Self-reported testing, HIV status and associated risk behaviours among people who inject drugs in Europe: important differences between East and West

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Aims: To describe HIV-related risk behaviours, HIV testing and HIV status among people who inject drugs (PWIDs) in the 2000 in European countries with high-prevalence HIV epidemics among PWID.

Methods: Data from 12 cross-sectional studies among PWID from seven countries were used. Meta-analysis was used to synthesize the data and meta-regression to explain heterogeneity [in addition to deriving adjusted odds ratios (AORmeta)].

Results: Data on 1791 PWID from western (the West) and 3537 from central and eastern (the East) European countries were available. The mean age of participating PWIDs was 30.6 years (SD 7.9), 75% were men, and 36% [95% confidence interval 34–37%) were HIV-infected (30% West, 38% East); 22% had not previously been tested for HIV. The prevalence of reported high-risk behaviour was significantly higher among PWID from the East. Comparison of HIV-infected and uninfected PWID within countries yielded similar results across all countries: HIV-infected PWID were less likely to be sexually active [AORmeta 0.69 (0.58–0.81)], reported less unprotected sex [AORmeta 0.59 (0.40–0.83)], but reported more syringe sharing [AORmeta 1.70 (1.30–2.00)] and more frequent injecting [AORmeta 1.40 (1.20–1.70)] than their HIV-uninfected counterparts.

Conclusion: Despite the absolute differences in reported risk behaviours among PWID in western and eastern Europe, the associations of risk behaviours with HIV status were similar across the sites and regions. There is a substantial potential for further HIV transmission and acquisition based on the continuous risk behaviours reported. HIV prevention and harm reduction interventions targeting PWID should be evaluated.

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Introduction

About 16 million individuals in 148 countries inject various illicit drugs, and about 3 million of these are probably infected with HIV [1]. Although people who inject drugs (PWIDs) constitute only 0.34% of the global population, they account for approximately 10% of the global HIV epidemic [2] and almost one-third of HIV incidence outside sub-Saharan Africa. New HIV epidemics among PWID are also emerging in Africa [3,4].

The majority of HIV-infected PWIDs reside in eastern Europe and south-east Asia [5]. In 2011, close to 54 000 new HIV diagnoses were in the WHO European Region. Within this region, the highest rates of diagnosed cases occurred in the East (22.4 per 100 000 population), followed by the West (6.5) and the Centre (1.6) [6]. Eastern Europe has the fastest growing HIV epidemic in the world, due mainly to drug injecting [7]. In western Europe, a long-term decline in injection drug use-related infections has been observed [8], although since 2010, new outbreaks have been reported in Greece and Romania [9].

Two studies described knowledge of HIV serostatus and preventive behaviour among PWIDs in Europe [10,11] in the early to mid-1990s. These suggested a positive effect of knowing one's HIV serological status on reducing risk behaviours. However, there were only minor improvements between 1990 and 1992–1993, indicating that prevention of HIV transmission among PWIDs must be reinforced. Since then, significant developments in HIV prevention and care have occurred in western Europe due to opioid substitution treatment (OST), needle and syringe programmes (NSPs) and antiretroviral treatment (ART) [12,13]. Implementing evidence-based HIV-prevention interventions, particularly involving multiple interventions, can avert HIV epidemics and reduce incidence among PWIDs [14,15]. In recent years, ART has emerged as a promising intervention to reduce infectiousness and sexual transmission of HIV [16]. Ecologic evidence also suggests that expansion of ART among HIV-infected drug injectors may reduce transmission [17]. Further, whereas in western Europe, the last increase in injection drug use occurred during the 1980s and 1990s, in several eastern European countries, the rapid expansion of injection drug use and related HIV epidemics emerged only around the turn of the century [18].

Our objective was to examine risk behaviour and HIV status among current PWIDs since 2000, in European countries with high-prevalence HIV epidemics among PWIDs. We compared self-reported data from HIV-infected and uninfected PWIDs in western European countries (the West, 'old epidemics', starting before 2000 and generally with well developed HIV prevention programmes); and eastern European countries (the East, 'new epidemics', starting after 2000, with limited/developing HIV prevention programmes).

Methods

A centralized dataset containing data from sero-behavioural surveillance and research studies across Europe was established by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). Further details on this collaborative project are presented elsewhere [19,20]. For the current analysis, data from 12 cross-sectional studies among current PWIDs conducted in countries with high-prevalence HIV epidemics among PWIDs were included (Appendix 1, Table 1, http://links.lww.com/QAD/A520). Only studies conducted since 2001 were included. Methods of the included studies are described in detail elsewhere [21–27]; therefore, only a summary is presented here (Appendix 1, http://links.lww.com/QAD/A520).

Sampling procedures and recruitment of patients in included studies

During 2001–2010, surveys and HIV testing were carried out in various venues (mainly via low threshold programmes/NSPs and drug treatment programmes) in current PWIDs (defined as those admitting injection drug use within the past 6 months). Sampling/recruitment approaches suitable for hard-to-reach populations were used: respondent-driven sampling (RDS) ($n = 6$), other chain referral methods ($n = 2$), and venue-based convenience sampling ($n = 4$). Information about self-reported drug use, injection and sexual risk behaviour was obtained. Recall periods for risk behaviours (syringe sharing, unprotected sex) varied between sites with a maximum of 12 months (Appendix 1, Table 2, http://links.lww.com/QAD/A520). Participants were also asked about previous HIV testing. Blood or oral fluid specimens were obtained for HIV testing. Serum specimens were tested for HIV antibodies using standard enzyme immunoassays (see Appendix 1 for more details, http://links.lww.com/QAD/A520).

Statistical analysis

Univariate statistics of frequency, central tendency, and dispersion were used to describe demographics, sexual behaviour (those reporting unprotected sex with main, casual or paying partners were considered as having unprotected sex, i.e. not always using condoms), drug use (those reporting injecting daily or more often were considered to be frequent injectors), and HIV sero-status. Odds ratios (ORs) and 95% confidence intervals (CIs) were used for comparisons (between HIV-infected and not infected). Adjusted ORs (AORs) and 95% CIs were calculated using a logistic regression model, adjusting

for drug injecting career length, age (as a continuous variable), and sex.

We present an analysis of data collected by period at different sites and different times. We used meta-analytic techniques [28] as the studies used different research methods (sampling strategies, units of measurement). We also examined the heterogeneity using stratified analyses and meta-regression (I^2 is provided as a measure of heterogeneity). The meta-variables used for heterogeneity assessment included region (western vs. eastern Europe), sampling methodology (RDS and other chain referral vs. time/location and convenience/venue-based sampling), study year, and recall period for the risk behaviour (number of sexual partners, condom use, injection frequency and syringe sharing recall periods). R^2 was calculated to measure the variance explained by meta-variables [28]. Random-effects models with restricted maximum likelihood estimate for between-studies variance were employed to combine unadjusted ORs (ORmeta) and adjusted ORs (AORmeta). Combined ORs with 95% CIs are presented. The significance level was set at 0.05.

The following groupings of data collection sites and sampling methods were used:

(1) PWID studies conducted in the Netherlands (2002–2003), Spain (three sites) (2001–2009), and Portugal (2009–2010) were defined as studies from western Europe, whereas studies in Poland (2004–2005), Latvia (2007), Estonia (2007–2009), and Russia (4 sites) (2007–2009) were defined as studies from eastern Europe.
(2) Studies recruiting participants using chain referral methods (RDS, snowball) were compared with studies using convenience sampling (including venue-based sampling, e.g. clients in services).

Additionally, we considered country-level variables: coverage with NSP, methadone maintenance therapy (MMT), proportion of PWIDs with imprisonment experience and problem alcohol consumption [proxy, adult (15+ years) male per capita consumption of pure alcohol] to see if they could explain the observed differences between western and eastern Europe.

Sensitivity analysis (by calculating ratios of adjusted ORs derived from meta-analysis) was used to examine robustness of the findings [29]. We used ratios of the meta-analysis ORs to assess the importance of different inclusion/exclusion criteria and different assumptions. Ratios close to 1.0 indicate that changing the inclusion/exclusion criteria or underlying assumptions would not affect the results.

Statistical software R version 2.15.1 with the metafor package was used.

Results

Cross-sectional data were obtained from seven countries: Estonia, Russian Federation (4 sites), Latvia, Netherlands, Poland, Portugal, and Spain (3 sites), resulting in a total of 12 data sets (sites) (see Appendix 1, http://links.lww.com/QAD/A520).

Data were available for 5373 current PWIDs. HIV serostatus was available for 5328 (1791 from the West, 3537 from the East). The mean age of participants was 30.6 years (SD 7.9) and 75% were men. About a third (34%) of the PWIDs were new injectors (injecting for 5 years or less) in the East, compared with about a quarter (23%) in the West (chi-square test $P < 0.0001$, difference of proportions 11%, 95% CI 8–13%). Significant differences in demographic profile and self-reported (risk) behaviours among PWIDs in western and eastern Europe were observed (Table 1). PWIDs from western Europe were less likely to be HIV-infected (West vs. East: 30 vs. 38%; $P < 0.0001$).

There were significant differences in the prevalence of reported sexual risk behaviours among PWIDs by HIV status in western and eastern Europe (Table 2). Any unprotected sex was reported by 47% of the HIV-infected in the West and 70% in the East ($P < 0.0001$, difference of proportions 23%, 95% CI 18–30%), and among HIV-uninfected by 58 and 82% respectively ($P < 0.0001$, difference of proportions 24%, 95% CI 19–27%). HIV-infected PWIDs in the East were more likely to report syringe sharing. Details about syringe sharing permitting distinctions between distributive sharing (passing on a syringe one has already used) and receptive sharing (using a syringe used by someone else) were available from four sites. Distributive sharing by HIV-infected PWIDs was reported by 32% in both Estonia and Latvia (East), vs. 23% in Spain and 6% in the Netherlands (West). Rates of distributive sharing did not differ by serostatus [AORmeta 1.04 (0.83–1.30), I^2 0%] or testing status (ever or never) [AORmeta 1.12 (0.70–1.78), I^2 58%] in these four sites. Receptive sharing by HIV-uninfected PWIDs was reported by 33, 44, 16, and 8% in Estonia, Latvia, Spain, and the Netherlands, respectively.

In the West, 46% of the HIV-positive PWIDs reported frequent injecting compared with 64% in the East ($P < 0.01$, difference of proportions 18%, 95% CI 13–24%). Among HIV-negative PWIDs, frequent injecting was reported by 44% in the West and 49% in the East ($P = 0.0026$, difference of proportions 5%, 95% CI 1–8%).

Despite differences in self-reported prevalence of risk behaviours, the comparison of HIV-infected and uninfected PWIDs within the countries yielded similar results (in terms of effect sizes and direction), with notable overlap in CIs for all ORs. Namely, HIV-infected PWIDs

Table 1. Socio-demographic risk behaviour characteristics of people who inject drugs and HIV prevalence in western and eastern Europe 2001–2010 in countries with high-prevalence HIV epidemics among people who inject drugs.

	All ($N = 5548$)	Western Europe ($n = 2011$)	Eastern Europe ($n = 3537$)	*P*-value[a] (West vs. East)
Age (mean, SD)	30.6 (7.9)	34.5 (8.5)	28.6 (6.8)	<0.0001
Sex (% of men)	75%	80%	73%	<0.0001
Duration of injection drug use (years, mean, SD)	10.4 (7.5)	13.3 (8.7)	8.9 (6.3)	<0.0001
New injectors (injecting ≤5 years; *n*/%)	1582 (30%)	408 (23%)	1174 (34%)	<0.0001
Frequent injectors (injecting daily +, %)	51%	44%	55%	<0.0001
Sharing (yes, %)	26%	13%	32%	<0.0001
Sexually inactive (past 12 months) (%)	20%	30%	14%	<0.0001
One sexual partner (past 12 months) (% of all sexual active IDUs)	49%	53%	48%	0.0009
Sex work (yes, %)	14%	11%	16%	< 0.0001
Always using condoms (yes, %; main, casual, commercial partners combined)	29%	44%	22%	< 0.0001
Never tested for HIV (before the study, %)	22%	11%	27%	< 0.0001
Tested HIV positive before study (% of those ever tested)	30%	27%	32%	< 0.0001
HIV prevalence (%, 95% CI)	36% (34–37%)	30% (28–32%)	38% (37–40%)	< 0.0001

CI, confidence interval; IDU, injection drug use.
[a]Wilcoxon rank sum test *P*-value for comparing age and duration of injection drug use; Fisher's exact tests *p*-value for comparing proportions.

were less likely to be sexually active [AORmeta 0.69 (0.58–0.81)] or report unprotected sex than their HIV-uninfected counterparts [AORmeta 0.58 (0.40–0.83)] (Table 2). However, HIV-infected PWIDs reported higher injection-related risks: syringe sharing [AORmeta 1.70 (1.30–2.00)] and injecting frequently [AORmeta 1.40 (1.20–1.70)] (Table 2).

Heterogeneity was high ($I^2 = 76\%$) for the association of self-reported unprotected sex and HIV seropositivity. In our analysis, 0% of the variance was explained by the sampling methodology, 20% by the study year, and 43% by the condom use recall period.

Acknowledging that availability of harm reduction interventions in the Russian Federation was lower than in other countries of this analysis, we performed a sensitivity analysis omitting the Russian data. Calculated ratios of AORs (from the meta-analysis: AOR_Russia excluded/AOR_Russia included) for the comparisons provided in Table 2 were close to 1 (point estimates of AOR ratios ranging from 0.93 to 1.16; all 95% CIs indicating no significant difference from unity; data available on request).

We also tested the effect of selected country-level contextual factors (coverage of needle/syringe programmes, OST, criminalization of PWIDs – measured as the proportion of PWIDs ever imprisoned, and problem alcohol consumption measured at the country level). As per meta-regression model estimates, these factors did not significantly contribute to the between-studies variance (explaining from 0 to 7% of estimates of I^2).

Further, the HIV-infected were more likely to have been tested for HIV before the interview [AORmeta 1.60 (1.30–2.10)]. Overall, 78% of PWIDs had ever been tested for HIV. Of those, PWIDs who reported having tested HIV-negative ($n = 2723$, 70%), 15% were HIV-infected by the time of the interview (8% in the West, 19% in the East).

One-fifth (22%) of current PWIDs reported never having been tested for HIV (West vs. East: 11 vs. 27%; $P < 0.0001$, difference of proportions 17%, 95% CI 15–19%).

Discussion

Our study documents significant differences between PWIDs in western and eastern Europe, that is between those who have experienced the older vs. the more recent HIV epidemics among PWIDs in Europe. In parallel with significantly higher HIV prevalence among PWIDs in the East, consistently higher prevalences of risk behaviours were reported (e.g. East vs. West: syringe sharing 32 vs. 13%), suggesting a potential for further expansion of the more recent epidemics.

Testing for HIV is a prerequisite for several HIV prevention interventions and linkage to HIV care [30–32]. Given that one-fifth of all PWIDs had never been tested and HIV prevalence is substantial even among those who had been previously tested, there is a need for continuous, sustained, population-based HIV testing for PWIDs in Europe.

Despite the absolute differences in reported risk behaviours, the associations of risk behaviours with HIV status (HIV-positive or negative) were similar across the sites and the two regions. The robustness of cross-site/region behaviour patterns is further supported by our finding of only minor changes in measures of association

Table 2. Sexual and injection risk behaviours among HIV-infected and uninfected current people who inject drug in Europe 2001–2010 in countries with high-prevalence HIV epidemics among people who inject drug.

	HIV-infected	HIV-uninfected	HIV^+ vs. HIV^- Logistic regression analysis	HIV^+ vs. HIV^- Logistic regression analysis	HIV^+ vs. HIV^- Meta-analysis	HIV^+ vs. HIV^- Meta-analysis
$N = 4948$ (West 2011, East 2937)	*n* (%)	*n* (%)	OR (95% CI)	AOR (95% CI)	ORmeta (95% CI), I^2	AORmeta (95% CI), I^2
Proportion of sexually active	1464 (77%)	2798 (82%)	0.74 (0.65–0.86)	0.74 (0.64–0.86)	0.69 (0.58–0.83) 16%	0.69 (0.58–0.81) 0%
Western Europe	349 (65%)	900 (72%)	0.70 (0.56–0.88)	0.70 (0.56–0.88)	0.69 (0.5–0.96) 4%1	0.63 (0.49–0.8) 0%
Eastern Europe	1115 (82%)	1898 (88%)	0.65 (0.54–0.79)	0.66 (0.54–0.80)	0.73 (0.59–0.9) 0%	0.74 (0.59–0.91) 0%
Proportion reporting 2+ sexual partners among sexually active[a]	666 (45%)	1494 (53%)	0.73 (0.64–0.83)	0.75 (0.66–0.86)	0.79 (0.67–0.93) 21%	0.84 (0.7–1) 25%
Western Europe	150 (43%)	433 (48%)	0.81 (0.63–1.05)	0.88 (0.67–1.14)	0.9 (0.68–1.2) 6%	0.97 (0.65–1.5) 42%
Eastern Europe	516 (46%)	1061 (56%)	0.68 (0.58–0.79)	0.70 (0.60–0.82)	0.75 (0.61–0.92) 30%	0.8 (0.65–0.98) 23%
Reporting any unprotected sex	930 (64%)	1938 (73%)	0.67 (0.59–0.77)	0.68 (0.59–0.79)	0.61 (0.43–0.86) 75%[b]	0.58 (0.4–0.83) 76%[b]
Western Europe	162 (47%)	540 (59%)	0.62 (0.48–0.80)	0.58 (0.45–0.76)	0.7 (0.36–1.4) 82%	0.7 (0.34–1.5) 83%
Eastern Europe	768 (70%)	1398 (80%)	0.57 (0.48–0.69)	0.56 (0.47–0.67)	0.56 (0.39–0.8) 63%[b]	0.52 (0.36–0.75) 60%[b]
Frequent injecting (daily+)	1072 (60%)	1535 (47%)	1.66 (1.47–1.86)	1.59 (1.41–1.79)	1.5 (1.2–1.8) 40%	1.4 (1.2–1.7) 16%
Western Europe	209 (46%)	500 (44%)	1.06 (0.85–1.33)	1.03 (0.82–1.29)	1.1 (0.89–1.4) 0%	1.2 (0.94–1.5) 0%
Eastern Europe	863 (64%)	1035 (49%)	1.90 (1.65–2.19)	1.78 (1.54–2.05)	1.7 (1.5–2) 0%	1.6 (1.3–1.9) 0%
Sharing of used syringes	616 (34%)	718 (22%)	1.85 (1.62–2.10)	1.84 (1.62–2.11)	1.6 (1.3–2.1) 52%	1.7 (1.3–2) 31%
Western Europe	85 (17%)	137 (11%)	1.61 (1.19–2.18)	1.62 (1.18–2.19)	1.5 (1–2.1) 11%	1.3 (0.72–2.3) 45%
Eastern Europe	531 (40%)	581 (27%)	1.77 (1.52–2.05)	1.69 (1.46–1.97)	1.8 (1.2–2.6) 77%	1.7 (1.4–2) 0%
Ever tested for HIV (before the study participation)[c]	1437 (84%)	2257 (72%)	2.01 (1.72–2.35)	1.71 (1.46–2.00)	2.1 (1.5–2.8) 59%	1.6 (1.3–2.1) 42%
Western Europe	334 (93%)	809 (84%)	2.51 (1.60–4.08)	1.93 (1.24–3.10)	2.1 (1.4–3.4) 0%	1.4 (0.76–2.7) 34%
Eastern Europe	1103 (82%)	1448 (67%)	2.18 (1.85–2.58)	1.88 (1.59–2.23)	2 (1.4–3) 73%	1.7 (1.3–2.3) 47%

AOR, odds ratios adjusted for people who inject drugs career length, age and sex; AORmeta, adjusted odds ratios derived from meta-regression; OR, odds ratios; ORmeta, odds ratios derived from meta-analysis.

[a]Those sexually inactive were excluded from the calculations of the proportion reporting 2+ sexual partners.

[b]All HIV^+ people who inject drugs (PWIDs) from Orel had had unprotected sex; for meta-analysis, Orel was excluded from the calculations of 'reporting any unprotected sex'.

[c]People who inject drugs from Portugal were all tested for HIV prior to the study, HIV-positive PWIDs from Madrid were all tested for HIV prior to the study; Portugal and Madrid data were excluded from the analysis of 'ever tested for HIV'.

(OR) after multiple regression and meta-regression analysis. According to our results, HIV-infected PWIDs in both eastern and western Europe are more likely to report previous HIV testing, injecting at least daily, and equipment sharing than their HIV-negative counterparts, and, significantly, HIV-infected PWIDs were less likely to be sexually active and reported less unprotected sex. Previous studies have given conflicting results: reporting either no difference in risk behaviour among PWIDs by HIV status (in Myanmar [33], Indonesia [34], USA [35] and Mexico [36]), increased injection risks in HIV-positives (in Nigeria [37] and India [38]) or decreased injection risks in HIV-positives (in Canada [39]). Comparison of HIV risk behaviours among PWIDs by HIV status calls for further systematic literature review, accounting for contextual factors such as HIV testing rates and awareness of seropositivity in the PWID population, HIV prevalence, stage of the HIV or injection drug use epidemic, availability of harm reduction and health (HIV) services (including ART coverage among PWIDs), the policy (law enforcement and security) and economic environment.

On the basis of the observed risk behaviour among PWIDs, there is still a substantial potential for HIV transmission in PWIDs. Ongoing HIV acquisition is shown by the significant numbers of new HIV infections among those whose self-reported last HIV test before the interview was negative. Sizeable proportions of HIV-infected PWIDs also reported unprotected sex and syringe sharing. In parallel, there is significant potential for HIV acquisition among HIV-uninfected PWIDs, given that two-thirds report unprotected sex and a quarter syringe sharing. Providing user-friendly, integrated services and truly accessible HIV prevention and care services to this target group [40] remains a significant implementation aim and challenge, especially in eastern Europe.

Our study has several limitations. We used data from cross-sectional studies in which the temporality between exposure (risk behaviours or HIV testing) and outcome (HIV seropositivity or risk behaviours) cannot be established. However, observing consistently reduced risk behaviours among the HIV-infected PWIDs across sites/regions supports the hypothesis that, following testing, HIV-positive PWIDs engage in less sexual risk behaviour than the HIV-negative ones. This is probably due to a reduction in sexual risk behaviour following a positive test, as the alternative explanation that those who report less sexual risk behaviour are more likely to get infected seems unlikely. We also acknowledge that the data were derived from multiple studies with some differences in the behavioural measures (especially regarding recall periods). However, the resulting errors would probably apply in a similar manner to both groups (HIV-infected/uninfected) within sites, and would therefore not affect comparisons between these groups. Social desirability bias would potentially also lead to similar effects (i.e. underestimation) on the measures of association.

We used data from a variety of sites and contexts across Europe and from studies employing different methods. We see a strength of the current analysis in the methodology (meta-analysis/regression) used. Use of meta-analysis/regression enabled us to take into account individual studies context and assess methodological heterogeneity and thus distinguish effects of these factors (site, measures, timing, recruitment methods) from underlying behavioural patterns.

Finally, our results might not be generalizable to all PWIDs in Europe given that the data came from countries with high HIV prevalence among PWIDs and because convenience sampling was used in some studies. However, these countries are among the most affected by injection drug use and HIV epidemics, and we believe our findings therefore have significance for the wider European HIV epidemic among PWIDs.

In conclusion, PWIDs in eastern Europe (where HIV epidemics are more recent) engage in higher and more frequent risk behaviours than PWIDs in the West (where the HIV epidemics are older). Whether this represents the 'natural course of an epidemic' or might (also) reflect differences in the coverage of interventions [12] warrants further analysis.

Compared with HIV-negative PWIDs, those infected with HIV are engaging in less sexual transmission behaviour, but exhibit higher injection-related transmission risks, suggesting different factors affecting these risk behaviours.

There is still a substantial potential for further HIV transmission among PWIDs in Europe, given the high levels of self-reported risk behaviours. Thus, an intensification of HIV prevention and harm reduction interventions targeting this population group is warranted, especially in eastern Europe.

Testing for HIV is a prerequisite for effective HIV prevention and care, and should be expanded.

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Conflicts of interest

The authors report no conflicts of interest.

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