Low-Frequency Heroin Injection among Out-of-Treatment, Street-Recruited Injection Drug Users

Jennie L. Harris, Jennifer Lorvick, Lynn Wenger,
Tania Wilkins, Martin Y. Iguchi, Philippe Bourgois,
and Alex H. Kral

ABSTRACT *In this paper, we explore the understudied phenomenon of "low-frequency" heroin injection in a sample of street-recruited heroin injectors not in drug treatment. We conducted a cross-sectional study of 2,410 active injection drug users (IDUs) recruited in San Francisco, California from 2000 to 2005. We compare the sociodemographic characteristics and injection risk behaviors of low-frequency heroin injectors (low-FHI; one to 10 self-reported heroin injections in the past 30 days) to high-frequency heroin injectors (high-FHI; 30 or more self-reported heroin injections in the past 30 days). Fifteen percent of the sample met criteria for low-FHI. African American race, men who have sex with men (MSM) behavior, and injection and noninjection methamphetamine use were independently associated with low-FHI. Compared to high-FHI, low-FHI were less likely to report syringe sharing and nonfatal heroin overdose. A small but significant proportion of heroin injectors inject heroin 10 or less times per month. Additional research is needed to qualitatively examine low-frequency heroin injection and its relationship to drug use trajectories.*

KEYWORDS *Low-frequency heroin injection, Heroin, Drug injection, Out-of-treatment drug users*

INTRODUCTION

Substance abuse treatment providers and researchers tend to address heroin use as if it were habit-forming without exception (Morral et al. 2000[1]; Center for Substance Abuse Research[2]). Although heroin is highly addictive, with most people using it every day, there is evidence that some people use heroin far less frequently. Based on data from the National Survey on Drug Use and Health from 2005 to 2007, an estimated 432,000 people in the United States used heroin in the past year (Office of Applied Studies[3]). Of these, approximately 194,000 did not meet the criteria for heroin abuse or dependence, suggesting that a substantial proportion of heroin users were not chronic users.

Harris is with the RTI International, 3040 Cornwallis Rd., Research Triangle Park, NC 27709, USA; Lorvick, Wenger, and Kral are with the RTI International, 114 Sansome Street, Suite 500, San Francisco, CA 94104-3812, USA; Wilkins is with the Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, 725 Martin Luther King Jr. Blvd., CB# 7590, Chapel Hill, NC 27599, USA; Iguchi is with the School of Nursing and Health Studies, , Georgetown University, 101 St. Mary's Hall, 3700 Reservoir Road, NW, Washington, DC, 20057, USA; Bourgois is with the University of Pennsylvania, 2632 South Street, Philadelphia, PA 19104, USA.

Correspondence: Jennie L. Harris, RTI International, 3040 Cornwallis Rd., Research Triangle Park, NC 27709, USA. (E-mail: jlh@rti.org)

In the mid1970s, Norman Zinberg pioneered the systematic study of "controlled" heroin use. His groundbreaking theory of "Drug, Set and Setting" was inspired by a "lack of research on patterns of drug use that lay between abstinence on one extreme and chronic, dysfunctional addiction on the other"[4]. His work countered the prevailing view that occasional heroin use was simply a step on the downward spiral to full-fledged addiction. Reviewing the drug literature from 1957 to 1981, Zinberg concluded that 40 % of the opiate-using population consisted of "occasional" heroin users[4]. Controlled users were significantly less likely than compulsive users to say they used opiates to escape or alleviate depression. They tended to belong to social groups that reinforced the norm of occasional, rather than compulsive, use[4,5]. The primary motivation for occasional heroin use in this group was pleasure or "to enjoy the high"[4]. Zinberg observed that the study of controlled users could not only provide important insights into reducing use among compulsive users but could also increase our understanding of why controlled users reject abstinence[4,6].

The study of controlled heroin use dropped off in the early 1980s, perhaps because of the more pressing issue of HIV/AIDS among injection drug users (IDUs) as well as the zero-tolerance political environment of the War on Drugs[7]. One exception was an Internet-based study in Britain[8] that divided heroin users into two groups: "nondependent" users who could cease heroin use without experiencing physical withdrawal and "controlled dependent" users who used heroin daily but who perceived their use as controlled and not problematic. Central findings of the study were that heroin does not always lead to addiction and that chaotic use is not an inevitable outcome of dependence[8]. Similar to Zinberg, the authors found that many controlled users had been through previous periods of compulsive use.

The studies discussed above consisted of stably housed middle- or working-class individuals who were either employed or attending college. Along with the emergence of HIV/AIDS came a greater focus on underclass, street-based populations of IDUs living in urban environments. "Controlled" heroin use is largely unexplored in this population, but evidence suggests it exists. For example, we queried a database of over 30,000 IDUs and crack cocaine smokers from 23 US cities as part of the National Institute on Drug Abuse Cooperative Agreement study from 1992 to 1998[9]. Among the 13,000 active IDUs for whom injection initiation was at least 2 years prior and who were not in drug treatment at the time of interview, 15 % reported injecting heroin one to 10 times in the past 30 days. We used the cutoff of 10 heroin injections as the United States Office of National Drug Control Policy's definition of "hardcore" heroin drug use is more than 10 days of use in the past month[1,7].

Thus, it appears that a substantial minority of IDUs not in drug treatment inject heroin infrequently, at least over the course of short periods of time. There is a notable absence of research regarding heroin use that examines infrequent use, especially as it applies to marginalized, urban poor IDUs. This paper explores sociodemographic characteristics, substance use patterns, drug injection risk behaviors, and utilization of prevention services among low-frequency heroin injectors (low-FHI) and compares them to more "typical" heroin injectors who inject at least once day—high-frequency heroin injectors (high-FHI). Three research questions will be explored in this paper: (1) What are the sociodemographic characteristics of low-FHI? (2) Are low-FHI supplementing heroin injection with noninjected opiate use? (3) What is the injection risk behavior profile of low-FHI compared to high-FHI?

METHODS

Procedures

We present data from the Urban Health Study, a serial cross-sectional study of street-recruited IDUs in San Francisco that was conducted from 1986 to 2005 using methods of which have previously been explained in detail[10,11]. Respondents were recruited from inner-city neighborhoods using targeted sampling methods[12,13]. Eligibility criteria included having injected illicit drugs in the 30 days prior to the study, being at least 18 years of age, and provision of informed consent to participate in the study. Recent injection was confirmed by physical examination for signs of recent venipuncture ("tracks"). Following informed consent, participants were interviewed using a standardized questionnaire. Participants were also tested for HIV, given pre- and post-test counseling, and provided referrals to social and medical services as appropriate. Blood specimens were analyzed for HIV antibodies using enzyme immunoassay, and positive specimens were confirmed using Western blot assay. Study participants were paid $15 for contributing to the research. The University of California San Francisco Institutional Review Board approved all study procedures.

For this paper, we examined the first observation of unduplicated participants from 2000 to 2005 (N=2,410) who reported injecting heroin at least once in the past 30 days and were not currently in methadone or buprenorphine drug treatment. We excluded people currently in methadone or buprenorphine treatment because we were not interested in examining the known phenomenon where people continue using heroin infrequently while in substance abuse treatment[14–16].

Measures

Dependent variables include low-FHI, receptive and distributive syringe sharing, and nonfatal heroin overdose. We categorized the sample into three groups based on self-reported frequency of heroin use in the past 30 days. The Office of National Drug Control Policy's definition of "hardcore" heroin drug use is more than 10 days of use in the past month[1,7]. As a proxy for non-hardcore drug use, the low-FHI group was defined as reporting one to 10 injections of heroin and/or a heroin combination with stimulants (e.g., "speedball" [heroin plus cocaine] and "goofball" [heroin plus methamphetamine]) in the past 30 days. Fifteen percent (n=354) of heroin users met this criterion. The definition of high-FHI—30 or more injections of heroin and/or a heroin combination in the past 30 days—represents a heroin use frequency that is most likely daily, conventionally considered a dependent drug use pattern. Seventy-six percent (n=1,844) of heroin users were categorized as high-FHI based on this criteria. An additional 9 % of subjects (n=212) reported between 11 and 29 heroin injections in the 30 days prior to the interview. This third group is not included in subsequent analyses because the goal of this paper is to describe the characteristics of low-FHI relative to more typical high-FHI. Distributive syringe sharing was considered present if participants reported having given or loaned syringes/needles to someone else to use at least once in the past 30 days. Receptive syringe sharing was considered present if participants reported having injected using syringes/needles that they knew had been used by someone else in the past 30 days. To assess nonfatal heroin overdose, participants were asked if they had overdosed on heroin in the past year.

Independent variables include sociodemographic characteristics, HIV status, substance use, substance use-related risk behaviors, syringe exchange program use, and substance abuse treatment history. HIV status was determined by serological test results. Frequency of use of heroin and other drugs was determined by a

question pattern that asked whether each drug had been used in the past 30 days followed by a question regarding the number of times. Separate queries were made for injected and noninjected drugs.

Statistical Analyses

Bivariate analyses were conducted to assess associations between independent variables and dependent variables. Associations were examined using the Pearson's chi-square statistic. Next, a multivariate logistic regression model was constructed using covariates identified as significant at $p<0.10$ in bivariate analyses. Stepwise model selection was performed to select a parsimonious model including only significant predictors of low-FHI at $p<0.05$. To examine associations between low-FHI as the explanatory variable, receptive and distributive syringe sharing, and past-year nonfatal heroin overdose, separate multivariate logistic regression models were constructed controlling for covariates that were significant with these outcomes at $p<0.10$ in bivariate analyses. Low-FHI was forced into those models to further explore its relationship with these outcomes, while only covariates that were significant at the $p<0.05$ level were retained in the final models. All statistical analyses were performed using SAS Version 9.1.3 (SAS Institute, Inc., Cary, NC).

RESULTS

In this sample, 15 % of heroin injectors were low-FHI. Compared to high-FHI in bivariate analysis, a significantly higher proportion of low-FHI were male, African American, homeless, HIV antibody positive, and men who have sex with men (MSM) (Table 1). Both injected and noninjected methamphetamine use were more prevalent among low-FHI compared to high-FHI. In multivariate analysis, African American race, MSM behavior, HIV antibody positive status, and injection and noninjection methamphetamine use were indepedently associated with low-FHI (Table 2). Participants aged 50 or younger and those reporting being homeless had lower odds of being low-FHI.

We next examined whether low-FHI were supplementing injection heroin with noninjected opiates. The prevalence of noninjected opiate use did not differ significantly by heroin injection frequency.

Lastly, we compared injection risk behaviors among low-FHI and high-FHI through bivariate and multivariate analyses. Syringe sharing—both receptive and distributive— and past year heroin overdose were less prevalent among low-FHI compared to high-FHI (Tables 3). To explore differences in receptive syringe sharing and heroin overdose by heroin injection frequency in greater depth, we conducted multivariate analyses. After adjusting for confounding factors, low-FHI had significantly lower adjusted odds of receptive syringe sharing (adjusted odds ratio=0.62; 95 % confidence interval=0.43 to 0.89) and nonfatal heroin overdose in the past year (adjusted odds ratio=0.31; 95 % confidence interval=0.18 to 0.53) compared to high-FHI (data not shown).

DISCUSSION

The characteristics of low-FHI are quite different from those of high-FHI. Polydrug use was very common among both heroin injection frequency groups. Although 26 % of heroin injectors in the sample also injected methamphetamine, the prevalence of methamphetamine injection was higher among low-FHI than it was among high-FHI, suggesting that some low-FHI may be primary methamphetamine users. For some primary methamphetamine users, heroin may be used to come "down" from

TABLE 1 Sociodemographic characteristics and substance use among out-of-treatment past-month heroin injection drug users, by injection frequency: San Francisco 2000–2005

Characteristic	Total % (N=2,198)	Low-FHI % (n=354)[a]	High-FHI % (n=1,844)[b]	Odds ratio	95 % CI
Gender					
Male	73	79	72	1.4	(1.1, 1.9)
Female	27	21	28		
Age group (years)					
18–30	12	10	13	0.78	(0.53, 1.12)
31–50	68	67	69	0.93	(0.73, 1.18)
51+	19	23	19	1.3	(1.0, 1.7)
Race/ethnicity					
White	41	37	42	0.79	(0.62, 1.00)
Black or African American	39	46	38	1.4	(1.1, 1.8)
Hispanic or Latino	9	5	9	0.46	(0.27–0.78)
Other	11	12	11	1.2	(0.8, 1.7)
Currently homeless	67	57	69	0.61	(0.49–0.77)
HIV antibody positive	10	17	9	2.1	(1.5, 2.9)
Men who had sex with men (past 6 months)	8	18	5	3.9	(2.8, 5.5)
Median years of injection (IQR)	22 (12–31)	21 (11–31)	22 (12–31)		
Inject less than 5 years	7	8	7	0.83	(0.5, 1.3)
Substance use (past 30 days)					
Any polydrug use	80	85	79	1.5	(1.1, 2.0)
Noninjected opiates	40	43	40	1.1	(0.9, 1.4)
Injected methamphetamine	26	41	23	2.3	(1.8, 2.9)
Noninjected methamphetamine	14	24	12	2.5	(1.8, 3.3)
Smoked crack	66	65	67	0.95	(0.74, 1.21)
Non-injected barbiturates or benzodiazepines	22	18	23	0.74	(0.54, 1.00)
Daily alcohol use	25	27	25	1.1	(0.8, 1.4)
Syringe exchange program utilization (past 30 days)	84.4	70.3	87.1	0.35	(0.27, 0.46)
Drug treatment experience					
Ever participated in drug treatment	71.1	66.3	72.0	0.77	(0.60, 0.98)
Any drug treatment (past 12 months)	33.6	25.1	35.1	0.62	(0.48, 0.81)
Methadone treatment (past 12 months)	22.2	10.7	24.4	0.37	(0.26, 0.53)

[a]Low-FHI reported injecting heroin and/or a heroin combination 1 to 10 times in the past 30 days
[b]High-FHI reported injecting heroin and/or a heroin combination 30 or more times in the past 30 days

methamphetamine. Rather than being a heroin-specific drug use pattern, low-FHI may be a facet of polydrug use. Drug use researchers would benefit from a better understanding of the interplay between heroin and methamphetamine use. The higher prevalence of MSM behavior among low-FHI points to a distinct subpopulation that merits further study, particularly given their generally higher prevalence of HIV infection, methamphetamine use, and related HIV risk behaviors[17,18].

TABLE 2   Independent risk factors for low-frequency heroin injection among heroin injectors: San Francisco 2000–2005

Characteristic	Adjusted odds ratio	95 % CI
Race		
White	Reference	Reference
African American	2.0	(1.5, 2.6)
Hispanic	0.78	(0.43, 1.40)
Other	1.4	(0.9, 2.1)
Currently homeless	0.63	(0.49, 0.82)
Men who had sex with men (past 6 months)	3.0	(2.0, 4.3)
HIV antibody positive	1.5	(1.1, 2.2)
Methamphetamine use (past 30 days)		
Injected	2.0	(1.5, 2.7)
Noninjected	1.8	(1.2, 2.5)

Perhaps because they inject less frequently, low-FHI engage in fewer injection-related risk behaviors than high-FHI and are less prone to overdose. Qualitative researchers have reported a direct relationship between the onset of opiate withdrawal symptoms and syringe sharing[19,20]. Some have argued that a logic promoting ancillary paraphernalia sharing is driven by anxiety over suffering from withdrawal symptoms in the future[21]. Low-FHI may represent an alternative strategy to protect oneself from withdrawal symptoms that consciously or unconsciously shelters low-FHI IDUs from the pressures that routinize risky injection practices. These findings imply that several social dynamics contribute to why low-FHI may be less likely to suffer negative health outcomes of injection.

A number of limitations apply to the findings presented in this paper. One is the single time frame used to assess heroin injection frequency (past 30 days), which may not represent individuals' patterns of heroin injection over a longer period of time. Our definition of high-FHI assumes that 30 or more injections in the past 30 days roughly represent a daily or greater frequency of use; however, other heroin use patterns are possible, such as "bingeing." We did not have data assessing opiate dependence in the study population, which would perhaps have provided more insight into the issue of heroin use frequency. The study sample was recruited using targeted sampling, which seeks to be representative of the population of street-recruited IDUs, and is not the same as random sampling. Thus, findings cannot be

TABLE 3   Drug injection risk behaviors, by injection frequency category: San Francisco 2000–2005

Characteristic	Total % (N=2,198)	Low-FHI % (n=354)[a]	High-FHI % (n=1,844)[b]	Odds ratio	95 % CI
Injection risk behaviors (past 30 days)					
Receptive syringe sharing	20.8	15.1	21.9	0.63	(0.46, 0.87)
Distributive syringe sharing	21.4	12.0	23.2	0.45	(0.32, 0.63)
Heroin overdose (past 12 months)	13.5	7.0	14.8	0.44	(0.27, 0.71)

[a]Low-FHI reported injecting heroin and/or a heroin combination 1 to 10 times in the past 30 days
[b]High-FHI reported injecting heroin and/or a heroin combination 30 or more times in the past 30 days

generalized to all populations of IDUs, especially not the middle-class stably housed users studied by Zinberg in the 1970s and early 1980s. In addition, cross-sectional data cannot confer causality. With the exception of HIV status, data are based on self-report and are, therefore, subject to recall bias and social desirability effects. However, a review of research regarding the validity and reliability of self-report data from illicit drug users verifies that such data are sound[22].

Despite these limitations, this paper establishes that a sizable number of street-recruited, out-of-treatment heroin injectors are low-frequency users of heroin as defined by conventional standards in the field of drug use research. Additional findings in this paper are more suggestive than definitive. A more purposive study is needed to examine low-FHI and its relationship to drug use trajectories, patterns of drug use frequency, drug treatment participation, HIV risk behavior, and polydrug use. The authors are currently conducting a longitudinal qualitative study comparing low-FHI and high-FHI, which will examine these issues in-depth.

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