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## Irish Injecting Drug Users and Hepatitis C: Importance of the social context of injecting

**Short title:** Social context of injecting and HCV

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# Irish Injecting Drug Users and Hepatitis C: Importance of the social context of injecting

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## Summary

**Background.** The incidence of hepatitis C (HCV) infection among injecting drug users (IDU) in Dublin is particularly high by international standards. The most robust predictor of an IDU's HCV status is their total number of lifetime injecting episodes. It is proposed that participation in specific unsafe injecting practices is the principal contributor to this accumulated risk. We sought to test this hypothesis. The relationship between social context of injecting and HCV status was also examined.

**Methods.** We conducted a cross-sectional survey of IDU recruited from treatment settings in Dublin. Participants had injected in the preceding six months and had not previously been tested for HCV. A structured interview was administered.

**Results.** HCV testing was performed on 159 IDU and 61% were antibody positive. The three characteristics that were significant independent predictors of a positive test result were increased total number of lifetime injecting episodes, closer social relationships with other IDU and injecting in the home of other IDU. Frequency of recipient syringe sharing, backloading and sharing of injecting paraphernalia were not independently associated with infection.

**Conclusions.** We found that the robust association between HCV infection and number of lifetime injecting episodes was not explained by increased unsafe injecting practices. The socialised nature of heroin injecting in Dublin is contributing to the HCV epidemic in this population. These findings suggest that accidental and unnoticed sharing of injecting equipment may be an important contributor to an IDU's increasing risk of infection over time.

## Medical Subject Headings

Hepatitis C

Injecting drug users

Risk factors

Syringe sharing

Social context

## Key Messages

- Hepatitis C (HCV) status among injecting drug users (IDU) is strongly correlated with their total number of lifetime injecting episodes.
- Self-reported unsafe injecting practices, such as recipient syringe sharing, are not strong predictors of HCV status.
- IDU who are in intimate relationships with other IDU are at increased risk of HCV infection.
- IDU should use a new sterile syringe on each injecting occasion.
- If IDU choose to re-use a syringe, they should take great care to ensure that it does not become accidentally mixed up with the injecting equipment of other IDU.

## Introduction

Injecting drug users (IDU) are at high risk for hepatitis C (HCV) infection [1,2]. In studies examining the prevalence of HCV in populations of IDU, duration of injecting and the frequency of injecting each day are the factors most consistently associated with infection [3-13]. Numerous studies measuring the incidence of HCV infection among IDU have found that increased frequency of injecting is associated with seroconversion [9, 14-16]. Overall, this body of research confirms that an IDU's risk of exposure to HCV increases as their number of lifetime injecting episodes increase [17].

Injecting drugs does not cause HCV infection in itself. It is engagement in unsafe injecting practices which permits the parenteral spread of this virus. Specific injecting practices such as borrowing used syringes from other IDU (recipient syringe sharing), backloading and the sharing of 'cookers' and filters constitute unsafe injecting practices. (Backloading involves the preparation of heroin in one syringe and subsequent transfer of half the contents to a different syringe). Many studies have demonstrated an association between these practices and HCV infection [3-6, 15]. It has been proposed that engagement in these specific overt risk behaviours is the principal contributor to an individual's risk of HCV infection [1]. If this assertion is correct, accurate measurement of unsafe injecting episodes should predict HCV status more robustly than measurement of total number of lifetime injecting episodes.

The social context in which IDU inject has also been linked with HCV status [18]. IDU who inject in company and those who are injected by someone else have been demonstrated to be at increased risk of infection [3,5]. IDU who are in a sexual relationship with another IDU are more likely to engage in unsafe injecting practices and may be at increased risk of HCV

infection [13, 19, 20]. A number of researchers have reported that settings in which there is reduced access to sterile injecting equipment, particularly prisons, are associated with increased risk of HCV infection [6,8].

In Dublin, the prevalence and incidence of HCV among IDU has been demonstrated to be particularly high by international standards. The incidence of HCV infection has been found to be 66 infections per 100 person years at risk [16]. High rates of infection have been matched by high rates of self-reported risk behaviour [20, 21]. Seventy per cent of IDU reported recent recipient syringe sharing, while 87% reported sharing of drug injecting paraphernalia such as spoons and filters [20]. Recipient syringe sharing was found to be significantly associated with less education, parental unemployment, polydrug injecting, injecting in company, perceiving less danger in sharing and having more intimate relationships with other IDU. This highlights the importance of social context in influencing risk behaviour in Dublin. Despite frequent unsafe injecting and a high prevalence of HCV infection, the incidence and prevalence of HIV infection were very low in the mid-1990s [7, 16]. Among IDU who had been injecting for up to five years, only 0.6% were HIV positive. However, there has been some evidence of a recent increase in HIV incidence in, with many new cases occurring in clusters of young IDU [22].

In view of the important contribution made by social circumstances in influencing HCV rates among IDU and the particularly high incidence of HCV in Dublin, some further description of the drug using culture in Dublin is warranted to put the current study in context. The heroin using population in Dublin is very young by European standards [23]. Most IDU spend some time chasing (smoking) heroin prior to injecting. Heroin is 'cooked' on spoons in preparation for injecting. Most IDU come from materially deprived backgrounds and continue to live at

home with their family of origin [24]. Socially, they tend to aggregate into loosely bound but identifiable clusters [22]. Addiction treatment services expanded substantially during the early 1990s, greatly increasing access to methadone treatment. By 1996, there were 13 syringe exchange programs in the city. Plans to open further syringe exchanges have met with very substantial local community resistance. Communities reported concerns that children would pick up discarded needles and worried that syringes would be used as weapons in robberies. No syringe exchange provides 24-hour access. The number of outreach workers increased during the 1990s. They offer advice on safe injecting, provide syringe exchange directly to IDU and facilitate treatment entry.

In this study we sought to examine factors associated with HCV status among IDU in Dublin. We hypothesised that frequency of unsafe injecting practices would predict HCV status more robustly than number of lifetime injecting episodes. Secondly, we hypothesised that the social context in which IDU injected would influence their HCV status.

## **Method**

The patients in this study were drawn from a number of different treatment settings in Dublin. These settings included the two inpatient drug dependency units and the largest outpatient drug treatment centre. Patients were also recruited from seven smaller treatment centres. These smaller treatment centres were selected on the basis of interest in the research being expressed by the lead clinician at these sites. Patients were eligible to participate if they had not previously been tested for HCV and they had a history of injecting in the previous six months. These patients were routinely offered HCV testing as part of their overall treatment

package. When the interviewer visited the treatment site, clinical staff identified new patients who met the inclusion criteria. A structured interview was administered to IDU who consented to participate in the study, before they underwent HCV testing. The structured interview was adapted from that used in a WHO study [25]. The lead author (BPS) conducted all interviews. This interview provides detailed information on injecting behaviour during the preceding six months. Patients reported (i) the number of months during which they injected, (ii) the typical number of days per month on which they injected and (iii) the average number of injecting episodes which occurred on an injecting day. The number of injecting episodes in the six month period was the product of these three variables. Patients then estimated the frequency that they engaged in the specific unsafe injecting behaviours during the preceding six months (e.g. using another IDU's spoon every second injecting occasion and recipient syringe sharing one in every ten injecting episodes). The number of these episodes was calculated by multiplying the proportion (e.g.  $\frac{1}{2}$  or  $\frac{1}{10}$ ) by the number of injecting episodes in the past six months.

In order to estimate the total number of lifetime injecting episodes, we asked participants to state when they first injected. If they had been injecting for more than six months, they were asked to report any previous periods during which their injecting frequency was increased or decreased due to factors such as abstinence, reverting to heroin smoking or receipt of methadone treatment. If such periods were reported, they were taken into account when estimating the number of lifetime injecting episodes.

Recipient syringe sharing was specifically explored as suggested by McKegney & Bernard , i.e. we ensured that we distinguished between borrowing a needle or syringe from another IDU versus lending an item to another IDU [26]. When not directly examined, IDU may

under-report recipient syringe sharing with their spouse or regular sexual partner.

Consequently, we explored recipient syringe sharing across the range of categories of social relationships including strangers, acquaintances, close friends and their spouse, girlfriend or boyfriend. We did not examine other unsafe injecting behaviours in the same detail across these social relationships.

Consenting patients for HCV testing, conducting of testing and informing them of test results remained the clinical responsibility of the doctor at their clinic. No tests were conducted for purely research purposes.

The screening test for HCV was a third generation enzyme linked immunosorbant assay (EIA) for antibody to HCV ( Ortho Diagnostics, Amersham, Buckinghamshire, England ). All positive results were confirmed with an additional EIA. A recombinant immunoblot assay was used in situations where the two EIA gave contradictory results. The initial screen for HIV was with two EIA tests for antibody to HIV. Positive tests were confirmed with the Western blot assay.

### *Statistical Analysis*

Associations between categorical variables and HCV status were examined using Pearson's chi square test. Odds ratio and their 95% confidence intervals were reported to indicate the magnitude and direction of associations. For the purposes of data presentation and statistical analysis, quantitative variables were converted into categories and associations with HCV status were subsequently explored via Mantel-Haenszel chi square test for trend. These same



statistical tests were also used to examine for association between variables and completion of HCV testing.

When conducting power calculations, we examined our ability to detect significant associations between HCV and strong predictors of infection (odds ratio 3.0), and also with moderate predictors of infection (odds ratio 2.0). The level of statistical significance was set at 0.05. We anticipated completing HCV testing on 160 interviewees and this meant that we had 90% power to detect strong predictors of infection and 50% power to detect moderate predictors.

To test the hypothesis that injecting related variables would predict HCV status independently of total number of lifetime injections, each variable was separately entered into a logistic regression equation along with 'lifetime injecting episodes'. The Wald statistic was utilised to derive p values.

A logistic regression analysis was conducted to identify those variables independently predictive of HCV status. All variables examined on univariate analysis were considered for selection into the final regression equation. Variables were chosen by using the forward and backward selection techniques. The selected variables were examined for evidence of interaction. The variance in observed outcome explained by the regression equation was calculated using the Nagelkerke  $R^2$  value [27].

## **Results**

Only two of the patients approached to participate in the interview refused. Among the 242 patients interviewed, 159 (66%) underwent HCV testing and our analysis focused on this latter group. Males accounted for 58% of this group. The median age of participants was 21 years (interquartile range [IQR] 19 to 25 years) and median time since commencement of injecting was 22 months ( IQR 9 to 38 ). Sixty-seven per cent reported injecting every day. Heroin was the main drug injected by 155 (97%) participants. Compared to those who failed to undergo HCV testing following interview, the group who underwent testing reported increased recipient syringe sharing ( $p=0.04$ ) and increased backloading ( $p=0.04$ ). Undergoing testing was also significantly associated with younger age ( $p=0.03$ ), parental employment ( $p=0.03$ ) and a lower perception of danger in borrowing a syringe ( $p=0.01$ ). One hundred and thirty nine (87%) of the patients tested for HCV also underwent HIV testing. All of these patients tested negative for HIV antibodies.

Ninety-seven (61%) participants tested positive for HCV antibodies. The associations between HCV status and injecting variables, including unsafe injecting practices, are reported in Table 1. Testing positive for HCV was significantly associated with the number of lifetime injecting episodes. On univariate analysis, it was also significantly associated with the duration of the injecting career, the number of different substances injected, the number of episodes of sharing spoons and filters and the number of episodes of backloading in the preceding six months. None of these associations remained significant when we controlled for the confounding effect of ‘number of lifetime injecting episodes’ in the logistic regression analysis. HCV status was not associated with any of the other injecting variables examined. Specifically, there was no significant association between infection and the number of episodes of recipient syringe sharing.

**Table 1. Association between hepatitis C status and quantitative injecting variables**

	Hepatitis C Positive			Univariate analysis		Adjusted for total lifetime injection episodes	
	Number	Number	%	$\chi^2$ trend	p value	Wald statistic	p value
<b>Lifetime Injecting</b>							
Number of lifetime injecting episodes							
1-100	28	8	29				
101-1000	48	28	58				
1001+	83	61	73	17.2	<0.001		
Duration of injecting career							
Less than 12 months	49	26	53				
12 to 59 months	86	52	60				
Five years or more	23	19	83	5.0	0.03	0.05	0.82
Delay between first opiate use and first injecting							
Less than 12 months	42	30	71				
12 to 36 months	53	32	60				
More than 36 months	50	28	56	2.2	0.13	0.07	0.79
<b>Injecting behaviours in past six months</b>							
Usual number of IDU in company when injecting							
None (injects alone)	28	18	64				
One	56	33	59				
Two or more	31	20	65	0.002	0.97	0.6	0.45
Number of substances injected							
One	50	23	46				
Two	58	36	62				
Three or more	51	38	75	8.6	0.003	1.9	0.17
Average number of times each syringe is used							
Once only	16	8	50				
Two or three times	38	24	63				
Four to ten times	52	27	52				
More than ten times	52	37	71	1.7	0.19	0.27	0.60
Number of episodes of recipient syringe sharing							
None	38	21	55				
1 – 10	60	33	55				
11 – 100	46	33	72				
101 or more	15	10	67	2.4	0.12	0.60	0.42
Number of episodes of using a spoon or filter which had been already used another injector							
None	16	8	50				
1 – 10	24	8	33				
11 – 100	38	23	61				
101 or more	69	51	74	9.7	0.002	2.8	0.10
Number of episodes of backloading							
None	36	17	47				
1 – 10	16	9	56				
11 – 100	29	20	69				
101 or more	14	11	79	5.5	0.02	2.9	0.09
Number of people from whom borrowed syringes							
None	36	19	53				
One	53	32	60				
Two or more	56	38	68	2.1	0.15	1.8	0.18
<b>Beliefs about risk behaviours</b>							
Perceived risk in borrowing a used syringe from an acquaintance							
Very High	70	38	54				
Moderately High	36	25	69				
Lower	48	31	65	1.5	0.22	0.42	0.52

The association between HCV status and socio-demographic and other categorical injecting variables are reported in table 2. Those IDU who described their closest relationship with another IDU as being no more than an ‘acquaintance’ were at significantly reduced risk of HCV infection compared to those who described other IDU as their close friends or spouse/boyfriend/girlfriend. HCV status was unrelated to any other socio-demographic characteristic. Self reported difficulty in accessing sterile injecting equipment and failure to use bleach were not significantly associated with infection.

**Table 2.** Association between hepatitis C and categorical socio-demographic and injecting variables

Socio-Demographic Characteristics	Number	HCV Positive		Univariate Analysis		
		Number	%	Odds Ratio (OR)	95% CI of OR	p value
<b>Socio-Demographic Characteristics</b>						
Gender						
Male	93	54	58	1.0		
Female	66	43	65	1.3	0.7 – 2.6	0.37
Age (Years)						
21 and below	83	49	59	1.0		
22 and over	76	48	63	1.2	0.6 – 2.3	0.60
Employment						
Working	33	79	55	1.0		
Unemployed	126	18	63	1.4	0.6 – 3.0	0.39
Accommodation Stability						
Stable	143	88	62	1.0		
Unstable (Temporary or many moves)	16	9	56	0.8	0.3 – 2.3	0.68
Education						
Left school aged 15 or older	119	72	61	1.0		
Left school aged 14 or younger	40	25	63	1.1	0.5 – 2.3	0.82
Parental Employment						
Employed	90	56	62	1.0		
Unemployed	53	31	58	0.9	0.4 – 1.7	0.66
<b>Lifetime injecting</b>						
Injecting in Prison						
Never	141	84	60	1.0		
Yes	18	13	72	1.8	0.6 – 5.2	0.3
<b>Past six months of injecting</b>						
Accessibility to sterile injecting equipment						
Difficult to access	48	26	54	0.7	0.3 – 1.4	0.28
Not difficult to access	109	69	63	1.0		
Usual Location when injecting						
Own home or in a non-IDU’s home	63	33	52	1.0		
Home of another IDU	31	22	71	2.2	0.9 – 5.6	0.09
Elsewhere or many locations	64	42	66	1.7	0.8 – 3.5	0.13
Closest relationship with another injector						
Spouse, girlfriend, boyfriend	51	35	69	3.5	1.3 – 9.4	0.01
Close friend or sibling	82	52	63	2.8	1.1 – 6.9	0.02
Acquaintance	26	10	38	1.0		
Bleach cleaning of borrowed syringes						
Borrowed but always used bleach	27	19	70	1.0		
Borrowed and didn’t always use bleach	92	56	61	0.7	0.3 – 1.7	0.37
Never borrowed syringes	38	21	55	0.5	0.2 – 1.5	0.22

Following forward and backward selection procedures, three variables were selected for entry into the logistic regression equation. The results are reported in table 3. It emerged that greater number of lifetime injecting episodes, closer social relationships with other IDU and injecting in the home of other IDU were each independently predictive of HCV positive status. There was no evidence of interaction between the variables. The Nagelkerke  $R^2$  value was 0.24.

Given the international evidence supporting an association between duration of injecting career and HCV status, we entered this variable into the regression equation both with and without ‘number of lifetime injecting episodes’ in a post hoc analysis. It did not significantly improve the fit of the model. There was no evidence of a significant interaction with ‘number of lifetime injecting episodes’.

**Table 3.** Multiple variable analysis of factors associated with HCV infection

	Adjusted Odds Ratio (AOR)	95% C.I. of AOR	p value
Number of lifetime injecting episodes			
1 – 100	1.0		
101 – 1000	3.8	1.3 – 11.6	0.02
More than 1000	8.7	2.9 – 25.9	<0.001
Usual location when injecting			
Own home or in a non-IDU’s home	1.0		
Home of another IDU	4.7	1.5 – 14.4	0.007
Elsewhere or many locations	1.8	0.8 – 3.9	0.15
Closest relationship with another injector			
Spouse, girlfriend, boyfriend	3.4	1.1 – 10.2	0.03
Close friend or sibling	2.8	1.0 – 7.7	0.04
Acquaintance	1.0		

## Discussion

HCV status was strongly associated with the total number of lifetime injecting episodes, with the odds ratio of infection increasing approximately by three for each ten-fold increase in number of lifetime injecting episodes. This finding was expected and is consistent with the international literature. It emerged that the detected association between HCV infection and unsafe injecting practices was quite tenuous. Although infection was associated with increased frequency of backloading and with increased frequency of sharing of injecting paraphernalia, no association was found with recipient syringe sharing. Other investigators have also experienced greater success in identifying associations between HCV and behaviours such as backloading and the sharing of filters than between HCV and recipient syringe borrowing [3, 6, 15]. In any case, the associations between each of these former two practices and HCV infection was lost when analysis controlled for ‘number of lifetime injecting episodes’. This replicated the finding of Garfein *et al.* who noted that significant associations between HCV and risk behaviours on univariate analysis, did not persist when controlled for length of injecting history [3]. We therefore failed to confirm our hypothesis that frequency of engagement in specific unsafe injecting practices would predict HCV status more robustly than total number of lifetime injecting episodes.

There are important methodological reasons that may have contributed to our failure to confirm this hypothesis. Firstly, IDU may choose to under-report engagement in unsafe injecting practices, making significant associations more difficult to detect. However, the proportion of IDU reporting unsafe injecting was high by international standards and there is general consensus that IDU do reliably report such behaviours in studies of this type [28, 29]. Secondly, unsafe injecting behaviours were measured in the six months prior to interview

rather than over the interviewee's entire injecting career. We opted to focus on this six month period in order to maximise the possibility of accurate recall, replicating methods used in other studies of this type. It is possible that frequency of recent unsafe injecting may differ substantially from rates of unsafe injecting early in an IDU's history. Thirdly, although this study had acceptable power to identify characteristics strongly associated with HCV infection, it had only 50% power to detect factors moderately associated with infection.

Apart from methodological considerations, there is one intriguing possible clinical explanation for our finding that self-reported rates of unsafe injecting poorly predict HCV status. IDU can only report episodes of unsafe injecting which they have noticed. Researchers in Australia and Scotland have demonstrated that there is much opportunity for inadvertent, accidental and unnoticed sharing of injecting equipment, particularly when IDU inject in the company of others [2, 30, 31]. Consequently, during an IDU's injecting career, their risk of acquiring HCV, or indeed HIV, will be the sum of the risk associated with engagement in overtly noticed unsafe injecting episodes plus the risk associated with unnoticed, or covert, unsafe injecting practices. If the latter occur more frequently than the former in this era of harm reduction, then reported rates of unsafe injecting will correlate poorly with HCV status.

It emerged that the total number of lifetime injecting episodes predicted HCV status more accurately than duration of injecting career. The latter variable does not take into account the fluctuations in injecting frequency which can occur over time. Most of the IDU in this study had short injecting histories and this simplified the estimation process. Calculation of lifetime injecting episodes would be more difficult in studies examining IDU with longer injecting histories.

It emerged that HCV status was significantly associated with aspects of the social context in which IDU injected. Those patients who reported closer social relationships with other IDU were at increased risk of infection. Research in Dublin and elsewhere has shown that IDU are more likely to engage in recipient syringe sharing with other IDU whom they know well, such as their spouse, girlfriend or boyfriend [19, 20, 32]. Those IDU who usually injected in the home of another IDU were also more likely to test positive for HCV antibodies. We found that the majority of IDU use each syringe on at least four occasions. This suggests that most IDU will usually have used syringes on their person or among their belongings. This increases the opportunity for both deliberate and accidental sharing of syringes, particularly if injecting in the social contexts that we identified as being significantly associated with infection, i.e. away from one's own home and with close friends. Unfortunately, drug injecting in Dublin is a very socialised behaviour among young IDU, and commonly occurs in exactly such a setting.

## **Conclusions**

The association between HCV and specific overt unsafe injecting behaviours was not strong. Overall, we found that the total number of lifetime injecting episodes was the most important predictor of HCV status. These findings suggest that interventions that reduce injecting are likely to have a greater impact on HCV prevention than interventions designed to make injecting safer. Methadone maintenance is effective in reducing injecting but novel interventions to prevent or reverse the transition from heroin smoking to injecting warrant further examination [2]. The other independent predictors of HCV infection related to the social context in which IDU inject. This finding also has important implications for harm



reduction programs. While clinicians and staff at syringe exchanges need to ensure attention continues to be paid to unsafe injecting practices, greater attention should be directed towards the setting and context in which the individual IDU injects. There is a need for discussion with IDU about how they ensure that their syringes and injecting equipment do not become mixed up with the equipment of other IDU when injecting in company. This might serve to raise awareness of the possibility of accidental and unnoticed sharing of injecting equipment and thereby reduce its occurrence. The advice to IDU must be that they should use a new sterile syringe on each injecting episode [33]. Greater accessibility to syringe exchanges in Dublin would facilitate their cooperation with this advice, but the concerns of local communities who oppose such exchanges will need to be addressed through ongoing communication and education.

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