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Research paper

HIV and hepatitis C prevalence, and related risk behaviours among people who inject drugs in three cities in Croatia: Findings from respondent-driven sampling surveys

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ABSTRACT

Background: There are limited data on HIV and hepatitis C virus (HCV) epidemiology among people who inject drugs (PWID) in Croatia. This study aims to provide data on HIV and HCV prevalence and sexual and injecting risk behaviours among PWID in Zagreb, Split, and Rijeka.

Methods: Using respondent-driven sampling (RDS) we recruited from November 2014 to February 2015 a total of 176 PWID in Zagreb, 255 in Rijeka and 399 in Split. Participants provided biological specimens for HIV and HCV testing and completed a behavioural questionnaire.

Results: The proportion of female PWID ranged from 19.5% in Zagreb to 26.0% in Split. In the month before the survey, 2.5% of PWID in Split, 5.6% in Rijeka and 8.0% in Zagreb reported sharing non-sterile needles and syringes. Many PWID injected opioid substitution therapy (OST) in the month before the survey (57.0% in Zagreb and 57.5% in Split and Rijeka, respectively). Among PWID who had a casual sexual partner in the past 12 months (ranging from 39.2% in Split to 44.4% in Rijeka) condom use was low. Although HIV prevalence was low (0.2% in Rijeka and Zagreb, 0.3% in Split), HCV antibody prevalence was considerable (29.1% in Zagreb, 31.5% in Rijeka, 38.3% in Split). HIV and HCV testing coverage in the past 12 months was insufficient (6.8% and 7.0% in Split; 13.2% and 13.5% in Zagreb; 20.2% and 21.5% in Rijeka, respectively).

Conclusion: We found a low-level HIV epidemic and a sizable HCV epidemic among PWID in Zagreb, Split and Rijeka. Presence of high-risk injecting and sexual behaviours together with inadequate HIV and HCV testing coverage call for development of a comprehensive approach to harm reduction and introduction of needle and syringe exchange programmes in prisons, as well as strengthening sexual health interventions.

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Introduction

Drug injecting practices using non-sterile injecting equipment are a well-known risk factor for acquiring numerous blood born viral and bacterial infections (MacArthur et al., 2014). However, representative data on the spread of Human immunodeficiency virus (HIV), hepatitis C virus (HCV) and other blood borne

infections among people who inject drugs (PWID) are difficult to obtain, mainly due to the fact that drug use is criminalized in most countries of the world.

Estimations of the size of the population of problematic drug users (defined as injecting drug use or regular and/or long-term use of opiates, cocaine and/or amphetamines) (PDU) (European Monitoring Centre for Drugs and Drug Addiction, 2013) and PWID were done in Croatia in 2006 and 2012 using the multiplier method. In 2006, it was found that there might be 1370 (95% CI 760–3423) PWID in Rijeka, 2805 (95% CI: 1515–9313) in Zagreb and 3347 (95% CI 1320–16,716) in Split (Kolaric, Stajduhar, Gajnik,

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Rukavina, & Wiessing, 2010) while in 2012 it was estimated that 10,012 (95% CI 7842–13,723) PDU lived in the entire Croatia (OCDAGRC, 2013).

Needle and syringe exchange programmes (NSEP) for PWID were established in Croatia in 1996. They are run by non-governmental organizations (NGOs), and are currently available at 102 locations. NSEP also provide free condoms and voluntary, anonymous and free-of-charge counselling and testing for HIV, HCV and other blood-borne infections (European Monitoring Centre for Drugs and Drug Addiction, 2015b). Needles and syringes can be bought at pharmacies at a price of 0.2 USD per needle with a syringe. NSEPs are not available in prisons.

Free-of-charge methadone treatment for those insured by the Croatian Health Insurance Fund was introduced in Croatia in 1991, while the treatment with buprenorphine was introduced in 2004. In 2009, a combination of buprenorphine and naloxone (Suboxone[®]) was approved as an alternative substitution substance. Opioid substitution therapy (OST) is predominantly administered by general practitioners and is available in prisons as well. In 2014, a total of 5067 clients were receiving OST out of which 51.4% were taking buprenorphine (Croatian Institute of Public Health, 2015b).

The highest HIV prevalence of 2.8% and 4.5% in key populations for HIV assessed in integrated bio-behavioural surveys (IBBS) in Croatia was found among men who have sex with men (MSM) in 2010 (Bozicevic et al., 2012) and 2006 (Bozicevic et al., 2009), respectively. In 2007, a study based on the snowball sampling among PWID recorded HCV antibody prevalence of 29% in Rijeka, 51% in Zagreb and 65% in Split (Kolaric et al., 2010). No HIV cases were found in this study. Since beginning of reporting until end of 2014, 1208 HIV cases were reported in Croatia and 5.9% of these were reported as being due to injecting drug use. Among 92 persons newly diagnosed with HIV in 2014 there were no cases attributed to injecting drug use (Croatian Institute of Public Health, 2015a).

The aim of this paper is to describe the results of the first IBBS using respondent-driven sampling (RDS) among PWID in Split, Rijeka and Zagreb and to assess correlates of never being tested for HIV and HCV in Split and Rijeka.

Methods

Participants and procedures

We used RDS, a chain referral sampling method that collects data on social network sizes and recruitment patterns (Heckathorn, 1997, 2002) and is widely used to sample hard-to-reach populations at risk for HIV (Malekinejad et al., 2008; White et al., 2015), to recruit PWID in the cities of Zagreb, Split and Rijeka. To be eligible for the study, participants needed to be 18 years of age or older, injected drugs for non-medical reasons in a month prior to enrolment into the study (every participant had to show injecting scars), be living in the city where the survey was carried out for more than 12 months prior to study start, and be capable of understanding and accepting the informed consent. All participant information was anonymous and confidential. The sample size was set at 400 for both Split and Zagreb and at 350 study participants for Rijeka.

In Split and Rijeka data collection sites were located in the premises of NGOs that provide NSEP through “drop-in” centers to PWID, whereas in Zagreb the study site was located at the HIV Voluntary Counseling and Testing (VCT) Centre at the University Hospital for Infectious Diseases (UHID). Site staff was either employees of the NGOs or health professionals experienced in working with PWID, who were also trained in RDS methodology prior to the implementation of the study.

Recruitment in Rijeka started with six initial respondents (seeds) while in Split and Zagreb it started with nine and 10 seeds, respectively. Due to either slow recruitment rates or in order to replace non-productive seeds two additional seeds were introduced in Split, five in Rijeka and nine in Zagreb. Participants received a primary incentive (15 USD supermarket coupon) and up to three coupons for recruiting their peers into the study. For each successful referral, participants received a secondary incentive (8 USD supermarket coupon).

Participants provided informed consent before participating and were screened for eligibility. Upon inclusion, they received pre-test counseling and provided biological specimens for HIV and HCV testing. After testing, participants completed a behavioral questionnaire together with the interviewer. Post-test counseling was provided to all those who collected their results. Those with positive test results were referred to further care. To ensure confidentiality, participant’s coupons, questionnaires, specimens, and test results were coded using a unique study identification number. Ethical Approval was granted by the Ethical Board of the University of Zagreb, the Ethical Board of UHID and the Ethical Board of Croatian National Institute of Public Health.

Survey data collection and procedures

We designed an interviewer-administered questionnaire based on the European Monitoring Centre for Drugs and Drug Abuse (EMCDDA) protocol (European Monitoring Centre for Drugs and Drug Abuse, 2014). The questionnaire included questions regarding socio-demographic characteristics, social network sizes, imprisonment, knowledge about HIV and HCV, drug use, overdose history, using and sharing of injecting equipment, sexual behaviors, HIV and HCV testing history and tobacco smoking habits.

Laboratory tests

In Zagreb and Rijeka participants gave a sample of oral fluid and were tested using rapid tests for HIV (OraQuick ADVANCE[®] Rapid HIV-1/2 Antibody Test, OraSure Technologies, USA) and HCV antibodies (OraQuick[®] HCV Rapid Antibody Test, OraSure Technologies, USA). In Split, participants gave a venous blood sample which was tested for HIV (Vidas[®] HIV duo quick, BioMérieux, France) and HCV antibodies (Enzygnost anti-HCV 4,0[®], Siemens, Germany) with enzyme immunoassays (EIA) at the Split-Dalmatia County Institute of Public Health. Samples reactive for HIV were confirmed with line immunoassay for HIV (INNO-LIA[™] HIV I/II Score[®], Innogenetics N.V., Belgium) at the Department of Virology, UHID in Zagreb.

Statistical analysis

The sample and estimated population proportions with 95% confidence intervals were calculated using RDS Analyst software version 0.51 (Handcock, Fellows, & Gile, 2014). In the analysis we used the Gile’s SS (sequential sampler) estimator that is based on the inclusion probabilities that are calculated using participants self-reported network sizes, recruitment patterns and estimated population size (Gile, 2011). Initial respondents (seeds) were included in the analysis. Homophily, convergence/equilibrium and bottlenecks were analyzed for key indicators (age, HCV status, receiving free needles or syringes in a month prior to the survey, using a non-sterile needle or syringe at last injection, using a condom at last sex, testing for HIV within 12 months prior to the survey and knowledge about HIV transmission) (Gile, Johnston, & Salganik, 2015). To calculate population estimates in the RDS

Analyst we used available population size estimates of PWID in each city (Kolaric et al., 2010).

We used Stata's 13.1 facilities for survey data analysis with weights generated by RDS Analyst 0.51 to conduct bivariable and multivariable logistic regression analysis to determine correlates associated with never being tested for HIV and HCV (Heckathorn, 2007; StataCorp., 2013). Independent variables used in the model included socio-demographic factors, access to harm reduction services and indicators of high-risk sexual and injecting practices. Factors associated with the outcome at $p < 0.2$ in the bivariable analysis, as well as age and gender were included in the final logistic regression model. The cut-off for considering a result to be statistically significant in the multivariable analysis was set up at $p = 0.05$. Regression models excluded participants with missing values on any variable in the model. The logistic regression analysis was not carried out for Zagreb due to the small sample size reached and because convergence was not reached on all key indicators.

Results

Recruitment patterns

Data collection lasted from November 2014 to February 2015. In total, 830 PWID were enrolled in the study – 399 in Split, 255 in Rijeka and 176 in Zagreb. A sample size determined prior to the beginning of the surveys was reached only in Split. In Zagreb and Rijeka, only 44.0% and 72.9%, respectively, of the planned sample size was reached. The maximum chain length ranged from 11 in Zagreb to 16 in Rijeka. Proportion of the coupons returned to the study site ranged from 34.1% in Rijeka to 48.8% in Split. Convergence was reached on all seven key indicators in Rijeka and Split, while in Zagreb four out of seven indicators converged.

Socio-demographic characteristics

The estimated median age of PWID was 33 in Zagreb, 34 years in Rijeka and 37 in Split. The highest proportion of females was

found in Split (26.0%) (see supplementary material Table 1a). The highest educational attainment for the majority of PWID was a completed high school. The median monthly income ranged from 119.4–238.8 USD across the cities and current employment from 18.0% in Split to 38.3% in Zagreb. The proportion of PWID who reported ever been imprisoned ranged from 44.4% to 50.3%.

Drug using behaviors

The median of the first injection drug use was 18 years in Split, 19 in Rijeka and 20 in Zagreb. The most commonly injected drug in the month before the survey in Split and Rijeka was heroin (50.8% and 40.4%, respectively), while in Zagreb it was methadone (48.0%) (Table 1). In the month prior to the survey methadone and/or buprenorphine were injected by 57.5% of PWID in Rijeka and Split, and 57.0% in Zagreb. A sizable proportion of PWID injected stimulant drugs (amphetamines, methamphetamines or cocaine) in the month prior to the survey (9.9% in Rijeka, 11.0% in Zagreb and 16.5% in Split).

The reported frequency of injecting in the past month was considerably higher in Split (76.6% injected for more than 21 days in a month) compared to Zagreb and Rijeka (13.4% and 14.6% injected for more than 21 days in a month, respectively). Sharing of needles and syringes in a month before the survey with another person was reported by 2.5% of PWID in Split, 5.6% in Rijeka and 8.0% in Zagreb while 1.0%, 8.7% and 17.0%, respectively, shared non-sterile injecting equipment such as cooker, cotton, water or acid with another person in the same time-period. Among those ever imprisoned, a substantial number injected drugs while in prison (from 11.1% in Zagreb to 22.2% in Split) and the use of non-sterile needles and syringes in a prison setting was commonly reported (from 61.5% in Zagreb to 81.1% in Rijeka).

Between one third of PWID in Zagreb and nearly one-half in Split ever experienced an episode of a drug overdose. Naloxone[®], an opioid antagonist medication used to counter the effects of opioid overdose, is still not widely available for PWID in Croatia and only three PWID in Rijeka and two in Zagreb reported using it

Table 1
Injecting behaviours and drug use among PWID in three Croatian cities, 2015.

	Split		Rijeka		Zagreb	
	n/N	% (95% CI) ^a	n/N	% (95% CI)	n/N	% (95% CI)
Age at first injection drug use						
≤17	161/399	38.2 (32.2, 44.0)	91/255	28.8 (21.0, 34.8)	56/176	25.3 (16.7, 33.4)
18–24	198/399	52.3 (46.6, 58.4)	119/255	49.0 (40.3, 57.4)	93/176	59.0 (48.9, 69.4)
≥25	40/399	9.5 (6.0, 12.9)	45/255	22.7 (15.3, 31.2)	27/176	15.7 (9.0, 22.5)
Type of drugs injected in the past month						
Heroin	182/398	50.8 (45.0, 57.4)	101/253	40.4 (31.6, 49.5)	60/176	40.1 (27.4, 53.0)
Methadone	192/398	45.0 (38.6, 50.8)	63/253	21.6 (14.2, 28.1)	90/176	48.0 (34.7, 61.0)
Buprenorphine	84/398	14.3 (9.9, 17.7)	97/253	38.3 (29.3, 47.3)	27/176	10.4 (3.7, 16.7)
Amphetamine/methamphetamine	26/398	8.8 (5.0, 13.0)	7/254	4.0 (2.9, 8.3)	4/176	1.3 (0.0, 2.5)
Cocaine	37/398	8.5 (5.2, 11.7)	21/253	5.9 (0.0, 9.0)	19/176	8.7 (3.0, 14.3)
Frequency of injecting during past month						
1–10 days	31/387	12.2 (6.1, 19.0)	177/254	75.8 (70.3, 82.9)	124/175	76.2 (67.0, 85.6)
11–20 days	64/387	11.2 (7.5, 14.1)	28/254	9.5 (5.2, 13.3)	24/175	10.4 (43.9, 16.3)
≥21 days	292/387	76.6 (69.6, 83.7)	49/254	14.6 (9.2, 19.1)	27/175	13.4 (56.9, 20.9)
Frequency of injecting (on days when injecting)						
1 time per day	156/376	44.5 (38.8, 50.7)	167/255	68.4 (61.1, 76.2)	100/174	63.6 (53.9, 73.6)
≥2 times per day	220/376	55.4 (49.2, 61.3)	88/255	31.7 (23.7, 39.0)	74/174	36.4 (26.3, 46.2)
Used sterile needle/syringe at last injection	393/395	99.7 (99.3, 100)	237/254	93.7 (90.5, 96.8)	167/176	95.1 (91.3, 98.9)
Used non-sterile needle/syringe in the past month	10/389	2.5 (0.9, 4.1)	62/254	24.3 (17.8, 30.9)	30/174	15.8 (7.9, 23.6)
Used non-sterile injection equipment ^b at last injection	8/391	1.8 (0.0, 3.5)	48/242	19.4 (12.2, 26.5)	36/159	17.7 (10.7, 24.2)
Ever injected drugs while in prison ^c	56/213	22.2 (15.9, 27.8)	22/122	17.0 (5.9, 27.7)	13/89	11.1 (4.0, 18.1)
Ever experienced drug overdose	184/397	44.1 (37.9, 50.1)	116/255	40.7 (31.7, 48.6)	73/174	33.4 (23.4, 42.9)

^a Weighted population estimates and confidence intervals (CI).

^b Cooker, cotton, water or acid.

^c Among those ever imprisoned.

the last time they saw someone overdosing on drugs, while in Split nobody reported using this medication.

Sexual behaviours

A majority of PWID – ranging from 64.4% in Split to 76.9% in Zagreb – had a steady sexual partner in the past 12 months (See supplementary material Table 2a). Sharing needles and syringes with a regular sex partner who injects drugs differed considerably among the cities – from approximately one out of ten PWID in Split to slightly over one-quarter in Zagreb. In the 12 months preceding the survey, a substantial proportion of PWID had casual sexual partners (from 39.2% in Split to 44.4% in Rijeka) and the majority reported more than one such partner. Condom use at last sex with casual partners was most frequently reported by PWID in Zagreb (60.9%). Commercial sex was relatively rare with the exception of Split where 22.8% of PWID reported paying for sex 12 months prior to the survey.

Enrollment in the harm reduction programmes

Although slightly over a half of PWID ever used NSEP in Zagreb (55.5%), use of NSEP was almost universal in Split (See supplementary material Table 3a). “Drop-in” and outreach NSEP were mentioned as the commonest source of sterile needles and syringes in the month prior to the survey by the majority of PWID in Split (94.8%) while this was the case with only 32.9% of PWID in Rijeka and 19.2% in Zagreb. Pharmacies seem to be the key source of needles and syringes in Rijeka and Zagreb. PWID from Rijeka and Zagreb reported obtaining the median of six (IQR 2–25) and 10 (IQR 3–30) needles and syringes in the month preceding the survey, respectively; while PWID in Split obtained a median of 40 (IQR 30–50).

More than one-half of PWID were ever included in any drug addiction treatment (from 55.5% in Zagreb to 76.9% in Rijeka). Among these, 49.6% of PWID in Rijeka and 30.9% in Zagreb were receiving OST at the time of the study. In contrast to Rijeka and Zagreb, that was the case with only 3.3% of PWID in Split where the majority of respondents (78.6%) were in treatment programmes run by therapeutic communities, which do not offer OST but rehabilitation through peer support and social programmes.

Prevalence of HIV infection and HCV antibody and testing history

HIV prevalence among PWID in all three cities was low – 0.2% (95% CI 0.0–0.6) in Zagreb, 0.2% (95% CI 0.0–0.2) in Rijeka and 0.3% (95% CI 0.0–0.7) in Split (Table 2). The prevalence of HCV antibody was, however, much higher – 29.1% (95% CI 18.4–39.6) in Zagreb, 31.5% (95% CI 22.4–40.1) in Rijeka and 38.3% (95% CI 31.4–44.3) in Split. HIV and HCV testing among PWID appears to be low. In the past 12 months HIV testing ranged from 6.8% in Split to 20.2% in Rijeka, while HCV testing from 7.0% to 21.5%, respectively.

Correlates of never being tested for HIV and HCV

The results of the multivariable analysis suggest that PWID in Split who were not currently on OST had 13.8 (95% CI 1.8–107.7) times higher odds of never being tested for HIV and 11.8 (95% CI 1.5–91.8) times higher odds of never being tested for HCV compared to those who were on OST at the time of the study (Tables 3 and 4). Similarly, PWID in Rijeka who were currently not on OST had 5.4 (95% CI 2.3–12.9) times higher odds of never being tested for HIV and 12.1 (95% CI 4.5–32.8) times higher odds of never being tested for HCV compared to those on OST. In Split, those younger than 35 years of age had higher odds of never being tested for HIV and HCV compared to those aged 35 and older. Also in Split, those who reported that the NSEP was not their main source for obtaining clean injecting equipment in past month had lower odds of never being tested for HIV and HCV compared to those whose main source for obtaining clean injecting equipment was NSEP.

Discussion

We found the HIV prevalence of 0.2% among PWID in Zagreb and Rijeka and 0.3% in Split, respectively, which is comparable to the other countries of Central and South Europe (such as Hungary, Slovakia, Czech Republic, Montenegro, Bosnia and Herzegovina, Macedonia, Albania) where injecting drug use is rarely reported as a mode of HIV transmission (Bozicevic, Handanagic, Lepej, & Begovac, 2013) and HIV prevalence in PWID is mainly below 1.0% (European Monitoring Centre for Drugs and Drug Addiction, 2015c; Jolley et al., 2012). Such findings are encouraging and suggest much lower HIV prevalence among PWID in Croatia compared to estimates of HIV prevalence of 30% among PWID in some of the Western European countries and 38% in some Eastern European countries (Uusküla et al., 2014).

Findings from our study demonstrate that the HCV epidemic is well-established among PWID in Croatia. This was expected due to the higher infectivity of HCV compared to HIV (Doerrbecker et al., 2013) and the practice of sharing non-sterile needles and syringes and other injecting equipment. When compared with the estimated prevalence of HCV antibodies among PWID in the EU countries in 2014 (ranging from 14% in Malta to 84% in Portugal) Croatia was still in the lowest third of this range (European Monitoring Centre for Drugs and Drug Addiction, 2015c). Despite this most probably low-level HIV epidemic among PWID in three largest cities in Croatia, the existent HCV epidemic indicates the need for better coverage with harm reduction programmes that would reduce high-risk injecting and sexual behaviours among PWID.

Our findings suggest that PWID in Croatia start injecting drugs when they are around 20 years of age. They therefore appear to start injecting drugs at a somewhat younger age than their counterparts in other EU countries, where the mean age at the first

Table 2
Prevalence of HIV, HCV antibody and testing for HIV and HCV among PWID in three Croatian cities, 2015.

	Split		Rijeka		Zagreb	
	n/N	% (95% CI) ^a	n/N	% (95% CI) ^a	n/N	% (95% CI) ^a
HIV infection	1/390	0.3 (0.0, 0.7)	2/254	0.2 (0.0, 0.2)	1/176	0.2 (0.0, 0.6)
Ever tested for HIV	261/398	58.2 (51.1, 64.4)	181/252	73.3 (65.2, 81.9)	100/173	50.0 (33.9, 64.4)
Tested for HIV in past 12 months and know the result ^b	24/395	6.8 (4.1, 9.7)	44/212	20.2 (11.8, 28.6)	33/168	13.2 (6.5, 19.4)
HCV antibody	173/387	38.3 (31.4, 44.3)	85/254	31.5 (22.4, 40.1)	55/176	29.1 (18.4, 39.6)
Ever tested for HCV	274/398	61.5 (54.3, 67.9)	196/250	78.0 (70.0, 86.0)	116/175	56.6 (39.4, 73.3)
Tested for HCV in past 12 months and know the result	24/390	7.0 (4.2, 9.9)	50/212	21.5 (12.2, 30.2)	35/163	13.5 (6.2, 20.2)

^a Weighted population estimates and confidence intervals (CI).

^b Respondents who knew they were HIV positive were excluded from the analysis.

Table 3

Factors associated with not being tested for HIV among PWID in Split and Rijeka: bivariable and multivariable logistic regression with unadjusted odds ratios (OR) and adjusted ORs (AOR) with confidence intervals (CI), weighted by degree and recruitment weights, 2015.

	Split			Rijeka		
	No. not tested/no. total	OR (CI 95%)	AOR ^a (CI 95%) N ^b = 314	OR (CI 95%)	AOR ^a (CI 95%) N ^b = 198	
Sex						
Male	99/304	1	1	48/184	1	1
Female	37/86	1.4 (0.8, 2.6)	1.4 (0.6, 3.1)	23/42	1.4 (0.7, 2.9)	1.0 (0.4, 2.4)
Age						
≥35	67/270	1	1	21/108	1	1
<34	67/125	4.2 (2.5, 7.1)	3.7 (2.1, 6.6)	50/143	1.8 (0.9, 3.8)	1.5 (0.6, 3.7)
Education						
Secondary school and higher	126/358	1		51/197	1	
Primary or less	11/38	1.2 (0.5, 2.7)	–	19/54	1.5 (0.7, 3.2)	
Currently employed						
No	113/333	1		51/195	1	
Yes	24/63	1.4 (0.8, 2.6)	–	20/57	1.4 (0.7, 3.0)	
Needle and syringe exchange programmes as main source for needles and syringes in past month						
Yes	112/320	1	1	12/74	1	1
Not	3/10	0.2 (0.0, 1.2)	0.2 (0.0, 0.8)	53/158	2.5 (0.9, 7.0)	2.2 (0.7, 6.9)
Currently on OST ^c						
Yes	1/18	1	1	17/130	1	1
No	130/370	15.1 (2.2, 104.7)	13.8 (1.8, 107.7)	53/110	6.0 (2.9, 12.6)	5.4 (2.3, 12.9)
Frequency of injecting drugs in days when injecting						
1	61/155	1		55/167	1	1
≥2	70/220	0.8 (0.5, 1.3)	–	16/85	0.6 (0.3, 1.2)	0.5 (0.2, 1.1)
Used non-sterile needle and syringes last month						
No	131/378	1		53/186	1	
Yes	4/10	0.9 (0.2, 3.5)	–	18/62	1.1 (0.5, 2.3)	–
Had casual sex partner in past 12 months						
No	65/203	1		42/123	1	1
Yes	48/135	1.3 (0.8, 2.1)	–	23/105	0.6 (0.3, 1.1)	0.4 (0.2, 1.1)
Used condom in last sex in past 12 months						
Yes	36/118	1		15/54	1	
No	73/208	1.4 (0.8, 2.4)	–	47/115	1.4 (0.6, 3.2)	–

^a Controlling for gender, age and variables associated with the outcome at $p < 0.2$ in the bivariable analysis.

^b Number of respondents included in the final model.

^c Opioid substitution treatment; – not significant in the bivariable analysis and therefore not included in the multivariable logistic regression model.

drug injection is 23 years ([European Monitoring Centre for Drugs and Drug Addiction, 2015c](#)).

Another important result relates to the frequently reported injection of methadone and buprenorphine. This finding is in concordance with data presented in the latest EMCDDA report, which raises concern regarding the increased use of opioids other than heroin in the EU countries ([European Monitoring Centre for Drugs and Drug Addiction, 2015c](#)). Considering that in the National Report on Persons Treated for Drug Abuse in 2014 fewer than 10% of entrants to drug treatment programmes in Croatia reported opioids other than heroin as their primary drug, there appears to either be a possible misreporting or an underestimation of the extent of misuse of OST in Croatia ([Croatian Institute of Public Health, 2015b](#); [European Monitoring Centre for Drugs and Drug Addiction, 2015c](#)). Additionally, according to the same report, only 7.0% of people treated in 2014 reported injecting drugs one month prior to visiting the OST treatment centre while our data suggest that a significant proportion of PWID in Rijeka and Zagreb are enrolled in OST but also regularly inject drugs ([Croatian Institute of Public Health, 2015b](#)).

Our results are showing that slightly over a half of PWID in Split injected drugs more than twice a day on the days they injected, which could in part be explained by concurrent use of several substances, including the frequently mentioned injection of non-opioids—i.e., cocaine, amphetamines and methamphetamines. The vast majority of PWID in all three cities reported using a sterile needle and syringe at last injection, which is higher compared to the estimates for the majority of the Western Balkan countries ([European Monitoring Centre for Drugs and Drug Addiction, 2015a](#)). Nevertheless, still a sizeable proportion of PWID from Zagreb and Rijeka used non-sterile needles and syringes and other injecting equipment in the month prior to the survey. However,

sharing of needles and syringes and other injecting equipment varied significantly between the cities and it was less frequent when compared with the sharing practices among PWID from Western Balkan ([European Monitoring Centre for Drugs and Drug Addiction, 2015a](#)) or East and West European countries ([Hope et al., 2014](#); [Uusküla et al., 2014](#)).

We found a wide variation in utilization of NSEP and OST across the cities despite the fact that they have been available in Croatia since 1990s ([European Monitoring Centre for Drugs and Drug Addiction, 2015b](#)). Although it is encouraging that PWID buy needles and syringes at low prices in pharmacies, our results indicate the need to strengthen the outreach of NSEP in Rijeka and Zagreb and to re-establish OST in Split. Another important finding is that the majority of PWID who ever injected while in prison reported sharing of needles and syringes while incarcerated. This poses a significant risk to a wider spread of parenterally transmitted infections in prisons and in communities during the post-release period and calls for strengthening HIV interventions in a prison setting that should include a strong linkage to services to newly released prisoners ([Dolan et al., 2015](#); [Gough et al., 2010](#); [Jürgens, Nowak, & Day, 2011](#)).

Our results, in particular those reported from Split, seem to support the increasing concern regarding the association between sexual and drug-related risk behaviours ([European Monitoring Centre for Drugs and Drug Addiction, 2015c](#); [Rhodes et al., 2006](#)). Casual sexual partners were frequently reported in all three cities and condom use at last sex in these partnerships was low. Other studies have shown that PWID are unlikely to use condoms with non-regular partners and have multiple partners simultaneously or within short time-periods ([Chikovani, Gogvadze, Bozicevic, Rukhadze, & Gotsadze, 2013](#); [Gyarmathy et al., 2011](#)). We found somewhat less favourable patterns of sexual behaviours in Split

Table 4
Factors associated with not being tested for HCV among PWID: bivariable and multivariable logistic regression with odds ratios (OR) and adjusted ORs (AOR) with confidence intervals (CI), weighted by degree and recruitment weights, 2015.

	Split			Rijeka		
	No. not tested/no. total	OR (CI 95%)	AOR ^a (CI 95%) N ^b = 314	OR (CI 95%)	AOR ^a (CI 95%) N ^b = 216	
Sex						
Male	93/304	1	1	34/183	1	
Female	30/86	1.1 (0.6, 2.2)	1.3 (0.5, 3.0)	20/64	1.6 (0.8, 3.5)	
Age						
≥35	57/269	1	1	20/108	1	
<34	64/126	4.8 (2.8, 8.2)	3.8 (2.1, 6.9)	34/141	1.1 (0.5, 2.4)	
Education						
Secondary school and higher	114/358	1		13/54	1	
Primary or less	10/38	1.3 (0.6, 2.9)	–	41/195	1.0 (0.5, 2.4)	
Currently employed						
No	104/333	1		40/196	1	
Yes	20/63	1.2 (0.7, 2.4)	–	14/54	1.3 (0.6, 2.9)	
Needle and syringe exchange programmes as main source for needles and syringes in past month						
Yes	103/320	1	1	4/74	1	
Not	3/10	0.3 (0.1, 1.3)	0.2 (0.0, 0.9)	43/156	3.4 (0.8, 15.6)	
Currently on OST ^c						
Yes	1/18	1	1	7/130	1	
No	119/370	13.3 (1.9, 92.4)	11.8 (1.5, 91.8)	47/107	14.1 (5.6, 35.7)	
Frequency of injecting drugs on days when injecting						
1	57/156	1		41/163	1	
≥2	61/220	0.8 (0.5, 1.3)	–	13/87	0.6 (0.3, 1.4)	
Used non-sterile needle and syringes in last month						
No	118/378	1		44/184	1	
Yes	4/10	1.1 (0.3, 4.1)	–	10/62	0.6 (0.3, 1.4)	
Had casual sex partner in past 12 months						
No	60/204	1		28/121	1	
Yes	44/135	1.3 (0.7, 2.2)	–	22/105	1.0 (0.5, 2.1)	
Used condom in last sex in past 12 months						
Yes	33/118	1		10/53	1	
No	67/209	1.3 (0.7, 2.3)	–	38/162	1.6 (0.7, 4.0)	

^a Controlling for gender, age and variables associated with the outcome at $p < 0.2$ in the bivariable analysis.

^b Number of respondents included in the final model.

^c Opioid substitution treatment; – not significant in the bivariable analysis and therefore not included in the multivariable logistic regression model.

where approximately one in five PWID reported paying for sex in the 12 months prior to the survey. Additionally, a considerable proportion of PWID in Split inject stimulant drugs and several studies (Booth et al., 2008; Evans et al., 2003) showed that injecting amphetamines and cocaine is associated with risky sexual behaviours and transmission of sexually transmitted infections.

There are several findings that demonstrate current gaps in HIV and HCV prevention that are important for further development of interventions for prevention of these infections in PWID in Croatia. HIV and HCV testing coverage should be considerably increased by enabling testing in the community settings at the NGO premises and by strengthening provider-initiated testing particularly at the facilities where PWID access OST and NSEP. Results of multivariable analysis showed no clear correlation of high-risk sexual and injecting behaviours with testing for HIV and HCV. Therefore, certain groups at risk—for example, PWID who inject drugs more frequently, use non-sterile needles and syringes, have casual sex partners and do not use condoms regularly—should be specifically targeted with interventions. There is a need to ensure better access to drug dependence treatment, particularly in Split, as it is highly effective in reducing high-risk injecting behaviours and HIV and HCV transmission (MacArthur et al., 2014).

To succeed in reaching PWID, efforts should be made to integrate services and offer a comprehensive package of interventions at points where they seek health care such as OST centres. The role of pharmacies in HIV and HCV interventions should also be considered as they are reportedly a major source of needles and syringes for PWID in Zagreb and Rijeka. It has been shown that the ability to purchase sterile injecting equipment at pharmacies can reduce frequency of high-risk injecting behaviours (Jones, Pickering, Sumnall, McVeigh, & Bellis, 2010; MacArthur et al., 2014).

Study limitations

Several study limitations need to be mentioned. Most importantly, target sample sizes were not reached in Zagreb and Rijeka. Furthermore, considering that the RDS Analyst diagnostics analysis indicated that the population estimates were not stabilized for the sample in Zagreb, while the sample in Split seems to have consisted predominantly of clients of the NGO that provided its premises for the survey, the generalization of our findings to the population of PWID living in these two cities should be done with caution. Due to the fact that survey sites in Rijeka and in Split were open only during the morning and early afternoon, we may have oversampled PWID who are unemployed. Additionally, it is possible that due to the incentive offered, poorer PWID were more likely to participate in the study. It is also possible that the reporting bias influenced participants' reporting of their network sizes, which are used to calculate the sampling weights, and that the social desirability and recall bias influenced reporting of sexual and drug using behaviours.

Conclusion

Key findings of this study point to a low-level HIV epidemic, a sizable HCV epidemic and low recent testing rate for HIV and HCV among PWID across three largest cities in Croatia. Development of a more comprehensive approach to harm reduction in PWID should enable better coverage with NSEP, OST, HIV and HCV testing services, prevention of overdose and reduction of injecting behaviours among those on OST. There is an urgent need to enable NSEP in prisons and strengthen the access to both OST and NSEP services for PWID in the post-release period. Additional

efforts should be also put on strengthening sexual health interventions due to presence of high-risk sexual behaviours.

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Contributors

All authors participated in the planning and conception of the research questions and the study design. SH, IB, MC, ZD and JBg conceptualised the study design and coordinated the study implementation. ODR did the laboratory analysis of the samples. SH, SS, ZD and JB were responsible for analysing the data. SH drafted the article, and all authors participated in interpreting the data and critically revising the manuscript. All authors read and approved the revised manuscript.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.drugpo.2016.04.007>.

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