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Fentanyl and drug overdose: perceptions of fentanyl risk, overdose risk behaviors, and opportunities for intervention among opioid users in Baltimore, Maryland, USA

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Abstract

Background: Fentanyl-related mortality has skyrocketed among people who use opioids (PWUO) in North America. The current study of PWUO aims to examine the perceived fentanyl risk and training needs; fatal overdose prevention behaviors; and, feasibility of a peer education approach to reducing fentanyl-related fatal overdoses in Baltimore, Maryland, USA.

Methods: 316 street-recruited PWUO were interviewed about fentanyl in Baltimore, MD

Results: Most participants (56%) reported that “all” or “almost all” heroin in Baltimore was adulterated with fentanyl and were worried (75%) about their drug buddies overdosing on fentanyl. Half (54%) the participants felt that they needed more training to respond to an overdose. Many participants (66%) reported receiving naloxone or a prescription for it, yet only 17% carried naloxone with them “often” or “always.” Among people who inject drugs only 13% had naloxone available “often” or “always” when they injected with others, and 51% “often” or “always” injected alone. Almost half of participants (47%) were “very willing” to talk with people in their neighborhood about fentanyl.

Conclusions: The majority of PWUO perceived that most heroin in Baltimore was adulterated with fentanyl, yet most did not carry naloxone and PWID often did so alone. Given the high perceived risk of fentanyl and relatively low uptake of fatal overdose prevention behaviors, there is an urgency for safe injection facilities, access to medically assisted treatment, and programs that work with the drug-using community to deliver overdose prevention training as well as promote behaviors to carry naloxone and not use drugs alone.

Introduction

Opioid overdose mortality rates have dramatically increased in the US and in several other countries in the last decade (Martins et al., 2015; Rudd, Seth, & Scholl, 2016; Richard et al., 2015; Roxburg et al., 2017). In the last few years, fentanyl-related mortality among people

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who use opioids (PWUO) has skyrocketed. Between 2015 and 2016, the fatal overdose rates attributed to synthetic opioids more than doubled (Hedegarrd, Warner, & Miniño 2017). Fentanyl is currently the most popular illicitly manufactured opioid and has more than 20 analogs with varying pharmacokinetic properties and potencies (Fairbairn, Coffin, & Walley 2017; Ciccarone, Ondocsin, & Masr 2017; Kuczyńska et al., 2018).

Fentanyl poses an increasing public health concern due to its potency, rapid onset of action, low production costs, and association with rising rates of fatal overdose. Fentanyl is a powerful synthetic opioid, approximately 30 to 50 times more potent by weight than heroin (Ciccarone, Ondocsin, & Masr 2017; Fairbairn, Coffin, & Walley 2017). Due to its high lipid-solubility, fentanyl has a rapid onset of action with speed depending on dosage and method of delivery (Fairbairn, Coffin, & Walley 2017; Stanley, 2014). A synthetic opioid, fentanyl has much lower production costs than heroin, a natural opioid made from the resin of poppy plants. Fentanyl, and its analogs, can be acquired through diversion of fentanyl-containing medicines or, more commonly, manufactured clandestinely and mixed with heroin to increase potency at minimal cost (Kuczyńska et al., 2018; Kim, 2014; Kuhlman, McCaulley, & Valouch 2003; Gladden, Martinez, & Seth, 2016). People who inject drugs (PWID) are at especially high risk of fatal fentanyl overdose because injecting fentanyl can cause life-threatening respiratory depression within two minutes, compared to 10 minutes for heroin (Green & Gilbert, 2016; Stanley, 2014). Irrespective of mode of administration, fentanyl's rapid onset of action and potency can cause central nervous system depression which can result in fatal overdose (Fairbairn, Coffin, & Walley, 2017). In the event of a fentanyl-related overdose, rapid response from peers or emergency response professionals and administration of one or more doses or naloxone, an opioid antagonist that reverses the effects of opioid overdose, can prevent a fatal overdose. (Fairbairn, Coffin, & Walley, 2017; Somerville et al., 2017). Fentanyl has been linked with the majority of recent fatal opioid overdoses, with fentanyl detected in 56.3% of 5,152 opioid overdose deaths in 10 US states from July to December 2016 (O'Donnell et al., 2017). Fentanyl analogs have been present in a some (14%) of the recent opioid overdose deaths (O'Donnell et al., 2017). Fentanyl was found to be mixed with other illicit drugs, such as heroin, in 57% of the deaths involving fentanyl and 51% of deaths involving fentanyl analogs (O'Donnell et al., 2017). The rise in fentanyl deaths coincides with high rates of fentanyl that have been found in drug treatment samples. A Massachusetts study of patients seeking inpatient opioid withdrawal management reported that 87% of patients had positive urine toxicology test results for fentanyl (Kenney et al., 2018).

There is a strong regional pattern in fentanyl–linked overdose. From 2013-2014 fentanyl-related deaths increased by 1,008, from 392 (2013) to 1,400 (2014) across eight high-burden states located in the Northeast (Massachusetts, Maine, and New Hampshire), Midwest (Ohio), and South (Florida, Kentucky, Maryland, and North Carolina; Gladden, Martinez, & Seth, 2016). This regional focus may be attributed to heroin distribution patterns with Mexican solid black tar and brown powder heroin sold in the west and Columbian white powder heroin sold in the east (Gladden, Martinez, & Seth, 2016; Ciccarone, 2009). Illicitly manufactured fentanyl is often mixed with white powder heroin which is sold in the east, the same region associated with a high prevalence of fentanyl-related overdose (Gladden, Martinez, & Seth, 2016). Baltimore, Maryland represents a city with a large increase in

fentanyl-linked overdose deaths. From 2016 to 2017, fentanyl-linked overdose deaths increased in Baltimore, Maryland by 267% (Baltimore City Health Department, 2017).

A potential response to the surge in fatal overdoses is peer education on fentanyl-related overdose prevention. Peer education provides an underutilized, low cost, and effective strategy to disseminate harm reduction strategies (Latkin, 2003; Sherman et al., 2009). Peer education, which trains community members in harm reduction strategies, offers a unique opportunity to disseminate harm reduction strategies to underserved populations, such as opioid users. Evaluations of overdose prevention trainings has found that peers can effectively diffuse overdose prevention information and response skills to their drug using network (Bardwell et al., 2018; Winhusen et al., 2016).

Despite fentanyl's pharmacological potency and increasing role in overdose mortality, few studies have examined the perceived risk of fentanyl and intervention opportunities to address fentanyl-related fatal overdose. The goal of this study was to address this gap by examining PWUO's perceptions of fentanyl risk and training needs as well as engagement in overdose risk prevention behaviors and feasibility of peer education as an approach to prevent fentanyl-related fatal overdoses. The aims of the study were to first, assess whether PWUO in Baltimore perceive that their drugs are laced with fentanyl and their concern that their drug buddies were at risk of overdosing on fentanyl, hence determining the need for overdose prevention. Second, examine perceived training needs. Third, evaluate engagement in behaviors that may prevent a fatal overdose among PWUO. These behaviors included carrying naloxone and, among PWID, the immediate access to naloxone during an injection episode and the frequency of injecting alone. Fourth (4), survey whether PWUO were willing to talk to people in their neighborhood about fentanyl. Finally (5), identify factors associated with PWUO willingness to work in their communities to educate their peers about fentanyl.

Methods

Study design and population

Study participants, who were recruited in Baltimore, Maryland from December 2016 to January 2018, provided screening data for a randomized clinical trial for an intervention to enhance hepatitis C (HCV) and HIV prevention and care among substance users residing in impoverished neighborhoods. Study protocols were approved by Johns Hopkins Bloomberg School of Public Health IRB, and participants provided written informed consent prior to enrollment. Recruitment was conducted through street-based outreach, word-of-mouth, flyers, advertisements in local newspapers, and community agency referrals. The initially recruited index participants were also encouraged to recruit network members. However, network members were not included in these analyses as the sample was small (N=49), the enrollment criteria were different, and their recruitment was not independent of the indexes. A survey was administered face-to-face, and sensitive questions were assessed via audio computer assisted self-interviewing (ACASI). Criteria for index enrollment were reporting on the initial screener that they were ages 18-55, and ever had injected drugs. There were 390 index participants screened, and 316 (81%) were identified as PWUO as defined by reporting in the prior year. injection drug use, any mode of heroin use, or using prescription

opioids to get high and were included in the current analyses. Of the PWUO, 210 (67%) reported injecting drugs in the prior 6 months and are defined in this study as PWID.

Measures

Participants were asked if they had ever heard of Narcan (naloxone) and there were also questions on homelessness, current medically assisted drug treatment, history of experiencing and witnessing drug overdoses, and demographics. Specific measures of interest to this study included:

Perceived fentanyl risk and training needs—To assess perceptions of fentanyl adulteration in heroin (as a measure of perceived risk) among the participants who reported that they had heard about fentanyl we asked: “What percentage of heroin on the streets of Baltimore do you think contains fentanyl?” The response categories were “none (0%),” “some (25%),” “about half (50%),” “most (75%),” “all (100%), or don’t know.” The question “How worried are you about a drug buddy (friend) overdosing on fentanyl?” assessed the level of concern about fentanyl overdose among peers, which may be a motivator for engaging in fentanyl overdose prevention and care activities. The response categories were “not at all worried,” “just a little worried,” “quite a bit worried,” and “very worried.”

We also examined perceptions of skills to respond to an overdose, by asking participants to respond to statements “I am going to need more training before I would feel confident to help someone who has overdosed.” The response categories for this question were “strongly agree,” “agree,” “neither agree nor disagree,” “disagree,” and “strongly disagree.”

*Fatal overdose prevention behaviors*PWUO were asked whether they had ever been prescribed or received a kit containing Narcan (“yes” or “no”) and how often they carried naloxone. Additional questions were asked in a sub-analysis of PWID. One question assessed the frequency of having Narcan (naloxone) present during their injection episodes, and one question assessed the frequency of injecting alone. The response categories for these three questions were “never,” “rarely,” “sometimes,” “often,” and “always.”

Willingness to communicate with peers about fentanyl—To assess willingness to address fentanyl in the community, we asked: “How willing are you to talk with people in your neighborhood about fentanyl?” The response categories were “very willing,” “somewhat willing,” “neither willing nor unwilling,” “somewhat unwilling,” and “very unwilling.”

Analyses

Fifteen participants reported that they had not heard of the drug “fentanyl.” Consequently, we did not ask them any additional fentanyl-specific questions. These 15 cases did not differ from cases without missing data but, as the number of missing was small, we had low statistical power to examine differences. For the questions on injecting and overdose risk, we conducted a sub-analysis of the 210 PWID. Bivariate analyses compared those who were “very willing” to talk with people in their neighborhood about fentanyl to those who

reported that they were less than “very willing.” We used this cutoff as it was a median split and to reduce social desirability bias of some people endorsing the item to present themselves in a more favorable light. Additionally, this cutoff was used because the goal of the multivariate analysis was to identify factors associated with people’s willingness to disseminate information about fentanyl to their community, compared to those who were not. To assess factors associated with willingness to talk to others about fentanyl, a backward conditional multiple logistic regression model was used to develop a parsimonious model. Included in the model were the variables presented in table three, and we used $p<.10$ from the bivariate analyses for inclusion in the multivariate model.

Results

The mean age of study participants was 45 (median 47), 67.1% were male, 60.1% African American, 37.2% white, 91.3% unemployed, 39.2% had less than 12 years of education, and 52.5% reported that they had been homeless in the last six months. Almost all (98.7%) reported a history of heroin use, and 94.9% reported a history of injecting drugs to get high with 66.5% reporting injecting in the prior 6 months; 63.5% had a positive HCV antibody test; 9.5% were HIV positive; 67.1% were currently on medically assisted drug treatment; 92.1% reported ever witnessing an overdose, with 55.4% witnessing an overdose within the prior year; 89.7% reported at least one overdose had occurred in their neighborhood within the prior year (median number =9); 67.4% reported having themselves ever overdosed (median number of past overdoses =2), and 35.1% had overdosed within the last year. Almost all participants (93.9%) had heard about “narcan to reverse an opiate overdose.” Characteristics of PWUO are summarized in Table 1.

Perceived fentanyl risk and training needs

Fifteen PWUO (4.7%) reported that they had not heard of fentanyl (Table 2). Of the PWUO who reported having heard about fentanyl (n=301), two people (0.0%) reported that “none” of the heroin in Baltimore contained fentanyl. However, most (56.2%) reported that they thought that “most” or “all” of heroin in Baltimore contained fentanyl; 25.2% reported that “about half” contained fentanyl, 17.6% reported that “some” or about one-quarter contained fentanyl and one person reported, “don’t know.” Most (74.8%) participants also said that they were “quite a bit worried” or “very worried” about their drug buddies overdosing on fentanyl.

In response to the statement “I am going to need more training before I would feel confident to help someone who has overdosed” more than half (53.5%) the respondents reported that they “agreed” or “strongly agreed.”

Fatal overdose prevention behaviors

The majority of PWUO (65.8%) reported receiving or having been prescribed naloxone (Table 2; N=316). However, most of the participants (64.6%) reported “never” or “rarely” carrying Narcan. Among the 210 PWID, 51.4% reported injecting “often” or “always” alone, and only 12.5% had Narcan available “often” or “always” when they injected with others (data missing for 2 participants).

Willingness to communicate with peers about fentanyl

About half (47.2%) of respondents reported that they were “very willing” to talk with people in their neighborhood about fentanyl (Table 2; N=301). Bivariate analyses compared those who were “very willing” to talk with people in their neighborhood about fentanyl to those who reported that they were less than “very willing.” Older age, receiving naloxone or a prescription for naloxone, and being very worried about drug buddies overdosing from fentanyl were associated with willingness to talk with people in their neighborhood about fentanyl (Table 3). In a backward stepwise multivariate logistic regression analyses, the two variables of older age based on a median split, and reporting being very worried about drug buddies overdosing from fentanyl maintained statistical significance. Receiving naloxone or a prescription for naloxone (OR =1.65, CI=0.98-2.78) was marginally statistically significant ($p<.10$). In the final model, the Cox & Snell R Square was .131, and the −2 Log likelihood was 374.

Discussion

In the current study, we found that the majority of PWUO perceived that most heroin in Baltimore was adulterated with fentanyl. Many participants were worried about their drug-using peers overdosing on fentanyl, however, half of the participants felt that they needed more training to respond to an overdose. Using drugs without naloxone present was common and, among PWID, injecting drugs alone was also common. Most PWUO had been either prescribed or given naloxone, presumably through the City Health Department’s naloxone distribution program, which through 2016 trained over 18,000 individuals and distributed over 15,000 naloxone kits (Baltimore City Health Department, 2018). Despite the breadth of these efforts 3 to 4 out of every 10 PWUO interviewed reported not having a prescription or supply of naloxone. Moreover, it is not clear how many people who had naloxone had been trained how to use it or felt that they had sufficient training.

Only a few participants reported that they did not know about fentanyl or thought that little or no heroin in Baltimore was adulterated with fentanyl. We do not know if this is due to measurement error or whether they are unaware of the prevalence of fentanyl. Regardless, it should not be assumed that all PWUO have been informed about fentanyl and its associated increased risk of overdose. As with most health behaviors, the study results suggest that the perceived risk that drugs are laced with fentanyl is not necessarily associated with behaviors to mitigate fatal overdose. Protection Motivation Theory may provide insight into why PWUO are not engaging in overdose risk prevention behavior. The theory posits that information about a health threat initiates two cognitive processes: threat appraisal and coping appraisal (Rogers, 1995). Protection Motivation Theory suggests that PWUO perceive that fentanyl is a threat; evidenced by perceived vulnerability to being exposed to fentanyl and perceived severity of fentanyl exposure, with participants expressing concern about peers overdosing (Prentice- Dunn & Rogers, 1986, Maddux & Rogers, 1982). However, study findings suggest that PWUO feel that they do not have the ability to cope with an overdose; as evidenced by high levels of reported need for additional training to respond to an overdose. In accordance with Protection Motivation Theory, this implies that interventions should work to increase self-efficacy for fatal overdose prevention and that

health behavior messaging that stimulates fear arousal may not be effective in changing behaviors (Rogers, 1975; Maddux & Rogers, 1983; Prentice-Dunn & Rogers, 1986). Working to train PWUO to respond to an overdose may enhance self-efficacy.

Study findings suggest that a social diffusion approach to behavior change through peer educators, is likely to be viable as almost half of the sample (47.2%) reported that there were very willing to talk to people in the neighborhood about fentanyl, and another third (32.9%) reported that they were somewhat willing to talk to people in the neighborhood about fentanyl. The ability to diffuse opioid prevention information through social networks is supported by the Diffusion of Innovation Framework which explains how technological or behavioral innovation spreads from a few people to become accepted as the norm in the community (Rogers, 1995). The Diffusion of Innovation framework asserts that early adopters, such as peer educators, disseminate information and persuade others to adopt an innovation through interpersonal communication with their social networks (Winnet et al., 1995). Strategies for peer educators to enhance self-efficacy of PWUO to respond to an overdose may include trainers modeling overdose response behaviors and having realistic practice of the skills needed to administer naloxone. To further enhance motivation for behavior change, peer educators can also help PWUO identify greater rewards than response costs by discussing the intrinsic reward of saving lives in conjunction with providing training on how to prevent negative interactions that could occur from administering naloxone.

To assess the feasibility of a peer education approach for fentanyl-related fatal overdose prevention, we examined factors associated with willingness to talk to others about fentanyl. We found that the frequency of overdose in the neighborhood and experiencing an overdose were not associated with a willingness to talk to others in the community about fentanyl. Although this is a cross-sectional study, these findings suggest that the prevalence of overdose in neighborhoods and personal experiences of drug overdoses may not be linked to people wanting to talk about fentanyl overdose prevention in their neighborhood. However, having naloxone or a prescription for naloxone and concern over drug buddies overdosing were positively associated with willingness to talk to others in the neighborhood about fentanyl. It is possible that people who are concerned about their peers overdosing obtain naloxone. It also may be that obtaining naloxone or a naloxone prescription leads individuals to perceive themselves as able to address opioid overdose, and hence they are more willing to talk to others about fentanyl. We did not find that perceived training needs were associated with willingness to talk to others about fentanyl. However, we cannot conclude from this lack of an association that training in peer education will not increase willingness to talk to others about fentanyl. This study highlights the need for further research, particularly qualitative research, to determine potential explanations for these association. Qualitative findings could help extend health behavior theories, such as Protection Motivation Theory, to help explain why people engage in behaviors that involve helping others health.

Future research should identify barriers and facilitators of peer education including access to training as well as behavior change resulting from different content and/or dosages of training. Future studies should also explore the efficacy of fentanyl-specific overdose prevention training as fentanyl overdoses have narrow rescue windows and may require

multiple doses of Narcan that exceed the doses carried by laypeople (Green & Gilbert, 2016; Somerville et al. 2017). Furthermore, results of this study suggest that PWID are a high-risk subgroup of PWUO due to the high prevalence of injecting alone, low naloxone availability, and pharmacological potency of intravenous administration of fentanyl.

Other behaviors that can prevent fatal overdose should also be the subject of future investigation and interventions. For example, other harm reduction practices include testing drugs for adulteration and potency. One challenge for harm reduction interventions is the inability of drug users to detect the quantity of fentanyl and its analogs in heroin (Carroll et al., 2017). One approach to address fentanyl overdose is the distribution of fentanyl test strips which indicate the presence versus absence of fentanyl (Krieger et al., 2018). While our study suggests that most drug users already perceive that heroin is adulterated with fentanyl, these strips may be valuable for testing drugs that may not be perceived to be adulterated, such as cocaine. Moreover, a positive test strip can be used to facilitate conversations for planning overdose prevention and care. A second challenge for harm reduction interventions is the variable potency of heroin and pills due to erratic adulteration (Fairbain, Coffin, & Walley 2017). Toxicology research is needed to quickly detect fentanyl analogs and fentanyl purity so that interventions can improve risk reduction techniques.

Additionally, drug stigma is a potential target of harm reduction interventions, as stigma may lead to hiding drug use from family, friends, and health professionals (Latkin et al. 2013; Mora-Ríos et al. 2017). It is important that PWUO do not use drugs alone to prevent fatal overdoses; however, users may not want to use with other drug users. Consequently, there is a need for training family members and friends who do not use opiates on how to discuss the topic of safer drug use, administer naloxone, and negotiate with PWUO to be able to monitor drug use events.

There are study limitations that should be considered. First, the cross-sectional design does not provide information on temporality, and causal claims cannot be made. Second, the study is limited by the sampling and enrollment criteria which require that participants have a history of injection. These findings, therefore, may not be relevant to people who do not have an injection history, such as people who only orally ingest opioid pills or snort opioids. Finally, findings may be influenced by social desirability biases where people respond inaccurately to self-report measures in order to look favorable to others (Fisher, 1993). Despite these limitations, this study provides important insight into the prevalence of fentanyl in Baltimore, MD and intervention opportunities to address fatal fentanyl-related overdose.

Conclusion

Fentanyl has greatly contributed to the epidemic of fatal drug overdoses in North America. In the current study, participants voiced a high level of concern about peers overdosing on fentanyl and believed that heroin is often adulterated with fentanyl. Yet many frequently do not have naloxone readily available, inject drugs alone, and perceive that they have inadequate training to intervene in the event that they witness an overdose. However, almost half of the sample was willing to talk to people in the neighborhood about fentanyl. These

results suggest that there are substantial training needs among PWUO, especially PWID, for addressing fatal overdoses as well as needs to change opioid use behaviors to always carrying naloxone and not injecting alone. Further, PWUOs' willingness to talk to their community about fentanyl suggests a possible intervention strategy to disseminate overdose prevention training into communities through peer educators.

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Table 1:

Characteristics of people who use opioids (n=316)

		N (%)
Age (mean)		45
Gender	Male	212 (67.1)
	Female	104 (32.9)
Race	African American	190 (60.1)
	White	118 (37.2)
	Other	8 (2.7)
Current employment status	Unemployed	289 (91.3)
	Employed	27 (8.7)
Educational attainment	< 12 years	124 (39.2)
	≥ 12 years	192 (60.8)
Homeless in past 6 months	Yes	166 (52.5)
	No	150 (47.5)
Ever injected drugs to get high	Yes	300 (94.9)
	No	16 (0.5)
Ever used heroin	Yes	312 (98.7)
	No	4 (1.3)
Injected in past 6 months	Yes	210 (66.5)
	No	106 (33.5)
Ever tested antibody HCV positive	Yes	201 (63.5)
	No	115 (36.5)
HIV status	Positive	30 (9.5)
	Negative/unsure	286 (90.5)
Currently in medically assisted drug treatment	Yes	212 (67.1)
	No	104 (32.9)
Ever witnessed an overdose	Yes	291 (92.1)
	No	25 (7.9)
Witnessed an overdose in past year	Yes	175 (55.4)
	No	141 (44.6)
Overdoses in neighborhood in the last year	Yes	283 (89.7)
	No	33 (10.3)
Ever overdosed	Yes	213 (67.4)
	No	103 (32.6)
Overdose in past year	Yes	111 (35.1)
	No	205 (64.9)
Heard about Narcan or naloxone (n=309)	Yes	290 (93.9)
	No	19 (6.1)

Table 2:

Prevalence of perceptions of fentanyl and drug overdose risk behaviors among people who use opioids

Heard of fentanyl (n=316)	
Yes	301 (95.3)
No	15 (4.7)
Perceived prevalence of fentanyl in heroin (n=301)	N (%)
None (0%)	2 (0.0)
Some (25%)	53 (17.6)
About half (50%)	76 (25.2)
Most (75%)	129 (42.9)
All (100%)	40 (13.3)
Don’t know	1 (0.0)
Worried about a drug buddy overdosing on fentanyl (n=301)	
Not at all worried	22 (7.3)
Just a little worried	54 (17.9)
Quite a bit worried	86 (28.6)
Very worried	139 (46.2)
Need more training before feel confident to help someone who has overdosed (n=316)	
Strong disagree	17 (5.4)
Disagree	111 (35.1)
Neither agree nor disagree	19 (6.0)
Agree	116 (36.7)
Strongly agree	53 (16.8)
Prescribed or provided Naloxone (n=316)	
Yes	208 (65.8)
No	108 (34.2)
Frequency carry Narcan (n=316)	
Never	174 (55.1)
Rarely	30 (9.5)
Sometimes	55 (17.4)
Often	26 (8.2)
Always	31 (8.8)
Frequency of having Narcan present when injecting (n=208)	
Never	65 (31.3)
Rarely	73 (35.1)
Sometimes	44 (21.2)
Often	15 (7.2)
Always	11 (5.3)
Frequency of injecting alone (n=210)	
Never	18 (8.6)

Rarely	40 (19.0)
Sometimes	44 (21.0)
Often	79 (37.6)
Always	29 (13.8)
Willing to talk with people in their neighborhood about fentanyl (n=301)	
Very willing	142 (47.2)
Somewhat willing	99 (32.9)
Neither willing nor unwilling	30 (10.0)
Somewhat unwilling	14 (4.7)
Very unwilling	16 (5.3)

Table 3.

Chi-square, odds ratio (OR), and adjusted odds ratio (aOR) analysis of characteristics associated with willingness to talk with others about fentanyl.

	Willingness to talk with people in neighborhood about fentanyl						
	"Very willing n=142 n (%)	**Less than "Very willing" n=159 n (%)**	**Chi-square**	**OR, 95% CI (N=301)**	**p-value**	**aOR,95% CI (N=301)**	**p-value**
Age							
≤ 46 years	58 (40.8)	91 (57.2)	8.059	1.94(1.22- 3.07)	.005	1.89 (1.16-3.08)	p<.05
> 46 years	84 (59.2)	68 (42.8)					
Gender							
Male	96 (67.6)	108 (67.9)	.003	1.05 (0.64-1.70)	.953		
Female	46 (32.4)	51 (32.1)					
Education							
< 12 years	52 (36.6)	62 (39.0)	.180	1.11 (0.69-1.77)	.672		
≥ 12 years	90 (63.4)	97 (61.0)					
Homeless							
Yes	75 (52.8)	84 (52.8)	.000	.99 (0.64-1.57)	.998		
No	67 (47.2)	75 (47.2)					
Ever overdosed							
Yes	99 (69.7)	104 (65.4)	.634	1.22 (0.75-1.98)	.426		
No	43 (30.3)	55 (34.6)					
In medically assisted drug treatment							
Yes	90 (63.4)	96 (60.4)	.287	1.14 (0.71-1.81)	.592		
No	52 (36.6)	63 (39.6)					
Number of overdoses in neighborhood in the last year							
9 or less	70 (49.3)	81 (50.9)	.081	1.07 (0.68-1.68)	.775		
10 or more	72 (50.7)	78 (49.1)					
Witnessed an overdose in last year							
Yes	40 (28.2	62 (39.0	3.92	1.63 (1.00-2.65)	.045		
No	102 (71.8)	97 (61.0					
Worried about a drug buddy overdosing							
Less than "Very worried	52 (36.6)	110 (69.2)	32.001	3.89 (2.41-6.28)	p<.001	3.67 (2.25-5.97)	p<.001
"Very worried"	90 (63.4)	49 (30.8)					
Need more training before feel confident to help someone who has overdosed							
Disagree/neither agree nor disagree	71 (50.0)	72 (45.3)	.669	1.21 (0.77-1.90)	.413		
Agree	71 (50.0)	87(45.7)					
Prescribed or provided Naloxone							

	Willingness to talk with people in neighborhood about fentanyl						
	"Very willing n=142 n (%)	**Less than "Very willing" n=159 n (%)**	**Chi-square**	**OR, 95% CI (N=301)**	**p-value**	**aOR,95% CI (N=301)**	**p-value**
Yes	103 (72.5)	96 (60.4)	4.949	1.73 (1.07-2.82)	.026	1.65 (0.98-2.78)	p<.10
No	39 (27.5)	63 (39.6)					