

Research paper

Intimate partner violence and receptive syringe sharing among women who inject drugs in Indonesia: A respondent-driven sampling study

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ABSTRACT

Background: Intimate partner violence (IPV) and HIV are overlapping public health problems that disproportionately affect women who inject drugs. Little is known about the relationship between IPV and HIV-related unsafe injecting practices among women in low- and middle-income settings. This study investigated whether IPV victimisation was associated with receptive syringe sharing among women who inject drugs in Indonesia.

Methods: Respondent-driven sampling (RDS) was used to recruit 731 women aged 18+ years, injecting drugs in the preceding 12 months, and residing in Greater Jakarta or Bandung, West Java. Population estimates were derived using the RDS-II estimator. Multivariate logistic regressions assessed relationships between different forms of past-year IPV (i.e. psychological abuse, physical and/or injurious assault, forced sex) and receptive syringe sharing, controlling for city differences and sociodemographic cofactors.

Results: Overall, 21.1% of participants reported engaging in past-month receptive syringe sharing. In multivariate analyses controlling for all forms of IPV, receptive syringe sharing was significantly positively associated with experiencing psychological abuse (OR = 1.86; 95% CI = 1.06,3.24; p = 0.030), physical and/or injurious assault (OR = 1.73; 95% CI = 1.04,2.89; p = 0.034), and several covariates: injecting pharmaceuticals only (versus heroin only) (OR = 3.58; 95% CI = 1.66,7.69; p = 0.001), experiencing unstable housing and/or homelessness (OR = 2.89; 95% CI = 1.41,5.95; p = 0.004), and residing in Bandung, West Java (versus Greater Jakarta) (OR = 2.33; 95% CI = 1.40,3.90; p = 0.001).

Conclusion: IPV is a significant risk factor for HIV-related injecting risk among women who inject drugs in Indonesia. These findings indicate the urgent need to scale up harm reduction interventions and align existing programs with IPV prevention and support services, with specific efforts targeting the needs of female injectors.

Introduction

Unsafe injecting drug use is a major driver of the global HIV epidemic, accounting for 20% of new HIV infections outside of sub-Saharan Africa (UNAIDS, 2017a). Systematic review evidence suggests that women who inject drugs bear a disproportionate burden of HIV infections compared to male injectors in numerous settings (Des Jarlais, Feelemyer, Modi, Arasteh, & Hagan, 2012). Yet, until recently, women who inject drugs have remained largely unrecognised in research and

intervention development (El-Bassel & Strathdee, 2015).

Approximately 3–5 million people who inject drugs reside in East and South East Asia (Degenhardt et al., 2017). The region is also home to the largest absolute number of women who inject drugs (828,000, range 578,000–1,119,000), accounting for over 25% of the global female injecting drug user population (Degenhardt et al., 2017). Regional HIV prevalence among people who inject drugs is 15.2% (range 9.9%–20.4%), and HIV incidence in this population is increasing (Stone, 2016). Among national samples of women who inject drugs,

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HIV rates range from 6.4% in China to approximately 30% in Malaysia, Philippines and Thailand (Larney et al., 2015).

Indonesia is faced with an expanding HIV epidemic concentrated among key affected populations (UNAIDS, 2017b). People who inject drugs bear a disproportionate burden of HIV, which affects more than 50% of injectors in the capital, Jakarta (UNAIDS, 2014). Although national-level HIV prevalence rates are not sex-disaggregated, qualitative research suggests that HIV-related risk behaviours among women who inject drugs are widespread (Habsari, Rahardjo, Rahmah, & Handoyo, 2007; Indonesian National AIDS Commission, 2014; Sari & Nurmaya, 2009; Spooner et al., 2010). According to national harm reduction program data, 22% of women and 7% of men who inject drugs and live with HIV reported sharing needles and syringes in the preceding week, despite accessing harm reduction services during that period (Blogg, 2012). To develop a commensurate HIV response and optimise existing harm reduction services, it is vital to identify the factors driving HIV-related injection risk in this under-researched population.

Studies conducted with women who inject drugs in high-income countries suggest that one such factor may be intimate partner violence (IPV) (Gilbert et al., 2015). Indeed, extensive research to date has offered insight into how IPV contributes to elevated sexual HIV risks among drug-using women in North America (Braitstein et al., 2003; Strathdee et al., 1997; Wagner et al., 2009). Such risks include engaging in unprotected vaginal and anal sex, contracting sexually transmitted infections, having multiple partners, and trading sex for money, drugs, and shelter (El-Bassel, Gilbert, Wu, Go, & Hill, 2005, 2007). However, fewer studies have explored the relationship between IPV and risks associated with unsafe injecting drug use, and those that have are largely conducted in North America (Lorvick, Martinez, Gee, & Kral, 2006; Strathdee et al., 1997; Wagner et al., 2009). Evidence from multiple settings indicates that women are more likely to share injecting equipment than men (Roberts, Mathers, & Degenhardt, 2010; Sherman, Latkin, & Gielen, 2009; Strathdee et al., 1997). Moreover, women are more likely to engage in unsafe injecting practices within sexual relationships with other persons who inject drugs than in other social relationships (Bruneau et al., 2001; Cleland et al., 2007; Davies, Dominy, Peters, & Richardson, 1996; Hunter, Donoghoe, Stimson, Rhodes, & Chalmers, 1995). Several studies, all conducted in the U.S., have established a significant association between IPV and needle/syringe sharing and borrowing (Braitstein et al., 2003; Strathdee et al., 1997; Wagner et al., 2009). Specifically, IPV can elevate women's HIV risk by establishing a dynamic of control, fear and submission that inhibits the ability to negotiate safe behaviours (Maman, Campbell, Sweat, & Gielen, 2000). However, existing research remains limited. Among studies that have addressed this topic, the majority assessed lifetime history of sexual violence, including childhood abuse. Thus far, such research has not accounted for recent IPV or for the independent effects of different dimensions of IPV (e.g., psychological, physical, and sexual) on unsafe injecting practices. Moreover, existing research largely focuses on women in drug treatment or other health care settings, thus producing findings that may not be generalisable to community samples of women who inject drugs. Finally, existing studies addressing the links between IPV and HIV risk remain geographically limited to high-income regions, particularly North America (Gilbert et al., 2015). There is an urgent need to explore the effects of different dimensions of IPV on unsafe injecting behaviours in this vulnerable key population in Asia.

Understanding the interplay between IPV and HIV-related injection risk behaviours is crucial for informing interventions that address HIV vulnerability among women who use drugs in the region. This study aims to address this essential research gap by investigating whether different forms of IPV – psychological abuse, physical and/or injurious assault, and forced sex (rape) – are associated with unsafe injecting practices (i.e. receptive syringe sharing) in a community sample of women who inject drugs in Indonesia.

Methods

Study design and population

This study combined in-depth formative research with results from a quantitative survey based on a respondent-driven sample. Formative research conducted prior to the quantitative study comprised of four focus group discussions with members of the target population ($n = 39$) and key informant interviews with policy-makers, service providers, and community-based organisations in the substance use and HIV sectors. In addition to gathering information on the social networks of injection-drug using women, formative research also helped identify sub-populations of interest to guide the selection of initial recruits, inform the study instrument, and determine appropriate incentives.

The community of women who inject drugs was actively engaged throughout the development, implementation, and dissemination of this project. To ensure that all study procedures were sensitive to the needs of the community, three consultations with key population networks and community-based organisations were convened. A community advisory group comprised of women with an injecting drug use background was established to advise the research team throughout study implementation. Furthermore, a community consultation convened post-data collection guided the interpretation of findings and the formulation of a dissemination plan.

Between September 2014 and June 2015, 731 women were recruited from two sites in Indonesia: 1) Greater Jakarta, an administrative region with over 30 million inhabitants that includes Indonesia's capital Jakarta and adjacent metropolitan areas Bogor, Depok, Tangerang and Bekasi; and 2) Bandung, the provincial capital of West Java, and home to 8 million people. Study sites were selected with reference to their sizeable populations of people who inject drugs, and the substantial HIV burden shouldered by this group (Ministry of Health, 2012).

Women were eligible for the study if they were 18 years of age or older, injected any illegal or illicit drugs within the past 12 months, reported living in one of the study catchment areas, had a valid referral from an existing study participant, and were willing and able to provide informed consent.

Respondent-driven sampling (RDS) was used to recruit participants. RDS is an established, modified chain-referral method that employs statistical weighting to produce less biased estimates (Heckathorn, 1997). Conducting research with “hidden” or hard-to-reach groups such as people who inject drugs is often problematic because there may not be an adequate sampling frame (McCreech et al., 2012). Since injecting drug use is a highly stigmatised activity and an illegal act with harsh penalties in Indonesia (Lai, Asmin, & Birgin, 2013), reaching women who use drugs is challenging. Relative to men who inject drugs, women are more stigmatised and discriminated against by health services, the general community, peers, and family, which drives them to restrict their contact with service providers (Spooner et al., 2015). RDS addresses this challenge by facilitating access to hard-to-reach, networked groups via peer-to-peer referral (Johnston, Sabin, Mai, & Pham, 2006; Kendall et al., 2008). RDS analytic methods produce more representative samples than commonly used snowballing techniques by reducing biases that result from network-based sampling via adjustment for differentials in network size and rates of recruitment across groups (Heckathorn, 2002; Salganik & Heckathorn, 2004).

To commence recruitment, a diverse group of 20 seeds – heterogeneous by geography, age, socio-economic status, known HIV status, and levels of risk behaviour – was selected with guidance from the formative assessment and the community advisory group. A greater number of seeds was selected in Jakarta given its substantially larger geographical catchment area and number of inhabitants compared to Bandung. Initial recruits were asked to refer up to three eligible peers to the study, who, in turn, enlisted the next wave of participants. Recruitment continued in sequential waves until the desired sample size

was attained. Assuming a 36% HIV prevalence (Indonesian National AIDS Commission, 2012), and a design effect of 2 (Salganik, 2006), the study required a minimum sample size of 709 for estimating the expected proportion with 5% absolute precision and 95% confidence level.

Procedures

In response to the formative research finding that women would face multiple challenges attending interviews at a fixed site – as is standard practice in RDS studies – this study used mobile-site interviewing (Johnston, 2008; Platt, Luthra, & Frere-Smith, 2015). Potential participants were instructed to contact the research team by phone or text message to arrange an interview at a location convenient for them. Questionnaires on self-reported behaviour were administered by trained female peer fieldworkers. Information was collected in the local language (i.e. Bahasa Indonesia) using tablets equipped with Open Data Kit, an open-source data collection and management application operating on mobile devices (Hartung et al., 2010). As part of the RDS process, participants received a primary incentive of 75,000 Indonesian Rupiah (~USD \$5) for participating in the interview and a secondary incentive of 25,000 Indonesian Rupiah (~USD \$2) per eligible peer recruited. Each recruit was provided with a unique identifier and recorded in SyrEx2, a monitoring and evaluation tool developed by drug service providers (Alliance for Public Health, 2011).

Ethical considerations

Drug use in Indonesia is illegal and harshly prosecuted (Lai et al., 2013). This made the present study particularly sensitive and required additional care to protect participants. Participation was voluntary and data collected were anonymous. All participants were provided with a plain-language information sheet describing the nature of the study, limits to confidentiality, and explicit statements on participants' right to withdraw at any time. Informed consent forms were subsequently read aloud by the interviewer to ensure participants could make a fully informed decision, regardless of literacy level. Strict confidentiality was maintained, except where women requested assistance or referrals to health and support services. In the case that information disclosed suggested that a participant was at risk of significant harm (e.g. severe violence) the interviewer discussed concerns with the participant and offered service referrals. Following interviews, participants were provided with harm reduction materials and a directory of voluntary HIV counselling and testing services, sexual and reproductive health services, paralegal support and services for survivors of violence in the area. Ethical protocols were approved by the Central University Research Ethics Committee at Oxford University (ref no: SSD/CUREC2/13-23) and the Ethics Board of Atma Jaya University (ref no: 1114/III/LPPM-PM.10.05/11/2013).

Measurement

Receptive syringe sharing was measured using four items from the Blood-Borne Virus Transmission Risk Assessment Questionnaire (BBV-TRAQ), a validated instrument that captures the frequency of injecting, sexual and other skin penetration risk practices in the previous 30 days (Fry & Lintzeris, 2002). The BBV-TRAQ has been used extensively by governmental and community-based harm reduction and drug treatment programs (Wijoyo, Sarasvita, & Rachman, 2014) and research studies in Indonesia (Iskandar et al., 2010; Wijoyo et al., 2014). Items assessed included: "In the last month, how many times have you injected with another person's used needle/syringe?"; "In the last month, how many times have you injected with a needle/syringe after another person has already injected some of its contents?"; "In the last month, how many times have you received a needle-stick/prick from another person's used needle/syringe?" and "In the last month, how many times

have you re-used a needle/syringe taken out of a shared disposal/sharps container?" To achieve a higher sensitivity of the measure, affirmative responses (i.e., never, once, twice, 3–5 times, 6–10 times, > 10 times) were dichotomised to "any" or "no past-month receptive syringe sharing".

Intimate partner violence was assessed using items from the Revised Conflict Tactics Scale short form (CTS2S) (Strauss & Douglas, 2004). The reliability of the CTS2S for this sample was Cronbach's $\alpha = 0.85$. The following items were used for past-year IPV: psychological abuse ("My partner insulted or swore or shouted or yelled at me," "My partner destroyed something belonging to me or threatened to hit me"); physical assault ("My partner pushed, shoved, or slapped me," "My partner punched or kicked or beat-me-up"); injurious physical assault ("I had a sprain, bruise, or small cut, or felt pain the next day because of a fight with my partner," "I went see a doctor or needed to see a doctor because of a fight with my partner"); and forced sex or rape ("My partner used force, like hitting, holding down, or using a weapon, to make me have sex"). For each IPV dimension, responses were summed and dichotomised into any and no past-year violence victimisation. Scores for physical and injurious violence were combined since the specific items on the CTS2 physical and injurious subscales describe similar types of intimidation and control.

Informed by literature review and formative assessment, several potentially confounding socio-demographic and drug-related variables were assessed. Socio-demographic variables included: *age, education level, employment status, relationship status, individual monthly income, housing status, and having dependent children in the household or other dependents for whom the participant is responsible*. Individual monthly income was classified as being either below or above the average national monthly income in Indonesia (i.e. IDR 3.8 million/285 USD) (Statistics Indonesia, 2013). Housing status was assessed by asking participants about their current living arrangements. Unstable housing/homelessness referred to living on the street, including in public spaces (i.e. rail station, parks) or in temporary or transitional accommodation, such as a friend's home. Stable housing included residing in the family home, rental house or apartment, or long-term single-room accommodation (*kos-kosan*).

Participants also provided data on drug-related factors. These included *age of injecting initiation, duration of injecting* (Cleland et al., 2007), *type of substance injected in the previous year* (Stoicescu, Sari, & Esteria-Tobing, 2011), *intimate partner's injecting drug use status* (Shaw, Shah, Jolly, & Wylie, 2007), and *whether women usually injected drugs together with an intimate partner* (Tortu, McMahon, Hamid, & Neaigus, 2003). Participants were also asked whether they had knowledge of their *HIV status*. All measures were based on self-report.

Statistical analysis

Analyses were conducted using Stata 14.2 (StataCorp, College Station, TX) in four stages.

First, population proportions and 95% CIs and RDS network characteristics were calculated for outcome and analysis variables using the RDS add-on package in Stata (Schonlau & Liebau, 2012), which applies the RDS-II estimator to produce weighted estimates (Volz & Heckathorn, 2008). Network characteristics were calculated separately for the two survey sites. Network connectivity was assessed by asking: "(1) How would you best describe your relationship to your recruiter, i.e., the person who referred you to this study?" Participants' degree was measured using the following question: "(1) How many female friends or acquaintances do you know (you know their name and they know yours), who have injected drugs in the past year, are 18 years or older, and reside in Greater Jakarta or Bandung, and who you would be able to contact right now?" For this study, the standard portion of the social network question specifying a given timeframe (e.g. past month) in which participants had seen their peers was replaced with a question on participants' present ability to contact those in their network. Since

interview appointments were scheduled by phone or text message, the research team deemed that the latter more accurately reflected the number of recruits that participants were likely to recruit into the survey.

Seed dependence was assessed by evaluating convergence, which refers to the required referral chain length (i.e. recruitment depth) necessary to reach sampling equilibrium (Volz & Heckathorn, 2008). Since RDS recruitment starts with purposively selected seeds, and seeds may or may not accurately represent the underlying network structure of the target population, it is possible that the RDS recruitment process does not reach all sub-populations in a network. Consequently, the resulting sample may be more representative of the characteristics of the seeds rather than the characteristics of the target population, resulting in a form of selection bias (Tyldum & Johnston, 2014). If the required recruitment depth for a given variable is smaller than the longest chain in the sample, then the final sample will be independent of the seeds and convergence has been reached. Differential recruitment activity (i.e. the relative connectedness of one sub-population within the sample with another) was measured by comparing participants' degrees and level of homophily, and testing for bottlenecks (Lisa G. Johnston & Sabin, 2010). Homophily was calculated by comparing the estimated proportion of in-group ties within sample recruitment patterns with affiliation patterns that would result from random mixing. We referred to the homophily index proposed by Heckathorn, which contains values on a scale from -1.0 to 1.0, with scores close to 0 indicating random recruitment and scores higher than 0.3 (or -0.3) indicating substantial in-group contact (Heckathorn, 2002). The presence of bottlenecks, which indicate the absence of personal links between different sub-groups in a population, was assessed using network graphs produced with NetDraw (Borgatti, 2002). A severe bottleneck was observed for the two survey sites, such that all participants were clustered in either Greater Jakarta or Bandung, forming two isolated geographical components with minimal cross-group recruitment (see Fig. 1, Supplementary file) (Johnston & Luthra, 2014). Although the RDS estimators are designed to adjust for such biases to a certain extent, the presence of severe bottlenecks can add variance to a sample and produce unstable estimates (Gile, Johnston, & Salganik, 2015). In the presence of a bottleneck, it is recommended that estimates are reported for each sub-group individually, rather than combining them into an overall estimate (Goel & Salganik, 2010). Thus, population proportions and network characteristics were calculated separately for the two survey cities. However, in order to retain the power and precision corresponding to the initial calculated sample size, the unweighted samples from the two study sites were combined for the subsequent regression analyses (Johnston & Luthra, 2014).

Second, frequencies were calculated for all socio-demographic, background, and analysis variables using the aggregated dataset. Third, bivariate logistic regressions tested associations between IPV, drug-

related and socio-demographic factors and receptive syringe sharing as the dependent variable, and guided the subsequent model selection. Variables associated with receptive syringe sharing at $p < 0.1$ were retained in the multivariate models (Hosmer & Lemeshow, 1989). Fourth, three sets of multivariate logistic regressions were estimated sequentially with psychological abuse, physical and/or injurious assault, and forced sex. All multivariate analyses controlled for city differences and significant covariates from the bivariate regressions. These included: injection drug type, survey city, housing status, relationship status, and having dependent children or other dependents. A final multivariate logistic regression model included all IPV dimensions and significant covariates.

Results

Respondent-driven sample characteristics

This study recruited 731 women in total, using 18 seeds and 554 recruits in Greater Jakarta ($n = 572$) and 2 seeds and 157 recruits in Bandung ($n = 159$). Seed participant characteristics are summarised in Table 1. Of 20 seeds, only one seed (Q), in Greater Jakarta, failed to recruit any participants. Overall, 15 of 20 seeds propagated five or more waves of recruitment. Five seeds, two in Bandung (E, F) and three in Greater Jakarta (H, J, R), generated 54% ($n = 391$) of the total sample combined across the two survey cities. The largest recruitment chain reached up to 11 waves and contained 105 participants in Greater Jakarta, and 8 waves with 98 participants in Bandung. The largest recruitment chain accounted for 14% of referrals, such that no one chain dominated the sample. Recruitment referral chains for this sample are visually illustrated in Fig. 1.

Required referral length until convergence was 2–5 waves, which was smaller than the largest referral chain (8 waves) for Bandung, and 3–5 recruitment waves, which was smaller than the largest chain (11 waves), for Greater Jakarta.

The majority of participants in Greater Jakarta ($n = 550$; 96.2%) and Bandung ($n = 157$; 98.7%) were referred to the study by a friend. Two participants in Jakarta (0.4%) were referred by an acquaintance, one by a female intimate partner (0.2%), and one by a relative (0.2%). The mean degree was 4.7 (SD = 4.2, range 1–35) in Greater Jakarta, and 3.9 (SD = 2.0, range 1–21) in Bandung. No considerable differentials in women's mean degrees were observed for Bandung. There were demonstrated differentials in personal degree for receptive syringe sharing in Greater Jakarta, resulting in some participants having a greater potential to recruit peers with similar characteristics to them. Women who engaged in past-month receptive syringe sharing had an average degree of 6.67, as compared to an average degree of 4.23 among those who did not share syringes during that period, suggesting that the former group were over-represented in this sample.

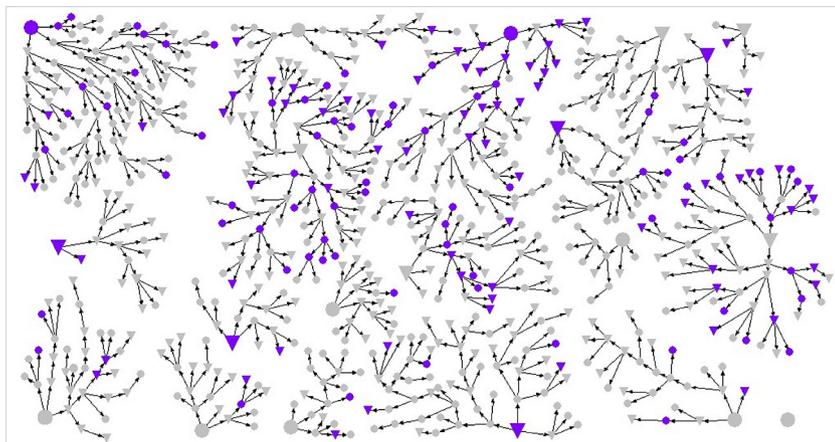


Fig. 1. Network diagram of women who inject drugs recruitment referral chains in Indonesia, 2015 ($n = 731$), by self-reported HIV status and past-month receptive syringe sharing. Larger shapes depict seed participants ($n = 20$); smaller shapes are recruited respondents ($n = 711$); triangle = self-reported HIV + status; circle = self-reported HIV- and/or unknown status; purple = engaged in past-month receptive syringe sharing; grey = did not engage in past-month receptive syringe sharing; arrows demonstrate the direction of recruitment. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

Table 1
Seed participant characteristics for the Perempuan Bersuara Study, Indonesia, 2015 (N = 731).

	Place of residence	Age	Education level	Known HIV status	Past-month receptive syringe sharing	Waves (n)	Recruits (n)
A.	Greater Jakarta (Bekasi)	31	High school	Negative	No	7	34
B.	Greater Jakarta (East Jakarta)	36	High school	Negative	No	8	26
C.	Greater Jakarta (East Jakarta)	34	Primary school	Negative	No	5	18
D.	Greater Jakarta (Bekasi)	23	High school	Positive	Yes	6	40
E.	West Java (Bandung)	37	High school	Positive	No	8	97
F.	West Java (Bandung)	31	High school	Positive	No	5	60
G.	Greater Jakarta (South Jakarta)	34	High school	Negative	No	3	19
H.	Greater Jakarta (South Jakarta)	38	Junior high	Negative	No	9	104
I.	Greater Jakarta (Central Jakarta)	31	High school	Positive	Yes	7	29
J.	Greater Jakarta (East Jakarta)	37	High school	Negative	No	10	63
K.	Greater Jakarta (Central Jakarta)	35	Post-secondary	Negative	Yes	6	25
L.	Greater Jakarta (West Jakarta)	35	High school	Negative	Yes	3	10
M.	Greater Jakarta (West Jakarta)	30	Junior high	Positive	Yes	4	16
N.	Greater Jakarta (Tangerang)	30	High school	Positive	No	5	18
O.	Greater Jakarta (South Jakarta)	28	High school	Positive	Yes	7	25
P.	Greater Jakarta (South Jakarta)	33	Post-secondary	Negative	No	6	27
Q.	Greater Jakarta (South Tangerang)	31	High school	Negative	No	0	0
R.	Greater Jakarta (Bogor)	33	High school	Positive	Yes	11	67
S.	Greater Jakarta (Bogor)	33	High school	Positive	No	2	5
T.	Greater Jakarta (Bogor)	31	High school	Positive	No	6	28

Tested variables showed low homophily across the two study sites, with the exception of one socio-demographic variable (i.e. age). Women 24 years of age or younger in Bandung tended to over-recruit other young women 32% of the time ($H = 0.32$), and at random only 68% of the time.

Overview of injecting practices and exposure to IPV victimisation, by city

Table 2 displays RDS-weighted estimations and 95% confidence intervals (CI) for injecting risk outcomes and IPV victimisation variables, by survey city. Overall, Bandung had a higher prevalence of HIV-related injecting risk practices relative to Greater Jakarta. The

proportion of women engaging in one or more past-month receptive syringe sharing practices in Bandung was three times higher (35.5%; 95% CI = 28.4, 43.2) than in Greater Jakarta (10.8%; 95% CI = 8.8, 13.1). In the preceding month, 26.6% (95% CI = 20.4, 33.9) of participants in Bandung and 4.4% (95% CI = 3.0, 6.3) in Greater Jakarta reported injecting drugs with someone else's used syringe. Furthermore, 17.3% (95% CI = 12.6, 23) of women in Bandung and 7.3% (95% CI = 5.7, 9.4) of women in Greater Jakarta received a needle-stick/prick from someone else's used needle/syringe in the same time period. The prevalence of re-using a needle/syringe from a shared disposal or sharps container was 18.6% (95% CI = 13.5, 25.1) in Bandung and 1.2% (95% CI = 0.06, 2.3) in Greater Jakarta.

Table 2

RDS-weighted estimations and 95% confidence intervals for injecting risk practices and intimate partner violence victimisation among women who inject drugs in the Perempuan Bersuara study, by survey city, Greater Jakarta and Bandung, Indonesia, 2015.

	Greater Jakarta (n = 572)				Bandung (n = 159)			
	N	Unweighted %	RDS-weighted %	95% CI	N	Unweighted %	RDS-weighted %	95% CI
Past-year intimate partner violence victimisation								
Psychological aggression								
Yes	348	60.8	58.8	54.7, 62.8	87	54.7	52.6	44.7, 60.3
No	224	39.2	41.2	37.2, 45.3	72	45.3	47.4	39.7, 55.3
Physical and/or injurious assault								
Yes	250	43.7	38.8	35.0, 42.8	75	47.2	42.2	34.8, 50.0
No	322	56.3	61.2	57.2, 65.0	84	52.8	57.8	50.0, 65.2
Forced sex (rape)								
Yes	19	3.3	3.1	2.0, 4.8	20	12.6	13.7	9.0, 20.3
No	553	96.7	96.9	95.2, 98.0	139	87.4	86.3	79.7, 91.0
Injecting risk practices (past 30 days)								
Injected with someone else's used syringe								
Yes	28	4.9	4.4	3.0, 6.3	46	28.9	26.6	20.4, 33.9
No	544	95.1	95.6	93.7, 96.9	113	71.1	73.4	66.1, 79.6
Injected with a needle/syringe after someone already injected its contents								
Yes	40	7.0	5.4	4.0, 7.4	49	30.8	25.4	19.5, 32.4
No	532	93.0	94.6	92.6, 96.0	110	69.2	74.6	67.6, 80.5
Received a needle-stick/prick from someone else's used needle/syringe								
Yes	61	10.7	7.3	5.7, 9.4	38	23.9	17.3	12.6, 23.2
No	511	89.3	92.6	90.6, 94.3	121	76.1	82.7	76.8, 87.4
Re-used a needle/syringe from a shared disposal/sharps container								
Yes	8	1.4	1.2	0.06, 2.3	34	21.4	18.6	13.5, 25.1
No	564	98.6	98.8	97.7, 99.4	125	78.6	81.4	74.9, 86.5
One or more of the receptive syringe sharing practices above								
Yes	95	16.6	10.8	8.8, 13.1	59	37.1	35.5	28.4, 43.2
No	477	83.4	89.2	86.9, 91.2	100	62.9	64.5	56.8, 71.6

Table 3
Sociodemographic characteristics, IPV victimisation, and syringe sharing practices among women who inject drugs in the Perempuan Bersuara study, Indonesia, 2015, unweighted estimates.

Total (N = 731)	N	%
Socio-demographic characteristics		
Survey city	572	78.2
Greater Jakarta	159	21.8
Bandung		
Age groups	92	12.6
≤ 24 years	473	64.7
25–34 years	166	22.7
≥ 35 years		
Education level (highest attained)	148	20.2
Lower than high school	583	79.8
High school or higher		
Employment status	407	55.7
Employed	324	44.3
Unemployed		
Individual monthly income (million IDR)	398	54.5
< 3.8 (approx. 285 USD)	333	45.5
≥ 3.8 (approx. 285 USD)		
Housing status	39	5.3
Unstable housing/homeless	692	94.7
Stable housing		
Relationship status	102	14.0
Single, never married	458	62.6
Married/steady relationship	99	13.5
Divorced	72	9.9
Widowed		
Dependent children or other dependents	413	56.5
Yes	318	43.5
No		
Self-reported HIV status	341	46.7
Positive	390	53.3
Negative/Unknown		
Drug-related variables		
Duration of injecting	47	6.4
≤ 2 years	86	11.8
2–5 years	223	30.5
5–10 years	375	51.3
10+ years		
Age of injecting initiation	208	28.4
≤ 18 years	353	48.3
19–24 years	170	23.3
≥ 25 years		
Injection drug type (past 12 months)	569	77.8
Heroin only	39	5.3
Pharmaceuticals only	4	0.6
Crystal methamphetamine only ^a	119	16.3
Heroin + pharmaceuticals		
Intimate partner injects drugs	381	52.1
Yes	350	47.9
No		
Injects most often with intimate partner	318	43.5
Yes	413	56.5
No		
Past-year intimate partner violence		
Psychological abuse	435	59.5
Yes	296	40.5
No		
Physical and/or injurious assault	325	44.5
Yes	406	55.5
No		
Forced sex (rape)	39	5.3
Yes	692	94.7
No		
Injecting practices		
Injected with someone else's used syringe	74	10.1
Yes	657	89.9
No		
Injected with a needle/syringe after someone already injected its contents	89	12.2
Yes	642	87.8
No		

Table 3 (continued)

Total (N = 731)	N	%
Received a needle-stick/prick from someone else's used needle/syringe	99	13.5
Yes	632	86.5
No		
Re-used a needle/syringe from a shared disposal/sharps container	42	5.8
Yes	689	94.2
No		
One or more of the needle/syringe sharing practices above	154	21.1
Yes	577	78.9
No		

More than half of the women in both cities experienced past-year psychological IPV, with higher prevalence reported in Greater Jakarta (58.8%; 95% CI = 54.7, 62.8) than Bandung (52.6%; 95% CI = 44.7, 60.3). Past-year physical and/or injurious assault was reported by 38.8% (95% CI = 35.0, 42.8) of women in Greater Jakarta and 42.2% (95% CI = 34.8, 50.0) of women in Bandung. Notably, the prevalence of forced sex (rape) was more than four times higher among women from Bandung (13.7%; 95% CI = 9.0, 20.3) than women from Greater Jakarta (3.1%; 95% CI = 2.0, 4.8).

Sociodemographic and drug-related characteristics

Socio-demographic characteristics calculated on the unweighted, aggregated sample from the two cities, are displayed in Table 3. The majority of participants were under 35 years of age (64.7%), with a mean age of 31.3 years (SD = 5.10 years; range: 18.0–44.6). 62.6% of women in the full sample were married or in a steady relationship, and 56.5% had children or other dependents. Nearly half of the women (44.3%) were unemployed, and one in five (20.2%) completed less than a high school education. Mean individual monthly income was IDR 4.3 million/USD 385 (SD = 3.38). 5.3% of women lived on the street or in unstable housing. Overall self-reported HIV prevalence was 46.7%. Considering that 56.3% of the women were last tested for HIV more than 12 months prior to the survey and 16.1% never accessed HIV testing, actual undiagnosed HIV prevalence in the sample is likely to be higher.

Self-reported injection drug type in the sample is shown in Table 3. Women injected several types of drugs in the previous year, ranging from heroin only (77.8%), to illicit pharmaceuticals only (5.3%), and crystal meth (0.6%). A substantial proportion of the sample (16.3%) injected both heroin and pharmaceuticals. Among women exclusively injecting pharmaceuticals, the most commonly injected pharmaceutical was buprenorphine (93.8%), an oral opioid antagonist used to treat opioid dependence, followed by illicit benzodiazepines (e.g. diazepam), commonly used to treat anxiety and depression, and opiate-based pain medications (e.g. codeine, tramadol) (6.2%). Participants injected drugs for an average of 10.3 years (SD = 5.09, range: 0.3–24.1). 6.4% of the women in the sample were new injectors (i.e. injecting for ≤ 2 years). Mean age of injecting initiation was 21.2 years (SD = 4.28, range: 12–37), with nearly one third (28.4%) of participants reporting initiating injecting at 18 years or younger. The youngest reported age of initiation to injecting drug use was 12 years old. 52.1% of women had an intimate partner who also injected drugs. Nearly half of women in the sample (43.5%) reported that they usually injected drugs together with an intimate partner.

Associations between past-year IPV and receptive syringe sharing

Results from bivariate analyses between variables from Table 3 and the receptive syringe sharing outcome are shown in Table 4. Elevated odds of receptive syringe sharing were associated with exposure to past-year psychological abuse (OR = 2.37; 95% CI = 1.59, 3.53;

Table 4

Bivariate associations between socio-demographic characteristics, IPV, and receptive syringe sharing among women who inject drugs in the Perempuan Bersuara study, Indonesia, 2015.

Independent variables	Dependent variable: receptive syringe sharing (n = 154)		
	ORs	95% CIs	p-value
Socio-demographic characteristics			
Survey city (ref. Greater Jakarta)	2.96	2.00, 4.37	< 0.001
Bandung			
Age groups (ref. ≤ 24 years)	0.93	0.54, 1.60	0.790
25–34 years	1.03	0.56, 1.91	0.919
≥ 35 years			
Education level (ref. high school and/or higher)	1.33	0.87, 2.03	0.190
Lower than high school			
Employment status (ref. employed)	0.99	0.69, 1.42	0.963
Unemployed			
Individual monthly income (ref. < 3.8 mill Rp./ 285 USD)	0.79	0.55, 1.13	0.193
≥ 3.8 mill Rp. (approx. 285 USD)			
Housing status (ref. stable housing)	3.13	1.62, 6.06	0.001
Unstable housing/homeless			
Relationship status (ref. single, never married)	0.53	0.33, 0.87	0.011
Married/in steady relationship	0.61	0.32, 1.16	0.133
Divorced	0.99	0.51, 1.92	0.972
Widowed			
Dependent children or other dependents (ref. no)	0.63	0.44, 0.90	0.011
Yes			
Self-reported HIV status (ref. negative/unknown)	1.27	0.89, 1.81	0.193
Positive			
Drug-related factors			
Duration of injecting (ref. ≤ 2 years)	1.12	0.46, 2.73	0.807
2–5 years	1.16	0.52, 2.56	0.717
5–10 years	1.13	0.52, 2.43	0.760
10+ years			
Age of injecting initiation (ref. ≤ 18 years)	1.06	0.69, 1.63	0.783
19–24 years	1.25	0.77, 2.05	0.369
≥ 25 years			
Injection drug type (past 12 months) (ref. heroin only)	5.06	2.60, 9.84	< 0.001
Pharmaceuticals only	1.92	1.22, 3.03	0.005
Heroin + pharmaceuticals			
Intimate partner injects drugs (ref. no)	1.02	0.72, 1.46	0.894
Yes			
Injects most often with intimate partner (ref. no)	1.07	0.75, 1.53	0.714
Yes			
Past-year intimate partner violence	ORs	95% CIs	p-value
Psychological abuse (ref. no)	2.37	1.59, 3.53	< 0.001
Yes			
Physical and/or injurious assault (ref. no)	2.43	1.69, 3.50	< 0.001
Yes			
Forced sex (rape) (ref. no)	3.13	1.62, 6.06	0.001
Yes			

Notes: 95% CI = 95% Confidence Intervals; ORs = Odds Ratios.

p < 0.001), physical and/or injurious IPV (OR = 2.43; 95% CI = 1.69, 3.50; p < 0.001), and forced sex (OR = 3.13; 95% CI = 1.62, 6.06; p = 0.001). Women were also more likely to engage in receptive syringe sharing if they resided in Bandung (versus Greater Jakarta) (OR = 2.96; 95% CI = 2.00, 4.37; p < 0.001), were homeless or unstably-housed (vs stably-housed) (OR = 3.13; 95% CI = 1.62, 6.06; p = 0.001), and injected pharmaceuticals only (OR = 5.06; 95% CI = 2.60, 9.84; p < 0.001) or combination heroin and pharmaceuticals (vs. heroin only) (OR = 1.92; 95% CI = 1.22, 3.03; p = 0.005). Women who were married or in a steady relationship (OR = 0.53; 95% CI = 0.33, 0.87; p = 0.011) and women with children or other dependents (OR = 0.63; 95% CI = 0.44, 0.90; p = 0.011) were less likely to engage in receptive syringe sharing, compared with their single

Table 5

Multivariate associations between IPV and receptive syringe sharing, controlling for socio-demographic and city differences among women who inject drugs in the Perempuan Bersuara study, Indonesia, 2015.

Independent variables	Dependent variable: receptive syringe sharing (n = 154)		
	ORs	95% CIs	p-value
Model 1 ^a			
Past-year psychological abuse (ref. no)	2.72	1.74, 4.23	< 0.001
Yes			
Injection drug type (past 12 months) (ref. heroin only)	3.47	1.63, 7.39	0.001
Pharmaceuticals only	1.27	0.74, 2.18	0.379
Heroin + pharmaceuticals			
Housing status (ref. stable housing)	3.14	1.54, 6.40	0.002
Unstable housing/homeless			
Relationship status (ref. single, never married)	0.67	0.38, 1.20	0.176
Married/in steady relationship	0.68	0.33, 1.40	0.292
Divorced	1.21	0.58, 2.55	0.615
Widowed			
Dependent children or other dependents (ref. no)	0.86	0.57, 1.30	0.475
Yes			
Survey city (ref. Greater Jakarta)	2.44	1.46, 4.05	0.001
Bandung			
Model 2 ^b			
Past-year physical and/or injurious assault (ref. no)	2.53	1.69, 3.77	< 0.001
Yes			
Injection drug type (past 12 months) (ref. heroin only)	3.71	1.75, 7.87	0.001
Pharmaceuticals only	1.20	0.70, 2.05	0.510
Heroin + pharmaceuticals			
Housing status (ref. stable housing)	3.02	1.48, 6.18	0.002
Unstable housing/homeless			
Relationship status (ref. single, never married)	0.73	0.41, 1.29	0.277
Married/in steady relationship	0.64	0.31, 1.34	0.238
Divorced	1.20	0.57, 2.53	0.630
Widowed			
Dependent children or other dependents (ref. no)	0.86	0.57, 1.30	0.481
Yes			
Survey city (ref. Greater Jakarta)	2.31	1.39, 3.85	0.001
Bandung			
Model 3 ^c			
Past-year forced sex (ref. no)	3.01	1.19, 7.57	0.025
Yes			
Injection drug type (past 12 months) (ref. heroin only)	3.17	1.52, 6.65	0.002
Pharmaceuticals only	1.19	0.70, 2.03	0.512
Heroin + pharmaceuticals			
Housing status (ref. stable housing)	4.08	2.03, 8.21	< 0.001
Unstable housing/homeless			
Relationship status (ref. single, never married)	0.93	0.53, 1.62	0.796
Married/in steady relationship	0.81	0.40, 1.66	0.050
Divorced	1.28	0.61, 2.67	0.510
Widowed			
Dependent children or other dependents (ref. no)	0.85	0.57, 1.28	0.444
Yes			
Survey city (ref. Greater Jakarta)	3.37	1.43, 3.92	0.001
Bandung			
Model 4 ^d			
Past-year psychological abuse (ref. no)	1.86	1.06, 3.24	0.030
Yes			
Past-year physical and/or injurious assault (ref. no)	1.73	1.04, 2.89	0.034
Yes			
Past-year forced sex (ref. no)	1.11	0.51, 2.41	0.785
Yes			

(continued on next page)

Table 5 (continued)

Independent variables	Dependent variable: receptive syringe sharing (n = 154)		
	ORs	95% CIs	p-value
Injection drug type (past 12 months) (ref. heroin only)	3.58	1.66, 7.69	0.001
Pharmaceuticals only	1.23	0.72, 2.12	0.448
Heroin + pharmaceuticals			
Housing status (ref. stable housing)	2.89	1.41, 5.95	0.004
Unstable housing/homeless			
Relationship status (ref. single, never married)	0.66	0.37, 1.18	0.163
Married/in steady relationship	0.62	0.30, 1.30	0.210
Divorced	1.17	0.55, 2.48	0.684
Widowed			
Dependent children or other dependents (ref. no)	0.87	0.58, 1.31	0.505
Yes			
Survey city (ref. Greater Jakarta)	2.33	1.40, 3.90	0.001
Bandung			

Notes: 95% CI = 95% Confidence Intervals; ORs = Odds Ratios; SE = Standard Errors.

^a Model 1 includes past-year psychological abuse only, controlling for survey city, injection drug type, relationship status, having children and/or other dependents, and housing status.

^b Model 2 includes physical and/or injurious assault, controlling for survey city, injection drug type, relationship status, having children and or other dependents, and housing status.

^c Model 3 includes forced sex, controlling for survey city, injection drug type, relationship status, having children and /or other dependents, and housing status.

^d Model 4 includes all IPV dimensions (psychological abuse, physical and/or injurious assault, forced sex) in the same multivariate logistic regression model, controlling for survey city, injection drug type, relationship status, having children and/or other dependents, and housing status.

counterparts and women without dependents, respectively.

Results of multivariate models for each dimension of IPV (models 1–3) are displayed in Table 5. After adjusting for covariates significant at $p < 0.1$ in bivariate analyses (i.e. survey city, injection drug type, relationship status, having children and or other dependents, and housing status), each form of IPV remained significantly associated with increased odds of receptive syringe sharing. In model 1, women who experienced psychological abuse were 2.7 more likely (OR = 2.72; 95% CI = 1.74, 4.23; $p < 0.001$) to engage in receptive syringe sharing. Exposure to physical and/or injurious assault more than doubled the odds of receptive syringe sharing in model 2 (OR = 2.53; 95% CI = 1.69, 3.77; $p < 0.001$) (model 2). In model 3, experiencing past-year forced sex tripled the odds of engaging in receptive syringe sharing (OR = 3.01; 95% CI = 1.19, 7.57; $p = 0.025$). The following covariates remained significantly positively associated with receptive sharing in all three models: injecting pharmaceuticals only, homelessness and/or unstable housing, and residing in Bandung.

The final multivariate model (model 4, Table 5) included all three forms of IPV. After adjusting for significant covariates, psychological abuse (OR = 1.86; 95% CI = 1.06, 3.24; $p = 0.030$) and physical and/or injurious assault (OR = 1.73; 95% CI = 1.04, 2.89; $p = 0.034$) retained a statistically significant positive association with receptive syringe sharing. Forced sex did not remain significant in the final model (OR = 1.11; 95% CI = 0.51, 2.41; $p = 0.785$). Additionally, women who injected illicit pharmaceuticals only (OR = 3.58; 95% CI = 1.66, 7.69; $p = 0.001$), and homeless and/or unstably-housed women (OR = 2.89; 95% CI = 1.41, 5.95; $p = 0.004$) had higher odds of engaging in receptive syringe sharing. Compared with their counterparts from Greater Jakarta, women from Bandung, West Java were more likely to engage in receptive syringe sharing (OR = 2.33; 95% CI = 1.40, 3.90; $p = 0.001$).

Discussion

To our knowledge, this is the first quantitative study to investigate associations between different dimensions of IPV and unsafe injecting practices amongst women who inject drugs in Asia. This study found that a sizeable minority of women who inject drugs in Indonesia continue to engage in receptive syringe sharing, despite more than a decade of harm reduction interventions (Indonesian National AIDS Commission, 2014). In 2015, 5.8% of people who inject drugs surveyed as part of national bio-behavioural HIV surveillance reported sharing needle-syringes in the previous week (Ministry of Health, 2015), compared with a rate nearly three times as high among women in this sample. These findings suggest that there remains a high potential for HIV infection among women who inject drugs and onward transmission to their injecting and sexual partners.

Furthermore, past-year rates of psychological abuse and physical and/or injurious violence in this sample were 8–24 times higher than rates among Indonesian women in the general population (Statistics Indonesia, 2017). The prevalence of physical and/or injurious assault in this study was comparable or higher than rates found in community samples of women who inject drugs in other low- or middle-income countries in the region, such as India (17%) and China (39.5%) (Gu et al., 2014; India HIV/AIDS Alliance, 2011). While previous research has shown a link between IPV and elevated risk for HIV-related sexual risk behaviours among women who inject drugs, this is the first study in the region to suggest a similar link between IPV and unsafe injecting practices.

This study adds new evidence from a lower-middle income setting showing that psychological abuse and physical and/or injurious assault were independently associated with greater HIV-related injecting risk, after controlling for other forms of IPV and socio-demographic factors. Previous research suggests that sharing injecting equipment within a sexual relationship can be associated with feelings of support, trust, love, intimacy and protection (MacRae & Aalto, 2000; Roberts et al., 2010; Sherman et al., 2009; Simmons & Singer, 2006), but also with male power and control (Barnard, 1993; Klee, 1993; Lazuardi et al., 2012; Spooner et al., 2010; Wagner et al., 2009). In the Indonesian context, qualitative research suggests that control – both physical and psychological – is central to the role of intimate partnerships in the lives of many women who inject drugs. Submitting to men's wishes, including on occasions where there is a known HIV risk, is often viewed as a way of avoiding conflict, confrontation and, potentially, further violence (Spooner et al., 2010). Similar to findings showing that women in violent relationships are less able to negotiate condom use (El-Bassel et al., 2005; Panchanadeswaran et al., 2010), this study extends previous research from the U.S. by suggesting that they may also be less able to negotiate safer drug injection (Wagner et al., 2009). Such power imbalances and their consequences seem to persist despite availability of sterile needles and syringes. These findings underline the urgent need to integrate case-finding and support interventions aimed at identifying and addressing IPV among women who use drugs within existing HIV prevention programs.

Notably, women who exclusively injected pharmaceuticals, primarily buprenorphine, were significantly more likely to share and re-use needles and syringes than women who injected heroin only. This finding is at odds with results from an international review suggesting that buprenorphine injectors report lower rates of injecting equipment sharing and other HIV-related risk behaviours, compared with heroin injectors (Yokell, Zaller, Green, & Rich, 2011). Medically-supervised oral buprenorphine was introduced in Indonesia in 2002 as substitution therapy for the detoxification and maintenance of opioid-dependent persons. However, the management of buprenorphine administration by private doctors, combined with the absence of national guidelines until recently, may have increased buprenorphine's potential for diversion and illicit use. Significantly higher rates of injecting equipment sharing among women who inject pharmaceuticals in this study may be

explained by increases in the diversion and illicit use of buprenorphine and other prescription drugs, coupled with the absence of comprehensive harm reduction programs targeting this sub-group of the drug-using population. Indeed, until recently, Indonesia's HIV prevention program has targeted heroin users, despite documented increases in the injection of illicit buprenorphine and other pharmaceuticals (Indonesian National AIDS Commission, 2014). Thus, this study's findings suggest that HIV prevention interventions in Indonesia would benefit from broadening their focus to include people who use multiple substances and drugs other than heroin.

Furthermore, unstable housing and homelessness were associated with greater HIV-related injection risk. Specifically, the odds of receptive syringe sharing were between 3–5 times as high among women who were homeless or unstably housed, compared with women with stable housing. This finding extends research from high-income settings highlighting that precarious housing increases HIV-related risks among people who use drugs (Aidala, Cross, Stall, Harre, & Sumartojo, 2005). Women's housing disadvantage may increase their HIV vulnerability by perpetuating gender power imbalances. For instance, many drug-using women living on the street resort to survival sex work to maintain their and/or their partner's drug supply and provide for dependents (Shannon et al., 2008). This increases women's risk of experiencing violence, and places them in high-risk sexual and injecting contexts where they may have limited negotiating power. Any effective HIV prevention strategy must include structural solutions such as enhanced housing and economic opportunities. Support toward housing and economic empowerment could be important tools for reducing HIV-related risk behaviours. Previous research in the U.S. shows that stable housing is associated with decreases in risky sexual and injecting behaviours (Aidala et al., 2005; Wenzel et al., 2009). Similarly, some economic enhancement initiatives for women who use drugs have been associated with a reduction in HIV risk behaviours (Pinkham, Stoicescu, & Myers, 2012; Sherman, German, Cheng, Marks, & Bailey-Kloche, 2006). Since the behaviours studied here are also risk factors for other blood borne viruses such as hepatitis B and C, structural interventions including housing support and economic empowerment could contribute to multiple prevention goals. Given that no such interventions have been tested among women who inject drugs in Indonesia to date, further research is needed to understand the multitude of risk environments shaping women's HIV vulnerability and develop appropriate and culturally-relevant responses.

Limitations include the cross-sectional nature of the study, which constrains the ability to make causal inferences. Second, self-reported data on injecting behaviours may be subject to social desirability bias. Women may be reluctant to report sharing of injecting equipment in a context where sterile needles and syringes are available. We attempted to improve reporting of HIV risk-taking by assuring confidentiality and anonymity, and by using female peer interviewers with an injecting drug use background. The latter strategy has been shown to provide greater opportunity to foster trust between participants and interviewers, thus improving the reliability of self-reported behaviours (Broadhead et al., 1998). Third, a secondary goal of this study was to generate representative prevalence estimates among women who inject drugs. RDS is based on the assumption that each sample comprises a single network component (Goel & Salganik, 2010). This assumption was fulfilled at the city level, but not at the level of the combined sample from the two study sites. There is currently no consensus on whether separate network samples can be aggregated (Johnston & Luthra, 2014). Current best practice is to test for bottlenecks, and if present, to conduct a sensitivity analysis by comparing several important variables for each of the two bottle-necked sub-samples (Johnston & Luthra, 2014). Since the two city sub-samples were bottlenecked and substantial differences were observed in terms of estimated population proportions for the receptive syringe sharing outcome, RDS-adjusted estimates were reported separately for each city. However, in order to retain the power and precision corresponding to

the original calculated sample size, and because city differences can be controlled for in multivariate analyses, the full, unweighted dataset was used for the regression analyses. Therefore, aside from the city-level estimates, findings may not be representative according to the theoretical premises upon which RDS is based (Heckathorn, 2002).

Despite these limitations, the present study has important implications. Reducing unsafe injection practices among people who inject drugs has been the target of numerous HIV prevention interventions implemented in Indonesia since the early 2000s (Morineau et al., 2012). Despite these interventions, an unacceptably high proportion of women continue to share and re-use injecting equipment. Existing harm reduction programmes aimed at reducing blood borne virus transmission among people who inject drugs in Indonesia should tailor their services to be more accessible to women (Malinowska-Sempruch, 2015). This could include creating women-only hours and child-friendly spaces within existing services, employing female peers, expanding mobile and outreach-led health services, and integrating harm reduction, sexual and reproductive health and rights education, and violence prevention services into a "one-stop shop" model of service provision (Blankenship, Reinhard, Sherman, & El-Bassel, 2015; Pinkham, Myers, & Stoicescu, 2012). Furthermore, case-finding and IPV prevention and support programs should target women who use drugs. Potential settings amenable to violence prevention interventions among drug-using women are outpatient substance use treatment and community-based drug treatment services (Tirado-Munoz, Gilchrist, Lligona, Gilbert, & Torrens, 2015). Case-finding interventions would be optimised by robust referral systems that enable effective referral to a diverse array of services, including legal advocacy and/or parenting and childcare support. Clearly, more effective public health responses to reduce violence and address unsafe injecting drug use amongst this highly vulnerable group are urgently needed.

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Authors' contributions

CS conceived the study, led the quantitative study design, data collection, analysis, and writing. LC and TS contributed to conceptualization of the paper and provided overall guidance on statistical analysis and writing. RA and MM contributed to the overall conceptualization of the paper and provided guidance on interpretation, and MM created the network diagram. All authors have read and approved the final text.

Conflicts of interest

The authors have no conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugpo.2018.08.009>.

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