Health Behaviors of the Emergent Young Population of Heroin Injectors in the Seattle Area

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A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University of Washington
2014

Committee:
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Program Authorized to Offer Degree:
Public Health, Health Services

University of Washington

Abstract

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Background: Recent indicators point to substantial increases in the number of young heroin users across much of the United States. Increases in drug-caused deaths involving heroin in King County, Washington appear to be due to increases among young adults. New young adult users are also driving the recent increases in treatment admissions for heroin use in Washington State. The purpose of this study is to characterize this younger generation of heroin users.

Methods: A cross-sectional analysis was conducted using intercept surveys at King County syringe exchange programs in 2013. Survey responses were restricted to heroin users (n=389) and then categorized by the participant's age (<30 and ≥30) for a descriptive epidemiological analysis.

Results: Younger heroin users were more likely than older heroin users to be incarcerated in the last year (43.0% vs. 31.3%, p 0.023) and to report recent syringe sharing (36.7% vs. 19.9%, p<0.001). Younger users were also more likely to witness a recent overdose (68.0% vs. 55.2%, p

0.016) and to possess take-home naloxone during the three months prior to the survey (36.7% vs. 23.9%, p 0.009). Younger heroin users were less likely than older users to report a recent abscess (21.9% vs. 48.3%, p<0.001).

Conclusion: Younger heroin users engage in risky injection practices more than older heroin users. A minority of respondents reported possession of take-home naloxone. Along with other significant differences between younger and older heroin users, these findings have implications for outreach programs and medical care for the younger generation of injection drug users.

INTRODUCTION

Heroin use among young people is increasing on a national level. Young people ages 18-25 accounted for 27.6% of the treatment admissions for heroin injection in 2009, which is a dramatic increase from 1992 when this age group only accounted for 8.4% of the treatment admissions (US Department of Health & Human Services, 2011).

This demographic shift in heroin use is reflected in Washington State, where increases in heroin use are primarily driven by individuals under age 30. The number of treatment admissions for heroin use increased dramatically from 1999 through 2012 among those aged 18-29, effectively decreasing the median age of treatment admissions for heroin from 40 to 29-years-old. This was paralleled by an increase in mortality secondary to overdoses involving heroin in individuals under age 30 (Banta-Green et al., 2013). The purpose of this study is to characterize this younger generation of heroin users in King County, Washington in order to inform outreach programs and medical care specific to this high-risk population.

Some risk factors for initiation of heroin use may be specific to today's young people. Previous studies have shown that heroin use is often preceded by prescription opioid abuse, especially in younger heroin users (Peavy et al., 2012). In 2012, 6% of tenth graders in Washington State reported using prescription opiates in order "to get high" in the prior month (Washington State Department of Health, 2014). Twenty-three percent of the tenth graders who had recently used prescription-type opiates to get high also reported using heroin at some point, compared to only 3% of the tenth graders who had not recently used prescription-type opiates to get high (ADAI,

2013). Both the opioid prescription rate and the misuse of prescription opioids increased among the general population in the United States from 2004 to 2011 (Atluri et al., 2014). Washington State has been on the front lines of strengthening regulations around prescribing opioids, with the possible unintended consequence of pushing prescription opioid abusers to heroin. Being on the leading edge of the epidemic of heroin use preceded by prescription opioid abuse makes us uniquely positioned to identify health behaviors in this population. Knowledge about these health behaviors will help us to mitigate these risks in the future, as well as to provide information to other regions facing earlier stages of this epidemic.

Injection drug users (IDUs) are at risk for infectious diseases such as human immunodeficiency virus (HIV) and hepatitis C (HCV), primarily via sharing syringes and other injection equipment. In 2009, about 75% of the IDUs in King County were infected with HCV (Public Health - Seattle & King County & Washington State Department of Health, 2012). Despite extensive progress in the understanding of HIV and HCV transmission, injection equipment sharing remains common in the United States. Sharing of injection equipment, such as cookers and cotton balls used as filters, is a common risk factor for HCV transmission, even among those who do not share syringes (Hagan et al., 2001). Injection drug use is also a risk factor for serious infections such as right-sided endocarditis and bacteremia (Moss & Munt, 2003).

In addition to younger age, factors associated with syringe sharing also include peer norms, injecting with a sexual partner, and requiring help injecting (Bailey et al., 2007; O'Connell et al., 2005; Wood et al., 2003). Among individuals aged 15-30, those who are aware of being HCV-negative are less likely to share syringes and injection equipment, but awareness of HCV-

positive status does not seem to be correlated with safer injection practices (Hagan et al., 2006). However, evidence from the Seattle area indicates that some IDUs who share syringes may preferentially share with HCV-concordant individuals (Burt et al., 2009).

Heroin users are at high risk for overdose, with estimates of annual incidence ranging from about 15% to 25% (Coffin et al., 2007; Darke et al., 2007; Jenkins et al., 2011). A recent analysis of opioid injectors at syringe exchange programs in King County showed that recent incarceration and sharing of injection materials are independently associated with nonfatal overdose (Jenkins et al., 2011). Incarceration is an especially strong risk factor for overdose in the time immediately after release from prison (Farrell & Marsden, 2008; Ochoa et al., 2005; Strang et al., 2013). Additional factors associated with overdose include witnessing an overdose, a personal history of an overdose, and younger age (Coffin et al., 2007; Ochoa et al., 2005). The availability of take-home naloxone (an opioid antagonist) for overdose reversal is increasing (The Network for Public Health Law, 2014). A report from the CDC indicated that naloxone was used to reverse thousands of overdoses from 1996 to 2010 (Centers for Disease Control and Prevention, 2012). Although Washington State is a later adopter of bystander use of naloxone for overdose reversal, implementation has accelerated (Banta-Green et al., 2013).

The goal of this study is to increase the understanding of the younger generation of heroin injectors, including the ways in which they differ from the heroin injectors age 30 and over. This younger generation of heroin users may be unique in ways that impact their public health and medical care needs. Given that the size of this population appears to be growing in part due to the cohort effects of recent initiates to heroin starting with prescription opioids and the fact that

Washington State may be ahead of the rest of the country in these trends, this analysis will inform outreach programs and healthcare interventions for young IDUs in King County, with lessons learned potentially helpful for the rest of the country.

METHODS

Study Setting & Data Collection

Over 5.7 million syringes were exchanged in King County, Washington in 2013. About half of these syringes were exchanged at syringe exchange facilities operated by Public Health – Seattle & King County (PHSKC). The other half were exchanged at facilities operated by People's Harm Reduction Alliance (PHRA), a non-governmental organization. The data for this study were collected at three PHSKC syringe exchange locations. The programs operated by PHSKC use a one-for-one protocol, in which a client exchanges used syringes for the same number of clean syringes. In addition to syringe exchange, these programs also provide services such as infectious disease testing, clean injection equipment, referrals to methadone treatment, overdose education and take-home naloxone, and case management.

This study was conducted at three syringe exchange program (SEP) sites in King County operated by PHSKC. During a two-week period in July 2013, clients at these SEP sites were asked to complete a survey. The survey was administered verbally by staff and volunteers trained in survey administration procedures. No personal identifiers were collected with the survey responses. The main domains of the survey questions were demographics, sexual behaviors, drug use behaviors, HIV and HCV testing, and overdose experience. The University of Washington Human Subjects Division determined that Institutional Review Board review was not required for this study as it is a secondary analysis of an anonymous data set.

All individuals using the PHSKC SEPs during the study period were asked to participate in the survey. Repeat participants (those who had already completed the survey) were asked only for demographic information upon subsequent contact. Survey administrators, syringe exchange staff and volunteers, made a total of 996 approaches at the syringe exchange locations. Of these, there were 475 unique participants, 414 repeat participants, 76 individuals who declined the survey, and 31 individuals who did not have complete information recorded for repeat status.

Data Analysis

The final sample for analysis was restricted to the 389 unique participants who reported recent heroin use and who had adequate data recorded for the injection and age-related questions. Heroin use included participants who used heroin alone, goofballs (heroin mixed with methamphetamine), or speedballs (heroin mixed with cocaine). Injection variables included the number of injection days per month, the number of injections on an average injecting day, and the number of times a syringe was used before getting rid of it. Exclusion of participants who answered "0" for all three of the injection variables was done in order to enhance the internal validity of the study by specifically analyzing injection drug users who use heroin.

Stata 13.1 was used for all data analysis. A stratified analytic approach was based on age: <30-years-old and ≥30-years-old. Pearson's chi-square statistic was used to evaluate the statistical significance of differences in the proportions by age group for categorical variables. Fisher's exact statistic was used to evaluate the p-values of categorical variables when the expected number per cell was less than or equal to 5. P-values less than 0.05 were considered statistically significant.

RESULTS

The demographic characteristics of the participants by age <30 versus ≥30-years-old are presented in **Table 1**. Younger respondents were significantly more likely to report incarceration in the last year (43.0% vs. 31.3%, p 0.023) and were less likely to have health insurance than older users (38.4% vs. 51.9%, p 0.013). Overall, there were more male than female respondents (69.9% vs. 29.3%), but there was no significant difference in the gender composition of the younger and older groups. A somewhat greater percentage of the younger participants identified as white (76.2%) compared to the older participants (66.0%). The majority of participants were not in permanent housing, with a somewhat greater percentage of older users in unstable housing compared to younger users (59.0% vs. 50.0%), although this difference was not statistically significant.

Injection behaviors of the heroin users in this study, categorized by age, are described in **Table 2**. Younger users were significantly more likely than older users to report being "hooked on" prescription opiates before heroin (62.5% vs. 36.9%, p<0.001) and reported almost twice as much recent syringe sharing (36.7% vs. 19.9%, p<0.001); however, there was no statistically significant difference for sharing of other injection equipment such as cookers and cotton. A greater proportion of younger users reported using a single syringe more than once, but older users were much more likely to report a recent abscess (p<0.001). Older users were also much more likely to report muscling in the last year (68.2% vs. 38.3%, p<0.001). Most participants injected daily, and there was no significant difference in injection frequency between groups.

Few significant differences existed for the kinds of drugs used in the three months prior to the survey, although a greater proportion of younger users reported using buprenorphine or Suboxone (a buprenorphine/naloxone combination) (39.1% vs. 28.0%, p 0.027) and benzodiazepines or other downers (54.7% vs. 43.7%, p 0.041), while a greater proportion of older users reported using opiate pain medications in the prior three months (42.5% vs. 30.5%, p 0.022). Note that the motivation for the use of buprenorphine and pain medications was not documented in this survey. Many of these heroin users are polydrug users, as indicated by the relatively high proportions of individuals who reported using drugs other than heroin and heroin mixtures in the three months prior to the survey.

Consequences of injection drug use by age categories of <30 versus ≥30-years-old are described in **Table 3**. Younger and older users were almost equally likely to report a personal overdose in the last year, but younger users were more likely to report witnessing an overdose (68.0% vs. 55.2%, p 0.016). Younger participants were also more likely to possess take-home naloxone in the three months prior to the survey (36.7% vs. 23.9%, p 0.009). Finally, younger respondents were much less likely to report a positive HCV status, but the wording of the question makes it unclear whether those who did not report a positive HCV status had been tested or not.

Table 1: Demographics by Age

	<30		≥30y/o		Total		
Characteristic	**n = 128**	***% = 32.90***	**n = 261**	***% = 67.10***	**n = 389***	***% = 100***	**p-value[b]**
Gender							0.367
Male	85	*66.41*	187	*71.65*	272	*69.92*	
Female	41	*32.03*	73	*27.97*	114	*29.31*	
Transgender[a]	2	*1.56*	1	*0.38*	3	*0.77*	
Race							**0.035**
White	96	*76.19*	171	*66.02*	267	*69.35*	
Black	2	*1.59*	18	*6.95*	20	*5.19*	
American Indian/AK Native	2	*1.59*	17	*6.56*	19	*4.94*	
Other	11	*8.73*	25	*9.65*	36	*9.35*	
Multiracial	15	*11.90*	28	*10.81*	43	*11.17*	
Identify as Latino or Hispanic	14	*10.94*	27	*10.34*	41	*10.54*	0.858
Education							0.999
Some HS or less	26	*20.31*	54	*20.69*	80	*20.57*	
HS or GED	45	*35.16*	92	*35.25*	137	*35.22*	
Some college	43	*33.59*	86	*32.95*	129	*33.16*	
Bachelor or higher	14	*10.94*	29	*11.11*	43	*11.05*	
Housing status							0.093
Permanent	64	*50.00*	107	*41.00*	171	*43.96*	
Homeless/temp/unstable	64	*50.00*	154	*59.00*	218	*56.04*	
Health Insurance[d]	48	*38.40*	134	*51.94*	182	*47.52*	**0.013**
Incarcerated in the last year	55	*42.97*	81	*31.27*	136	*35.14*	**0.023**
Sexual partners							**<0.001**
Not sexually active	6	*4.69*	74	*28.35*	80	*20.57*	
Opposite sex	98	*76.56*	163	*62.45*	261	*67.10*	
Same sex	11	*8.59*	12	*4.60*	23	*5.91*	
Both	13	*10.16*	12	*4.60*	25	*6.43*	
Number of sexual partners in last year							**<0.001**
0	6	*4.69*	74	*28.46*	80	*20.62*	
1	56	*43.75*	94	*36.15*	150	*38.66*	
2-9	60	*46.88*	76	*29.23*	136	*35.05*	
10+	6	*4.69*	16	*6.15*	22	*5.67*	

Table 2: Injection Behaviors by Age

	<30		≥30y/o		Total		
Injection behavior	**n = 128**	***% = 32.90***	**n = 261**	***% = 67.10***	**n = 389***	***% = 100***	**p-value[b]**
Injection frequency (days per month)							0.388[c]
0	4	*3.15*	9	*3.47*	13	*3.37*	
1-3	3	*2.36*	11	*4.25*	14	*3.63*	
4-9	5	*3.94*	23	*8.88*	28	*7.25*	
10-29	15	*11.81*	29	*11.20*	44	*11.40*	
Daily	100	*78.74*	187	*72.20*	287	*74.35*	
On an average injecting day, how many times do you inject							**0.039[c]**
0	0	*0.00*	2	*0.77*	2	*0.52*	
1-2	31	*24.22*	69	*26.54*	100	*25.77*	
3-5	83	*64.84*	136	*52.31*	219	*56.44*	
>5	14	*10.94*	53	*20.38*	67	*17.27*	
How many times did you use a syringe before getting rid of it							**0.014**
0	10	*7.87*	27	*10.38*	37	*9.56*	
1	31	*24.41*	101	*38.85*	132	*34.11*	
2-4	58	*45.67*	95	*36.54*	153	*39.53*	
>4	28	*22.05*	37	*14.23*	65	*16.80*	
Hooked on prescription opiates before heroin	80	*62.50*	96	*36.92*	176	*45.36*	**<0.001**
Abscess in last year	28	*21.88*	126	*48.28*	154	*39.59*	**<0.001**
Muscling in last year	49	*38.28*	178	*68.20*	227	*58.35*	**<0.001**
Femoral injection in last year	27	*21.09*	65	*24.90*	92	*23.65*	0.406
Shared syringes in last 3 months	47	*36.72*	52	*19.92*	99	*25.45*	**<0.001**
Shared cookers, cotton, water, or backloaded with another person in last 3 months	73	*57.03*	122	*46.92*	195	*50.26*	0.061
Use in the last 3 months:							
Speedball (heroin + cocaine)	38	*29.69*	97	*37.16*	135	*34.70*	0.145
Goofball (heroin + meth)	47	*36.72*	80	*30.65*	127	*32.65*	0.230
Heroin alone	128	*100.00*	255	*97.70*	383	*98.46*	0.184[c]
Powder cocaine alone	41	*32.03*	63	*24.14*	104	*26.74*	0.098
Crack cocaine alone	41	*32.03*	107	*41.00*	148	*38.05*	0.087
Methamphetamine alone	74	*57.81*	124	*47.51*	198	*50.90*	0.056
Benzodiazepines or other downers	70	*54.69*	114	*43.68*	184	*47.30*	**0.041**
Fentanyl	20	*15.62*	31	*11.88*	51	*13.11*	0.303
Methadone	40	*31.25*	103	*39.46*	143	*36.76*	0.114
Buprenorphine or Suboxone	50	*39.06*	73	*27.97*	123	*31.62*	**0.027**
Opiate pain medications	39	*30.47*	111	*42.53*	150	*38.56*	**0.022**

Table 3: Injection Consequences by Age

	<30		≥30y/o		Total		
Characteristic	**n = 128**	***% = 32.90***	**n = 261**	***% = 67.10***	**n = 389***	***% = 100***	**p-value[b]**
Self-reported HCV Status							**<0.001**
Positive	20	*15.62*	131	*50.38*	151	*38.92*	
Negative/Unknown	108	*84.38*	129	*49.62*	237	*61.08*	
OD in the last year	32	*25.00*	62	*23.94*	94	*24.29*	0.819
Witnessed OD in the last year	87	*67.97*	143	*55.21*	230	*59.43*	**0.016**
Had take-home naloxone in the last 3 months	47	*36.72*	62	*23.94*	109	*28.17*	**0.009**

[a]Not included in p-value calculations
[b]Pearson's $\chi 2$ test except where noted otherwise
[c]Fisher's exact test
[d]Responses of "don't know" were not included in analysis

*There were 389 total participants included in this analysis, however data were missing for some questions. The missing responses were <5% of the total for each question.

DISCUSSION

This study shows that King County heroin users under age 30 are more likely than older users to have a number of hazardous health behaviors, but they are also taking advantage of some harm reduction interventions such as take-home naloxone. They are significantly more likely to report recent incarceration, syringe sharing, using a single syringe more than once, recently using buprenorphine, and witnessing an overdose. Younger users are also more likely to possess take-home naloxone, although the proportion is only 36.7%. Younger users are less likely to report knowledge of a positive HCV test. As expected from previous studies in King County and elsewhere, the majority of younger users report being "hooked on" prescription drugs prior to initiating heroin use (Cicero et al., 2014; Peavy et al., 2012).

The extent of syringe sharing among younger users is a particularly worrisome finding, as syringe sharing is a very high-risk behavior for the transmission of infectious diseases such as HIV and HCV (Wodak & Cooney, 2006). Younger users typically have lower risk perception for HIV and lower HIV testing rates (Pollini et al., 2011). The risk for acute bacterial illnesses, such as right-sided endocarditis and sepsis, is also elevated in the context of syringe sharing (Gordon & Lowy, 2005). This study found that 36.7% of younger users recently shared syringes, which is almost double the proportion of older users who reported recent syringe sharing. These findings are corroborated by a recent study in Massachusetts showing that IDUs under age 25 had twice the odds of sharing injection equipment than IDUs ≥25-years-old (Tassiopoulos et al., 2013).

The disparity in syringe sharing between age groups indicates that the current methods of harm reduction outreach and education are not effectively reaching or impacting young people. It is also likely that the syringe sharing reported in this study represents a minimum in the community, as we expect that the extent of syringe sharing among people who do not frequent SEPs may be even greater (Bailey et al., 2007; Golub et al., 2007). It is crucial that public health workers, healthcare professionals, and community outreach groups develop strategies to educate young people about the risks of sharing syringes and the importance of harm reduction techniques, such as needle exchange. Additionally, healthcare professionals and SEPs should be vigilant about offering HCV and HIV testing to all IDUs, including young users. It is reassuring that less than 20% of older IDUs share syringes, but the new generation of IDUs is in a very precarious position in terms of high-risk behaviors and efforts must be made to encourage harm reduction techniques in this population. Keeping the population reservoir of infectious diseases lower is good medical and public health practice, as it will benefit not just the health of individuals, but also the broader population.

Although there was not a statistically significant difference between age categories for the sharing of equipment such as cookers and cotton, it is important to note that a high percentage of heroin users in this study reported sharing equipment (50.3%). Sharing equipment can spread diseases such as HCV (Hagan et al., 2001). In addition to outreach focusing on syringe sharing, it is also important to specifically address the risks of sharing injection equipment.

It is concerning that incarceration in the last year was much more prevalent among younger users, reaching 43% of the participants under age 30. Recent incarceration is a significant risk

factor for opioid overdose (Jenkins et al., 2011). In Washington State, drug overdose is the leading cause of mortality after release from prison, and these deaths are primarily due to opioids such as heroin (Binswanger et al., 2013). Our findings are consistent with a study in Australia that reported that IDUs under age 25 were more likely to have an arrest within the last year than older IDUs (Degenhardt et al., 2008). The finding that such a high proportion of King County's younger heroin users go through the correctional system indicates that the jails and prisons could be useful places to reach young people with public health programs focusing on harm reduction and treatment. Starting such programs in the correctional system has the potential to alter the risk behaviors of young people after release from prison or jail. It is also important to note that there are broader implications for health and economic wellbeing in the long-term for those with a criminal record, and it is likely that criminal activities were related directly or indirectly to drug use (Chandler et al., 2009).

Witnessing an overdose is another risk factor for a personal overdose (Coffin et al., 2007; Ochoa et al., 2005), and we found that younger users were more likely to report witnessing an overdose in the last year. It is somewhat reassuring that the age group that is most likely to witness an overdose is also most likely to possess take-home naloxone, as this opioid antagonist allows witnesses to reverse an overdose. However, only 36.7% of younger users and 23.9% of older users had take-home naloxone in the three months prior to the survey. Among the respondents who reported possessing take-home naloxone in the last three months, 59.2% of the younger users and 50.0% of the older users obtained it at PHRA and only 6.1% of the younger users and 20.7% of the older users obtained it at PHSKC SEPs. The PHRA SEP is based in a neighborhood with a large young adult population and has provided more take-home naloxone

for a longer period of time than PHSKC. Naloxone is a life-saving and cost-effective medication that has been shown to decrease overdose mortality in communities when a sufficient proportion of the population has been trained (Coffin & Sullivan, 2013; Walley et al., 2013).

Younger heroin users were more likely to use a syringe multiple times. This is a risk factor for injection site infections such as abscesses (Hope et al., 2008; Murphy et al., 2001) Older users were more likely to report an abscess, but younger users are clearly engaging in risk behaviors that increase the potential for future abscesses and loss of safe injection sites, i.e., "using up their veins." Individuals who have difficulty finding injection sites may resort to risky injection sites such as the femoral and jugular veins (Coffin et al., 2012). Syringe exchange programs can help to decrease these risk behaviors by educating clients about the importance of avoiding syringe reuse, in addition to other vein care education. A prior study showed that use of a SEP decreases the frequency of syringe reuse among IDUs ages 18-30, so it is also important for public health workers and healthcare professionals to reach out to IDUs in the community who do not currently use SEPs (Bailey et al., 2003).

As reported in other recent studies, younger heroin users are very likely to report being dependent on prescription opiates before heroin (Peavy et al., 2012). In our study sample, 62.5% of younger respondents reported being "hooked on" prescription-type opiates prior to initiating heroin use, compared to only 36.9% of older users. Thus, it is crucial that programs and further research focus on prescription opioid abuse prevention and intervention in young people (Banta-Green, 2012). Examples of potentially useful interventions include educating physicians about restraint in prescribing opioids to young people and for certain conditions, talking with parents

about how to properly control access to their prescription opioids and how to discuss medication safety and beliefs with children, and strengthening youth programs that concentrate on prescription medications. In order to ensure adequate treatment access, more medical providers need to be trained to treat patients with buprenorphine. Overall, a change in the culture of prescribers and the public around opioids and the promotion of alternative methods of pain relief might help to address the epidemic of escalating to heroin use.

Many of the heroin users in this study were polydrug users, as relatively high proportions of participants reported recent use of drugs other than heroin and heroin mixtures. For example, 57.8% of younger users and 47.5% of older users reported recent methamphetamine use, and 54.7% of younger users reported recent use of benzodiazepines or other downers. The proportion of heroin users surveyed at PHSKC SEP sites who also use methamphetamine alone has increased dramatically since 2009, when only 23% of opioid users reported using methamphetamine alone (Jenkins et al., 2011). The same is true of goofball use, as we found that 32.7% of King County heroin users reported recent goofball use compared to only 11% of King County opioid users in in 2009 (Jenkins et al., 2011). Drug deaths involving goofball increased substantially in 2012 and 2013 (Banta-Green, 2014). Interventions and outreach should be designed with the knowledge that most heroin users use more than one drug. This is also important information for healthcare professionals because the drugs that a patient uses can have implications for the diagnosis of certain conditions, safe treatment regimens for specific diseases, and medical care in overdose situations. Also, it can be easy for a healthcare professional to identify a patient as a “heroin user” when in fact they are likely to use multiple substances, often in combination, and of unknown purity and content.

The level of buprenorphine use among young heroin users is a somewhat unexpected result. Buprenorphine is an excellent and generally safe medication for treatment of opioid dependence, as well as chronic pain, and it is important to note that the respondents in the current study were not asked to specify reasons for using buprenorphine (Mauger et al., 2014). Several studies have indicated that many users of illicit buprenorphine choose the drug in order to treat withdrawal symptoms or opioid addictions (Bazazi et al., 2011; Schuman-Olivier et al., 2010). In 2009, a similar syringe exchange survey in King County found that 28% reported using buprenorphine in the previous few months. In that survey, 52% reported that their motivation in using buprenorphine was to prevent withdrawal ("to get or stay well") and 44% reported getting off of opiates as their motivation (to "detox").

This study has several limitations. The survey data were collected at PHSKC syringe exchange facilities, which only represent about half of the syringes exchanged in the Seattle area. The other half are exchanged at PHRA facilities. It is likely that the populations seen at PHSKC SEPs and PHRA SEPs differ in some ways. For example, PHRA may see a younger population of IDUs compared to PHSKC SEPs. Additional caution should be taken in generalizing the study conclusions to all Seattle area IDUs, as some characteristics are likely to differ between individuals who do not use syringe exchanges and those who do. For example, it is likely that SEP clients have lower rates of syringe sharing than IDUs who do not use a SEP (Bailey et al., 2007; Golub et al., 2007).

This study focused on IDUs who use heroin, so the results may not be generalizable to heroin users who do not inject heroin. However, this is unlikely to limit the usefulness of the study results because the heroin in the King County area is primarily black tar heroin, which is usually injected. In 2012, 83% of King County patients admitted to treatment for heroin use reported injecting the drug (Banta-Green et al., 2013).

The study design relied on self-report, which could bias the results. It is possible that underreporting occurred or that the responses were subject to recall bias. However, underreporting was minimized by administering the survey at syringe exchange sites by individuals who work with the target population. The voluntary, anonymous nature of the survey should also reduce self-report biases. There is no reason to expect differential reporting by age or for reporting to result in overestimation of use and related problems. We would expect any self-report biases to be towards underreporting drug use and related outcomes.

In this study, the survey responses were aggregated into two age categories: <30-years-old and ≥30-years-old. Using two categories provides useful information about younger users versus older users and it also allows for comparison with prior studies that have used similar age brackets. However, this categorization prevents discernment of characteristics that change gradually with age or are not linear.

The purpose of this study was to characterize the younger cohort of heroin users in the Seattle area in order to inform outreach programs and medical care. It is a descriptive epidemiologic study with a pragmatic goal to provide useful information for planning public health and medical

interventions that serve the younger heroin users in this region. The findings may be of interest to other regions of the country, as the trend of those abusing pharmaceutical opioids switching to heroin may have emerged earlier in Washington State due to state policies and practices to reduce opioid prescribing and misuse (Franklin et al., 2012). Young heroin users engage in high-risk injection practices to a greater extent than older heroin users. Public health workers and healthcare professionals who work with younger IDUs should focus health promotion efforts on reducing syringe sharing and multiple syringe uses, outreach in the correctional system, infectious disease testing, and prevention of prescription drug abuse. Take-home naloxone should be in the possession of all heroin users. Future studies are necessary to evaluate the generalizability of these study conclusions.

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