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## Gaps in naloxone ownership among people who inject drugs during the fentanyl wave of the opioid overdose epidemic in New York City, 2018

Alexis V. Rivera, MPH<sup>a</sup>, Michelle L. Nolan, MPH<sup>b</sup>, Denise Paone, EdD<sup>b</sup>, Sidney A. Carrillo, MPH<sup>a</sup>, Sarah L. Braunstein, PhD, MPH<sup>a</sup>

<sup>a</sup>Bureau of Hepatitis, HIV, and STIs, New York City Department of Health and Mental Hygiene, Long Island City, NY, USA

<sup>b</sup>Bureau of Alcohol and Drug Use, Prevention, Care and Treatment, New York City Department of Health and Mental Hygiene, Long Island City, NY, USA

### Abstract

**Background:** Community distribution of naloxone, a medication that reverses opioid overdose, is an effective public health strategy to prevent overdose deaths. However, data are limited on who has naloxone during the current fentanyl wave of the opioid overdose epidemic in the United States. We aim to determine correlates of naloxone ownership among a community sample of people who inject drugs (PWID) from New York City (NYC).

**Methods:** Data were drawn from the National HIV Behavioral Surveillance Study among PWID. Participants were recruited via respondent-driven sampling. Eligible participants completed an interviewer-administered survey. Log-linked Poisson regression was used to determine adjusted prevalence ratios (aPR) and 95% confidence intervals (CIs) between correlates of interest and current naloxone possession.

**Results:** Of 503 PWID, 60% currently owned naloxone. In the past 12 months, 74% witnessed an opioid overdose and 25% experienced one. Those who experienced current homelessness were less likely to own naloxone (aPR: 0.79; 95% CI: 0.68, 0.91), as were those who had been recently incarcerated (aPR: 0.83; 95% CI: 0.71, 0.97). Respondents who reported recent known or possible fentanyl use were more likely to own naloxone (aPR: 1.23; 95% CI: 1.07, 1.43) as were those who experienced an opioid overdose in the past 12 months (aPR: 1.33; 95% CI: 1.15, 1.53).

**Conclusions:** The prevalence of naloxone ownership among PWID in NYC was high, potentially due to widespread community naloxone distribution programs; however, gaps in naloxone ownership existed. Interventions that further ease access to naloxone, such as reclassifying naloxone as an over-the-counter medication and making it available ‘off the shelf’, should be considered. More research is needed to identify barriers to access, uptake, and sustained

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Corresponding Author: Alexis V. Rivera, 42-09 28<sup>th</sup> Street, CN-44, Long Island City, NY11101, arivera6@health.nyc.gov.

**Author contributions:** AR, SC, and SB managed data collection. AR conducted the analysis and took the lead in writing the manuscript. MN, DP, SC, and SB provided critical feedback and contributed to the writing of the manuscript.

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possession within this group to maximize the impact of naloxone distribution during the ongoing fentanyl wave of the opioid overdose epidemic.

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## Introduction

In 2019, there were 70,360 drug overdose deaths in the United States (US) and opioids were involved in 71% of those deaths.<sup>1</sup> Fentanyl is a potent opioid that has been identified in drugs sold in the unregulated drug market, including heroin, cocaine, and methamphetamine.<sup>2, 3</sup> Consistent with national data, in New York City (NYC), the emergence of fentanyl in the drug supply has coincided with an increase in overdose deaths. In mid-2015, fentanyl was introduced to the NYC drug supply<sup>4</sup> and since then, overdose deaths rates have increased by 54%, from 13.8 per 100,000 in 2015 to 21.2 per 100,000 in 2019. In 2016, 44% of overdose deaths involved fentanyl, and by 2019, 68% of overdose deaths involved fentanyl.<sup>5</sup>

One evidence-based strategy to address the opioid overdose death burden in the US is community distribution of naloxone, a medication that can reverse an opioid overdose and prevent death.<sup>6</sup> Because naloxone is a prescription medication and not available over-the-counter (OTC), the implementation of community naloxone distribution programs has relied on state-level naloxone access laws (NALs), which vary by state.<sup>7</sup> Despite advancements in easing legal restrictions on naloxone distribution to expand mechanisms for people to access this medication, studies have demonstrated mixed effectiveness of NALs in reducing opioid overdose deaths.<sup>7-9</sup> A recent systematic review found no associations between state-level NALs and opioid overdose deaths in more recent years (2015–2016) compared to earlier analyses where significant protective effects were found.<sup>7</sup> These results suggest that policy change alone may not be enough to achieve widespread naloxone possession among people likely to witness or experience an opioid overdose.

The examination of characteristics related to naloxone possession among people who use drugs (PWUD) can aid in identifying barriers to naloxone access and assist in focusing naloxone distribution efforts to those most likely to witness or experience an overdose. Several studies have reported no associations between outcomes related to naloxone possession and witnessing an opioid overdose<sup>10-12</sup> or experiencing an opioid overdose<sup>11, 13-16</sup> and gaps have also been found among groups that have been historically marginalized, such as Black people who inject drugs (PWID)<sup>10, 11, 17</sup> and those experiencing homelessness.<sup>11, 13</sup> Given the variability of naloxone access across states, especially under the context of the current fentanyl wave of the opioid overdose epidemic, additional local research is needed. For example, within NYC, little is known on whether those who may have used fentanyl, which increases overdose risk, have naloxone.

NYC has a long history of distributing naloxone to laypersons. In 2004, the Lower East Side Harm Reduction Center launched a pilot program in NYC that provided overdose education and naloxone distribution (OEND) to syringe exchange program (SEP) participants. Following the activist-led pilot's success, in 2006, New York State (NYS) legally permitted registered opioid overdose prevention programs (OOPPs) to distribute naloxone to laypersons. The NYC Department of Health and Mental Hygiene began

providing naloxone to OOPPs in 2009, and in 2017 dramatically expanded naloxone distribution through OOPPs and standing order pharmacies.

OEND programs can reach groups in their communities that are more likely to need or use naloxone, can supplement NAL laws that allow the provision of non-prescribed take-home naloxone, and have also been linked to reduced community-level opioid overdose deaths.<sup>18, 19</sup> However, a recent nationwide analysis found that the distribution of naloxone through OENDs, specifically those within SEPs, may not match geographic need<sup>20</sup>; this gap in distribution may be further compounded by the recent US naloxone shortage in the US and its impact on OEND's ability to provide naloxone.<sup>21</sup> With fentanyl-involved overdose deaths at epidemic levels in NYC, naloxone distribution must reach PWUD and people likely to witness an overdose. In this analysis, we aim to determine correlates of naloxone ownership among a community sample of PWID during the ongoing fentanyl wave of the opioid overdose crisis in NYC. This analysis will aid in identifying groups that may need better access to naloxone and can assist in understanding barriers to naloxone ownership.

## Methods

### Study Design

This analysis used NYC data from the 2018 CDC National HIV Behavioral Surveillance Study (NHBS). The 2018 cycle was the fifth NHBS data collection round among PWID, also known as IDU5 (Injection Drug Use 5). PWID were recruited via respondent-driven sampling (RDS); initial recruits, also known as 'seeds,' were recruited through stakeholder referrals or street outreach. Participants completed an anonymous interviewer-administered survey and were offered optional rapid HIV testing and hepatitis C testing. Participants were eligible if they were at least 18 years of age, resided in the NYC metropolitan statistical area (MSA), injected drugs without a prescription in the past 12 months, and were able to complete the interview in English or Spanish. Self-reported injection drug use was verified by interviewer assessment of injection track marks or knowledge of drug preparation for injection. Seeds had the same eligibility criteria with the exception that they had to identify as male or female and not as transgender. To increase the proportion of young PWID in the sample, the initial set of seeds were ages 18–29. Participants were able to recruit up to five of their peers who were also PWID for the study. Participants received incentives for all study components (survey completion, HIV testing, HCV testing, and peer recruitment). Data were collected from July - November 2018. The Institutional Review Board of the NYC Department of Health and Mental Hygiene approved the study.

### Measures

The primary outcome for the analysis was current naloxone ownership as ascertained by the question, "Naloxone is a drug that can reverse overdoses from heroin, fentanyl, or opioid painkillers. It is sometimes called Narcan. Do you currently own any naloxone?" Sociodemographic measures included self-identified gender (male, female, transgender), age group (18–29, 30), education level (less than high school, high school or equivalent), currently experiencing homelessness, incarceration in the past 12 months, and annual household income (<\$10,000, \$10,000). Hispanic/Latino ethnicity was ascertained in

addition to race (American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White). For this analysis, race/ethnicity was categorized to Hispanic/Latino, Black, White, and Other (which included those who were multiracial). Area of residence was defined as the NYC borough of residence (Bronx, Brooklyn, Queens, Manhattan, Staten Island); those who did not live in NYC, but lived in the surrounding NYC MSA were categorized as residing ‘outside of NYC’. Regarding drug use-related correlates, participants were asked the frequency in which they injected specific drugs (more than once a day, once a day, more than once a week, once a week or less, never). Opioid injection frequency was measured by obtaining the highest injection frequency category among heroin, speedball (cocaine and heroin), and painkillers in the past 12 months; the highest injection frequency was then dichotomized (daily vs. less than daily). Known or possible use of fentanyl was modified from a previous measure<sup>22</sup> and asked as, “In the past 12 months, have you used a drug that you thought or knew had fentanyl in it?” Those who responded that they did not know were categorized as not having known or possible fentanyl use. We ascertained personal experiences with either witnessing or experiencing an opioid overdose in the past 12 months; participants were separately asked if: 1) “In the past 12 months, did you overdose on heroin or painkillers? By overdose, I mean you turned blue, or stopped breathing from using drugs” and 2) “In the past 12 months, how many times have you seen someone overdose from heroin, fentanyl, or opioid painkillers?” Participants were also asked if they had received syringes from a SEP in the past 12 months and where they had received naloxone in the past 12 months. Among those who witnessed an opioid overdose in the past 12 months, respondents were asked if they administered naloxone the last time they witnessed an opioid overdose.

### Statistical Analysis

The analytical sample excluded seeds because they were non-randomly selected. We conducted descriptive analyses and used Chi-square and exact tests to determine differences in current naloxone ownership by correlates of interest. Variables associated with the outcome at a significance level of  $p < 0.10$  were tested in a multivariable model using backward selection and were retained if  $p < 0.05$ . We obtained adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs) using log-linked Poisson regression with robust standard errors. All analyses were conducted using SAS 9.4 (Cary, NC).

### Results

A total of 20 seeds were screened for eligibility, of which 17 seeds were eligible. A total of 503 non-seed eligible participants were recruited from RDS network chains initiated by 10 productive seeds (Figure 1). A productive seed was defined as a seed who recruited another eligible participant who completed the study. Sample characteristics are shown in Table 1. Most were male (77%), Hispanic/Latino (73%), 30 years of age or older (92%), and resided in the Bronx (61%). A high proportion of participants reported currently experiencing homelessness (58%), and most (62%) reported an annual household income of less than \$10,000. Regarding drug use-related behaviors in the past 12 months, almost all (99%) reported injecting opioids (data not shown), with 87% injecting opioids daily and 50%

reporting known or possible fentanyl use. Most received syringes from a SEP (76%) in the past 12 months.

A total of 303 (60%) participants reported currently owning naloxone. Of those who reported receiving naloxone in the past 12 months (n=233), 63% received a kit at a harm reduction program (Figure 2). Among those who witnessed an opioid overdose in the past 12 months (n=370), 176 (48%) administered naloxone the last time they witnessed an opioid overdose, of which 140 (80%) still currently owned naloxone (data not shown). In unadjusted analyses (Table 1), there were significant differences in naloxone ownership by homelessness, incarceration history, known or possible fentanyl use, and past 12-month opioid overdose. The adjusted prevalence of naloxone ownership was lower among those experiencing homelessness (aPR: 0.79; 95% CI: 0.68, 0.91) and those who were recently incarcerated (aPR: 0.83; 95% CI: 0.71, 0.97), and higher among individuals who reported known or possible fentanyl use (aPR: 1.23; 95% CI: 1.07, 1.43) and those who experienced an opioid overdose (aPR: 1.33; 95% CI: 1.15, 1.53) (Table 2).

## Conclusions

In this sample of PWID who mostly inject opioids in NYC, gaps in naloxone ownership were found among specific subgroups with known higher risks for overdose, including those recently incarcerated and people experiencing homelessness. This is alarming as both homelessness and recent incarceration increase the risk of overdose<sup>23–28</sup> and opioid-related mortality.<sup>26, 29, 30</sup> These findings highlight the need to address barriers to naloxone access, uptake, and sustained possession, particularly among individuals experiencing homelessness or those recently incarcerated.

Structural factors could influence barriers to naloxone uptake and sustained possession for PWID experiencing homelessness; for example, experiencing or anticipating drug use stigma within shelters, attributable to carrying naloxone, have been identified as a reason not to possess naloxone.<sup>31</sup> Those experiencing homelessness may also have difficulties in sustained possession because of housing instability, and hence, naloxone kit loss may be common. This result is similar to other areas<sup>11, 13</sup> but contradicts findings from Philadelphia<sup>32</sup> and Michigan.<sup>17</sup> These disparate results could be due to differences in how the outcome was defined and interpreted. For example, in Philadelphia, the outcome was ‘naloxone carrying’, determined by the question, “Do you carry naloxone?”. As Reed et al. noted, some respondents may have interpreted that study question as measuring lifetime naloxone possession. Similarly, in Michigan, the primary outcome was naloxone access, determined by the question, “Do you or your family/friends have access to naloxone/ Narcan?”. Inconsistent definitions and measures of naloxone possession across studies limit the ability to compare findings.<sup>33</sup>

Incarceration presents a known heightened risk of opioid overdose as opioid tolerance is lower post-release.<sup>34</sup> As a public health response, OEND programs have been implemented within some correctional settings and have been found to be feasible.<sup>35–38</sup> In 2015, NYS instituted OEND programs for those soon-to-be-released in some correctional facilities and in 2017 expanded these programs to all correctional facilities in the state. Although

these structural-level remedies are promising to improve naloxone access and overdose prevention, barriers to uptake persist. An evaluation of OEND programs within NYS correctional facilities revealed concerns and distrust of the legal system as potential reasons for refusing to take a naloxone kit at release<sup>39</sup>, suggesting that access and uptake may be improved for OEND programs if implemented outside of the correctional or legal setting. Less is known about naloxone access, uptake, and sustained possession post-release. Two studies found no associations between recent incarceration and naloxone-related outcomes.<sup>15, 32</sup> Due to OEND programs for those soon-to-be-released from NYS correctional facilities, we expected that recently incarcerated individuals would be more likely to possess naloxone. Our findings could point to barriers in uptake and sustained possession among recently incarcerated individuals. More research is needed to understand this ‘naloxone cascade’<sup>40</sup> among PWID upon release from incarceration.

Given these gaps in naloxone coverage in a city with widespread community distribution and a standing pharmacy order, interventions beyond NALs may be needed to ensure equitable coverage. One example would be the FDA recategorization of naloxone to an OTC medication, eliminating the need for a prescription. Although in NYC and other localities, a patient-specific prescription is not required to obtain naloxone at a pharmacy because of a standing order, the recategorization of naloxone to OTC could facilitate the availability of ‘off the shelf’ naloxone. ‘Off the shelf’ naloxone would remove the need to request naloxone verbally and receive training from a pharmacist and may overcome buyers’ concerns or fears related to drug use stigma or criminalization.<sup>41–43</sup> The FDA-approved intranasal spray formulation of naloxone had greater than 90% of usability without training<sup>44</sup>, lending further support for ‘off the shelf’ naloxone. Free OTC naloxone for Medicaid beneficiaries would also be necessary to ensure equitable access to OTC naloxone. The reclassification of naloxone should also be accompanied by efforts to minimize both individual-level (i.e., awareness, fear of administering naloxone) and structural-level barriers (i.e., geographic availability, stigma, criminalization) to access. Addressing these barriers across the naloxone cascade will be necessary to end the opioid overdose epidemic because not everyone who owns a naloxone kit will carry the kit or administer it in response to an overdose.

Our results also suggest promising trends related to overdose prevention. First, our data show that among those who received naloxone in the past 12 months, the majority (63%) received naloxone at a harm reduction program in the past 12 months, demonstrating that naloxone kits dispensed through harm reduction programs are likely to reach PWID who use or are connected to harm reduction programs. Increasing access to and utilization of harm reduction programs by PWID is critical for risk reduction and related services and to increase access to naloxone for overdose prevention. Although coverage is relatively high, our data do not directly ascertain whether participants were currently carrying naloxone or carry naloxone when in the presence of an opioid overdose. However, of those who witnessed an opioid overdose in the past 12 months (n=370), 48% reported administering naloxone at the last opioid overdose they witnessed, indicating at least moderate levels of naloxone carrying in the presence of an opioid overdose. Additionally, of those who administered naloxone at the last opioid overdose they witnessed (n=170), 80% currently owned naloxone, suggesting that consistent access, replacement, and sustained possession may be high overall. Second, the independent association between known or possible

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fentanyl use and naloxone ownership suggests that PWID in NYC are aware of the heightened overdose risk posed by fentanyl and supports previous qualitative results that PWID, including those in NYC, are practicing harm reduction as a response to this new era of the opioid overdose epidemic.<sup>31, 45</sup> This finding contradicts what has been found in other regions in the US.<sup>16, 46</sup> Our finding may be specific to NYC, where awareness of the overdose risk posed by fentanyl may be high amid community education efforts and the city's awareness campaigns that commenced in 2016.<sup>47-49</sup> Our third promising finding, the significant relationship between experiencing a recent opioid overdose and currently owning naloxone, is of importance as those who experience an opioid overdose are susceptible to a repeat overdose.<sup>50-53</sup> Although those who experience an overdose are not able to administer naloxone to themselves, having naloxone allows others to access and administer it and our results show that PWID with an opioid overdose history may be administering naloxone for others. This result may also speak to effective access that influences naloxone uptake among PWID with a prior history of opioid overdose. During our NHBS-IDU5 data collection period, the NYC Department of Health and Mental Hygiene implemented an overdose prevention intervention within emergency departments that included the provision of naloxone kits to patients who presented as a result of an opioid overdose. Of those who enrolled in the overdose prevention intervention, 57% received a naloxone kit for the first time, showing the feasibility of these programs to reach PWID most at risk.<sup>54</sup>

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This analysis is subject to limitations. We cannot ascertain whether gaps in currently owning naloxone exist due to gaps in interest, access, uptake, or sustained possession. We also did not ascertain if the respondent was currently carrying naloxone or if they carry naloxone when they anticipate being in the presence of an opioid overdose. Despite this, naloxone ownership is an important measure to examine as it is indicative of having access to a personal supply and a step towards carrying naloxone.<sup>55</sup> Future research would benefit by using standardized questions for naloxone access and carrying, such as McDonald and colleagues' multidimensional measure for naloxone 'carriage'<sup>33</sup>, in order to compare these measures across geographical areas and over time.<sup>55</sup> In terms of fentanyl use and past opioid overdose, due to the cross-sectional nature of the study, it is unknown whether PWID who use fentanyl or who experienced an opioid overdose are accessing naloxone or if these behaviors began after receiving a naloxone kit. However, risk compensation after naloxone provision has not been found.<sup>56</sup> Some variables, such as drug use behaviors, may be prone to social desirability bias; the effect of this bias may be limited due to the anonymous nature of the study. Lastly, these findings may not be generalizable to the general population of PWID in NYC. Although our recruitment method may have resulted in a high proportion of PWID experiencing homelessness, we do not believe it oversampled PWID who were experiencing homeless and who also did not own naloxone; thus minimizing the effect of selection bias on the association between homelessness and naloxone ownership. Notwithstanding these limitations, this analysis is one of the few quantitative examinations of the prevalence and correlates of naloxone ownership among PWID during the ongoing fentanyl wave of the opioid overdose epidemic in NYC.

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Community naloxone distribution is an established, safe, feasible, and effective public health measure to prevent opioid overdose death. Despite NALs that provide a mechanism for OEND programs and permit laypersons to administer naloxone, opioid overdose deaths

remain a public health crisis and are accelerating due to the increased presence of fentanyl in the drug supply.<sup>2, 57</sup> Our data revealed that although some PWID at increased overdose risk, such as individuals who knew or believed they had recently used fentanyl and those who had already experienced an opioid overdose, were more likely to own naloxone, current naloxone ownership was lowest among those who were experiencing homelessness or recently incarcerated. The recategorization of naloxone to OTC status may aid in addressing gaps in coverage. More research is needed to identify at which level of the naloxone cascade these gaps exist and why they exist to improve equity in access to and uptake of naloxone.

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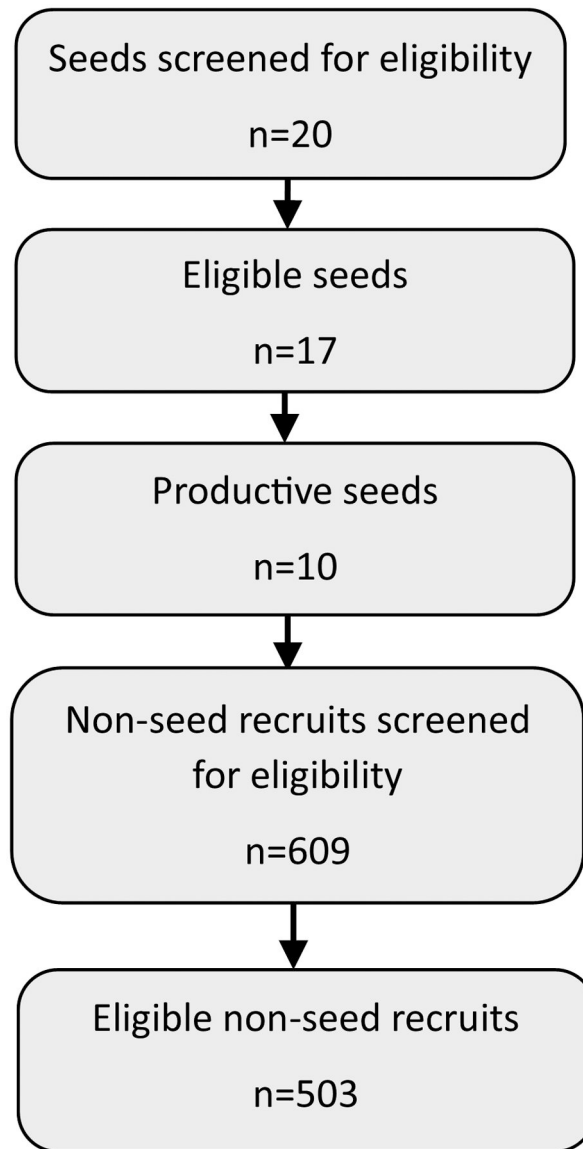
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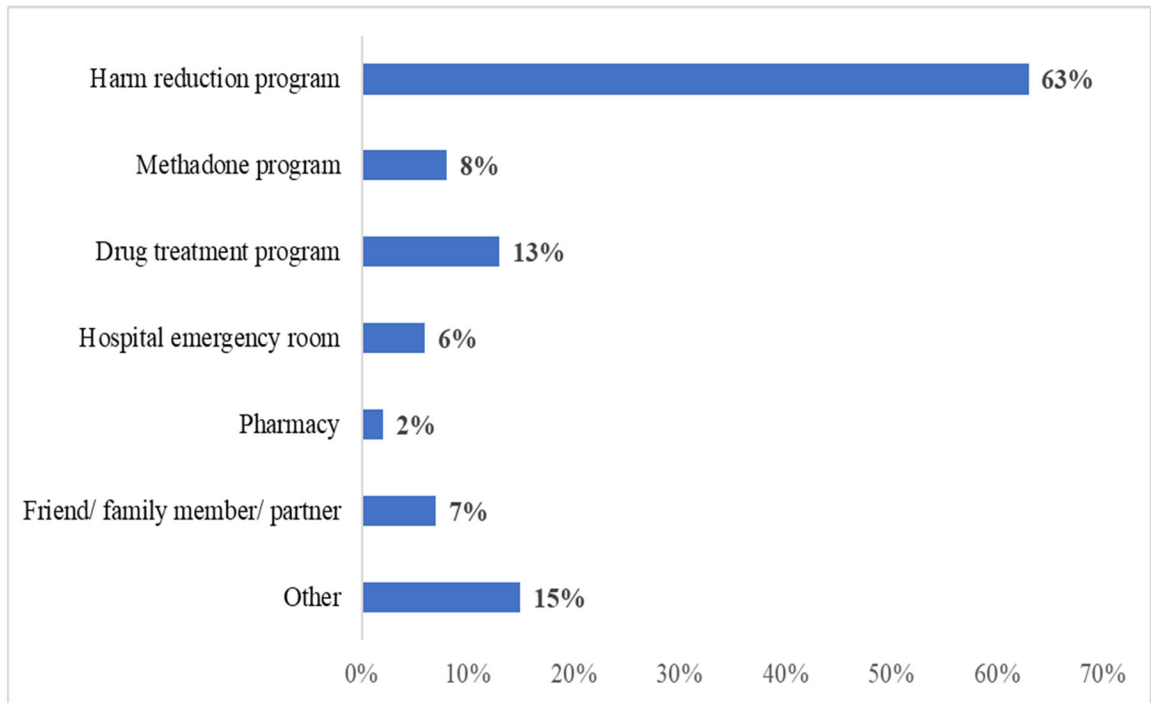
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**Figure 1.**  
Study recruitment and eligibility flow diagram.



**Figure 2.**

Where respondents received naloxone in the past 12 months (n=233).<sup>1</sup>

<sup>1</sup> Among those who reported receiving naloxone in the past 12 months (n=233); categories are not mutually exclusive.

**Table 1.**

Unadjusted associations with currently owning naloxone among people who inject drugs in New York City, National HIV Behavioral Surveillance Study, 2018 (n=503).

Variable	Total (n=503)	Currently owns naloxone		p-value <sup>a</sup>
		No (n=200)	Yes (n=303)	
Self-identified gender				0.278
Male	386 (77%)	160 (80%)	226 (75%)	
Female	108 (21%)	38 (19%)	70 (23%)	
Transgender	9 (2%)	2 (1%)	7 (2%)	
Race/ethnicity				0.485
Hispanic/Latino	367 (73%)	150 (75%)	217 (72%)	
Black	48 (10%)	20 (10%)	28 (9%)	
White	80 (16%)	26 (13%)	54 (18%)	
Other	8 (2%)	4 (2%)	4 (1%)	
Age group				0.122
18–29	42 (8%)	12 (6%)	30 (10%)	
30	461 (92%)	188 (94%)	273 (90%)	
Education level				0.891
Less than high school	232 (46%)	93 (47%)	139 (46%)	
High school or equivalent	271 (54%)	107 (54%)	164 (54%)	
Area of residence				0.526
Bronx	308 (61%)	118 (59%)	190 (63%)	
Brooklyn	84 (17%)	38 (19%)	46 (15%)	
Manhattan	88 (18%)	37 (19%)	51 (17%)	
Queens	21 (4%)	7 (4%)	14 (5%)	
Outside of New York City	2 (0.4%)	0 (0%)	2 (1%)	
Currently experiencing homelessness				0.003
No	209 (42%)	67 (34%)	142 (47%)	
Yes	294 (58%)	133 (67%)	161 (53%)	
Annual household income				0.605
<\$10,000	310 (62%)	121 (61%)	189 (62%)	
\$10,000	191 (38%)	79 (40%)	112 (37%)	
Missing	2 (0.4%)	0 (0%)	2 (0.7%)	
Incarcerated <sup>b</sup>				0.019
No	313 (62%)	112 (56%)	201 (66%)	
Yes	190 (38%)	88 (44%)	102 (34%)	
Opioid injection frequency <sup>b</sup>				0.368
Less than daily	67 (13%)	30 (15%)	37 (12%)	
Daily	436 (87%)	170 (85%)	266 (88%)	

Variable	Total (n=503)	Currently owns naloxone		
		No (n=200)	Yes (n=303)	p-value <sup>a</sup>
Known or possible fentanyl use <sup>b</sup>				0.003
No	248 (49%)	115 (58%)	133 (44%)	
Yes	254 (50%)	85 (43%)	169 (56%)	
Missing	1 (0.2%)	0 (0%)	1 (0.3%)	
Witnessed an opioid overdose <sup>b</sup>				0.133
No	120 (24%)	55 (28%)	65 (21%)	
Yes	370 (74%)	141 (71%)	229 (76%)	
Missing	13 (3%)	4 (2%)	9 (3%)	
Experienced an opioid overdose <sup>b</sup>				0.001
No	372 (74%)	164 (82%)	208 (69%)	
Yes	125 (25%)	34 (17%)	91 (30%)	
Missing	6 (1%)	2 (1%)	4 (1%)	
Received syringes from a syringe exchange program <sup>b</sup>				0.047
No	120 (24%)	57 (29%)	63 (21%)	
Yes	383 (76%)	143 (72%)	240 (79%)	

<sup>a</sup>Chi-square and exact tests were conducted among non-missing values.

<sup>b</sup>In the past 12 months.

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**Table 2.**

Adjusted associations with currently owning naloxone among people who inject drugs in New York City, National HIV Behavioral Surveillance Study, 2018 (n=496).<sup>a</sup>

	Currently owns naloxone	
	aPR (95% CI)	p-value
Currently experiencing homelessness	0.79 (0.68, 0.91)	0.001
Incarcerated <sup>b</sup>	0.83 (0.71, 0.97)	0.02
Known or possible fentanyl use <sup>b</sup>	1.23 (1.07, 1.43)	0.004
Experienced an opioid overdose <sup>b</sup>	1.33 (1.15, 1.53)	0.0001

<sup>a</sup>Among those with non-missing values.

<sup>b</sup>In the past 12 months.

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