



Factors Associated with Likelihood of Initiating Others into Injection Drug Use Among People Who Inject Drugs in West Virginia

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Abstract

People who inject drugs (PWID) play a critical role in injection-naïve individuals transitioning to injection drug use. We investigated factors associated with future likelihood of initiating injection-naïve individuals using multivariable logistic regression among 418 PWID in rural Appalachia (Cabell County, West Virginia). Less than 10% reported they were likely to initiate someone in the future. Acquiring syringes from a syringe services program was associated with decreased odds of being likely to initiate someone in the future (adjusted odds ratio [aOR] 0.46, 95% CI 0.23, 0.95), while having previously initiated someone into injection drug use was associated with increased odds (aOR 8.65, 95% CI 4.07, 18.41). Among our sample of PWID in Appalachia, a small proportion reported that they would be likely to initiate an injection-naïve individual in the future. Efforts to reduce injection initiation assistance should focus on this subpopulation of PWID who indicate a willingness to engage in this behavior.

Keywords Harm reduction · Injection drug use · Injection initiation · People who inject drugs · Rural health · Syringe services programs

Introduction

There are an estimated 15.6 million people who inject drugs (PWID) globally (3.2 million women and 12.5 million men). Among these persons, an estimated 17.8% are living with HIV, 52.3% are Hepatitis C (HCV)-antibody positive, and

9.1% are Hepatitis B (HBV) surface antigen positive [1]. PWID are also at high risk for skin and soft tissue infections and infective endocarditis [2–5]. In addition, injection drug use increases risks for fatal and nonfatal overdose [6–9]. Global estimates suggest that 82.9% of PWID primarily inject opioids, underscoring the urgency of implementing

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evidence-based response strategies to mitigate the range of adverse consequences associated with the opioid crisis [1]. In North America, there is an epidemic of opioid-involved overdose fatalities and concomitant increases in community-level risks for infectious disease outbreaks among PWID, driven in part by the over-prescription of opioid analgesics, widespread contamination of drug supplies with highly potent synthetic opioids, and low access to medications for opioid use disorder (MOUD) [10–17]. Averting injection-related morbidity and mortality may require the implementation of interventions designed to prevent persons who use drugs from transitioning to injection drug use.

Existing, predominantly urban-based research has shown that people who use drugs transitioning to injection drug use is associated with a myriad of sociodemographic and substance use-related factors, including to achieve stronger drug effects, out of curiosity, and social network influences [18–26]. Low educational attainment, exposure to violence, homelessness, poverty, and polysubstance use have also been shown to be associated with transitions to injection drug use [19, 27–33]. While the drivers of transitions to injection drug use are diverse and interconnected, studies have consistently demonstrated that PWID are of central importance to injection initiation processes as persons who are injection-naïve may require assistance during their first injection (e.g., preparing and injecting drugs) [19, 23, 34–36].

Studies have found that PWID are routinely sought out by people who use drugs to facilitate their transitions to injection drug use and that most injection-naïve individuals are injected for the first time by PWID in their social and sexual networks [19, 20, 22, 23, 25, 26, 31, 35, 37–41]. The prevalence and degree to which injection-naïve persons receive injection initiation assistance from PWID varies [35, 42]; for example, a study among recent injection initiates found that 76% and 79% reported their PWID initiators prepared their first injection and injected them for the first time, respectively [43]. Existing injection initiation literature has also found that the prevalence of PWID facilitating injection initiation varies geographically; for instance, a study in Tijuana, Mexico found that 14% of PWID reported having ever injected an injection-naïve person and only 4% reported having done so in the past 6 months [27]. By contrast, in samples of PWID in California, USA, 38% reported having ever initiated others into injection drug use [44] and 7% reported this behavior in the past year [28].

Qualitative research has found that many PWID are reluctant to facilitate injection initiation among injection-naïve individuals because they perceive the process as crossing a “moral boundary” [41, 45–47]. However, altruistic desires to protect others from harms associated with improper injection may lead PWID to facilitate injection initiation, given their experience and knowledge of how to more safely inject drugs and avoid overdose and skin and soft tissue infections

[37, 41, 45, 48]. A study conducted among PWID in California, for instance, found that nearly two-thirds of participants reported having facilitated injection initiation to prevent injury [48]. Studies have identified a multitude of other factors associated with PWID facilitating injection initiation; for example, a study conducted in Tijuana, Mexico found that male PWID were more than twice as likely to have facilitated injection initiation than their female counterparts [49]. Other studies have found that daily injection drug use, public injection, interactions with law enforcement, and the use of non-injection cocaine, heroin, and methamphetamine were associated with injection initiation [27, 50, 51]. Research has also found that PWID may facilitate injection initiation of injection-naïve persons in exchange for money, drugs, or a place to stay [41, 48, 52]. Further, a 2019 study in Vancouver found that PWID who reported active MOUD enrollment had significantly lower odds of recently providing injection initiation assistance [53].

Existing literature surrounding the role of PWID in injection initiation processes is informative, yet most studies reflect research conducted among PWID populations in urban centers. Little comparable work has been conducted among PWID residing in rural communities. This represents a significant deficit in our public health understanding of injection initiation processes given that the opioid crisis has had devastating consequences throughout rural America. In addition, many rural communities lack essential evidence-based policies and programs to respond effectively to injection drug use-associated consequences, setting the stage for worsening epidemics of overdose and bloodborne infectious diseases. The purpose of this study is to examine the future likelihood of PWID residing in a rural community in West Virginia (WV), USA injecting persons for their first time.

Methods

Study Context, Design, and Recruitment

This analysis used cross-sectional data collected in June–July 2018 as part of a PWID population estimation study in Cabell County, WV [54–56]. Cabell County is located in southwestern WV and borders Kentucky and Ohio. Cabell County has been deeply affected by the overdose crisis; in 2018, Cabell County had the highest count of opioid-involved overdose fatalities in the state [57].

Detailed methodological descriptions are reported in related publications [54–56]; briefly, the study used the capture–recapture method for population estimation, which has been widely used in public health among a variety of populations [58–65]. It involves two rounds of data collection in which members of the target population are surveyed [63]. During the capture phase, PWID were recruited at the

harm reduction program at the Cabell-Huntington Health Department. This is the only harm reduction program in Cabell County and offers PWID access to sterile injection equipment and a variety of other essential health and human services including HIV/STI testing, overdose prevention resources, drug treatment referrals, and vaccinations. During the recapture phase, study staff visited locations throughout Cabell County that were identified as locations where drug use activities may take place. We identified these venues via geospatial analyses of secondary data sources (e.g., overdose fatality data, locations of improper syringe disposal) and interviews with local stakeholders who had lived or professional experience related to drug use.

Due to the stigma associated with injection drug use, the study had broad eligibility criteria: at least 18 years old and to have ever used drugs. Data were collected anonymously via audio computer-assisted self-interviewing (ACASI) survey, and participants received either a \$10 grocery gift card or a small snack bag as an incentive. To avoid duplicate data generated by persons who may have participated multiple times, the survey included items that asked participants to report if they had previously completed the survey during either phase and resulting duplicates were excluded.

In total, 797 surveys were completed during the study. Given our interest in the likelihood of PWID injecting others in the future, this analysis uses a subsample of $n=418$ persons who reported having injected drugs in the past 6 months and who answered the question about our primary outcome. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved this study. All participants provided oral consent.

Measures

Outcome Variable

Our primary outcome was how likely it is that PWID would inject someone for their first time in the future which was ascertained via, “How likely is it that you would inject someone for their very first hit in the future?” Participants selected from a four-point scale: “definitely would not,” “probably would not,” “probably would,” and “definitely would.” We collapsed the scale into a dichotomized variable reflecting whether persons “definitely would not/probably would not” versus “probably would/definitely would” inject someone for the first time in the future.

Demographic Characteristics

Demographic characteristics included age (continuous variable), gender (male/female), race and ethnicity, highest education completed (less than high school diploma; high school diploma or equivalent; some college or more), and

sexual minority status (gay, lesbian, bisexual, or other versus heterosexual or straight). All participants were asked about their race (White, Black or African American, Asian, Pacific Islander, American Indian or Alaskan Native, Multiracial, and other) and ethnicity (Hispanic vs. non-Hispanic), but responses had low variability. Therefore, we dichotomized these data to a single measure: non-Hispanic, White vs. other.

Socioeconomic/Structural Vulnerabilities

Measures of socioeconomic vulnerability included homelessness, food insecurity, recent arrest (arrest in the past 6 months), and engaging in transactional sex work (sold or traded sex) in the past 6 months. Homelessness was defined as whether participants considered themselves homeless (yes/no). Food insecurity was a dichotomous measure that reflected if the participant reported going to bed hungry at least once a week during the past 6 months [66].

Drug Use

Drug use variables included years since first injection, frequency of injection on a typical day, types of drugs injected, injection in public places, receptive injection equipment sharing, and using drugs with other people. Years since first injection, defined continuously, was calculated by subtracting the reported age of first injection from current age. Participants self-reported the number of times they injected on a typical day. We recoded anomalous counts of daily injections (≥ 50 injections per day; $n=2$) as missing. Participants also reported the drugs that they had injected in the last 6 months, including: fentanyl, heroin, buprenorphine or Suboxone, prescription pain relievers, crystal methamphetamine, speedball (co-injection of heroin and cocaine), and cocaine. Using these data, we created a count variable (range 1–7) for the number of drugs participants reported injecting in the past 6 months. To assess public injection, participants were asked, “In the past 6 months, where did you typically use drugs?” We categorized the following responses as public locations, creating a binary variable: on the street, at a park, a stairwell in a building or business, an abandoned building, a public bathroom, on a bus or train, in a car, truck or other vehicle. Typically injecting at their or someone else’s home were considered to be private locations [67]. Individuals who selected “other” location as their primary injection location or refused to answer were recoded as missing ($n=12$). We also constructed a binary variable that reflected if participants reported having engaged in receptive injection equipment (i.e., syringes, cottons, cookers, and/or rinse water) sharing in the past 6 months. Participants reported the number of people they usually met with to use

drugs in the past 6 months (none, use alone; one person; 2+ people).

Service Utilization

We included a binary indicator of having obtained syringes from a syringe services program (SSP) in the past 6 months. We also included three binary indicators of past 6-month drug treatment utilization: any drug treatment, buprenorphine/Suboxone treatment, and receiving outpatient counseling (either individual or group-based).

Previous Initiation of Others into Injection Drug Use

Participants reported if they had injected someone for their first injection in the past 6 months (yes/no). This measure was included as related research has found associations between persons having previously provided injection initiation assistance and perceptions that they would assist others in the future [68].

Analysis

We used Chi Square, Fisher's exact, and Mann–Whitney tests to assess relationships between each variable and likelihood of initiating someone in the future. Based on these results, we carried forward all variables that were significantly associated ($p < 0.05$) with likelihood of initiating someone in the future to logistic regression analyses. We estimated bivariate models for likelihood of initiating someone in the future for each correlate. We then estimated a multivariable logistic regression model of likelihood of initiating someone in the future, which included all significant bivariate correlates from the Chi Square and Mann–Whitney tests, and number of drugs injected as it bordered on statistical significance. We also conducted sensitivity analyses using penalized maximum likelihood logistic regression models to account for the relative rareness of our outcome [69, 70]. There were no qualitative differences in the interpretation of the sensitivity and main analyses, so the results of the sensitivity analyses are not further reported. Statistical analyses were performed using Stata 14 (StataCorp, College Station, TX).

Results

The majority of our sample identified as male (61.0%) and non-Hispanic, White (83.7%). Median age was 35 years old (range 19–63). Approximately one in four (27.3%) reported having not completed high school. A small proportion (17.5%) of our sample identified as a sexual minority. In terms of socioeconomic and structural factors, a majority

reported being homeless (56.0%) and going to bed hungry at least once per week (64.8%). Sixty-one percent reported having engaged in receptive injection equipment sharing in the past 6 months. A median of 8 years (interquartile range [IQR] 4–15 years) had passed since participants' first injection, and the median number of injections on a typical day was 3 (IQR 2–6). Sixty-five percent reported acquiring syringes from an SSP in the last 6 months. Seventeen percent reported that they had previously injected someone for their first hit. Less than one in ten (9.8%) reported being likely to initiate someone into injection drug use in the future (Table 1).

In the unadjusted logistic regression models (Table 2), homelessness (odds ratio [OR] 3.08, 95% confidence interval [CI] 1.43, 6.63), number of drugs injected (OR 1.22, 95% CI 1.01, 1.46), receptive injection equipment sharing (OR 4.16, 95% CI 1.71, 10.14), and previously initiating someone into injection drug use (OR 11.24, 95% CI 5.59, 22.62) were associated with increased odds of being likely to initiate someone in the future. Conversely, obtaining syringes from a SSP was associated with decreased odds of being likely to inject someone in the future (OR 0.42, 95% CI 0.22, 0.81). In the adjusted logistic regression model, obtaining syringes from a SSP in the past 6 months remained associated with lower odds of being likely to initiate someone in the future (adjusted odds ratio [aOR] 0.46, 95% CI 0.23, 0.95) and having previously initiated someone into injection drug use (aOR 8.65, 95% CI 4.07, 18.41) was associated with increased odds of being likely to initiate someone in the future.

Discussion

Our study examined factors associated with being likely to initiate injection-naïve individuals in the future among PWID residing in a rural community. To the best of our knowledge, this is the first study to examine likelihood of initiating someone into injection drug use in the future among a sample of PWID in a rural area. Overall, we found that less than 10% of PWID in our sample reported they would be likely to initiate others in the future. PWID having recently initiated an injection-naïve individual was correlated with persons reporting they would be likely to inject someone in the future as has been reported in other research [28]. We also found that persons utilizing SSPs had lower odds of helping others initiate injection drug use in the future than persons who did not use SSPs.

Existing literature has found that the prevalence of PWID assisting with injection initiation varies across populations and by recency. For instance, studies have found that the proportion of PWID reporting having ever injected a non-injector ranges from 14 to 47% [18, 19, 27, 28, 35, 44, 48,

Table 1 Sample characteristics and correlates of likelihood to initiate others into injection drug use among people who inject drugs in Cabell County, West Virginia, USA, June–July 2018 (N=418)

	Total N (col%)	Would likely initiate others in the future		
		No (n=377) N (row%)	Yes (n=41) N (row%)	p-value
Demographic characteristics				
Age, median (IQR) ^a	35 (30–40)	35 (30–40)	35 (28–41)	0.732
Gender				0.314
Male	255 (61.0)	227 (89.0)	28 (11.0)	
Female	163 (39.0)	150 (92.0)	13 (8.0)	
Race/ethnicity				0.763
Non-hispanic, white	340 (83.7)	308 (90.6)	32 (9.4)	
Other	66 (16.3)	59 (89.4)	7 (10.6)	
Education				0.302
Less than high school	114 (27.3)	100 (87.7)	14 (12.3)	
High school or equivalent	146 (35.0)	130 (89.0)	16 (11.0)	
Some college or more	157 (37.7)	146 (93.0)	11 (7.0)	
Sexual minority	73 (17.5)	65 (89.0)	8 (11.0)	0.722
Socioeconomic/structural vulnerabilities				
Considers self to be homeless	234 (56.0)	202 (86.3)	32 (13.7)	0.003
Goes to bed hungry at least once per week	271 (64.8)	243 (89.7)	28 (10.3)	0.625
Arrested ^b	140 (33.5)	123 (87.9)	17 (12.1)	0.255
Engaged in sex work ^b	77 (18.4)	66 (85.7)	11 (14.3)	0.144
Drug use characteristics				
Years since first injection, median (IQR) ^a	8 (4–15)	8 (4–15)	10 (3–15)	0.769
Number of times inject per day, median (IQR) ^a	3 (2–6)	3 (2–6)	3 (2–5)	0.909
Number of drugs injected, median (IQR) (range 1–7) ^{a,b}	3 (2–4)	3 (2–4)	4 (2–5)	0.052
Injected in public ^b	199 (49.0)	176 (88.4)	23 (11.6)	0.258
Receptive injection equipment sharing ^b	255 (61.0)	220 (86.3)	35 (13.7)	0.001
Use drugs with people ^b				0.787
No, use alone	132 (31.6)	118 (89.4)	14 (10.6)	
One person	132 (31.6)	121 (91.7)	11 (8.3)	
Two or more people	154 (36.8)	138 (89.6)	16 (10.4)	
Service utilization^b				
Got syringes from a syringe services program	272 (65.1)	253 (93.0)	19 (7.0)	0.008
Any drug treatment	155 (37.2)	143 (92.3)	12 (7.7)	0.270
Buprenorphine/suboxone treatment	46 (11.0)	45 (97.8)	1 (2.2)	0.068
Outpatient counseling	21 (5.0)	19 (90.5)	2 (9.5)	0.961
Previously initiated someone ^b	71 (17.0)	46 (64.8)	25 (35.2)	<0.001

Bold values indicate $p < 0.05$

^ap-value using two-sample Mann–Whitney test

^bPast 6 months

53, 71–74]. Similar studies found that recent (e.g., past 6 or 12 months) injection initiation of non-injectors ranges from approximately 4 to 19% [27, 28, 35, 53, 72, 74]. Our finding that 17% of PWID in our sample reported having provided injection initiation assistance in the past 6 months aligns with existing research; however, among persons who reported having recently initiated a non-injector, more than 35% reported they would be likely to do so again in the

future. This proportion is significantly greater than rates found among PWID residing in more urban areas; for example, a recent study found that among PWID who had ever provided injection initiation assistance in Tijuana (Mexico), Vancouver (Canada), and San Diego (USA), 26.1%, 16.8%, and 14.7%, respectively, reported they would likely initiate someone in the future [68]. In contrast, a study in Los Angeles and San Francisco (USA) found that 66% of PWID

Table 2 Logistic regression results for correlates of likelihood of initiating others into injection drug use among PWID in Cabell County, West Virginia (N = 418)

	Unadjusted			Adjusted		
	OR	95% CI	p-value	aOR	95% CI	p-value
Considers self to be homeless	3.08	1.43, 6.63	0.004	2.25	0.98, 5.16	0.056
Number of drugs injected	1.22	1.01, 1.46	0.037	0.96	0.77, 1.18	0.678
Receptive injection equipment sharing ^a	4.16	1.71, 10.14	0.002	2.26	0.84, 6.10	0.107
Got syringes from a SSP ^a	0.42	0.22, 0.81	0.010	0.46	0.23, 0.95	0.036
Previously initiated someone ^a	11.24	5.59, 22.62	<0.001	8.65	4.07, 18.41	<0.001

Bold values indicate $p < 0.05$

SSP syringe services program, OR odds ratio, aOR adjusted odds ratio

^aPast 6 months

who provided injection initiation assistance in the past year reported being likely to initiate others in the future [28]. While methodological differences limit our ability to draw direct comparisons to studies conducted among other PWID populations, the prevalence of likelihood of future injection initiation among our sample remains concerning given the escalation of the opioid overdose crisis and increasing risks for infectious disease outbreaks among rural PWID. Future study should be conducted to better understand how to tailor interventions (e.g., “Break the Cycle” and “Change the Cycle”) designed to reduce engagement in injection initiation behaviors [75].

Our findings add to the existing scientific literature that demonstrates the need for multipronged interventions tailored to local contexts to reduce the burden of injection drug use [76–78]. For example, our finding that PWID having previously injected someone for their first hit was associated with likely future injection initiation underscores the need for individual-level interventions that focus on supporting behavior changes (i.e., reducing injection-related risks) among initiators and initiates. In addition, communities should explore expanding access to SSPs as they are an essential component of a robust and evidence-based public health strategy for addressing injection drug use-associated morbidity and mortality [79]. Research has shown that the implementation of SSPs can be complicated by a number of factors, including community-level opposition and policies that obstruct programs from following best practices [80–84]. The results of our analysis suggest that people who use SSPs have lower odds of reporting they would be likely to help others initiate injection drug use in the future than their counterparts who do not access SSPs. Communities should review all policies and operational practices to ensure services are delivered in alignment with established best practices, including making service delivery as widely accessible as possible to the PWID population [85].

Contrasting with existing literature, we did not find an association between drug treatment engagement and likelihood of future injection initiation among rural PWID [44, 53, 86]. This finding may be reflective of the more limited

access to MOUD in rural contexts relative to urban areas. In West Virginia, for example, many drug treatment programs employ abstinence-based approaches. Limited access to MOUD in rural areas may also explain why only approximately 11% of our sample reported having recently engaged in buprenorphine/Suboxone-based drug treatment. Notably, only one participant who reported being likely to initiate someone into injection drug use in the future reported having recently engaged in buprenorphine/Suboxone-based drug treatment. Future work should be conducted to better understand the role of drug treatment experiences with PWID providing injection initiation assistance in rural contexts.

The results of this study should be interpreted with careful consideration of the contextual factors that PWID may have perceived as relevant when they reported their likelihood of future injection initiation. Research has found that there is a diversity of reasons for PWID providing injection initiation assistance, including altruism (i.e., to prevent the initiate from immediate harms, such as overdose) [37, 41, 48, 52]. PWID deciding whether to provide injection assistance to a novice injector may occur in contexts where the initiate is at risk of incurring direct harm if they inject alone or without guidance from a more experienced PWID. As a result, willingness to initiate injection-naïve individuals should not necessarily be viewed as an adverse behavior that public health should work to suppress; rather, interventions are needed that educate PWID about how to balance their personal beliefs surrounding injection initiation with consideration for the relevant public health implications [37]. Future work should be conducted to better understand how to develop interventions that support PWID in their decision-making processes surrounding injection initiation and encourage persons to provide evidence-based support, in whatever form is most appropriate, to the injection-naïve individual. Further, interventions that ensure PWID are knowledgeable about available resources (e.g., drug treatment, harm reduction services) and are able to refer individuals seeking to transition to injection drug use to appropriate systems of care may result in additional public health gains.

Study limitations include a cross-sectional study design that does not permit establishment of causality. Data are also self-reported and subject to social desirability and recall bias; however, our use of anonymous data collection methods may have reduced the effects of social desirability bias. In addition, our data were collected in 2018, preceding the identification of an injection drug use-associated HIV cluster in Cabell County and the coronavirus pandemic [87]. As a result, our findings may not reflect the current lived experiences of PWID. Another limitation is that we cannot infer the details of the decision-making processes PWID in our study may have employed when reporting their likelihood of future injection initiation. As described previously, there are many overlapping and interconnected factors that affect injection initiation behaviors. Future work is needed to better understand what factors are most salient in PWID deciding to provide injection initiation assistance and how to empower PWID who initiate others to disseminate evidence-based risk reduction strategies to persons who are novices. Last, our study reflects findings from PWID sampled in a single county in rural Appalachia; as such, our findings may not be generalizable to other rural communities.

Preventing the transition of people who use drugs to injection drug use should be a public health priority given escalations in overdose and infectious disease among PWID. Our analysis demonstrated that PWID having previously injected an injection-naïve individual was associated with increased odds of persons reporting they would be likely to facilitate injection initiation in the future. In contrast, PWID having acquired syringes at a SSP was associated with lower odds of persons reporting they would be likely to help others initiate injection drug use in the future than their counterparts who do not access SSPs. Our findings underscore the importance of communities using combination approaches to reduce the consequences of injection drug use. Future research is needed to better understand the balance between PWID protecting novice injectors from immediate harms via providing initiation assistance and supporting efforts to prevent non-injectors to transitioning to injection drug use.

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Author Contributions STA secured funding. STA conceived this research question. STA, RHW, and AO oversaw the study implementation and data collection. STA, KES, and AM conducted the analyses. RHW independently confirmed results. All authors were involved in the interpretation of the findings and manuscript development.

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Data Availability Data is not publicly available due to privacy concerns.

Declarations

Conflict of interest Nothing to declare.

Ethical Approval Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed and approved this study.

Consent to Participate All participants gave verbal informed consent to participate.

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