Prevalence Rates of Acute Injection Related Injuries in a Sample of Persons Who Inject Drugs in Phoenix, Arizona

by

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ABSTRACT

Opioid use in the United States is skyrocketing. Overdose deaths have increased 433% in the last decade and will continue climbing. In addition to the mortality caused by illicit opioid misuse, morbidity rates have also risen. People Who Inject Drugs (PWID) demonstrate higher rates of Human Immunodeficiency Virus (HIV), Hepatitis C Virus (HCV), Endocarditis, Persistent Abscesses, Staphylococcus Aureus (S. aureus, Staph) and other skin infections. This thesis serves as (1) a systematic review of the differences in health conditions experienced by PWID and (2) an examination of the trends in skin and soft tissue infection from a small sample in Phoenix, Arizona. The author argues that PWID suffer from an increased rate of comorbid conditions associated with substance use. Targeted social work interventions could be useful in reducing the rates of disease and their impact on the individual and community.

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Background

Opioid Use Increasing

According to the United States Centers for Disease Control and Prevention (CDC), the United States is facing a drastic increase in the number of prescriptions written for opiate pain medication (OPM), nearly quadrupling from 1999 to 2014 (Centers for Disease Control and Prevention (CDC), 2017). From 2005 until 2011 the number of emergency room visits due to opioid pain medicine rose 117% and accounted for 29% of all hospital admissions (Crane, 2013). However, measures to decrease these deaths have varied from state to state. In Arizona, few practical steps are being taken to address the real issue, and in fact, according to a Pew Research Study, "only 16% of Americans believed that the United States was making progress in reducing prescription-drug abuse" (Doherty, 2013). Prescription opioid misuse is a serious problem in the United States (Dart, Surratt, Cicero, Parrino, Severtson, Bucher-Bartelson, & Green, 2015; Han, Compton, Blanco, Crane, Lee, & Jones, 2017).

Overdose Deaths Increasing

According to the CDC, between 1999 and 2016 there have been 351,630 opioid related deaths, increasing at a rate of 455% (Tinker, 2019). Nearly three million Americans have an opioid use disorder (OUD), 2 million of them being prescription opioids and 600,000 having an OUD involving heroin; every day nearly 90 Americans die from overdose (Jette, 2018). The increase in the number of overdoses due to OUD has reached epidemic proportions, with no community safe from its effects. Unless steps are

taken to prevent overdose deaths, the numbers will continue to rise, and the cost on communities, families, and country will be ever greater.

Acute Injection Related Injuries

Complications from ODU may include overdose, and non-fatal overdose. However, overdose is not the only consequence of injection drug use (IDU). Other illnesses and injuries can present due to IDU, including, Hepatitis C (HCV), Human Immunodeficiency Virus (HIV), and Acute Injection Related Injuries (AIRI) or Injection Related Infections or Disease (IRID) including soft tissue damage, abscesses, bone and joint infections, infective endocarditis and sepsis. In fact, from 2002 to 2012, inpatient hospitalizations increased at quadruple their normal rate for complex infections due to IDU (Goldstein, Wurcel, Merchant, Clark, & Stone, 2015; Ronan & Herzig, 2016). While death is the worst possible outcome for an individual, soft tissue damage and chronic illness are also significant impacts on the quality of life, health, and future outcome for individuals suffering from any substance use disorder (SUD). Reducing the frequency, intensity, and length of these injuries and illnesses would potentially provide for a better long-term health outcome and allow the individual to survive through their SUD with more of their health intact. Should the individual choose recovery, they would be in better physical health overall and therefore stand a better chance of being successful in their recovery to lead a longer and more productive life.

Literature Review

The existing literature on opioid health effects, skin infections, blood infections, and related harms was examined in an attempt to better articulate the knowledgebase. The method for identifying studies for inclusion in this systematic literature review was based on a database search utilizing Google Scholar and the electronic library at Arizona State University. The terms utilized for inclusion in this study were: *Opioid, Health, Risks, Heroin, Inject Drugs, Infection,* and *Endocarditis.* The results of this search yielded numerous studies. A large number of the studies came from outside of the United States, with Australia being a very common location for the research. There is a clear need for more research in the United States.

Secondary Data Analysis

A convenience sample of 82 persons in Phoenix, Arizona consisted of those utilizing one of two different syringe exchange sites located locally. When the individuals were finished gathering their supplies, they were asked if they would like to participate in a survey to gather information on persons who inject drugs (PWID) in Phoenix. The larger purpose of the study was to establish a baseline for the needs and wants of the community of PWID and to identify target areas of interactions with first responders in order to formulate a brief intervention. However, included in the survey materials were questions specific to the goal of this study which was identifying specific health impacts from injection drug use (IDU). The results of those survey responses are what provide the basis of this secondary data analysis. The purpose of this secondary data analysis was to gain a general understanding of the health conditions of PWID that relate to their skin

and soft tissue health. PWID are at a higher rate of skin infections, specifically those attributed to Staphylococcus aureus (Dahlman, Jalalvand, Blomé, Håkansson, Janson, Quick, & Nilsson, 2017). So, while researchers are generally familiar with the higher disease burden placed on PWID through their IDU on a broad scale, the research has not been conducted locally to determine if the same results are shared by PWID in Phoenix, Arizona.

Purpose Statement

The purpose of this study was to compare the known existing research on Acute Injection Related Injuries (AIRI) from studied populations, to a small sample of individuals in Phoenix, Arizona to establish whether the prevalence rates examined in existing research matches with the results shown locally.

Study One – Comprehensive Literature Review

Background

Taking advantage of the research and data that have been gathered by studies, in different locales, can provide the insight and depth of knowledge necessary to formulate the proper research questions. The inquiry is related to the prevalence of skin and soft tissue infections in PWID. While there was a large amount of literature on the health impacts of substance abuse and IDU in a broad sense, focusing on such a narrow area of the literature revealed a substantial lack of research.

Methods

The method for identifying studies for inclusion in this systematic literature review was based on Google Scholar and the electronic library at Arizona State University. The terms utilized for inclusion in this study were: *Opioid, Health, Risks, Heroin, Inject Drugs, Infection,* and *Endocarditis.* The results of this search yielded numerous studies. Those studies considered for inclusion were only those published in peer-reviewed English language journals from 2008 until the present. The search yielded 45 potential studies for inclusion in this literature review; of those, eight were removed for dealing primarily with patient care in the hospital setting, and not with harm reduction or AIRI prevalence; 10 were removed for dealing with population modeling and substance use trends; and four were removed for only dealing with treatment related issues. The remaining 23 studies had to meet specific inclusion criteria: (a) be conducted no earlier than 2008, in order to remain relevant to the current body of research on substance use, (b) deal exclusively with Injection Related Infection and Disease (IRID), Acute Infection Related Injury (AIRI), HIV, HCV, or Infective Endocarditis (IE), (c) be either primary research or a systematic review of primary research directly involving persons who inject drugs (PWID), and (d) be published in high quality journals as determined by the Journal Citation Report (JCR).

Results

Substance misuse is positively correlated with negative general physical and mental health overall, with PWID showing the strongest correlation (Lake & Kennedy, 2016). Of particular note in this review are the studies of physical health effects of

injecting drugs, specifically HIV, HCV, infective endocarditis, and other AIRI. Harm reduction measures, such as: safer injection techniques, proper skin hygiene, and wound care are promoted in various countries around the world and are beneficial to the individual and the community. Harm reduction measures can lower the overall burden of morbidity and mortality on the IDU community, as well as the community at large.

Harm Reduction Methods

There are various harm reduction methodologies that reduce the burden of substance use on the user's body, in order to prevent increased harm and improve quality of life. Prior to those harm reduction measures (in which participants are rarely, if ever taught proper safer injection techniques or wound care), 16% of individuals reported not cleaning their hands, applying a tourniquet correctly (38%), not applying pressure long enough (33%) and frequently missing a vein (56%) (Ivan, Rodgers, Maher, & Van Beek, 2016). Safer injection technique education can improve outcomes; Sweden, which has a number of harm reduction programs for PWID, conducted a study with the Karolinska University Hospital during January 2004 to December 2013 and showed an incidence rate of staphylococcus aureus in IDUs of 249 vs 0.79 for the general population in 100,000 person years (Asgeirsson, Thalme, & Weiland, 2016). However, by utilizing multiple harm reduction programs, actual rates of infection have been shown to decrease; utilizing interventions that combined substance-use treatment with support for SIFs was shown to reduce HCV seroconversion by 75% (Hagan, Pouget, & Des Jarlais, 2011). Overall, by utilizing harm reduction methods, the burden of death and disease was reduced in communities. In fact, communities that utilized a broader range of harm reduction

measures showed the most positive health benefits (Stancliff, Phillips, Maghsoudi, & Joseph, 2015).

Increased Burden of Disease

The greatest potential impact of IDU was demonstrated in the increased burden of chronic disease. One study showed that 11% of PWID tested positive for HIV (Spiller, Broz, Wejnert, Nerlander, Paz-Bailey, Centers for Disease Control and Prevention (CDC), & National HIV Behavioral Surveillance System Study Group, 2015); however, when taught proper harm reduction methods for injecting substances, incidence rates for HIV fell overall (Aspinall, Nambiar, Goldberg, Hickman, Weir, Van Velzen, Palmateer, Doyle, Hellard, & Hutchinson, 2014). Similar trends were found with regards to HCV. When data from the National Notifiable Disease Surveillance System (NNDSS) was studied, researchers found that PWID are at a 4-fold increase for acquiring HCV (Zibbell, Asher, Patel, Kupronis, Iqbal, Ward, & Holtzman, 2018). Additionally, in a global systemic review of IDUs in nearly 80 countries, 60-80% of IDUs tested positive for anti-HCV (Nelson, Mathers, Cowie, Hagan, Des Jarlais, Horyniak, & Degenhardt, 2011). The two studies conducted concerning infective endocarditis showed that IDU increased an individual's risk by 14.3% specifically for the 15 – 34 year-old age group (Wurcel, Anderson, Chui, Skinner, Knox, Snydman, & Stopka, 2016) and an 11.3% increase in the overall lifetime risk (Larney, Peacock, Mathers, Hickman, & Degenhardt, 2017). All other skin infections, diseases, abscesses and other acute traumas were grouped as either AIRI or IRID, depending on the study. The majority of individuals studied reported at least one skin infection during their lifetime from a low of 23 percent (Ivan, Beek, Wand,

& Maher, 2015) to a high of 70 percent (Dahlman, Håkansson, Kral, Wenger, Ball, & Novak, 2017), and 15% reported persistent leg ulcers (Coull, Atherton, Taylor, & Watterson, 2014). Additionally, IDU was attributed to a 9.8% increase in the risk of sepsis, a 2% risk of bone infections, and a 3.9% lifetime risk of other infections not otherwise stated (Larney et al., 2017); a 35% risk of abscesses, 32% risk of phlebitis, 23% of cellulitis, and a 4% risk of osteomyelitis (Lewer, Harris, & Hope, 2017).

Table 1

Studies Assessing Chronic and Acute Health Impacts of Individuals Who Inject Drugs

Author(s)	*Aims*	*Sample*	*Measures*	*Findings*
(Asgeirsson, Thalme, & Weiland, 2016)	To assess the epidemiology, clinical characteristics, and mortality of *S aureus* endocarditis (SAE) in PWID in Stockholm, Sweden	Method: Retrospective Study Eligibility: PWID treated for SAE at the Department of Infectious Diseases at the Karolinska University Hospital during January 2004 to December 2013 Size: 120 incidents	Retrospective Data Analysis: medical records were reviewed, and microbiological data obtained to identify cases with IE caused by *S aureus*, clinical data, including information on intravenous drug use, and echocardiography reports were reviewed and the diagnosis of SAE was verified according to the modified Duke criteria	SAE incidence among PWID 249 / 100,000 person years vs 0.76 / 100,000 in general population
(Aspinall et al., 2014)	To quantify the efficacy of needle exchange programs in reducing new HIV infections	Method: Review of 12 studies comprising at least 12,000 person-years Eligibility: Articles were quality assessed using the Newcastle-Ottawa (N-O) tool for cohort studies Size: 12,023 individuals	Data Extraction: study date, location, design, selection criteria, sample size, person-years (PY) of follow-up, sex, age at recruitment, number of HIV seroconversions observed, HIV incidence in the group not exposed to NSP, HIV prevalence, definition of NSP exposure [amount of injecting equipment collected (volume), the percentage of injections where a clean needle and syringe was used (coverage), frequency of attendance at NSP or injecting during a time period when NSP was legal], definition of non-NSP exposure (relating to lower volume, coverage or attendance, or injecting during a time period when access to NSP was not legal), unadjusted/adjusted odds ratios (ORs), risk ratios (RRs) or hazard ratios (HRs) of HIV incidence associated with exposure to NSP	5 reported a reduction in HIV 4 cohort studies reported no evidence of association
(Coull, Atherton, Taylor, & Watterson, 2014)	To identify the range and extent of skin problems in IDUs	Method: Cross-Sectional Survey Eligibility: IDU; 18 years or older Size: 200 individuals	Interviews: utilizing face to face interviews individuals were asked about their IDU history; ulcers; lumps; track marks; abscesses; burns; broken skin; chronic wounds; and rashes	60% reported at least 1 skin problem 15% reported leg ulcers

(Dahlman, Håkansson, Björkman, Alanko Blomé, & Kral, 2015)	To investigate life time, past 12 month and past 30-day prevalence for SSTI related to injection drug use	Method: Cohort Study Eligibility: Current or previous injection drug use, and participation in Malmo SEP Size: 80 participants	Interviews: "Have you [ever/past 12 months/past 30 days] had an abscess or symptoms of skin and soft tissue infection (redness, swelling, pain, pus)?", asked to discern difference between infection and irritation	58% lifetime prevalence of SSTI 30% past 12 months 14% past 30 days
(Dahlman et al., 2016)	To determine if behavioral patterns related to skin and equipment hygiene are associated with increased risk for skin and soft tissue injuries	Method: Cohort Study Eligibility: Recent IDU (30 Days); 18 Years or Older; Ability to consent Size: 201 Individuals 77% Male	Self-Reported Survey: Y/N single question about skin and soft tissue infection; follow-up questions about skin and equipment hygiene	70% Reported lifetime prevalence of SSTI 29% within 1 year 11% within 30 days 91% reported familiarity with symptoms of SSTI
(Dunleavy et al., 2017)	To determine the association between injecting behaviors and SSTI	Method: Cross-Sectional Survey Eligibility: Current IDU; Fixed needle exchange site user Size: 2344 Individuals	Self-reported Survey: Y/N single question about swelling, abscess, sore or open wound at injection site; Follow up: number of times injected in the past 30 days; frequency of sharing; needle reuse	28% SSTI within 1 year
(Hagan, Pouget, & Des Jarlais, 2011)	To meta-analyze the effects of risk-reduction interventions on HCV seroconversion and identify the most effective intervention types	Method: Systemic Review Eligibility: reported HCV prevalence or incidence rates, measures of association, HIV-HCV coinfection rates, HCV serological testing Size: 26 studies	Systematic Review: Data collection was done through database searches and calls for data from HCV researchers	Interventions using multiple combined strategies reduced risk of seroconversion by 75% (pooled relative risk, .25; 95% confidence interval, .07–.83). Effects of single-method interventions ranged from .6 to 1.6.

(Hope, Ncube, Parry, & Hickman, 2014)	To assess the prevalence of AIRI and other skin infections in IDUs	Method: Cohort Study Eligibility: Participant self-referral, >15yo, have injected drugs within the past 4 weeks Size: 855 participants	Logistical Regression: Participants underwent a computer-assisted interview, provided a dried blood spot sample (DBS) sample [tested for antibodies to the hepatitis B core antigen (anti-HBc), and hepatitis C (anti-HCV)]	48% reported having redness, swelling and tenderness (RST) 19% an abscess 10% an open wound 54% > 1 symptom 45% sought medical advice 9.5% hospitalized 8.8% septicemia 2.9% endocarditis
(Ivan, Van Beek, Wand, & Maher, 2015)	Examine the prevalence of injecting-related injuries and diseases (IRIDs) and associated risk factors among people who inject drugs (PWID)	Method: Retrospective cross-sectional study Eligibility: All new KRC clients identified as having ever injected drugs who completed a clinician-administered intake survey Size: 702 participants	Interview and Clinical Survey: record lifetime and recent experience of IRIDs, cutaneous conditions (abscess, cellulitis, skin ulcer), ostheo-articular and systemic infections (osteomyelitis, septic arthritis, septicaemia, endocarditis), vascular conditions (phlebitis, thrombosis, distal limb amputation) and other conditions (arrhythmia, other cardiac conditions, drug-induced psychosis, convulsions and any other conditions)	23% lifetime prevalence of IRID
(Ivan, Rodgers, Maher, & Van Beek, 2016)	To assess the burden of IRID amongst PWID	Method: Before and After Survey Eligibility: PWID; Underwent serological testing between 6/11 and 3/12 Size: 58 Individuals	Self-Reported Survey: Baseline survey to explore lifetime IRID; Injection technique documented; Harm Reduction messages delivered	16% reported not cleaning their hands prior to injecting 38% reported applying a tourniquet correctly 56% report not missing a vein 33% report applying pressure longer than 1 minute

(Lake & Kennedy, 2016)	To assess the potential negative health outcomes associated with injecting prescription opioids	Method: PRISMA Review Eligibility: 18 years old or older; current IDU; inclusive of IRID Size: 31 studies	Systematic Review: Various IRID identified and categorized; data reported by prevalence; health outcomes classified; drug use risk behavior and; adverse social exposers were excluded	PWID are at risk of poorer general physical and mental health PWID are at greater risk for contracting HCV
(Larney et al., 2017)	To assess the prevalence of non-viral IRID among people who inject drugs	Method: PRISMA Review Eligibility: Contained data on prevalence of, or risk factors for, any non-viral IRID Size: 29 IRID Prevalence; 17 risk factors	Systematic Review: Various IRID identified and categorized; data reported by prevalence	6.1% Current month abscess 32% Previous month abscess 1.3% 6-12mo endocarditis 0.5%-11.8% lifetime risk for endocarditis 1% 6-12mo sepsis 9.8% lifetime risk of sepsis 2% lifetime risk of bone infections 3.9% lifetime risk of other infections
(Lewer, Harris, & Hope, 2017)	To assess skin, soft tissue, and vascular infections (SSTVI) in PWID using hospital admissions	Method: Retrospective Chart Review Eligibility: Size: 63,671 participants	Statistical Analysis: identified patients with “injecting-related” infections as those with a relevant infection in the primary diagnostic field and “mental and behavioral disorders due to opioid use” in any other diagnostic field	35% abscess 32% phlebitis 23% cellulitis 4% septicemia 4% osteomyelitis 2% endocarditis 0.2% necrotizing fasciitis
(Lloyd-Smith et al., 2008)	To characterize the risk factors for current injection related infections among IDUs	Method: Longitudinal Analysis Eligibility: Must be SIF participant, must complete both intake and nurse-administered baseline questionnaires Size: 1065 individuals	Cohort Study: Participants enrolled in study voluntarily based on usage of the SIF, Scientific Evaluation of Supervised Injection (SEOSI)	Chance of having a skin infection: Female: 1.68 AOR Unstable housing: 1.49 AOR Borrowing Syringe: 1.6 AOR

				Requiring help injecting: 1.42 Injecting daily: 1.41
(Lloyd-Smith et al., 2009)	Evaluate the factors associated with receiving cutaneous injection-related infection (CIRI) care among PWID	Method: Cohort Study Eligibility: Users of the downtown Vancouver SIF after their second visit Size: 1,080 participants	Cohort Study: examined the total number of CIRI care events at the SIF reported by each participant, examined the sociodemographic and behavioral variables, collected as part of the baseline Scientific Evaluation of Supervised Injection questionnaire, stratified by whether receiving CIRI care was or was not obtained at the SIF	22 per 100 person years for CIRI care Female: 1.87 AHR Unstable housing: 1.39 Daily heroin injection: 1.52
(Lloyd-Smith et al., 2010)	To investigate determinants of hospitalization for an AIRI or related infectious complication among a cohort SIF users	Method: Data Regression Eligibility: Random recruitment of SIF participants, Scientific Evaluation of Supervised Injection (SEOSI) Size: 1083 participants	Cohort Study: Referrals for treatment and wound care made at SIF by nurse, a linkage of SEOSI participant data, SIF data and St. Paul's Hospital inpatient data was performed	Incidence Density for AIRI was 6.07 per 100 person years Length of Stay in Hospital when referred was 4 days vs 12 days for non-referral
(Nelson et al., 2011)	To assess the size and scope of the risk of HCV with IDU worldwide	Method: Systematic Review Eligibility: The number or prevalence of HCV-infected IDUs in a country or subnational area were mentioned Size: 77 of 152 countries where IDU had been reported	Data Analysis: Multiple reports were assessed for data on the prevalence of anti-HCV and HIV infection to assess HCV risk for IDUs	60-80% of IDUs had anti-HCV in 25 countries Over 80% had anti-HCV in 12 countries
(Phillips, Anderson, Herman, Liebschutz, & Stein, 2017)	To assess the risk practices associated with IRID in PWID	Method: Cross-Sectional Survey Eligibility: PWID; 18 years or older; self-report substance use 3 days a week Size: 143 Individuals	Self-Reported Survey: Demographics; HIV status; Substance Use; IRID history; ASI Drug Module administered; OSDQ administered; AUDIT-C administered; BIRSI administered	65% report at least one IRID within 1 year
(Pollini et al., 2010)	Assess the prevalence of abscesses and soft tissue infections in IDUs	Method: Cohort Study Eligibility: >18 years of age; having injected illicit drugs within the past month, as confirmed by inspection of injection stigmata Size: 623 participants	Self-Reported Survey: Baseline and semi-annual survey, sociodemographic, behavioral, and contextual questions. Cross sectional survey on abscess history and treatment added at follow-up. Serological testing for HIV, HCV, and Syphilis	46% reported ever having an abscess; 20% w/in 6 months 12% sought treatment

(Spiller, Broz, Wejnert, Nerlander, & Paz-Dailey, 2015)	Monitor HIV prevalence and risk factors in PWID	Method: Cross-Sectional Survey Eligibility: PWID within the previous 12 months; 18 years or older Size: 10,002 individuals	Self-Reported Survey: Participants offered anonymous HIV testing; administered a behavioral survey to establish risk factors and behaviors	11% tested positive for HIV 7% PWI Heroin only; 17% other or poly drug use 30% shared syringes
(Topp, Iversen, Conroy, Salmon, & Maher, 2008)	Identify lifetime prevalence and predictors of self-reported injecting-related injuries and diseases (IRID) and/or injecting-related problems (IRP)	Method: Cross-Sectional Survey Eligibility: clients of 45 NSPs in Australia Size: 1,961 Participants	Self-Reported Survey: participant indicated if they have any of five IRIDs (abscess; infection of an injecting site lasting more than one week; septicemia; thrombosis; endocarditis) and three IRPs (problems finding a vein; prominent scarring/bruising; swelling of hands or feet following injecting)	69% reported IRID or IRP 43% problems finding a vein 4% endocarditis
(Wurcel et al., 2016)	To determine rates of hospitalization for endocarditis	Method: Retrospective Chart Review Eligibility: Ages 15-64; Identified with IE; excluded with IE risk factors; included with IDU or HCV Size: 16,206 individuals	Statistical Analysis: compared IDU-IE by year to observe trends in admission and discharge	11-26% in hospital mortality rate Increase from 8% IDE-IE admission rate to 12.1% 15-34yo increased from 27.7% - 42% IDU IE increased from 40.2% in 2000 to 68.9% in 2013 in white males
(Zibbell et al., 2018)	To compare national rates of acute HCV to PWID	Method: Systematic Review Eligibility: Positive HCV antibody test; IDU Size: Nationwide	Data Analysis: Utilizing the National Notifiable Disease Surveillance System to determine rates of HCV in the general population and control for IDU	Annual incidence rate of acute HCV infection increased more than 2-fold (from 0.3 to 0.7 cases/100 000) from 2004 to 2014 Opioid IDU increased risk 4-fold

Discussion: Literature Review

Ever since the Reagan administration's proclamation of a "War on Drugs," punitive and criminal justice measures have been enacted in various degrees in an attempt to find a solution for substance use and the community level impact of substance use (Aspinall et al., 2014; Binswanger & Gordon, 2016; Dunleavy, Munro, Roy, Hutchinson, Palmateer, Knox, Goldberg, & Taylor, 2017; Fernandes, Cary, Duarte, Jesus, Alarcão, Torre, Costa, Costa, & Carneiro, 2017; Goldstein et al., 2015; Grau, Arevalo, Catchpool, & Heimer, 2002; Hagan et al., 2011; Harris, Brathwaite, McGowan, Ciccarone, Gilchrist, McCusker, O'Brien, Dunn, Scott, & Hope, 2018; Hellard, Rolls, Sacks-Davis, Robins, Pattison, Higgs, Aitken, & McBryde, 2014; Hooton, 2015; Hope, Kimber, Vickerman, Hickman, & Ncube, 2008; Ivan et al., 2016; Jette, 2018; Lim, Vos, Flaxman, Danaei, & Shibuya, 2012; Martin, Hickman, Hutchinson, Goldberg, & Vickerman, 2013; McNeil & Small, 2014; Metrebian et al., 2015; Nelson et al., 2011; Patel, Foote, Duwve, Chapman, Combs, Fry, Hall, Roseberry, Brooks, & Broz, 2018; Phillips, Stein, Anderson, & Corsi, 2012; Platt et al., 2018; Smith, Robinowitz, Chaulk, & Johnson, 2014; Stancliff et al., 2015; Wallace, Barber, & Pauly, 2018; Werb, 2018; Wiessing et al., 2017; Wilson, Donald, Shattock, Wilson, & Fraser-Hurt, 2015; Wood, McKinnon, Strang, & Kendall, 2012). However, as the opioid crisis continues to grow in America, it has become obvious to many that this strategy has failed. While addressing the issue of substance use, the normative view is to always assist an individual with moving toward recovery and abstinence of all substances. However, the harm reduction approach to substance use rejects this notion of abstinence and assumes that there will always be some level of recreational substance use and misuse (Hooton, 2015). Therefore,

the goal should be to reduce the harms associated with substance use, relative to the stated public policy of the "War on Drugs" (Marlatt, Blume, & Parks, 2001). Since there will always be substance use, the focus should be on harm reduction measures to reduce the burden of infectious disease, and on treatment to help individuals with their goals. This two-pronged approach to substance misuse, and substance use, will likely have a better community level outcome than simply waging war on a public health issue.

Harm Reduction

By assisting persons who inject drugs with basic sanitation and safe injection techniques health/behavioral health practitioners can reduce the number of missed veins and skin infections (Ivan et al., 2016). A missed vein could potentially develop into an abscess or a skin infection, which, if left untreated, could migrate to the heart and develop infective endocarditis. People who inject drugs consistently reported skin infections 28-70% (Coull et al., 2014; Dahlman, Håkansson, Björkman, Blomé, & Kral, 2015; Dunleavy et al., 2017; Phillips, Anderson, Herman, Liebschutz, & Stein, 2017) which can also develop into abscesses or other skin lesions. If those infections pass beyond the skin, are left untreated, conditions can progress to sepsis and be fatal. Additionally, IDU increases the absolute risk of complex bone infections by 2%, which can cause significant treatment issues and distress in the individual (Larney et al., 2017).
Basic injection supplies could potentially consist of alcohol swabs for cleaning the skin properly, individual use sterile water packets, and clean needles. These supplies reduced the spread of HIV in five cohort studies (Aspinall et al., 2014), and could be extrapolated to produce similar results

in reducing the spread of HCV, reducing the incidence rates of skin infections and infective endocarditis.

Infectious Disease

The community burden of infectious disease due to IDU is also enormous; over a 12-month period at a single hospital in Florida, it cost the state $11.4 million to treat injection related injuries and infections (Tookes, Diaz, Li, Khalid, & Doblecki-Lewis, 2015). Considering that illicit substance use is an ongoing issue, this cost is an ongoing expense; therefore, it could be expected to continue or increase year to year. The burden of this cost is placed on the community itself to bear, as many individuals with significant substance use problems may not have insurance or may be on state insurance. Individuals on Medicaid have their insurance paid by the state, therefore it is the rest of the community that bears the cost of these infections. By targeting the community of PWID with tailored harm reduction services like clean needles to prevent sharing and the spreading of disease, sterile supplies, safe injection techniques, basic wound care, and overdose prevention supplies it could potentially translate into a significant cost savings for the state. Additionally, it is not only a cost savings measure. According to the NASW Code of Ethics, "Social workers respect the inherent dignity and worth of the person" (Levy, 2017); therefore, it is a professional guiding principle of the Social Work profession that each individual has intrinsic worth and value.

Critique

While every effort is made to be as thorough as possible when conducting a systematic literature review, the reliance on published studies when focusing on a singular issue has its own limitations. Not every study takes into account various social determinants of health (SDOH),

which are the conditions of the places where individuals live, work, and play and can have a significant impact on an individual's health (Adler, Glymour, & Fielding, 2016). These studies use varied measures, and control for different variables. Additionally, while each study contained within the literature review is inherently valuable for adding to the body of literature, because of the social and economic variations of each location and community studied, there are an unknown number of factors influencing the health of the participants. While it's possible to draw preliminary conclusions from the data, it is impossible to assess causal factors.

Study Two - Secondary Data Analysis

Background

Subsequent to analyzing the data from the comprehensive literature review, a research concept was proposed to study the local population of IDU and attempt to assess the frequency and prevalence of AIRI. The goal of the study was to ascertain whether or not PWID in Phoenix suffered from the same acute skin issues, at the same prevalence rates, as PWID in other areas. While overdose is the most severe consequence of IDU, it is not the only consequence. A history of IDU can cause skin and soft tissue damage, endocarditis, septicemia, and chronic illnesses like HCV and HIV (Harris et al., 2018). Even if individuals avoid the most severe health consequences of IDU, death or HCV/HIV, they can still potentially be left with a lifetime of physical scarring. Ultimately, one of the primary goals of harm reduction is to protect the individuals' health and safety until such a time that they make the choice to make changes in their lives. And harm reduction need not be partaken in for solely moral reasons, it is also cost

effective and provides benefit to the community (Wilson et al., 2015). By assessing the prevalence rates of AIRI, and then working to develop interventions to address those complications, better long-term outcomes can provide for individuals in communities. For instance, an individual who uses substances chronically, may develop skin scarring from abscesses or other skin infections. These abscesses can impact the individual's self-esteem, reduce their employability, or lead to depression and anxiety. Therefore, discovering the prevalence of these acute injuries, and the impact on the individual's health can provide valuable information for researchers and clinicians involved in harm reduction and substance use.

Research Questions

Research Question One: What relationship, if any, exists between injection drug use and skin and soft tissue infections?

The null and alternate hypotheses for this research question were as follows:

Null Hypothesis: There is no significant correlation between injection drug use and skin and soft tissue infections.

Alternate Hypothesis: There is a significant correlation between injection drug use and skin and soft tissue infections.

Research Question Two: What relationship, if any, exists between injection drug use and reusing injection equipment?

The null and alternate hypotheses for this research question were as follows:

Null Hypothesis: There is no significant correlation between injection drug use and reusing injection equipment.

Alternate Hypothesis: There is a significant correlation between injection drug use and reusing injection equipment.

Research Question Three: What relationship, if any, exists between reusing injection equipment and sanitation measures; such as, hand washing and use of antiseptic?

The null and alternate hypotheses for this research question were as follows:

Null Hypothesis: There is no significant correlation between reusing injection equipment and sanitation measures; such as, hand washing and use of antiseptic.

Alternate Hypothesis: There is a significant correlation between reusing injection equipment and sanitation measures; such as, hand washing and use of antiseptic.

Research Question Four: What relationship, if any, exists between sharing needles and using sanitation measures; such as hand washing and use of antiseptic?

The null and alternate hypotheses for this research question were as follows:

Null Hypothesis: There is no significant correlation between sharing needles and using sanitation measures; such as hand washing and use of antiseptic.

Alternate Hypothesis: There is a significant correlation between sharing needles and using sanitation measures; such as hand washing and use of antiseptic.

Research Question Five: What relationship, if any, exists between sharing needles and sharing other injection supplies such as cookers, spoons, cotton, or tourniquets?

The null and alternate hypotheses for this research question were as follows:

Null Hypothesis: There is no significant correlation between sharing needles and sharing other injection supplies such as cookers, spoons, cotton, or tourniquets.

Alternate Hypothesis: There is a significant correlation between sharing needles and sharing other injection supplies such as cookers, spoons, cotton, or tourniquets.

Methods

Participants were recruited from the community of persons who use drugs (PWUD) at community syringe exchange sites in Phoenix, Arizona. Consenting participants (> 18 years of age) were screened to verify eligibility for inclusion. Participants were determined to be eligible if they self-reported currently using opioids. Exclusion criteria included the obvious presence of severe cognitive or psychiatric impairment (i.e., not oriented to person, place, and time) and unable to speak and understand the English language (resources limited the ability for the research team to translate materials). Electronic gift cards for survey research were available to eligible remote participants if necessary. Initially, researchers conducted a semi-systematic literature review to evaluate empirical research related to first responders and engagement with community members. Further, researchers explored validated instruments that evaluate study constructs including addiction severity, health status, treatment history, health disparity, and engagement. Ultimately, researchers constructed an instrument with less than 20-minute

response time. Initially, construct validity was assessed by piloting the instrument in collaboration with project experts and community partners. Once the instrument had established face validity, a web-based survey using Qualtrics was created, a software that enables users to collect and analyze survey data.

Quantitative Measures

- Demographics were assessed with a brief set of questions that included items such as age, sex, race/ethnicity, education, employment, marital and family status, and income.
- Addiction Severity –The primary outcome of interest for substance use frequency was based on participant self-reports on the number of days (during the past three months) that they have used any drugs or alcohol. The Short Inventory of Drug/Alcohol Problems (SIP-A/D) (Kiluk, Dreifuss, Weiss, Morgenstern, & Carroll, 2013) was used to assess problematic use patterns. Combined drug/alcohol problem scores were used to create an index of severity.
- Treatment History- The Treatment Services Review focused on services for seven potential problem areas: medical status, employment, support, drug use, alcohol use, legal status, family/social status, and psychiatric status. Participants were asked (using an adapted self-report instrument) about the services that they received in the past 90 days including (but not limited to) emergency room visits and instances of incarceration (McLellan, Alterman, Cacciola, Metzger, & O'Brien, 1992).
- Self-reported Health Status- Using the RAND Measures of Quality of Life SF-36 Survey Instrument (Hays & Morales, 2001), researchers assessed multiple measures of quality of

life, including physical, mental and emotional health. Participants were asked about various aspects of their health.

- Health Disparity Questions- To assess health disparities, researchers mirrored the questions used in the AZ Behavioral Risk Factor Surveillance System 2017 (AZBRFSS; Arizona Department of Health Services, 2017).
- Questionnaire. Items specifically focused on Section 1 of AZBRFSS: Health Status, Section 2: Healthy Days - Health-Related Quality of Life, Section 6: Chronic Health Conditions, State-Added Section 6: Prescription Drug Abuse, State-Added Section 7: Substance Abuse, and State-Added Section 11: Opioid Use / Chronic Pain. By utilizing parts of the same instrument used by the Arizona Department of Health, data were able to be compared to the data gathered for Arizonans and FR-BRIEF SITD participants.

Data was collected from Qualtrics and analyzed using SPSS, focusing on descriptive statistics including frequencies and crosstabs and, bivariate correlation.

Results

The survey of Shot in the Dark community participants generated a large amount of data on the individual demographics of the population. The average age of the survey participants was 38 years ago (Table 2). Of participants, 37.1% reported their health as being good or better, with 41% reporting it as average or worse, with 2.9% reporting their health to be *Terrible* (Table 2). The reported gender of the participants was skewed towards male (53.3%) with female being reported as 35.2%, and Two Spirit and Agender at both 1% (Table 2). Nearly one quarter of survey participants reported completing at least some college (23.8%), and 19% reported not finishing high school (Table 2).

Table 2

Demographics of Individuals Surveyed

n = 105	Total	
	n	%
Health status		
Excellent, good	39	37.1
Average, poor	43	41.0
Terrible	3	2.9
Age (mean)	38	
Gender		
Male	56	53.3
Female	37	35.2
Two Spirit	1	1
Agender	1	1
Race		
American Indian or Alaskan Native	5	4.8
Black or African American	9	8.6
Hispanic, Latino or Spanish	16	15.2
Native Hawaiian or Other Pacific Islander	1	1
White (Not Hispanic)	70	66.7
Education		
Did not complete High School	20	19
Graduated High School	22	21
GED	20	19
Technical or Professional School	7	6.7
Some College	25	23.8
Graduated College	6	6

Over half of all study participants reported no chronic medical problems (57.1%), with the most common reported problems being: more than one chronic health condition (13%), Hepatitis C (10%), Abscesses (8.0%) and Back Pain (4.0%) (Appendix: Figures 18 and 19). The majority of study participants reported injecting their drug of choice (72.4%), with over half (59%) reporting that they injected their DOC the same day as the survey (Table 3). Needle reuse was higher than half (61%) but sharing of needles was significantly lower (21%); however, sharing of supplies

other than needles was reported more frequently (34.3%) (Table 3). Participants reported that heroin was their overall Drug of Choice (DOC) (58.1%) with amphetamines coming in second with nearly half as many (12.4%) participants reporting it as their DOC (Table 3). Most participants reported preferring to inject into a vein (65.7%), followed by into the muscle (11.4%) at a far lower frequency of response. The location of preference for injection on the body was spread fairly evenly overall, with responses including: Lower arm (13.3%), inside the elbow (12.4%), upper arm (11.4%), hand or leg (both at 7.6%), and "wherever I can" at (23.8%) (Table 2). Most participants reported positive personal hygiene, with respondents answering if they washed their hands before injecting stating *Probably* or *Definitely Yes* 51.4% of the time, cleaning the skin with antiseptic 49.5%, cleaning the skin with soap and water 37.2%, and using new unshared sterile water 50.5% (Tables 3, 4, 5, and 6).

Table 3

Chronic Medical Issues and Injection Habits

	Total	
n = 105	*n*	%
Do you have any chronic medical problems?		
Yes	38	36.2
No	60	57.1
Do you inject your drug of choice?		
Yes	76	72.4
No	18	17.1
When was the last time you injected your DOC?		
Today	62	59.0
Yesterday	10	9.5
This Week	6	5.7
Last Month	1	1.0
Within the last 30 days	4	3.8
Have you reused any of your injection equipment?		
Yes	64	61.0
No	23	21.9

Table 4

Skin and Injection Hygiene Data

	Total	
n = 105	*n*	%
Do you wash your hands first?		
Definitely Yes, Probably Yes	54	51.4
Might or might not	19	18.1
Probably Not	14	13.4
Do you clean the skin with antiseptic?		
Definitely Yes, Probably Yes	52	49.5
Might or might not	18	17.1
Probably Not, Definitely Not	18	17.1
Clean the skin with soap and water?		
Definitely Yes, Probably Yes	39	37.2
Might or might not	26	24.8
Probably Not, Definitely Not	22	20.9
Use new sterile water? (*n*, %)		
Definitely Yes, Probably Yes	53	50.5
Might or might not	18	17.1
Probably Not, Definitely Not	16	15.3

Table 5

Injection Site Preference

	Total	
n = 105	*n*	%
What area of the body do you frequently use as your injection site?		
Inside of the elbow	13	12.4
Hand	8	7.6
Upper Arm	12	11.4
Lower Arm	14	13.3
Leg	8	7.6
Groin	1	1.0
Neck	4	3.8
Foot	2	1.9
Wherever I can	25	23.8
What area of the body do you frequently use as your injection site?		
Into a vein	69	65.7
Into the muscle	12	11.4
Under the skin	1	1.0
Wherever I can	10	9.5

Table 6

Needle Sharing and Drug of Choice

	Total	
n = 105	*n*	%
Have you shared needles in the past 30 days?		
Yes	22	21.0
Maybe	8	7.6
No	57	54.3
Have you shared injection equipment other than needles in the past 30 days?		
Yes		
Maybe	36	34.3
No	9	8.6
	42	40.0
What is your preferred drug of choice?		
Alcohol	3	2.9
Heroin	61	58.1
Methadone	3	2.9
Other Opiates/Analgesics	2	1.9
Cocaine	2	1.9
Amphetamines	13	12.4
Cannabis	6	5.7
Hallucinogens	1	1.0

Discussion: Secondary Data Analysis

This research was conducted with the original hypothesis being that individuals who inject drugs would likely suffer from higher rates of skin and soft tissue infections (AIRI). The theory supporting this hypothesis was that breaking the skin barrier and injecting a foreign and highly acidic substance (Ciccarone & Harris, 2015) into the body would be likely to introduce bacteria and cause AIRI. However, the evidence from this cohort was unable to support this hypothesis and the hypothesis is rejected. Only 8.0% of respondents claimed to have problems with abscesses (Appendix: Figure 19), and only 36.2% stated they had any chronic medical

condition (other than addiction itself) at all (Table 2). These data seemingly contradict the commonly held belief that PWID suffer from chronic poor health overall as a result of their substance use; however, due to the small sample size, and the population surveyed, it is entirely possible that the data are outliers.

Pearson *r* correlations were used due to it being the commonly accepted "gold standard" for correlations (Laurent, 1998). However, there are some limitations to its usage. Firstly, correlations cannot be used to show a cause-and-effect relationship, it merely shows that two items are correlated. Secondly, outliers can have a significant effect by pulling the line of best fit formed by the correlation too far in one direction. Nevertheless, Pearson *r* is still the most widely used and commonly accepted correlation statistic for measuring the degree of relationship between two or more linearly related variables.

Potential Protective Factors

While there is inherent risk in injecting substances, there are also ways to mitigate some of the risk and lower the chance of negative outcomes. One item that stood out as interesting and could likely explain the low prevalence rates of AIRI was the high uptake of beneficial skin hygiene routines by PWID. Most of the individuals reported washing their hands (51.4%), cleaning the skin with alcohol or other antiseptic (49.5%), using soap and water to wash their skin before injecting (37.2%), and using new, unshared, sterile water (50.5%); this trend could easily reduce the frequency and severity of acute skin infections. An additional factor that could likely explain the findings is the location of the data collection itself. Over half (54.3%) of the participants of the survey reported that they had not shared needles in the past 30 days. This

figure could be explained due to the fact that the data were gathered from individuals who were participating in the local Phoenix syringe access program (SAP). Along with new needles, and medical supplies, participants were also offered information on safer injection techniques from these SAPs. Harm reduction kits could contain new cookers, tourniquets, cotton balls and alcohol swabs. Basic medical supplies were often limited versions of these kits and could include alcohol swabs and literature on safer injection techniques. It can be posited that individuals who would frequent a syringe exchange program to get new needles and safer injection information, are using those basic medical supplies to clean their skin before injecting, and that is effectively reducing the incidence rates of abscesses and other AIRI. Unfortunately, at the time of this study, the full harm reduction kits were no longer being provided due to funding limitations. However, during the data collection period of the study, limited medical supplies were still somewhat available, and participants were offered information about safer injection techniques. The past availability of these products could potentially have been a positive influence on AIRI and reduced the number and frequency of skin and soft tissue infections. It is impossible to note if these limited supplies, and the often frequent fluctuations in the available quantity of clean needles available to participants, had any effect on the reported frequency of AIRI.

Injection Drug Use and Equipment Reuse

The second research question was, what relationship if any, exists between persons who inject drugs and the reuse of injection equipment. The null hypotheses stated: there is no significant correlational between injection drug use and the reuse of injection related equipment. Descriptive statistics and correlations were calculated to analyze the data.

Table 7

Injection Drug Use and Injection Related Equipment Reuse

	Reuse Injection Equipment	New sterile water
Inject DOC	.319**	-.222*

(*) Correlation is significant at the 0.05 level (2-tailed).
(**) Correlation is significant at the 0.01 level (2-tailed).

Table 7 displays the findings in relation to research question two. Each of the items were correlated using Pearson *r*. There was a significant correlation with the reuse of injection equipment and the use of new sterile water and injection drug use. Based on the overall results of the analysis and individual analyses the null hypothesis was rejected. With the exception of the use of sterile water there was a strong correlation.

Injection Equipment Reuse and Sanitation Measures

The third research question was, what relationship if any, exists between reusing injection equipment and sanitation measures; such as hand washing and use of antiseptic. The null hypotheses stated: there is no significant correlational between reusing injection equipment and sanitation measures; such as hand washing and use of antiseptic. Descriptive statistics and correlations were calculated to analyze the data.

Table 8

Injection Equipment Reuse and Skin Hygiene

	New sterile water	Wash hands	Antiseptic use	Soap and water
Reused Injection Equipment	-.123	-.137	-.167	.009

(*) Correlation is significant at the 0.05 level (2-tailed).
(**) Correlation is significant at the 0.01 level (2-tailed).

Table 8 displays the findings in relation to research question three. Each of the items were correlated using Pearson *r*. There was no significant correlation with any of the items. Based on the overall results of the analysis and individual analyses the null hypothesis was accepted.

Needle Sharing and Sanitation Measures

The fourth research question asked, what relationship if any, exists between sharing needles and sanitation measures; such as hand washing and use of antiseptic. The null hypotheses stated: there is no significant correlational between sharing needles and sanitation measures; such as hand washing and use of antiseptic. Descriptive statistics and correlations were calculated to analyze the data.

Table 9

Sharing Needles and Skin Hygiene

	New sterile water	Wash hands	Antiseptic use	Soap and water
Sharing needles	-.404**	-.236*	-.282**	-.204

(*) Correlation is significant at the 0.05 level (2-tailed).
(**) Correlation is significant at the 0.01 level (2-tailed).

Table 9 displays the findings in relation to research question four. Each of the items were correlated using Pearson *r*. There was a significant correlation with the sharing of needles and the use of sterile water, the sharing of needles and washing hands, and the sharing of needles and the use of antiseptic. Based on the overall results of the analysis and individual analyses the null hypothesis was rejected. With the exception of the use of soap and water, there was a strong correlation between needle sharing and skin hygiene.

Needle Sharing and Equipment Sharing

The fifth and final research question was, what relationship if any, exists between sharing needles and sharing other injection supplies such as cookers, spoons, cotton, tourniquets, and water. The null hypotheses stated: there is no significant correlational between sharing needles and sharing other injection supplies such as cookers, spoons, cotton, tourniquets, and water. Descriptive statistics and correlations were calculated to analyze the data.

Limitations

While the data from this study is interesting, and contributes to the overall knowledge about substance use, there are limitations to what can be inferred from the results. First, due to the limitations of the study design, causation cannot be assumed; all results are correlations only and do not take into account cofounding variables. Secondly, this data cannot be generalized across the entire population, since disparities in race cannot be accounted for. Due to the small sample size, and the limited information gathered, it is impossible to know if the results are indicative of what would be seen in a larger population study. Additionally, due to the variability in funding that Shot in the Dark receives, harm reduction supplies are not always available to participants and the supplies vary at easy site. This unpredictability adds an additional variable to

the data that the researchers are unable to control for. Another variable with the Shot in the Dark supplies, is the lack of educational materials in Spanish. Arizona has a very significant Hispanic population, some of which might have limited ability to speak and read English. Therefore, the lack of materials in alternate languages might limit the population they are able to serve, and therefore artificially skew the sample.

Studies done concerning the population of persons who inject drugs are frequently concerning HIV and HCV. While the AZ BRFSS did inquire about HIV status, the AZ-BRIEF did not. Since this data analysis was focused primarily on acute skin infections and acute disease, rather than chronic medical conditions, the question concerning HIV status was not asked. Hepatitis C was only addressed in this study due to multiple participants indicating their HCV status in their survey responses. However, while no respondents indicated a positive HIV status in their survey response, no specific conclusion can be drawn from that. Therefore, since this study did not specifically inquire about HIV status, and since it was not indicated in any of the survey responses, it was not included in the data analysis. Another limitation of the AZ-BRIEF study is the lack of study materials in Spanish. Similar to the limitation with Shot in the Dark educational materials, the lack of Spanish language survey materials is inherently limiting regarding the population surveyed.

Table 10

Sharing Needles and Sharing Equipment and Supplies

	Sharing injection equipment	New sterile water
Sharing needles	.355**	-.404**

(*) Correlation is significant at the 0.05 level (2-tailed).

(**) Correlation is significant at the 0.01 level (2-tailed).

Table 10 displays the findings in relation to research question five. Each of the items were correlated using Pearson *r*. There was strong correlation with the sharing of needles and the other supplies. Based on the overall results of the analysis and individual analyses the null hypothesis was rejected.

Conclusion

The data from the comprehensive literature review was not born out by the data in our small study; the data from the literature review showed that AIRI is fairly common in PWID, however, this study did not show a correlation between IDU and AIRI. It is impossible to extrapolate the reason for this, as there are too many unaccounted-for variables in the process. However, it would be safe to assume that the syringe exchange sites contributed to greater overall health implications in the participants who are able to access them. This conclusion is borne out by the high rates of usage of hygiene supplies by the participants; alcohol swabs and sterile water are commonly utilized by the participants of the survey, as are items provided by the syringe access sites where the studies were conducted. The sharing of needles had a strong positive correlation with the sharing of other injection equipment other than needles, and a strong negative correlation with using new sterile water. Thus, one can conclude that persons who share needles, are also likely to share other supplies and not use sterile water for their injection

practices. There was also a strong positive correlation between individuals who injected their drug of choice, and the reuse of needles. This underlines the need for a higher availability and easier access to new sterile syringes.

The findings from the literature review underlie the need for solutions to substance use; the cost to communities is shown both in the toll it takes on members of the community in illness and injury, and in the fiscal cost of treating acute injection related injuries that can be significant. Simple measures such as providing clean needles, alcohol swabs, and sterile water could address both the issue of acute infections and the fiscal cost of treating abscesses and wounds in city and county emergency rooms. One anomaly in the data showed up during the study that bears addressing; while the participant use of alcohol swabs and sterile water was relatively high (49.5% and 50.5%, respectively) the rate of skin washing with soap and water remained significantly lower (37.2%). While it is impossible to know the reason for this discrepancy, researchers considered that lack of access to restrooms (public or private) or homelessness might play a factor. Lack of access to warm running water and soap, due to lack of stable housing would make it more difficult to wash one's hands. Additionally, the alcohol swabs are small, pre-packaged, and easily portable. The ability for an individual who does not have stable housing to carry though around with them is far easier, as they can be stored in pockets or in a backpack, unlike running water. In conclusion, while the data from this small cohort study did not align well with the data from the literature, there was still a large amount of valuable data gathered and conclusions that could be drawn.

Practical Implications

The goal of harm reduction social work is to provide tools and services to individuals engaged in potentially harmful activities that reduce their personal harm from that activity (Dunleavy et al., 2017; Stancliff et al., 2015; Wilson et al., 2015). This recognizes that every person has dignity, and inherent value, and that simply suffering from a substance use disorder should not be a reason to not provide help and support. While the research conducted did not show that there is a prevalence of AIRI in PWID, it does show a correlation between the usage of harm reduction and the negative instances of these skin and tissue infections. Nearly half of all participants engaged in healthy skin hygiene practices, which could likely have reduced their chances of infection significantly.

Encouraging healthy hygiene practices and expanding access to these harm reduction practices could potentially expand that effort and assist more individuals in protecting their lives and health. For instance, expanding access to syringe access programs could reduce the sharing of needles and reduce infections; expanding access to harm reduction kits (sterile cotton balls, alcohol or iodine swabs, sterile water, new cookers, and new tourniquets) could additionally reduce the risk of skin infections. Expanding public health classes on the topics of skin hygiene and wound care could also provide a net public health benefit, as well as a significant benefit to the individual's quality of life.

Of the four research questions that were asked, the strongest correlation was between injection drug use and reusing needles and sharing needles and sharing other injection equipment. It can be inferred that persons who are likely to share their needles are also likely to share the rest of their equipment, and that persons who inject drugs are likely to also reuse their

supplies. Reusing needles should be discouraged, as they quickly become dull and are more likely to tear the skin and veins and cause additional trauma to the user's body. A simple and practical solution to this problem is making it easier for PWID to access clean, sterile, needles, and working to reduce the stigma that individuals face when purchasing needles from pharmacies. While reducing the stigma might be easier said than done, since as a society it is all too easy to pass judgment on individuals, a person who can access new sterile needles is far less likely to reuse them, and therefore far less likely to suffer secondary trauma from the reuse of those needles.

Another potential harm in needle reuse is that of bacteria. While the substances the user is injecting were likely cooked or heated up prior to the initial injection, there is a potential for residue to remain within the barrel of the syringe itself and to contaminate further doses. This residue could harbor harmful pathogens, and since it is not cooked a second time, would be introduced into the user's bloodstream. This topic might be a valuable avenue of further research in the future; do persons who reuse needles have a higher instance of skin and blood infections than persons who do not?

Additionally, the sharing of needles should be discouraged, as it is an easy way to share communicable diseases. HIV and Hepatitis C are both easily transmitted via blood contact and injection drug use and reducing the vector for transmission by reducing needle sharing is a valuable public health goal for harm reduction social workers. However, disease transmission can occur with more than just needle sharing, and the sharing of other injection equipment highlights how this might not occur to an individual. If multiple people are using the same bottle of water, they can mix microscopic droplets of blood into the water and contaminate it for each

other. The same issue can occur with multiple people sharing cookers for their substance; by sharing these items, they increase the likelihood of cross-contamination and increase their risk for communicable diseases.

By practicing basic hygiene, increasing access to education, and promoting the expansion of basic services and supplies for persons who inject drugs, their overall quality of life can be improved and protected, and their incidence of infection and illness can be reduced. While the act of handing out alcohol swabs might not seem like it would have a substantial impact in and individual's life, it could prevent potentially life-threatening infections or enable an individual to find a better job. Increasing funding and support for syringe access programs could reduce or eliminate injection drug users as a vector for the transmission of HIV and HCV, as well as reduce the risk of abscesses and other skin infections. The benefit to these basic services can be significant if approached from a harm reduction perspective.

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APPENDIX A

DATA COLLECTED OCTOBER 2018-FEBRUARY 2019

Table 7

Demographics and Sanitation

	Gender	Level of Education	Inject DOC	Reuse Injection Equipment	Hand Washing	Antiseptic usage	Soap usage	Shared Needles	Shared Equipment	Overdosed
Gender	1	-.072	.159	.242*	-.186	-.151	-.040	.028	.147	-.044
Level of Education	-.072	1	-.025	-.045	.100	.174	.183	.001	-.278**	.158
Inject DOC	.159	-.025	1	.319**	-.260*	-.320**	-.251*	.123	.173	-.130
Reuse Injection Equipment	.242*	-.045	.319**	1	-.137	-.167	.009	.315**	.408**	-.152
Hand Washing	-.186	.100	-.260*	-.137	1	.681**	.677**	-.236*	-.358**	.080
Antiseptic usage	-.151	.174	-.320**	-.167	.681**	1	.657**	-.282**	-.379**	.109
Soap usage	-.040	.183	-.251*	.009	.677**	.657**	1	-.204	-.244*	.030
Shared Needles	.028	.001	.123	.315**	-.236*	-.282**	-.204	1	.355**	-.272*
Shared Equipment	.147	-.278**	.173	.408**	-.358**	-.379**	-.244*	.355**	1	-.254*
Overdosed	-.044	.158	-.130	-.152	.080	.109	.030	-.272*	-.254*	1

(*) Correlation is significant at the 0.05 level (2-tailed).
(**) Correlation is significant at the 0.01 level (2-tailed).

Table 8

Injection Drug Use, Sanitation and Health Problems

	Inject DOC	Reuse Injection Equipment	Antiseptic usage	Soap usage	New sterile water	Shared Needles	Hand Washing	Chronic Medical Problems
Inject DOC	1	.319**	-.320**	-.251*	-.222*	.123	-.260*	.013
Reuse Injection Equipment	.319**	1	-.167	.009	-.123	.315	-.137	-.051
Antiseptic usage	-.320**	-.167	1	.657**	.498**	-.282**	.681**	.073
Soap usage	-.251*	.009	.657**	1	.567**	-.204	.677**	.160
New sterile water	-.222*	-.123	.498**	.567**	1	-.404**	.544**	.138
Shared Needles	.123	.315**	-.282**	-.204	-.404**	1	-.236*	-.100
Hand Washing	-.260*	-.137	.681**	.677**	.544**	-.236*	1	-.085
Chronic Medical Problems	.013	-.051	.073	.160	.138	-.100	-.085	1

(*) Correlation is significant at the 0.05 level (2-tailed).
(**) Correlation is significant at the 0.01 level (2-tailed).

APPENDIX B

DATA COLLECTED OCTOBER 2018-FEBRUARY 2019

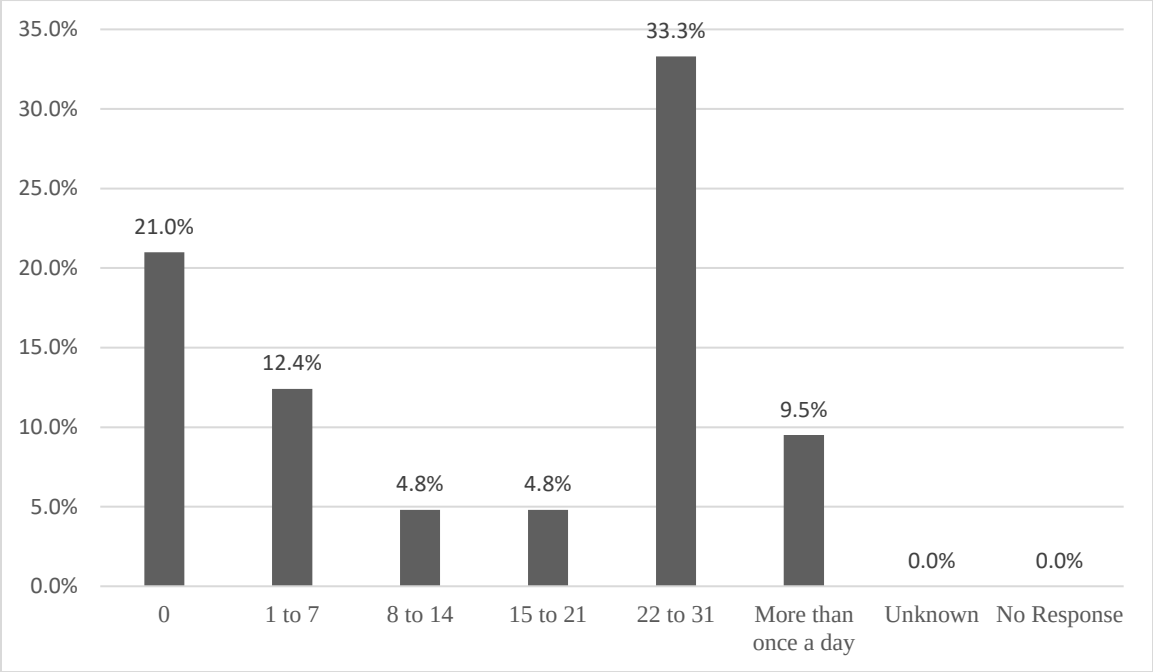

Figure 1. Heroin Use - Past 30 Days

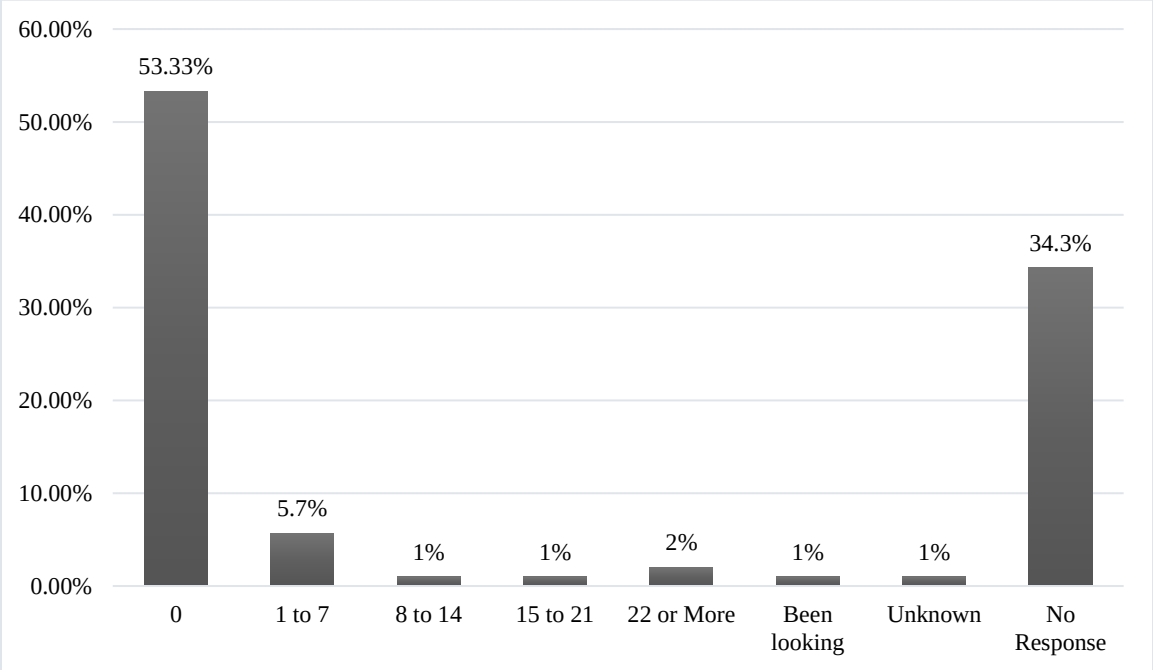

Figure 2. Fentanyl Use - Past 30 Days

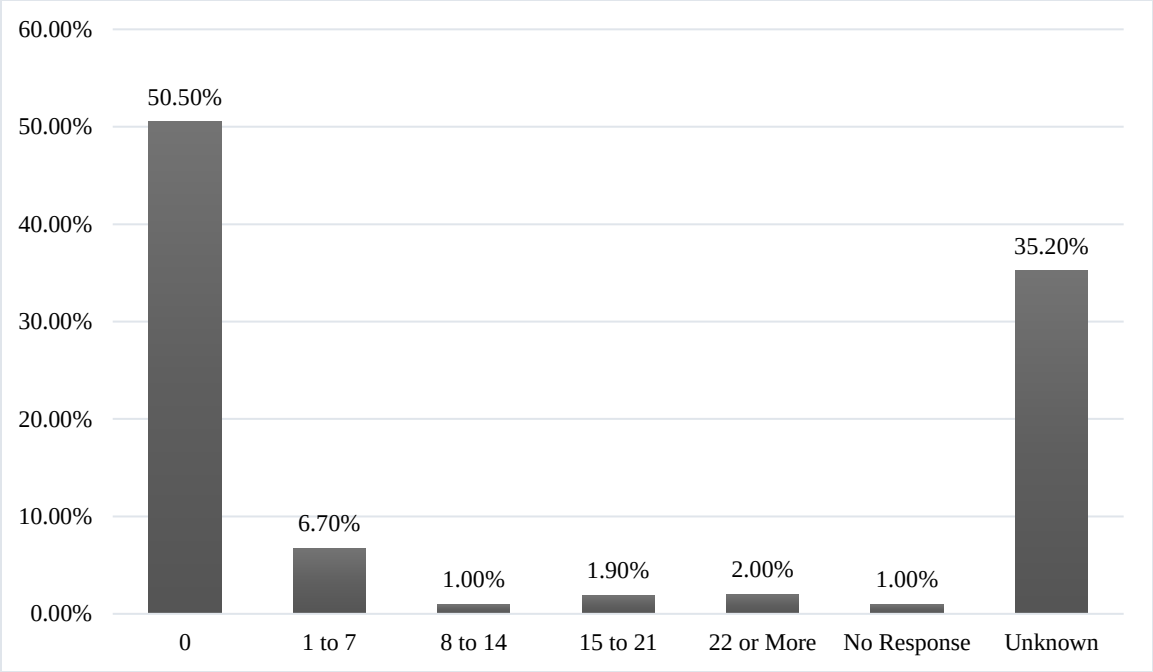

Figure 3. Other Opioid Use (Oxycodone / OxyContin) - Past 30 Days

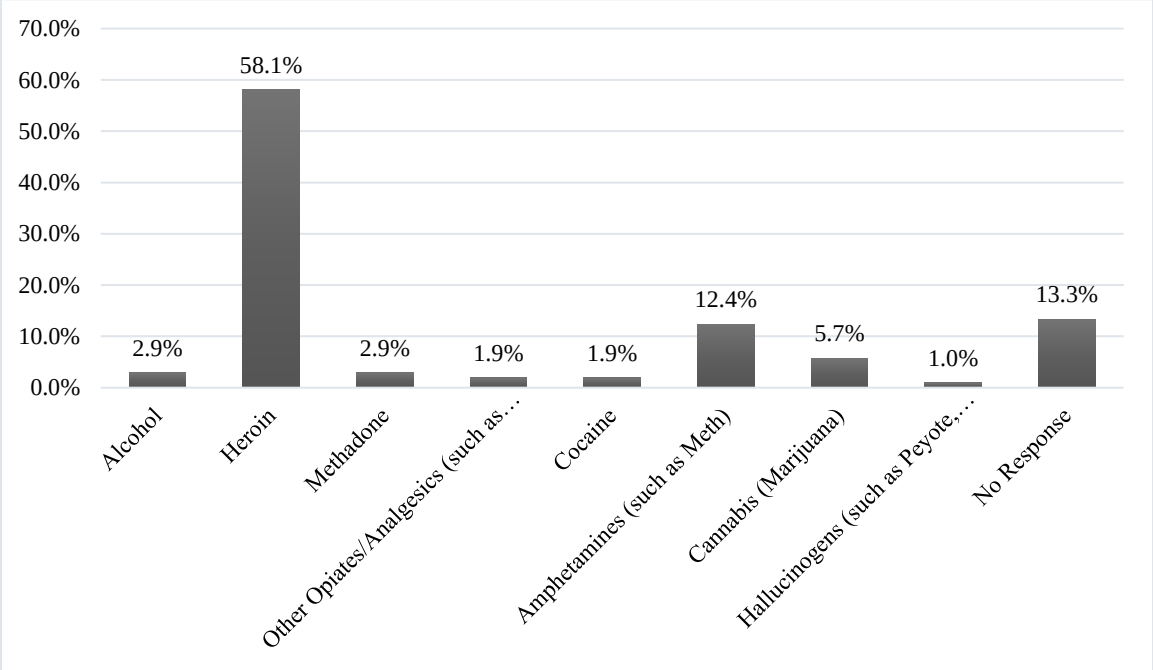

Figure 4. Preferred Drug of Choice

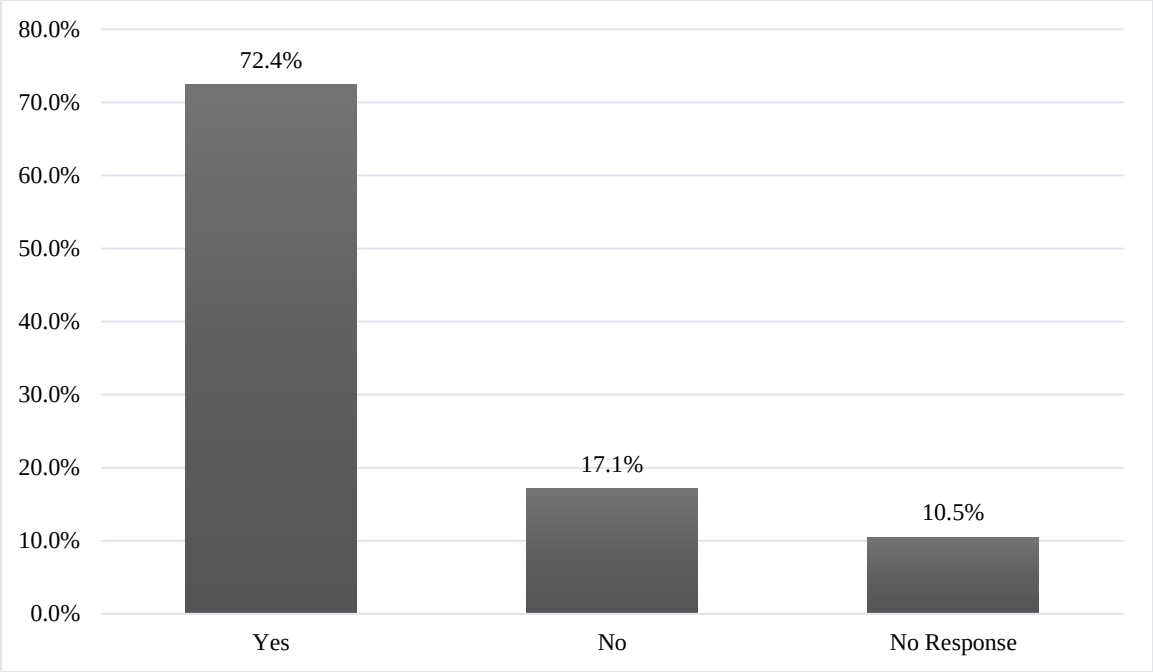

Figure 5. Do You Inject Your Drug of Choice

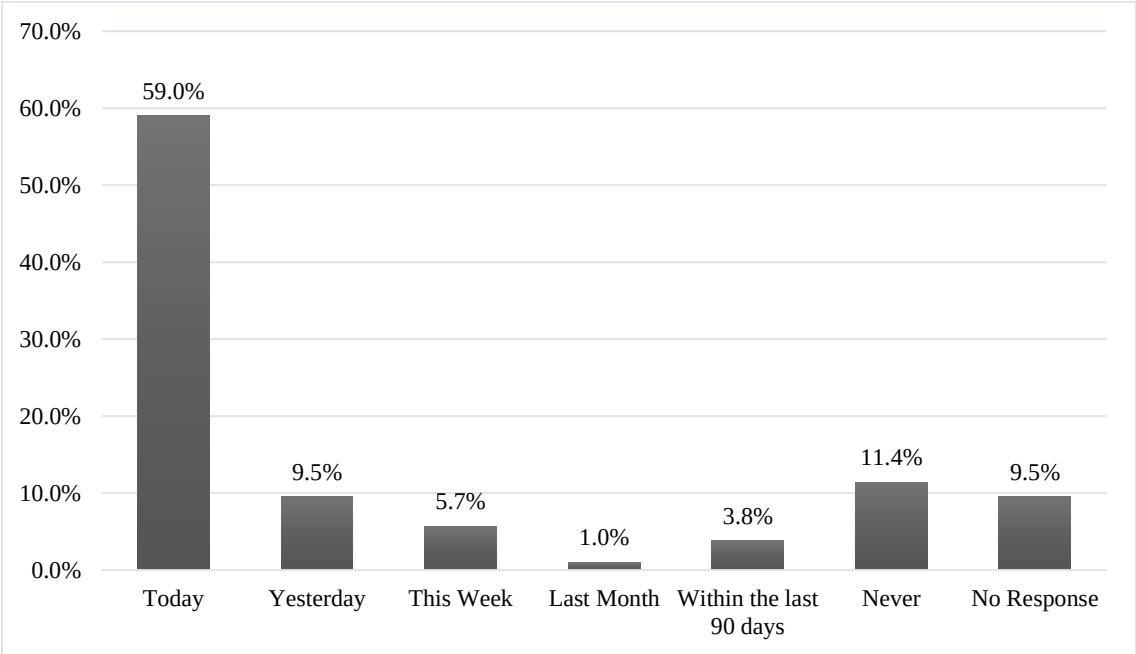

Figure 6. When was the last time you injected a drug?

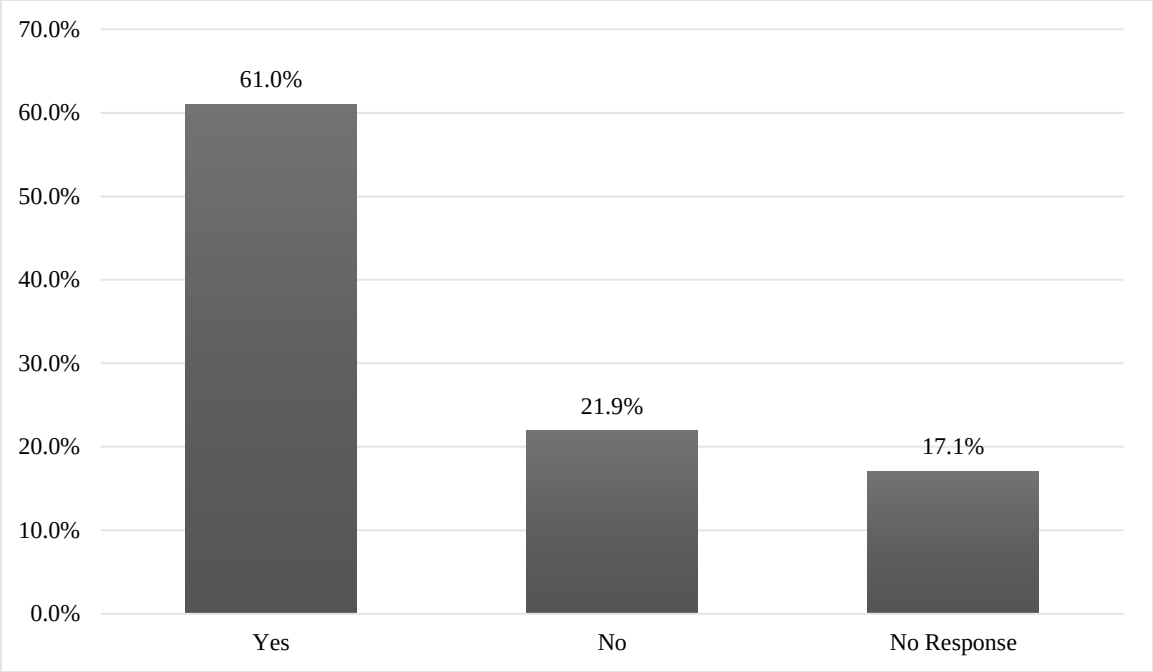

Figure 7. During the past month have you reused any of your injection equipment like Needles, Cookers, Cotton, or Tourniquets?

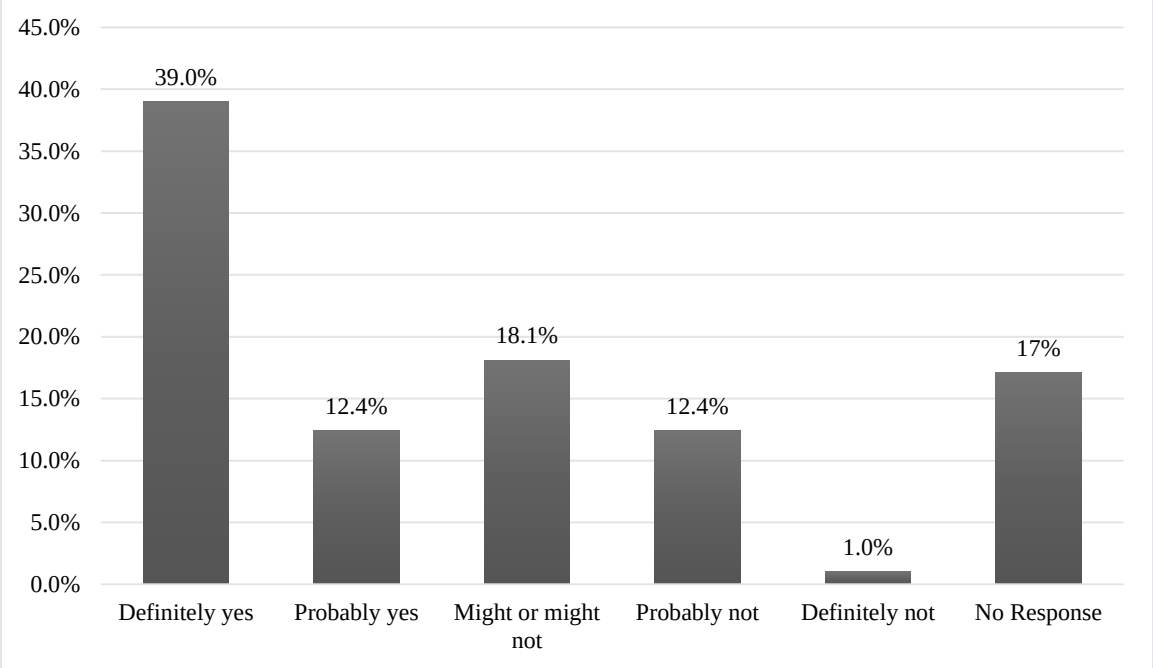

Figure 8. Before you inject, do you wash your hands first?

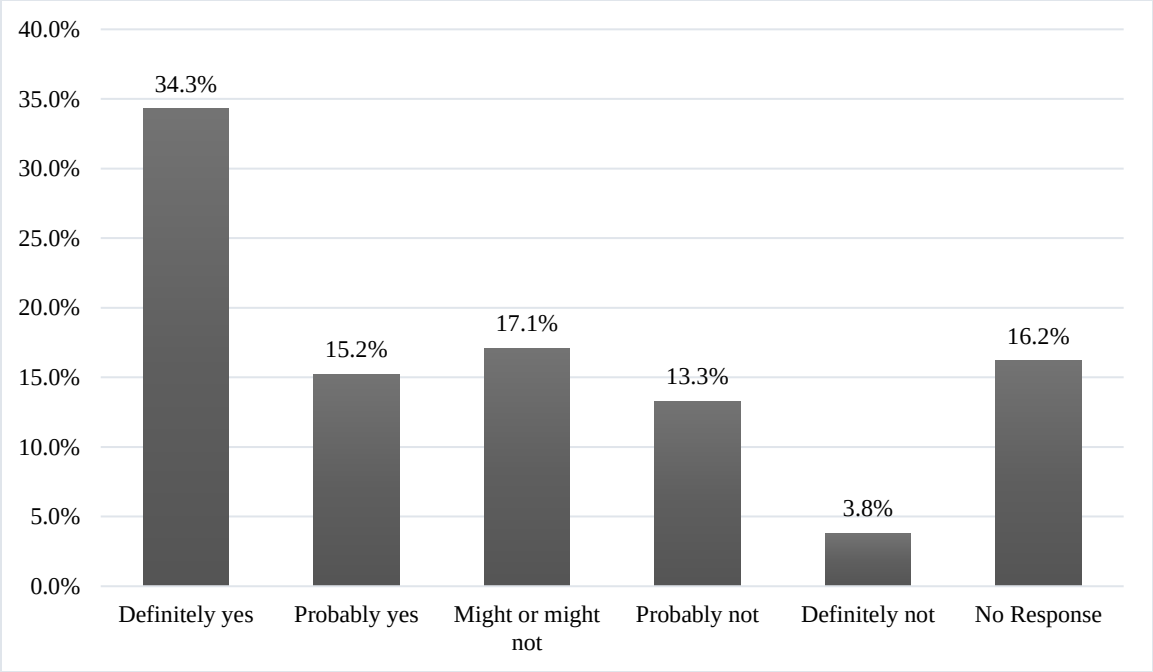

Figure 9. Before you inject, do you clean the skin where you plan to inject with Alcohol, Iodine, or other Antiseptic?

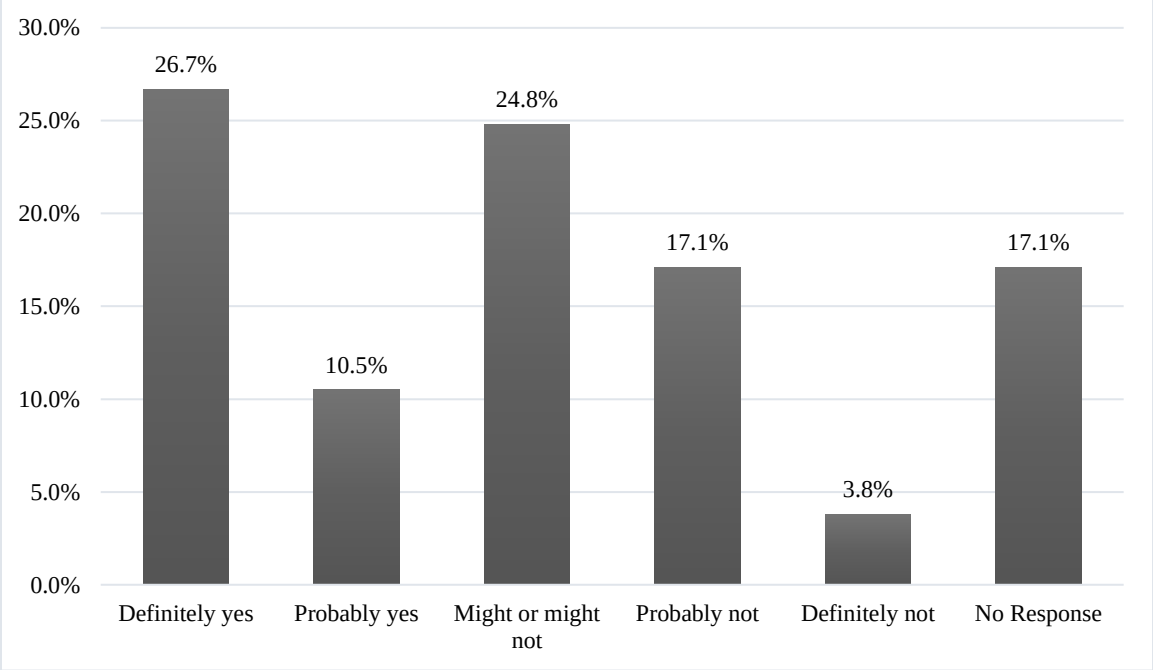

Figure 10. Before you inject, do you clean the skin where you plan to inject with soap and water?

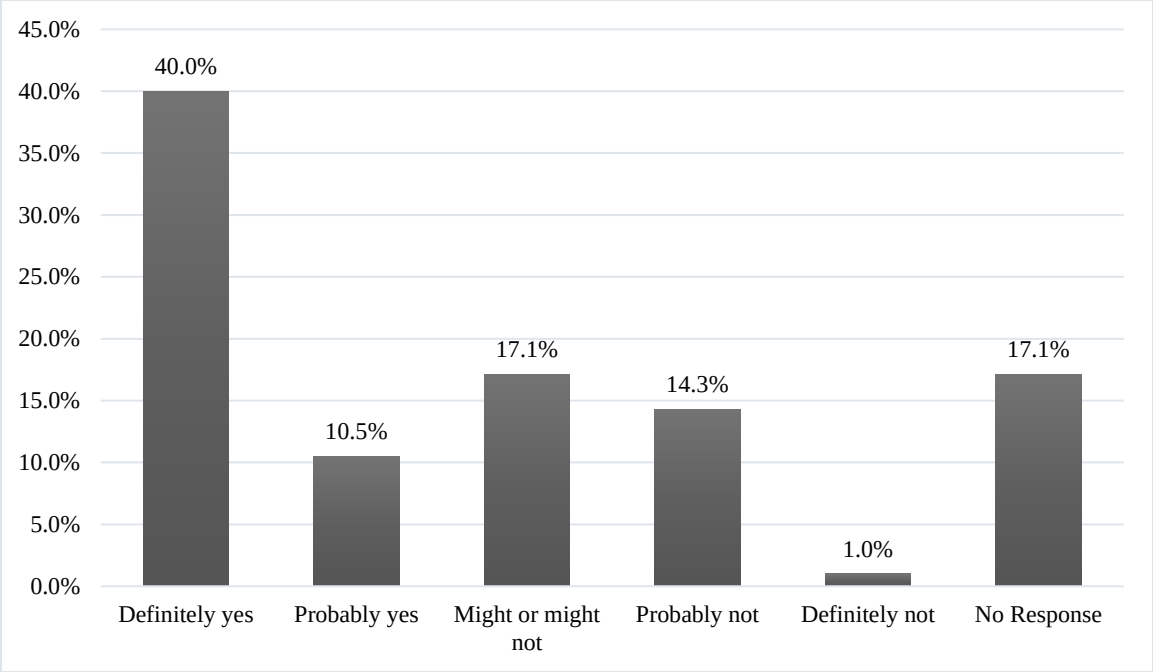

Figure 11. Do you use new, sterile, unshared water each time you inject?

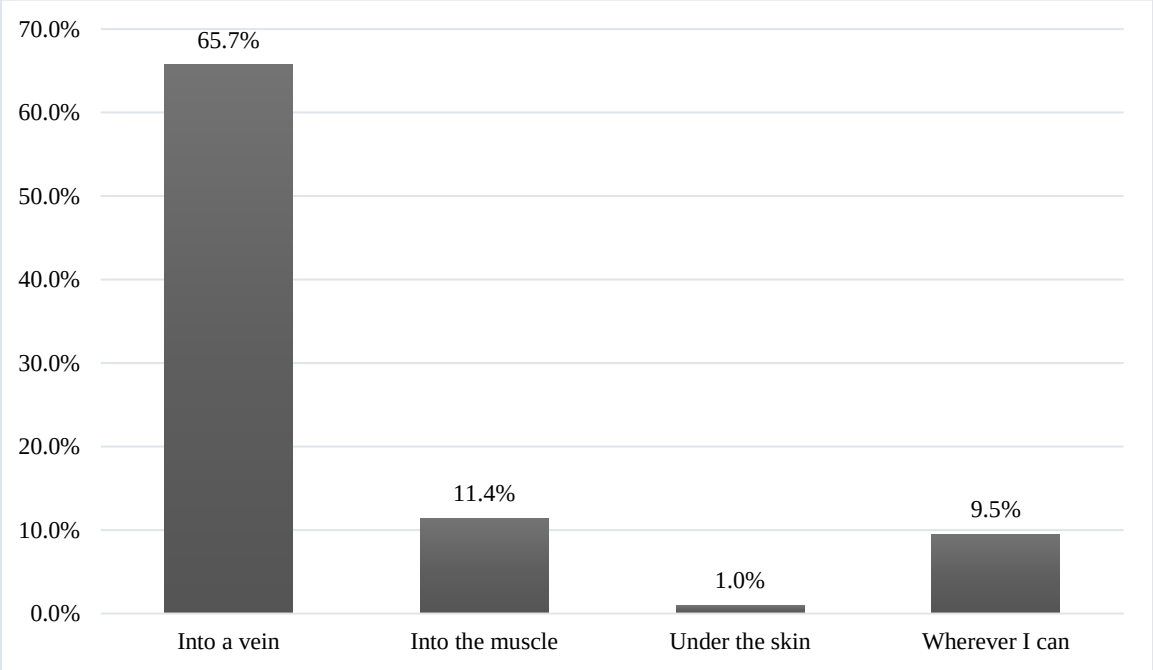

Figure 12. What location do you use to inject your substances most often?

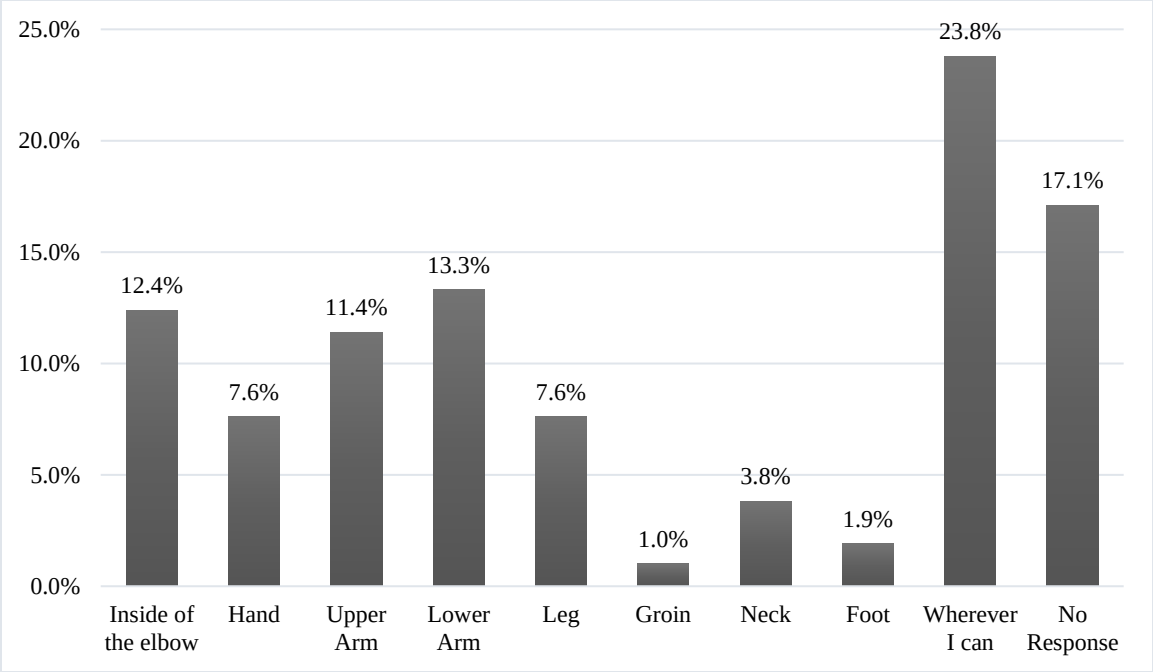

Figure 13. If you have a preference, what area of the body do you frequently use as your injection site?

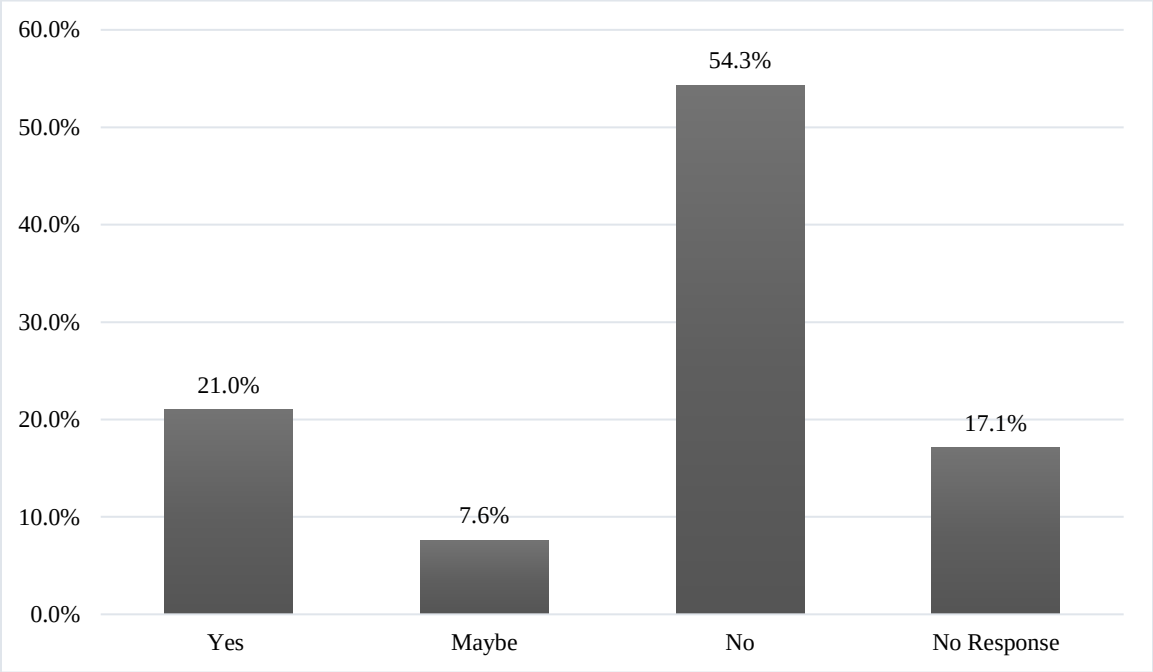

Figure 14. Have you shared needles in the last 30 days?

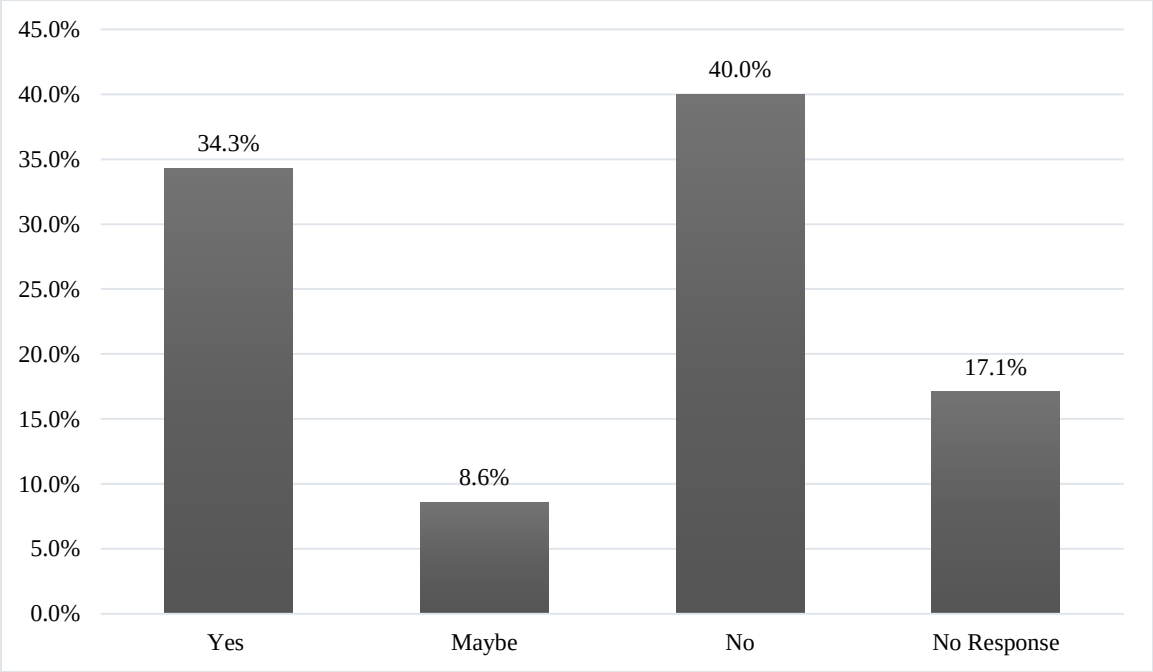

Figure 15. Have you shared other equipment besides needles (e.g., cookers, spoons, cotton, tourniquets/tie offs) in the last 30 days?

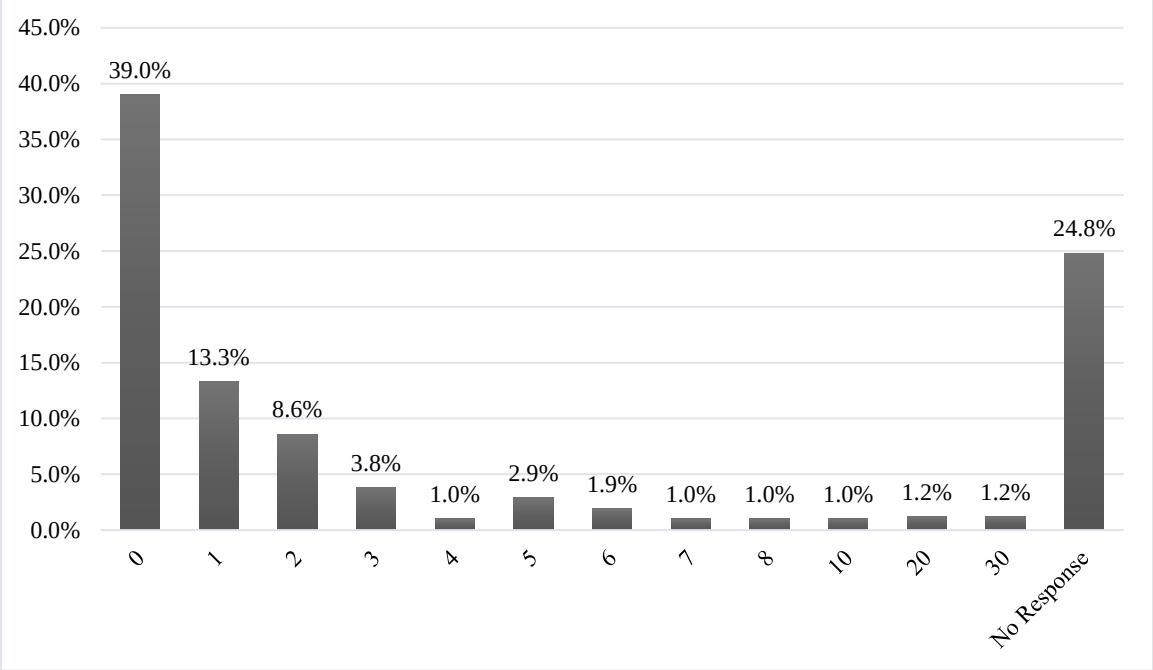

Figure 16. How many times in your life have you overdosed from the misuse of opioids (e.g., heroin or Oxycontin)?

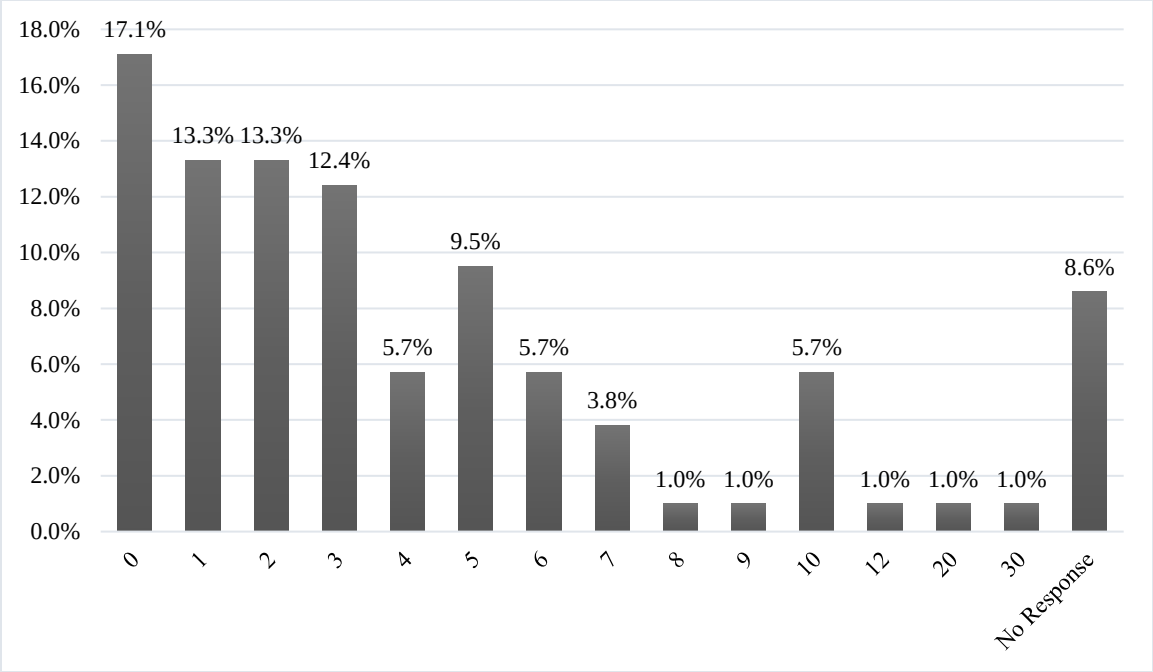

Figure 17. How many times in your life have you been hospitalized for medical problems (exclude detox, alcohol/drug treatment, and childbirth)?

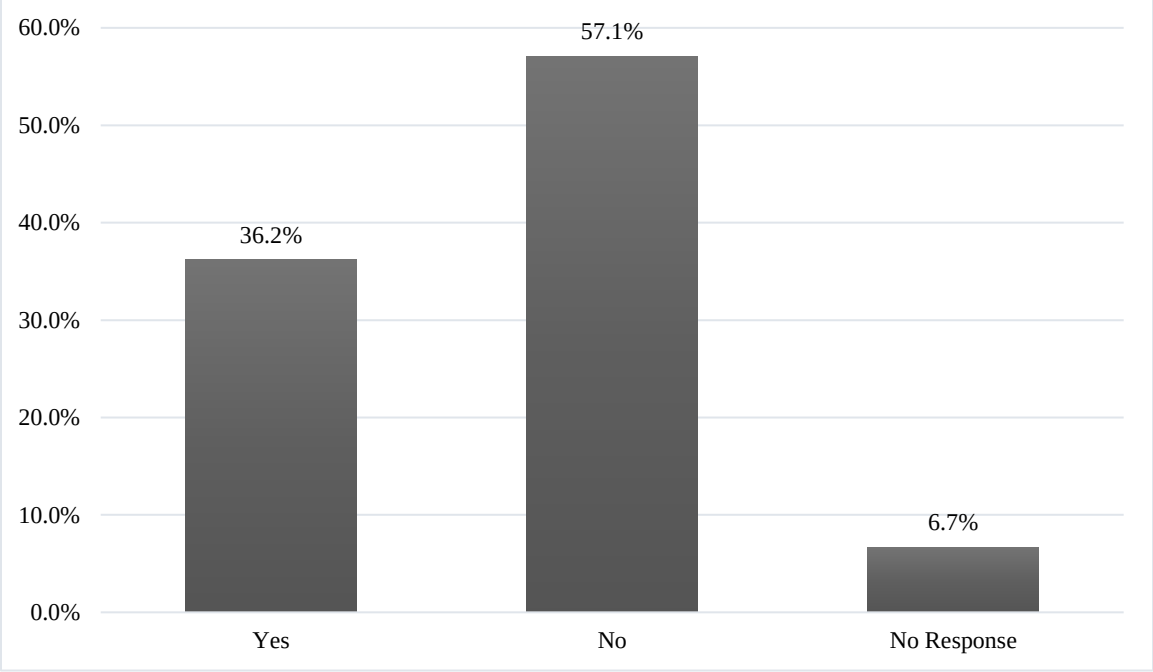

Figure 18. Do you have any chronic medical problems which continue to interfere with your life?

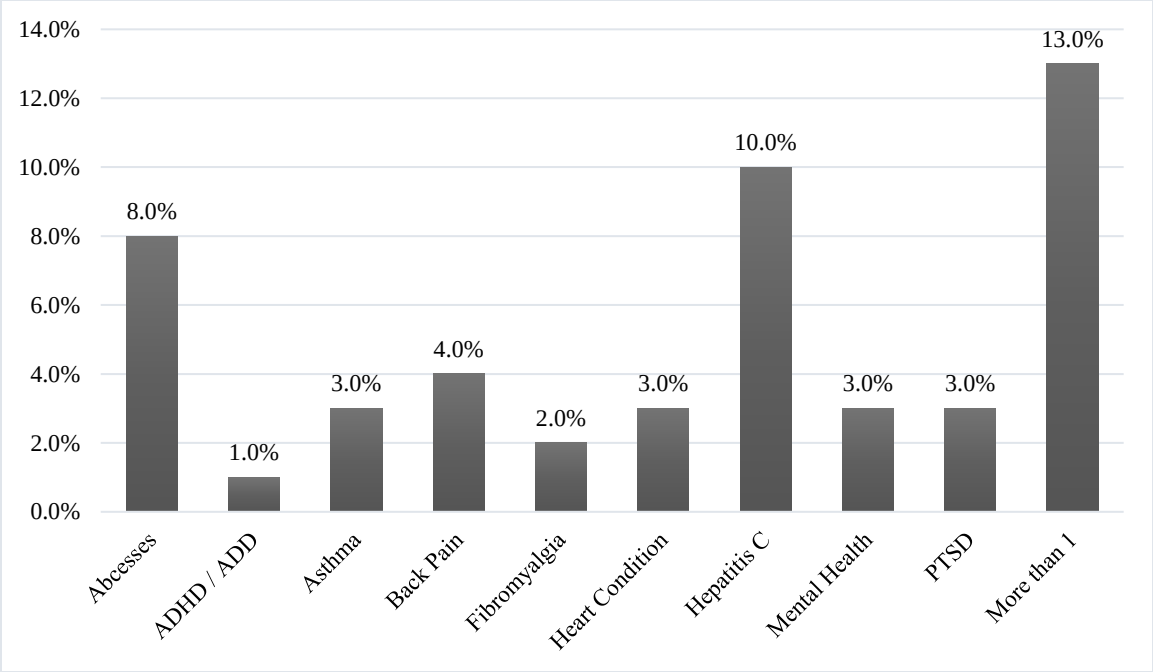

Figure 19. Do you have any chronic medical problems which continue to interfere with your life?