

Naloxone possession and carriage among people who use opioids in NYC: The impact of person-level and time-varying contextual factors

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Background

In 2021, there were more than 100,000 overdose deaths in the US in a single year. **Fatal overdoses accelerated during the era defined by COVID-19-related shutdowns.** Opioid-related overdose mortality in New York City (NYC) mirrored national trends. In 2021, NYC reported more overdose-related emergency department visits, hospitalizations, and administrations of the opioid overdose reversal drug, naloxone, than ever before.

Research shows **overdose education and naloxone distribution** programs reach individuals at high risk for overdose and are a cost-effective strategy for reducing opioid-related overdose deaths. Increasing the availability of naloxone, especially to people who use opioids (PWUO), **results in rapid and dramatic increases in overdose reversals.** Yet, community coverage of naloxone continues to lag well behind documented need.

Ecological momentary assessment (EMA), has untapped potential for improving our understanding of naloxone possession and carriage. EMA assess an individual's behaviors and experiences **as they go about their life in their own environment.** Cross-sectional approaches, which measure naloxone at a single timepoint (e.g., ever received or currently possess naloxone), do not provide the repeated data collection structure needed to accurately gauge this nuanced behavior over time.

Methods

EMA study data were collected **May 2019 – May 2022.** Enrollment lasted 2 years. Participants received **four EMA per month at semi-randomized times via SMS text message** (e.g., randomized hours 11am-9pm with targeted ratios of weekend to weekday days). Participants were compensated \$15 for every weekly EMA entry. All participants were trained as overdose responders and equipped with intranasal naloxone at enrollment.

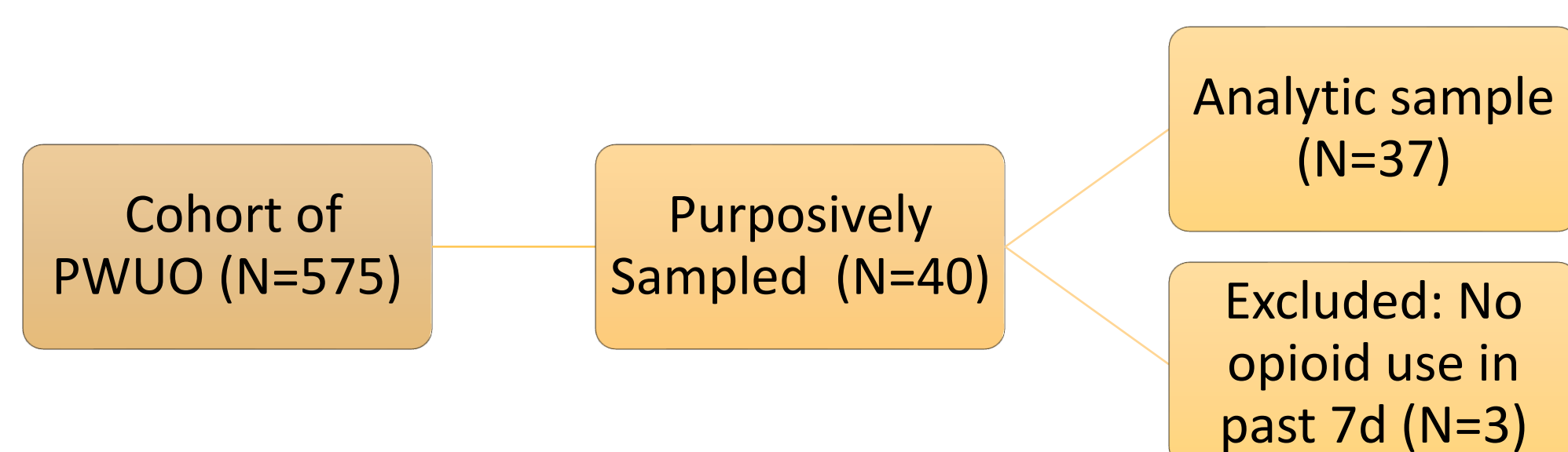
We engaged weekly EMA to:

- (1) Measure how often naloxone is possessed/carried across time.
- (2) Test for the impact of time-varying EMA predictors and baseline individual/structural predictors on naloxone possession and carriage.

EMA Outcome Variables

- **Naloxone possession:** "In the past 7 days, how often have you had a naloxone kit in your personal possession?"
- **Naloxone carrying:** "In the past 7 days, when you've been outside of your current residence, how often have you carried naloxone?"
- *Response options dichotomized as **inconsistent** [most of the time, rarely, and never] vs. **consistent** [all the time].*

Figure 1. Sampling Framework



Analysis:

- Descriptive statistics to assess the frequency of weeks with consistent naloxone possession and carriage.
- Mixed effects logistic regression to evaluate the impact of each EMA- and baseline-level predictor on each outcome.
- A random intercept approach allowed estimates to vary across individuals and adjusted estimates for multiple EMAs contributed by each participant.

Results

37 participants
(Table 1)

2914 total EMAs

76.1 (SD 35.6)
Avg. # of EMAs per participant

Average # of EMAs submitted per participant by time:

Before COVID-19: 19.0
(SD 15.1)

After COVID-19: 65.2
(SD 23.7)

Person-level (Mean weeks [SD])

- Consistent naloxone possession: 47.5 (38.1)
- Consistent Naloxone carrying: 45.0 (38.4)

EMA-level (%[N])

- Consistent naloxone possession: 70.6% (1637/2320)
- Consistent naloxone carrying: 61.0% (1571/2575)

Table 1. Participant Demographics

Characteristic	% (N)
Age (Mean (M) [SD])	35.92 (10.52)
Male gender	51.4% (19)
White race	67.6% (25)
Hispanic/Latinx	48.6% (18)
Currently homeless	43.2% (16)
Ever in prison	37.8% (14)
Age first opioid use (M [SD])	20.1 (5.8)
Ever inject opioids	78.4% (29)
Ever overdose	64.9% (24)
Previously naloxone trained	67.6% (25)
Visits SEP at least 1x/month	59.5% (22)

Table 2. Weekly- and person-level factors associated with consistent naloxone carrying and possession

	Consistent Possession		Consistent Carrying	
	Bivariate	Multivariable	Bivariate	Multivariable
	Odds Ratio (95% Confidence Interval)			
Weekly EMA Predictors				
COVID-19 (yes)	3.29 (2.54 - 4.28)***	10.25 (3.39 - 30.98)***	2.29 (1.78 - 2.95)***	4.39 (2.04 - 9.45)***
Positive affect	1.03 (0.93 - 1.13)		0.99 (0.88 - 1.19)	
Negative affect	1.01 (0.98 - 1.04)		0.99 (0.96 - 1.03)	
Stress	0.96 (0.91 - 1.02)		1.01 (0.94 - 1.08)	
Pain	1.05 (0.94 - 1.18)		1.01 (0.89 - 1.12)	
Craving	0.97 (0.94 - 0.99)*	0.89 (0.65 - 1.14)	0.95 (0.92 - 0.98)**	0.97 (0.74 - 1.27)
Opioid use repertoire				
No opioids (ref)	-			
Buprenorphine or Methadone only	0.82 (0.38 - 1.75)		0.52 (0.23 - 1.14)	
Illegal opioids w/ or w/o other opioid	1.72 (0.99 - 2.99)		1.45 (0.83 - 2.35)	
Injected in past 7 days (yes)	0.49 (0.27 - 0.89)*	2.09 (0.86 - 5.10)	0.43 (0.24 - 0.79)**	3.74 (1.40 - 10.21)**
Baseline Predictors				
Current age (centered at 18 years)	0.91 (0.83 - 1.01)		0.90 (0.80 - 1.01)	
Gender (female)	6.95 (2.21 - 21.82)**	13.42 (2.93 - 61.39)**	15.01 (3.95 - 56.95)***	17.71 (3.98 - 78.77)***
White (yes)	6.41 (2.07 - 19.82)**	11.04 (2.25 - 54.14)**	5.39 (1.50 - 19.39)*	5.85 (1.35 - 25.29)**
Currently homeless (yes)	2.25 (0.58 - 8.70)		2.48 (0.56 - 10.95)	
Frequency of SSP use	2.40 (1.26 - 4.58)**	0.59 (0.21 - 1.61)	2.55 (1.20 - 5.41)*	0.53 (0.21 - 1.35)
Ever OD in lifetime (yes)	7.42 (2.54 - 21.67)***	5.96 (1.32 - 26.82)*	9.13 (2.42 - 34.33)**	1.72 (0.41 - 7.13)
Network size (continuous)	0.98 (0.95 - 1.01)		0.98 (0.95 - 1.01)	

*p<.05; **p<.01; ***p<.001

Predictors of naloxone possession in multivariable model (Table 2)

- The COVID-19 shut-down time period, Female gender, White race, Lifetime overdose history

Predictors of naloxone carriage in multivariable model

- The COVID-19 shut-down time period, Injection within the past 7 days, Female gender, White race

Conclusions

- Our study used weekly EMAs to track contextual factors impacting consistent naloxone possession and carriage among a diverse cohort of PWUO living in NYC. PWUO reported consistently possessing and carrying naloxone during 60-70% of study weeks, with both behaviors increasing during COVID-19 related shut-downs.
- Our findings speak to the ability of harm reduction organizations to quickly adapt to unprecedented circumstances, and the determination of PWUO to remain equipped with naloxone in a time when the opioid drug market became saturated with fentanyl and COVID-19 shut-downs restricted access to many life-saving services.
- White, female participants had greater odds of both naloxone possession and carriage. Racially disproportionate access to naloxone may partially explain why overdose-related mortality rates are increasing rapidly among Black and Hispanic/Latinx men.
- Targeted outreach to equip Black and Hispanic/Latinx women and men with naloxone is needed to curb growing overdose death disparities in NYC and elsewhere.
- This study is not without limitations. The sample was recruited from a single city with legally sanctioned syringe and naloxone access laws, and a robust naloxone distribution program.

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