Short Report

Prevalence and correlates of carrying naloxone among a community-based sample of opioid-using people who inject drugs

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ABSTRACT

Background: Overdose prevention programs are effective at reducing opioid overdose deaths through training people who inject drugs (PWID) how to respond to witnessed overdoses and use naloxone. This report examines prevalence and correlates of carrying naloxone among a community-based sample of PWID.

Methods: Using respondent driven sampling, PWID (n = 571) in Philadelphia, PA were recruited for the 2015 National HIV Behavioral Surveillance project. The impact of socio-demographics, social services, and law enforcement interaction on naloxone carrying were analyzed using multivariable logistic regression.

Results: Odds of carrying naloxone were higher among PWID who were: homeless (adjusted odds ratio [aOR] = 1.65, 95% confidence interval [CI]: 1.01, 2.83), reported a syringe exchange program as their primary source of syringes (aOR = 2.92, CI: 1.68, 5.09), and had been stopped by police ≥6 times (aOR = 2.16, CI: 1.12, 4.16) or arrested (aOR = 1.84, CI: 1.02, 3.30) in the past year.

Conclusions: Syringe exchange access was associated with naloxone carrying and is likely a primary source for naloxone and overdose reversal training for PWID. Homelessness and law enforcement encounters are known barriers to harm reducing behaviors; however, both were positively associated with carrying naloxone in this sample. Larger studies are needed to explore these relationships in greater depth.

Introduction

Overdose and overdose prevention

Since the 1990s, overdose deaths have been on the rise in the United States, with nearly 400,000 deaths between 1999 and 2017 (Centers for Disease Control & Prevention, 2019). This was exacerbated in 2013 when the "third wave" of the opioid epidemic, marked by an increase of deaths involving fentanyl and fentanyl analogs, began (Centers for Disease Control & Prevention, 2019). There have been massive efforts to increase the availability of naloxone, an opioid antagonist that temporarily reverses the effects of the opioids causing an overdose, to people at risk for opioid overdose death, including a 2018 Advisory from the US Surgeon General encouraging individuals to carry naloxone (Adams, 2018). Communities with overdose prevention programs (OPP) have lower rates of overdose deaths than those without these programs (McClellan et al., 2018; Walley et al., 2013).

According to data compiled by the City of Philadelphia, Philadelphia's overdose death rate is higher than most other major U.S. cities and deaths attributable to opioid overdose rose from 495 in 2014 to 561 in 2015 (Department of Behavioral Health & Intellectual DisAbility Services, 2018). The increase in deaths is largely due to the recent introduction of fentanyl into the city's inexpensive heroin supply, with nearly 33% of overdose deaths in 2015 involving fentanyl or a fentanyl analog, an 85% increase from the previous year. This number has steadily climbed with saturation of the drug markets. In 2017, there were 1074 opioid overdose deaths, with fentanyl present in 84% of those deaths (Department of Behavioral Health & Intellectual DisAbility Services, 2018).

The rapid increase in opioid overdoses led to several changes in naloxone laws and policy. First, Prevention Point Philadelphia, the city's only sanctioned syringe exchange program (SEP), began operating an OPP in 2006 that distributed 3500 doses of naloxone in 2015, 95.7% of which went to PWID (Mazzella, personal communication,

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August 31, 2018). Additionally, a state law expanding access to naloxone and providing limited immunity against arrest of persons overdosing and helping during an overdose, known as the Good Samaritan Law, went into effect in November 2014 (Balmert et al., 2016). Finally, the Philadelphia Police Department began formally training and equipping police officers with naloxone in February 2015, although they did not report any overdose reversals until 2016 (Department of Behavioral Health & Intellectual DisAbility Services, 2018; Philadelphia Police Department, 2015).

Despite a wealth of literature describing who participates in overdose and naloxone training (Clark, Wilder, & Winstanley, 2014), little is known about characteristics of opioid-using people who inject drugs, both trained and untrained, who carry naloxone. This exploratory paper describes the characteristics of opioid-using PWID who answered "yes" to the question "Do you carry Narcan®?" in 2015, a pivotal time when illicitly manufactured fentanyl was emerging in US drug markets and naloxone access was expanding. Our rationale is that assessing prevalence and correlates of carrying naloxone among those at high risk for opioid overdose is one step towards understanding the potential impact of key legislation to increase naloxone saturation and the reach of OPP in Philadelphia at the beginning of the 3rd wave of the opioid epidemic.

Methods

National HIV behavior surveillance survey

The National HIV Behavioral Surveillance (NHBS) project is funded by the Centers for Disease Control and Prevention and conducted annually in partnership with state and local health departments to assess HIV risk behaviors in vulnerable populations; the 2015 cycle focused on PWID (Gallagher, Sullivan, Lansky, & Onorato, 2007). Respondent-driven sampling (RDS) was used to recruit participants (Heckathorn, 2011). Methods for NHBS recruitment for PWID have been previously described (Gallagher et al., 2007). Briefly, eligible participants were: at least 18 years of age, able to complete the interview in Spanish or English, lived within the Philadelphia Metropolitan Statistical Area (Philadelphia, Delaware, Montgomery, Bucks and Chester Counties), and reported injection drug use within the past 12 months. Respondents were compensated $25 for completion of the survey, $25 for a rapid HIV test, and $10 for each eligible respondent that they recruited to the study. Study procedures were approved by the City of Philadelphia and Drexel University Institutional Review Boards.

Measures

The NHBS survey assessed demographics; health care and services utilization including current health insurance (yes/no), 12-month receipt of drug treatment, primary source of syringes in the past 12 months (SEP/pharmacy or secondary source), and how long participants had known about naloxone. Drug use behaviors assessed included: length of time injecting in years; frequency of non-prescription drug use by various routes of administration (injection and non-injection) including: heroin, speedball, opioid analgesics, powder cocaine, crack cocaine, methamphetamine, and benzodiazepines (daily/non-daily use). Three variables were used to assess law enforcement interactions in the past year: number of police stops (asked as "How many times in the last time months have you been stopped or harassed by the police [but not arrested]?"), number of arrests, and whether participants had been incarcerated for more than 24 h. Our outcome of interest was naloxone carrying (yes/no) in response to "Do you carry Narcan®?".

Analyses

All data were weighted in RDS Analyst, using RDS sampling weights to account for biases related to network size or homophily (Heckathorn, 2007), and analyzed in SAS version 9.3. After assessing the distribution of drug use and other key demographic characteristics among participants with complete survey data, we restricted the sample to those reporting any opioid use and removed 5 transgender participants due to concerns about small cell size. Due to differences in the correlation of police stops and arrests on carrying naloxone, we decided to categorize police stops based on quartiles and dichotomize police arrests to be above and below the median. Descriptive statistics were calculated for demographics, health care and service utilization, drug use behaviors, and law enforcement interaction. Bivariable and multivariable logistic regression were used to assess for factors associated with carrying naloxone. Variables with $p \leq 0.1$ in the bivariable analyses were included in the multivariable regression model and final models were built using backwards elimination of covariates in which model fit was assessed using Homser-Lemeshow goodness-of-fit test and Akaike's Information Criterion (AIC). All factors with $p \leq 0.05$ were considered statistically significant and confounders were assessed via change in any remaining parameter estimate > 10% upon removal as compared to the full model (Maldonado & Greenland, 1993).

Results

The 571-person sample is described in Table 1. In the bivariable analysis, compared to PWID who did not carry naloxone, PWID who carried naloxone were more frequently homeless (59.7% vs. 36.6%, $p = 0.02$), less likely to be insured (55.9% vs. 80.7%, $p = 0.04$), and more frequently accessed an SEP as their primary source for syringes in the past year (68.2% vs. 44.1%, $p = 0.02$). Those who carried naloxone also more frequently reported ≥ 6 police stops (47.1% vs. 22.8%, $p < 0.01$) and at least one arrest (55.7% vs. 37.1%, $p < 0.01$) in the past year.

In the final adjusted multivariable model, PWID who were currently homeless had 1.7 greater odds of carrying naloxone (adjusted odds ratio [aOR] = 1.65, 95% confidence interval [CI]: 1.01, 2.83), while those listing the SEP as their primary source of syringes had 2.9 greater odds of carrying naloxone (aOR = 2.92, 95% CI: 1.68, 5.09). In terms of police interaction, the odds of carrying naloxone among PWID reporting 6 or more stops in the past 12 months (aOR = 2.16, 95% CI: 1.12, 4.16) and having at least one arrest during the same time period (aOR = 1.84, 95% CI: 1.02, 3.30) were approximately 2-fold higher compared to those reporting no stops and those reporting no arrests, respectively.

Discussion

Results from this analysis demonstrate that in this sample of Philadelphia-based opioid-using PWID, homelessness, law enforcement encounters, and source of syringes were associated with greater odds of carrying naloxone. Explanations of these significant associations may be best contextualized within the risk environments that condition drug use and engagement in harm reduction. Risk environment theory posits that drug use-related risk is manufactured by the interactions of social and environmental conditions at the macro and micro levels in which a person uses drugs (Rhodes, 2009). In this study, the macro risk environment – i.e., structural factors such as policy, laws, and services for people who use drugs – seems to be driving behavior. For example, homelessness may operate to make drug use more visible. Homeless PWID are, therefore, more likely to come into contact with social services provided by entities like syringe exchange programs and the criminal justice system by virtue of their visibility. Homelessness and interaction with law enforcement are associated with increased overdose risk (Beletsky et al., 2015). Research has also shown that police presence in areas where PWID are highly visible is a barrier to the use of harm reduction methods (Cooper, Moore, Gruskin, & Krieger, 2005; Wagner, Simon-Freeman, & Bluthenthal, 2013). However, our data

Table 1

Factors Associated with Carrying Naloxone among a Community-based Sample of PWID in Philadelphia, PA (n = 571).

Demographics	Total n = 571 n (%)[†]	Carry Naloxone n = 70 (12.3) n (%)[†]	Don't Carry Naloxone n = 501 (87.7) n (%)[†]	P	Bivariable Regression Results Crude OR (95% CI)	Multivariable Regression Model aOR (95% CI)
Median age (IQR)	35 (29, 44)	35.5 (31, 43)	35 (29, 44)	.38	0.98 (0.95, 1.02)	
Gender identity						
Male	429 (78.3)	46 (73.9)	383 (78.6)	.51	0.77 (0.36, 1.63)	
Female	142 (21.7)	24 (26.1)	118 (21.4)		Ref	
Race/Ethnicity						
White, non-Latino or Hispanic	380 (63.9)	44 (59.2)	336 (64.2)	.30	Ref	
Black, non-Latino or Hispanic	61 (11.7)	9 (25.8)	52 (10.6)		2.64 (0.89, 7.82)	
Latino or Hispanic	115 (21.1)	17 (15.0)	98 (21.6)		0.75 (0.33, 1.71)	
Other[a]	15 (3.4)	**	**		‡	
Country of birth						
U.S. mainland born	517 (89.9)	66 (94.5)	451 (89.6)	.19	Ref	
U.S. non-mainland born[b]	54 (10.1)	**	50 (10.4)		0.50 (0.15, 1.68)	
Currently homeless	282 (38.3)	45 (59.7)	237 (36.6)	.02	2.57 (1.22, 5.41)	1.65 (1.01, 2.83)
Educational attainment						
Less than high school graduate	173 (27.2)	25 (27.9)	148 (27.2)	.79	Ref	
At least high school graduate/GED	276 (51.5)	29 (46.0)	247 (52.0)		0.86 (0.37, 2.01)	
Some college, tech school, or higher	122 (21.2)	16 (26.1)	106 (20.8)		1.22 (0.48, 3.14)	
Federal poverty status						
Below federal poverty level	479 (81.1)	54 (71.1)	425 (81.4)	.24	Ref	
Above federal poverty level	92 (18.9)	16 (18.2)	76 (28.9)		1.93 (0.76, 4.45)	
Health Care and Services Utilization						
Current health care insurance	439 (78.9)	48 (55.9)	391 (80.7)	.04	0.30 (0.14, 0.68)	
Drug treatment, 12 months	283 (56.3)	40 (61.7)	243 (55.9)	.54	1.27 (0.57, 2.85)	
Primary source of syringes, 12 months						
SEP	272 (45.9)	48 (68.6)	224 (44.7)	.02	2.72 (1.21, 6.12)	2.92 (1.68, 5.09)
Pharmacy/Secondary[c]	299 (52.4)	22 (31.4)	277 (55.3)		Ref	Ref
Length of time known about Naloxone						
Never heard until today	84 (15.7)	12 (9.4)	72 (16.2)	.29	Ref	
< 6 months	69 (12.9)	9 (25.2)	60 (11.9)		3.65 (0.98, 13.6)	
> 6 months	418 (71.5)	49 (65.5)	369 (71.9)		1.57 (0.67, 3.69)	
Drug Use Behaviors						
Median Length of injection career (IQR)	12 (5, 20)	13.5 (6, 20)	11 (5, 20)	.86	1.00 (0.96, 1.03)	
Daily Injection Drug Use, 12 months						
Speedball	159 (22.4)	21 (21.2)	138 (22.5)	.85	0.93 (0.43, 2.00)	
Heroin	544 (94.7)	68 (96.3)	476 (94.6)	.63	1.50 (0.28, 7.95)	
Opioid analgesics	20 (3.7)	**	15 (3.7)	.81	1.17 (0.33, 4.19)	
Non-opioid (i.e., cocaine, crack, methamphetamine)	155 (19.1)	27 (26.2)	128 (18.6)	.24	1.55 (0.74, 3.25)	
Daily Non-injection Drug Use, 12 months						
Benzodiazepines	72 (10.2)	8 (6.1)	64 (10.5)	.19	0.55 (0.21, 1.44)	
Heroin	48 (8.5)	7 (6.8)	41 (8.7)	.61	0.77 (0.28, 2.18)	
Opioid analgesics	33 (5.1)	**	28 (5.3)	.22	0.47 (0.13, 1.69)	
Shared syringe for injection, 12 months	183 (29.7)	22 (40.2)	161 (28.9)	.29	1.66 (0.72, 3.79)	
Law Enforcement Interactions						
Stops by police (without arrest) 12months						
0	262 (45.9)	24 (34.3)	238 (47.5)	< .01	Ref	Ref
1	26 (4.6)	**	24 (4.8)		0.36 (0.07, 1.94)	0.84 (0.18, 3.76)
2–5	125 (21.9)	11 (15.7)	125 (25.0)		0.92 (0.33, 2.56)	0.72 (0.33, 1.63)
≥6	147 (25.7)	33 (47.1)	114 (22.8)		4.39 (1.81, 10.7)	2.16 (1.12, 4.16)
Arrests by police, 12 months						
0	346 (60.6)	31 (44.3)	315 (62.9)	< .01	Ref	Ref
≥1	225 (39.4)	39 (55.7)	186 (37.1)		3.18 (1.49, 6.96)	1.84 (1.02, 3.30)
Incarcerated, 12 months	251 (44.0)	42 (53.2)	209 (38.0)	.12	1.85 (0.86, 4.01)	

[†] Weighted percentage.

‡ Excluded PWID reporting Other from regression analyses.

** Cells < 6 were suppressed due to small cell size.

[a] Category includes American Indian or Alaska Native, Asian, or Native Hawaiian or other Pacific Islander.

[b] 50 (92.5%) of respondents born in non-mainland United States were from Puerto Rico.

[c] Secondary sources include friend, relative, sex partner, dealer, shooting gallery, or off the streets.

shows that these homeless PWID and those who experienced arrests or ≥6 stops were more likely to carry naloxone. While the precise cause of the relationship between police interaction and naloxone carrying is unclear, one explanation is that carrying naloxone is actually a risk factor for police interaction. A study of syringe exchange participants in California found that those accessing legal (and therefore likely more visible) syringe exchange services reported more arrests and citations than those accessing unsanctioned (and less visible) syringe exchange services (Martinez et al., 2007). Carrying naloxone may make PWID more visible to police and therefore more vulnerable to arrest. An alternative explanation is that interactions with law enforcement officers are facilitating increased access to naloxone among PWID in Philadelphia, for example if law enforcement officers are encouraging PWID they interact with to carry the medication. Future research should assess participants' perceptions of their interactions with law enforcement, as well as separately ask about police stops, harassment, arrests,

and police assistance during overdoses (both experienced overdoses and witnessed overdoses), and if and how there are potentially beneficial interactions of police with PWID to encourage carrying naloxone.

Respondents in this sample who acquired most of their syringes from the SEP in Philadelphia had greater odds of carrying naloxone. Given that 68.2% of those carrying naloxone primarily accessed syringes at the SEP, and that Prevention Point's OPP dramatically increased naloxone distribution to 3500 doses in 2015 at the time of data collection, it is likely most of these respondents received naloxone either directly or indirectly from the SEP. This suggests that SEPs, who have traditionally played a vital role in decreasing health harms from drug use, are also pivotal in addressing the overdose crisis. However, additional efforts are needed to promote naloxone to non-SEP users who may be less likely to hear about advances in harm reduction interventions, such as naloxone, as rapidly if at all.

Limitations

These results should be interpreted in consideration of the limitations of the design and data available. First, data are from a cross-sectional survey in one US city, therefore we cannot establish causality in the observed relationships and findings may not be generalizable to other locations. Second, carrying naloxone was asked with one question, "Do you carry naloxone?" We recognize the limitations of a single item that has no qualitative descriptors and recognize it may have been interpreted differently by respondents. For example, some respondents may have interpreted "Have you ever carried naloxone?" while others may have interpreted the question to mean "Are you currently carrying naloxone?" Future research should address these limitations. Third, RDS is subjected to two main sources of bias: differential network size (e.g., individuals from smaller networks tend to be underrepresented) and recruitment (e.g., artificial increase in recruitment due to homophily). We adjusted for such biases using sampling weights generated from RDSA.

Conclusion

In this sample of opioid-using PWID, those who carried naloxone regularly accessed an SEP for syringes and may have received other services there, including training on overdose prevention and naloxone. The PWID who carried naloxone were also more likely to have structural vulnerability to overdose through homelessness and interactions with law enforcement in the form of police stops and arrests. Our results indicate that harm reduction organizations such as SEPs continue to be important points of contact for naloxone distribution and the relationship between law enforcement, overdose, and overdose prevention measures needs to be assessed further.

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Declaration of Competing Interest

None.

Acknowledgements

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