs. That's the addiction. That's-but I don't know. Right now, I just don't care. I don't know.*

Similarly, 'Rob' (a 37-year-old multiracial man) described reversing the overdose of a close friend. When asked why he felt that this experience did not affect his drug use, he explained:

*I get fucking horrified whenever [close friend] goes out, you know. But with me, it's like, well, if I go out and I die, then what the fuck. I ain't gonna know it. I know that sounds kind of messed up.*

Like others who expressed that knowing someone who overdosed did not affect their drug use, 'Scott' and 'Rob' attributed this response to feelings of ambivalence about living.

### Discussion

As a result of the ongoing overdose crisis, people who use drugs are experiencing profound and recurring trauma, bereavement, and other emotional affect following the overdoses of people they knew. In this analysis, we identified substantial variation in the effect of knowing someone who overdosed on subsequent drug use behaviors and emotional affect. To our knowledge, this study is among the first to investigate the influence of knowing someone who has overdosed on individual drug use behaviors, and findings have important implications for overdose prevention interventions, which are described in detail below.

Our finding that knowing someone who has overdosed can engender acute feelings of grief, bereavement, and trauma is supported by prior research that has documented experiences of disenfranchised grief (Valentine et al., 2016) and bereavement (Templeton et al., 2017) following a fatal overdose of a network member, particularly among family members of the decedent (Feigelman et al., 2020, 2011; Titlestad et al., 2021a, 2021b). Previous research has also established that witnessing an overdose event, including those that are nonfatal, are traumatic experiences (Bowles et al., 2020; Schneider et al., 2021; Selfridge et al., 2020), although this phenomenon has been examined most extensively in peer harm reduction workers and first responders (Kolla & Strike, 2019; Mamdani et al., 2021; Pike et al., 2019; Shearer et al., 2019; Wallace et al., 2018). Scarce prior literature has examined experiences of bereavement and trauma stemming from direct and indirect exposure to overdose among people who use drugs (Bowles et al., 2020; Selfridge et al., 2020). One study documented diverse emotional reactions to overdose events among people who use opioids and responded to an overdose event (Brandt et al., 2022). The present study strengthens

and extends this prior work by documenting experiences of bereavement and trauma among people who use drugs and knew someone who has overdosed, and by examining the effect of overdose occurring in social networks on drug use behaviors. Moreover, while prior research has documented the role of substance use in emotion regulation (Weiss et al., 2022), particularly in down-regulating negative emotions (Wong et al., 2013), this study is among the first to document increased drug use to manage negative emotions following the overdose of a network member.

Our finding that both witnessed and non-witnessed overdose can precipitate changes in drug use behaviors that increase risk of overdose is consistent with prior research that direct and indirect exposure to a traumatic event can lead to PTSD symptoms (Breslau & Kessler, 2001; May & Wisco, 2016; Weathers & Keane, 2007), and has important implications for network-based overdose prevention interventions. Earlier research has documented that witnessing a greater number of overdoses is associated with greater overdose risk (Bohnert et al., 2012; Havens et al., 2011; Man et al., 2002). However, we also found that indirect exposure to overdose (i.e., learning about an overdose without directly witnessing the event) was followed by increased engagement in drug use practices that increased risk of overdose for some participants, particularly when the individual who overdosed was someone emotionally close to the participant. Previous research has documented that learning about the accidental or violent death of a loved one, such as a close friend or family member, can result in PTSD (Breslau & Kessler, 2001; May & Wisco, 2016; Weathers & Keane, 2007). While the probability of developing PTSD from indirect exposure is lower than that from direct exposure (May & Wisco, 2016), our finding that indirect exposure to overdose can precipitate negative emotional affect and increased drug use for some individuals is supported by this previous research.

Extensive prior literature has documented the efficacy of overdose education and naloxone distribution programs (Clark et al., 2014; McAuley et al., 2015; McDonald & Strang, 2016; Razaghizad et al., 2021), which provide take-home naloxone and encourage naloxone carriage for administration to bystanders. Current findings suggest that, in addition to overdose education and naloxone distribution programs, other network-based overdose prevention interventions may be effective and responsive, particularly those that utilize social network structures to diffuse overdose prevention messaging (Latkin et al., 2019a, 2019b) and those that integrate social support networks into therapeutic programming (Panebianco et al., 2016). In particular, emergency department-based interventions that disseminate overdose education and naloxone to persons who have overdosed, as well as friends and family members (with patient consent), warrant additional investigation and replication (Welch et al., 2019). Overall, findings in the present study suggest a need for enhanced investment in the development, implementation, and assessment of network-based overdose prevention interventions.

Among participants who engaged in risk behaviors following the overdose of someone they knew, a subset described increasing their drug use with suicidal intention and increased suicidal ideation. Relatedly, some participants who reported no change in their drug use behaviors described sentiments of ambivalence about living. Suicide contagion is a well-documented phenomenon whereby knowing someone who died by suicide can prompt suicidal behavior in others (Abrutyn et al., 2020; Cheng et al., 2014; U.S. Department of Health & Human Services, n.d.). Suicide contagion may be an explanation for current findings; however, overdose deaths that were perceived to be unintentional and overdoses that were nonfatal were both found to prompt increased drug use with suicidal intention, increased suicidal ideation, and feelings of ambivalence about living. Current findings imply a so-called “overdose contagion,” whereby knowing someone who has overdosed may increase individual risk of overdose, regardless of perceived decedent intention (i.e., unintentional overdose) and overdose outcome (i.e., nonfatal versus fatal). While additional research is needed to validate and further characterize this phenomenon, current findings underscore the need for

a more robust integration of bereavement support, mental health services, and low threshold, trauma-informed therapeutic environments (Little & Franskoviak, 2010; Vakharia & Little, 2017) in settings that serve people who use drugs. Critically, current findings also indicate a need for enhanced screening for active suicidal ideation and ambivalence about living, particularly given that ambivalence about living is a documented risk factor for future suicide attempts (Naherniak et al., 2019).

While this research was conducted in the US setting, our findings are translatable to other settings and have implications for broader drug policy and practice. First, our findings demonstrate that fatal overdose may increase overdose risk behaviors in others. As such, our work underscores the need for enhanced and sustained investment in naloxone distribution globally, as well as policies that reallocate naloxone from “prescription-only” to “over-the-counter” status to increase accessibility (Walsh & Bratberg 2021). Notably, Australia, Canada, Italy, and the UK all permit prescription-free distribution of naloxone (Strang et al., 2019), and there is an urgent need to replicate this approach in other settings. Additionally, policymakers are encouraged to enhance investment in bereavement support and mental health services in settings that serve people who use drugs, such as harm reduction and treatment programs and emergency departments. In particular, opportunities may exist to provide aftercare or bereavement support to surviving family members and close friends of people who overdose (Templeton et al., 2017; Titlestad et al., 2021a, 2021b), and additional investment in the development and implementation of such programs may be promising.

Current findings should be interpreted in light of several limitations. First, our sample primarily comprised participants who identify as cisgender and white, which reflects the local demographics in Rhode Island. As a result, our findings may not reflect the experiences of more diverse populations, including persons who are gender diverse and people of color. Moreover, given that overdose rates are elevated and increasing among Black and Hispanic/Latinx populations in the US (Townsend et al., 2022), future research is needed to intentionally engage these communities and to characterize the experiences of Black and Hispanic/Latinx people who use drugs. Second, our findings reflect the perspectives of participants who were willing to discuss the overdose events of people they knew. Individuals who declined participation for any reason may differ systematically from those included in the current sample and have differing perspectives. Third, participant accounts of overdose events may be subject to recall bias and recall errors (Wright & Pescosolido, 2002), such as ascribing the details of one event to another. Nonetheless, self-reported drug use behaviors are generally valid (Darke, 1998; Johnson et al., 2000; Napper et al., 2010; Smith et al., 2010), and we restricted the sample to people who knew someone who overdosed in the prior 90 days to reduce recall bias. Thus, we expect that the experiences described herein are accurate and reliable. Finally, the methodologies leveraged in the current investigation do not permit causal inference. Future research might seek to investigate relevant constructs longitudinally.

## Conclusions

Among people who use drugs and knew someone who overdosed recently, we found variation in drug use behaviors following the overdose of a network member, including increased risk behaviors, protective behaviors, and no change in drug use behaviors following the overdose of a network member. Participants who engaged in risk behaviors following the overdose of someone they know described increasing drug use to manage feelings of bereavement and trauma, and a subset of these participants described increased drug use with suicidal intention and suicidal ideations. Future research is needed to identify mediators of the effect of overdose occurring in social networks on individual overdose risk. Our findings also suggest a need for enhanced investment in network-based overdose prevention interventions, as well as more ro-

bust integration of bereavement support and mental health services in settings that serve people who use drugs.

### Ethics approval

This study was approved by the Brown University Institutional Review Board.

### Declarations of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Acknowledgements

This work was conducted on the traditional lands of the Narragansett peoples. This study was supported by grant F31-DA052971 from the National Institute on Drug Abuse (AM) and grant R01-DA047975 from the National Institute on Drug Abuse (RN, BDLM). This work was also supported by the COBRE on Opioids and Overdose, which is funded by the National Institute of General Medical Sciences of the National Institutes of Health (P20GM125507). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Sponsors had no role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

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