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Overlap between harm reduction and HIV service utilisation among PWID in India: Implications for HIV combination prevention

M Kumi Smith^{a,b}, Sunil S SOLOMON^c, Derek AT CUMMINGS^d, Aylur K SRISKRISHNAN^e, M Suresh KUMAR^e, CK VASUDEVAN^e, Allison M MCFALL^a, Gregory M LUCAS^c, David D CELENTANO^a, and Shruti H MEHTA^a

^a. Johns Hopkins University Bloomberg School of Public Health, 615 N Wolfe Street, Baltimore, Maryland, USA

^b. University of North Carolina at Chapel Hill School of Medicine, 130 Mason Farm Road, Chapel Hill, NC, USA

^c. Johns Hopkins University School of Medicine, 733 N Broadway, Baltimore, MD 21205, USA

^d. Emerging Pathogens Institute, University of Florida at Gainesville, Gainesville, USA

^e. Y.R. Gaitonde Centre for AIDS Research and Education, Chennai, Tamil Nadu, India

Abstract

Background: In some regions, HIV incidence is rising among people who inject drugs (PWID). Combination prevention approaches are well suited to PWID who face multiple sources of HIV risk. This analysis investigates patterns of utilisation to basic HIV services (HIV counselling and testing [HCT], antiretroviral therapy [ART]) as well as harm reduction programs (needle and syringe exchange programmes [NSEP] and opioid agonist therapy [OAT]) among PWID and how utilisation of harm reduction services is associated with HIV-related care seeking behaviours.

Methods: Respondent-driven sampling was used to recruit 14,481 PWID across 15 cities in India. Sampling-weighted multilevel logistic regression models assessed associations between utilisation of harm reduction service and HCT and ART use among those indicated (90.3% and 5.0% of full sample, respectively). We considered both recent (prior year) and ever use of services.

Results: Overall, 42.3% reported prior HIV testing and 57.9% of eligible persons reported ART initiation, but overlap with NSEP and OAT use was limited. In adjusted models, recent and ever use of both NSEP and OAT were significantly associated with recent and ever HCT utilisation, respectively; however, harm reduction utilisation was not associated with ART initiation among eligible participants.

Conclusions: Harm reduction services may play a key role in linking PWID with HIV testing; however, they were not associated with ART initiation among eligible individuals. Moreover, a

corresponding author: M Kumi Smith: kumi.smith@unc.edu.

CONFLICTS OF INTEREST

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large majority who utilised NSEP and OAT were not engaged in optimal HIV care or prevention, highlighting missed opportunities and a need for stronger linkages between NSEP/OAT and HIV care and treatment, particularly among those actively injecting. These findings provide key insights to better understand how services can be linked or combined to optimise service utilisation among PWID.

Keywords

HIV; harm reduction; injection drug use; India

INTRODUCTION

The unprecedented efficacy of novel tools for HIV prevention, including treatment as prevention (Cohen et al., 2011), pre-exposure prophylaxis (Vargas et al., 2010), and medical male circumcision (Gray et al., 2007) have fuelled calls for an “AIDS-free generation” and strategies for “Getting to Zero” (PEPFAR, 2013; UNAIDS, 2013). Indeed, at the same time that some reports suggest a gradual slowing of the global HIV pandemic (Nagelkerke et al., 2014; World Bank Group, 2016), others indicate that HIV transmission remains persistent in certain sub-regions such as Eastern Europe and Central Asia (UNAIDS, 2016). The same reports also indicate the epidemic may even be increasing in vulnerable populations such as men who have sex with men (MSM; Beyrer et al., 2013, 2016) and persons who inject drugs (PWID) particularly for those living in low- and middle-income settings (Beyrer et al., 2010; Dolan et al., 2015). Future HIV elimination strategies will therefore need to address the prevention challenges specific to these sub-epidemics, success of which will depend on tailored interventions capable of delivering locally relevant and sustainable services that are accessible to these hard-to-reach populations.

India’s population of about PWID (estimated at about 1.1 million in 2014; National AIDS Control Organisation, 2014) is one of the largest in the world, among whom national estimates place HIV prevalence at around 10.0%, with reported prevalence in some regional epidemics as high as 31.1% (Aceijas, Stimson, Hickman, & Rhodes, 2004; Lucas et al., 2015). Government-led HIV prevention efforts in India have historically been focused on services for female sex workers (FSW; Steinbrook, 2007), and as a result coverage of relevant programs for PWID such as needle and syringe exchange programs (NSEP), opioid agonist therapy (OAT), HIV counselling and testing (HCT), and antiretroviral therapy (ART), has been uneven and poorly integrated across healthcare settings (Solomon et al., 2016). In addition, fear of drug-use related stigma and discrimination (Chakrapani, Velayudham, Shunmugam, Newman, & Dubrow, 2013; Ekstrand, Ramakrishna, Bharat, & Heylen, 2013; Latkin et al., 2010) and low HIV awareness among PWID (Chakrapani, Newman, Shunmugam, & Dubrow, 2011; Panda, Chatterjee, Ba, & Ray, 1998) have created additional barriers for care access in this population (Mehta et al., 2015; Solomon et al., 2009). As the HIV epidemic in PWID continues to expand, a challenge for future HIV control in India will be prevention programs addressing PWID’s multifaceted sources of risk (i.e. sexual and drug use-related transmission risk including the intersection of these risks (Solomon et al., 2010, 2011; Suohu et al., 2012) as well as structural barriers such as poor access to clean needles, OAT, or HIV testing (Degenhardt et al., 2010; Go et al., 2015)),

while also addressing their long standing barriers to care. Integral to this will be a better understanding of existing patterns of utilisation of HIV-related health services and predictors of these patterns.

This study uses cross-sectional data collected as part of the baseline survey for a cluster-randomised trial exploring the effect of bundling multiple HIV prevention and treatment services for PWID on HCT utilisation and HIV incidence ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01686750) Identifier: NCT01686750; Solomon et al., 2016) The goal of this analysis is to characterise patterns and correlates of service utilisation among PWID in the baseline sample of this trial (prior to the intervention) in order to better understand how services can be linked or combined to optimise service utilisation among PWID.

MATERIALS AND METHODS

Study setting and population

As previously described,(Solomon et al., 2016) this cross-sectional survey among PWID from sites in 15 cities (Figure S1), includes 7 sites in North-eastern India where injection drug use has been endemic for decades, and 8 sites in North and Central India where increases in injection drug use have variably been reported (Lucas et al., 2015). Preliminary ethnographic research conducted with local non-governmental organisations informed details of the respondent-driven sampling (RDS) approach, a chain-referral recruitment method particularly well-suited for sampling hard-to-reach populations (Heckathorn, 2002). Approximately 1000 participants were recruited at each site starting with 2 “seeds” per site.

Eligible individuals 1) were at least 18 years of age, 2) reported injection drug use in the previous 2 years, 3) provided informed consent, and 4) presented a valid recruitment coupon (except for the seeds). Each participant who completed a survey questionnaire and biological testing received two coupons for recruitment of new individuals from his or her network. Participants received compensation for taking part in the study, as well as for recruiting eligible participants. Barcoded coupons allowed study staff to track chains of recruitment, and a biometric system that converted fingerprint images to unique hexadecimal codes helped prevent duplicate enrolment of PWID at any site in the trial.

Procedures

Consenting individuals took part in face-to-face electronic interviewer-administered surveys that captured information on demographic factors, network size, drug and alcohol use, use of NSEP and OAT, sexual behaviours,(Saunders, Aasland, Babor, De la Fuente, & Grant, 2006) and history of prior HIV testing, HIV diagnosis, and ART use (among those with confirmed HIV diagnoses). Rapid HIV testing was performed on-site, and blood samples were shipped to the YR Gaitonde Centre for AIDS Research and Education (YRG CARE) laboratory in Chennai, India for additional testing. Participants who tested positive were referred to free local HIV treatment centres, and were invited to return within two weeks for their CD4 cell counts.

Laboratory methods

Participants' HIV status was determined through an algorithm informed by results of three rapid HIV testing kits: Alere™ Determine™ HIV-1/2 (Alere Medical Co., Ltd., Chiba, Japan), First Response HIV card test 1–2.0 (PMC Medical India Pvt Ltd, Daman, India), and Signal Flow Through HIV 1+2 Spot/Immunodot Test kit, (Span DiagnOATics Ltd, Surat, India). Samples with indeterminate results were confirmed with Western blot tests, and CD4 cell count was measured for HIV-positive participant using the FlowCARE™ PLG CD4 (CD45-FITC/CD4-PE) assay (Beckman Coulter, Brea, CA, USA) and HIV RNA with RealTime HIV-1 assay (Abbott Laboratories, Abbott Park, Illinois, USA).

Statistical Analysis

Overall sample characteristics were assessed as the median and range of site-level proportions across all 15 sites with each estimate weighted for network effects with the RDS-II estimator (Volz & Heckathorn, 2008). Analysis of service use overlap between NSEP and OAT with HCT, and NSEP and OAT with ART was assessed using Venn diagrams. HCT utilisation was assessed only among the 13,073 participants who were HIV negative or HIV positive but unaware of their HIV positive status (i.e., eligible for HCT). ART utilisation was assessed among the 712 HIV positive PWID who were aware of their HIV positive status and eligible for ART (those who either reported ever initiating ART or who had a CD4 cell count of 350 cells/ul or less at the time of the survey). Separate Venn diagrams were constructed for recent (within the past year) and historic (ever) utilisation of services.

Univariable and multivariable logistic regression analyses were used to explore the relationship between 1) use of NSEP and OAT within the past year and HCT within the past year and 2) ever use of NSEP and OAT and HCT ever, both compared to the referent of never having accessed these services. Similar models were constructed to explore the relationship between NSEP and OAT and ever having initiated ART. Associations with recent use (“within the past year” use) as well as lifetime use (“ever” use) of NSEP and OAT were examined separately to examine whether presumed differences between the two groups (i.e. awareness of the existence of these services among ever utilisers versus greater social isolation among never-utilisers) might result in distinct predictors of service utilisation across groups. Of note, our investigation of ART initiation behaviours relied on cross-sectional data and we were therefore unable to assess treatment eligibility (defined by CD4 cell counts) in the past. This precluded us from distinguishing between individuals who remained untreated in the past due to high CD4 cell counts versus other any reasons (e.g. individual choice, failure to be offered treatment). We therefore modified the outcome to indicate whether or not participants had ever initiated ART in the past, given that they were eligible for treatment by the time they enrolled in the baseline survey.

Models used multi-level logistic regression analysis with a random intercept for each site (to account for clustering) and scaled RDS-II sampling weights. Multivariable models were adjusted with factors determined to be confounders of the association between NSEP, OAT and utilisation of HCT or ART, as identified through directed acyclic graphs or which were associated with the outcomes at $p < 0.10$. (Greenland, Pearl, & Robins, 1999; Textor, Hardt, &

Knüppel, 2011) Unweighted estimates for multivariable regression results are provided in supplemental tables (Table S1). Statistical analyses were conducted in SAS 9.3 and Stata 13.

Ethical oversight

This study was approved by the institutional review boards of YRGCARE in Chennai, India and Johns Hopkins Medical Institutions in Baltimore, USA. Study survey participants provided verbal informed consent.

RESULTS

Demographic and Behavioural Characteristics

Between January and December 2013, 14,481 PWID were enrolled (Table 1). The site-level median age was 29 years (site median range, 24–34), and the median site-level proportion of male participants was 97.6% (range, 76.7–99.9). Most participants had received a secondary school education (site median, 61.2%; range, 32.8–86.8), and less than half were married or cohabitating with a primary partner (site median, 42.2%; range, 18.7–61). Though the site-level median of sharing needles at last use was 37%, a significant portion had never utilised NSEP (site median 54.9%; range, 28.3–90.4) and an even higher proportion (site median, 81.3%; range, 46.8–100) had never utilised OAT.

Service Utilisation Patterns

Among the 13,073 participants who were HIV negative or HIV positive but unaware of their status, nearly 60% and 80% of PWID in the baseline study had never utilised NSEP or OAT, respectively, in spite of high prevalence among them of who reported daily injection (29.0% and 39.8%, respectively), ever having shared needles (23.3% and 31.6%, respectively), or ever having used opioids (88.4% and 72.5%, respectively). More specifically, over half had not utilised any of the three services (NSEP, OAT or HCT) in the past year (53.6%, Figure 1, panel A) and 14.7% had only utilised NSEP, despite 91.3% of this group reporting active drug injection in the previous 6 months. Only 5.2% had utilised all three services in the past year. A larger proportion had utilised both HCT and NSEP (7.8%) than HCT and OAT (3.2%) in the past year. While overall more individuals reported a lifetime history of HCT, NSEP and OST (9.5%, Figure 1, panel B), HCT and NSEP (12.7%) or HCT and OAT (4.9%), there was still a significant proportion that utilised either only NSEP (11.8%) or OAT (2.9%) and yet had never been tested for HIV.

Among the 712 HIV positive, ART-eligible PWID, 14.8% had never utilised NSEP, OAT, or ART; only 9.1% reported use of all three services. Overlap between ART and NSEP (14.2%) was greater than that between ART and OAT (7.3%).

Factors Associated with HCT utilisation

In univariable analysis (Table 2), odds of utilising HCT within the past year were significantly higher among those who had utilised NSEP also in the past year (odds ratio [OR], 2.83; 95% confidence interval [CI], 1.97–4.06) as compared to those who had never utilised NSEP. Odds of HCT in the prior year were also significantly higher among those who had utilised OAT in the past year (OR, 3.74; 95% CI, 3.00–4.67) as compared to those

who had never utilised OAT. Utilising HCT within the past year was also more common among those who had attended secondary school, (OR, 1.45, 95% CI, 1.20–1.75) and who reported injecting drugs other than heroin, buprenorphine or other pharmaceuticals (hereafter referred to as “other” drugs), including combinations of drugs in the past 6 months (OR, 1.53; 95% CI, 1.18–1.99).

Odds of having ever utilised HCT were significantly higher for those who had ever utilised NSEP (OR, 3.09; 95% CI, 2.30–4.15) as compared to those who had never utilised it, and for those who had ever utilised OAT (OR, 4.64; 95% CI, 3.63–5.93) compared to those who had never utilised it. Having ever utilised HCT was also significantly more common among those with at least a high school education (OR, 1.36; 95% CI, 1.17–1.59), those who were married (OR, 1.17, 95% CI, 1.01–1.35) those reporting injection of other drugs in the past 6 months (OR, 1.44; 95% CI, 1.09–1.90; compared to those who exclusively injected heroin in the time same time period) and those who had shared needles some time before most recent use (OR, 1.31; 95% CI, 1.03–1.67), as compared to having never shared needles. Having ever utilised HCT was less likely among men (OR, 0.54; 95% CI, 0.34–0.85) and those over the age of 30 (OR, 0.71; 95% CI, 0.61–0.82).

In multivariable analyses adjusted for confounders (Figure 3), the odds of having utilised HCT in the past year were significantly higher among those who had utilised NSEP in the past year (aOR, 2.41, 95% CI, 1.72–3.38), as well as among those who had utilised OAT in the same time period (aOR, 3.59; 95% CI, 2.68–4.81). Odds of having ever utilised HCT were also significantly higher among those who had ever utilised NSEP (aOR, 2.60; 95% CI, 2.01–3.36).as well as those who had ever utilised OAT (aOR, 3.87; 95% CI, 2.89–5.17).

Factors Associated with ART Initiation

In univariable analysis (Table 3), odds of having ever been on ART were lower among those who had ever utilised NSEP (OR, 0.61; 95% CI, 0.38–0.98) and those who had ever utilised OAT (OR, 0.75; 95% CI, 0.45–1.27), though the latter association was not statistically significant. The odds of having ever been on ART were also significantly lower among individuals who were over the age of 30 (OR, 0.35; 95% CI, 0.22–0.57), who injected other drugs (OR, 0.51, 95% CI, 0.27–0.94) and those who shared needles at most recent use (OR, 0.41; 95% CI, 0.20–0.85), as opposed to never. Odds of having ever been on ART were significantly higher among those making 6000 rupees or less in a month (OR, 2.16; 95% CI, 1.48–3.14).

Multivariable analysis (Figure 3) found that having ever utilised NSEP (aOR, 0.73; 95% CI, 0.47–1.12) or OAT (aOR, 0.87; 95% CI, 0.52–1.48) were negatively associated with ever having initiated ART. However, neither of these associations was statistically significant.

Reasons for Not Accessing HCT or ART

Among the 7571 (57.9%) participants who were HIV negative or unaware of their positive status and had never utilised HCT services, the most common reason for not testing was perceived low risk for HIV infection (39.2%). The next most commonly reported reasons included never having heard of HIV (20.8%) and not knowing where to get tested (16.7%).

Among the 300 individuals who were ART-eligible and aware of their HIV status but who had not started ART, the most commonly cited reason for abstaining from treatment was the belief that one was healthy or not in need of treatment (86.2%), followed by not knowing where to go to get ART (19%) and then by the fact that ART was not available where testing was done (7.5%).

DISCUSSION

Harm reduction services are critical for both HIV negative and positive PWID to prevent acquisition among those not yet infected, and to maintain health, promote adherence, and reduce risk of onward transmission among those already infected. These services also have the added benefit of providing a means by which PWID may be reached and engaged into HIV testing and treatment services. Although our cross-sectional associations cannot inform causal hypotheses, these results can inform more specific theories about how utilisation of certain types of health services may make certain clients more likely to consider uptake of others. Specifically, our analysis found that utilisation of either type of harm reduction service was associated with higher odds of HIV testing but not of ART initiation. These findings also highlight the potential role of harm reduction service in linking PWID clients to HIV testing services, particularly important in light of the sizeable group of participants who had never utilised HIV related services despite engagement in harm reduction services.

HIV-related services are available free of charge in India but through varied and disjointed mechanisms. HCT and ART, for example, are generally subsidised by the government sector via integrated counselling and testing centres and ART centres, respectively. NSEP and OAT, on the other hand, are typically administered by non-government organisations supported by federal funds (although more recently government funded OAT centres have opened in India's northern and central Indian states). In particular, NSEP distribute services directly in the community to improve access for harder-to-reach PWID such as those with ongoing drug use. Government-administered services, on the other hand, have the advantage of broader programmatic capacity to provide lifelong service to large numbers of patients. Linkage of patients between field-based services (e.g., NSEP, OAT) and those provided in more formal settings (e.g., HCT, ART) may therefore benefit from a consideration of the strengths of each type of service delivery model. The Indian national collaboration on AIDS (NCA) trial from which our data arise ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01686750) Identifier: NCT01686750) provides one such delivery model which blends the two in the form of government-managed clinics situated within the community, offering a range of specialised services tailored for PWID (Solomon et al., 2016). Results of this trial are forthcoming, and will possibly add to a growing evidence base in support of service integration for comprehensive HIV control in PWID. (Bachiredy et al., 2014; Haldane et al., 2017)

We observed the strongest positive associations between harm reduction services and HCT access. However, the sizable portion (17.2%) who had ever utilised harm reduction service but had never been tested exposes a critical service gap. Most such individuals indicated that they avoided testing because of low self-perception of risk, ignorance about HIV, or not knowing where to go to get tested, highlighting the importance of motivational counselling and providing information on testing centres to directly address these barriers.

The null association between NSEP and OAT use and ART initiation may be due to the inherent link between harm reduction services and active drug injection, a common barrier to ART initiation. The potential impact of factors underlying this barrier such as unwilling providers (Chakrapani et al., 2013; Uhlmann et al., 2010) or lower ART-seeking behaviour among active PWID due to perceived or experienced stigma in healthcare settings (Steward et al., 2008), is an area for further inquiry. Better characterisation of such barriers will be an important starting point for creating effective ART programs for actively injecting PWID (Mathers et al., 2010; McFall et al., 2016; Wolfe, Carrieri, & Shepard, 2010)

Past research has noted that participation in drug use related services forms a conduit to seeking of HIV-related care seeking. The outreach model employed by NSEP, for example, has been found to provide an ideal platform for recruiting clients into care, as was reported by a US national HIV testing campaign which found the highest acceptance rates for HIV testing among volunteers recruited at NSEP (as opposed to through shelters or drug treatment centres; Bowles et al., 2015; Porter, Metzger, & Scotti, 2002). The link between NSEP participation and ART-related care is less well-understood, though a pilot program in New Haven reported high rates of viral suppression among ART patients recruited through a mobile NSEP clinic (Altice, Springer, Buitrago, Hunt, & Friedland, 2003).

Our findings also highlight the advantages of chain-based referral methods for recruiting study and intervention participants from hard to reach populations. The fact that large numbers of PWID who had never accessed any kind of harm reduction services in spite of prevalent self-reported risk (i.e. daily injection and needle sharing) suggests that our RDS recruitment design may have captured a subgroup with the riskiest behaviours. This demonstrates an established feature of RDS design in recruiting more representative samples, (Abdul-Quader et al., 2006; Lansky et al., 2007) but also informs future strategies for targeted recruitment of these subgroups into prevention services.

Findings from this study should be interpreted in light of several limitations. The 15 study sites were not selected randomly but rather to include a diverse range of epidemiologic settings that included both established and emergent HIV epidemics among PWID (Lucas et al., 2015), and so data from this study should not be considered nationally representative. The epidemiological diversity of the sample must also be considered when interpreting results of multi-level models, which take into account wide differences in site-specific effects. A second limitation is our use of cross sectional data which precluded knowledge of past treatment eligibility among HIV diagnosed clients, limiting our ability to infer the associations between utilisation of harm reduction programs and the odds of initiating ART. A final limitation was our reliance on self-reported data from clients regarding complex timelines of past utilisation for multiple services. Extensive and ongoing training of survey interviewers was implemented throughout the trial to minimise recall bias, any of which is unlikely to be associated with any other potential confounders.

Growing consensus in HIV prevention science supports the notion that combination prevention and integrated service delivery can be expected to be more effective than stand-alone services in reducing HIV transmission, particularly in groups like PWID who face multiple sources of risk (Jones et al., 2014; Kurth, Celum, Baeten, Vermund, & Wasserheit,

2011). Combination approaches also allow for design of tailored combinations of services that address behavioural and transmission patterns specific to certain locations and populations. Identification of the optimal sets of combinations for PWID across various settings will require a better understanding of the role these services play in engagement of PWID across the care continuum, and interactions among the services. Our study identified important links between harm reduction services and HIV testing, which could be further exploited to bring greater numbers of active PWID into testing and care. Such efforts could involve site-based counselling and testing in OAT or NSEP clinics and offices, with attention to addressing the lack of risk perception or HIV awareness cited by many PWID as to their reasons for not pursuing HIV testing.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

TITLE: Overlap of OAT and NSEP utilisation among the 13,073 HIV negative and HIV positive but unaware individuals with having accessed HCT within the past year (panel A), and ever having accessed HCT (panel B). Of the 13,073, 177 (1.4%) individuals reported that they did not know when they had last accessed NSEP or OAT so were excluded from the analyses of recent use patterns (panel A).

CAPTION:

HCT: HIV counseling and testing

NSEP: needle and syringe exchange program

OAT: opioid agonist therapy

Figure 2.

TITLE: Overlap of OAT and NSEP utilisation among the 712 ART eligible individuals with having ever initiated ART.

CAPTION:

ART: antiretroviral therapy

NSEP: needle and syringe exchange program

OAT: opioid agonist therapy

Figure 3.

TITLE: Adjusted odds ratios and 95% confidence intervals for effect of recent (within the past year) and ever use of NSEP and OAT, on the utilisation of HIV counselling and testing (red) and ART initiation (black).

CAPTION:

* Individuals who accessed HCT, NSEP, or OAT in the past year are by definition also considered to have ever accessed this service; that is, the two categories were not mutually exclusive.

** Models assessing associations with recent HCT utilisation were adjusted for other harm reduction use (NSEP or OAT, depending on the exposure of interest), alcohol use, drug choice, education level, and monthly income. Models assessing associations with ART utilisation were adjusted for other harm reduction use (NSEP or OAT, depending on the exposure of interest), age, alcohol use, drug choice, and education level.

OR: odds ratio; CI: confidence interval; HCT: HIV counselling and testing; ART: antiretroviral therapy; NSEP: needle and syringe exchange; program; OAT: opioid agonist therapy

Table 1.

Median site-level characteristics of people who inject drugs (PWID) across 15 sites in India (N=14,481).

	Median [*]	Range
Access of needle exchange program		
Past year [†]	41.3	(9.3–69.6)
Ever	45.1	(9.6–71.7)
Never	54.9	(28.3–90.4)
Access of opioid substitution program		
Past year [†]	18.7	(0–53.3)
Ever	16.2	(0–45.2)
Never	81.3	(46.8–100)
Age, years (median)	29	(24–34)
Male (%)	98.3	(79.2–99.9)
Education		
Primary school or less	32.8	(5.8–66.8)
Secondary school	61.2	(32.8–86.8)
High school and above	4.6	(0.4–14.7)
Monthly income (median, Indian rupees)	5,000	(0–30,000)
Currently married or cohabitating [‡] (%)	42.2	(18.7–61)
Age at first injection, years (median)	21	(9–54)
Injection frequency in last 6 months		
None	8.5	(0.5–28.3)
Less than daily	29.4	(10.9–71)
Daily	58.0	(13.8–84.3)
Alcohol use [§]		
None/non-hazardous use	60.1	(34.8–88.1)
Hazardous use	20.4	(7.3–34.3)
Dependence	15.6	(4.6–45.5)
Unprotected hetero sex in the past 6 months	53.3	(36–76.1)
Drugs injected in last 6 months		
None	8.8	(0.5–28.3)
Heroin only	6.6	(0–94.3)
Buprenorphine & other pharmaceuticals only	23.4	(0.2–87.3)
Combination/other drugs	37.1	(2–74.6)
Needle sharing		
At most recent use	61.5	(26.2–81)
Before last use	37.0	(18.5–71.1)
Never	2.5	(0.4–7.4)

^{*} All site-level characteristics weighted using RDS-II weights

[†] Those who reported service utilization in the past year were a subset of those who have ever utilized this service; the two categories are therefore not mutually exclusive.

[‡]Those not considered married or cohabitating were those reporting that they were widowed, divorced, never married, or who did not live with their long-term partner.

[§]Hazardous use defined by score ≥ 8 on Alcohol Use Disorder Identification Test (AUDIT) and dependence defined by AUDIT score ≥ 15 .¹⁹

Table 2.

Demographic and behavioral characteristics of 13,073 HIV negative (or undiagnosed positive) participants stratified by patterns of HCT utilization. Univariable odds ratios assess association between participant characteristics and odds of having accessed HCT within the past year or ever, both versus never having accessed HCT.

	In last year (N=3547)		Ever (N=5502)		Never (N=7572)	
	N (%) [*]	OR (95% CI)	N (%) [*]	OR (95% CI)	N (%) [*]	N (%) [*]
Ever accessed needle and syringe exchange						
Never (ref)			2608 (47.4)	1.00		5696 (75.2)
Ever			2894 (52.6)	3.09 (2.30–4.15)		1875 (24.8)
Recently accessed needle and syringe exchange [†]						
Never (ref)	1589 (44.8)	1.00				
In the last year	1820 (51.3)	4.06 (3.11–5.3)				
Ever accessed opioid agonist therapy						
Never (ref)			3632 (66)	1.00		6863 (90.6)
Ever			1869 (34)	4.64 (3.63–5.93)		709 (9.4)
Recently accessed opioid agonist therapy [†]						
Never (ref)	2222 (62.6)	1.00				
In the last year	1140 (32.1)	2.76 (1.92–3.98)				
Age (years)						
Over 30 (ref)	1425 (40.2)	1.00	2389 (43.4)	1.00		2868 (37.9)
30 or under	2123 (59.8)	0.94 (0.81–1.08)	3112 (56.6)	0.71 (0.61–0.82)		4703 (62.1)
Male	196 (5.5)	0.77 (0.48–1.25)	5093 (92.6)	0.54 (0.34–0.85)		7285 (96.2)
Education						
Primary school or less (ref)	1043 (29.4)	1.00	1629 (29.6)	1.00		2954 (39)
Secondary school	2312 (65.2)	1.45 (1.20–1.75)	3531 (64.2)	1.36 (1.17–1.59)		4122 (54.4)
High school and above	192 (5.4)	1.29 (0.85–1.95)	341 (6.2)	1.27 (0.95–1.69)		495 (6.5)
Monthly income (rupees)						
Over 6000 (ref)	1149 (32.4)	1.00	1758 (32.0)	1.00		2219 (29.3)
6000 or less	2398 (67.6)	0.93 (0.81–1.07)	3744 (68.0)	0.94 (0.84–1.04)		5353 (70.7)
Currently married or cohabitating [‡]	1546 (43.6)	1.05 (0.93–1.18)	2424 (44.1)	1.17 (1.01–1.35)		3080 (40.7)

	In last year (N=3547)		Ever (N=5502)		Never (N=7572)	
	N (%) [*]	OR (95% CI)	N (%) [*]	OR (95% CI)	N (%) [*]	
Age at first injection, years (years)						
Over 20 (ref)	1866 (52.6)	1.00	2816 (51.2)	1.00	3897 (51.5)	
20 or younger	1671 (47.1)	0.94 (0.78–1.12)	2672 (48.6)	0.93 (0.78–1.10)	3638 (48)	
Injection frequency in last 6 months						
None (ref)	311 (8.8)	1.00	480 (8.7)	1.00	646 (8.5)	
Daily	1617 (45.6)	1.13 (0.74–1.73)	2769 (40.9)	1.09 (0.75–1.59)	3972 (52.5)	
Less than daily	1619 (45.6)	1.23 (0.86–1.76)	2252 (50.3)	1.09 (0.82–1.46)	2954 (39)	
Alcohol use [§]						
None/non-hazardous use (ref)	2120 (59.8)	1.00	3333 (60.6)	1.00	4733 (62.5)	
Hazardous use	790 (22.3)	0.92 (0.75–1.13)	1174 (21.3)	1.02 (0.83–1.26)	1492 (19.7)	
Dependence	637 (18.0)	0.77 (0.57–1.03)	994 (18.1)	0.89 (0.69–1.15)	1345 (17.8)	
Unprotected heterosexual sex in the past 6 months	1987 (56.0)	1.03 (0.85–1.25)	3033 (55.1)	1.03 (0.88–1.21)	4024 (53.2)	
Drugs injected in last 6 months ^{//}						
Heroin only (ref)	855 (24.1)	1.00	1682 (30.6)	1.00	1724 (22.8)	
Buprenorphine & other pharmaceuticals only	735 (20.7)	0.91 (0.69–1.19)	1143 (20.8)	0.77 (0.51–1.18)	1789 (23.6)	
Other and combinations of drugs	1404 (39.6)	1.53 (1.18–1.99)	1819 (33.1)	1.37 (1.02–1.83)	2755 (36.4)	
Needle sharing						
Never (ref)	2239 (63.1)	1.00	3114 (56.6)	1.00	4607 (60.8)	
At most recent use	81 (2.3)	1.00 (0.82–1.21)	141 (2.6)	1.34 (1.09–1.64)	147 (1.9)	
Before last use	1219 (34.4)	0.83 (0.52–1.33)	2233 (40.6)	1.31 (1.02–1.68)	2818 (37.2)	

^{*} All site-level characteristics weighted using RDS-II weights

[†] Individuals who had ever accessed NSEP but not in the last year (N=138) or who had ever accessed OAT but not in the last year (N=185) are not included.

[‡] Those not considered married or cohabitating were those reporting that they were widowed, divorced, never married, or who did not live with their long-term partner.

[§] Hazardous use defined by score 8 on Alcohol Use Disorder Identification Test (AUDIT) and dependence defined by AUDIT score 15–19.

^{//} Each category refers to exclusive use of listed drugs in the past 6 months. Other drugs included cocaine, crack, stimulants (e.g. methamphetamine), allergy medicine or antihistamines, and any others without a pre-specified category. Those who listed more than one kind of drug in the past 6 months were considered to inject a combination of drugs. This subcategory was restricted to the 11,388 HIV negative PWID who reported any injection drug use within the past 6 months

OR: odds ratio; CI: confidence interval; ref: referent

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The following variables were missing data for the indicated numbers of respondents: marital status (N=1); sex (N=1); alcohol use (N=1); age at first injection (N=57 including 24 who reported ages greater than current age).

Table 3.

Demographic and behavioral characteristics of the 712 ART-eligible HIV positive participants stratified by ART initiation. Univariable odds ratios assess association between participant characteristics and odds of having ever initiated ART, versus never having initiated ART.

	Untreated (N=300) N (%) [*]	Treated (N=412) N (%) [*]	OR (95% CI)
Ever accessed needle and syringe exchange			
Never (ref)	134 (44.6)	246 (59.7)	1.00
Ever	166 (55.4)	166 (40.3)	0.61 (0.38–0.98)
Ever accessed opioid agonist therapy			
Never (ref)	194 (64.7)	295 (71.6)	1.00
Ever	106 (35.3)	117 (28.4)	0.75 (0.45–1.27)
Age (years)			
Over 30 (ref)	170 (56.7)	322 (78.2)	1.00
30 or under	130 (43.3)	90 (21.8)	0.35 (0.22–0.57)
Male	237 (79.1)	296 (71.8)	0.66 (0.38–1.15)
Education			
Primary school or less (ref)	72 (24)	122 (29.6)	1.00
Secondary school	211 (70.2)	271 (65.7)	0.81 (0.56–1.17)
High school and above	17 (5.7)	19 (4.5)	0.63 (0.23–1.75)
Monthly income rupees			
Over 6000 (ref)	105 (35.2)	98 (23.8)	1.00
6000 or less	195 (64.8)	314 (76.2)	2.16 (1.48–3.14)
Currently married or cohabitating [†]	144 (47.8)	231 (56.2)	1.23 (0.80–1.88)
Age at first injection, years (years)			
Over 20 (ref)	124 (41.3)	221 (53.7)	1.00
20 or younger	176 (58.6)	190 (46.2)	0.73 (0.45–1.19)
Injection frequency in last 6 months			
None (ref)	73 (24.3)	148 (35.8)	1.00
Daily	90 (29.9)	125 (30.2)	0.49 (0.2–1.22)
Less than daily	137 (45.8)	140 (33.9)	0.74 (0.27–1.99)
Alcohol use [‡]			
None/non-hazardous use (ref)	218 (72.7)	302 (73.3)	1.00
Hazardous use	50 (16.8)	55 (13.4)	0.81 (0.48–1.39)
Dependence	31 (10.4)	55 (13.3)	1.55 (0.88–2.75)
Unprotected heterosexual sex in the past 6 months	168 (56.1)	216 (52.4)	0.92 (0.71–1.19)
Drugs injected in last 6 months [§]			
Heroin only (ref)	105 (35.2)	157 (38)	1.00
Buprenorphine & other pharmaceuticals only	47 (15.5)	54 (13)	0.89 (0.39–2.08)
Other and combinations of drugs	37 (12.2)	65 (15.8)	0.51 (0.27–0.94)

	Untreated (N=300) N (%) [*]	Treated (N=412) N (%) [*]	OR (95% CI)
Needle sharing			
Never (ref)	52 (17.3)	134 (32.6)	1.00
At most recent use	245 (81.6)	272 (66)	0.41 (0.2–0.85)
Before last use	3 (1.1)	6 (1.4)	0.69 (0.2–2.41)

^{*} All site-level characteristics weighted using RDS-II weights

[†] Those not considered married or cohabitating were those reporting that they were widowed, divorced, never married, or who did not live with their long-term partner.

[‡] Hazardous use defined by score ≥ 8 on Alcohol Use Disorder Identification Test (AUDIT) and dependence defined by AUDIT score ≥ 15.¹⁹

[§] Each category refers to exclusive use of listed drugs in the past 6 months. Other drugs included cocaine, crack, stimulants (e.g. methamphetamine), allergy medicine or antihistamines, and any others without a pre-specified category. Those who listed more than one kind of drug in the past 6 months were considered to inject a combination of drugs. This subcategory was restricted to the 11,388 HIV negative PWID who reported any injection drug use within the past 6 months

OR: odds ratio; CI: confidence interval; ref: referent