

RESEARCH REPORT

Continuing injecting risk behaviour: results from the Amsterdam Cohort Study of drug users

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Abstract

Aims. To give a detailed description of injection-related risk behaviours, and to estimate the relative importance of these behaviours with regard to HIV transmission. **Design.** The present study was part of the Amsterdam Cohort Study of drug users. **Setting.** In Amsterdam, a city with extensive preventive measures, large HIV-risk reductions have taken place, but no further decreases have occurred since 1991. **Participants and measurements.** A detailed questionnaire on injecting risk behaviour was completed by a cross-section of participants in 1992/93 ($n = 168$). Among 48 HIV-seroconverters, a questionnaire was completed concerning possible HIV-transmission route. **Findings.** Of 96 HIV-negative participants, 23% deliberately borrowed a used syringe, 18% reported possible “accidental” borrowing, 9% front/backloading, 4% simultaneous injection, and 32% possible sharing of ancillary equipment. Of deliberate borrowers, 64% borrowed from a person with unknown or positive HIV serostatus, and 81% did not appropriately clean the equipment; 79% borrowed in the absence of serious withdrawal symptoms. Risk factors differed for deliberate and ‘accidental’ borrowing. Among the HIV seroconverters, the most likely transmission route was borrowing in 29% of cases, front/backloading in 8%, borrowing or front/backloading in 21%, unprotected sexual contact in 23% (mainly with regular partner) and either injecting or sexual risk in 13%. Women were much more likely to report sexual transmission ($p = 0.016$). Borrowing was admitted by 43% before, and 64% after awareness of HIV-seroconversion. **Conclusions.** As the injecting risk is high, usually deliberate, and often in the absence of withdrawal symptoms, further prevention seems difficult. Although deliberate borrowing is the main risk for HIV seroconversion, unprotected sexual contacts and front- and backloading may be more important than previously thought in Amsterdam. Under-reporting of borrowing is probably substantial, but does not alter the above conclusions.

Introduction

Injecting drug users (IDUs) are at a high risk of acquiring infectious diseases via shared use

of needles and syringes. These include human immunodeficiency virus (HIV), hepatitis B (HBV) and C (HCV) virus, and human

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Submitted 24th June 1998; initial review completed 16th October 1998; final version accepted 18th December 1998.

T-lymphotrophic virus type 2 (HTLV-2). Especially with regard to HIV and HBV, sexual transmission can also be important. Large reductions in injecting and sexual risk behaviours have been reported among IDUs and several combinations of interventions can be effective in achieving this, although risk elimination has not been achieved.^{1,2}

In Amsterdam, substantial reductions in HIV incidence³ and injecting^{3,4} and sexual risk behaviours⁵⁻⁷ among drug users have been observed. However, since 1991 no further reductions in injecting risk behaviour have occurred, leaving a substantial residual risk. During 1995-97, among HIV-negative current injectors, HIV incidence was 3-4% per year and 15% still reported borrowing over 4-monthly periods.³ Given the variety of extensive harm reduction measures (e.g. large scale methadone and needle exchange programmes, information and outreach activities), further risk reduction appears to be difficult to achieve.³

The present study was part of the Amsterdam Cohort Study (ACS), an ongoing comprehensive prospective study among drug users which started in 1985. The main aim of this paper is to give a detailed description of the residual injecting risk behaviour, given the earlier decline, using a questionnaire which was completed in 1992/93 (shortly after the stabilization of injecting risk). In earlier studies in Amsterdam injecting behaviour data were measured crudely, referring only to borrowing and lending used needles and multiple needle use.^{3,4} Here we also consider mixing (who borrows from whom), needle and syringe cleaning methods, front- and backloading,^{8,9} accidental borrowing (compared to deliberate), and sharing of ancillary equipment (e.g. spoons, cottons; also called indirect sharing¹⁰). This information is important to guide further prevention of injecting-associated risk behaviour. The relative importance of various injecting (and sexual) behaviours for HIV transmission was also studied, using an in-depth questionnaire which was administered to HIV seroconverters, concerning possible HIV transmission routes. After the large reduction in borrowing in Amsterdam other injecting behaviours and sexual risk behaviour may have risen in importance, which would imply that preventive measures should be adapted. For instance, in a setting with high needle availability and a previous reduction in needle sharing, frontloading

was reported to be a major risk factor for both HIV and HCV infection.⁸

Methods

In December 1985, an ongoing prospective cohort study of drug users was started in Amsterdam.^{3,6,11} Briefly, recruitment is via methadone posts, a sexually transmitted disease (STD) clinic for drug-using prostitutes (until 1996) and word of mouth. Over 95% of participants have a history of methadone treatment, compared to an estimated 80% for all heroin-dependent drug users in Amsterdam. Participation in the cohort is voluntary and with informed consent. The participants are asked to return every 4 months for follow-up visits. At each visit a blood sample is taken and a standardized questionnaire administered by specially trained nurses. Blood specimens are tested for HIV by enzyme linked immunosorbent assay (ELISA); positive specimens are confirmed by immunoblotting. At the first (intake) visit, questions about current behaviour refer to the 6-month period before intake, while at follow-up these questions refer to the period between the present and the preceding visit.

The extended injecting risk questionnaire: definitions and variables

Between May 1992 and July 1993, an extended standardized questionnaire concerning current injecting risk behaviours was administered once to current injectors. The importance of the questionnaire and giving honest answers was stressed. The questionnaire was administered only when there was enough time. Of 241 eligible IDUs, 168 (70%) completed the questionnaire. The 168 IDUs questioned, compared to the 73 who were not interviewed, were attending less often for an intake visit (2% versus 33%, $\chi^2 = 46.1$, $df = 1$, $p < 0.001$ (intake cohort visits take more time than follow-up visits), were older (mean age 35.7 versus 33.0, $t = 3.31$, $df = 239$, $p = 0.001$), resided longer in Amsterdam (median number of years 18.0 versus 12.5, Mann-Whitney U -test: $Z = 2.49$, $p = 0.013$), and injected for a longer period (median number of years 13.5 versus 10.5, Mann-Whitney U -test: $Z = 3.94$, $p = 0.002$). No statistically significant differences were found for gender ($\chi^2 = 0.33$, $df = 1$, $p = 0.57$), nationality ($\chi^2 = 1.49$, $df = 2$, $p = 0.47$),

Table 1. Definitions of injecting risk variables

Variable name	Definition variable (scaling used for analysis)
Risk for oneself	
1 Deliberate borrowing	Using a needle and/or syringe when it was known, beforehand, that it was used by another IDU (yes, no)
2 Front/backloading	Dividing drugs by sticking the needle of one syringe into the front or the back of another syringe, given that the needle or a syringe was previously used by another IDU (yes, no) (in Dutch: "streepjes delen")
3 Simultaneous use	Sharing one syringe filled with drugs, given injection with it after another IDU (yes, no)
4 Accidental borrowing	Accidental injection with needles and/or syringes which were previously used by another, without realizing it at that time (certain, maybe, impossible)
5 Ancillary equipment sharing	Use of injecting equipment other than needles and syringes, such as filters, spoons, glasses, cans, etc. which have been in contact with blood from other IDUs (certain, maybe, impossible)
Risk for other IDUs	
6 Deliberate lending	Giving a needle and/or syringe, which was already used by oneself, to another IDU (yes/no)
7 Front/backloading/ simultaneous use	Dividing drugs by sticking the needle of one syringe into another syringe, given that a needle or syringe was previously used by oneself/Sharing one syringe filled with drugs with another person injecting after oneself (yes/no)
8 Accidental lending	Someone taking a needle and/or syringe from oneself (accidentally or deliberately), without asking, which was already used by oneself (certain, maybe, impossible)

Deliberate needle-associated risk is defined as either deliberate borrowing, front- or backloading or simultaneous use.

HIV-serostatus ($\chi^2 = 0.07$, $df = 1$, $p = 0.80$), current borrowing ($\chi^2 = 0.11$, $df = 1$, $p = 0.74$) or lending ($\chi^2 = 0.17$, $df = 1$, $p = 0.68$) of previously used syringes/needles.

In the extended questionnaire several current risk behaviours were defined, concerning behaviours with risk for oneself and with risk posed to other IDUs (Table 1). The questionnaire also included standardized items on mixing (who practised risk with whom), injecting equipment cleaning, and circumstances surrounding the last risk episode (e.g. with whom, where, when, withdrawal symptoms). All analyses are stratified by HIV-serostatus.

Among HIV-negatives with regard to risk for oneself, determinants for deliberate (Table 1, variables 1, 2 and 3 combined) and accidental (variable 4, the categories "certain" or "maybe" combined) needle-associated risk were studied. Among HIV-positives statistical power was low. The potential determinants were all self-reported and measured at the cohort visit at which the extended injecting behaviour was taken. Categories were based mainly on equal category sizes. Set 1 consisted of socio-demographic variables:

nationality (Dutch, other), gender, age (< 32, 32–37, > 37 years), number of years residing in Amsterdam (continuous), current housing situation, current prostitution and duration of injecting (< 10, 10–16, > 16 years). Set 2 concerned current drug use behaviours: main type of drug injected (heroin, cocaine, speedball, other), frequency of injecting (< 15, ≥ 15 times per month), alcohol use (none, 1–4, > 4 glasses/day), injecting mainly on the streets, main injecting partner (alone, steady sexual partner, others), re-use of the same needle/syringe (exclusively single use, 1–2, ≥ 3 times), mean number of days of needle/syringe possession after first use and having drugs but no own injecting equipment. Set 3 consisted of current behaviours and opinions related to harm reduction activities: attending a methadone programme (every week, not every week), methadone dosage (≤ 60 , > 60 mg), percentage of new needles/syringes via exchange programmes (0%, 1–99%, 100%), main reason for exchanging (no exchanging, practical reasons (= cheap, easy to get), to avoid infection with HIV), number of needles/syringes exchanged per needle exchange visit (no ex-

changing, 1–12, ≥ 12 syringes), frequency of exchanging needles/syringes (no exchanging, daily, 1–6 times per week, < 1 time per week), perceived access to new needles/syringes besides the exchange programmes (difficult, reasonable, easy).

Significant ($p < 0.05$) and independent determinants were established using logistic regression analysis. First, independent predictors were determined per variable set, after which the remaining variables were combined. The multivariate models were constructed using forward stepwise variable selection. Interaction and residual confounding in the final models were checked.

Risk behaviour among HIV-seroconverters

In a subgroup of participants who seroconverted to HIV within the study, a "seroconversion questionnaire" was administered by physicians after participants were informed that they had acquired HIV infection, in order to check transmission routes systematically. The possible transmission period was defined as both the interval between the first HIV-antibody-positive visit and the last HIV-negative visit and between the last two HIV-negative visits. Possible risks measured were: borrowing (deliberate and accidental); front- or backloading; unprotected (without condoms) hetero- and homosexual contact with steady, casual and commercial partners; and miscellaneous (e.g. ancillary equipment sharing, needle-stick accident, blood transfusion). Answer categories for all behaviours were: no, from/with a known HIV-positive person, from/with a person with unknown serostatus.

Between December 1985 and May 1997, 81 participants acquired HIV infection. Starting in January 1995, the seroconversion questionnaire is administered to every new seroconverter ($n = 15$) at the cohort visit following HIV seroconversion or at an additional visit on invitation. Of 66 IDUs who seroconverted before 1995, the same questionnaire was administered retrospectively to 33; the median interval between interview and seroconversion was 30 months. As a result, 48 interviews were available for analysis. The mean (median) year of seroconversion was 1992 (1993).

Results

Extended injecting risk behaviour questionnaire

The extended questionnaire was administered to 168 current injectors. Of the respondents 77.4% were men, the mean age was 35.7 years ($SD = 5.8$, range: 22–50), the mean number of years since first injection was 13.8 ($SD = 7.0$, range: < 1 –30) and 42.9% were HIV-seropositive. Since the previous visit, 29% injected fewer than 15 times per month, 39% between 15 and 45 times and 32% more than 45 times. The main type of drug injected was heroin alone for 15%, cocaine for 10% and speedballs (cocaine and heroin combined) for 57%.

Injecting behaviour with risk for oneself among HIV negative IDUs

Table 2 shows the prevalence of different types of injecting behaviour with risk for oneself among 96 HIV negative IDUs. These behaviours pertain to a mean (median) period of 5.2 (4.0) months (since the previous cohort visit for $n = 94$, and during the 6 months preceding intake for $n = 2$). The mean number of preceding cohort visits was 7.7.

Deliberate borrowing was reported by 22 (23%) participants. Among borrowers, the mean frequency of borrowing was 19 times (median = 2; range 1–200). The method of cleaning the deliberately borrowed syringe(s) was: no method in 14%, cold water in 67%, warm water in 10%, boiling in 10%, bleaching in 24%, alcohol in 15% and another method in 19% (the sum of percentages exceeds 100 since one person could have used several cleaning methods). In total, 81% did not always clean the borrowed equipment appropriately, i.e. inconsistent use of bleach or boiling. Nine (9%) IDUs admitted frontloading. Four (4%) people practised backloading, all of whom also reporting frontloading. Simultaneous use was reported by four (4%) participants.

In total, deliberate needle-associated risk behaviour (see methods) was reported by 25 (26%) participants. For 25% this exclusively concerned needles/syringes from their steady sexual partner, for 50% equipment from (an)other person(s) and in 25% from both. Sixty-four per cent were uncertain about having used needles/syringes exclusively from HIV-seronegative IDUs. When this last percentage is combined with 81% not appropriately cleaning needles, this results in an

Table 2. *Injecting risk behaviour with risk for oneself among 96 HIV negative injecting drug users in the Amsterdam cohort study*

Deliberate borrowing	Back/front loading	Simultaneous use	Accidental borrowing	<i>n</i>	(%)
+	+	+	possible	1	1
+	+	+	-	2	2
+	+	-	-	3	3
+	-	+	-	1	1
+	-	-	certain	2	2
+	-	-	-	13	14
-	+	-	possible	2	2
-	+	-	-	1	1
-	-	-	certain	2	2
-	-	-	possible	10	10
-	-	-	-	59	61
22 (23%)	9 (9%)	4 (4%)	17 (18%)*	96	100

For definitions, see Table 1. *, the categories 'certain' and 'maybe' are combined.

estimate of 52% of 25 participants, or 14% of the total study population, who reported deliberate needle-associated risk behaviour with a chance of acquiring HIV infection.

With regard to accidental borrowing, four (4%) participants were certain this happened while 13 (14%) thought this may have occurred. Of these 17 (possible) accidental borrowers, for 13% this concerned needles/syringes of steady sexual partners, for 83% equipment of others than their steady partner, and for 4% both. The cleaning method of accidentally borrowed syringes was: 38% no cleaning, 19% with cold water, 25% warm water, 13% boiling and 6% bleaching. Similar to deliberate borrowing, 81% did not always clean accidentally borrowed equipment appropriately.

Thirty-two per cent ($n = 31$) of HIV-seronegative IDUs reported the possibility of sharing of ancillary equipment. Of these 31, 15 (48%) were certain it happened and 16 (52%) thought it was possible. Ancillary equipment that was (possibly) shared were mainly spoons (49%), cottons (40%) and glasses (11%); sharing cans/containers was not reported. Of 69 participants who denied any deliberate or accidental needle-associated risk of which they were certain (Table 2), nine (13%) were certain they shared ancillary equipment which could have been in contact with blood of other IDUs.

The various types of deliberate needle-associated risks appear interrelated: all four participants who reported simultaneous use, and six of nine IDUs who reported front/backloading also

reported deliberate borrowing (Table 2). All correlation coefficients between the three deliberate behaviours (Table 3) are statistically significant and vary between 0.30 and 0.40. Accidental borrowing and the three deliberate behaviours were not related. Sharing of ancillary equipment was significantly associated with two of the deliberate behaviours but not to accidental borrowing.

Deliberate versus accidental needle-associated risk: determinants and situational factors

Of the variables described in the Methods section (univariate analysis), deliberate needle-associated risk was higher among IDUs who reported frequent re-use of the same needle/syringe, having drugs but no own injection equipment, and obtaining between 1% and 99% of all new needles/syringes via a needle exchange programme. Frequent re-use of the same needle/syringe and having drugs but no own equipment were independent determinants (Table 4).

With regard to (possible) accidental borrowing, the variable being ≥ 38 years of age was univariately associated with an increased risk, while obtaining all (100%) new needles/syringes via needle exchange programmes was protective. Multivariately, these two variables remained significant and one other variable did improve the model significantly: frequent injecting (≥ 15 times per month) increased the likelihood of accidental borrowing (Table 4).

The circumstances surrounding the last time

Table 3. Correlation coefficients between injecting risk behaviours with risk for oneself among 96 HIV negative injecting drug users in the Amsterdam cohort study

	1	2	3	4	5
1 Deliberate borrowing	1.00				
2 Back/frontloading	0.33**	1.00			
3 Simultaneous use	0.38***	0.47***	1.00		
4 Accidental borrowing	0.01	0.07	0.01	1.00	
5 Ancillary equipment sharing	0.25*	0.18	0.28**	0.05	1.00

For definitions, see Table 1. Variables 1, 2 and 3 are coded 0 = no, 1 = yes. Variables 4 and 5 are coded 0 = impossible, 1 = maybe, 2 = certain. *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$.

that needle-associated risk occurred were fairly similar for deliberate ($n = 19$) and (possible) accidental behaviour ($n = 17$), and can be characterized by: using a needle/syringe of a friend/acquaintance (58% and 65%, respectively); at own home (47% and 71%) or on the streets (26% and 6%); in the evenings (56% and 43%); from Monday to Friday (88% and 75%); concerning injecting of speedballs (63% and 65%); within 30 minutes to the nearest syringe exchange (72% and 71%); and in the absence of serious withdrawal symptoms (79% and 82%). None of these percentages differed significantly between deliberate and accidental behaviour, but statistical power was low to detect differences.

Injecting behaviour with risk for another

Among 72 HIV-seropositive participants, deliberate lending was not reported and only one (1%) admitted frontloading with risk for another IDU (Table 5). Another nine (13%) reported

the possibility of accidental lending, although no one was certain this did actually happen.

Among 96 HIV-negatives, 19 (20%) reported a deliberate behaviour with risk for another; nine (9%) reported deliberate lending, while 16 (17%) reported front/backloading or simultaneous use (Table 5). Of the nine deliberate lenders, 38% lent to their steady sexual partner, 50% to others and 13% to both. Eleven (11%) HIV-negatives exclusively reported accidental lending as risk for another IDU, of whom two were certain it happened and nine thought it was possible.

Risk behaviour among HIV-seroconverters

Of 48 interviewed seroconverters, 46 reported injection in the possible HIV-infection period (see methods). Table 6 presents different HIV-risk profiles which were aggregated into five distinct categories indicating the most likely HIV transmission route: for 14 (29%) seroconverters

Table 4. Independent determinants of deliberate needle-associated risk and accidental borrowing among 96 HIV negative injecting drug users in the Amsterdam cohort study

	OR	95% CI
Deliberate needle-associated risk		
Having drugs but no own needle/syringe	4.55	1.59–12.50
Re-use of the same injection equipment	2.36†	1.06–5.24
Accidental borrowing*		
Percentage syringes via exchange programmes		
• no exchanging (0%)	1	
• not all syringes (1–99%)	1.15	0.13–10.09
• all syringes (100%)	0.10	0.01–0.95
Injecting ≥ 15 times per month	10.59	1.40–79.83
Age > 37 years	0.08	0.01–0.84

For definitions, see Table 1. OR, odds ratio; CI, confidence interval. † The odds ratio corresponds to each next category (single needle use, 1–3 times, ≥ 3 times). * This includes both the category 'certain' and 'maybe'.

Table 5. *Injecting risk behaviour with risk for another IDU among 96 HIV negative and 72 HIV positive injecting drug users in the Amsterdam cohort study*

Deliberate lending	Accidental lending *	Simultaneous use/back/frontloading	HIV-positive		HIV-negative	
			n	%	n	%
-	-	-	62	86	66	69
-	-	+	1	1	4	4
-	+	-	9	13	11	11
-	+	+	0	0	6	6
+	-	-	0	0	1	1
+	-	+	0	0	3	3
+	+	-	0	0	2	2
+	+	+	0	0	3	3

For definitions, see Table 1. * The categories 'certain' and 'maybe' are combined.

this was borrowing of used needles/syringes (category 1), for four (8%) front- or backloading (category 2), for 10 (21%) either borrowing of front- or backloading (category 3), for six (13%) either injecting or sexual risk behaviour (category 4), and for 11 (23%) sexual contact (category 5). Women were much more likely than men to report heterosexual transmission: 60% of 15 women fell into category 4 or 5, compared to 24% of 33 men ($p = 0.016$). No trends over time were observed with regard to probable transmission route.

Other risk behaviours than those shown in Table 6 were less often reported. None of the seroconverters reported unprotected homosexual contacts. Only five reported unprotected commercial sexual contact with clients, and two reported unprotected sexual contacts with prostitutes. The three seroconverters without HIV-risk in Table 6 concern one who only reported a needle-stick accident, one who only mentioned ancillary equipment sharing and one who denied all possible risks.

The majority of seroconverters (29, or 60%) knew of HIV-infection of one or more people with whom they engaged in risk behaviour, especially with regard to borrowing, front- or backloading and steady sexual partners (Table 6).

Discussion

A previous study showed that after a strong initial decline in borrowing of used needles/syringes (1986-1991), there was no further decline in Amsterdam.³ The present study therefore describes injecting-associated risk behaviour shortly after this stabilization (1992-1993). Although continuing injecting risk consists of vari-

ous types of behaviour, borrowing of needles or syringes known beforehand to have been used by somebody else was most important (reported by 23%). In about half of IDUs who reported borrowing this carried a high risk of acquiring HIV infection, due to inadequate cleaning of needles/syringes of people who were not known to be HIV-negative. The importance of borrowing is confirmed by the finding that of HIV seroconverters 29% reported borrowing to be the only or most likely HIV transmission route, and 42% reported it to be a possible route.

Self-reported borrowing appears to be underestimated substantially at follow-up visits: among 48 HIV-seroconverters, 43% reported borrowing in the standard questionnaire (before knowledge of HIV-seroconversion), compared with 64% in the seroconversion questionnaire (after being informed of HIV-seroconversion), an increase of 50%. Participants may become more reluctant to admit risk behaviours at follow-up visits, since at the end of each visit within our cohort study IDUs receive HIV test results and counselling. As a result, the reported prevalence of borrowing of 15% in 1997 (3) is in reality probably closer to 25% per 4 months, which is in line with the proportion reporting borrowing at intake visits. In general, this high residual risk is in agreement with the high HIV-incidence of 3-4% per year during 1994-97.³

Further prevention of borrowing appears difficult, as the vast majority of those who still borrow appear to do this deliberately, in the absence of withdrawal symptoms, and from people who may be HIV-positive. Moreover, of HIV-seroconverters who were likely to be infected via borrowing about two-thirds admitted borrowing from a person known to be HIV-positive.

Table 6. Self-reported HIV-risk behaviour during the possible HIV transmission period among 48 HIV-seroconverters in the Amsterdam cohort study

Borrowing	Front- or backloading	Unprotected sexual contact		n	Risk*
		Steady partner	Casual partner		
HIV +	-	-	-	7	1
HIV +	-	-	HIV?	1	1
HIV +	-	HIV?	-	1	1
HIV +	-	HIV +	-	1	4
HIV +	-	HIV +	HIV?	1	4
HIV +	HIV?	-	-	1	1
HIV +	HIV +	-	-	3	3
HIV +	HIV +	-	HIV?	2	3
HIV +	HIV +	-	HIV +	1	4
HIV +	HIV +	HIV +	-	1	4
HIV?	-	-	-	3	1
HIV?	-	-	HIV?	1	1
HIV?	-	HIV?	-	1	4
HIV?	-	HIV +	-	1	5
HIV?	-	HIV +	HIV?	1	5
HIV?	HIV?	-	-	4	3
HIV?	HIV?	-	HIV?	1	3
HIV?	HIV?	HIV +	-	1	5
-	HIV +	-	HIV?	1	2
-	HIV +	-	-	1	2
-	HIV?	HIV?	-	1	4
-	HIV?	-	-	2	2
-	-	HIV +	-	4	5
-	-	-	HIV +	2	5
-	-	-	HIV?	2	5
-	-	-	-	3	-
32	19	13	13	48	total
19	9	10	3	29	known HIV + only

HIV +, practised behaviour with known HIV-positive; HIV?, practised behaviour with someone with unknown serostatus. *Risk refers to categories of most probable HIV infection route: 1, borrowing; 2, front- or backloading; 3, borrowing or front- or backloading; 4, borrowing or front- or backloading or unprotected sex; 5, unprotected sex.

As needle availability and knowledge of HIV transmission routes are high in Amsterdam, the immediate anticipated effects of drug use seem to overwhelm the possibility of acquiring HIV infection. This is in line with results of an ethnographic study in Rotterdam, the Netherlands: study participants were aware of risks involved with needle-sharing, and sharing was associated primarily with (immediate) availability of syringes, experience with the injecting ritual and drug craving.¹²

On the other hand, determinants of deliberate borrowing, i.e. "having drugs but no own needle/syringe" and "using injection equipment more than once", may be amenable to intervention (to avoid misunderstandings: in a recent study in the ACS³, (a) having drugs but no own needle/syr-

inge was not reported as a determinant as this variable is not measured in the standard questionnaires and (b) additional risk factors were identified due to larger statistical power). Another in-depth study in Baltimore also found that sharing was related to drug users' planning where and when they will inject drugs.¹³ These findings translate into the prevention messages to always ensure clean injecting equipment before purchasing drugs and to use needles and syringes only once ("one set, one shot"). However, in Amsterdam needle availability has been high for many years and these messages have already been integrated into several Amsterdam prevention activities. Nevertheless, it is important to know that the residual injecting risk remains associated with these behaviours, and strength-

ening these messages may still have some beneficial effect.

Front- and backloading were the second most prevalent injecting risk behaviours reported (by 9%). For 8% of HIV-seroconverters this behaviour was reported to be the most likely transmission route, while another 21% could have been infected by either front- or backloading or borrowing. As this behaviour may therefore contribute substantially to current HIV-transmission, we recommend that Amsterdam prevention measures emphasize more strongly the dangers of front- and backloading. Of the few identified previous studies specifically addressing the risks associated with front- and backloading, three out of four found this behaviour to be associated with a higher likelihood of parenterally transmitted diseases.^{8,14-16}

Accidental borrowing occurs (among HIV negatives, 4% were certain and for another 13% it may have happened) and it is clearly a different behaviour from deliberate sharing (not correlated, different determinants). However, accidental borrowing appears to be of minor importance with regard to HIV-transmission: only five of 48 seroconverters reported accidental borrowing, all of them also admitting deliberate borrowing. Simultaneous needle and syringe use was practised by only 4% of HIV seronegatives; unfortunately this behaviour was not measured separately in the seroconverter questionnaire.

In the above discussion, the various injecting risk behaviours were evaluated in the context of HIV transmission. However, the importance of specific behaviours may be different with regard to HBV and HCV transmission. For instance, among HIV negative IDUs, the prevalence of front/backloading or simultaneous use with infection risk for another IDU (17%) is higher than the prevalence of deliberate lending (9%). Of HIV negative IDUs in Amsterdam, 57% were reported to be infected with HBV and 59% with HCV.¹¹ Also, IDUs who did not report needle-associated risks still run a considerable risk of acquiring HCV infection, as sharing of ancillary equipment is often reported in this group. In general, it may be that IDUs are more concerned with, or knowledgeable about, HIV infection than hepatitis infections. Therefore, prevention may be improved by implementing a more comprehensive approach, emphasizing the general importance of injecting hygiene.

In Amsterdam, unprotected sexual contacts

may contribute more to HIV transmission among IDUs than thought previously. Eleven (23%) seroconverters reported this to be the most likely infection route; eight of them reported it to be the only possible route. The majority (8 of 11) reported unprotected sex with an HIV-positive steady partner. Another six (13%) reported that sexual transmission was possible. Women reported significantly more often than men the possibility of having acquired HIV infection heterosexually (60% and 24%, respectively). However, careful interpretation of these data is warranted; the proportion likely to be infected via sexual transmission may be overestimated as IDUs may find it more difficult to admit or recall injecting than sexual risk behaviour. However, one cannot exclude the possibility of substantial sexual HIV transmission, especially because so many reported a known HIV-positive partner. Therefore, especially among female IDUs, expansion of HIV-prevention targeted at sexual risk reduction may reduce HIV incidence. However, further prevention of unprotected sexual contact may also be difficult, as a large risk reduction has already taken place,⁶ and as the majority of HIV-seroconverters took a deliberate risk through unprotected sexual contact with a steady partner known to be HIV-positive.

In the past, heterosexual HIV-transmission among Amsterdam drug users was considered very rare, as among non-injecting heterosexual drug users in our cohort the HIV prevalence is very low.⁶ Therefore, the different results here can be explained by non-random mixing, i.e. injectors are more likely to have steady partners who also inject and vice versa, injecting partners having a much higher HIV-prevalence than non-injectors.

Unprotected heterosexual contacts with casual and commercial partners appears to be of less importance, as this was reported by <10% of seroconverters, never with a known HIV-positive person and always in the presence of an injecting risk behaviour. Homosexual contacts were not reported as a possible HIV infection risk.

Although several suggestions have been made as to how HIV prevention measures can be improved in Amsterdam, we feel that one should not expect too much effect on top of the already large risk reduction. Interventions targeted at cessation of injection behaviour may be more effective in the long term. In fact, in Amsterdam

the number of injectors appears to have decreased substantially, as indicated by a large decrease in the number of needles distributed via the needle exchange programmes (from about 1 million in 1991 to 500 000 in 1997), a continuous increase in the mean age of drug users in methadone programmes (17) and IDUs recruited on the streets (18). It is unclear to what extent this decrease is caused by a decrease in initiation, an increase in cessation of injecting or by selective migration and mortality.

However, given the high residual risk which appears hard to prevent, HIV prevalence will remain high for many years among Amsterdam current and former injectors. Therefore, prevention of initiation of injection in the next generation of drug users is of crucial importance, especially since recent injectors have a relatively high HIV incidence (19). With regard to HCV infection this may even be more important, given the higher infectivity of the virus. After 2 years of initiation of injecting more than half of IDUs can have acquired HCV infection.²⁰ A previous Amsterdam study found no clues how to establish effective primary prevention of injection.²¹ However, this study was carried out among a group of relatively old Caucasian heroin users, the majority having a history of methadone treatment. The incidence and determinants of injecting may well be different among non-injecting drug users who are younger, of ethnic minorities, or mainly dependent upon cocaine. Also, this previous Amsterdam study was not designed specifically to study modifiable determinants of injecting.

Acknowledgements

We especially thank J. Bax, A. Snuverink and H. van Haastrecht for support, and S. Strathdee for valuable comments. This study was performed as part of the Amsterdam cohort studies on AIDS, a collaboration between the Municipal Health Service, the Academic Medical Centre and the Central Laboratory of the Netherlands Red Cross Blood Transfusion Service, Amsterdam, the Netherlands. This study was supported by the Netherlands Foundation for Preventive Medicine as part of the Stimulation Programme on AIDS Research of the Program Committee for AIDS Research (PccAo) (grant no. 28-1258).

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