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Take-home naloxone possession among people who inject drugs in rural West Virginia

Sean T. Allen[a,*], Rebecca Hamilton White[a], Allison O'Rourke[b], Suzanne M. Grieb[c], Michael E. Kilkenny[d], Susan G. Sherman[a]

[a] Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, 624 N. Broadway, Baltimore, MD, 21205, USA
[b] DC Center for AIDS Research, Department of Psychology, George Washington University, 2125 G St. NW, Washington, DC, 20052, USA
[c] Center for Child and Community Health Research, Department of Pediatrics, Johns Hopkins School of Medicine, Baltimore, MD, 21224, USA
[d] Cabell-Huntington Health Department, 703 7th Ave., Huntington, WV, 25701, USA

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ABSTRACT

Background: Take-home naloxone (THN) possession among people who inject drugs (PWID) in rural communities is understudied. Better understanding the nature of THN possession among rural PWID could inform the implementation of overdose prevention initiatives. The purpose of this research is to determine factors associated with rural PWID having recently received THN.

Methods: Data from a PWID population estimation study implemented in Cabell County, West Virginia were used for this research. Multivariable Poisson regression with a robust variance estimator was used to evaluate the independent effects of several measures (e.g., sociodemographics, structural vulnerabilities, substance use) on PWID having received THN in the past 6 months.

Results: Forty-eight percent of our sample (n = 371) of PWID reported having received THN in the past 6 months. Factors associated with having received THN were: age (adjusted Prevalence Ratio [aPR] = 1.02; 95% Confidence Interval [CI]: 1.01–1.03), having recently accessed sterile syringes at a needle exchange program (aPR = 1.82; 95% CI: 1.35–2.46), believing that doctors judge people who use drugs (aPR = 1.50; 95% CI: 1.07–2.12), and having witnessed at least one non-fatal overdose in the past 6 months (aPR = 1.44; 95% CI: 1.06–1.94). Greater numbers of overdose events in the past 6 months were also associated with having received THN.

Conclusions: Among rural PWID in West Virginia, slightly less than half received THN in the past 6 months. Rural communities need overdose prevention interventions that are responsive to the unique needs of rural PWID, decrease stigma, and ensure PWID have access to harm reduction services and drug treatment programs.

1. Introduction

In 2017, more than 70,000 drug overdose deaths occurred in the United States (US) with more than two-thirds involving opioids (Scholl et al., 2018). The consequences of the modern opioid crisis are not distributed evenly across the US; for example, overdose fatality rates in rural areas now exceed those of their urban counterparts (Mack et al., 2017). Data from rural states underscore the need for expanding access to evidence-based strategies to prevent overdose fatalities. In 2017, West Virginia had the highest rate of drug overdose deaths in the US (57.8 per 100,000) and experienced a statistically significant increase in its drug overdose death rate from 2016 (Centers for Disease Control and Prevention (CDC, 2018). These high and increasing rates of overdose fatalities are partially attributed to fentanyl, a synthetic opioid that is 50–100 times more potent that morphine (Gladden et al., 2016; O'Donnell et al., 2017; Peterson et al., 2016). Multiple studies have found that people who inject drugs (PWID) may not know their drugs contain fentanyl, resulting in elevated overdose risks (Amlani et al., 2015; Karamouzian et al., 2018; Kenney et al., 2018; Miller and Russell, 2016).

Communities throughout the US have implemented a variety of response strategies to prevent overdose fatalities. Good Samaritan laws, for example, provide legal protections for individuals who call for help during an overdose event and, as of December 2018, have been

* Corresponding author at: Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, 624 N. Broadway #184, Baltimore, MD, 21205, USA.
E-mail addresses: sallen63@jhu.edu (S.T. Allen), rwhite75@jhmi.edu (R.H. White), orourkea@gwu.edu (A. O'Rourke), sgrieb1@jhmi.edu (S.M. Grieb), Michael.E.Kilkenny@wv.gov (M.E. Kilkenny), ssherman@jhu.edu (S.G. Sherman).

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implemented in 46 states (Network for Public Health Law, 2018; SAMHSA, 2017). States have also implemented enabling legislation to allow pharmacists to dispense naloxone (American Pharmacists Association, 2015; Bailey and Wermeling, 2014; Thornton et al., 2017). Additionally, many jurisdictions have enacted standing orders that allow naloxone to be dispensed without a prescription to anyone who meets established criteria (e.g., at-risk of witnessing or experiencing an overdose) (Naloxone Info, 2013; NC Department of Health and Human Services, 2016; Pennsylvania Department of Health, 2018; SAMHSA, 2017).

Take-home naloxone (THN) programs are another strategy communities may implement in which persons at risk of experiencing an overdose, such as PWID, are trained on how to properly respond to an overdose, including naloxone administration (Harm Reduction Coalition, 2012). THN programs have been widely implemented throughout the US and studied among a number of populations at high-risk of overdose, including: detox patients, individuals that are homeless, methadone patients, prison inmates, and PWID (Bennett and Holloway, 2012; Enteen et al., 2010; Galea et al., 2006; Gaston et al., 2009; Lewis et al., 2016; Piper et al., 2008; Rowe et al., 2015; Wagner et al., 2010; Walley et al., 2013). The public health benefits of THN programs are well-documented; a 2016 systematic review found that THN programs led to improved survival rates among their participants and were associated with reductions in overdose mortality rates (McDonald and Strang, 2016). There is also no evidence of compensatory drug use risks following PWID receiving THN (Jones et al., 2017).

1.1. The current study

Existing THN research is not reflective of rural communities during the modern opioid crisis. Rural jurisdictions throughout the US have implemented an array of structural changes (e.g., policy changes) and public health initiatives (e.g., prescription drug monitoring programs) to prevent overdose. Cabell County, West Virginia, for example, recently implemented several overdose prevention initiatives, including: quick response teams that offer overdose prevention education and recovery support services to persons that recently overdosed, comprehensive harm reduction services, and community naloxone distribution campaigns (Babcock et al., 2017; City of Huntington, 2018). The expansion of overdose prevention initiatives in Cabell County was complemented by state-level efforts to prevent overdose mortality, such as the implementation of a Good Samaritan law and standing order for naloxone, and authorization of pharmacists to dispense naloxone (West Virginia Department of Health and Human Resources, 2018; Legal Science, 2018; West Virginia Board of Pharmacy, 2018). While these overdose prevention initiatives have many parallels to urban areas, very little research has been conducted to understand factors associated with non-urban PWID having received THN. This is an important gap that warrants exploration as emergency medical services (EMS) in rural areas face challenges that may increase response times (Gonzalez et al., 2009; Faul et al., 2015), leaving PWID as the most proximal person to administer naloxone during an overdose event. Further, among rural PWID in Appalachia, an estimated 56% reported having injected fentanyl in the past 6 months, underscoring the need for expanding how we understand THN possession among groups at-risk of overdose in rural communities (Allen et al., 2019a). Similarly, rural PWID in Appalachia may also have insufficient access to comprehensive harm reduction services (Allen et al., 2019b); for example, among a sample of PWID in West Virginia, 66% reported having accessed sterile injection equipment at a harm reduction program (Allen et al., 2019a). Given the evolving overdose prevention landscape in rural communities throughout the US, better understanding access to THN among rural PWID could be informative for overdose prevention initiatives. The purpose of this study is to determine factors associated with having received THN among a rural PWID population in West Virginia.

2. Methods

2.1. Study design and recruitment

This research used data from a parent study that aimed to quantify the size and characteristics of a rural PWID population in Cabell County, West Virginia (a county the US Census Bureau characterized as 86% rural) (Allen et al., 2019a; US Census Bureau, 2012). The parent study and research related to it have been described elsewhere (Allen et al., 2019a,c; Allen et al., 2019d); for brevity, we provide a brief description of the methodology and instrumentation used in the parent study. All data were collected anonymously via audio computer assisted self-interview (ACASI) in June and July 2018 at the Cabell-Huntington Harm Reduction Program (housed at the Cabell-Huntington Health Department) and in community locations where PWID were known to congregate, such as public parks and parking lots. The Cabell-Huntington Harm Reduction Program was implemented in September 2015 and offers access to sterile injection equipment, overdose prevention resources (including naloxone), HIV/STI testing, vaccinations, and drug treatment referrals. Prior to launching the parent study, we engaged a diverse group of local stakeholders in discussions surrounding how to best engage the local PWID population in our research. From these discussions, we ascertained that there was pervasive community-level stigmatization of addiction and that PWID may be hesitant to report injection drug use if asked as part of the screener. As a result, we elected to set broad inclusion criteria: 1. Having ever used drugs of any form and, 2. At least 18 years old. All participants received either a snack bag or a $10 grocery gift card as an incentive. In total, 797 surveys were collected with 46.8% (n = 373) indicating injection drug use in the past 6 months and Cabell County residence. Due to data collection tablets overheating and resulting missing data, n = 2 individuals were excluded from the analysis. The final analytical sample for the present research was n = 371. The Institutional Review Board at the Johns Hopkins Bloomberg School of Public Health approved this research.

2.2. Measures

2.2.1. Dependent variable

The outcome of interest was if persons had received THN from any sources in the past 6 months, which was assessed (yes/no) via, “In the past 6 months, did you get Narcan or naloxone to carry with you?”.

2.2.2. Sociodemographics

Participants reported their age as a continuous measure. Gender was coded as male and female. Race/ethnicity was coded as a binary variable, White, non-Hispanic versus all others (e.g., Hispanic, Black, multiracial, and other). Education level was dichotomized to those who indicated having less than a high school education and those who had completed at least high school. Similarly, relationship status was dichotomized to those who reported being single versus in a relationship or partnered. Sexual minority status was collapsed to those who identified as heterosexual versus all others, including: gay, lesbian, bisexual, and other.

2.2.3. Structural vulnerabilities

Participants reported (yes/no) if they considered themselves homeless. Employment status was dichotomized to those who reported being unemployed versus all others (e.g., full-time, part-time, temporary or seasonal work). Food insecurity was dichotomized to those who reported going to bed hungry at least once per week versus those who reported less frequently or never going to bed hungry. Engagement in transactional sex work in the past 6 months was assessed binarily (yes/no) via, “In the past 6 months, did you sell sex? By selling sex, I mean trading or exchanging oral, vaginal, or anal sex for things like money, food, drugs, or a place to stay.” We also asked (yes/no) participants about recent arrest (“Have you been arrested in the past 6

Table 1
Characteristics among rural PWID by having accessed THN in the past 6 months (n = 371).

Variable	Total (n = 371), N (%)	Did not access THN (n = 192) N (%)	Accessed THN (n = 179) N (%)	p-value
Sociodemographics				
Age, mean (SD)[a]	35.8 (8.7)	34.2 (8.4)	37.5 (8.6)	< 0.001
Male	221 (59.6)	123 (64.1)	98 (54.7)	0.068
White, non-Hispanic	302 (83.4)	156 (84.8)	146 (82.0)	0.480
Did not graduate high school	105 (28.3)	57 (29.7)	48 (26.8)	0.539
Married or in a relationship	175 (47.3)	83 (43.5)	92 (51.4)	0.126
Sexual Minority	64 (17.3)	36 (18.8)	28 (15.6)	0.429
Structural vulnerabilities				
Considers self homeless	212 (57.1)	105 (54.7)	107 (59.8)	0.322
Unemployed	245 (66.0)	133 (69.3)	112 (62.6)	0.173
Food insecurity	239 (64.4)	115 (59.9)	124 (69.3)	0.059
Transactional Sex Work past 6 months	67 (18.1)	35 (18.2)	32 (17.9)	0.930
Arrested in past 6 Months	113 (30.5)	54 (28.1)	59 (33.0)	0.312
Has Health Insurance	271 (73.0)	138 (71.9)	133 (74.3)	0.599
Substance use				
Years since first injection	10.9 (9.3)	10.4 (8.5)	11.6 (10.1)	0.214
Number of Injections on a Typical Day				< 0.001
0	41 (11.1)	31 (16.2)	10 (5.6)	
1–2	74 (20.0)	46 (24.1)	28 (15.6)	
3–5	161 (43.5)	78 (40.8)	83 (46.4)	
> 5	94 (25.4)	36 (18.8)	58 (32.4)	
Receptive injection equipment sharing, past 6 months	224 (60.4)	112 (58.3)	112 (62.6)	0.404
Syringes	153 (41.2)	77 (40.1)	76 (42.5)	0.645
Cookers	163 (43.9)	72 (37.5)	91 (50.8)	0.010
Cotton	134 (36.1)	61 (31.8)	73 (40.8)	0.071
Rinse water	154 (41.5)	73 (38.0)	81 (45.3)	0.158
Drug use level, past 6 months				0.067
Decreased or stayed the same	279 (75.2)	152 (79.2)	127 (70.9)	
Increased	92 (24.8)	40 (20.8)	52 (29.1)	
Accessed sterile syringes at a needle exchange in past 6 months	246 (66.3)	101 (52.6)	145 (81.0)	< 0.001
Use drugs alone	117 (31.5)	64 (33.3)	53 (29.6)	0.440
Attempted to quit drugs in past 6 months	275 (74.1)	135 (70.3)	140 (78.2)	0.083
Number of Times Overdosed in the Past 6 months				< 0.001
0	209 (56.3)	138 (71.9)	71 (39.7)	
1–2	78 (21.0)	28 (14.6)	50 (27.9)	
3–5	45 (12.1)	12 (6.3)	33 (18.4)	
> 5	39 (10.5)	14 (7.3)	25 (14.0)	
Witnessed a Non-Fatal Overdose in past 6 months	258 (71.1)	114 (60.3)	144 (82.8)	< 0.001
Witnessed a Fatal Overdose in past 6 months	144 (38.8)	57 (29.7)	87 (48.6)	0.003
Injection drug use, past 6 months				
Cocaine	132 (35.6)	52 (27.1)	80 (44.7)	< 0.001
Heroin	304 (81.9)	142 (74.0)	162 (90.5)	< 0.001
Speedball	139 (37.5)	54 (28.1)	85 (47.5)	< 0.001
Crystal Methamphetamine	263 (70.9)	124 (64.6)	139 (77.7)	0.006
Prescription Pain Medications	81 (21.8)	45 (23.4)	36 (20.1)	0.438
Fentanyl	208 (56.1)	85 (44.3)	123 (68.7)	< 0.001
Suboxone or Buprenorphine	110 (29.6)	61 (31.8)	49 (27.4)	0.354
Thinks doctors judge people who use drugs	303 (81.9)	145 (75.9)	158 (88.3)	0.002

[a] *t*-test.

months?"), he alth insurance coverage ("Do you currently have health insurance?"), and if they felt doctors judge people who use drugs ("Do you think doctors in your community judge people that use drugs?"). We included measures for health insurance coverage and if persons felt judged by doctors as they may be informative for naloxone distribution initiatives (i.e., those who face added challenges accessing healthcare services may have differing levels of access to overdose prevention resources and require more tailored interventions).

2.2.4. Substance use

Participants were asked how old they were when they first injected any drug to get high. We then calculated the number of years since first injection by subtracting age at first injection from reported age. Participants reported the number of times they injected on a typical day. For analytical purposes, these data were grouped into 4 injection frequency categories: 0, 1–2, 3–5, and more than 5. Receptive injection equipment sharing was measured via, "In the past 6 months, did you use any of the following items that you knew had been used by someone else?" with answer options including: syringes or needles, cookers, cotton, and rinse water. We also asked participants how many persons they met up with to use drugs (in the past 6 months), with responses dichotomized to using alone versus all others. Participants were asked to report if their recent (past 6 months) substance use had increased, decreased, or stayed the same. We dichotomized these data to those who reported that their drug use had increased versus those who reported their drug use had decreased or stayed the same. Additionally, the survey included measures for if persons had, in the past 6 months, attempted to quit using drugs and accessed sterile injection equipment at a needle exchange program. Persons reported substances they had injected in the past 6 months: cocaine, heroin, speedball (co-injection of heroin and cocaine), crystal methamphetamine, prescription pain medications, fentanyl, and buprenorphine/Suboxone. Participants also reported the number of times in the past 6 months they: overdosed to the point of passing out, witnessed a fatal overdose, and witnessed a non-fatal overdose. Personal overdose experiences were collapsed into four categories: 0, 1–2, 3–5, and more than 5 overdoses. We constructed binary variables for having witnessed fatal and non-fatal overdose(s) in the past 6 months.

2.3. Analysis

Proportions are reported for all categorical variables. Initial tests for association with having received THN in the past 6 months were calculated using Pearson's chi-square tests and independent samples t-tests, with $p < .05$ indicating statistical significance. Criteria for selecting variables for inclusion in the multivariate model included statistical significance ($p < .05$) and consideration for how factors may influence the risk environment for overdose among rural PWID. The risk environment framework identifies factors (e.g., structural, social, economic) that shape individuals' risks for drug use and HIV (Green et al., 2009; Cloud et al., 2019; Rhodes, 2002, 2009). Utilizing this framework allows us to better understand the complex and interacting factors associated with rural PWID having received THN. In addition, we conducted analyses to determine if the substances PWID reported having injected in the past 6 months were associated with one another. These analyses suggested that many of the substances injected were highly associated with one another, thus suggesting a high prevalence of polysubstance use. As a result, we did not retain drug-specific injection drug use measures in the multivariate model, but rather the number of injections on a typical day. Similarly, our binary measures for having witnessed fatal and non-fatal overdoses were correlated; as a result, we retained having witnessed a non-fatal overdose in the multivariate analysis. Multivariable Poisson regression with a robust variance estimator was used to evaluate the independent effect of covariates on having received THN due to its high prevalence. Adjusted prevalence ratios and associated 95% confidence intervals are reported. Hosmer-Lemeshow goodness-of-fit test was used to asses model fit. All statistical analyses were conducted using SAS Enterprise Guide v7.1.

3. Results

On average, participants were 35.8 years old (Table 1). The majority reported being male (59.6%), White, non-Hispanic (83.4%), and considered themselves homeless (57.1%). A majority also reported being unemployed (66.0%) and experiencing food insecurity (64.4%). Nearly three in four reported having some form of health insurance (73.0%). Small proportions reported not graduating high school (28.3%) and identified as a sexual minority (17.3%). The average number of years since first injection was 10.9 years. On a typical day, most persons reported injecting either 3–5 times (43.5%) or more than 5 times (25.4%). The majority reported having received sterile syringes from a needle exchange program in the past 6 months (66.3%). Slightly more than half (56.3%) reported no overdose experiences in the past 6 months and a minority (10.5%) reported more than 5 recent overdoses. Seventy-one percent reported having witnessed a non-fatal overdose in the past 6 months. Overall, 48.2% (n = 179) reported having received THN in the past 6 months (Table 2).

3.1. Factors associated with having received THN

There were significant differences ($p < .05$) between rural PWID that had and had not received THN in the past 6 months (Table 1). Those who received THN were slightly older than their counterparts who had not gotten THN (37.5 and 34.2 years, respectively). Compared to their counterparts that did not receive THN, rural PWID that reported having received THN were more likely to report injecting more than 5 times per day (32.4% and 18.8%, respectively) and having accessed sterile syringes at a needle exchange program in the past six months (81.0% and 52.6%, respectively). In terms of overdose-related experiences, those who reported having received THN were more likely than their counterpart PWID to report having recently (past 6 months): overdosed more than 5 times (14.0% and 7.3%, respectively), witnessed at least one non-fatal overdose (82.8% and 60.3%, respectively), and witnessed at least one fatal overdose (48.6% and 29.7%, respectively). Rural PWID that reported having received THN were also more likely than their counterparts who did not receive THN to report injecting (in the past six months): cocaine (44.7% and 27.1%, respectively); heroin (90.5% and 74.0%, respectively); speedball (47.5% and 28.1%, respectively); crystal methamphetamine (77.7% and 64.6%, respectively), and fentanyl (68.7% and 44.3%, respectively). Additionally, a greater proportion of those who reported having received THN indicated they felt doctors judge people who use drugs than those who did not receive THN (88.3% and 75.9%, respectively).

Table 2
Adjusted Prevalence Ratios for Characteristics of PWID who reported having received THN in the past 6 months.

	Adjusted Prevalence Ratios (95% CI)	P-value
Age	1.02 (1.01-1.03)	< 0.001
Witnessed a Non-Fatal Overdose in past 6 months	1.44 (1.06-1.94)	0.018
Number of Injections on a Typical Day		
0	1.0 (ref)	
1–2	1.06 (0.62-1.82)	0.819
3–5	1.17 (0.72-1.93)	0.519
5+	1.44 (0.87-2.40)	0.160
Number of Times Overdosed in past 6 months		
0	1.0 (ref)	
1–2	1.62 (1.28-2.05)	< 0.001
3–5	1.86 (1.42-2.44)	< 0.001
5+	1.43 (1.04-1.98)	0.030
Accessed sterile syringes at a needle exchange, past 6 months	1.82 (1.35-2.46)	< 0.001
Thinks doctors judge people who use drugs	1.50 (1.07-2.12)	0.020

In multivariate analysis, factors associated with rural PWID having received THN in the past 6 months were: age (adjusted Prevalence Ratio [aPR] = 1.02; 95% Confidence Interval [CI]: 1.01–1.03), having accessed sterile syringes at a needle exchange in the past 6 months (aPR = 1.82; 95% CI: 1.35–2.46), believing that doctors judge people who use drugs (aPR = 1.50; 95% CI: 1.07–2.12), and having witnessed at least one non-fatal overdose in the past 6 months (aPR = 1.44; 95% CI: 1.06–1.94). In addition, greater numbers of personal overdose events in the past 6 months were associated with having received THN; those who reported 1–2, 3–5, and more than 5 overdose events were significantly more likely to have received THN than those PWID who had not overdosed (aPR = 1.62; 95% CI: 1.28–2.05, aPR = 1.86; 95% CI: 1.42–2.44, and aPR = 1.43; 95% CI: 1.04–1.98, respectively). Goodness-of-fit tests indicated adequate fit of the multivariable model (p-value = 0.11).

4. Discussion

This research demonstrates that slightly less than half of PWID in Cabell County, West Virginia recently received THN and that persons who did had risks for overdose in excess of their non-THN accessing counterparts. Among our sample, persons who received THN reported more frequently: injecting; overdosing; and, witnessing both fatal and non-fatal overdoses. PWID who reported having received THN were also more likely to report being older, having accessed sterile syringes at a needle exchange program, and believing doctors judge people who use drugs. Overall, these findings suggest that existing harm reduction services are reaching PWID who are at high risk of overdose. Further, PWID who received THN reported greater use of multiple injectable drugs, including: cocaine, heroin, speedball, crystal methamphetamine, and fentanyl. In adjusted analyses, we found that PWID having received THN was associated with several indicators that could suggest high-risk for overdose, such as: having witnessed a non-fatal overdose, number of injections per day, number of recent overdoses, and feeling that doctors judge people who use drugs. We also found that age was associated with having received naloxone (i.e., the odds of having received THN

increased with age).

While our data suggest that existing THN initiatives in Cabell County serve PWID at high risk of overdose, they also demonstrate that disparities exist. For example, in adjusted analyses, PWID who reported having recently accessed sterile syringes at a needle exchange program were nearly twice as likely to have received THN. These data underscore the importance of ensuring harm reduction services are accessible to rural PWID as well as supporting innovative collaborations that ensure PWID who do not access harm reduction services are able to access naloxone through other venues. Given that Cabell County has a single harm reduction program and that it operates as a single, fixed-site, efforts should be undertaken to expand access to harm reduction services and THN, particularly for PWID who live in more rural parts of the county and who may have diminished access to existing overdose prevention services. The association between accessing sterile injection equipment at a needle exchange program and THN access also aligns with existing research demonstrating that the benefits of harm reduction programs extend beyond infectious disease prevention (Centers for Disease Control and Prevention (CDC, 2019; Des Jarlais et al., 2015).

Overall, more than 4 out 5 PWID in our sample reported they felt doctors judge people who use drugs and, among those who received THN, nearly 9 out of 10 felt doctors judge people who use drugs. These are concerning findings that speak to the stigmatization of injection drug use in rural communities. There is an urgent need for multi-pronged initiatives in rural communities to destigmatize drug use and bolster the ability of the healthcare infrastructure to meet PWID where they are at and tailor service delivery (including increased access to medication assisted treatment) in ways that best fit within their lives.

Collectively, overdose prevention initiatives in Cabell County led to a 40% reduction in EMS call for overdoses in 2018 (Nash, 2018). While we cannot say with certainty that these reductions in EMS calls for overdose translated to averted overdose fatalities, they are suggestive of an improving overdose prevention landscape. Expanded naloxone access, enhanced overdose prevention education among people who use drugs, and increased access to evidence-based drug treatment programs may lead to further reductions in fatal and non-fatal overdose. We also found that among PWID who had not received THN, an estimated 1 in 3 reported using drugs alone. Research should be conducted to better understand the unique overdose prevention needs of this subpopulation of PWID as they are at high-risk given their substance use profiles, lack of THN, and use of drugs alone.

These data are not without limitations. First, we are not able to assess population-level naloxone coverage relative to the total number of overdose events. Relatedly, we are not able to determine if PWID at highest risk for overdose are receiving THN at levels appropriate to their risk. Additionally, we did not measure where PWID acquired naloxone, if they still have it, or ever used it. Another limitation of this research is that we did not evaluate interactions with law enforcement beyond whether persons had recently been arrested. This limitation should be addressed in future research as evidence has shown a correlation between overdose experiences among PWID and interactions with law enforcement (Wagner et al., 2015). The majority of our sample also identified as White; as a result, our ability to understand THN access across demographic groups is limited. This limitation reflects the relative racial and ethnic homogeneity in our study setting (US Census Bureau, 2017). Given our inclusion criteria, all participants were at least 18 years old; it is plausible that factors associated with THN possession are different among adolescents. Our analysis excludes those people who use drugs via non-injection routes of administration. Future work should be conducted to understand naloxone access and overdose risks among individuals who use opioids via non-injection routes of administration. All data were also self-reported and therefore subject to recall and social desirability bias. Finally, this analysis reflects a single rural PWID population and our findings may not be generalizable to other rural communities.

Addressing disparities in access to THN in rural communities will require both additional research to better understand population-level needs for naloxone in the modern opioid crisis and novel interventions that are responsive to the unique needs of rural PWID in Appalachia. PWID having utilized syringe services programs was associated with THN possession; this finding speaks to the critical importance and public health utility of implementing comprehensive harm reduction programs in rural communities. Our research demonstrates that while existing THN initiatives in Cabell County serve PWID at high-risk of experiencing an overdose, there is an urgent need for increased naloxone access and overdose prevention education. Achieving greater reductions in overdose will also require enhanced healthcare provider education as it pertains to destigmatizing addiction as well as community-level interventions aimed at reducing stigmatization of drug use. Our findings fill an important gap in the public health literature given the dearth of literature on access to THN in rural communities and can be used to inform the implementation of initiatives designed to further reduce overdose experiences among rural PWID populations.

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Nothing declared.

Contributors

STA conceived this research question. STA, RHW, and AO oversaw the study implementation and data collection. STA, RHW, and AO conducted the analyses. All authors were involved in the interpretation of the findings and manuscript development. All authors have read and approved the final manuscript.

Declaration of Competing Interest

Dr. Sherman is an expert witness for plaintiffs in opioid litigation.

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