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HEPATITIS B, HEPATITIS C AND HIV IN THE IRISH PRISONER POPULATION:

AN OVERVIEW OF PREVALENCE RATES AND RISK FACTORS

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Thesis submitted for the degree
Doctor in Philosophy
at University of Dublin

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DECLARATION

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SUMMARY

Introduction

This thesis reports the estimated prevalence of antibodies to hepatitis B core antigen, hepatitis C virus and HIV in two distinct prison populations.

Objective

This thesis provides a synthesised analysis of the prevalence of blood borne viral infections and their determinants in the Irish prisoner population, both entrants (committal) and inmates (census).

Participants and Methods

A census survey was carried out from September to November 1998. Nine of the 15 prisons in the Republic of Ireland were selected and 1205 of 1366 inmates participated. 607 of the 718 consecutive prison entrants committed to five of seven committal prisons participated in the committal survey from the 6th April to the 1st May 1999. The respondents completed an anonymous risk factor questionnaire and provided an oral fluid specimen for antibody testing.

Results

In the census survey anti-HBc prevalence was 8.7% (95% CI 7.2 to 10.5), anti-HCV was 37% (95% CI 34.3 to 39.9) and anti-HIV 2% (95% CI 1.3% to 3%). The most important predictor of antibody positivity for hepatitis B and hepatitis C was a history of injecting drug use (anti-HBc adjusted OR 22, anti-HCV adjusted OR 81). 42.4% of male respondents and 59.7% of female respondents reported ever injecting drugs. 20.8% of 501 injecting drug users reported first injecting in prison. 70.5% of injectors reported sharing needles in prison. Men reporting anal sex with other men was an important risk factor for testing positive for anti-HIV (adjusted OR 8)

In the committal survey, the prevalence of anti-HBc was 6% (95% CI 4% to 9%), of anti-HCV was 22% (95% CI 19% to 25%) and anti-HIV was 2% (95% CI 1% to 4%). One third of the respondents had never previously been in prison (197); these had the lowest prevalence of anti-HBc (2%), of anti-HCV (3%) and of anti-HIV (0%). 29% of the 593 respondents reported a history of injecting drug use. Only 7% (14/197) of those entering prison for the first time reported ever injecting drugs compared to 40% (157/394) of those previously in prison. Injecting drug use was the most important predictor of anti-HBc (adjusted OR 16) and anti-HCV (adjusted OR 89). 26.6% of male respondents and 63.4% of female respondents reported ever injecting drugs. 18.5% of the 157 injecting drug users reported first injecting in prison. 40.1% of injectors reported sharing needles in prison.

The estimated prevalence of anti-HBc and anti-HCV was significantly higher in the census survey population than in prison entrants but the prevalence of anti-HIV was the same. The prevalence of anti-HBc and anti-HIV in the census survey population was similar to the rates found in recidivist prison entrants (anti-HBc: 8.7%, *versus* 8.1%, p = 0.7; anti-HIV: 2.0%, *versus* 2.8%, p= 0.4). The prevalence of anti-HCV in the census survey (37.0%), remained higher than in recidivist prison entrants (31.0%), p= 0.03.

The proportion reporting injecting drug use in the census survey was significantly higher than in the committal survey. When first time prisoners were excluded from the committal survey, the proportions of injecting drug users in both surveys were similar (committal 39.8% *versus* census 43.2% p = 0.3).

In the two surveys the prevalence rates for anti-HBc and anti-HIV in injecting drug users were similar. The prevalence of anti-HCV in injectors in the census population (81.3%) was significantly higher than in prison entrant injectors (71.7%). The prevalence rate of anti-HCV in injectors in the census survey population (81.3%) was more similar to that found in recidivist prison entrants (74.5%), p= 0.06. In both surveys the prevalence rates for anti-HCV increased with increasing time spent in prison (census survey: $\chi 2$ trend= 99.3, p = 0.0001 and committal survey: $\chi 2$ trend = 115.8, p <0.0001).

In both surveys high proportion of injectors over 29 years old tested positive for anti-HBc, while in the committal survey there was also a high proportion of injectors 15 to 19 years old who tested positive for anti-HBc. These observations indicate possible cohort effects. Hepatitis C antibodies were most common in those 20 to 24 years old. Prevalence rates of anti-HCV across all age groups in the census survey were significantly higher than in the committal survey. This is accounted for by the higher prevalence in injecting drug users in each age group in the census survey than in the committal survey with the exception of those 20 to 24 years old (census injectors 88.0% *versus* committal injectors 75.3%). It is possible that this age group had higher risk injecting practices (as a result of increased time spend in prison) in the census survey than in the committal survey. In both surveys the highest prevalence rates of anti-HIV were found in those over 30 years old.

In the census survey, hepatitis antibody rates were higher in women than in men, but this was not statistically significant different. In the committal survey, the proportion of women testing positive for anti-HBc, anti-HCV and anti-HIV were significantly higher than in men. In female injectors, the prevalence of anti-HBc, anti-HCV and anti-HIV was not significantly lower in the census survey than in the committal survey. This is possibly due to the small numbers.

Tattooing was not asked about in the census survey. In the committal survey tattooing in prison was the only independent risk factor identified for the presence of anti-HCV in non injectors.

Conclusions

This study quantifies an appalling situation in Irish prisons. Infection with hepatitis C secondary to injecting drug use is endemic in Irish prisons. This situation requires urgent intervention and rigorous surveillance.

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LIST OF ABBREVIATIONS

CI	Confidence interval
df	Degrees of freedom
EIA	Enzyme immunoassay
HBc	Hepatitis B core antigen
HbsAg	Hepatitis B surface antigen
HbeAg	Hepatitis B e antigen
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
IDU	Injecting drug use/user
RIA	Radio immune assay
STI	Sexually transmitted infection

CHAPTER 1 A Review of the Literature

INTRODUCTION

This literature review is presented in five sections.

1.1 Describes three blood borne viral infections.

Studies included describe the prevalence of antibodies to the hepatitis B virus (anti-HBc and anti-HbsAg), hepatitis C virus (anti-HCV) and HIV virus (anti-HIV) in drug users in the community or in prison using laboratory test results rather than self-reported results. Prevalence studies in prison populations were excluded when the study population was not clearly categorised (inmate or entrant) or the journal article was not published in English. The literature includes studies available up to and including December 1999.

1.2 Presents a general profile of injecting drug users in Ireland and elsewhere, services available in general to deal with drug addiction, and evidence for effectiveness of these services in reducing the prevalence of blood borne viruses in injecting drug users.

1.3 Provides a general profile of Irish prisoners and also identifies the risk factors for bloodborne viral infections in a prison environment and evidence for effectiveness of these services in reducing the prevalence of blood borne viruses in injecting drug users in prison settings.

1.4 Describes the Irish prison system with particular reference to the health services including drug misuse.

1.5 Presents the study rationale and objectives.

1.6 Lists the team members and their contribution to the study.

1.7 Presents the thesis objectives.

1.1 BLOOD BORNE VIRUSES

1.1.1 Hepatitis B

Aetiology and Transmission

Hepatitis B is an infection caused by the hepadnavirus. [1] The incubation period usually lasts two to three months but can take up to six months. [1] The virus can be transmitted through blood, semen, vaginal secretions, and saliva. [2] The main routes for transmission are parenteral (through infected blood products and contaminated needles and syringes), [3] [4] vertical (in utero or during delivery) [5] and sexual (particularly in those who engage in casual sex and men who have sex with men). [4] Occupational exposure, particularly among health care workers, is also a risk factor for contracting the virus. [6] In closed institutions hepatitis B can be transmitted through blood (cuts and abrasions) [7] and possibly urine/faeces. [8] An estimated 400 million individuals are carriers for hepatitis B worldwide. [6] Of those who are infected with hepatitis B, 5 to 10% become established carriers [9] and one tenth of these develop chronic persistent or active hepatitis. Individuals with these conditions have a high subsequent risk of cirrhosis or carcinoma of the liver. [10] Men, immunosupressed individuals, and infants are more likely to become established carriers. [1]

Antigen and Antibody Tests

Hepatitis B virus is detected through a variety of tests at different stages of the infection. One month following exposure to the hepadnavirus the hepatitis B surface antigen (HbsAg) can be detected. A short time later the e antigen (HbeAg) may be present in the blood; a high level of the e antigen indicates high infectivity. Two to three weeks later antibody to the B core antigen (anti-HBc IgG) can be detected. Presence of anti-HBc indicates having been infected naturally with the hepadnavirus, while anti-HBs indicates a vaccine induced immunity or full recovery from the infection. A continued presence of HbsAg for six months or more indicates a carrier status. [11] Best available evidence is that the long-term carrier rate, and hence infectivity, of someone who has ever been infected with hepatitis B is 10%. [12] The hepatitis B antibody test used in this survey measures anti-HBc. This test has a

sensitivity of 82% (18% false negative) and specificity greater than 99% (less than 1% false positive).

Prevalence

The prevalence rates of carriers in blood donors in Australia, Western Europe and North America are between 0.1% and 0.5%; these are classified as 'low endemic areas'. Sexual and parenteral are the most common routes of transmission. [1] In low endemic areas the groups commonly infected with hepatitis B are injecting drug users, homosexual men, prostitutes and those who engage in casual sex. The prevalence of hepatitis B carriers is higher in these groups than in the general population. For example, the prevalence of antibodies to hepatitis B core antigen in current injecting drug users was 78.7% in Baltimore, [13] 65.7% in drug users who had 'ever injected' in Baltimore [14] and approximately 50% in injecting drug users in London. [15] (Table 1.1) In these studies (Table 1.1) older injectors, those injecting for longer periods of time and those who share needles and syringes were more likely to test positive for hepatitis B.

The prevalence of hepatitis B in prison populations reveals that a higher proportion of prisoners test positive for antibodies to hepatitis B core antigen than in the general population (Table 1.2). [16 17 18 19 20 21] In the majority of these studies injecting drug use is an important risk factor. Women, negroid and hispanic populations (living in the USA) seem more susceptible to infection with hepatitis B. There are no published studies that compare the prevalence of antibodies to hepatitis B core antigen in committal prisoners with those resident in the same prisons.

Table 1.1 The prevalence of hepatitis B in injecting drug users

Year published	Study design	Study population	Sample size	Study findings
1995 Levine *et al* [14]	Survey	Volunteers from various services accessed by IDUs in Baltimore	2,272	78.7% current drug users tested positive for anti-HBc. Injecting drug use was the most important risk factor.
1996 Garefin *et al* [13]	Baseline survey	Volunteers from various services accessed by IDUs* in Baltimore	716	65.7% tested positive for anti- HBc. The independent risk factors were daily injecting, injected cocaine within the last six months and injecting for more than 6 months.
1996 Rhodes *et al* [15]	Two surveys	IDUs living in two communities in London	1) 505 2) 507	1) 51.5% tested positive for anti-HBc. 2) 47.9% tested positive for anti-HBc. Those who tested positive: had a higher mean age; were more likely to share needles and syringes; the mean injecting period was longer .
1998 Smyth *et al* [26]	New attendees registered at drug service	IDUs living in Dublin city.	735	Prevalence of HbsAg was 1%. The only independent risk factor identified was a history of injecting drug use prior to 1990
In press Fitzgerald *et al* [27]	Review of client records	Clients attending methadone clinics in Dublin	64	28% tested positive for anti-HBc.

* injecting drug user

Table 1.2 The prevalence of hepatitis B in prison populations

Year published	Study design	Study population	Sample size	Study findings
1985 Anda *et al* [16]	Survey Blood samples	Male committal prisoners Wisconsin	619/646	19% of all respondents tested positive for anti-HBc; 40% of IDU* respondents tested positive for anti-HBc. The independent risk factors were: intravenous drug use; history of jaundice; previous blood transfusion; and black or latino race.
1995 Crofts *et al* [17]	Survey Blood samples	Committal prisoners Victoria	3627	33% of all respondents tested positive for anti-HBc; 52% of IDUs tested positive for anti-HBc. The risk factors were female gender and injecting drug use.
1997 Butler *et al* [18]	Survey Blood samples	Committal prisoners Sydney	408	31% tested positive for anti-HBc; 43% of IDU respondents tested positive for anti-HBc. The independent risk factors were age over 25 years and co-morbidity for HCV.
1997 Rotily *et al* [19]	Survey Blood samples	Committal prisoners Marseille	391/411	21.7% tested positive for anti-HBc; 37.1% of IDU respondents tested positive for anti-HBc. The independent risk factors were: age over 24 years and injecting drug use.
1998 Malliori *et al* [20]	Survey Blood samples	Drug using prisoners in two Greek prisons	533/544	57.6% tested positive for anti-HBc; 67.2% of IDUs tested positive for anti-HBc. Risk factors were not reported.
2000 Weild *et al* [21]	Survey Oral fluid samples	Prisoners resident in 8 English and Welsh prisons	3930	8% tested positive for anti-HBc.
		Adult IDU resident in 8 English and Welsh prisons	775	20% tested positive for anti-HBc The independent risk factors were: being over 30 years old; injecting for more than 11 years; injected in the month prior to imprisonment; injecting while in prison; and imprisoned more than 10 times.

* njecting drug user

In Ireland the prevalence of hepatitis B is low in the general population, about 1 in 4000 among new blood donors and 1 in 3,000 women attending for antenatal care. [22] The national population prevalence for hepatitis B, based on a postal survey in 18 District Electoral Divisions using a multi-stage stratified cluster sampling technique, was 0.5% (95%CI 0.0 -1.8). [23] In Ireland, the prevalence of antibodies to hepatitis B core antigen in individuals with intellectual disability living in residential accommodation is high (58% and 49.5%).[8] [24] Devlin et *al* [25] reported that 11% of intellectually disabled persons not living in residential accommodation tested positive

for anti-HBc. Studies estimating the prevalence of blood borne viruses tend to have been conducted using cohorts of drug users attending particular drug services. Of the attendees in Trinity Court (national drug treatment centre), 1% tested positive for HbsAg. [26] In a cohort of injectors attending Eastern Health Board methadone clinics the prevalence of HbsAg and anti-HBc, based on laboratory reports, was 1.5% and 29% respectively. [27]

Treatment and Prevention

Treatment for acute hepatitis B is mainly supportive. Interferon therapy has been used for the treatment of chronic hepatitis B and inhibits viral replication in between 36% and 45% of those treated. [28] [29] Approximately 10% of patients who respond lose their carrier status six months after therapy. Interferon is useful only for those who have no immunodeficiencies. Those with an impaired response require antiviral therapy. [6]

It is possible to prevent infection with hepatitis B with a safe and effective vaccine. [30] In order to maximise protection against hepatitis B three doses are required at zero, one and six months. In Ireland this vaccine is recommended for high-risk groups; prisoners and injecting drug users are two of the high-risk groups named in the guidelines. [31]

1.1.2 Hepatitis C

Aetiology and Transmission

In the 1970s a new type of hepatitis was identified and classified as non-A non-B hepatitis. [32] This infection was associated with long term liver disease and common in individuals with haemophilia. [33] In a review of the viral infection, Sharara *et al* [34] noted that the hepatitis C virus was identified in 1988 and the first test was developed to identify the virus in 1991. The hepatitis C virus is a single stranded RNA virus belonging to the flaviviridae family. The incubation period for hepatitis C ranges between two weeks and six months. There is evidence that the virus damages the liver and lymphatic system.

The virus is found in the blood and the main route of transmission is parenteral, [35] although there is evidence of vertical transmission in approximately 10% of infected women. [36] Individuals who received infected blood products have been infected. For example, almost 100% of haemophilia patients were infected prior to blood donor screening. [37] Injecting drug users are a high risk group for hepatitis C; [35] there are a small number of reported cases as a result of tattooing [38] and needle stick injuries. [39] Sexual transmission occurs rarely and seems to be associated with HIV infection and more common in those with multiple sexual partners. [34]

Antibody Tests

Antibodies to the hepatitis C virus (anti-HCV) develop on average three months after infection but may take up to six months. [39] The presence of hepatitis C antibodies indicates either previous or current infection. Anti-HCV ELISA 3 is used to screen blood for hepatitis C, positive cases are confirmed using RIBA 3, and in certain situations viral detection may be performed. The infection persists in 80% to 85% of those infected [40 41] and up to 50% of these will develop chronic hepatitis. Individuals with chronic hepatitis will have an increased risk of cirrhosis of the liver and hepatocellular carcinoma; these conditions usually appear two decades after initial infection. [42] The hepatitis C antibody test used in this survey was developed and validated by the Central Public Health Laboratory and it detects the presence of anti-HCV. The sensitivity of the antibody test used in this survey is estimated to be 80% (Appendix 1). This means that the false negative rate is 20%: one in every five who

test negative is actually positive. The specificity was 100% which implies that all test results which are positive are truly positive.

Prevalence

In America 1.8% of the population have hepatitis C antibodies. [43] The prevalence in the general European population varies. In the northern countries it is estimated to be 1% while in the Mediterranean the prevalence is just under 5%. [44] The prevalence of hepatitis C antibodies is much higher in injecting drug users (Table 1.3): 76.9% tested positive for hepatitis C antibodies in Baltimore, USA, [13] 89.9% in current users, [14] while in Glasgow the prevalence was 90% in 1990 and 77% in 1995. [45] In Australia the estimated prevalence of hepatitis C antibodies in male and female injecting drug users was between 47% and 88% and between 51% and 85% respectively. [46]

Studies carried out in Australian, Canadian and Greek prisons reported a high prevalence of hepatitis C antibodies (Table 1.4) . [17] [18] [20] [47] The study in Greece indicated that 81% of injecting drug users had hepatitis C [20] and 66% of injecting drug users in New South Wales had hepatitis C (Table 1.4). [18] The estimated prevalence of hepatitis C antibodies in inmates at five Scottish prisons was 20%, and 49% in inmates reporting injecting drug use (Table 1.4). [48] In a national survey of English and Welsh prisoners (Table 1.4), [21] 7% tested positive for hepatitis C antibodies, whereas in injecting drug users the prevalence was 31%, over 4 times higher. The main risk factor for contracting hepatitis C was injecting drug use, and injecting in prison was an important risk factor (Table 1.4). There are no published studies that compare the prevalence of hepatitis C antibodies in committal prisoners with those resident in the same prisons.

Table 1.3 The prevalence of hepatitis C in injecting drug users

Year published	Study design	Study population	Sample size	Study findings
1995 Levine *et al* [14]	Survey	Volunteers from various services accessed by IDUs in Baltimore	2,272	89.9% of current drug users tested positive for anti-HCV.
1996 Garefin *et al* [13]	Baseline survey	Volunteers from various services accessed by IDUs in Baltimore	716	76.9% tested positive for anti- HCV. The independent risk factors were: daily injecting; injected cocaine within the last six months; and injecting for more than 6 months
1997 Crofts *et al* [46]	Review of all published studies and surveillance	IDUs		Overall anti-HCV prevalence ranged between 8% and 94%. Prevalence in males ranged between 47% and 88%; and females between 51% and 85%.
1998 Goldberg *et al* [45]	Laboratory samples	IDUs in 1990 and 1995 in Glasgow	295 (1990) 285 (1995)	90% tested positive for anti-HCV in 1990. 77% tested positive for anti-HCV in 1995. There was a significant reduction in the overall prevalence and a highly significant reduction in the prevalence in those less than 25 years old between 1990 and 1995.
1998 Smyth *et al* [26]	New attendees registered at drug service	IDU living in Dublin.	735	Prevalence of anti-HCV was 61.8%. The independent risk factors were a longer history of injecting drug use and spending more than £65 per day on drugs.
1999 Smith *et al* [49]	IDUs injecting less than 25 months	Tested for anti-HCV between 1993 and 1996	353	Prevalence of anti-HCV was 52.1%.
2001 Fitzgerald *et al* [27]	Review of client records	Clients attending methadone clinics in Dublin	99	79% tested positive for anti-HCV.

* injecting drug user

Table 1.4 The prevalence of hepatitis C in prison populations

Year published	Study design	Study population	Sample size	Study findings
1995 Crofts *et al* [17]	Survey Blood samples	Committal prisoners Victoria	3627	39% of all respondents tested positive for anti-HCV; 64% of IDUs tested positive for anti-HCV. The risk factors were women and injecting drug use.
1995 Ford *et al* [47]	Survey Blood samples	All female prisoners Kingston	113/130	39.8% tested positive for anti-HCV. No risk factors reported.
1997 Butler *et al* [18]	Survey Blood samples	Committal prisoners Sydney	408	37% tested positive for anti-HCV; 66% of IDU respondents tested positive for anti-HCV. The independent risk factors were: injecting drug use; previous imprisonment; and past exposure to hepatitis B.
1998 Malliori *et al* [20]	Survey Blood samples	Drug using prisoners in two Greek prisons	533/544	58.2% tested positive for anti-HCV; 80.6% of IDUs tested positive for anti-HCV. The only independent risk factor was sharing needles in prison.
1999 Gore *et al* [48]	Survey Oral fluid samples	Prisoners resident in five Scottish prisons	1864/2121	20.3% tested positive for anti-HCV; 49% of IDUs tested positive for anti-HCV. 53% of IDUs who injected inside prison tested positive while 44% of those who tested positive reported never injecting in prison.
2000 Weild *et al* [21]	Survey Oral fluid samples	Prisoners resident in 8 English and Welsh prisons	3930	7% tested positive for anti-HCV.
		Adult IDU resident in 8 English and Welsh prisons	775	31% tested positive for anti-HCV. The independent risk factors were: age (those between 31-35 years and over 41 years also were more likely to test positive); injecting while in prison, and imprisoned more than 10 times.

* injecting drug user

In Ireland there is no national prevalence estimate available for hepatitis C. The prevalence of hepatitis C among blood donors is low; 4 in 100,000 in 1999 and 2000 (Dr Joan O'Riordan personal communication 2001) .The infection mainly occurs in two populations: cohorts of individuals who became infected through infected blood products, and injecting drug users. Among injecting drug users the prevalence estimates vary: 52.1%, [49] 61.8% [26] and 76% [27]

Treatment and Prevention

Hepatitis C is difficult to treat as there are several viral genotypes; treatment is mainly supportive. Interferon therapy has been used for the treatment of some types of hepatitis C and inhibits virus replication in approximately 15-25% of those treated. [50] This therapy is difficult to tolerate and further complicated by the 'needle buzz' experienced by injecting drug users. In clinical trials combination therapy (interferon and ribavirin) increased the effectiveness of the therapy by almost 10%. For example,[51] peginterferon alfa-2a was associated with a higher rate of virologic response than was interferon alfa-2a at week 48 (69% *versus* 28%, p=0.001) and at week 72 (39% *versus* 19%, p=0.001). Sustained normalization of serum alanine aminotransferase concentrations at week 72 was also more common in the peginterferon group than in the interferon group (45% *versus* 25%, p=0.001) indicating a reduction in the damage to hepatic cells. Vaccination development is difficult due to the various types and subtypes. [52]

1.1.3 Human Immunodeficiency Virus (HIV)

Aetiology and Transmission

HIV (subsequently known as HIV1) was identified in 1981 and HIV2 was identified in 1986. [32] This virus causes acquired immunodeficiency syndrome. The virus attaches itself to the CD4 particle of the T-lymphocytes. [33] These T-lymphocytes co-ordinate the body's immune response and when their numbers fall, opportunistic infections develop. The specific opportunistic infections depend on geographic location and stage of the infection. The HIV virus is found in all body fluids and is transmitted via sexual intercourse (both heterosexual and homosexual), mother to foetus and baby, infected blood products and unsterile procedures with needles, syringes and skin piercing instruments.

Antigen and Antibody Tests

The viral RNA assay and the p24 antigen test can detect HIV infection during the initial acute HIV 1 infection. HIV can be detected through the presence of HIV 1 antibodies in the blood between 3 weeks and 3 months following infection depending on the test used. [33] The viral RNA and CD4 cell counts are commonly used to determine the progress of the disease or the response to treatment. The test for antibodies to the HIV virus used in this survey is a measure of ever having been infected with HIV. Best knowledge is that people (excluding newborn babies) who have ever been infected with HIV remain infectious for the duration of their lifetime. Both sensitivity and specificity for the antibody test to HIV used in this survey were greater than 99% (manufacturer's data).

Prevalence

HIV has infected over 36 million people worldwide. [53] In the high prevalence areas of Africa and Asia (where more than 8.8% of the adult population are infected) the primary transmission route is via heterosexual intercourse, [53] while in the low prevalence areas (less than 0.5%) of North America and western Europe the main transmission routes are unsterile injecting drug use [54] and homosexual practices. [53] The prevalence rates in these sub-groups are higher than the general population. For example, the prevalence in injecting drug users in Baltimore, USA, was 20.5%, [13]

39.4% among those on a methadone treatment programme in the Bronx, [55] 24.5% in current drug users in Baltimore [14] and 7% in London [15] (Table 1.5).

The reported prevalence of HIV antibodies in prison populations in the northern hemisphere is generally low (Table 1.6), 0–4.5%,[21 56 57 58 59 60 47 61 62 63 64 65] although one French prison reported HIV prevalence of 6%. [19] The risk factors identified in these studies were female gender, ethnicity, injecting drug use and certain sexual practices.

One American study examined the prevalence of HIV antibodies in both inmates and committal prisoners and found a similar prevalence in both populations. [56]

The best estimate of the prevalence of HIV antibodies in the Irish population was based on unlinked anonymous tests in antenatal women, and was 0.02%. [66] This is a cumulative prevalence and may slightly overestimate the prevalence in the population. Voluntary linked testing for antibodies to HIV has been available in Ireland since 1985 and, up to the end of 1999, there had been 2,195 persons identified as having antibodies to HIV. [67] Of these, 913 (42%) were intravenous drug users and 498 (23%) were homosexual men. Just over 1% of the attendees in Trinity Court tested positive for HIV antibodies. [26] In the cohort of injectors attending Eastern Health Board methadone clinics in 1997, the prevalence of HIV antibodies, based on laboratory reports, was 8%. [27]

Table 1.5 The prevalence of HIV in injecting drug users

Year published	Study design	Study population	Sample size	Study findings
1989 Schoenbaum *et al* [55]	Survey	Clients attending a methadone programme in the Bronx	452/875	Prevalence anti-HIV was 39.4. The independent risk factors were: negroid or hispanic ethnicity; recent injecting drug use; injecting drug use in shooting galleries; sexual partner who also injected drugs; and low income.
1995 Levine *et al* [14]	Survey	Volunteers from various services accessed by IDUs in Baltimore	2,272	24.5% current drug users tested positive for anti-HIV.
1996 Garefin *et al* [13]	Baseline survey	Volunteers from various services accessed by injecting drug users in Baltimore	716	20.5% tested positive for anti-HIV 1. The independent risk factors were never married and homosexual or bisexual practices.
1996 Rhodes *et al* [15]	Two surveys	IDUs* living in two communities in London	1) 505 2) 507	7.0% tested positive for anti-HIV 6.9% tested positive for anti-HIV Those who tested positive were more likely to have ever shared injecting equipment and recently shared
1998 Smyth *et al* [26]	New attendees registered at drug service	IDUs living in Dublin.	735	Prevalence of anti-HIV was 1.2% No independent risk factors were identified. Injecting for more than 5 years, commencing injecting prior to 1990 and current age over 24 years were associated with injecting drug use.
2000 Fitzgerald *et al* [27]	Review of client records	Clients attending methadone clinics in Dublin	90	17% tested positive for anti-HIV

* injecting drug user

Treatment and Prevention

There is currently no vaccine and no cure for this viral infection. Therapies have been developed to treat opportunistic infections and slow the pace of the infection. [68] Compliance with this therapy is difficult.

Table 1.6 The prevalence of HIV in prison populations

Year published	Study design	Study population	Sample size	Study findings
1990 Horsburgh *et al* [56]	Baseline and follow up survey Blood samples	Nevada correctional facilities. Prisoners committed from August 1985.	5216	2.4 % tested positive for anti-HIV.
		Prisoners resident between September and December 1985.	3837	2.4 % tested positive for anti-HIV.
		Prisoners discharged from the prisons between August 1987 and July 1988.	1105	2 sero conversions, both injecting drug users. Hispanic or negroid persons were more likely to test positive, as were women and those more than 30 years old
1991 Vlahov *et al* [57]	Survey Blood samples	Committals to 10 correctional facilities	10994/ 11534	The prevalence of anti-HIV was 4.3%. The independently risk factors were: female gender, age over 25 years; non white race; having committed a drug offence; and been in a mid or south Atlantic prison.
1992 Bird *et al* [58]	Survey Oral fluid samples	Male inmates in Saughton Prison	378/499	4.5% tested positive for anti-HIV; 25% of injecting drug users tested positive for anti-HIV. Injecting drug use, history of hepatitis and place of residence were associated with testing positive for anti-HIV.
1993 Bird *et al* [59]	Survey Oral fluid samples	Young male offenders in Polmont Institution	421/422	0% tested positive for anti-HIV
1994 Rothon *et al* [60]	Survey Oral fluid samples	Committals to adult prisons in British Columbia	2482/2719	1.1% tested positive for anti-HIV. Testing positive for anti-HIV was associated with injecting drug use.
1995 Gore *et al* [63]	Survey Oral fluid samples	Inmates in Glenochill prison	295/352	2.4% tested positive for anti-HIV; 24% of the inmates who reported injecting drugs between January and June 1993 tested positive for anti-HIV
1995 Crofts *et al* [17]	Survey Blood samples	Committal prisoners Victoria	3627	0.5% tested positive for anti-HIV; 0.3% of IDUs tested positive for anti-HIV.

Table 1.6 continued overleaf

Table 1.6 The prevalence of HIV in prison populations (cont.)

Year published	Study design	Study population	Sample size	Study findings
1995 Bird *et al* [61]	Survey Oral fluid samples	Inmates in Barlinnie prison	985/1073	0.9% tested positive for anti-HIV.
1995 Ford *et al* [47]	Survey Blood samples	All female prisoners Kingston	113/130	0.9% tested positive for anti-HIV. No risk factors reported.
1996 Dufour *et al* [62]	Survey Oral fluid samples	Inmates in prison in Quebec city	618/651	3% of all respondents tested positive for anti-HIV (2% of men and 8% of women). 9% of male IDUs* and 16% of female IDUs tested positive for anti-HIV Injecting drug use was the most important risk factor. Other independent risk factors for women respondents were: increasing numbers of sexual partners and having sex with a bisexual man. In the IDU population independent risk factors were sharing needles and homo/bisexual practices.
1997 Gore *et al* [64]	Survey Oral fluid samples	Male inmates in Perth Female inmates in Cornton Vale	304/434 134/145	2% tested positive for anti-HIV 0% tested positive for anti-HIV
1997 Rotily *et al* [19]	Survey Blood samples	Committal prisoners Marseille	391/411	6% tested positive for anti-HIV; 21% of IDU respondents tested positive for anti-HIV.
1997 Bellis *et al* [65]	Survey Oral fluid samples	Committal prisoners to a prison in Liverpool	905/969	0% tested positive for anti-HIV
1998 Malliori *et al* [20]	Survey Blood samples	Drug using prisoners in two Greek prisons	533/544	0.2% tested positive for anti-HIV; 0.3% of IDUs tested positive for anti-HIV.
2000 Weild *et al* [21]	Survey Oral fluid samples	Prisoners resident in 8 English and Welsh prisons. Adult IDU resident in 8 English and Welsh prisons	3930 775	0.4% tested positive for anti-HIV. 0.5% tested positive for anti-HIV. Independent risk factors not reported

*injecting drug user

1.2 DRUG ADDICTION AND DRUG SERVICES

1.2.1 Profile of Individuals with Drug Addiction in Ireland and Elsewhere

In Ireland, problematic drug use is associated with social and economic disadvantage. Drug users attending the drug services are young (58% of users are less than 25 years old), male (70% of users are male) and unemployed (86% were unemployed in 1997 and 80% in 1998). [69] [70] Drug users tend to leave school at an early age and are from socially disadvantaged areas (43% of drug users in treatment reside in five deprived boroughs of Dublin). [69] [70] Approximately one quarter of drug users attending treatment services live with another drug user, and two thirds of them continue to live with their family. [70] In 1998, 85% of drug users in treatment were from the Eastern Regional Health Authority area and 80% of these users reported that heroin was their main drug. [70] Exactly 71% of users reported using a second drug, of these 17% used benzodiazepines. Just over half of the drug users (51%) reported that injecting was the main route of administration, while 34% reported smoking. [70] Most drug users (60%) commenced using between 15 and 19 years of age, while 13% started before their fifteenth birthday. [70] Two thirds used their drug daily. [70] Of those injecting, one third reported sharing injecting equipment in the previous month. In the late eighties and early nineties, increased numbers of heroin users in Dublin led to increased crime rates in Dublin.

Obtaining a daily supply of illicit drugs can present a financial challenge for drug users; Hutchinson *et al* found that the average weekly drug spending in Glasgow was £324 per injector (£11,000 per injector per year). [71] Higher drug spending was associated with robbery, drug dealing, prostitution and imprisonment. In Oslo [72] theft accounted for 23% of drug payments, drug dealing financed 42% of payments and 21% of the respondents paid for their drugs through prostitution.

Table 1.7 Reported injecting practices in community based studies

Year published	Study design	Study population	Sample size	Study findings
1989 Schoenbaum *et al* [55]	Survey	Clients attending a methadone programme in the Bronx, New York	452/875	The prevalence anti-HIV was 39.4%. The independent risk factors were negroid or hispanic ethnicity, recent injecting drug use, higher proportion of injecting drug use in shooting galleries, sexual partner who also injected drugs, and low income. Other risk factors associated with testing positive for anti-HIV were: higher number of injections per month, use of cocaine, higher proportion shared needles with strangers.
1996 Stark *et al* [73]	Survey	IDUs* attending drug services in Berlin	324	Front loading more than 100 times was independently associated with testing positive for anti-HIV(OR 3.5) and anti-HCV(OR 5.4).
1997 Stark *et al* [74]	Survey	IDUs attending drug services in Brelin	669	A history of syringe sharing in prison was independently associated with testing positive for anti-HIV(OR 10.4), anti-HBc(OR 3.9) and anti-HCV(OR 9.7).
1997 Patrick *et al* [75]	Case control study	Cases IDUs with a recent positive HIV test Controls IDUs with a recent negative HIV test in Vancouver	89 192	IDUs testing positive for anti-HIV were more likely to have borrowed syringes, a history of unstable housing and have injected more than 4 times per day.
1997 Dorman *et al* [76]	Survey	Clients attending a drug treatment centre, Trinity Court, Dublin	186	In the previous six months: 55.7% shared injecting equipment 61.6% lent injecting equipment 94.2% of those who shared attempted to clean their equipment Only 49.5% cleaned their equipment effectively.

* injecting drug user

In 1989 Schoenbaum *et al* [55] identified the following risk factors for HIV seropositivity: frequent injecting, over 25% of injections with used needles, over 25% of injections shared with strangers or acquaintances and women whose partner was an intravenous drug user (Table 1.7). Injecting drug users who employed the practice of 'front and back loading more than 100 times' were more likely to test positive for HIV antibodies (3.5 times more likely) and hepatitis C antibodies (5.5 times more likely) than other injecting drug users in Berlin (Table 1.7). [73] In 1997, Stark *et al* [74] reported that those who shared needles and syringes in prison were significantly more likely to test positive for hepatitis B antibodies, hepatitis C antibodies and HIV

antibodies than those who had not shared in prison (Table 1.7). The findings of Patrick *et al* [75] in relation to HIV seroconversion were similar (Table 1.7).

In 1997 injecting drug users attending a drug treatment centre in Dublin reported several high risk behaviours; 55.7% shared needles, 94.2% of those who shared reported cleaning their equipment but less than half (49.5%) of them cleaned their equipment effectively (Table 1.7). [76]

There has been one attempt to measure the prevalence of opiate use in Ireland. This was a capture-recapture estimate, based on three 1996 data sets: methadone treatment list, acute hospital discharges and police data. [77] The analysis was confined to Dublin residents and the estimated total number of opiate users was 13,460 (95% confidence interval 12,037 to 15,306), a prevalence of 21 persons per 1,000 aged 15 to 54 years. The wide confidence interval occurred because there was little overlap between the data sets. Also, it was not clear whether the police data represented habitual opiate users.

1.2.2 Community Drug Treatment Services in Ireland

In Ireland services for drug addiction commenced in the sixties and gradually developed over the next twenty-five years. During this period the main emphasis of the service was detoxification and abstinence. [69]

In Ireland a larger proportion of individuals with HIV infection acquired their infection through injecting drug use than in other northern European countries. [78] In 1991 the Department of Health published a *Government Strategy to Prevent Drug Misuse*. [79] This strategy represented a major policy shift with the introduction of a harm reduction approach, including the provision of methadone maintenance and needle exchange on a wide scale for injecting drug users. This policy was endorsed in 1992 in the *Report of the National AIDS Strategy Committee*. [80]

The drug treatment services in Ireland are mainly based in Dublin, the epicentre of the heroin addiction problem in Ireland. [70 81] The services have gradually expanded since 1991. [81] These services were designed to deal with heroin addiction and its consequences; they also deal with polyvalent addiction, in particular alcohol and benzodiazepines. These services include a variety of activities provided by a multi-disciplinary team. An external evaluation of the Eastern Health Board's response to

drug misuse was published in 1995. [82] It recommended operational research, professional training for drug services staff, decentralisation of drug services, the introduction of a strictly regulated '*Methadone Prescribing Protocol*' and the elimination of waiting lists. At the time it was also recognised that drug addiction stemmed from social problems (drug misuse was concentrated in 12 deprived areas of Dublin [70]) which required input from central government. [81] This evaluation influenced government policy in relation to drugs. In 1996 the *Report of the Ministerial Task Force on Measures to Reduce the Demand for Drugs* [83] was published and ten million pounds was made available for the development of local responses to drug abuse. Drug Task Forces have been established in the 12 affected areas. Membership of the task force include the statutory services, voluntary services and local communities. Responses to drug misuse are developed in consultation with this group. By December 1998 there were eight needle exchange centres [70] and methadone was prescribed through 47 drug services clinics, a mobile unit and 97 general practitioner surgeries. [84] From December 1996 to December 1998 access to methadone increased by 56% (3315 were registered for methadone at the end of 1998). Following pilot testing a revised version of the '*Methadone Prescribing Protocol*' was published in 1997. [85] This provided guidelines on screening clients and prescribing practices; it also introduced mandatory training for general practitioners and instituted controls on numbers to be treated in each practitioner's surgery. Therefore, increased access to services was accompanied by increased control of abuse by both clients and service providers. Over 6,000 individuals had presented for needle exchange in the Dublin area from 1989 to 1998. [86] The main focus of these drugs services are needle exchange and methadone substitution or maintenance, although these services also provide an opportunity for these marginalized clients to access other services, such as hepatitis B immunisation, education on safe sex, outreach services, referral to specialist services, and counselling. The drug services also link with other community activities to facilitate practical responses to basic needs, relieve boredom, provide training or facilitate employment.

1.2.3 Review of Community Based Harm Reduction Services

Harm reduction services have been reviewed in drug using communities in Western Europe and the USA. The findings are generally positive.

Marsch [87] selected earlier studies and performed a meta-analysis to examine the effectiveness of methadone. The analysis revealed an overall reduction in illicit drug use, reduction in high risk HIV related behaviours, and a reduced incidence of drug and property related crime.

Klee and Morris [88] examined the impact of increasing the availability of sterile injecting equipment: the prevalence of sharing remained static although the frequency of sharing equipment was reduced. Injecting drug users were also more likely to discriminate with whom they shared.

In a study by Hurley *et al,* [89] involving 81 cities in the USA, of which 29 had needle exchange programmes and 52 had no needle exchange programmes, reported that the HIV sero-prevalence rates were on average 11% lower in the cities with needle exchange programmes than in cities without needle exchange.

Goldberg *et al* [45] found that the overall prevalence of hepatitis C antibodies had fallen in injecting drug users in Glasgow (90% to 77%) five years after the establishment of a needle/syringe exchange service. The prevalence in young injecting drug users was much lower in 1997 than in 1990, 29% and 92% respectively.

Smyth *et al* [49] states that lower rates of hepatitis C antibodies infection in short term drug users, those who commenced injecting after 1994, (40.3% *versus* 64.5% in long term drug users) can be attributed to the expanded drug services in Dublin.

1.3 GENERAL PROFILE OF PRISONERS

1.3.1 Socio-Demographic Profile and Health Status of Irish Prisoners

In 1997, Bacik *et al* [90] reviewed the recorded socio-economic and forensic profile of Irish offenders living in Dublin. The authors found striking evidence that offenders were 12 times more likely to belong to the 'most deprived' population group than the 'least deprived' group. There was also a much higher proportion of men (89%) than women (11%) offenders. They were a young population, their age range was between 16 and 62 years with 50% of them less than 24 years old. The average age of male offenders was slightly less than female offenders. Offenders from the most deprived areas were more likely to receive a prison sentence than the least deprived areas (29% *versus* 19% respectively). Property offences were more likely to receive a custodial sentence than other offences; property offences include burglary, robbery, larceny, malicious damage, arson, trespass, receiving stolen goods, forgery and false pretences.

In 1997, O'Mahony [91] conducted a survey to examine the sociological and criminological profile of a sample of inmates in Mountjoy Male Prison. He reported evidence of social inequality in those imprisoned in Dublin. For example, 15% of prisoners who participated in the survey reported their fathers had spent time in prison. Over half of the respondents (56%) came from only six deprived communities in Dublin. Most lived in rented accommodation with their parents. Almost two fifths (38%) were less than 25 years old, 35% were single, 80% had left school before they were 16 years old, 13% had lived in a young offenders institution, 47% had no skills training and 88% had never been employed.

O'Mahony [91] also examined reported health related behaviours of the inmates in Mountjoy Male Prison: 91% of respondents smoked, 68% drank alcohol when outside prison and 86% smoked cannabis. Over three-quarters of respondents had used drugs apart from cannabis. Two thirds of all respondents had smoked or injected heroin. Heroin use had doubled when compared to a similar survey 10 years earlier. [92] Heroin was the main drug used although most respondents were polydrug users. [91]

In 1986, 31% of the prisoners surveyed described themselves as ill. [92] Almost one fifth of the sample (18%) had been admitted to a psychiatric hospital. Another 18%

reported having attempted suicide. In the 1997 survey, [91] 14 (13%) prisoners reported they had a serious illness or disability apart from HIV and hepatitis. The illnesses described were TB (2 cases), asthma (2), eczema (1), epilepsy (1), lower back pain (4) and mental illnesses (4).

In 1998 the Department of Health Promotion at the National University of Ireland, Galway, conducted a national health and lifestyle survey in the Irish population. This survey examined lifestyles, attitudes of and nutrition practices in the Irish population and is known as the SLAN survey. [93] In 1999, the same group, conducted a general health care study of the Irish prisoner population. [94] An adapted version of the SLAN survey questionnaire was used for the prisoners' survey. [93] The results of the general health care survey of the Irish prisoner population were compared to men aged 14 to 44 years and from social classes IV, V and VI in the SLAN survey. Prior to the publication of general health care study of the Irish prisoner population, the data on this sub-population (from the SLAN survey) were not previously published (Dr F. Hannon, personal communication 2001). The Irish prisoner population reported lower levels of excellent or very good health (29% males and 16% females) than the general population in the SLAN survey (40% of similar aged males). Almost a quarter of prisoners reported that they had a long standing disability or illness that limited their activity (compared to 7% of males in the SLAN survey). This figure does not include those infected with HIV or hepatitis C virus or those with asymptomatic illnesses. The four most common conditions reported by prisoners in the 12 months prior to the interview were depression (22% of male prisoners and 42% of female prisoners), anxiety (14% male and 11% female), skin diseases (12% male and 15% female), and asthma (10% male and 36% female). All mental health indicators were much worse for the Irish prison population than for the general population. Mental health indicators were particularly high in women prisoners; 75% of women prisoners and 48% of men were classified as psychologically distressed. Prisoners reported a high lifetime drug utilisation rate (72% of males and 89% of females compared with 14% of males in the SLAN survey). One quarter of the men and just under two-fifths of the women drank daily outside prison. All women respondents and 91% of men reported current cigarette smoking. The prisoners had a lower mean blood pressure than the general population and they reported higher levels of strenuous exercise. The prisoner's current diet was comparable in quality to that of

the general population, although only 24% of respondents consumed a similarly high quality diet prior to imprisonment.

1.3.2 Prison a Risk Factor for Blood Borne Viral Infections

Transmission of the viral infections

It has been reported that conditions in prisons promote the spread of hepatitis B, hepatitis C and HIV through high risk behaviours such as sharing injecting equipment, unsafe sexual practices and tattooing. Illegal drug use is also associated with drug overdose, abscesses, cellulitis and septicaemia. [95]

A study in seven Scottish prisons revealed that male prison staff considered the perceived risk of contracting HIV was greater in prison than outside; the prisoners' view was that the higher risk was outside the prison. [96]

Horsburgh *et al* [56] found that sero-conversion to HIV was rare in correctional institutes. They found two possible cases in 3,837 individuals examined over a three-year period, but they may have had the disease before entry or acquired it during temporary release. In contrast, in Glenochill prison, Scotland, six of the 12 inmates who tested positive for HIV had contracted the virus in prison. [97] Investigation of the same outbreak showed that seven inmates acquired hepatitis B infection in prison. [98] Transmission of hepatitis B and hepatitis C has been reported in Australian prisons. Crofts *et al* [17] found 10 cases each of hepatitis B and hepatitis C, although all cases had spent more than three months outside prison between tests. Haber *et al* [99] found that four prisoners tested positive for hepatitis C between four to 52 months of imprisonment. Two of these reported injecting drug use in prison, one received a laceration from a barber's shears and the other's lacerations were as a result of a physical assault.

Injecting Drug Use

Several studies have examined practices that may increase the risk of contracting these infections in prison. Injecting drug use was the most common risk factor for hepatitis B, hepatitis C and HIV. [20 60 100] Studies also reveal that those who share equipment, particularly needles or syringes were most at risk. [20 60 74] Individuals injecting for more than six years were also more likely to develop hepatitis C. [20] Two studies found that those who had spent more time in prison were more likely to have

contracted hepatitis C. [20 101] Gore *et al* [48] found a small but non-significant difference in the overall prevalence of hepatitis C between those who injected in prison (44%) and those who did not inject in prison (53%). Hepatitis B was associated with a high incidence of sharing injecting equipment and male homosexual intercourse. [19]

Table 1.8 summarises findings of the recent studies of injecting practices in prison. At least one quarter of injectors continue to inject in prison. [20 21 58 59 61 63 64 102 103 104 105] Between two thirds and three quarters of those who continue to inject share needles and syringes in prison. [105] In prison, large cohorts of injecting drug users share a small number of needles and syringes. [105] These are never disposed of unless they are no longer usable. Filters, spoons and water are also shared in prison. [105] Turnbull *et al* conclude that while injecting is less frequent than outside prison, the injectors who continue in prison have a higher prevalence of risk behaviours. The practice of backloading is also common in prison. [74 105] Some injectors start injecting in prison. Studies conducted in Scottish prisons reveal that between 5% and 30% of injecting drug users started injecting in prison, [61 63 64 106] and a national survey of English and Welsh prisons revealed that 5.2% of injecting drug users had started in prison. [107]

Turnbull *et al* [105] reported that drug supply in the prison is maintained through a variety of strategies, such new entrants, court appearances and family/friends' visits. Drugs are obtained through purchase, friendship and bartering goods or services. Prisoners report injecting in various places in the prison, the most common place being in their cell after lock up. Prisoners also reported injecting drug use in the exercise yard and during visits. The results of two other studies on individuals injecting in prison also reported attempts to clean equipment in prison; use of boiling water or bleach are the common methods. [74 104]

Table 1.8 Reported injecting practices in prison based studies

Year published	Study design	Study population	Sample size	Study findings
1990 Carvell *et al* [102]	Survey	IDUs* living in London who had spent time in prison since 1982, and during the study period were attending a needle exchange programme.	50	94% used illegal drugs in prison. 66% continued to inject in prison. 52% shared needles or syringes inside.
1991 Gaughwin *et al* [103]	Survey of two samples	1) Male inmates in South Australian prisons	373	36% injected in prison. In prison 9% injected daily, 30% injected weekly, and 61% injected occasionally.
		2) Interview of former inmates attending drug services in Adelaide	50	78% were injecting in the six months prior to imprisonment. 52% injected at least once while in prison. 59% of IDUs used a previously used needle for one or more injection. In prison 14% injected daily, 28% injected weekly, 20% monthly and 38% injected occasionally.
1991 Turnbull *et al* [104]	National survey	Male and female respondents ex-prisoners recruited through networks and probation officers	452	36% of the sample had ever injected, of these 27% injected on the last occasion in prison. Of the respondents who reported injecting in prison, 60% reported sharing injecting equipment. Of those who shared in prison, 79% reported cleaning their equipment. Hot or boiling water was the most common method (68%) and bleach was used by 5%.
1992 Bird *et al* [58]	Survey	Male inmates in Saughton Prison	378/499	18% ever injected drugs. 47% continued to injected in prison.
1993 Bird *et al* [59]	Survey	Young male offenders in Polmont Institution	421/422	17% ever injected drugs. 25% continued to inject in prison.
1995 Gore *et al* [63]	Survey	Inmates in Glenochill Prison	295/352	27% ever injected drugs 59% continued to inject in prison. 25% started injecting in prison.

*injecting drug user

Table 1.8 continued overleaf

Table 1.8 Reported injecting practices in prison based studies(cont.)

Year published	Study design	Study population	Sample size	Study findings
1995 Bird *et al* [61]	Survey	Inmates in Barlinnie prison	985/1073	36% ever injected drugs. 50% continued to inject in prison. 6% started injecting in prison.
1995 Rotily *et al* [100]	Survey	Committals to Baumattes Prison	432	20% ever injected drugs. 51% shared needles or syringes outside.
1996 Dufour *et al* [62]	Survey	Inmates in prison in Quebec city	618/651	38% of women and 26% of men ever injected drugs. 58% of women and 49% of men shared needles or syringes in the last year. 27% of women and 14% of men cleaned their needles with bleach after each injection.
1997 Gore *et al* [64]	Survey	Male inmates in Perth	304/434	29% ever injected drugs. 85% injected while in prison. 31% started to inject in prison
		Female inmates in Cornton Vale	134/145	46% ever injected drugs. 57% injected while in prison. 2% started to inject in prison
1997 Rotily *et al* [19]	Survey	Committal prisoners Marseille	391/411	23% ever injected drugs. 27% shared needles and syringes in the last six months.
1998 Malliori *et al* [20]	Survey	Drug using prisoners in two Greek prisons	533/544	68.9% ever injected drugs. 35% continue to inject in prison. 89% of those testing positive for anti-HCV shared needles and syringes in prison.
2000 Weild *et al* [21]	Cross sectional survey	Adult male prisoners in 6 English and Welsh prisons	3176	24% of adult prisoners ever injected. 31% of these ever injected in prison.
		Adult IDU* in 8 English and Welsh prisons	775	6% of these started injecting in prison. 75% of these shared needles and syringes outside prison.

* injecting drug user

Sexual Practices

Table 1.9 contains a summary of sexual practices in prison. Carvell *et al* [102] reported 10% of injecting drug users had sexual intercourse in prison with 6% of men reporting ever having sex with men in prison. Turnbull *et al* [104] reported that 45 (10%) ex-prisoners interviewed said they had engaged in sexual activity while in prison. Thirty five of the 45 described their sexual orientation as either bisexual, homosexual or lesbian, the remainder described themselves as heterosexual. In prison 42 out of the 45 reported having same partner sex. Therefore, men who would not normally have sex with other men do so in prison. Condoms were not used by any of those who engaged in sexual intercourse in prison. Men who have sex with men outside prison were more likely to use condoms. Gaughwin *et al* [103] reported higher rates of men having sex with men in south Australian prisons than those reported in the United

Kingdom. For example, in seven Scottish prisons between 0 and 2% of male inmates said they had anal sex with other men while in prison. [58 59 61 63 64] Weild *et al* [21] reported 3.5% of adult male inmates said they had anal sex with a man in English and/or Welsh prisons. This was lower than that reported by Turnbull.

Generally the proportion of female prisoners reporting ever having been paid for sex is higher than for men (Table 1.9). [21 59 62] The proportion of injecting drug users reporting ever having been paid for sex is similar to non users. In the Scottish prison studies, 12 to 15% of inmates reported ever having been treated for a sexually transmitted infection (Table 1.9). [58 61 63 64] In the studies reviewed the proportion of injecting drug users ever treated for a sexually transmitted infection is slightly higher than in non injectors.

Table 1.9 Reported sexual practices in prison based studies

Year published	Study design	Study population	Sample size	Study findings
1990 Carvell *et al* [102]	Survey	IDUs living in London, who had spent time in prison since 1982, and during the study period were attending a needle exchange programme	50	10% had sex in prison. 6% ever had anal sex with men in prison.
1991 Gaughwin *et al* [103]	Interview with 2 samples	1. Male inmates in South Australian prisons 2. Interview of former inmates attending drug services in Adelaide	373 50	12% ever had anal sex with men in prison. No sexual risk factors reported.
1991 Turnbull *et al* [104]	National survey	Male and female respondents ex-prisoners recruited through networks and probation officers in England	452	10% engaged in sexual activity in prison, and 50% of reported sexual activity was anal sex between men.
1992 Bird *et al* [58]	Survey	Male inmates in Saughton Prison	378/499	60% had two or more partners in the year prior to imprisonment, (IDUs 74%). 3% of men had anal sex with men in the year prior to imprisonment, (IDUs 6%). No one had anal sex with men in prison. 6% had ever paid for sex, (IDUs 11%). Less than 1% had ever been paid for sex.
1993 Bird *et al* [59]	Survey	Young male offenders in Polmont Institution	421/422	36% had six or more partners in the year prior to imprisonment. Over 4% had anal sex with men in the year prior to imprisonment. Less than 1% had anal sex with men in prison.
1995 Gore *et al* [63]	Survey	Inmates in Glenochill Prison	295/352	72% had two or more partners in the year prior to imprisonment. 2% of men had anal sex with men in the year prior to imprisonment, (IDUs 3%). 1% of men ever had anal sex with men in prison, (IDUs 1%). 12% had ever been treated for an STI*, (IDUs 15%). 7% reported ever paying for sex, (IDUs 8%). 1% had ever been paid for sex, (IDUs 1%).

*Sexually transmitted infection

Table 1.9 continued overleaf

Table 1.9 Reported sexual practices in prison based studies (cont.)

Year published	Study design	Study population	Sample size	Study findings
1995 Bird *et al* [61]	Survey	Inmates in Barlinnie prison	985/1073	65% reported two or more partners in the year prior to imprisonment. 3% had anal sex with men in the year prior to imprisonment, (IDUs 4%). Less than 1% of men ever had anal sex with men in prison, (IDUs less than 1%). 11% had ever been treated for an STI*, (IDUs 15%). 4% had ever paid for sex, (IDUs 3%). Less than 1% of injectors and non injectors had ever been paid for sex.
1996 Dufour *et al* [62]	Survey	Inmates in prison in Quebec city	618/651	16% of male non IDU had sexual intercourse with an IDU partner, (IDUs 60%). Less than 1% of men ever had anal sex with men in prison, (IDUs less than 1%). 3% of men had ever been paid for sex, (women 36%).
1997 Gore *et al* [64]	Survey	Male inmates in Perth	304/434	69% had two or more partners in the year prior to imprisonment 1% of men ever had anal sex with men in prison, (IDUs 4%). 15% had ever been treated for an STI, (IDUs 21%). 9% ever paid for sex, (IDUs 7%).
		Female inmates in Cornton Vale	134/145	34% of the women had two or more partners in the year prior to imprisonment 17% of women ever had anal sex, (IDUs 16%). 5% had ever been treated for an STI, (IDUs 3%). 23% reported ever been raped, (IDUs 19%). 9% had ever been paid for sex, (IDUs 19%).
2000 Weild *et al* [21]	Survey	Adult male prisoners in 6 English and Welsh prisons	3176	63% reported two or more partners in the year prior to imprisonment. 3% of men ever had anal sex with men in the year prior to imprisonment. 3.5% of men ever had anal sex with men in prison. 15% had ever been treated for an STI. 5% had ever been paid for sex.
		Female prison	400	33% reported two or more partners in the year prior to imprisonment. 10% of women ever had sex in prison. 17% had ever been treated for an STI. 15% had ever been paid for sex. 83% had two or more partners in the year prior to imprisonment.
		Young offender	696	0.7% of young offenders had anal sex with men in the year prior to imprisonment. 0.4% of young offenders ever had anal sex with men in prison. 7.8% had ever been treated for an STI. 4.0% had ever been paid for sex

*Sexually transmitted infection

Tattooing

Tattooing is thought to be a common practice in prison and is sometimes performed using shared sowing needles or straight pins available in tailoring classes. Borstal marks are considered a sign of identity within the prison community. Turnbull *et al*[104] found that 26 (6%) prisoners interviewed had a tattoo done on their last occasion in prison. Of these half had used shared tattooing equipment. Albildgard [38] reports the presence of hepatitis C antibodies in an individual who reported having a tattoo but had no other risk factors. Gore *et al* [48] identified 27 non injectors who tested positive for antibodies to the hepatitis C virus in two Scottish prisons, but none reported having a tattoo.

1.3.3 Prison a Risk Factor for Blood Borne Viral Infections in Ireland

Two studies which examined the sociological and criminological profile of prisoners in Mountjoy Male Prison, Dublin between 1986 and 1996 identified that there was a growing problem with injecting drug use and HIV infection. [91 92] In the 1997 study ten prisoners (7%) reported testing positive for HIV, [91] while only three prisoners reported testing positive for HIV in the 1986 survey. [92] Thirty individuals (28%) reported testing positive for hepatitis in 1997. This survey did not differentiate between hepatitis B and hepatitis C.

In the 1997 survey [91] 45 respondents reported using heroin in prison, 37 had injected. Of those who injected in prison 84% had shared syringes. Six prisoners reported starting their drug habit during this prison sentence. A review of inmates attending the drug detoxification programme at Mountjoy prison [108] revealed needle sharing increased from 60% outside prison to 98% in prison.

There is no published information on sexual practices or tattooing in the Irish prison population.

1.3.4 Review of Harm Reduction Services in Prison

In 1993 following an outbreak of hepatitis B and HIV among injecting drug users in HM Prison Glenochil in Scotland a prevention initiative was introduced. [109] This intervention was multifaceted including: increased availability of hepatitis B vaccine; provision of bleach tablets to clean injecting equipment; provision of a methadone detoxification programme; improved access to drug and harm minimization counselling for inmates, and increased training for prison officers. By mid-1996 all these measures had been sustained and several could be found in many other prisons throughout Scotland. Follow-up investigations showed no evidence of epidemic spread of HIV during the 12 months after the initiative was introduced.

In 1994 Dolan *et al* [110] introduced revised syringe cleaning guidelines for injecting drug users imprisoned in New South Wales. Some injector respondents (23%) reported adopting the revised syringe cleaning guidelines.

Dolan *et al* [111] also studied injecting frequency in a cohort of ex-prisoners who were receiving methadone maintenance and reported that there was a reduced mean number of injections per week in prison *versus* outside prison in New South Wales in 1994 (0.16 *versus* 0.35). A study in New South Wales examined the drug use and injection risk taking among injectors in prison *versus* injectors in the community setting attending a methadone maintenance programme. [112] The authors concluded that injectors in prison injected less frequently than injectors in the community (44% *versus* 84%), but had higher levels of needle sharing (borrowed 15% *versus* 32%; lent 21% *versus* 35%).

In 1996 Kent [113] reported that Switzerland, Germany, Spain and Australia have already started to provide inmates with sterile injection equipment, either through prison physicians or via dispensing machines. Results of these studies are not available in published literature. A Swiss prison was the first to evaluate a needle exchange program in a one-year pilot project that ended in June 1995, although they had begun distributing sterile needles on an *ad hoc* basis since the late 1980s. [114] Ninety-four of the 100 female inmates agreed to a voluntary blood test on arrival at the prison; 6% tested positive for antibodies to HIV. In the year following the introduction of sterile needles, no new cases of HIV infection or hepatitis were found; the prison reported that there was no increase in drug consumption, needle sharing

decreased significantly and fears that needles would be used as weapons proved unfounded.

The European Monitoring Centre for Drugs and Drug Addiction [115] estimates that between 15 and 50% of prisoners in European countries have a history of drug use. Prisons contain a unique concentration of severe drug problems and require particular attention to ensure provision of a broad range of treatment interventions. Provision of methadone treatment within prisons varies across European countries. Spain and Austria provide high levels of methadone maintenance treatment, injectors entering these countries' prisons can commence methadone maintenance treatment in prison. In other European countries (Belgium, Germany, Greece, Ireland, Italy, the Netherlands, and Portugal) methadone detoxification treatment is provided. In the United Kingdom entrants already on methadone maintenance can continue treatment in prison. One third of United Kingdom prisoners taking methadone maintenance outside prison continue to do so in prison. There have been problems associated with the provision of methadone in United Kingdom prisons. Deaths have occurred in non-tolerant individuals.

In an Australian prison, Dolan *et al* [116] observed a 50% reduction in the incidence of anti-HCV in drug users randomly allocated to methadone maintenance compared to drug users randomly allocated to a methadone maintenance list. None of the study subjects acquired HIV.

At the time of the prevalence surveys in Irish prisons, which are the subject of this dissertation, there were two methadone programmes options available, both in Mountjoy prison complex. The first was a short detoxification programme offered to prison entrants who could prove they were currently dependant on heroin (personal observation of prison services). This dose or length of detoxification did not comply with the recommendations of the methadone protocol. [85] The second option was to attend the drug detoxification programme at Mountjoy prison. [108] A review of this programme revealed that over a 30 month period only 187 inmates had been admitted to this programme and of these, 173 had successfully completed their treatment. These were mainly older prisoners and their average number of convictions were 16.2 and average age of contact with the criminal justice system was 13.8 years.

1.4 IRISH PRISONS

1.4.1 Organisation of the Prison Services

The Prison Services Unit at the Department of Justice, Equality and Law Reform managed prisons in Ireland until 1999. A new prison authority, the Irish Prisons Services, was set up in 1999. This is gradually assuming responsibility for prison services management.

In 1998 there were 15 prisons in Ireland. Five of these were located in Dublin. Seven of the 15 prisons were committal prisons. There were 11,131 committals (new entrants/receptions) to Irish prisons in 1998 (Catherine M. Linehan personal communication 1999) indicating a 10% increase since 1993. [117] In its report for 1994, the Department of Justice, Equality and Law Reform [117] reported just over 5% of committals were women. From September to November 1998, the average of prisoners residing in Irish prisons was 2,687 (Catherine M. Linehan personal communication 1999), indicating a 20% increase since 1993. [117] In 1999 a new remand prison for Lensiter (this province includes Dublin City and County) was opened (Cloverhill Remand Prison). In two of the Dublin prisons, there are special prison units for sex offenders.

The prisons and places of detention administered by the Department of Justice, Equality and Law Reform in 1998 are listed in Table 1.10. [117]

Table 1.10 Irish prisons and places of detention 1998

Prison	Function
Mountjoy Male	Committal prison
Mountjoy Female	Committal prison
The Training Unit	Place of detention for adult males under going industrial training
St Patrick's Institution	Committal prison and place of detention for male juveniles
Wheatfield	A place of detention for adult and juvenile males
Arbour Hill	Prison for male prisoners
Shanganagh Castle	Place of detention for male juveniles
Loughlan House	Open centre for the detention of male adults
Shelton Abbey	Open centre for male adults
The Curragh	Place of detention for male adults
Portlaoise	Committal prison for male prisoners from the special criminal court
Limerick Male & Female	Committal prison
Cork	Committal prison for male prisoners
Fort Mitchel	Place of detention for male adults
Castlerea	Committal prison for male prisoners

1.4.2 Health Services in Irish Prisons

Irish prison health services are provided within the prison services, and supervised by the Director of Prison Medical Services at the Department of Justice, Equality and Law Reform.

In 1993 the Department of Justice published the *Report of the Advisory Committee on Communicable Diseases in Prison.* [118] Neither hepatitis B nor hepatitis C were mentioned in the report and, in relation to HIV, the report stated that 'current policy may militate against a prisoner seeking advice about their HIV status when in prison'. The policy at that time encouraged the segregation of prisoners testing positive for HIV; subsequently this policy was discontinued.

With regard to hepatitis B vaccine, a written policy has been circulated to prison medical staff and the policy is to offer vaccination to those with sentences longer than eight months (Dr. E. Dooley, personal communication, 1995).

In February 1996, the Department of Justice estimated that 40% of prisoners had a history of serious drug misuse. [119] At that time the total prison population was just over 2,000. Since 1993 there has been no published report on policy in relation to infection control in prison. The Department of Justice did not have any systematic information on prevalence of hepatitis B, hepatitis C, or HIV among the prisoner population.

'Prisoner' is a named category in the voluntary linked HIV testing system and, since 1985, 39 individuals with such a designation have tested positive. [67] This is not a reliable indicator of prevalence of the virus among prisoners.

Government policy in relation to drugs was reviewed and in 1996 the *Report of the Ministerial Task Force on Measures to Reduce the Demand for Drugs* recommended that specific attention be paid to prisons in the response to the drug issue. [83] It was estimated at that time that approximately 70% of prisoners in Mountjoy Prison (the largest prison in Dublin) had a history of drug misuse.

In March 1999, the Department of Justice, Equality and Law Reform circulated a draft action plan entitled *Drug Misuse and Drug Treatment in the Prison System.* [120] The action plan advocates that services available outside prison to injecting drug users should be available within prison where at all possible.

Medical services within the prisons are provided by part time general practitioners. The general practitioner refers prisoners to specialists when required. Prison officers who have completed a basic health care course administer health care; a small number of these officers have a nursing background.

1.5 STUDY RATIONALE, AIM AND OBJECTIVES

In the Republic of Ireland it has been estimated that 40% of prisoners misuse drugs. Infection with hepatitis B virus, hepatitis C virus and HIV is associated with injecting drug use. Previous research in Irish prisons identified a growing problem with injecting drug use and HIV infection. These studies were based on self reporting, and were confined to prisons in the Mountjoy Complex. They did not specifically include hepatitis B or hepatitis C. Studies have shown that harm reduction strategies can reduce the spread of these infections.

In the Republic of Ireland the health services in Irish prisons are provided through the prison authorities and there is no formal link with the health authorities. Harm reduction interventions were introduced in community settings by the Eastern Health Board in 1992, but the Irish prison service had failed to provide any substantial intervention by 1998. Many drug users spend time in prison and those accessing drug services were not provided the same services while in prison thereby potentially diluting the overall effect of harm reduction in the community. There are many reported barriers to the provision of harm reduction services in Irish prisons, including political will, the Prison Officers Association (prison officers union) and the individual ethos of doctors providing medical services.

In order to initiate appropriate responses, it was important to know both the prevalence of hepatitis B, hepatitis C and HIV infections and the pattern of risk behaviours in prison environments. It was against this background that the Department of Justice, Equality and Law Reform commissioned a study to estimate the prevalence of hepatitis B, hepatitis C and HIV in Irish prisoners. The Department of Community Health and General Practice, Trinity College Dublin, was awarded the contract to undertake the study. The terms of reference in the Request for Proposal are given in Appendix 2.

The study was designed in two phases: a census survey of 1,200 prisoners and a survey of 600 committal prisoners. The survey of committal prisoners was necessary to determine the prevalence of the three infections in short term prisoners as these prisoners would be under represented in the census survey.

The study aim was to:

- Ascertain the prevalence and determinants of hepatitis B, hepatitis C and HIV in Irish prisoners with a view to maximising protection of the Irish prisoner population.

The study objectives were to:

- Ascertain the prevalence of blood borne infections among prison populations on entrants (committal) and inmates (census)
- Identify the determinants of the blood borne infections in each of the populations
- Compare the general characteristics of committal and census survey populations

1.6 TEAM MEMBERS AND THEIR CONTRIBUTIONS

The prevalence surveys were funded by the Department of Justice, Equality and Law Reform and conducted by a multi-disciplinary team. The team members were as follows:

- Shane Allwright, (SA) - Senior Lecturer in Epidemiology at the Department of Community Health and General Practice, Trinity College Centre for Health Sciences.
- Joseph Barry, (JB) - Senior Lecturer in Public Health in the same department
- Fiona Bradley, (FB) - Lecturer in General Practice in the same department
- Jean Long, (JL) - PhD student in the same department and the author of this thesis.
- Sheilagh Reaper Reynolds, (SRR) -MSc student in the same department
- John V Parry, (JP) - Deputy Director of the Sexually Transmitted and Bloodborne Virus Laboratory, in the PHLS Central Public Health Laboratory.
- Lelia Thornton, (LT) - Specialist in Public Health Medicine at the Department of Public Health, Eastern Regional Health Authority

The team leader for the study was SA. SA, JB, FB and LT developed the original protocol and tendered for funding. The protocol was revised by JL and SRR for the committal survey. LT negotiated the contract for oral fluid analysis with the Public Health Laboratory Services and acted as principal liaison between the Dublin team and the Public Health Laboratory Services for both surveys. JP supervised the development of laboratory methods and the laboratory analysis for the samples collected in both surveys. Statistical advice was sought from Dr Alan Kelly at the Department of Community Health and General Practice, Trinity College Centre for Health Sciences.

The author of this thesis (JL) joined the research team after the funding had been secured and the protocol for the census survey developed. For the census survey, JL was involved in the data collection and contributed to the analysis plan. SA carried out the analysis with JL. JL contributed to the report prepared for the Department of Justice, Equality and Law Reform. [121] Two papers have been published based on this report. [122 123] JL reviewed the literature and prepared the tables for both papers. JL

performed the analysis and drafted this section for the paper by Thornton *et al.* [123] JL also made comments on drafts versions of the papers by Allwright *et al.* [122] and Thornton *et al.* [123]

For the committal survey, JL and SRR supervised the data collection. JL contributed to the analysis plan and carried out the analysis with SA. JL wrote the report for the Department of Justice, Equality and Law Reform with contributions from the other authors. [124] One paper is in press in the British Medical Journal based on this report. [125] JL was the lead author on the third paper.

1.7 THESIS AIM AND OBJECTIVES

The aim of this thesis is to

- Provide a synthesised analysis of the prevalence of blood borne viral infections and their determinants in the Irish prisoner population (both entrants and inmates).

The objectives of this thesis are to:

- Compare the characteristics of prison entrants (committal) and prison inmates (census)
- Compare the prevalence rates of anti-HBc, anti-HCV and anti-HIV in both populations
- Compare the determinants of each of the blood borne viral infections in the two populations
- Estimate the overall prevalence of anti-HBc, anti-HCV and anti-HIV in respondents by prison exposure
- Identify the determinants of infection in respondents by prison exposure
- Estimate the average number of cases of anti-HBc, anti-HCV and anti-HIV in the Irish prisoners from September to November 1998.

CHAPTER 2 The Study Methodology

INTRODUCTION

The Department of Justice, Equality and Law Reform commissioned a study of the prevalence of hepatitis B, hepatitis C and HIV in Irish prisoners. The Department of Community Health and General Practice, Trinity College Dublin, was awarded the contract to undertake the study. The study was designed in two phases: a census survey of 1,205 prisoners and a survey of 607 committal prisoners.* The rationale for the committal survey was to ensure adequate representation of short term prisoners as the census survey would include a higher proportion of prisoners serving longer sentences. The research team also wished to determine if the prevalence of the three viral infections and the main risk factors in the committal population differed from the census survey population. This chapter describes the methods employed to conduct and analyse the prevalence surveys in the census and committal survey populations and is presented in seven sections:

2.1 Sampling

2.2 Fieldwork

2.3 Data collection instruments

2.4 Collection of the oral fluid specimens

2.5 Statistical methods

2.6 Methods employed to estimate the total numbers of cases of bloodborne viral infection

*In this study committal prisoners are those who have entered the prison within the preceding 48 hours, accused or guilty of a new crime (excluding those returning from temporary release or transferred from another prison). The committal population includes individuals on remand, following sentence, committed as a result of a bench warrant, and non-nationals without valid documentation.

2.1 SAMPLING

2.1.1 Census Survey Sampling

The prison population in Ireland at the time of the survey numbered approximately 2,700, located in 15 prisons. A sampling strategy was devised which, by categorising the 15 prisons according to expected prevalence rates for infection as high, medium or low risk, allowed conclusions to be drawn about infection rates in groups of similar prisons (Figure 2.1). The expected prevalence rate was based on the proportion of injecting drug users in prison, the main risk factor for the spread of these infections in Ireland. The high risk prisons were those with the highest proportion of injecting drug users (70%), [83] the medium risk prisons were those expected to have a smaller drug problem and the low risk prisons have little or no injecting drug use. The decision to group the prisons in this way assured both confidentiality and an adequate sample for accurate estimation of infection prevalence in medium and high risk prisons.

The three low risk prisons (Curragh, Castlerea and Arbour Hill) were excluded as the number of prisoners involved (approximately 275) was inadequate to allow for a stable estimation of prevalence. For the purpose of sample size calculation, the predicted prevalence of infection, in particular hepatitis C, was estimated using information obtained from a study of drug users attending Health Board run clinics, [27] together with information from the Department of Justice, Equality and Law Reform on the estimated prevalence of intravenous drug use in prisons. It was estimated that a sample size of 1,200 was required (Table 2.1). [126] Nine prisons were selected for survey: all the high risk prisons and a random sample (weighted proportional to population size) of the medium risk prisons (Figure 2.1). The high risk prisons were Mountjoy Male, Mountjoy Female, St Patrick's Institution, Wheatfield and the Training Unit, and the selected medium risk prisons were Cork, Limerick, Portlaoise and Shelton Abbey. Following discussion with the Department of Justice, Equality and Law Reform and with representatives of political prisoners, it was agreed that the political prisoners in Portlaoise prison (50 approximately) would not form part of the study population, as they would be classified as a low risk atypical prisoner population.

The survey was carried out over a three month period from September to November 1998. The fieldwork took between one and two days to complete in each prison.

A census of all prisoners on a given day was carried out in the medium risk prisons and the two small high risk prisons (Mountjoy Female and the Training Unit), while in the three larger high risk prisons half of the population was sampled employing a systematic random sampling technique. In Wheatfield the inmates in every second cell on each of the 18 units were invited to take part in the survey; in Mountjoy the inmates on one side of each landing were selected; in St. Patrick's Institution every second person on the prison list was invited to take part in the survey.

Prisoners who were absent from the premises at the time of the survey, and the very small number of prisoners who were considered by the prison governor to be a safety risk for the research staff, were excluded from the sample.

Table 2.1 Minimum sample size estimates required for the prevalence surveys

Survey	Disease	Expected prevalence	Precision	Confidence level	Sample size estimation
Census	**High risk**				
	HIV	13%	±3	95%	405
	Hepatitis B	20%	±3	95%	536
	Hepatitis C	53%	±3.5	95%	595
	Medium risk				
	HIV	7%	±3	95%	250
	Hepatitis B	10%	±3	95%	333
	Hepatitis C	26%	±3.5	95%	486
	Sample required				1081
Committals					
	HIV	2	±1.5	95%	325
	Hepatitis B	8.6%	±3	95%	326
	Hepatitis C	37%	±4	95%	534
	Sample required				534

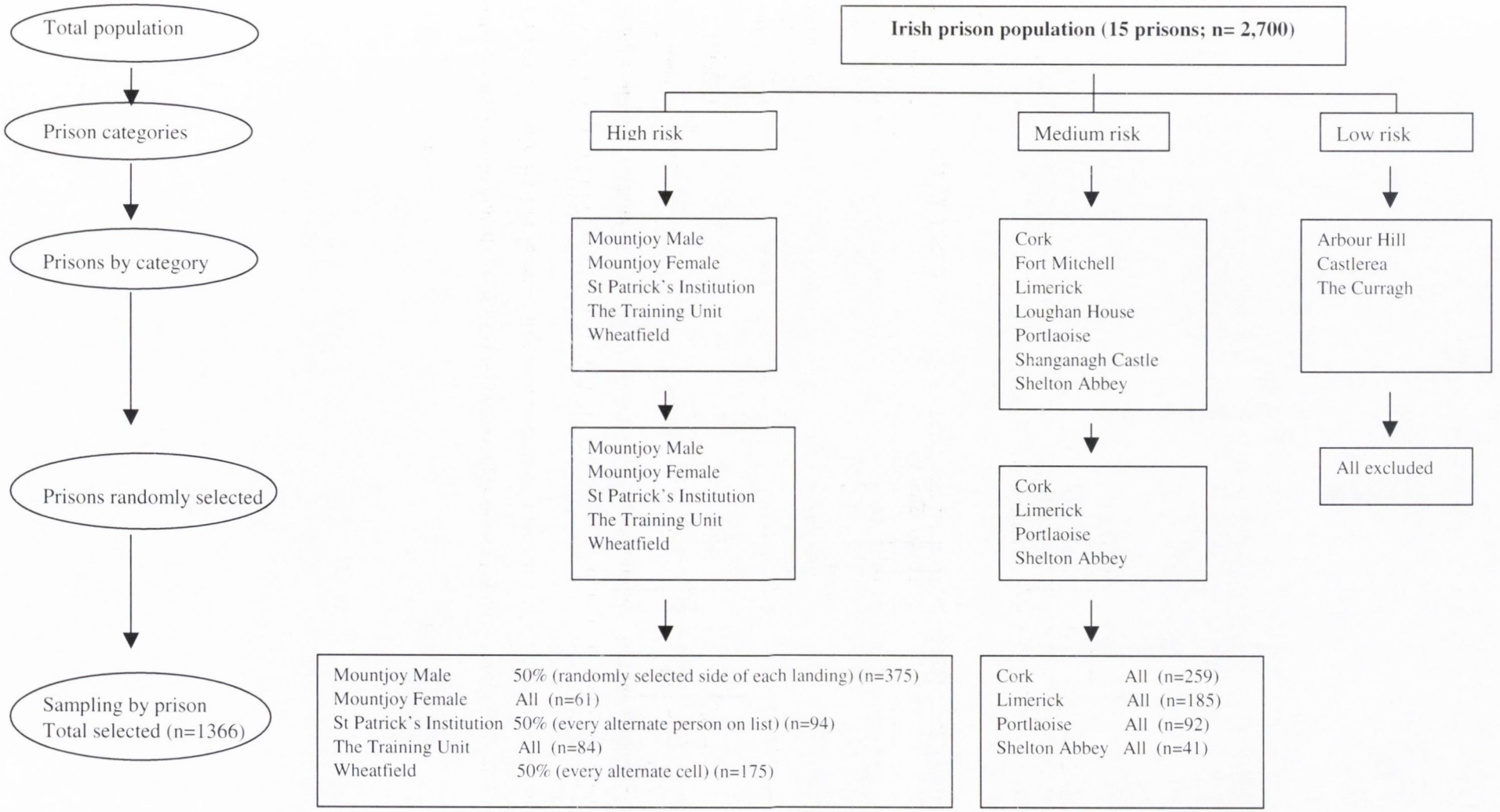


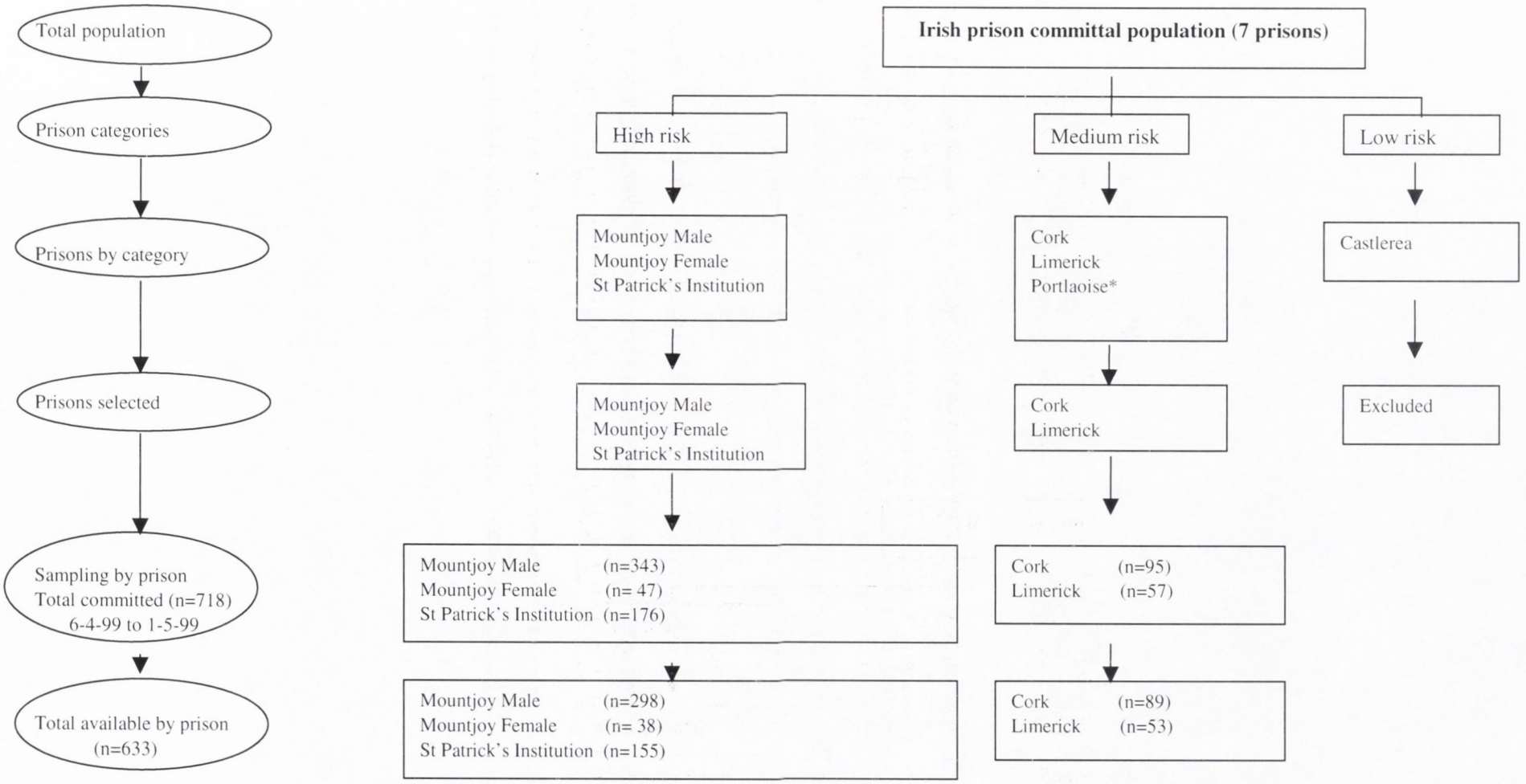
Figure 2.1 Prisons participating in the census survey by category and sampling procedure

2.1.2 Committal Survey Sampling

The annual prison committal population (prison entrants) in Ireland is approximately 11,000, committed to seven prisons: Cork, Castlerea, Limerick, Mountjoy Male and Female, Portlaoise and St Patrick's Institution (Figure 2.2). All except two prisons, Castlerea and Portlaoise, were included in the survey. These prisons were excluded as the numbers committed are very small and it would have been difficult to maintain confidentiality. (The number of committals to Castlerea was 136 in 1998; only a very small number of high security prisoners (approximately 50) were committed annually to Portlaoise.)

The five prisons included were Mountjoy Male and Female and St. Patrick's Institution (both high risk), and Cork and Limerick (both medium risk). Based on the predicted prevalence of hepatitis C infection (from the census survey), it was estimated that a sample size of 534 was required (Table 2.1). [126] Given the usual committal rate, it was estimated that it would take three to four weeks to attain a sample of this size.

The survey was carried out from 6th April to 1st May 1999. The fieldwork involved visiting each prison daily and interviewing all those committed within the previous 48 hours. The list of committals was obtained from the committal register maintained in each prison. Prisoners who had been upset on entry to prison were placed in a secure environment for 24 hours and interviewed the following morning. None of the prisoners committed during the survey period were considered a security risk for the interviewers. Six individuals who were unable to provide informed consent were excluded from the survey. Due to space constraints or the nature of the prisoners' offence, 85 committals were released or transferred from the committals area before they could be interviewed.



*Excluded due to small numbers

Figure 2.2 Prisons participating in committal survey by category and sampling procedure

2.2 FIELDWORK

The study was approved by St James' and Federated Dublin Voluntary Hospitals' - Joint Research Ethics Committee. Procedures to ensure compliance with ethical procedures are outlined in Appendix 5.

For the *census survey* preparatory work was carried out in each prison through meetings between the research team, the prison governor and key staff. The approach taken in carrying out the survey varied in different prisons according to the conditions and population of the individual prison. Staff and prisoners were briefed in advance of the survey by posters on notice boards, and by individual information leaflets (Appendix 3a to 3c). The survey was carried out by a team of researchers who met the prisoners in groups. The groups varied in size from 10 to 40. Prisoners who did not wish to meet the researchers in a group setting were approached individually to explain the study to them and to seek their co-operation. In many cases this approach was successful and the survey was then carried out, usually in their cell.

For the *committal survey* preparatory work was carried out in each prison through correspondence and meetings between the research team, the prison governor and key staff. The approach taken in carrying out the survey varied slightly in different prisons according to the prison conditions, wishes of the prison authorities, and the time prisoners were usually transferred from the courts. Staff and prisoners were briefed in advance of the survey through individual information leaflets. The survey was carried out by a team of researchers who met the prisoners individually or in pairs.

During both surveys, the survey team was briefed in advance and consisted of health professionals or experienced researchers (Appendix 4). A health professional was available at all times to answer questions of a medical nature. The prisoners were given an introductory talk lasting five minutes, explaining the purpose and process of the survey (Appendix 5). They were advised that all data collected would be anonymous and confidential and that no information that could identify an individual would be released to the prison authorities or to the Department of Justice, Equality and Law Reform. Prisoners were informed that they would not be able to get their individual test results from the survey, but were advised that testing was available through the prison medical service. They were invited to ask questions or make comments. With the agreement of the prisoners, the survey then proceeded.

The survey was voluntary. All eligible prisoners were encouraged to participate but no inducements were offered and no negative sanctions were imposed on non-respondents.

2.3 DATA COLLECTION INSTRUMENTS

There were two parts to the survey: collection of an oral fluid specimen and completion of a questionnaire (Appendices 6a to 6d). In order to complete the process as quickly as possible, the questionnaire was generally filled in while the oral fluid specimen was being collected.

Traditionally, prevalence of hepatitis B, hepatitis C and HIV has been estimated by taking blood from subjects and carrying out a range of serological tests. Recently, techniques have been developed to allow for oral fluid analysis. This is a more convenient and safer body fluid on which to carry out virology tests and results obtained are comparable to those obtained with blood tests.

The questionnaire was based on one used in cross-sectional prison surveys in Scottish, [58 59 61 63 64] and English and Welsh Prisons [107] These studies do not refer to a formal validation process. However the authors [58 61 64 127] noted the high percentage of questions that followed logical checks and there was a high proportion of agreement when oral fluid test results were matched with risk factors. [61 127] The questionnaire was adapted based on perceived risk factors in the Irish population. The questionnaire consisted of closed, multiple choice questions.

In the census survey the questions related to demography, details of prison sentences, history of injecting drug use, sexual practices, self-reported hepatitis and HIV testing and results, and hepatitis B vaccination history.

The questionnaire was modified for the committal survey. Questions relating to demography, history of injecting drug use, self-reported HIV and hepatitis testing and results, and hepatitis B vaccination history were the same as those used in the census survey. The questions covering details of prison sentences were adapted to suit the committal population and an additional question '*how many times have you been in prison*?' was asked. This question would allow us to identify first time prisoners. Additional questions on number of heterosexual partners in the previous 12 months, and selling or buying sex were included, and prisoners were also asked about

tattooing inside and outside prison. It was thought these questions might assist in explaining infections in those with no apparent risk factors.

In both surveys the questionnaire was self-administered and took an average of 5 minutes to complete. Those who had literacy difficulties were assisted in completing the questionnaire by a researcher. The survey was anonymous – no name, address or other identifier was recorded on either the questionnaire or the oral fluid specimen. Prisoners who did not wish to provide an oral fluid sample were asked to complete a questionnaire. Once completed, the questionnaire and oral fluid specimen were placed in an envelope and all envelopes were then placed in a collection bag. A number was later assigned to each questionnaire and specimen, linking the two. At the end of each day of fieldwork the questionnaires were checked for internal consistency.

During both surveys, anonymous demographic information (age and gender) was gathered on the prison population in each prison to calculate response rate and establish representativeness of respondents.

The survey procedures, including the use of the questionnaire and the oral fluid testing, were piloted on a group of prisoners and appropriate alterations were made following this experience.

2.4 COLLECTION OF ORAL FLUID SPECIMENS

Oral fluid specimens were collected with a proprietary device called EpiScreen™ (Epitope Inc., Oregon, USA). This consists of a cotton fibre pad treated with hypertonic salt solution on a plastic stick. Capillaries lining the gum and cheek mucosae leak significant amounts of plasma proteins, including immunoglobulins, into the mouth. The EpiScreen™ pad is designed to collect oral fluid specimens rich in this capillary transudate ('oral mucosal transudate'). The pad is placed between the lower gum and cheek and held in place for at least two minutes. After collection, the pad is placed in a tube, provided as part of the collection kit, containing a non-toxic preservative solution that inhibits bacterial growth and degradation of immunoglobulins. Once specimens are collected they can be stored for up to 21 days at temperatures between 4°C and 37°C. For this study, specimens were kept refrigerated until transported in several large batches by overnight courier to the

Central Public Health Laboratory in the United Kingdom. Laboratory processing of the specimens commenced on the next working day and the specimens were tested blind to demographic and risk factor characteristics.

Each oral fluid specimen was tested for total IgG (to check specimen quality), anti-HIV, anti-HBc and anti-HCV antibodies.

Anti-HIV testing was done using the Murex 1+2 GACELISA (VK61, Abbott Diagnostics, Maidenhead, UK), [128] [129] with positives confirmed using a modified Clonesystems EIA® (Biostat Diagnostics, Stockport, UK). Anti-HBc testing used Murex ICE® (Abbott Diagnostics, Maidenhead, UK), with positives confirmed with an 'in-house' RIA. [130] Anti-HCV testing used a modified protocol for the Ortho HCV 3.0 SAVe ELISA® (Product no. 940982, Ortho Diagnostics, Amersham, UK); borderline reactives were further investigated using a modified Chiron RIBA® HCV 3.0 (product no. 930780, Ortho Diagnostics, Amersham, UK). [125] [147]

2.5 STATISTICAL METHODS

Data entry was carried out using an automated procedure [131] and was subsequently checked manually. Statistical analysis was carried out using JMP IN, [132] and Stata. [133]

In each survey, Pearson $\chi 2$ test, and Fisher's exact test were used to compare proportions in independent groups of categorical data. The $\chi 2$ test for trend was used to identify linear trends in categorical data. Multiple logistic regression models were developed to determine which variables best predicted positive antibody results in the complete sample, and in injectors and non injectors in both surveys. Exact 95% confidence intervals were calculated for proportions of binomial variables and for regression adjusted odds ratios.

The two data sets were combined. Pearson $\chi 2$ test, Fisher's exact test and $\chi 2$ test for trend were used to perform formal comparisons of the risk factors and prevalence rates, committal survey *versus* the census survey.

The combined data sets were then grouped by prison exposure: yes or no. Multiple logistic regression models were developed to determine which variables best predicted positive antibody results in those who had and had not spent time in prison.

2.6 METHODS EMPLOYED TO ESTIMATE THE TOTAL NUMBERS OF CASES OF BLOODBORNE VIRUSES IN IRISH PRISONS.

The survey prevalence rates can be used to estimate the number of cases in medium and high risk prisons. But estimates of the numbers of cases in the low risk prisons are required as all these prisons were excluded from the survey. It may be assumed that the prevalence of the three infections among prisoners in the low risk prisons would be higher than national prevalence, but possibly lower than the prevalence in non-drug users in medium risk prisons. Two sets of prevalence rates were employed to estimate the number of cases of each of the viral infections in low risk Irish prisons at the time of the survey:

- The 95% confidence interval estimates for the prevalence rates in medium risk prisons.
- The national prevalence rates for hepatitis B [23] and HIV. [66] There is no national prevalence estimate available for hepatitis C.

CHAPTER 3 The Study Results

INTRODUCTION

The results of the two prevalence surveys are presented in nine sections.

3.1 General information including response rate, age and gender profile and prison history of respondents.

3.2 Prevalence of antibodies to hepatitis B core antigen (anti-HBc), antibodies to hepatitis C virus (anti-HCV) and antibodies to human immunodeficiency virus (anti-HIV).

3.3 Prevalence and characteristics of drug use, in particular heroin.

3.4 Sexual practices.

3.5 Tattooing.

3.6 Uptake of hepatitis B vaccination.

3.7 Analysis of factors contributing to increased risk of testing positive for anti-HBc, anti-HCV and anti-HIV by survey

3.8 Analysis of factors contributing to increased risk of testing positive for anti-HBc, anti-HCV and anti-HIV by prison exposure prior to the survey: yes or no

3.9 Estimation of the average number of cases of anti-HBc, anti-HCV and anti-HIV in prisoners from September to November 1998.

Three main subject areas are covered in each section are: the results of the census survey; the results of the committal survey; and comparison of the two surveys.

In the census survey one questionnaire was discarded, as it did not conform to logical checks; the oral fluid sample result was retained for estimating prevalence only. Eleven respondents did not provide an oral fluid sample and one oral fluid sample was inadequate for analysis. These respondents' questionnaires were excluded from analysis.

In the committal survey two respondents provided oral fluid samples only; these were retained for estimating prevalence. Ten respondents did not provide an oral fluid sample and one oral fluid sample was inadequate for analysis. These respondents' questionnaires were excluded from analysis.

Analyses refer to the 1193 participants in the census survey and 596 participants in the committal survey who provided analysable oral fluid or, for analyses relating to injecting drug use status, refer to the 1178 respondents in the census survey and 593 respondents in the committal survey who declared their injector status. Denominators vary because not all respondents answered all questions. To preserve confidentiality, analyses are given by prison group rather than by individual prison. Relevant comparisons between the two surveys are provided at the end of each sub-section.

3.1 GENERAL INFORMATION

3.1.1 Response Rates

The two surveys had high response rates.

Census Survey

The governors of the nine selected prisons agreed to the census survey; 1,205 out of 1,366 prisoners agreed to participate in the survey, an overall response rate of 88.2%; 1193 (99.0%) respondents contributed an analysable oral fluid sample. The response rate for each prison is shown in Table 3.1. All the participating prisons had high response rates.

Table 3.1 Census survey response rate by prison

Prison	Prison population on the day of the survey	Exclusions*	Sample selected	Number responded	Response rate (%)
High risk					
Mountjoy Male	769	3	375	359	96
Mountjoy Female	64	3	61	50	82
The Training Unit	85	1	84	77	92
St Patricks	184	15	94	88	94
Wheatfield	349	2	175	143	82
Medium risk					
Cork	266	7	259	228	88
Limerick M&F	197	12	185	142	77
Portlaoise	94†	2	92	80	87
Shelton Abbey	41	0	41	38	93
Total	2049	45	1366	1205‡	88

*Exclusions were those not available for the survey (in court, in hospital, on temporary release or discharged that morning); already surveyed in previous prison; seriously ill; too dangerous (7 in Cork, 2 in Wheatfield)
†Political prisoners excluded (approximately 50 - exact number not released for security reasons)
‡11 respondents did not provide an oral fluid sample and one sample was inadequate for analysis

Committal Survey

The governors of the five selected prisons agreed to the survey; 607 out of 627 prisoners agreed to participate in the survey, an overall response rate of 97%; 596 (98.2%) respondents contributed an analysable oral fluid sample. The response rate for each prison is shown in 3.2. Just over 5% (31) of the respondents said they had participated in the census survey, and two respondents were included in both surveys (not shown separately in table).

Table 3.2 Committal survey response rate by prison

Prison	Committal population during the survey period	Released or transferred immediately	Sample available	Exclusions	Refusals	Number responded	Response rate (%)
High risk							
Mountjoy Male	343	45	298	2	7	289	98
Mountjoy Female	47	9	38			38	100
St Patrick's	176	21	155	1	3	151	98
Medium risk							
Cork	95	6	89	1	4	84	96
Limerick M&F	57	4	53	2	6	45	88
Total	718	85	633	6*	20	607†	97

*6 individuals were excluded from the survey, as informed consent could not be obtained (language or psychological difficulties).

† 10 respondents did not provide an oral fluid sample and one sample was inadequate for analysis. Two individuals did not complete the questionnaire but provided samples.

3.1.2 Age and Gender

Census Survey

The age profile of the respondents in the census survey was similar to that of the overall population of the nine participating prisons at the time of the survey ($\chi^2 = 1.7$, df 7, $p = 0.98$).The median (range) age of the respondents was 25 (16-67) years.

Only 57 (4.8%) of the 1,193 respondents were women (Table 3.3). The age distribution was similar in men and women. ($\chi^2 = 4.4$, df 4, $p = 0.36$)

Committal Survey

The age profile of the respondents was similar to that of the overall committal population of the five participating prisons at the time of the survey ($\chi^2 = 0.9$, df 5, $p = 0.97$).The median (range) age of the respondents was 23 (15-73) years.

Just under 6.9% (41/596) were women (Table 3.3). The age distribution was similar in men and women ($\chi^2 = 1.8$, df 4, $p = 0.78$).

Census and Committal Survey Comparison

As anticipated, the prison population was very young. Respondents in the committal survey were even younger than those in the census survey (Table 3.3). For example, 12.5% (74/593) of the committal population were less than 18 years old compared to 3.5% (40/1137) of the census population.

A higher proportion (not quite statistically significant) of the respondents in the committal survey were women: 6.9% (41/596) compared with 4.8% (57/1193) in the census survey (Table 3.3).

Table 3.3 Comparison of selected demographic and sentencing characteristics

	Census		Committal		Test of association
	No.	%	No.	%	
Age in years					
15-17	40	3.5	74	12.5	$\chi 2$ 66.3 df 8 p< 0.0001
18-19	137	12.1	90	15.2	
20-24	367	32.3	169	28.5	
25-29	253	22.3	94	15.9	
30-34	146	12.8	62	10.5	
35-44	134	11.8	65	11.0	
45-54	45	4.0	34	5.7	
55-64	14	1.2	4	0.7	
65 or more	1	0.1	1	0.2	
n	1137		593		
Gender					
Male	1136	95.2	555	93.1	$\chi 2$ 3.4 df 1, p= 0.07
Female	57	4.8	41	6.9	
n	1193		596		
Time spent in prison in the last 10 years					
≤ 3 months	136	11.6	261*	50.3	$\chi 2$ 320.0 df 3 p< 0.0001
4 – 11 months	197	16.8	64	12.3	
12 – 36 months	299	25.6	107	20.6	
> 36 months	538	46.0	87	16.8	
n	1170		519		

* 197 of whom were first time entrants

3.1.3 Respondents' Prison History

Census Survey

In the census survey, of the 1185 respondents there were 156 (13.2%) remand prisoners and 59 (5.0%) prisoners with a sentence of three months or less. Almost two fifths (452/1185, 38.1%) of the respondents said they were currently serving a sentence of more than three years, and almost half (46.0%, 538/1170) reported having been in prison for more than three years during the last 10 years (Table 3.3).

Young offenders (under 21 years old) are usually separated from the older prisoners. In this survey less than one third of the young offenders (77/244, 36.1%) were detained in St. Patrick's Institution, Dublin, which is the only young offenders' institution in Ireland.

Committal Survey

Only 47.0% (276/587) of the respondents had been sentenced prior to committal while the remainder were in on remand (310/587, 52.8%), or for extradition (1/587, 0.2%). One third of the respondents (197/591, 33.3%) said they had never been in prison before. Over one fifth (127/591, 21.5%) of the respondents had been committed to prison more than 5 times. Just under 17% reported having been in prison for more than three of the last 10 years (Table 3.3).

In this survey almost three quarters of the young offenders (145/201) were committed to the young offenders' institution.

Census and Committal Survey Comparison

The current sentence profile of the committal survey population differed from that of the census survey population in that a higher proportion was on remand (310/587, 52.8% *versus* 156/1185, 13.2%; $\chi^2 = 339.5$, df 1, $p < 0.0001$). The proportion of committal prisoners who reported having been in prison for more than three of the last 10 years (87/519, 16.8%) was significantly lower than in the census survey (538/1170, 46.0%) ($\chi^2 = 320.0$, df 3, $p < 0.0001$) (Table 3.3).

A significantly higher proportion of young offenders (prisoners less than 21 years old) were committed were committed to St. Patrick's Institution (institution designated for young offenders) (72.1%) compared to the proportion of young offenders detained in this institution at the time of the census survey (31.6%) ($\chi^2 = 72.6$, df 1, $p < 0.0001$).

3.2 PREVALENCE OF HEPATITIS B, HEPATITIS C AND HIV

Prevalence was determined using antibody assays of oral fluid. These rates were compared with self-reported infection status. Although most of those with infections reported injecting drug use or sexual risk behaviours, some respondents had evidence of infection without apparent risk factors.

3.2.1 Prevalence of Anti-HBc, Anti-HCV and Anti-HIV from Oral Fluid

Census Survey

Table 3.4 presents the estimated prevalence of anti-HBc, anti-HCV and anti-HIV in the Irish prison population. The presence of anti-HCV was by far the most common; 442 of 1,193 respondents tested positive (37.0%); anti-HBc was less common (104/1,193, 8.7%). Anti-HIV was relatively uncommon: only 24 respondents tested positive (2.0%).

As expected, the prevalence of anti-HBc and anti-HCV was higher in the high risk prisons (Appendix 7). For example, 50.9% (363/713) of respondents were positive for anti-HCV in the high risk prisons compared to 16.5% (79/480) in the medium risk prisons. The five Dublin prisons, Mountjoy Male and Female, St. Patrick's Institution, the Training Unit and Wheatfield Prison, had been defined for sampling purposes as high risk prisons as they were known to have illicit drug problems (see Methods). The proportion of respondents in these five prisons who reported ever injecting drugs was 58.0% (410/707), higher than the 21.0% (99/471) in the medium risk i.e. non-Dublin prisons. This is consistent with the prediction on which the sampling strategy was based.

The prevalence of anti-HBc and anti-HIV was higher in prisoners aged 30 or over than in those under 30 years of age (anti-HBc 13.8% *versus* 6.5%, $\chi^2 = 16.0$, df 1, $p < 0.0001$; anti-HIV 4.4% *versus* 1.0%; $\chi^2 = 14.0$, df 1, $p = 0.0002$). However the prevalence of anti-HCV was higher in those under 30 than in those aged 30 or over (anti-HCV 41.0% *versus* 26.8%; $\chi^2 = 20.9$, df 1, $p < 0.0001$) (Table 3.4). The highest prevalence for anti-HCV was found in those aged 20 to 24 years (175/367, 47.7%).

The prevalence rates of anti-HBc and anti-HCV were higher in women prisoners than in men although the differences were not significant (anti-HBc 12.3% *versus* 8.5% p=0.33 and anti-HCV 42.1% *versus* 36.8% p=0.42) (Table 3.4). A higher proportion

of women (34/57, 59.7%) reported ever injecting compared to the proportion of men (475/1121, 42.4%), $\chi^2 = 6.6$, df 1, p =0.01.

Over two fifths of respondents (43.2%, 509/1178) reported ever injecting drugs. The prevalence of antibodies for each of the three infections was higher in those who reported ever injecting drugs than in non injectors (anti-HBc 18.5% *versus* 1.5%, $\chi^2 =$ 103.5, df 1, p < 0.0001; anti-HCV 81.3% *versus* 3.7%, $\chi^2 = 744.6$, df 1, p < 0.0001; and anti-HIV 3.5% *versus* 0.9%, Fisher's exact test p =0.003) (Table 3.4).

The prevalence of anti-HBc and anti-HCV increased significantly with increasing time spent in prison in the ten years prior to the survey (anti-HBc χ^2 trend= 7.5, p = 0.006: anti-HCV χ^2 trend= 99.3, p = 0.0001) (Table 3.4). For example, the prevalence of anti-HCV rose steadily from 14.7% (20/136) in those who had spent less than 3 months in prison to 51.5% (277/538) in those who had spent more than three years.

Figure 3.1 shows the inter-relationship between the three infections; 38.5% (459/1193) of prisoners tested positive for antibodies to one or more virus. Most of those who tested positive for anti-HBc or anti-HIV also had antibodies to one or more of the other two viruses (94/104, 90.4% and 20/24, 83.3% respectively) whereas only 22.9% (101/441) of those testing positive for anti-HCV had an additional infection.

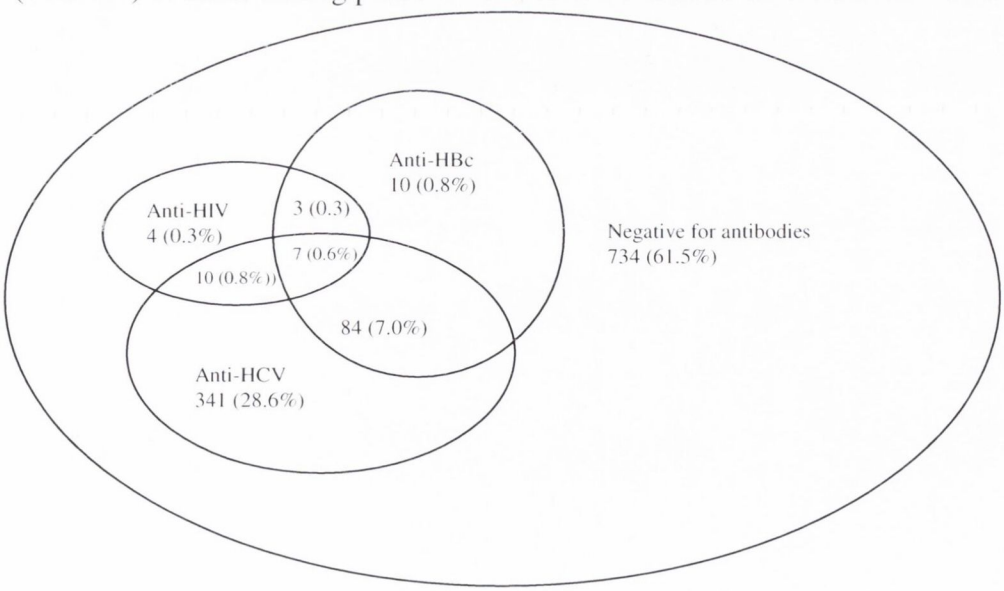


Figure 3.1 Number (%) of prisoners who tested positive for anti-HBc, anti-HCV and anti-HIV in the census survey

Table 3.4 Comparison of prevalence rates of anti-HBc, anti-HCV and anti-HIV in the census and committal surveys by selected characteristics and risk factors

	Respondents		Antibodies to hepatitis B core antigen					Antibodies to hepatitis C virus					Antibodies to HIV				
			Census*		Committal*			Census*		Committal*			Census*		Committal*		
	Census	Committal	No.	%	No.	%	p-value †	No.	%	No.	%	p-value †	No.	%	No.	%	p-value
Total Sample‡	1193	596	104	8.7	37	6.2	0.06	442	37	130	21.8	<0.0001	24	2.0	12	2.0	1.0
Gender																	
Men	1136	555	97	8.5	28	5.1	0.01	418	36.8	107	19.3	<0.0001	23	2	8	1.4	0.6
Women	57	41	7	12.3	9	22.0	0.2	24	42.1	23	56.1	0.2	1	1.7	4	9.8	0.2
Age																	
15-19 years old	177	164	9	5.1	11	6.7	0.5	47	26.6	22	13.4	0.003	1	0.7	2	1.2	0.6
20-24 years old	367	169	26	7.1	8	4.7	0.3	175	47.7	58	34.3	0.004	1	0.3	2	1.2	0.2
25-29 years old	253	94	17	6.7	5	5.3	0.6	105	41.5	29	30.9	0.07	6	2.4	2	2.1	0.9
30 years old or more	340	166	47	13.8	12	7.2	0.03	91	26.8	19	11.5	<0.0001	15	4.4	6	3.6	0.7
Time spent in prison in the previous ten years																	
<3 months	136	261	7	5.2	7	2.7	0.2	20	14.7	13	5.0	0.0009	0	0.0	1	0.4	1.0
3-12 months	197	64	13	6.6	7	10.9	0.3	39	19.8	16	25.0	0.4	0	0.0	2	3.1	0.4
12-36 months	299	107	23	7.7	10	9.4	0.6	102	34.1	38	35.5	0.8	3	1.0	2	1.9	0.6
> 36 months	538	87	61	11.3	10	11.5	1.0	277	51.5	53	60.9	0.1	21	3.9	7	8.1	0.08
Ever Injected drugs																	
Yes	509	173	94	18.5	31	17.9	0.9	414	81.3	124	71.7	0.007	18	3.5	10	5.8	0.02
No	669	420	10	1.5	5	1.2	0.7	25	3.7	6	1.4	0.03	6	0.9	2	0.5	0.4

*95% binomial confidence intervals are presented in Appendix 7

†p-values refer to $\chi 2$ tests of association and Fisher's Exact Tests

‡Analyses refer to the 1193 participants in the census survey and 596 participants in the committal survey who provided analysable oral fluid. Denominators vary because not all respondents answered all questions.

Table 3.4 continued over leaf

Table 3.4 Comparison of prevalence rates of anti-HBc, anti-HCV and anti-HIV in the census and committal surveys by selected characteristics and risk factors (cont.)

	Respondents		Antibodies to hepatitis B core antigen					Antibodies to hepatitis C virus					Antibodies to HIV				
			Census*		Committal*			Census*		Committal*			Census*		Committal*		
	Census	Committa	No.	%	No.	%	p-value †	No.	%	No.	%	p-value †	No.	%	No.	%	p-value
Injectors ‡																	
Men	475	147	88	18.5	23	15.7	0.4	390	82.1	101	68.7	0.0005	17	3.6	6	4.1	0.8
Women	34	26	6	17.7	8	30.8	0.2	24	70.6	23	88.5	0.2	1	2.9	4	15.4	0.2
Non injectors ‡																	
Men	646	405	9	1.4	4	1.0	0.8	25	3.9	6	1.5	0.03	6	0.9	2	0.5	0.7
Women	23	15	1	4.4	1	6.8	1.0	0	0.0	0	0.0	-	0	0.0	0	0.0	-
Injectors ‡																	
15-19 years old	69	32	9	13.0	11	34.4	0.01	47	65.6	21	68.1	0.8	1	1.5	2	6.3	0.2
20-24 years old	191	73	25	13.1	6	8.2	0.3	168	88.0	55	75.3	0.01	1	0.5	1	1.4	0.5
25-29 years old	122	38	17	13.9	4	10.5	0.6	97	79.5	28	73.7	0.5	4	3.3	2	5.3	0.6
30 years old or more	102	28	38	37.3	9	32.1	0.6	81	79.4	18	64.3	0.1	11	10.8	5	17.9	0.3
Non injectors ‡																	
15-19 years old	106	132	0	0.0	0	0.0	-	0	0.0	1	0.8	0.3	0	0.0	0	0.0	-
20-24 years old	169	96	1	0.6	2	2.1	0.3	7	4.1	3	3.1	0.7	0	0.0	1	1.0	0.4
25-29 years old	129	55	0	0.0	1	1.8	0.3	6	4.7	1	1.8	0.7	2	1.6	0	0.0	1.0
30 years old or more	237	136	9	3.8	2	1.5	1.0	10	4.2	1	0.7	0.06	4	1.7	1	0.7	0.7

*95% binomial confidence intervals are presented in Appendix 7

†p-values refer to $\chi 2$ tests of association and Fisher's Exact Tests

‡Analyses refer to the injector (509) and non injector (669) participants in the census survey and the injector (173) and non injector (420) participants in the committal survey who provided analysable oral fluid. Denominators vary because not all respondents answered all questions.

*Analyses refer to the 1193 participants in the census survey and 596 participants in the committal survey who provided analysable oral fluid. Denominators vary because not all respondents answered all questions.

†p-values refer to $\chi 2$ tests of association and Fisher's Exact Tests

Committal Survey

Table 3.4 presents the estimated prevalence of anti-HBc, anti-HCV and anti-HIV in the committal prison population. The prevalence of anti-HCV was higher than the other antibodies; 21.8% of respondents (130/596) tested positive. Anti-HBc was less common (6.2%, 37/596 tested positive). Anti-HIV was relatively uncommon: only 12 respondents (2.0%) tested positive.

The prevalence of anti-HCV was higher in the high risk prisons, 27.3% (129/473) of respondents tested positive for anti-HCV in the high risk prisons compared to 0.8% (1/123) in the medium risk prisons (Appendix 7). The proportion of respondents in three Dublin prisons (Mountjoy Male and Female, and St. Patrick's Institution) who reported ever injecting drugs was 36.4% (172/473), higher than the 0.8% (1/120) in the medium risk (Cork and Limerick). This is consistent with the prediction on which the sampling strategy was based.

Anti-HBc rates were highest in those over 30 years old and in injectors between 15 and 19 years old. Anti-HCV was more common in those under 30 years (25.5%) than in those aged 30 or over (11.5%), χ^2 = 14.0, df 1, p<0.0001 (Table 3.4). The highest prevalence of anti-HCV was found in those aged 20 to 24 years (58/169, 34.3%).

Positive antibody rates for the three infections were significantly higher amongst the women (Table 3.4): the anti-HBc rate was four times higher in women than men (22.0% *versus* 5.1%; χ^2 = 18.7, df 1, p <0.0001), the anti-HCV rate was almost three times higher in women than men (56.0% *versus* 19.3; χ^2 = 30.4, df 1, p <0.0001), and anti-HIV was seven times higher in women than men (9.8% *versus* 1.4%; Fisher's exact test p =0.006). These differences are likely to be partially attributable to the fact that the proportion of female committals reporting injecting drug use was considerably higher, at 63.4% (26/41), than the corresponding figure for men (26.6%, 147/552), χ^2 = 25.0, df 1, p <0.0001.

Twenty nine percent (173/593) of respondents reported ever injecting drugs. The prevalence of antibodies for each of the three infections was significantly higher in those who reported ever injecting drugs than in non injectors, (anti-HBc 17.9% *versus* 2%, χ^2 = 60.1, df 1, p <0.0001; anti-HCV 71.7% *versus* 1.4%, χ^2 = 353.3, df 1, p <0.001; and anti-HIV 5.8% *versus* 0.5%, χ^2 = 17.4, df 1, p <0.0001).

Prevalence rates for anti-HCV increased significantly with increasing time spent in prison in the ten years prior to the survey (Table 3.4). For example, the prevalence of anti HCV rose steadily from 5.0% (13/261) in those who had spent less than 3 months in prison to 60.9% (53/87) in those who had spent more than three years (χ^2 trend = 115.8, p <0.0001). One third of the respondents had never previously been in prison. Table 3.5 shows that the prevalence of the three antibodies in respondents who had never previously been in prison was significantly lower than in respondents who had previously been imprisoned (anti-HBc 2.0% *versus* 8.1%, χ^2 = 8.5, df 1, p <0.01; anti-HCV 3.1% *versus* 31.0%, χ^2 = 60.3, df 1, p <0.0001; anti-HIV 0.0% versus 2.8%, Fisher's exact test p = 0.02).

Twenty nine percent of respondents entering prison (173/593) reported ever injecting drugs. Only 7.1% (14/197) of those entering prison for the first time had ever injected drugs, whereas 39.9% (157/394) of those previously in prison reported ever injecting drugs. The prevalence of the three antibodies was higher in injectors previously in prison, (anti-HBc was 18.5%, anti-HCV was 74.5%, and anti-HIV was 6.4%) than in injectors who had never spent time in prison (anti-HBc was 7.1%, anti-HCV was 35.7%, and anti-HIV was 0.0%) (Table 3.5). The difference was statistically different for anti-HCV (χ^2 = 9.5, df 1, p <0.002), but not for the smaller numbers of anti-HBc or anti HIV positive injectors (anti-HBc Fisher's exact test p = 0.5; anti-HIV Fisher's exact test p = 1.0).

In the non drug injecting population the prevalence of each of the infections was very low (anti-HBc was 1.2%; anti-HCV was 1.4%; and anti-HIV was 0.5%) (Table 3.5). Two of the five non injectors who tested positive for anti-HBc had previously spent time in prison. Five of the six non injectors who tested positive for anti-HCV had spent time in prison. Two non-injectors tested positive for anti-HIV (one had spent time in prison and the other did not answer the question).

Table 3.5 Prevalence of anti-HBc, anti-HCV and anti-HIV in entrants to Irish prisons by injecting status and prison history

	Total	Anti-HBc No.	%	95% CI	p-value #	Anti-HCV No.	%	95% CI	p-value #	Anti- HIV No.	%	95% CI	p-value #
Total sample	596*	37†	6.2	4.4 to 8.5		130	21.8	18.6 to 25.4		12†	2.0	1.0 to 3.5	
Previously spent time in prison	394	32	8.1	5.6 to 11.3	< 0.01	122	31.0	26.4 to 35.8	<0.0001	11	2.8	1.4 to 4.9	= 0.02
Never previously spent time in prison	197	4	2.0	0.6 to 5.1		6	3.1	1.1 to 6.5		0	0.0	0.0 to 1.9	
Injecting drug users	173†‡	31	17.9	12.5 to 24.5		124	71.7	64.3 to 78.3		10	5.8	2.8 to 10.4	
Previously spent time in prison	157	29	18.5	12.7 to 25.4	= 0.3	117	74.5	67.0 to 81.1	<0.01	10	6.4	3.1 to 11.4	= 0.3
Never previously spent time in prison	14	1	7.1	0.2 to 33.9		5	35.7	12.8 to 64.9		0	0.0	0.0 to 23.2	
Non injectors	420† §	5	1.2	0.4 to 2.8		6	1.4	0.5 to 3.1		2§	0.5	0.1 to 1.7	
Previously spent time in prison	236	2	0.9	0.1 to 3.1	= 0.7	5	2.1	0.7 to 4.9	= 0.2	1	0.4	0.0 to 2.3	= 1.0
Never previously spent time in prison	183	3	1.6	0.3 to 4.7		1	0.6	0.0 to 3.0		0	0.0	0.0 to 2.0	

* Antibody prevalence estimated in 596 respondents with analyzable oral fluid samples.

† Three respondents with analyzable samples including one who tested positive for anti-HBc did not declare injector status.

‡ Two injectors did not provide information on time spent in prison

§ One non injector did not provide information on time spent in prison and also tested positive for anti-HIV

derived from χ 2 tests of association or Fisher's exact test

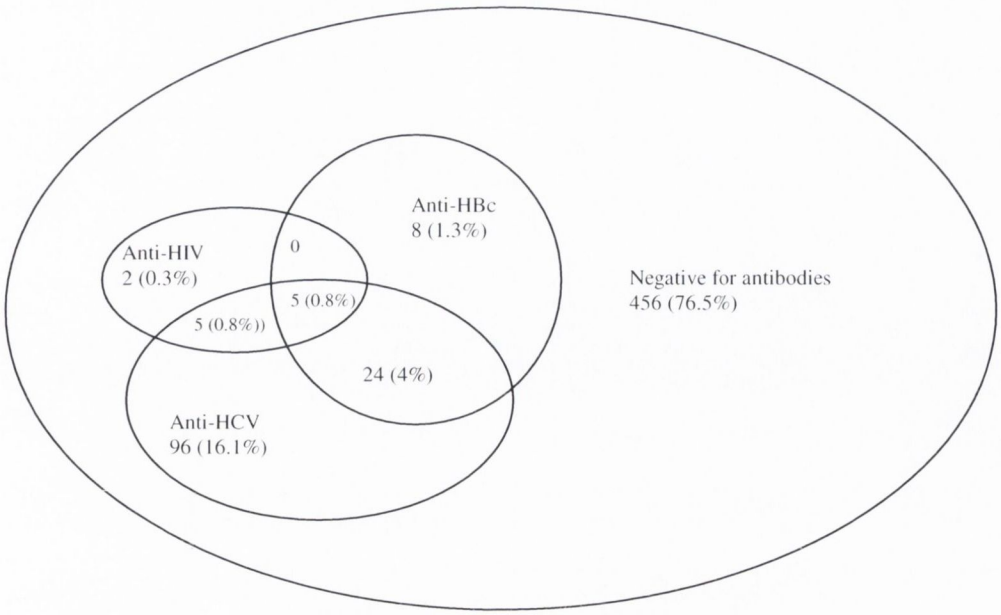


Figure 3.2 Number (%) of prisoners who tested positive for anti-HBc, anti-HCV and anti-HIV in the committal survey population

Figure 3.2 shows the inter-relationship between the three infections; 23.5% (140/596) of prisoners had evidence of infection with at least one virus. Most of those who tested positive for anti-HBc or anti-HIV also had antibodies to one or more of the other two viruses (29/37, 78.4% and 10/12, 83.3% respectively) whereas only 26.2% (34/130) of those positive for anti-HCV had an additional infection.

Census and Committal Survey Comparison

The overall prevalence of anti-HBc and anti-HCV was significantly higher in the census survey population than in prison entrants but the prevalence of anti-HIV was the same (Table 3.4). The prevalence of anti-HBc and anti-HIV in the census survey population was similar to the rates found in recidivist prison entrants (anti-HBc: 104/1193, 8.7%, *versus* 32/394, 8.1%, p = 0.7; anti-HIV: 24/1193, 2.0%, *versus* 11/394, 2.8% p= 0.4). The prevalence of anti-HCV in the census survey (442/1193, 37.0%) remained higher than the rate in recidivist prison entrants (122/394, 31.0%) p= 0.03 (see Table 3.4 and 3.5).

In both surveys the prevalence rates of anti-HBc and anti-HIV in injecting drug users were similar (Table 3.4). The prevalence of anti-HCV in injectors in the census population (81.3%) was significantly higher than in prison entrant injectors (71.7%), (Table 3.4). The prevalence rate of anti-HCV in the census survey injector population

(414/509, 81.3%) was almost the same as that found in recidivist prison entrant injectors (117/157, 74.5%,), p= 0.06.

A high proportion of injectors over 29 years old tested positive for anti-HBc (Table 3.4). In the committal survey a high proportion of injectors 15 to 19 years old tested positive for anti-HBc, possibly indicating a cohort effect. Hepatitis C antibodies were most common in those injectors 20 to 24 years old (Table 3.4). Prevalence rates of anti-HBc across all age groups in the census survey were significantly higher than in the committal survey. This is due to the higher prevalence of injecting drug users in each age group in the census survey than in the committal survey with the exception of those 20 to 24 years old (census 168/191 88.0% *versus* committal 55/73, 75.3%). It is possible that this age group had higher risk injecting practices in the census survey than in the committal survey. In both surveys the highest prevalence rates of anti-HIV were found in those over 30 years old (Table 3.4).

In the census survey, hepatitis antibody rates were higher in women than in men, but this was not statistically significant different. In the committal survey, the proportion of women testing positive for anti-HBc, anti-HCV and anti-HIV were significantly higher than in men. (Table 3.4) In female injectors, the prevalence of anti-HBc, anti-HCV and anti-HIV was not significantly higher in the census survey than in the committal survey (Table 3.4). This is possibly due to the small numbers.

In both surveys the prevalence rates for anti-HCV increased with increasing time spent in prison (census survey: $\chi 2$ trend= 99.3, p = 0.0001 and committal survey: $\chi 2$ trend = 115.8, p <0.0001).

3.2.2 Comparison of Prevalence from Oral Fluid Assay and from Self Reported Status

In both the census and committal surveys the self-reported prevalence for each infection (calculated as a proportion of the total survey population) was lower than the prevalence derived from the oral fluid assays (Table 3.6). Using self reports to estimate prevalence within the prisons would have seriously under-estimated the prevalence of each of the antibodies. The majority of respondents (Table 3.7) said they had not been tested previously. Others did not know whether they had been tested for the viruses (Table 3.7), and of those who said they had been previously tested, a considerable number said they did not know their result (Table 3.8).

Table 3.6 Comparison of proportions antibody positive for hepatitis B, hepatitis C and HIV: oral fluid test results *versus* self-reported status.

	Census survey		Committal survey	
	Oral fluid antibody test n=1193 No.(%)	Self-reported status n=1193 No.(%)	Oral fluid antibody test n=596 No.(%)	Self-reported status n=596 No.(%)
Hepatitis B positive	104 (8.7)	63 (5.3)	37 (6.2)	20 (3.5%)
Hepatitis C positive	442 (37.1)	229 (19.2)	130 (21.8)	88 (14.5)
HIV positive	24 (2.0)	19 (1.6)	12 (2.0)	10 (1.7)

Table 3.7 Self-reported testing status for hepatitis B, hepatitis C and HIV

	Census survey Self-reported test n(%)				Committal survey Self-reported test n(%)			
	Total	Yes n(%)	No n(%)	Don't know n(%)	Total	Yes n(%)	No n(%)	Don't know n(%)
Hepatitis B	1170	334(28.6)	769(65.7)	67 (5.7)	593	121(20.4)	441(74.4)	31 (5.2)
Hepatitis C	1156	344(29.9)	724(62.6)	88 (7.6)	594	130(21.9)	440(74.1)	24 (4.0)
HIV	1178	445(37.8)	699(59.3)	34 (2.9)	594	170(28.6)	417(70.2)	7 (1.2)

Table3.8 Self-reported test result status for hepatitis B, hepatitis C and HIV

	Census survey Self-reported test result n(%)				Committal survey Self-reported test result n(%)			
	Total	Positive n(%)	Negative n(%)	Don't know n(%)	Total	Positive n(%)	Negative n(%)	Don't know n(%)
Hepatitis B	321	63 (19.6)	208 (64.8)	50 (15.6)	119	20 (16.8)	84 (70.6)	15 (12.6)
Hepatitis C	338	229(67.8)	75 (22.2)	34 (10.1)	127	88 (69.3)	25 (19.7)	14 (11.0)
HIV	439	19 (4.3)	367 (83.6)	53 (12.1)	168	10 (6.0)	126 (75.0)	32 (19.1)

The respondents who reported previous tests for any of these infections differed from the wider group in that they were more likely to be drug users. For example:

- Respondents who reported injecting drug use were 10 times more likely to have had a test for hepatitis B than those who did not report injecting drug use in the committal survey (hepatitis B test 98/165, 59.4% *versus* 23/396; 5.8%, χ^2 = 197.7, df 1,, p< 0.0001) and four times more likely in the census survey (hepatitis B test 251/479, 52.4% *versus* 83/616, 13.5%; χ^2 = 192.6, df 1,, p< 0.0001);
- Those who reported injecting drug use were 16 times more likely to have had a test for hepatitis C than those who did not report injecting drug use in the committal survey (hepatitis C test 113/168, 67.3% *versus* 17/401, 4.2%; χ^2 = 266.8, df 1, p<0.0001) and eight times more likely in the census survey (hepatitis C test 299/486, 61.5% *versus* 45/575, 7.8%; χ^2 = 346.6, df 1,, p<0.0001);
- Those who reported injecting drug use were 5 times more likely to have had a test for HIV than those who did not report injecting drug use in the committal survey (HIV test 114/172, 66.3% *versus* 56/414, 13.5%; χ^2 = 164.2, df 1, p <0.0001) and almost four times more likely in the census survey (HIV test 330/500, 66.0% *versus* 114/636, 17.9%; χ^2 = 271.8, df 1, p <0.0001).

Consequently the apparent prevalence for all three infections in the previously tested group (self-reported status) was considerably higher than in the overall group and similar to the prevalence among the injecting drug users.

Table 3.9 Self-reported infection status and oral fluid antibody test results

	Oral fluid test result	Census survey Self-reported test result		Committal survey Self-reported test result	
		Positive	*Negative*	*Positive*	*Negative*
Hepatitis B	*Positive*	33	21	11	12
	Negative	30	187	9	72
Hepatitis C	*Positive*	218	28	85	6
	Negative	11	47	3	19
HIV	*Positive*	8	8	4	2
	Negative	11	359	6	124

Table 3.9 shows the number of respondents in the census and committal surveys who reported a previous negative test result but tested positive using oral fluid assay and

vice versa. The numbers in these tables relate only to respondents who knew their test results. In the census survey over a third (28/75) who claimed to have had a negative test result for hepatitis C had a positive oral fluid test result. The proportion of those testing positive but reporting negative was lower for hepatitis B (21/208, 10.1%) and for HIV (8/367, 2.2%,). Fifty eight percent (11/19) of those who reported being HIV positive tested negative on the oral fluid assay, while almost half (30/63) who self reported being hepatitis B positive tested negative. Eleven (4.8%) of those who reported that they were hepatitis C positive were negative on the oral fluid test.

The levels of discrepancy between self reported test results and laboratory test results in the committal survey were similar to the levels reported in the census survey. Table 3.9 also shows the number of respondents in the committal survey who reported a previous negative test result but tested positive to the oral fluid assay and *vice versa.* Almost one quarter (6/25) who claimed to have had a negative test result for hepatitis C had a positive oral fluid test result. The proportion of those testing positive but reporting negative was lower for hepatitis B (14.3% 12/84) and for HIV (1.6% 2/126). Sixty percent (6/10) of those who reported being HIV positive, tested negative on the oral fluid assay, while almost half who self reported being hepatitis B positive tested negative. Only three (3.4%) of those who reported that they were hepatitis C positive were negative on the oral fluid test.

3.2.3 Infections among Respondents with No Risk Factors

In both surveys there were a proportion of respondents who reported none of the main risk factors.

Census Survey

There were 536 (out of 1,193) respondents who reported having none of the main risk factors (i.e. said they had never injected drugs, never had anal sex with a man either inside or outside prison, and never been treated for a sexually transmitted infection). Among this subgroup there were seven who were anti-HBc positive, 18 anti-HCV positive and three anti-HIV positive; three of these were positive for both anti-HBc and anti-HCV. All were men. Ninety-two (out of 536) had reported smoking heroin in the last year, two of these tested positive for anti-HBc and nine tested positive for anti-HCV. Smoking heroin may be a proxy for occasional injecting. When heroin smoking was excluded, there remained five who were anti-HBc positive, nine anti-HCV positive and three anti-HIV positive; of these 2 tested positive for both anti-HBc

and anti-HCV. All were unaware of being positive except one who had reported a previous positive hepatitis C result.

Committal Survey

Of the 596 respondents, 370 reported having none of the main risk factors (i.e. said they had never injected drugs, never had anal sex with a man either inside or outside prison, and never been treated for a sexually transmitted infection). Among this subgroup, three respondents tested anti-HBc positive, five anti-HCV positive and two anti-HIV positive. All were men. Thirty-two of these 370 reported smoking heroin in the last year; two of these tested positive for anti-HCV. When respondents who smoked heroin, had tattoos, or had been paid for sex were excluded, there still remained one respondent who tested positive for anti-HBc, one who tested positive for anti-HCV and two who tested positive for anti-HIV that had no reported risk factors. None of these four respondents had tested positive for more than one antibody and none of them reported having been aware that they had one of the infections.

Census and Committal Survey Comparison

There was good agreement between reported risk behaviours and testing positive for one or more of the antibodies. Overall, very few respondents had unexplained antibodies. The proportion of unexplained positive antibody tests was slightly lower in the committal survey population (4/596, 0.7%) than in the census survey population (15/1193, 1.3%).

3.3 DRUG USE

This section reports the prevalence of heroin use among the prison population, the associated drug behaviours and access to methadone programmes outside prison.

3.3.1 Reported Drug Use

Census Survey

Table 3.10 shows that 540 (45.9%) respondents said they had smoked heroin in the last year and 509 (43.2%) stated they had (ever) injected drugs. Overall, 545 (49.6%) of 1099 respondents said they had used heroin. Most, but not all, of those who said they had smoked heroin in the last year had also injected drugs (417/536, 77.8%) and *vice versa*.

Women prisoners were more likely to smoke heroin (χ^2 = 4.6, df 1, p = 0.03) and/or inject drugs (χ^2 = 6.6, df 1, p = 0.01) than men. Almost 60% (34/57) of women respondents reported smoking heroin in the last year compared to 45.2% (516/1120) of male respondents. Almost 60% (34/57) of women respondents reported ever injecting drugs compared to 42.4% (475/1121) of men.

More than half the injectors (263/490) said they had commenced injecting before their 18th birthday (Table 3.10). Most respondents had been injecting for a considerable time period; 81.8% (383/468) had first injected more than three years ago. Respondents who reported starting injecting three years or more ago were significantly more likely to test positive for anti-HBc and anti-HCV than respondents who started injecting less than three years ago (anti-HBc 82/383, 21.4% *versus* 6/85, 7.1%, χ^2 = 9.4, df 1, p = 0.002; anti-HCV 327/383, 85.4% *versus* 55/85, 64.7%, χ^2 = 19.8, df 1, p <0.0001).

Almost three quarters (342/462 74.0%) of injectors said they had injected drugs in the week prior to committal (55.8% in the previous 24 hours) (Table 3.10). This suggests that most were current injecting drug users.

Table 3.10 Reported drug use in the committal and census survey

	Census		Committal		Test of association
	No.	%	No.	%	
Smoked heroin in the last 12 months					
Yes	540	45.9	184	31.0	$\chi 2$ 36.0 df 1, p< 0.0001
No	637	54.1	409	69.0	
n	1177		593		
Ever injected drugs					
Yes	509	43.2	173	29.2	$\chi 2$ 32.8 df 1, p< 0.0001
No	669	56.8	420	70.8	
n	1178		593		
Age in years when first injected					
10-13	25	5.1	7	4.1	$\chi 2$ 2.1 df 6, p= 0.9
14-15	95	19.4	32	18.5	
16-17	143	29.2	45	26.0	
18-19	92	18.8	33	19.1	
20-24	90	18.4	39	22.5	
25-29	31	6.3	11	6.4	
30 or over	14	2.9	6	3.5	
n	490		173		
No of years since first injected					
< 3	85	18.2	54	31.6	$\chi 2$ 14.3 df 4, p= 0.006
3-5	151	32.3	48	28.1	
6-8	110	23.5	32	18.7	
9-14	71	15.2	25	14.6	
15 or over	51	10.9	12	7.0	
n	468		171		
Last time injecting before coming into prison					
On the day before	258	55.8	72	41.9	$\chi 2$ 9.9 df 4, p= 0.04
In the week before	84	18.2	40	23.3	
In the month before	34	7.4	15	8.7	
In the year before	43	9.3	25	14.5	
More than one year before	43	9.3	20	11.6	
n	462		172		

Committal Survey

Table 3.10 shows that 184 respondents said they had smoked heroin in the last year and 173 stated they had (ever) injected drugs. Overall, 212 (35.8%) of the 592 respondents said they had used heroin. Most, but not all, of those who said they had smoked heroin in the last year had also injected drugs (144/184, 78.3%) and *vice versa*. Almost 40% (157/394) of respondents who had spent time in prison previously reported ever injecting compared to 7.1% (14/197) of first time prisoners.

Women prisoners were more likely to smoke heroin (χ^2 = 28.6, df 1, p < 0.0001) and/or inject drugs (χ^2 = 25.0, df 1, p < 0.0001) than men. Sixty eight percent of women respondents (28/41) reported smoking heroin in the last year compared to 28.3% of male respondents (156/552). Almost two thirds (26/41) of the women

respondents reported ever injecting drugs compared to one quarter (147/552) of men respondents.

Almost half the injectors (48.6%, 84) said they had commenced injecting before their 18th birthday (Table 3.10). Just over 68% (117/171) of these had first injected more than three years ago. Respondents who reported starting injecting three years or more ago were significantly more likely to test positive for anti-HCV than respondents who started injecting less than three years ago (anti-HCV 30/54, 78.6% *versus* 92/117, 55.6%; $\chi^2 = 9.6$, df 1, $p < 0.001$).

Sixty five percent (112/172) of injectors said they had injected drugs in the week prior to committal (41.9% in the previous 24 hours) (Table 3.10). This suggests that a high proportion of committal prisoners were current injecting drug users.

Census and Committal Survey Comparison

The proportion reporting drug use was significantly lower in the committal survey than in the census survey (smoked heroin: 31.0% *versus* 45.9%, $\chi^2 = 36.0$, df 1, $p < 0.0001$; ever injected drugs: 29.2% *versus* 43.2%, $\chi^2 = 32.8$, df 1, $p < 0.0001$) (Table 3.10). However, when first time prisoners were excluded from the committal survey, the proportion of injecting drug users in both surveys were similar (census 509/1173, 43.2% *versus* committal 157/394, 39.9%, $\chi^2 = 1.3$, df 1, $p = 0.3$).

In both surveys, over three quarters of those who used heroin reported both injecting (ever) and smoking (heroin in the last year).

In both surveys, a higher proportion of women respondents reported using heroin, although the gender differential was larger in the committal survey (difference between proportion of women and men injecting drug users, committal 36.8% *versus* census 17.6%).

Respondents in both surveys reported starting injecting at similar ages, ($\chi^2 = 2.1$, df 6, $p = 0.9$) (Table 3.10), although a lower proportion of the injecting drug users in the census survey reported commencing injecting less than three years ago compared to the committal survey (census 18.2% *versus* committal 31.6%, $\chi^2 = 14.3$, df 4, $p = 0.006$) (Table 3.10).

The proportions of respondents who injected on the day before committal to prison were higher in the census survey than in the committal survey, (χ^2 = 9.9, df 4, p = 0.04) (Table 3.10).

3.3.2 Reported Drug Using Behaviours

Census Survey

Table 3.11 shows 104 prisoners (8.7% of the 1,193 respondents), or one fifth of injectors (104/501), said they first started injecting drugs while in prison.

Drug use within prison was common. For example, 44.9% (148) of the 330 respondents with a history of injecting drug use who had been in prison for more than three months, stated that they had injected drugs in the previous month; 101 (30.6%) reported injecting 1 to 19 times in the previous month while 47 (14.2%) said that they had injected 20 or more times (Table 3.11).

The prevalence of anti-HCV increased marginally with an increased frequency of injecting in the previous month. The prevalence of anti-HCV was 80.1% (177/221) in injectors who did not inject in the month prior to the survey, 85.6% (119/139) in those who injected 1 to 19 times, and 90.5% (67/74) in those who injected 20 or more times (χ^2 trend = 5.0, p = 0.03).

The proportion of respondents who shared filters and spoons in prison and in the month before committal was similar (Table 3.11). However, a higher number of injectors said they shared needles and syringes inside prison than outside prison:

- 70.5% said they shared needles while in prison whereas 45.7% said they shared needles in the month before committal (Table 3.11)
- 72.2% (332/460) said they shared syringes in prison while 51.2% reported sharing syringes in the month before committal (Table 3.11)

Almost 86% (190/221) of injectors who said they had shared needles in the month before coming into prison tested positive for anti-HCV compared to a slightly lower proportion (80.2%, 211/263) of those who had not shared outside in the month before committal, (χ^2 = 2.8, df 1, p = 0.09). A similar non-significant difference was observed for syringes and other items (spoons and filters) in the month prior to imprisonment.

A higher proportion of respondents who reported sharing needles in prison tested positive for anti-HCV than those who had never shared needles in prison. Over 90% (314/347) of those who said they had ever shared needles in prison tested positive for anti-HCV compared to 62.1% (90/145) of those who had not shared needles in prison, (χ^2 = 56.2, df 1, p <0.0001). A similar excess risk was observed for sharing syringes and other items (spoons and filters) in prison (syringes 297/332, 89.5% *versus* 80/128, 62.5%, χ^2 = 45.4, df 1, p <0.0001; spoons and filters 269/301, 89.4% *versus* 98/146, 67.1%, χ^2 = 33.1, df 1, p <0.0001).

Table 3.11 Reported injecting practices

	Census		Committal		Test of association
	No.	%	No.	%	
Started injecting in prison					
Yes	104	20.8	29	18.5	$\chi2$ 0.4 df 1, p= 0.5
No	397	79.2	128	81.5	
n	501		157		
Times injected in the last month					
0	182	55.2	47	28.1	$\chi2$ trend 65.3 p< 0.0001
1-19	101	30.6	35	21.0	
20 or more	47	14.2	85	50.9	
n	330*		167		
Share needles in the month before committal					
Yes	221	45.7	52	30.6	$\chi2$ 11.8 df 1, p= 0.0006
No	263	54.3	118	69.4	
n	484		170		
Share needles in prison					
Yes	347	70.5	63	40.1	$\chi2$ 47.3 df 1, p< 0.0001
No	145	29.5	94	59.9	
n	492		157		
Share syringes in the month before committal					
Yes	229	51.2	56	32.9	$\chi2$ 16.6 df 1, p< 0.0001
No	218	48.8	114	67.1	
n	447		170		
Share syringes in prison					
Yes	332	72.2	68	43.3	$\chi2$ 42.8 df 1, p< 0.0001
No	128	27.8	89	56.7	
n	460		157		
Share filters or spoons in the month before committal					
Yes	260	58.4	82	48.8	$\chi2$ 4.6 df 1, p = 0.03
No	185	41.6	86	51.2	
n	445		168		
Share filters or spoons in prison					
Yes	301	67.3	66	42.0	$\chi2$ 31.2 df 1, p< 0.0001
No	146	32.7	91	58.0	
n	447		157		
Attending a methadone programme prior to committal					
Yes	185	37.2	60	34.9	$\chi2$ 0.3 df 1, p= 0.6
No	312	62.8	112	65.1	
n	497		172		

* Only respondents who have spent 3 or more months in prison on this sentence.

Committal Survey

Table 3.11 shows 29 prisoners (7.3% of the 399 respondents), or one fifth of injectors (29/156), said they first started injecting drugs while in prison.

Of the 167 respondents with a history of injecting drug use, 35 (21.0%) reported injecting 1 to 19 times in the previous month while 85 (50.9%) said that they had injected 20 or more times (Table 3.11).

The prevalence of hepatitis C increased significantly with an increased frequency of injecting in the previous month. The prevalence of anti-HCV was 51.1% (24/47) in injectors who did not inject in the month prior to the survey, it was 68.6% (24/35) in those who injected 1 to 19 times and 84.7% (72/85) in those who injected 20 or more times (χ^2 trend = 17.5 $p < 0.0001$).

The proportion of respondents who shared filters and spoons inside prison was lower than the proportion who shared filters and spoons in the month prior to committal (Table 3.11). However, a higher number of injectors said they shared needles and syringes in prison than outside:

- 63 (40.1%) of the 157 reported they shared needles while in prison whereas 30.6% (52/170) said they shared in the month before committal (Table 3.11)
- 68 (43.4%) of the 157 reported they shared syringes in prison while 32.9% (56/170) reported sharing outside (Table 3.11)

Those who shared needles in the month before imprisonment were significantly more likely to test positive for anti-HCV than those who did not share. Almost 86.5% (45/52) of injectors who said they had shared needles in the month before coming into prison were infected with anti-HCV compared to 64.4% (76/118) of those who had not shared outside in the month before committal, (χ^2 = 8.6 df 1, p = 0.003). A similar significant difference was observed for sharing syringes and other items (spoons and filters) in the month before committal (syringes 48/56, 85.7% *versus* 73/114, 64.0%, χ^2 = 9.3, df 1, p =0.003; spoons and filters 67/82, 81.7% *versus* 53/86 61.6%; χ^2 = 8.3, df 1, p =0.004).

Those who shared needles in prison were also significantly more likely to test positive for anti-HCV than those who did not share needles in prison. Ninety two percent

(58/63) of those who said they had ever shared needles inside prison were infected with anti-HCV compared to 62.8% (59/94) of those who had not shared needles in prison, (χ^2 = 17.1 df 1, p < 0.0001). Similar excess risks were observed for sharing syringes and other items (spoons and filters) in prison (syringes 62/68, 91.2% *versus* 55/89, 61.8%, χ^2 = 17.5, df 1, p <0.0001; spoons and filters 60/66, 90.9% *versus* 57/91, 62.6%, χ^2 = 16.1, df 1, p <0.0001).

Census and Committal Survey Comparison

Similar proportions of injecting drug users in both surveys reported starting injecting in prison: 18.6% (29/156) in the committal survey and 20.8% (104/501) in the census survey. (χ^2 1.2, df 1, p = 0.3) (Table 3.11)

The reported number of times injecting in the month prior to this prison entry in the committal survey were significantly different from those reported by respondents who had spent more than three months in prison in the census survey (Table 3.11). A higher proportion of the census population reported not injecting in the month prior to the survey (χ2 77.4 df 2, p< 0.0001) (Table 3.11). In both surveys the prevalence of anti-HCV increased with increased injecting frequency in the month prior to the survey.

Compared to the committal population, respondents in the census survey reported higher rates of sharing needles and syringes both in the month prior to imprisonment and in prison (Table 3.11). For example, in the census survey 70.5% (347/492) said they shared needles while in prison compared to 40.1% (63/157) of respondents in the committal survey, (χ2 11.8, df 1, p = 0.001).

In both surveys a higher proportion of respondents sharing needles in prison or outside tested positive for anti-HCV than respondents who had not shared in prison or outside.

3.3.3 Methadone Treatment prior to Committal

Just over a third of the injecting drug users in both the census (185/497, 37.2%) and committal (60/172, 34.9%) survey said they were on a methadone programme prior to committal (Table 3.11). In the committal survey a further three young respondents were on a methadone programme for heroin smokers at the time of committal.

In the census survey over half of those who said they were on methadone at committal (100/185, 54.1%) said they had injected on the day before entering the prison. A further 48 (26.0%) said they injected in the month before entering the prison. Only 37 (20%) respondents said they had not injected in the month prior to imprisonment.

Fifteen of these 37 (i.e. on methadone at committal and had not injected in the month prior to imprisonment) had recommenced injecting drugs in prison:

- 4/15 said they had injected more than 20 times in the previous month
- 14/15 reported that they had shared equipment in the prison
- 10/15 tested positive for anti-HCV.

The pattern of injecting prior to imprisonment and while attending a methadone programme reported in the committal survey was similar to that reported in the census survey. A high proportion of respondents in the committal survey who said they were on methadone at committal (24/60, 40.0%) said they had injected on the day before entering the prison. A further 24 (40.0%) said they injected in the month before entering this committal. Only 12 (20.0%) respondents said they had not injected in the month prior to committal.

Among those committals registered on a methadone programme:

- 24/58 said they had injected more than 20 times in the previous month
- 20/59 reported that they had shared equipment during previous imprisonment
- 47/60 tested positive for anti-HCV.

3.4 SEXUAL PRACTICES

3.4.1 Census Survey

Most respondents (1083/1174, 92.3%) reported heterosexual activity in the year prior to committal. Only 28 men reported that they had ever had anal sex with a man (2.5% of the 1,108 men who responded to the question), and 20 (1.9% of the 1,079 who answered the question) reported having had anal sex with a man while in prison. These two groups were not necessarily the same men. For example, six men reported anal sex in prison having previously denied ever having sex with another man.

Two thirds (675/1021) of the survey respondents reported never using condoms during heterosexual intercourse. Condom use (always or sometimes) by those reporting homosexual intercourse was infrequent (4/21). However, these questions did not differentiate between monogamous relationships and casual partners.

One eighth of respondents (147/1158, 12.7%) said they had been treated for sexually transmitted infections. The proportion of injectors (87/499, 17.4%) reporting treatment for sexually transmitted infections was higher than the proportion of non injectors (60/650 9.2%), (χ^2 = 17.0, df 1, p <0.0001). The pattern was the same for both men and women (male injector 78/466, 16.7% *versus* male non injector 60/627, 9.6 %, χ^2 = 12.5, df 1, p =0.0006; female injector 9/33, 27.3% *versus* female non injector 0/23, 0.0%, χ^2 = 7.5, df 1, p =0.007).

The prevalence of anti-HBc, anti-HCV and anti-HIV was examined in those who reported risky sexual practices *versus* those who reported safe practices. The significant findings were:

- The prevalence rates of anti-HBc and anti-HIV were significantly higher in men who reported anal sex with other men than in those men who did not report anal sex with men (anti-HBc 7/28, 25.0% *versus* 88/1080, 8.2 %, χ^2 = 9.9, df 1, p =0.002; anti-HIV 5/28, 17.9% *versus* 18/1080, 1.7% χ^2 = 35.2, df 1, p <0.0001).
- The prevalence rates of all three viral infections were higher in those reporting a history of treatment for sexually transmitted infections than in those who reported never having treatment for a sexually transmitted infection. (anti-HBc

26/147, 17.7% *versus* 75/1011, 7.4%, χ^2 = 17.0, df 1, p <0.0001; anti-HCV 73/147, 49.7% *versus* 359/1011, 35.5%, χ^2 = 11.0, df 1, p <0.0001; and anti-HIV 9/147, 6.1% *versus* 15/1011, 1.5%, χ^2 = 13.6, df 1, p <0.0002)

- The prevalence rate of anti-HIV was higher in respondents who used condoms during heterosexual intercourse than in those who reported never using condoms (anti-HIV 12/346, 3.5% *versus* 7/675, 1.0%; χ^2 = 7.4, df 1, p =0.007).

3.4.2 Committal Survey

Most respondents (531/585, 90.8%) reported heterosexual activity in the year prior to committal. Only nine men reported that they had ever had anal sex with a man (1.6% of the 552 men who responded to the question), and two (0.6% of the 349 who answered the question) reported having had anal sex with a man while in prison. One of these men reported anal sex in prison having previously denied ever having sex with another man.

Approximately half of the survey respondents reported never using condoms during heterosexual intercourse (276/524) or homosexual intercourse (4/8). Over one third (193/528, 36.6%) reported having three or more heterosexual partners in the previous 12 months; this group was significantly more likely to use condoms (127/191, 66.5%) than those who reported having one or two partners (119/330, 36.1%), (χ^2 = 45.1, df 2, p < 0.0001).

Almost 5% (26/551, 4.7%) of respondents reported paying for any type of sex. Only 2.5% (15/591) of respondents reported having been paid for any type of sex. However, for all injecting drug users this figure rose to 7.1% (12/170), to 13.2% (5/38) for women respondents and to 21.7% (5/23) for female injecting drug users.

Forty-four (7.5%) of the 590 respondents said that they had ever been treated for sexually transmitted infections. The proportion of injectors (27/170, 15.9%) reporting treatment for a sexually transmitted infections was higher than the proportion of non injectors (17/419, 4.1%), (χ^2 = 24.5, df 1, p <0.0001). The pattern was the same for men (male injector 24/147, 16.3% *versus* male non injector 15/404, 3.7%, χ^2 = 26.1, df 1, p <0.0001). Equal proportions of female injectors (3/23, 13.0%) and non

injectors (2/15, 13.3%) reported treatment for a sexually transmitted infection, χ^2 = 0.0, df 1, p = 1.0.

The prevalence of anti-HBc, anti-HCV and anti-HIV was examined in those who reported risky sexual practices *versus* those who reported safe practices. The significant findings were:

- The prevalence rates of the three viral infections was higher in respondents who reported ever having been paid for sex than in those who reported never having been paid for sex (anti-HBc 4/15, 26.7% *versus* 31/576, 5.4%, Fisher's exact test p =0.009; anti-HCV 9/15, 60.0% *versus* 118/576, 20.5%, χ^2 = 13.5, df 1, p =0.0002; and anti-HIV 2/15, 13.3% *versus* 10/576, 1.7%, Fisher's exact test p =0.03).
- The prevalence rates of hepatitis antibodies was higher in those reporting a history of treatment for sexually transmitted infections than in those who reported never having treatment for a sexually transmitted infection (anti-HBc 8/44, 18.2% *versus* 27/546, 5.0%, χ^2 = 12.8, df 1, p =0.0003; and anti-HCV 26/44, 59.1% *versus* 101/546, 18.5%, χ^2 = 39.7, df 1, p <0.0001) This pattern was not observed for HIV (anti-HIV 1/44, 2.3% *versus* 11/546, 2.0%, χ^2 = 0.0, df 1, p =0.6).

3.4.3 Census and Committal Survey Comparison

In both surveys a large proportion of men did not use condoms. Reported non-use of condoms by men was significantly higher in the census survey (66.1%, 675/1021) than in the committal survey (52.7%, 276/524), χ^2 = 26.4, df 1, p = 0.0001.

The proportion of respondents reporting treatment for a sexually transmitted infection was also significantly higher in the census population (census 12.7%, 147/1158 *versus* committal 7.5%, 44/590; χ^2 = 11.0, df 1, p = 0.001). In both surveys, reporting treatment for sexually transmitted infections was more common in injecting drug users than in non-drug users: 15.9% in the committal survey and 17.4% in the census survey. In the census survey male and female injectors were more likely to report treatment for a sexually transmitted infection than their non injector counterparts. The pattern was also observed for male injectors in the committal survey. Female

injectors and their counterpart non injectors were equally likely to report treatment for a sexually transmitted infection in the committal survey.

In both surveys, a history of treatment for sexually transmitted infections was associated with testing positive for anti-HBc and anti-HCV. In the census survey a history of treatment for sexually transmitted infections was associated with testing positive for anti-HIV but not in the committal survey, possibly due to the small numbers.

In the census survey men who reported anal sex with men (28/1108) were more likely to test positive for anti-HIV; this association was not found in the committal survey. This could be due to the small numbers of men reporting anal sex in the committal survey (9/552).

3.5 TATTOOING

In the committal survey the number of respondents with tattoos was ascertained, whether the tattoo had been done in prison or outside, and who did them.

Three hundred and fifty two respondents reported having a tattoo, almost three fifths of the 593 respondents. One hundred and thirty-one tattoos were carried out by an artist, 112 by a friend, and 105 were self-administered. Eighty-seven respondents (24.7%) were tattooed in prison.

Tattooing was significantly associated with injecting drug use, and smoking heroin (injecting drug use 137/172, 79.7% *versus* 215/420, 51.2%, $\chi 2 = 41.0$, df 1, $p< 0.0001$; smoking heroin 138/183, 75.4% *versus* 214/409, 52.3%; $\chi 2 = 28.0$, df 1, $p< 0.0001$). The proportion of prison entrants reporting tattooing increased with increasing time spent in prison in the ten years prior to the survey (χ^2 trend = 76.2, $p < 0.0001$). For example, 41.1% (81/197) of those who had never spent time in prison had a tattoo, 45.3% (29/64) of those who had spent between 1 day and 3 months had a tattoo, 74.1% (126/170) of those who had spent between 3 months and 3 years had a tattoo, while 88.5% (77/87) of the respondents who had spent more than three of the last ten years in prison had a tattoo.

Table 3.12 Tattooing as a risk factor for hepatitis C in committal prisoners

	Tattoo		
	Yes	**No**	Test of association
	No./Total (%)	**No./Total (%)**	
Anti-HCV positive	105/352(29.8)	24/241 (10.0)	Pearson $\chi 2 = 33.1$, df = 1, $p < 0.0001$
	Tattoo done in prison		
	Yes	**No**	
	No./Total (%)	**No./Total (%)**	
Anti-HCV positive	36/87(41.4)	69/263 (26.2)	Pearson $\chi 2 = 7.1$, df = 1, $p = 0.007$
	Tattoo done by:		
	Self/friend	**Artist**	
	No./Total (%)	**No./Total (%)**	
Anti-HCV positive	77/217 (35.5)	28/131 (21.4)	Pearson $\chi 2 = 7.7$, df = 1, $p = 0.005$

Testing positive for anti-HCV was more common in those with a tattoo than in those without a tattoo (Table 3.12). Among the 87 who had a tattoo done in prison, 41.4% (36) were anti-HCV positive compared to 26.2% (69/263) among those who had their tattoo done outside prison. The prevalence of anti-HCV was higher in those who had done their own tattoo or had it done by a friend (77/217, 35.5%) than in those who had it done by a tattoo artist (28/131, 21.4).

3.6 UPTAKE OF HEPATITIS B VACCINE

It is Department of Justice, Equality and Law Reform policy that all prisoners sentenced for eight months (equivalent to serving six months) or more should be offered hepatitis B vaccination (Dr Enda Dooley, personal communication 1995).

Self-reported vaccine uptake was as follows:

- Twenty nine percent (302/1045) of respondents reported completing three doses of hepatitis B vaccine in the census survey compared with 9.9% (55/554) in the committal survey. The proportion who had completed three doses of the vaccine in the committal survey increased to 13.4% (50/373) when those individuals who had never spent time in prison were excluded.
- An additional, 19.0% (199/1045) completed one or two doses of the vaccine in the census survey compared to 11.9% (66/554) in the committal survey. The proportion who had completed one or two doses of the vaccine in the committal survey increased to 16.6% (62/373) when those individuals who had never spent time in prison were excluded.
- Over half (544/1045) of the respondents in the census survey reported not receiving hepatitis B vaccine compared to over three quarters (433/554) of respondents in the committal survey. The proportion who had not received the vaccine in the committal survey decreased to 70.0% (261/373) when those individuals who had never spent time in prison were removed.

It is important to note that the vast majority of those respondents who had accessed vaccine had done so in prison: 90.8% (443/488) of respondents in the census survey and 82.4% (89/108) in the committal survey (in those individuals who had previously spent time in prison).

In both the census and the committal survey similar trends were noted in vaccine uptake rates:

- Uptake rates were low in those who were still susceptible to hepatitis B infection, that is, respondents whose antibody status was hepatitis B negative. In the census survey a slightly higher proportion of those who tested positive for anti-HBc had one or more doses of hepatitis B vaccine than anti-HBc negative respondents (59/97, 60.8% *versus* 447/948, 47.2%; $\chi^2 = 2.6$, df 1, p =0.11). In the committal survey a significantly higher proportion of those who were anti-HBc positive had one or more doses of vaccine than anti-HBc negative respondents (36.1%, 13/36 *versus* 20.3%, 105/518; $\chi^2 = 4.6$, df 1, p = 0.03).

- Uptake rates were higher in injecting drug users. For example, in the census survey a significantly higher proportion of injecting drug users (298/476, 62.6%) had one or more doses of hepatitis B vaccine than non injectors (201/561, 35.8%), $\chi^2 = 74.0$, df 1, $p < 0.0001$. A significant difference was also observed in the committal survey (79/171, 46.2% *versus* 42/382, 11.0%; $\chi^2 = 85.7$, df 1, $p < 0.0001$)

- In both surveys uptake rates were higher in those who had spent more than three of the last ten years in prison. In the census survey 64.2% (318/494) of respondents who had spent more than three of the last ten years in prison had one or more doses of hepatitis B vaccine compared to 34.1% (182/534) of those who had spent less than three of the last ten years in prison, ($\chi^2 = 93.5$, df 1, $p < 0.0001$). A similar significant pattern was noted in the committal survey. Only 4% (7/180) of those who had never spent time in prison had one or more doses of hepatitis B vaccine, while 23.2% (52/228) of those who had spent between 1 day and 3 years in prison had accessed one or more doses, and 61.2% (52/85) of the respondents who had spent more than three of the last ten years in prison had accessed one or more doses of vaccine, (χ^2 trend = 262.9, $p < 0.0001$).

3.7 INDEPENDENT RISK FACTORS FOR INFECTION

In order to clarify the links between these various risk factors and positive antibody status, the factors were combined in multivariate regression analyses (logistic regression), the main findings of which are described below. The relationships presented are those that remained statistically significant or were deemed clinically important after taking account of confounding. The associations are expressed as odds ratios (OR) adjusted for confounding. Section 3.7.1 details the independent risk factors for positive antibody status identified in the census survey and section 3.7.2 details those identified in the committal survey. In section 3.7.3 risk factors in the committal and census population are compared.

3.7.1 Census Survey

Logistic regression models for the three viral infections are presented in Table 3.13. Variables considered for inclusion in the model are listed below the table as a footnote.

Respondents who reported ever injecting drugs were 22 times more likely to test positive for anti-HBc than those who did not report injecting (adjusted OR 21.6, 95%CI 10.9-47.6). Respondents aged 35 years or older were 10 times more likely to test positive for anti-HBc than those aged 16 to 19 years (adjusted OR 9.7, 95%CI 3.8-28.6). Respondents who reported treatment for a sexually transmitted infection were almost two times more likely to test positive for anti-HBc than those who were never treated for a sexually transmitted infection (adjusted OR 1.9, 95%CI 1.1-3.3).

Respondents testing positive for anti-HCV were very likely to be injecting drug users (adjusted OR 80.8, CI 47.9-143); they tended to be in their early twenties (adjusted OR 2.8, CI 1.5-5.3), smoke heroin (adjusted OR 2, CI 1.2-3.3), and the risk of infection increased with increasing time spent in prison during the last 10 years.

Individuals who reported ever injecting drugs were three times more likely to be anti-HIV positive than non injectors (adjusted OR 3.4, CI 1.3-9.5), as were individuals who reported ever having been treated for a sexually transmitted infection (adjusted OR 3.0, CI 1.2-7.4). Men who had anal sex with other men were eight times (adjusted OR 8.4, CI 2.4- 25.1) more likely to be anti-HIV positive (Table 3.12). The total number who tested positive for anti-HIV was very small (24/1193) and the numbers with each of the three main risk factors were even smaller (injecting drug user: 18,

treated for sexually transmitted infection: 9 and men having anal sex with men: 5). Therefore inferences from this model are limited.

Table 3.13 Logistic regression model to identify determinants of anti-HBc, anti-HCV and anti-HIV in the Irish prison (census) population

	Total	Positive	Prevalence %	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen (104/1193)					
Ever injected drugs					
No	669	10	1.5	1	
Yes	509	94	18.5	21.6 (10.9-47.6)	<0.0001
Missing	*15*				
Age group					
16-19	177	9	5.1	1	
20-24	367	26	7.1	1.5 (0.6-4.1)	0.4
25-34	399	37	9.3	2.3 (1-6.3)	0.07
35 or more	194	27	13.9	9.7 (3.8-28.6)	<0.0001
Missing	*56*				
Ever treated for sexually transmitted infection					
No	1011	75	7.4	1	
Yes	147	26	17.7	1.9 (1.1-3.3)	0.02
Missing	*35*				
Whole model χ^2=142, p<0.0001					
Antibodies to hepatitis C virus (442/1193)					
Ever injected drugs					
No	669	25	3.7	1	
Yes	509	414	81.3	80.8 (47.9-143)	< 0.0001
Missing	*15*				
Age group					
16-19	177	47	26.6	1	
20-24	367	175	47.7	2.8 (1.5-5.3)	0.002
25-34	399	158	39.6	1.8 (0.9-3.4)	0.08
35 or more	194	38	19.6	1.9 (0.8-4.5)	0.1
Missing	*56*				
Months spent in prison over the last 10 years					
<3	136	20	14.7	1	
3-11	197	39	19.8	2.9 (1.2-6.9)	0.01
12-36	299	102	34.1	4.0 (1.9-8.6)	<0.001
> 36	538	277	51.5	6.5 (3.2-13.3)	< 0.0001
Missing	*23*				
Smoked heroin in the previous 12 months					
No	637	82	12.9	1	
Yes	540	353	65.4	2 (1.2-3.3)	0.007
Missing	*16*				
Whole model χ^2=848, p<0.0001					
Antibodies to HIV (24/1193)					
Ever injected drugs					
No	669	6	0.9	1	
Yes	509	18	3.5	3.4 (1.3-9.5)	0.01
Missing	*15*				
Ever treated for sexually transmitted infection					
No	1011	15	1.5	1	
Yes	147	9	6.1	3 (1.2-7.4)	0.02
Missing	*35*				
Men ever had anal sex with men					
No	1080	18	1.7	1	
Yes	28	5	17.9	8.4 (2.4-25.1)	0.001
Missing	*85*				
Whole model χ^2=28 , p<0.0001					

The initial model included age, gender, time spent in prison in the preceding 10 years, injecting drug use, smoking heroin, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse, and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors were retained in the final model.

Injecting drug use was clearly the biggest contributor to testing positive for anti-HBc and anti-HCV, and was also important in predicting anti-HIV infection. Consequently the data have been analysed to identify separate behaviours in injectors and non injectors that increased the risk of testing positive for these antibodies (Table 3.14 and 3.15 respectively).

Injecting drug users aged 30 or over were four times more likely than injectors less than 30 years old to test positive for anti-HBc (adjusted OR 4.1, 95% CI 2.4-7.0) (Table 3.14). Injectors with a history of treatment for sexually transmitted infection were twice as likely to test positive for anti-HBc when compared with those who had not reported treatment for sexually transmitted infection (adjusted OR 2.1, 95% CI 1.1-3.7). Respondents injecting for three years or more were also more likely to test positive for anti-Hbc than those injecting less than three years (adjusted OR 3.0, 95% CI 1.3-8.8).

Injectors who had spent more than three of the last 10 years in prison were more likely to test positive for anti-HCV (adjusted OR 2.9, 95%CI 1.1-7.6) than those who had spent less than three months in prison (Table 3.14). Those who were injecting for three years or more (adjusted OR 2.9, 95%CI 1.5-5.4), or had shared needles in prison (adjusted OR 2.9, 95%CI 1.5-5.7) or who reported injecting 20 or more times in the month prior to the survey were also more likely to test positive for anti-HCV (adjusted OR 3.0, 95%CI 1.1-10.0).

Injecting drug users aged 30 or over were nine times more likely than injectors under 30 to test positive for anti-HIV (adjusted OR 9.2, 95% CI 3.0-30.0) (Table 3.14). Anti-HIV positive injectors were more likely to report using condoms in heterosexual intercourse than HIV negative injectors (adjusted OR 12.7, 95% CI 3.8-58.7).

Table 3.14 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in injectors in the Irish prison (census) population

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen (94/509)					
Age group					
<30 years	382	51	13.4	1	
≥30 years	102	38	37.3	4.1 (2.4-7.0)	<0.0001
Missing	*25*				
Years since first injecting					
<3years	85	6	7.1	1	
≥3 years	383	82	21.4	3.0 (1.3-8.8)	0.03
Missing	*41*				
Ever treated for sexually transmitted infection					
No	412	66	16.0	1	
Yes	87	25	28.7	2.1 (1.1-3.7)	0.02
Missing	*10*				
Whole model 44 p <0.0001					
Antibodies to hepatitis C virus (414/509)					
Months spent in prison over the last 10 years					
<3 months	40	19	47.5	1	
3-11 months	49	36	73.5	2.3 (0. 8-7.1)	0.1
12-36 months	120	97	80.8	2.4 (0.9-6.6)	0.08
> 36 months	296	260	87.8	2.9 (1.1-7.6)	0.03
Missing	*4*				
Years since first injecting					
< 3 years	85	55	64.7	1	
≥ 3 years	383	327	85.4	2.9 (1.5-5.4)	0.001
Missing	*41*				
Sharing needles in prison					
No	145	90	62.1	1	
Yes	347	314	90.5	2.9 (1.5-5.7)	0.002
Missing	*17*				
No. of times injected in the month prior to the survey					
0	221	177	80.1	1	
1-19	139	119	85.6	1.1 (0.5-2.1)	0.9
20 Or more	74	67	90.5	3.0 (1.1-10.0)	0.05
Missing	*75*				
Whole model χ^2=53, p<0.0001					
Antibodies to HIV (18/509)					
Age group					
<30 years	382	6	1.6	1	
≥30 years	102	11	10.8	9.2 (3.0-30.0)	<0.0001
Missing	*25*				
Use condom when have sex with women					
No	311	4	1.3	1	
Yes	138	12	8.7	12.7 (3.8-58.7)	0.0002
Missing	*60*				
Whole model $\chi 2 = 32$ p <0.0001					

The initial model included the variables age, gender, time spent in prison in the preceding 10 years, smoking heroin, length of time since first injection, started injecting in prison, sharing practices in prison and outside prison, injecting frequency in prison, on methadone prior to committal, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors were retained in the final model. Interaction between age and number of years since first injecting was not significant.

Models were developed for respondents without a history of injecting drug use and are presented in Table 3.15.

Non injectors aged 30 or over were 12 times more likely than non injectors under 30 to test positive for anti-HBc (adjusted OR 12.7, 95% CI 2.3-239.). Men who had anal sex with other men were eight times more likely to be anti-HBc positive (adjusted OR 12.3, 95% CI 1.6-65.6).

Non injectors who smoked heroin (adjusted OR 4.0, 95% CI 1.7-9.3.), and tested positive for anti-HBc (adjusted OR 13.5, 95% CI 2.6-55.7) were more likely to test positive for anti-HCV.

Reporting anal sex with men was a powerful predictor of HIV in non-injectors (adjusted OR 56.0, CI 9.1-349.0).

Table 3.15 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in non injectors in the Irish prison (census) population

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen (10/669)					
Age group					
<30 years	404	1	0.3	1	
≥30 years	237	9	3.8	12.7 (2.3-239.3)	0.02
Missing	*28*				
Men ever had anal sex with men					
No	617	7	1.1	1	
Yes	12	2	16.7	12.3 (1.6-65.6)	0.006
Missing	*40*				
Whole model $\chi 2$ 16 = p =.0003					
Antibodies to hepatitis C virus (25/669)					
Smoked heroin in the previous 12 months					
No	546	14	2.6	1	
Yes	119	11	9.2	4.0 (1.7-9.3)	0.001
Missing	*4*				
Oral fluid positive for anti-HBc					
No	659	22	3.3	1	
Yes	10	3	30.0	13.5 (2.6-55.7)	0.001
Missing					
Whole model $\chi 2 = 18$ $p < 0.0001$					
Antibodies to HIV (6/669)					
Men ever had anal sex with men					
No	617	3	0.5	1	
Yes	12	3	25	56.9 (9.1-349)	<0.0001
Missing	*40*				
Whole model $\chi 2 = 16.3$ $p < 0.0001$					

The initial model included age, gender, time spent in prison in the preceding 10 years, smoking heroin, ever had sex with a man inside or outside prison, use condoms during heterosexual intercourse, ever treated for a sexually transmitted infection, and whether respondents had commenced or completed hepatitis B vaccination (for the hepatitis B model only). Significant factors were retained in the final model.

3.7.2 Committal Survey

Logistic regression models for the three viral infections are presented in Table 3.16. Variables considered for inclusion in the model are listed below the table as a footnote. After adjusting for other risk factors, a history of injecting drug use remained by far the most important independent risk factor for both anti-HBc and anti-HCV.

Table 3.16 Logistic regression model to identify determinants of anti-HBc, anti-HCV and anti-HIV in Irish prison entrants

	Total	Negative	Positive	Prevalence	Odds ratio	95% CI	p-value
	No.	No.	No.	%			
Antibodies to hepatitis B core antigen (37/596)							
Ever injected drugs							
No	420	415	5	1.2	1		
Yes	173	142	31	17.9	15.9	6.5-47.6	<0.0001
Missing	3						
Gender							
Male	555	527	28	5.1	1		
Female	41	32	9	22.0	2.7	1.1-6.5	0.03
Missing	0						
Whole model	$\chi 2 = 59$ $R^2 = .22$ $p < 0.0001$						
Antibodies to hepatitis C virus (130/596)							
Ever injected drugs							
No	420	414	6	1.4	1		
Yes	173	49	124	71.7	89.1	37.4-255.3	<0.0001
Missing	3						
Gender							
Male	555	448	107	19.3	1		
Female	41	18	23	56.1	7.3	1.9-35.8	0.009
Missing	0						
Months spent in prison over the last 10 years							
<3 months	261	248	13	5.0	1		
3-11 months	64	48	16	25.0	4.9	1.5-17.4	0.01
12-36 months	107	69	38	35.5	5.2	2.0-14.6	0.001
> 3 years	87	34	53	60.9	14.2	5.1-43.6	<0.0001
Missing	77						
Ever treated for sexually transmitted infection							
No	546	445	101	18.5	1		
Yes	44	18	26	59.1	7.4	1.9-33.7	0.007
Missing	6						
Whole model	$\chi 2 = 353$ $R^2 = .64$ $p < 0.0001$						
Antibodies to HIV (12/596)							
Gender							
Male	555	547	8	1.4	1		
Female	41	37	4	9.8	9.6	2.3-37.4	0.001
Missing	0						
Months spent in prison over the last 10 years							
<3 months	261	260	1	0.4	1		
3-11 months	64	62	2	3.1	8.4	0.8-185.2	0.09
12-36 months	107	105	2	1.9	4.9	0.5-107.9	0.2
> 3 years	87	80	7	8.1	27.1	4.5-521.2	0.003
Missing	77						
Whole model	$\chi 2 = 23.2$ $R^2 = .20$ $p < 0.0001$						

The initial model included age, gender, time spent in prison in the preceding 10 years, tattooing, injecting drug use, smoking heroin, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse, and ever been paid for sex. Significant factors were retained in the final model.

Respondents who reported ever injecting drugs were 16 times more likely to be anti-HBc positive than those who did not report injecting (adjusted OR 15.9, 95% CI 6.5-47.6). Women were three times more likely to test positive for anti-HBc than men (adjusted OR 2.7, 95% CI 1.1-6.5).

Injecting drug users were 89 times more likely to test positive for anti-HCV than non injectors (adjusted OR 89.1, 95% CI 37.4-255.3). Women were seven times more likely to test positive for anti-HCV than men (adjusted OR 7.3, 95% CI 1.9-35.8). Respondents who said they had had treatment for sexually transmitted infections were over seven times more likely to test positive for anti-HCV than those who did not report treatment (adjusted OR 7.4, 95% CI 1.9-33.7). Respondents who had spent increasing time in prison during the last 10 years had an increasing risk when compared to those who had spent less than three months in prison. Tattooing was no longer a risk factor after adjusting for other risk factors in the anti-HCV model.

Women were 10 times more likely to test positive for anti-HIV than men (adjusted OR 9.6, 95% CI 2.3-37.4). Respondents who had spent more than three years of the last 10 years in prison had an increased risk of testing positive for anti-HIV (adjusted OR 27.1, 95% CI 4.5-521.2). The total number testing positive for anti-HIV was very small (12/596) and the numbers with either risk factor were even smaller (women: 4, and over three years spent in prison: 7). Therefore inferences from this model are limited.

Injecting drug use was clearly the biggest contributor to testing positive for anti-HBc and anti-HCV. Consequently the data have been analysed to identify separate behaviours in injectors and non injectors that increased the risk of testing positive for the three antibodies (Tables 3.17 and 3.18 respectively).

Table 3.17 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in injectors entering Irish prisons

	Total	Negative	Positive	Prevalence	Odds ratio	95% CI	p-value
	No.	No.	No.	%			
Antibodies to hepatitis B core antigen (31/173)							
Age							
< 30 years	143	122	21	14.7	1		
≥ 30 years	28	19	9	32.1	5.1	1.7-15.3	0.003
Missing	2						
Gender							
Male	147	124	23	15.7	1		
Female	26	18	8	30.8	2.7	0.8-8.3	0.1
Missing	0						
No. of heterosexual partners in the last year							
1-2	103	86	17	16.5	1		
3-10	42	36	6	14.3	1.2	0.4-3.8	0.7
10+	10	6	4	40	6.0	1.3-26.1	0.02
No partner	12						
Missing	6						
Whole model	$\chi2 = 13.8$	$p = 0.008$					
Antibodies to hepatitis C virus (124/173)							
Gender							
Male	147	43	101	68.7	1		
Female	26	3	46	88.5	3.5	1.2-34.4	0.05
Missing	0						
Times injected in the last month							
0	47	23	24	51.1	1		
1-19	35	11	24	68.6	3.0	1.0-9.4	0.05
20 or more	85	13	72	84.7	6.3	2.5-17.2	0.0002
Missing	6						
Shared needles in prison							
No	94	35	59	62.8	1		
Yes	63	5	58	92.1	6.3	2.3-20.3	0.0007
First time in prison	14						
Missing	2						
Whole model	$\chi2 = 36.6$	$p < 0.0001$					
Antibodies to HIV (10/173)							
Age							
< 30 years	143	138	5	3.5	1		
≥ 30 years	28	23	5	17.9	8.0	1.9-37.6	0.005
Missing	2						
Gender							
Male	147	141	6	4.1	1		
Female	26	22	4	15.4	3.6	0.8-16.8	0.1
Missing	0						
Shared needles in the month before imprisonment							
No	118	115	3	2.5	1		
Yes	52	45	7	13.5	5.9	1.4-31.5	0.02
Missing	3						
Whole model	$\chi2 = 16.8$	$p = 0.0008$					

The initial model included the variables age, gender, ever imprisoned, time spent in prison in the preceding 10 years, tattooing, smoking heroin, length of time since first injection, started injecting in prison, sharing practices in prison and outside prison, injecting frequency in prison, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, number of heterosexual partners, use of condoms during heterosexual intercourse, ever been paid for sex. Significant factors were retained in the final model.

Injectors aged 30 or over were five times more likely to test positive for anti-HBc than injectors under 30 years old (adjusted OR 5.1, 95% CI 1.7-13.3). Injectors with a history of more than 10 sex partners in the previous 12 months were also more likely to test positive for anti-HBc than those who had reported having one or two partners (adjusted OR 6.0, 95% CI 1.3-26.1).

Female injectors were over three times more likely to test positive for anti-HCV than male injectors (adjusted OR 3.5, 95% CI 1.2-34.4). Injectors who reported injecting 20 or more times in the month prior to the survey were six times more likely to test positive for anti-HCV than those who did not inject in the month prior to the survey (adjusted OR 6.3, 95% CI 2.5-17.2). Injectors who had shared needles in prison were six times more likely to test positive for anti-HCV than injectors who had not shared needles in prison (adjusted OR 6.3, 95% CI 2.3-20.3).

Injectors aged 30 or over were eight times more likely to test positive for anti-HIV than those under 30 years old (adjusted OR 8.0 95% CI 1.9-37.6). Respondents who shared needles in the month prior to imprisonment were almost six times more likely to test positive for anti-HIV (adjusted OR 5.9, 95% CI 1.4-31.5).

An attempt was made to develop appropriate models for respondents without a history of injecting drug use:

Five respondents tested positive for anti-HBc; no independent risk factors were identified (two of those testing positive for anti-HBc had no reported risk factors, two had tattoos and one reported both smoking heroin and having been treated for a sexually transmitted infection).

Six non injector respondents tested positive for anti-HCV; five had spent time in prison and four had tattoos. (Table 3.18) The model indicated that non injectors who were tattooed inside the prison were more likely to test positive for anti-HCV (adjusted OR 11.9, CI 1.4-237.3) than those who had tattoos done outside prison, no other risk factors showed significant discrimination.

As only one non injector tested positive for anti-HIV, it was not possible to develop a model. This respondent had no apparent risk factors, but had spent time in prison.

Table 3.18 Logistic regression model to identify the determinants of anti-HCV infection in non injectors entering Irish prisons

	Total	Negative	Positive	Prevalence	Odds ratio	95% CI	p-value
	No.	No.	No.	%			
Antibodies to hepatitis C virus (4/215)							
Tattoo done							
Outside	167	166	1	0.6	1		
In prison	46	43	3	6.5	11.6	1.4-237.3	0.04
No tattoo	205						
Missing	2						
Whole model	$\chi 2 = 5.3$ $p < 0.02$						

The initial model included the variables age, gender, time spent in prison in the preceding 10 years, tattooing, smoking heroin, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, number of heterosexual partners, use of condoms during heterosexual intercourse, and ever been paid for sex. Significant factors were retained in the final model.

3.7.2 Census and Committal Survey Comparison

The independent risk factors for the three viral infections identified for the total populations, injector populations and non injector populations in the census and the committal survey are compared informally in Table 3.19.

All Respondents

Injecting drug use was a significant risk factor for testing positive for anti-HBc and anti HCV in the two surveys. Injecting drug use was also an important predictor of anti-HIV in the census survey, but was not significant in the committal survey, possibly due to small numbers.

Testing positive for all three antibodies was more common among women in the committal survey but not in the census survey.

Time spent in prison was a significant risk factor for testing positive for anti-HCV in both surveys; this was also an important predictor for anti-HIV in the committal survey.

Injector Respondents

In injecting drug users the main risk factors for anti-HBc (age 30 years and over) and anti-HCV (injecting 20 or more times in the last month and sharing needles in prison) were the same in both surveys.

In both surveys increasing age (age 30 years and over) was a risk factors for testing positive for anti-HIV among injecting drug users. Other risk factors differed in the two surveys. This lack of consistency is may be due to small numbers in both surveys.

Non Injector Respondents

In non injectors it was not possible to develop models for anti-HBc or anti-HIV in the committal survey, thus comparison with the census survey was not possible.

The numbers of non-injectors in the census survey were adequate, but the risk factors identified for anti-HCV were out of line with other results.

Tattooing in prison (a proxy for contaminated tattooing equipment) was an independent risk factor for anti-HCV in the committal survey although the numbers were small. Tattooing was not asked about in the census survey.

Table 3.19 Independent risk factors for testing positive for anti-HBc, anti-HCV and anti-HIV in Irish prisoners and prison entrants

	Census				Committals			
	Risk factor	Odds ratio	95% CI	P value	Risk factor	Odds ratio	95% CI	P value
Anti-HBc								
Total sample	✓ Ever injected drugs	21.6	10.9-47.6	<.0001	✓ Ever injected drugs	15.9	6.5-47.6	<0.0001
	Age >35	9.7	3.8-28.6	<0.0001	Women	2.7	1.1-6.5	0.03
	Ever treated for an STI	1.9	1.1-3.3	0.02				
Injector	✓ Age ≥ 30 years	4.1	2.4-7.0	<0.0001	✓ Age ≥ 30 years	5.1	1.7-15.3	0.003
	≥3 years since first injecting	3.0	1.3-8.8	0.03	10 or more heterosexual partners in the 12 months prior to committal	6.0	1.3-26.1	0.02
	Ever treated for an STI	2.1	1.1-3.7	0.02				
Non injector	Age ≥ 30 years	12.7	2.3-239.3	0.02	No risk factors identified			
	Men ever had anal sex with other men	12.3	1.6-65.6	0.006				
Anti-HCV								
Total sample	✓ Ever injected drugs	80.8	47.9-143	< 0.0001	✓ Ever injected drugs	89.1	37.4-255.3	<0.0001
	✓ Months spent in prison in the last 10 years				✓ Months spent in prison in the last 10 years			
	3-11	2.9	1.2-6.9	0 .01	3-11	4.9	1.5-17.4	0.01
	12-36	4.0	1.9-8.6	<0 .001	12-36	5.2	2.0-14.6	0.001
	> 36	6.5	3.2-13.3	< 0.0001	> 36	14.2	5.1-43.6	<0.0001
	Age group 20-24	2.8	1.5-5.3	0.002	Women	3.5	1.9-35.8	0.009
	Smoked heroin in the previous year	2.0	1.2-3.3	0 .007	Ever treated for an STI	7.4	1.9-33.7	0.007
Injector	> 36 months of the last 10 years spent in prison	2.9	1.1-7.6	0.03	Women	3.5	1.2-34.4	0.05
	≥3 years since first injecting	2.9	1.5-5.4	0.001				
	✓ Ever shared needles in prison	2.9	1.5-5.7	0.002	✓ Ever shared needles in prison	6.3	2.3-20.3	0.0007
	✓ Injected 20 or more times in the month prior to the survey	3.0	1.1-10.0	0.05	✓ Injected 20 or more times in the month prior to the survey	6.3	2.5-17.2	0.0002
Non injector	Smoked heroin in the previous year	4.0	1.7-9.3	0.001	Tattoo done in prison	11.6	1.4-237.3	0.04
	Oral fluid positive for anti-HBc	13.5	2.6-55.7	0.001				
Anti-HIV								
Total sample	Ever injected drugs	3.4	1.3-9.5	0.01	Women	9.6	2.3-37.4	0.001
	Ever treated for an STI	3	1.2-7.4	0.02	>36 months of the last 10 years spent in prison compared to <3/12	27.1	4.5-521.2	0.003
	Men ever had anal sex with other men	8.4	2.4-25.1	0.001				
Injector	✓ Age ≥30 years	9.2	3.0-30.0	<0.0001	✓ Age ≥ 30 years	8.0	1.9-37.6	0.006
	Used condom when have sex with women	12.7	3.8-58.7	0.0002	Shared needles in the month before imprisonment	5.9	1.4-31.5	0.009
Non injector	Men ever had anal sex with other men	56.9	9.1-349.0	0.0001	Unable to develop model			

✓ indicates the predictors for each antibody that were the same in the committal and census population

3.8 FORMAL ESTIMATION OF PREVALENCE AND IDENTIFICATION OF OVERALL INDEPENDENT RISK FACTORS FOR THE THREE VIRAL INFECTIONS BY TIME SPENT IN PRISON

3.8.1 Rationale for and Methods Employed to Combine the Two Prevalence Surveys

All respondents in the census survey and two thirds of committal respondents had prison experience. The two data sets were merged and then divided into two subsets: those respondents who had spent time in prison prior to the survey (n=1587) and those who had never been in prison before (n=197). The data were divided in this manner because the author was confident, based on analysis already presented in this chapter, that those who had spent time in prison in both surveys represent a similar population and have had similar experiences. Respondents who had never been to prison had a different risk factor profile and lower prevalence rates of blood borne viruses. Most of these new entrants represent a different population.

The evidence for this judgement was gathered when first time prisoners were excluded from the committal survey population. It was found that the prevalence rates of anti-HBc and anti-HIV antibodies were similar to those reported in the census survey. (anti-HBc 8.1% *versus* 8.7%; χ^2 = 0.8, df 1, p= 0.71; anti-HIV 2.8% *versus* 2.0%; χ^2 = 0.8, df 1, p= 0.36) (Tables 3.4 and 3.5). The prevalence of anti-HCV was somewhat lower in the committal survey (122/394, 31.0%) than that reported in the census survey (442/1193, 37.0%), χ^2 = 4.8, df 1, p= 0.03 (Tables 3.4 and 3.5). The prevalence of antibodies in injecting drug users previously in prison was similar in both the committal and census surveys (Tables 3.4 and 3.5) (committal *versus* census, anti-HBc 18.5% *versus* 18.5%, χ^2 = 0.0, df 1, p= 1.0; anti-HCV 74.5% *versus* 81.3%, χ^2 = 3.5, df 1, p= 0.06; and anti-HIV 6.4% *versus* 3.5%, χ^2 = 2.4, df 1, p = 0.17). When first time prisoners were excluded from the committal prisoner population, the proportions reporting the major risk factors were similar to those in the census survey (injecting drug use, census 43.2% *versus* committal 40.0% Fisher's exact p= 0.3; men having anal sex with men, census 2.5% *versus* committal 1.6% Fisher's exact p= 0.4).

Combining the data sets to include all those previously imprisoned would increase the power of the study for this sub-group and permit the overall estimation of prevalence

and the identification of independent risk factors for the three infections for respondents in the two surveys who had spent time in prison.

3.8.2 Prevalence and Independent Risk Factors in Respondents who

3.8.3 Spent Time in Prison

Prevalence and independent risk factors in all respondents who spent time in prison

In respondents who had spent time in prison the overall prevalence of anti HBc was 136/1587 (8.6%, 95%CI 7.2-10.1), anti-HCV was 564/1587 (35.5%, 95%CI 33.2-38.0) and anti-HIV was 35/1587 (2.2%, 95%CI 1.5-3.1).

Logistic regression models were developed to identify overall risk factors for the three viral infections in all respondents who had spent time in prison (Table 3.20). Variables considered for inclusion in the models are listed as a footnote below Table 3.20. A similar proportion of respondents in each survey tested positive for anti-HBc, anti-HCV and anti-HIV. After adjusting for other risk factors, a history of injecting drug use was by far the most important independent risk factor for anti-HBc, anti-HCV and anti-HIV. The 95% confidence intervals around the adjusted odds ratios were narrower that those observed for the separate models developed for each prevalence survey.

Respondents who reported ever injecting drugs were 22 times more likely to be anti-HBc positive than those who did not report injecting durg use (adjusted OR 15.9, 95% CI 12.0-44.3). Respondents aged 35 years or more were four times more likely to test positive for anti-HBc than those aged between 16 and 19 years (adjusted OR 4.2, 95% CI 2.1-8.9). Respondents who said they had treatment for sexually transmitted infections were two times more likely to test positive for anti-HBc than those who did not report treatment (adjusted OR 2.0, 95% CI 1.2-3.1). Female gender was no longer a determinant for testing positive for anti-HBc.

Injecting drug users were almost eighty times more likely to test positive for anti-HCV than non injectors (adjusted OR 79.6, 95% CI 49.5-133.0). Respondents between 20 and 24 years old were two times more to test positive for anti-HCV than those aged between 16 and 19 years (adjusted OR 2.0, 95% CI 1.1-3.4). Respondents who had spent increasing time in prison during the last 10 years had an increasing risk when compared to those who had spent between one day and three months in prison.

Female gender and respondents ever treated for a sexually transmitted infection were no longer independent risk factors for testing positive for anti-HCV.

Injecting drug users were over four times more likely to test positive for anti-HIV than non injectors (adjusted OR 4.3, 95% CI 1.9-10.9). Respondents who said they had had treatment for sexually transmitted infections were over two and a half times more likely to test positive for anti-HIV than those who did not report treatment (adjusted OR 2.6, 95% CI 1.1-5.8). Female gender and time spent in prison were no longer independent risk factors for testing positive for anti-HIV.

The data have been analysed to identify separate behaviours in injectors and non injectors that increased the risk of testing positive for anti-HBc, anti-HCV and anti-HIV. Variables considered for inclusion in the model are listed below the table as a footnote.

Table 3.20 Logistic regression model to identify determinants of anti-HBc, anti-HCV and anti-HIV in respondents (census and committal) who had spent time in prison

	Total	Positive		Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen (136/1587)					
Survey					
Census	1193	104	8.7	1	
Committal	394	32	8.1	1 (0.6-1.5)	0.8
Ever injected drugs					
No	905	12	1.3	1	
Yes	666	123	18.5	22.0 (12.0-44.3)	<.0001
Missing	*16*				
Age group					
16-19	271	20	7.4	1	
20-24	491	33	6.7	0.7 (0.4-1.4)	0.4
25-34	517	46	8.9	1.2 (0.6-2.3)	0. 7
35 or more	249	31	12.5	4.2 (2.1-8.9)	<0.0001
Missing	*59*				
Ever treated for sexually transmitted infection					
No	1367	99	7.2	1	
Yes	181	32	17.7	2.0 (1.2-3.1)	0.007
Missing	*39*				
Whole model χ^2=178.9 p<0.0001					
Antibodies to hepatitis C virus (564/1587)					
Survey					
Census	1193	442	37.1	1	
Committal	394	122	31.0	0.9 (0.6-1.3)	0.5
Ever injected drugs					
No	905	30	3.3	1	
Yes	666	531	79.7	79.6 (49.5-133.0)	< 0.0001
Missing	*16*				
Age group					
16-19	271	67	24.7	1	
20-24	491	230	46.8	2.0 (1.1-3.4)	0.01
25-34	517	198	38.3	1.3 (0.7-2.2)	0.4
35 or more	249	43	17.3	1.2 (0.6-2.4)	0.7
Missing	*59*				
Months spent in prison over the last 10 years					
<3	210	28	13.3	1	
3-11	260	55	21.2	3.1 (1.5-6.3)	0 .002
12-36	405	140	34.6	3.4 (1.9-6.4)	<0 .0001
> 36	624	329	52.7	6.8 (3.8-12.6)	< 0.0001
Missing	*88*				
Smoked heroin in the previous 12 months					
No	873	104	11.9	1	
Yes	697	452	64.9	1.8 (1.1-2.7)	0 .01
Missing	*16*				
Whole model χ^2=1076.4, p<0.0001					

The initial model included survey, age, gender, time spent in prison in the preceding 10 years, injecting drug use, smoking heroin, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse, and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors plus survey type were retained in the final model.

Table 3.20 is continued over leaf

Table 3.20 Logistic regression model to identify determinants of anti-HBc, anti-HCV and anti-HIV in respondents (census and committal) who had spent time in prison (cont.)

	Total	Positive	Prevalence %	Odds ratio (95% CI)	p-value
Antibodies to HIV (35/1587)					
Survey					
Census	1193	24	2.0	1	
Committal	394	11	2.8	1.2 (0.5-2.8)	0.7
Ever injected drugs					
No	905	7	0.8	1	
Yes	666	28	4.2	4.3 (1.9-10.9)	0.001
Missing	*15*				
Ever treated for sexually transmitted infection					
No	1367	25	1.8	1	
Yes	181	10	5.5	2.6 (1.1-5.8)	0.02
Missing	*35*				
Men ever had anal sex with men					
No	1440	25	1.7	1	
Yes	34	5	14.7	7.2 (2.2-20.3)	0.0004
Missing	*85*				
Whole model χ^2=32.3, p<0.0001					

The initial model included survey, age, gender, time spent in prison in the preceding 10 years, injecting drug use, smoking heroin, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse, and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors plus survey type were retained in the final model.

Prevalence and Independent Risk Factors for Injectors who Spent Time in Prison

The prevalence rates for injectors who had spent time in prison were anti HBc 123/666 (18.5%, 95%CI 15.6-21.6), anti-HCV 531/666 (79.7%, 95%CI 76.5-82.7) and anti-HIV 28/666 (4.2%, 95%CI 2.8-6.0).

A similar proportion of injectors in each survey tested positive for anti-HBc and anti-HCV (Table 3.21). There was a consistently higher prevalence of antibodies by prison location, but after adjusting for other risk factors, the association was not statistically significant.

After adjusting for other risk factors, injectors aged 30 or over were four and a half times more likely to test positive for anti-HBc than injectors under 30 years old (adjusted OR 4.6, 95% CI 2.8-7.7). Injectors who had spent between three and eleven months in prison were almost four times more likely to test positive for anti-HBc than those who had spent between one day and three months in prison (adjusted OR 4.3, 95% CI 1.5-14.1). Injectors who had received one or more doses of hepatitis B vaccine were 60% less likely to test positive for anti-HBc than those who had not received any doses of the vaccine (adjusted OR 0.5, 95% CI 0.3-0.7). Injectors who started injecting more than three years prior to the surveys were two times more likely to test positive for anti-HBc than respondents who started

injecting within the three years prior to the surveys (adjusted OR 2.0, 95% CI 1.1-4.5). None of the sexual risk factors was identified as an independent risk factors for testing positive for anti-HBc in this model.

After adjusting for other risk factors, injectors who had shared needles in prison were over four times more likely to test positive for anti-HCV than injectors who had not shared needles in prison (adjusted OR 4.2, 95% CI 2.5-7.2). Injectors who had received one or more doses of hepatitis B vaccine were two times likely to test positive for anti-HCV than those who had not received any doses of the vaccine (adjusted OR 2.1, 95% CI 1.2-3.2). Time spent in prison during the ten preceding years was no longer significant when hepatitis B vaccine status was included to the model.

After adjusting for other risk factors, twice the number of injectors tested positive for anti-HIV in the committal survey than in the census survey although the numbers in both surveys were small (adjusted OR 2.1, 95% CI 0.9-5.0). Injectors aged 30 years or over were nine times more likely to test positive for anti-HIV than those less than 30 years old (adjusted OR 9.0, 95% CI 4.0-21.1). Injectors who shared needles in the month prior to imprisonment were over two times more likely to test positive for anti-HIV than those who did not share in the month prior to imprisonment (adjusted OR 2.5, 95% CI 1.1-5.7). None of the sexual risk factors was identified as an independent risk factors for testing positive for anti-HIV in this model.

Table 3.21 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in injectors (census and committal) who had spent time in prison

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen (123/666)					
Survey					
Census	509	94	18.5	1	
Committal	157	29	18.5	1 (0.6-1.7)	1.0
Prison					
Outside Dublin	100	13	13.0	1	
Dublin	566	110	19.4	1.8 (0.9-3.9)	0.1
Age group					
<30 years	536	75	14.0	1	
≥30 years	103	42	40.8	4.6 (2.8-7.7)	<0.0001
Missing	*27*				
Months spent in prison over the last 10 years					
<3 months	56	7	12.5	1	
3-11 months	68	19	27.9	4.3 (1.5-14.1)	0.01
12-36 months	171	30	17.5	2.5 (0.9-7.5)	0.09
> 36 months	353	66	18.7	2.4 (0.9-7.1)	0.09
Missing	*18*				
Years since first injecting					
<3 years	130	14	10.8	1	
≥3 years	493	102	20.7	2.2 (1.1-4.5)	0.03
Missing	*43*				
One or more doses of hepatitis B vaccine					
No	258	54	20.9	1	
Yes	373	61	16.4	0.4 (0.3-0.7)	0.0007
Missing	*35*				
Whole model $\chi 2$ 55.5 p <0.0001					
Antibodies to hepatitis C virus (531/666)					
Survey					
Census	509	414	74.5	1	
Committal	157	117	81.3	1 (0.6-1.6)	1.0
Prison					
Outside Dublin	100	67	67.0	1	
Dublin	566	464	82.0	1.9 (1.0-3.5)	0.05
Age group					
<30 years	514	411	80.0	1	
≥30 years	125	97	77.6	0.8 (0.4-1.4)	0.3
Missing	*27*				
Months spent in prison over the last 10 years					
<3 months	56	26	46.4	1	
3-11 months	68	50	73.5	2.1 (0.9-5.2)	0.1
12-36 months	171	135	79.0	1.9 (0.9-4.0)	0.1
> 36 months	353	310	87.8	2.1 (0.9-4.5)	0.07
Missing	*18*				
Years since first injecting					
< 3 years	130	83	63.9	1	
≥ 3 years	493	414	84.0	1.6 (0.9-2.7)	0.09
Missing	*43*				
Sharing needles in prison					
No	239	149	62.3	1	
Yes	409	371	90.7	4.2 (2.5-7.2)	<0.0001
Missing	*18*				
One or more doses of hepatitis B vaccine					
No	258	181	70.2	1	
Yes	373	325	87.1	2.0 (1.2-3.2)	0.007
Missing	*35*				
Whole model χ^2=85.4, p<0.0001					

The initial model included the variables: survey, prison location, age, gender, time spent in prison in the preceding 10 years, smoking heroin, length of time since first injection, started injecting in prison, sharing practices in prison and outside prison, on methadone prior to committal, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors plus survey type and prison location were retained in the final model. Interaction between age and number of years since first injecting was not significant.

Table 3.21 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in injectors (census and committal) who had spent time in prison (cont.)

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to HIV (28/666)					
Survey					
Census	509	18	3.5	1	
Committal	157	10	6.4	2.1 (0.9-5.0)	0.09
Prison					
Outside Dublin	100	1	1.0	1	
Dublin	566	27	4.8	4.8 (0.9-87.2)	0.1
Age group					
<30 years	536	16	2.1	1	
≥30 years	103	11	12.8	9.0 (4.0-21.1)	<0.0001
Missing	25				
Shared needles in the month prior to imprisonment					
No	369	13	3.5	1	
Yes	270	15	5.6	2.5 (1.1-5.7)	0.03
Missing					
Whole model	$\chi2 = 33.9$, $p < 0.0001$				

The initial model included the variables: survey, prison location, age, gender, time spent in prison in the preceding 10 years, smoking heroin, length of time since first injection, started injecting in prison, sharing practices in prison and outside prison, on methadone prior to committal, ever had sex with a man inside or outside prison, ever treated for a sexually transmitted infection, use of condoms during heterosexual intercourse and whether respondents had commenced or completed hepatitis B vaccination (hepatitis B model only). Significant factors plus survey type and prison location were retained in the final model. Interaction between age and number of years since first injecting was not significant.

Prevalence and Independent Risk Factors in Non Injectors who Spent Time in Prison

The prevalence rates for non injectors who had spent time in prison were anti HBc 12/905 (2.0%, 95%CI 0.7-2.3), anti-HCV 30/905 (3.1%, 95%CI 2.3-4.7) and anti-HIV 7/905 (0.8%, 95%CI 0.3-1.6).

Models were developed for respondents without a history of injecting drug use (Table 3.22). A similar proportion of non injectors in each survey tested positive for all three infections. The models were similar to those developed using the census survey data.

Non injectors aged 30 or over were seven times more likely to test positive for anti-HBc than non injectors under 30 (adjusted OR 7.7, 95% CI 1.9-51.6). Men who had anal sex with other men were twelve times more likely to be anti-HBc positive (adjusted OR 12.3, 95% CI 1.7-60.4).

Non injectors who spend more than three of the last 10 years in prison were more likely to test positive for anti-HCV than those who spent between one day and three months in prison. Non injector respondents who smoked heroin were over three and a half times more likely to test positive for anti-HCV than respondents who did not smoke heroin (adjusted OR 3.6, 95% CI 1.6-7.7). Non injector respondents who tested

positive for anti-HBc were more likely to test positive for anti-HCV than those who tested negative for anti-HBc (adjusted OR 12.4, 95% CI 2.4-52.4). The tattooing variables were not entered in the model as these questions were only asked in the committal survey.

Reporting anal sex with men was a powerful predictor of HIV in non-injectors (adjusted OR 48.6, CI 8.8-245.2).

Table 3.22 Logistic regression model to identify the determinants of anti-HBc, anti-HCV and anti-HIV in non injectors (census and committal) who spent time in prison

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen positive (12/905)					
Survey					
Census	669	10	1.5	1	
Committal	236	2	0.9	0.3 (0.02-1.8)	0.3
Age group					
<30 years	590	3	0.5	1	
≥30 years	286	9	3.2	7.7 (1.9-51.6)	0.01
Missing	*29*				
Men ever had anal sex with men					
No	844	8	1.0	1	
Yes	16	2	12.2	12.3 (1.7-60.4)	0.004
Missing	*45*				
Whole model $\chi 2$ 16.7 = p =0.0008					
Antibodies to hepatitis C virus (30/905)					
Survey					
Census	669	25	3.7	1	
Committal	236	5	2.1	1.1 (0.4-2.9)	0.9
Months spent in prison over the last 10 years					
<3 months	154	2	1.3	1	
3-11 months	190	5	2.6	2.4 (0.5-18.3)	0.3
12-36 months	230	5	2.2	1.5 (0.3-11.4)	0.6
> 36 months	267	18	6.7	5.2 (1.3-35.2)	0.04
Missing	*18*				
Smoked heroin in the previous 12 months					
No	756	17	2.3	1	
Yes	145	13	9.0	3.6 (1.6-7.7)	0.001
Missing	*4*				
Oral fluid positive for anti-HBc					
No	893	27	3.0	1	
Yes	12	3	25.0	12.4 (2.4-52.4)	0.001
Missing					
Whole model $\chi 2 = 29.0$ p <0.0001					
Antibodies to HIV (7/905)					
Survey					
Census	669	6	0.9	1	
Committal	236	1	0.4	0.5 (0.02-2.8)	0.5
Men ever had anal sex with men					
No	844	4	0.5	1	
Yes	16	3	18.8	48.6 (8.8-245.2)	<0.0001
Missing	*45*				
Whole model $\chi 2 = 15.7$ p =0.0004					

The initial model included survey, age, gender, time spent in prison in the preceding 10 years, smoking heroin, ever had sex with a man inside or outside prison, use condoms during heterosexual intercourse, ever treated for a sexually transmitted infection, and whether respondents had commenced or completed hepatitis B vaccination (for the hepatitis B model only). Significant factors were retained in the final model.

3.8.3 Prevalence and Independent Risk Factors for New Prison Entrants

The prevalence rates for new prison entrants were anti HBc 4/197 (2.0%, 95%CI 0.6-5.1), anti-HCV 6/197 (3.1%, 95%CI 1.1-6.5) and anti-HIV 0/197 (0.0%, 95%CI 0-1.9).

An attempt was made to develop models to identify determinants of hepatitis for respondents without a history of imprisonment.

No independent risk factors were identified for the four respondents who tested positive for anti-HBc. One of these respondents also tested positive for anti-HCV and reported a history of injecting drug use.

Six respondents tested positive for anti-HCV and injecting drug use was the only independent risk factor identified (Table 3.23).

Table 3.23 Logistic regression model to identify the determinants of anti-HCV infection in those who had never been in prison before

	Total	Positive	Prevalence	Odds ratio	95% CI	p-value
	No.	No.	%			
Antibodies to hepatitis C virus (6/197)						
Ever injected drugs						
No	183	1	0.6	1		
Yes	14	5	35.7	101.1	14.4-2048.9	<0.0001
Missing	0					
Whole model	$\chi 2 = 23$. $p < 0.0001$					

The initial model included the variables age, gender, tattooing, smoking heroin, ever injected, ever had sex with a man, ever treated for a sexually transmitted infection, number of heterosexual partners, use of condoms during heterosexual intercourse, and ever been paid for sex. Significant factors were retained in the final model.

3.9 ESTIMATED NUMBERS OF CASES OF HEPATITIS B, HEPATITIS C AND HIV IN THE IRISH PRISON POPULATION

The prevalence rates from the census survey permitted estimation of the average number of cases in high and medium risk prisons from September to November 1998.

The author attempted to estimate the total number of cases of each of the viral infections in the low risk prisons at the time of the survey employing what ever national prevalence rates were available and the prevalence rates for non injectors in medium risk prisons.

3.9.1 Prevalence Estimates Employed for Low Risk Prisons

Prevalence Rates in Non Injectors in Medium Risk Prisons from the census survey

- The prevalence of hepatitis B among those residing in medium risk prisons and who also reported never injecting drugs was 1.1% (4/372, 95% CI 0.29-2.7%).
- The prevalence of hepatitis C among those residing in medium risk prisons and who also reported never injecting drugs was 2.7% (10/372, 95% CI 1.3-4.9%).
- The prevalence of HIV among those residing in medium risk prisons and who also reported never injecting drugs was 0.8% (3/372, 95% CI 0.17-2.3%).

National Prevalence Rates

- The national population prevalence for hepatitis B, based on a postal survey in 18 District Electoral Divisions using a multi-stage stratified cluster sampling technique, was 0.51% (95%CI 0.0-1.8%). [O'Connell, 1999 #115]
- There is no national prevalence estimate available for hepatitis C.
- The Irish population prevalence for HIV, based on unlinked anonymous tests in antenatal women, was 0.02%. [HIV Surveillance Sub-Committee of the National Aids Strategy Committee, 1998 #40] This is a cumulative prevalence and may slightly overestimate the prevalence in the population.

The above two sets of assumptions were applied to the numbers in the low risk prisons to estimate the total numbers of infected persons in the low risk prisons.

3.9.2 Estimated Numbers of Cases among those in Low Risk Prisons September to November 1998

Number of cases based on prevalence rates in non injectors in medium risk prisons

The average population in low risk prisons for the period was September to November 1998 was 397. The estimated numbers of infected persons in the low risk prisons, employing the prevalence among non injectors in medium risk prisons, based on the mean population for September to November 1998 were:

- Hepatitis B, between 1 and 11 cases
- Hepatitis C, between 5 and 19 cases
- HIV, between 0 and 9 cases

Number of cases based on the national prevalence rates

The estimated numbers of infected persons in the low risk prisons, employing the national prevalence rates available, based on the mean population for September to November 1998 were:

- Hepatitis B, 2 cases
- HIV, less than 1 case

3.9.3 Estimated Numbers of Cases among those in Medium and High Risk Prisons September to November 1998

In the census survey, just under 54% (1,193) of high and medium risk prisoners were tested for anti-HBc (104), anti-HCV (442) and anti-HIV (24); 44.8% of all prisoners were tested. The proportion of positive cases for each infection among the samples tested was applied to the average prison population in the medium risk prisons (867) and high risk prisons (1,422) at the time of the survey to estimate the total number of cases in these populations.

The estimated average number of cases in medium risk prisons from September to November 1998 was:

- Hepatitis B, 31 cases
- Hepatitis C, 143 cases
- HIV, 7 cases

The estimated average number of cases in high risk prisons from September to November 1998 was:

- Hepatitis B, 174 cases
- Hepatitis C, 725 cases
- HIV, 40 cases

3.9.4 Estimated Numbers of Cases among those in Irish Prisons September to November 1998

The average number of cases in Irish prisons was:

- Hepatitis B, between 206 and 216 cases
- Hepatitis C, between 873 and 887 cases
- HIV, between 47 and 56 cases

These estimates include both the estimated number of cases in low risk prisons and proportional adjustments from the survey sample to the total prison population in medium and high risk prisons.

CHAPTER 4 Discussion

INTRODUCTION

This discussion is presented in four sections.

4.1 Important findings and original aspects.

4.2 Strengths and limitations of the study design and their implications.

4.3 Comparison between the two prevalence surveys and with other studies.

4.4 Policy implications and future research.

4.1 IMPORTANT FINDINGS AND ORIGINAL ASPECTS

4.1.1 Study Aim and Design

This is the first study to estimate the prevalence rates of antibodies to hepatitis B core antigen, hepatitis C virus and HIV in respondents entering prisons and those already imprisoned employing similar methods for both surveys. The results of the two surveys provides baseline data for the prison services.

The main advantage of this study design was that it permitted adequate representation of short-term prisoners through a survey of prison entrants (committal survey). This design also allowed the author to make direct comparisons between two distinct prisoner populations (inmates and entrants). These comparisons included prevalence rates, characteristics and risk factors. The study comparisons also permitted the author to identify different sub-populations within the two survey populations.

4.1.2 Prevalence Rates, Risk Populations and Risk Practices

The results of the two surveys indicated that a high proportion of prisoners, and a very high proportion of injecting drug users, tested positive for anti-HCV. Testing positive for anti-HBc was less common in injectors entering or incarcerated in Irish prisons. Testing positive for anti-HIV was relatively uncommon in the two surveys. These findings indicate that hepatitis C is endemic in Irish prisoners and a major public health issue.

In the committal survey, one third of the prison entrants had never previously been in prison. The prevalence rate of anti-HBc was four times lower and anti-HCV was 10 times lower in first time entrants than in recidivist prisoners. No new prison entrant tested positive for anti-HIV. Only 7% of new entrants reported injecting drug use compared with 40% of recidivist entrants and 43% of inmates. This implies that a large proportion of first time prisoners belong to a different population.

When the two survey populations were combined and new entrants were excluded, injecting drug use was the most important independent risk factor for testing positive for anti-HBc, anti-HCV and anti-HIV in recidivist respondents. In the same respondent population 'men reporting anal sex with men' was an independent risk factor for testing positive for anti-HIV, but the numbers of men reporting anal sex were small.

In the combined survey populations, excluding new entrants, recidivist injectors who reported first injecting three or more years ago were more likely to test positive for both anti-HBc and anti-HCV. Sharing needles in prison and increasing time spent in prison were additional risk factors for recidivist injectors who tested positive for anti-HCV. This indicates that injecting practices and associated imprisonment are the main risk factors for these two infections in Irish prisoners.

Recidivist respondents who reported injecting drug use in the committal survey were two and a half times more likely to test positive for anti-HIV than injector respondents in the census survey. The committal survey design intended to capture short term prisoners while the census survey would as a result of its design capture longer term prisoners. This indicates that a large number of injectors testing positive for anti-HIV spend short periods in prison. This may be explained by the sympathetic practice of early release for injectors testing positive for HIV.

As this study estimated the prevalence of anti-HBc, anti-HCV and anti-HIV, we were able to note the overlap between the three antibodies; 77% of the respondents who tested positive for anti-HBc also tested positive for anti-HCV. Among those who tested positive for both anti-HBc and anti-HCV, 97% reported injecting drug use. There were three respondents who tested positive for both anti-HIV and anti-HBc; two of these reported injecting drug use and the other (male respondent) reported having had anal sex with other men.

In the combined recidivist survey population, recidivist non injectors reporting a history of having anal sex with other men were more likely to test positive for both anti-HIV and anti-HBc.

In non injectors who participated in the committal survey, the only independent risk factor identified for testing positive for anti-HCV was having had a tattoo done in prison. This finding has not been previously published and further investigation is required as this unexpected finding provides indirect evidence of a link between tattooing in prison and anti-HCV. The number of respondents who both reported having had a tattoo done in prison and subsequently tested positive for anti-HCV were small compared to the numbers who reported injecting drug use and then tested positive for anti-HCV. The attributable risk percent for tattooing in prison is small compared to the attributable risk percent for injecting inside or outside prison.

However the benefit of providing sterile tattooing practices in the prison environment should not be underestimated even if the intervention only prevents a small number of prisoners contracting hepatitis C.

In both surveys a number of consistent findings were reported: approximately one fifth of injectors reported that they had commenced injecting in prison; respondents reported starting injecting at similar ages; a higher proportion of injectors reported that they had shared needles in prison than outside prison; approximately one third of all injectors were attending a methadone maintenance programme prior to this prison entry; over four fifths of those who had accessed hepatitis B vaccine had done so in prison; small numbers of men reported anal sex with other men; and similar proportions of injecting drug users reported treatment for a sexually transmitted infection.

Some findings differed between the two surveys. In the committal survey the proportion of respondents who were less than 20 years old or were on remand was higher than in the census survey. The proportion of respondents who reported spending more than three of the preceding ten years in prison, using heroin, having had treatment for a sexually transmitted infection, or having had one or more doses of hepatitis B vaccine was lower in the committal survey than in the census survey. The proportion of injector respondents reporting injecting 20 or more times in the month prior to the survey was higher in the committal survey than in the census survey (excluding injector respondents in the census survey who had spent less than three months in prison on this sentence). The proportions of injector respondents who reported sharing injecting equipment inside or outside prison, injecting on the day before coming into prison or commencing injecting more than three years prior to the survey was lower in the committal survey than in the census survey. These findings are explored and explained with appropriate comparisons from the literature in sections 4.3.2 and 4.3.3.

4.1.3 Self Reported Test Results *versus* Laboratory Analysis

This is the first time that self reported infection status for all three viral infections in Irish prisoners could be compared directly with objective laboratory test results. In those who reported testing there were many discrepancies between their self reported results and the results of the oral fluid assays.

4.1.4 Self Reported Hepatitis B Vaccination Status

In the census survey, 48% of respondents had one or more doses of hepatitis B vaccine in the census survey compared to 22% in the committal survey. This increased to 30% (62/373) of the committal population when first time prison entrants were removed. Of those who had received vaccination over four fifths of the respondents reported they had received it in prison.

4.1.5 Injectors' Drug Using Characteristics in the Community *versus* in Prison

The pattern of injecting drug use characteristics and practices observed in this study is similar to those reported in the '*National Drug Treatment Reporting System, Statistical Bulletin, 1997 and 1998*' which presents statistics for drug users in treatment in the community. [70] The proportion of heroin users reporting having been on a methadone list prior to this prison committal was similar to the proportion of heroin users attending community drug services estimated by Comiskey and Barry. [77] Therefore it would appear that many of the characteristics of injecting drug users in prison are similar to those in the community.

4.1.6 Estimated Numbers of Cases of Hepatitis B, Hepatitis C and HIV in the Irish Prison Population

On a single day there are approximately 2,700 individuals detained in Irish prisons. Of these, over 200 are infected with Hepatitis B, almost 900 are infected with Hepatitis C and almost 50 are infected with HIV.

Individuals may be committed to prison more than once in the year [88] [89] but the approximate number of re-committals for a given year is not available. The Department of Justice, Equality and Law Reform were unable to provide the percentage of re-committals in 1998 and for reasons of confidentiality could not provide us with access to files. Therefore, it is not possible to provide realistic estimates of the numbers of infected persons entering Irish prisons in 1999. Therefore these numbers do not take account of the turnover of prisoners in the Republic of Ireland.

These people are cared for by a handful of general practitioners and medical orderlies, most of whom have no recent training in infectious diseases. These numbers emphasise the need for a new approach to health service planning in Irish prison.

4.2 STRENGTHS AND LIMITATIONS OF THE STUDY

4.2.1 Scope of the Study

In Ireland the largest group of prisoners infected with hepatitis B, hepatitis C and HIV is injecting drug users. Problematic drug use is associated with social and economic disadvantage. Two-fifths of drug users in treatment reside in five deprived boroughs of Dublin. [69] [70] The Governor of the Mountjoy Prison Complex said in a television interview "*the problem of drug addiction does not stem from our prisons but reflects the high levels of deprivation and inequality in our society.*" He then went on to say that deprivation in the community has to be addressed in tandem with prison programmes that address drug misuse. The study presented in this thesis provides a limited epidemiological view of the issues of drug misuse in Irish prisons.

4.2.2 Sampling, Representation and Generalisability

In the census survey the 15 prisons were categorised as high, medium or low risk according to expected prevalence rates for infection. This sampling strategy allowed conclusions to be drawn about infection rates in groups of similar prisons. The three low risk prisons were excluded from the census survey as the number of prisoners involved (approximately 275) was inadequate to allow stable estimation of prevalence and ensure confidentiality. The annual committal population in Ireland is approximately 11,000, committed to seven prisons. Two prisons were excluded from this survey as the numbers committed are very small (186 in 1998) and it would have been difficult to maintain confidentiality. One of the two excluded prisons was a low risk prison (Castlerea). The overall estimated infection prevalence rates reported in the census and committal surveys reflect the rates of infection in high and medium risk prisons. The exclusion of low risk prisons is likely to provide only a marginal overestimation of the prevalence rates in the Irish prisoner populations (entrants and inmates), as the numbers in low risk prisons are very small. The estimated prevalence rates in the drug using population reflect the overall prevalence rates, as there are few injecting drug users in the low risk prisons. In both surveys the prevalence rates of each of the antibodies were higher in high risk than in medium risk prisons. This was expected and is in line with the sampling rationale.

A high proportion of respondents in the committal survey population were remand or short-term prisoners whereas a high proportion of respondents in the census survey population had longer sentences. This was in line with the rationale for the study design.

Both surveys had high response rates (census survey 88%, committal survey 97%) and adequate representation of the prisoner population. The proportion of respondents who participated in the census survey represented 45% of the total prisoner population at the time of the survey. In the committal survey, respondent participation represented 85% of the total population committed to these prisons during the survey period, and 6% of the approximately 11,000 committals entering Irish prisons each year. The age profiles of the respondents were similar to those of the overall populations from which each sample was selected. Therefore, the findings of this study are representative of Irish prisoners in high and medium risk prisons, and of the drug using population in Irish prisons.

4.2.3 Questionnaire Design, Completion and Accuracy

The questionnaire was based on one used in cross-sectional prison surveys in UK prisons. [58 59 61 63 64 107] These studies do not refer to a formal validation process. However, the authors [58 61 64 127] note the high percentage of questions that followed logical checks and the high level of agreement when oral fluid test results were matched with risk factors. [61 127] The questionnaire was short and comprised of categorical questions. It covered a selected number of background characteristics, the main risk practices, attending methadone programmes, hepatitis B vaccine uptake and previous testing for the three viral infections. The questionnaire was designed for an audience with basic literacy levels. The disadvantage of the nominal or categorical answer options was that they did not allow prisoners to express views that may have differed from the choices on the questionnaire.

In the census survey one questionnaire was discarded as the respondents' answers did not follow logical checks while in the committal survey all completed answers were internally consistent.

Overall a higher proportion of respondents failed to complete all questions in the questionnaire in the census survey than in the committal survey. The completion of the questionnaires is discussed separately for each survey.

In the census survey 5% of the respondents did not answer the question 'how old are you?' possibly because its position on the questionnaire was not highly visible (see Appendix 6a to 6d). In the census survey 95% of respondents provided information on sharing needles whereas less than 88% provided information on sharing syringes and spoons or filters. The respondents who answered the question on needle sharing may have assumed that if the answer to this question was the same for the other two questions then there was no need to continue to answer the other questions on sharing. Fifteen percent of respondents who reported injecting drug use did not answer the question 'how many times have you injected in the last month?' This may have been because the injectors did not want to reveal that they were injecting in prison, or alternatively, they may not have injected in the last month and failed to insert a zero. Between 3% and 6% of respondents did not answer the questions relating to sexual practices and sexual risk factors in the census survey. These questions are of a very sensitive nature and respondents may have felt uneasy answering them.

In the committal survey the question 'how old are you?' was moved to a more visible position and only 0.5% failed to answer the question. In the committal survey 13% of the respondents failed to complete the question 'how much of the last ten years have you spent in prison?' compared with only 2% of census survey respondents. This question may not have been answered because the author failed to provide the categorical choices provided in the census survey, instead requiring the respondent to calculate the exact amount of time spent in prison. Therefore, this question may have been less likely to be completed by those with longer prison histories leading to selection bias among those who answered the question. For all other questions, including those relating to injecting practices and sexual practices, only between 0.5% and 1% did not answer each question in the committal survey. The higher level of completion for each question in the committal survey (with the exception of the question on time spent in prison in the last ten years) may have occurred because there were only one or two other respondents in the room during the committals interviews whereas, in most cases there were at least ten people present during the

census interviews. It is possible committal respondents felt more comfortable asking the researcher to help with reading the questionnaire than in the census survey. The author's impression was that a higher proportion of respondents requested assistance to complete the questionnaire in the committal survey than in the census survey.

Questions that require participants to recall previous experiences are prone to recall bias. In the census survey questions relating to practices prior to imprisonment were prone to recall bias particularly for the prisoners who had spent longer in prison on this sentence, while in the committal survey questions that asked about previous prison experiences were prone to recall bias for recidivist prisoners who had not been to prison in recent months. The questions likely to be influenced by recall bias in the census survey were 'when was the last time you injected before coming into prison?' and those seeking information on sharing practices in the month prior to imprisonment. In the committal survey the questions most likely to be influenced by recall bias were those related to sharing injecting equipment in prison.

Respondents were asked 'how many times did you inject in the last month'. Some respondents in the census survey reported that they had injected 'lots' or 'loads' of times rather than an exact number; this statement was coded as '88'. The variable was treated as an ordinal variable with the data categorised into three groups to reflect regularity of injecting in prison (0 was currently not injecting, 1 to 19 indicated injecting infrequently and 20 or more represented injecting regularly and includes '88' codes). The interpretation of this data was problematic because some prisoners were in prison for less than one month at the time of the survey and cut off points for number of times injecting in the last month outside prison are not the same indicator of frequency/risk as those injecting in prison. Therefore, those in prison less than three months were excluded form the variable describing number of times injecting in the month prior to the census survey. This could have been overcome if the exact number of times injecting in the month prior to the survey were collected in the census survey and if 'time in prison on this sentence' contained an additional option- 'less than one month'. The data could then have been treated as continuous data and mean or median number of injections in prison and outside prison compared. This indicates the importance of working through the analysis plan prior to starting a survey. In the committal survey, all respondents provided the exact number of times

injected. For comparison purposes the data were coded using the same categories as in the census survey. The variable 'grouped' number of times injecting in the month prior to each survey was excluded from the combined model as the 'categories' represented different levels of heroin dependency and risk within the census survey and between the two surveys.

Overall prisoners were willing to complete the questionnaire as evidenced by the good response rates. The prisoners were not afraid to answer the drug questions but the men were uneasy about answering the questions relating to anal sex with other men. These questions were least likely to be answered truthfully and the proportions reporting homosexual practices presented in this study were likely to be under estimated. The question relating to the number of sexual partners in the twelve months prior to the survey was greeted with giggling and the prisoners were more likely to over estimate their sexual conquests in the previous year.

Continuous data were collected for two variables, age and year first injected. The distribution of the data for both variables were skewed and the data were categorised into groups rather than transformed, because grouped data were considered easier for the researcher to handle, present and explain the findings to service providers.

For bivariate analyses, age was grouped in five year age bands from 15 to 35 and 10 year age bands thereafter. The data were further grouped for the logistic regression analyses to conserve degrees of freedom but reflect the age groups with similar prevalence of blood borne viruses.

Each injector respondent was asked how old she was when started injecting. This was subtracted from the respondents current age and the number of years since first injecting was estimated. The distribution for years since first injection was skewed and data were grouped to reflect the introduction of the *'methadone protocol'* three years prior to the survey.

4.2.4 Sensitivity and Specificity of the Oral Fluid Tests

The specificity of the oral fluid assays for all three antibodies was high, as was the sensitivity of the oral fluid assay for anti-HIV. The specificity of the test for anti-HCV was 100%. This implies that those who tested negative for anti-HCV were truly negative and did not contribute to an increased prevalence estimate. The specificities of the tests for anti-HBc and anti-HIV were 99%. This implies that 1% of those who tested positive for anti-HBc and anti-HIV were possibly negative. The sensitivities of the oral fluid assays for anti-HBc (82%) and anti-HCV (80%) were less than ideal. Therefore, the prevalence rates of anti-HBc and anti-HCV are likely to be under estimates of the true prevalence rates. This implies that the true prevalence rates for both viruses could be 20% higher than the reported estimates. In injectors the true prevalence of anti-HBc could be as high as 23% and anti-HCV could be 90% to 100%.

4.2.5 Unexplained Antibody Positive Test Results

The overall proportion of 'unexplained' positive antibody tests was very low. The proportion of unexplained positive antibody tests was slightly higher in the census survey population (15/1193, 1.3%) than in the committal survey population (4/596, 0.7%). The higher proportion of unexplained positive antibody tests in the census survey than in the committal survey may be partially explained by the fact that respondents were not asked about tattooing or commercial sex in the census survey. In the census survey injecting drug use has to be suspected for the two respondents testing positive for both anti-HBc and anti-HCV but reporting none of the risk factors, as concomitant infection with both is uncommon in non-injectors (section 3.2.3). In the census survey smoking heroin (11) and/or tested positive for hepatitis B core antigen (3) were independent risk factors for non injectors who tested positive for anti-HCV (section 3.7.1, Table 3.15). The practice of smoking heroin has not been shown to be a biological risk factor for hepatitis C. Therefore the most likely explanation is that these were heroin users who did not wish to reveal their injecting habit. Taken together, the above suggest that there were 16 injecting drug users in the census survey who did not wish to reveal their injector status. The data from the committal survey population were interrogated using the same methods but no

respondents were found who were likely to be injecting drug users who did not reveal their injector status.

In both surveys inaccurate self-reporting of risk behaviours might explain the small proportion of positive antibody tests in respondents with no apparent risk factors. Inaccurate reporting is always a potential problem in surveys, particularly with sensitive topics such as injecting drug use and sexual practices. Alternatively, they may have had a partner whose sexual history was unknown to them, or, they may have been infected through needle stick injuries, tattooing (in the census survey) infected blood products or other unidentified routes of infection such as sharing razors and toothbrushes. Overcrowding in prison may be another contributing factor.

4.2.6 Self Reported Test Results *versus* Laboratory Analysis

In both surveys there were similar high levels of discrepancy between self reported test results and laboratory test results. Possible reasons for the discrepancies include: confusing the conditions hepatitis B and hepatitis C, mistakes in filling out the questionnaire, misunderstanding the questions, deliberate misrepresentation, change in antibody status since the previous test, and test error (including discrepancies between different laboratories).

4.2.7 Causal Relationship

Conclusions from cross-sectional surveys are limited. It is not possible to deduce from this survey whether the higher infection rates in recidivist prisoners are due to more chaotic drug use patterns (for example, a higher proportion of injectors previously imprisoned had started injecting more than three years earlier), or to the previous prison exposure(s). Increased risk associated with prison exposure is probably due to the high risk injecting practices adopted in prison, such as sharing a small number of needles with a large and varied cohort of inmates, rather than spending time in prison *per se*. The fact that spending increased time in prison remained an independent risk factor for testing positive for anti-HCV in injectors after taking account of reported sharing practices, implies that there may be additional risk practices in prison that were not investigated in this survey.

4.3 COMPARISONS BETWEEN THE TWO PREVALENCE SURVEYS AND OTHER STUDIES

4.3.1 Prevalence Rates

This is the first study to estimate the prevalence rates of antibodies to hepatitis B core antigen, and hepatitis C in either respondents entering Irish prisons or those already imprisoned employing similar methods for both surveys. Comparisons with other countries are largely limited to prevalence studies in prison entrants or cross-sectional samples in different prison settings. However a study in Nevada employed similar methods to assess the prevalence of HIV only in prison entrants and inmates. [56]

The Irish studies provide the baseline prevalence rates for hepatitis B, hepatitis C and HIV in the Irish prisoner population by prison history and injecting drug use. In the census survey population, the presence of anti-HCV was by far the most common (37%); anti-HBc was less common (8.7%) and anti-HIV was relatively uncommon (2%). In the census survey the prevalence of anti-HBc was 12 times higher in those who reported ever injecting drugs than in those who did not report injecting drug use (18.5% *versus* 1.5%). The prevalence of anti-HCV was 22 times higher in injectors than in non injectors (81.3% *versus* 3.7%). The prevalence of anti-HIV was over three times higher in injectors than in non injectors (3.5% *versus* 0.9%).

In the committal population the prevalence rates followed a similar pattern. Over one fifth of the respondents tested positive for anti-HCV. Anti-HBc was again less common (6.2%, tested positive). Anti-HIV was relatively infrequent (2.0% tested positive). In the committal survey the prevalence of anti-HBc was nine times higher in those who reported ever injecting drugs than in those who did not report injecting drug use (17.9% *versus* 2%). The prevalence of anti-HCV was 51 times higher in injectors than in non injectors (71.7% *versus* 1.4%). The prevalence of anti-HIV was almost 12 times higher in injectors than in non injectors (5.8% *versus* 0.5%). One third of the prison entrants had never previously been in prison. The prevalence rate of anti-HBc was four times lower and anti-HCV was 10 times lower in those who had never been in prison than in those who had previously been in prison (anti-HBc 2.0% *versus* 8.1%; anti-HCV 3.1% *versus* 31.0%). No new prison entrant tested positive for anti-HIV while 11 recidivist prison entrants tested positive for anti-HIV.

When the two prevalence survey populations were merged and first time prisoners were excluded, the prevalence rates in respondents who had spent time in prison were similar in both inmates and entrants. The prevalence rates for recidivist injectors and recidivist non injectors were also similar to those found in injectors and non injectors who participated in the census survey.

In the census survey the anti-HBc positivity rates in Irish prisoners and injecting drug users were similar to those in England and Wales [21] in spite of the higher proportion of injecting drug users in Irish prisons. The prevalence of antibodies to hepatitis B core antigen in injectors entering Irish prisons was lower than the 52% and 43% prevalence reported in injectors entering Australian prisons, [17 18] and also lower than in injectors entering French prisons (37%). [19]

More than one third of all prisoners, and more than four-fifths of injecting drug users, were anti-HCV positive. The prevalence of anti-HCV in Irish prisoners who reported injecting drug use was similar to that found in Greek prisoners [20] but higher than that reported in Scottish prisoners, [48] and also English and Welsh prisoners. [21] More than one fifth of all Irish prison entrants were anti-HCV positive. This figure was lower than that reported for prison entrants in Australia (39% and 37%). [17 18] The prevalence of anti-HCV in Irish prison entrants (70%) who reported injecting drug was higher than that reported among injector prison entrants in Australia (64% and 66%). [17 18] The lower prevalence rates of anti-HCV in injectors in Scottish prisons may be as a result of access to harm reduction strategies in these prisons.

The prevalence rates of infection with HIV in the census survey and committal survey were similar. The prevalence rates were also comparable to those reported in prison inmates in the UK (0 to 4.5%), [21 58 59 61 63 64] and prison entrants in developed countries (0 to 6%). [17 65 57 19 60] Horsburgh *et al* [56] also found the same prevalence of anti-HIV in both prison entrants and a cross sectional sample (2.4%) as in this study.

4.3.2 Respondents' Characteristics

The characteristics of the respondents who participated in the prevalence surveys were similar to the findings from other Irish studies. [90 91] Irish prisoners were mainly young males and a high proportion of them injected drugs. In the census survey 43% of the respondents reported injecting drug use, while in the committal survey 29% reported injecting drug use. When first time entrants were excluded from the committal survey population, 40% of recidivist prison entrants reported injecting drug use. Only 7% of first time prison entrants reported injecting drug use.

In the committal survey over half of the prison entrants were committed on remand. This was a direct result of the Irish bail laws, which permit the detention of certain defendants until trial. This leads to a high proportion of short-term prisoners in Irish prisons. Also, in this survey the researchers observed that a noticeable proportion of the new entrants to prison were imprisoned for non payment of fines. Unfortunately this observation was not consistently documented in our questionnaires and so cannot be quantified. O'Mahony [134] reported that 35% of committal prisoners were imprisoned for non payment of fines. This sub-group accounted for a high proportion of the new entrants to prison during our survey, and partially account for the lower proportion of first time entrants reporting injecting drug use compared with recidivist prison entrants.

Only 5% of the census survey population and 7% of the committal survey population were women. Bacik *et al* [90] found that Irish women were less likely to commit crime. The authors reported that crimes committed by women were less serious in nature than those committed by men. Women were more likely to be cautioned by the police and less likely to be prosecuted. Being female was not the only factor that reduced the likelihood of imprisonment, but also being married, being from a higher socio-economic group, and/or having dependent children. In both prevalence surveys, a higher proportion of female respondents reported injecting drug use than male, but the gender differential was larger in the committal survey. In both surveys, this resulted in a higher prevalence of the infection in women respondents than in men respondents. When models were created to identify independent characteristics and risk factors for injectors, female gender remained an independent characteristic for testing positive for anti-HCV in the committal population. However when the data

were further explored it was observed that a higher proportion of these women reported sharing needles in the month prior to imprisonment than men. This suggests that female prison entrants were more likely to be chaotic drug users rather than having an increased biological susceptibility.

O'Mahony [134] reported that the Irish prison population had a much higher proportion of young offenders (15 to 21 years old) than the proportion found in other European countries, 25% *versus* 10% respectively. In the census survey a slightly lower proportion of young offenders was observed (21%) while the proportion of young offenders in the committal survey was much higher (34%). Ireland has only one young offenders institution, St Patrick's Institution, Dublin. Therefore, only young offenders from Leinster are committed to an appropriate institution. At the time of the census survey, less than two fifths of young offenders were serving their prison sentence in this institution. This reflects the transfer system within Irish prisons. The author discovered a variety of reported reasons for transferring young offenders to other adult prisons. These include efforts made by the prison authorities to detain inmates near their homes (so as to permit family visits); to address serious overcrowding in Dublin prisons; and to facilitate inmates' requests to avoid the heroin culture in Dublin prisons.

4.3.3 Respondents' Risk Factors

Injecting Drug Use and Practices

In both surveys, approximately one fifth of injectors reported that they had commenced injecting in prison. In separate in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) conducted by the author, preliminary results indicated that * the most common reasons for starting injecting in prison were: inadequate quantities of heroin available to support a smoking habit (smoking wastes too much heroin), peer pressure (to belong to the crowd), boredom (helps the time pass in prison) and escapism (helps cope with imprisonment). Surveys in some Scottish prisons have also reported similarly high figures, [63] [64] [106] but

*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

elsewhere the proportion commencing injecting drug use in prison is much lower. [61 64 106]

Respondents in both surveys reported starting injecting at similar ages. In the census survey a significantly higher proportion of the injecting drug users reported commencing injecting more than three years prior to the survey than injectors in the committal survey. In general, this finding was explained by older age profile in the census survey population than in the committal survey. With the exception of those injecting three to five years where the prevalence of anti-HCV was higher in the census survey (128/151, 84.8%) than in the committal survey (33/48, 68.6%), p= 0.01. It is possible that this age group had higher risk injecting practices (as a result of increased time spend in prison) in the census survey than in the committal survey.

A lower proportion of the census survey population reported injecting in the month prior to the survey than the committal survey population. Less than half of those with a history of injecting drug use reported continuing to use while in prison. This suggests that some injecting drug users stopped injecting while in prison. This is in line with the lower injecting frequency inside *versus* outside prison reported in other studies. [20 58 61 63 64 102 104] In both surveys a higher proportion of injectors reported that they had shared needles in prison than outside prison. This is consistent with sharing practices reported inside and outside prison in England [104] and Australia. [111] In the committal survey the overall proportions of injector respondents who reported sharing needles, syringes and spoons inside or outside prison was lower than in the census survey. This may be as a result of recently increased availability of harm reduction in the community as well as increased awareness of the dangers of needle sharing. A higher proportion of injector respondents 20 to 35 years old reported sharing injecting equipment than in those 15 to 19 years old indicating that the younger age group may have a higher awareness of the benefits of harm reduction. Smith *et al* also used this explanation to account partially for the lower prevalence of anti-HCV in younger Irish injecting drug users in the community. [49] Other possible explanations are that the highest proportion of chaotic drug users is among the 20 to 35 year old population cohort, or a dose-response relationship (older injectors are

more likely to have injected for a longer period). During the in-depth interviews * the interviewees were asked: were needles easily available in prison? in what condition are the needles and syringes? how do injectors clean their needles? and was it possible to avoid sharing needles in prison? According to the respondents needles and particularly syringes are very scarce in the prisons as they are bulky and difficult to pass across during visiting. They are usually brought in at the time of committal, although the 'small brown needles' can be passed through personal contact during a visit. When a prisoner is released he passes his needle and syringe on to another prisoner. Needles and syringes are never disposed of unless they are found by prison officers or can no longer be reshaped for functional use. Cleaning needles was in general a haphazard procedure. The cleaning procedure was divided into two phases: cleaning during and after injecting. During injecting most reported rinsing the needle and syringe in a cup of cold or hot water between each user, but in general the same cup of water was used for all the injectors. Once the group had completed injecting, some respondents used bleach, others used hot soapy water, others used cold water only and others reported a combination of these methods to clean and store their injecting equipment. Some respondents believed that bleach killed HIV and cold water killed hepatitis C virus. Respondents reported that it would be impossible not to share your needles with others in prison. Owning a needle in the prison environment is a currency and would permit an injector to maintain his heroin habit while in prison. If an injector refused to share his needle he would be isolated from other users.

Hepatitis B infection was associated with drug use and with older age. Heroin was introduced to Dublin in the early 1980s and this was associated with an increase in cases of hepatitis B infection in the early cohorts of injecting drug users (documented outbreak 1982 to 1984). Later cohorts of injecting drug users may have been protected to some extent by the provision of harm reduction programmes (methadone maintenance and needle exchange which were introduced in the early 1990s[79]) and hepatitis B vaccination. The prevalence of anti-HBc was higher in those 15 to 19 years in the committal survey than in the same age group in the census survey. This may reflect a recent unidentified

*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

cohort of hepatitis B infection. In 1998, the total number of hepatitis B cases increased dramatically (from less than ten to more than 100) but this was mainly as a result of the introduction of hepatitis B screening for asylum seekers. Examination of official hepatitis B case notifications for persons aged 15 to 19 years identified 12 cases in 1998 and 7 cases in 1999 (Dr L. Thornton personal communication 2001). No risk factor data were collected and these cases may represent either young drug users or asylum seekers or both. When the two survey populations were combined and first time entrants excluded, the most important independent risk factor for anti-HBc was injecting drug use. This finding is consistent with findings from other European studies.[20 21 19]

In the combined survey populations, excluding new entrants, for recidivist prisoners the most important independent risk factor for anti-HCV was injecting drug use. This finding is consistent with findings from other two other studies. [20 21] The prevalence rate of anti-HCV was highest in those 20 to 24 years old. Given the limited access to injecting equipment in prison and the high prevalence of infection, it is hardly surprising that sharing needles in prison also emerged as a significant risk factor for hepatitis C in injectors. Malliori *et al* [20] reported similar findings in Greek prisons. Gore *et al* [48] found a small but non-significant difference in the overall prevalence of hepatitis C between those who injected in prison (53%) *versus* those who did not inject in prison (44%). Injectors who had spent increasing time in Irish prisons were more likely to test positive for anti-HCV. Butler *et al* [18] and Weild *et al* [21] also reported that exposure to prison was an independent risk factor for testing positive for anti-HCV.

HIV was less common among Irish prisoners than expected. This finding is consistent with findings from other European studies. [20 21 19 60 100] For recidivist entrants and inmates, the most important independent risk factor for anti-HIV was injecting drug use, although the numbers in this study testing positive for anti-HIV and reporting injecting drug use were very small.

The proportion of prisoners who reported that they had accessed 'methadone prior to this committal' was similar in both surveys. This reflects the estimated proportion of drug users attending community based methadone programmes. [77] At the time of these surveys prisoners were not offered methadone maintenance on entry to prison. In fact, the Irish prison services only provided a short methadone detoxification

course to prison entrants and this course did not comply with the recommendations of the methadone protocol. [85] Experience of methadone maintenance in community settings suggests that if a greater proportion of drug users were offered methadone maintenance in prison, [87] this might have the effect of reducing the risk of viral transmission.

Sexual Practices

In both Irish surveys, a very low proportion of men reported having sex with other men while in prison. These findings are similar to the findings from seven Scottish prison surveys where between 0% and 2% of male inmates said they had anal sex with other men while in prison. [58 59 61 63 64] The proportion of men reporting having sex with other men in Australian [103] and English and Welsh prisoners [21] is higher than that reported by Irish prisoners. In the Irish prevalence surveys, a total of seven men reported anal sex in prison having previously denied ever having anal sex with another man. It may be that this behaviour was, for them, atypical, and would not have occurred outside prison. Turnbull *et al* [104] reported a similar pattern of behaviour in English prisoners. When the two prevalence survey populations were combined and new entrants were excluded, men who reported anal sex with men were more likely to test positive for anti-HIV.

A history of sexually transmitted infections is an indicator of "unsafe sex". When the two survey populations were combined and first time entrants excluded, a history of treatment for sexually transmitted infections was an independent risk factor for testing positive for anti-HBc and anti-HIV. In the committal survey the proportion of respondents who reported having had treatment for a sexually transmitted infection was lower than in the census survey. This lower prevalence remained even when first time entrants were removed. The explanation for this observation is unknown but possible reasons are: lower exposure in this young population, inability to recognise the symptoms, too embarrassed to seek medical treatment or unwilling to reveal previous treatment for sexually transmitted infections to the researchers. In both surveys, reporting treatment for sexually transmitted infections was more common in injectors than in non injectors. In the Scottish prison studies, [58 61 63 64] the proportion of injecting drug users ever treated for a sexually transmitted infection was also higher than in non injectors. Injector males in both surveys and injector females in

the census survey were more likely to report having had treatment for a sexually transmitted infection than their non injector counterparts. In the committal survey, female injectors and their counterpart non injectors were equally likely to report treatment for a sexually transmitted infection. It is possible that this indicates that a number of short term female prisoners are imprisoned for prostitution and these do not have a history of injecting drug use.

Only the committal survey respondents were asked if they had ever been paid (money or goods) for sex. A small proportion of respondents (2.5%) reported having been paid for any type of sex. None of the non injectors admitted that they had ever been paid for sex, but this may be because they did not want to reveal this practice to the researchers. Five of the 23 women injectors who answered this question reported that they had been paid for sex. Female injectors may have sold sex to pay for their drug habit The prevalence rates of the three viral infections were higher in respondents who reported ever having been paid for sex than in those who reported never having been paid for sex. However this was not an independent risk factor in the logistic regression models possibly because a high proportion of those reporting selling sex were also injecting drug users.

In the census survey respondents testing positive for anti-HIV were more likely to report using condoms during heterosexual intercourse than those testing negative for anti-HIV, while in the committal survey equal proportions of respondents reported condom use. In the census survey initially it was thought that this may have occurred because those infected with HIV wished to protect their partner(s) but the lack of consistency with the committal survey findings leaves us wondering if there is another unidentified explanation such as the older age profile of the census prison population.

Tattooing

Tattooing was not asked about in the census survey. In the committal survey almost three fifths of the 593 respondents reported having a tattoo. Three quarters of the injector and half of the non injector respondents reported having a tattoo. One quarter of those reporting a tattoo had had it done in prison. In the committal survey tattooing in prison was the only independent risk factor identified for the presence of antibodies to hepatitis C in non injectors. Abildgaard [38] reported the presence of hepatitis C antibodies in an individual with a tattoo but no other risk factors. Turnbull *et al* [104]

reported that 6% of prisoners and Dolan *et al* [110] found that 23% of prisoners had a tattoo done on their last occasion in prison. Turnbull *et al* [104] also found that half of the respondents who reported having a tattoo done in prison had shared tattooing equipment. Taken together, these findings suggest that tattooing may transmit hepatitis C in prison.

4.3.4 Uptake of Hepatitis B Vaccine

The prison services policy in the Republic of Ireland is to offer hepatitis B vaccination to all prisoners with sentences of eight months or longer (Dr. E. Dooley, personal communication, 1995). In the committal survey the proportion of respondents who reported having had one or more doses of hepatitis B vaccine was lower than in the census survey. This is a direct result of the prison services policy as a very high proportion of committal prisoners are on remand or serving short sentences (less than six months). Almost half of the respondents in the census survey and 30% of recidivist prison entrants in the committal survey reported receiving one or more doses of hepatitis B vaccine. It is important to note that the vast majority of those respondents who had accessed the vaccine had done so in prison, 91% of respondents in the census survey and 82% of recidivist prison entrants in the committal survey. Although there is room for improvement, vaccine uptake is higher than in English and Welsh prisoners [21] and injecting drug using populations in the England. [135] When both surveys were combined and first time entrants were excluded, respondents who reported having had one or more doses of hepatitis B vaccine were less likely to test positive for anti-HBc. This finding and the unexpectedly low prevalence of hepatitis B suggest that the Irish vaccination policy may be having some effect.

4.3.5 Sensitivity and specificity of oral fluid tests

Cameron et al [147] estimated the sensitivity and specificity for oral fluid assay when detecting the presence of anti-HCV. She reported high specificity (over 99%) and lower sensitivity (85%). The sensitivity estimations are higher than that found by Parry while specificity estimations are similar. Both authors suggest that oral fluid assay is suitable for epidemiological assessment (although the prevalence of anti-HCV will be underestimated) but confirmatory serological tests are required for diagnostic purposes.

4.3.5 Self Reported *versus* Laboratory Viral Test Results

There were many discrepancies between reported results and the results of the oral fluid assays.

Almost half of those who self-reported a positive result for hepatitis B virus were in fact antibody negative on oral fluid testing. A similar result was found in injecting drug users in England, with 38% of those who reported past infection being negative for anti-HBc. [135] Unless previously vaccinated, these individuals remain susceptible to hepatitis B virus but would be unlikely to avail of or be offered vaccination in the belief that they are already infected.

Thirty seven percent of those in the census survey and one quarter of those in the committal survey who thought they were negative for hepatitis C virus, were in fact antibody positive on oral fluid testing. As infection persists in the majority of those with hepatitis C viral antibodies, [40 41] these prisoners unwittingly pose an infection risk to others if they engage in activities likely to transmit infection. Being unaware of their true infection status, they are also unlikely to be referred for specialist assessment and treatment as appropriate. Information collected during the indepth interviews indicated that* some respondents confuse hepatitis A, B and C, their methods of transmission and prevention. This may explain some of the inconsistencies between self reported and laboratory test results for hepatitis. Also, Irish prisoners who have hepatitis C receive a preferential diet so it may be beneficial to report being hepatitis C positive.

Eleven respondents in the census survey and six respondents in the committal survey reported they were infected with HIV when in fact they had a negative oral fluid result. The psychological consequences of thinking one is anti-HIV positive when in fact one is negative for the infection should not be underestimated. Some prisoners during the indepth interviews reported that* they were afraid to have a HIV test. They assumed that they were HIV positive because of their perceived high risk practices.

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*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

Other respondents who had tests that were negative and reported an enormous sense of relief. On the other hand there are privileges for prisoners who test positive for HIV. Edwards *et al* [136] reported that one quarter of 100 prisoners who reported that they were HIV positive were in fact negative. The authors also reported that 14 out of a further 21 inmates from two south London prisons declined repeat tests while also reporting attendance at a HIV treatment centre. All 14 were found to have provided false information. Their reasons for stating that they were HIV positive when in fact they were HIV negative were a desire for a letter to plead mitigating circumstances in court, access to a preferential diet, and/or access to drug therapy (sedatives or opioids). This could also be occurring in Irish prisons.

At the time of these surveys routine testing for these three blood borne viruses was performed at the Viral Reference Laboratory at the National University of Ireland, University College, Dublin. We were unable to use this facility, as at that time it did not have the equipment required to identify antibodies to the hepatitis C virus from oral fluid samples. Therefore, the Public Health Laboratory Services at Colindale in London performed the laboratory analysis for this study. It is possible that there was a degree of laboratory variability between the two laboratories.

Experience from this study and other studies [135] [136] implies that self-reporting is not a reliable method of determining infection status. The mismatch between self-reported prevalence and laboratory results thus has important implications for education and counselling programmes within the prison service, and may have serious public health consequences. Some prisoners are unaware that they have been infected and may continue to transmit infection through behaviours such as sharing equipment for injecting drug use and unprotected sexual intercourse. Accurate knowledge of infection status, coupled with appropriate education programmes, may result in risk behaviour modification, increased vaccination uptake and reduced risk of transmission.

4.4 POLICY IMPLICATIONS AND FUTURE RESEARCH

4.4.1 Policy Implications

Only a small number of the new entrants committed to prison during the survey period were infected with one or more of the viruses while a much larger proportion of recidivist prisoners were infected with one or more of the viruses. As imprisonment leads to high risk practices, these surveys point to the need for increased testing, harm reduction and infection control measures in Irish prisons.

Viral infections – Testing and Treatment

A very high proportion of injecting drug users in Irish prisons tested positive for anti-HCV. The infection persists in 80% of those infected [40 41] and up to 50% of these will develop chronic hepatitis. Between 30% and 60% of those with chronic hepatitis as a result of hepatitis C infection will develop chronic active hepatitis and, of these, 5% to 20% will develop cirrhosis of the liver. [12] This will contribute significantly to the future burden of disease within deprived communities in Ireland. In the USA, recent research into drug therapy for hepatitis C has yielded encouraging findings using combination therapy during initial treatment and treatment of relapsed cases. [51 52 137] It is well recognised that drug users are unstable and may continue to inject while on methadone maintenance. In Ireland hepatitis C treatment protocols stipulate that injectors with this infection requiring treatment for their condition must be stable on methadone maintenance for a period of time. In separate in-depth interviews with prisoners (16 of whom had a history of injecting drug use)*, the respondents indicated that the most stable periods in their lives have been while serving a prison sentence. Edwards et al [136] reported good adherence to HIV therapy in two south London prisons. It would be advisable for the prison health authorities to continue to review research on hepatitis C treatment and to consider proactive treatment for sentenced ex-drug user prisoners.

It would also be advisable for the hospital specialists to review their criteria for treatment when dealing with sentenced prisoners.

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*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

It is clear that both injecting drug use and infection with hepatitis C virus are linked and endemic in Irish prisons. This vulnerable population may not be aware of the possible long term consequences of being infected with the hepatitis C virus. In the in-depth interviews,* prisoners who reported that they were infected with the hepatitis C virus were asked how they felt when they received their viral test results? Some prisoners said they were delighted they 'only' had hepatitis C and not the virus (HIV). Respondents also indicated that every injector is infected with the hepatitis C virus and a common infection could not have serious consequences. There is an urgent need to provide updated information to both health professionals and prisoners on the prevention of, and the long term consequences of hepatitis C while updating both groups on treatment possibilities for hepatitis C

The low prevalence of HIV in the two surveys is consistent with data from outside prison which demonstrate a fall-off in the number of drug users presenting with HIV and AIDS in this country over the past 5 years. [67] There were two undiagnosed cases of HIV among the respondents tested in the committal survey and three undiagnosed cases of HIV among the respondents tested in the census survey. The value of assessing risk factors and offering routine testing to those with risk factors such as injecting drug users should be considered in the future as research has shown that current treatment regimes for HIV positive individuals, when commenced early, extend survival and prevent damage to the immune system. [138 139] Infection with HIV is always a cause of concern because of its high death rate. However, it should be stressed that the major public health issue identified in this study is hepatitis C.

The results of this study demonstrated that self-reported infection status is unreliable and should not be used as a basis for planning preventive and treatment services. All prisoners need to have the opportunity to request testing for hepatitis B virus, hepatitis C virus and HIV directly from the prison doctor, with assurances of confidentiality of both request and result. The test results should be provided to all those tested and the health professionals need to ensure that those tested understand the test results. More than one explanatory session may be required. Those who test positive need to be

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advised about reducing the risk of transmission to others, and should be referred for further investigation and treatment where appropriate. If oral fluid rather than blood testing is used, an additional more sensitive test may be required for those testing negative for hepatitis B virus and hepatitis C virus.

Hepatitis B Vaccination

In both surveys hepatitis B vaccination uptake is higher in Irish prisoners than reported in prisoners incarcerated in English and Welsh prisons. The vaccine was targeted towards long term prisoners rather than towards those who are hepatitis B negative. Vaccine commencement rates are higher in injecting drug users but not completion rates. This may be because the importance of completing the vaccine was not clear to the injecting drug users or because they do not think the vaccine is important or useful. In separate in-depth interviews* many respondents reported misinformation about hepatitis B and hepatitis C that may have influenced their evaluation of the effectiveness of the vaccine. Some respondents reported that they had received hepatitis B vaccination and subsequently discovered that they were hepatitis B positive. The most likely explanation is that they were infected with hepatitis B prior to receiving the vaccination, but their perception was that the vaccine did not work. The purpose of, number of doses, and target group for the vaccine need to be clarified with all prisoners. The *'National Immunisation Guidelines for Ireland'* have identified prisoners and injecting drug users as high risk groups and recommend that they complete a course of the vaccine. [31] The vaccine is now available free of charge to those who hold a medical card and are also specified as belonging to a high risk population according to these guidelines. With the exception of those having documented evidence of immunity, all prisoners should be offered the vaccine on committal, regardless of their length of sentence. Follow up doses can be given by their general practitioner or in drug treatment centres. However, this will lead to clients accessing vaccination services from different providers and patient held records may be required to prevent duplication of effort.

*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

Harm Reduction - Drug Use and Practices

In Ireland, as elsewhere, injecting drug use in prison is here to stay. The time has come for policy makers, researchers and clinicians working in prisons to ensure that being in prison does not add unnecessarily to the health risks of this already disadvantaged population. Community drug treatment services in Ireland have evolved considerably over the last decade and needle exchange and methadone maintenance are widely available. The Irish prison health care system has not kept pace with this change, and but is not unique in this, as few prison health care services implement such measures. [81 115 140] Our surveys suggests a need to consider provision of harm reduction measures in Irish prisons. Sterilising tablets, needle exchange, methadone maintenance, methadone detoxification and drug free units have been presented as harm reduction methods that could be used in prisons. The evidence supporting the afore-mentioned harm reduction methods in prison settings needs to be examined prior to their introduction. There is considerable evidence for promoting methadone maintenance [87] and needle exchange [45 49 89] in community settings, although there is limited evidence of their effectiveness in preventing hepatitis C in community settings or in the prison environment. [111 112 116] Small scale prison studies have shown that bleach and needle exchange can reduce the spread of HIV in prisons [109 113] but has not been evaluated for hepatitis C. Dolan *et al* observed a lower incidence of anti-HCV in injectors randomly allocated to methadone maintenance than in injectors randomly allocated to a methadone maintenance waiting list in an Australian prison. [116]

Harm Reduction - Tattooing

The findings of the committal survey suggest that tattooing may transmit hepatitis C. It may be advisable therefore to include a question on tattooing in future viral prevalence studies and to consider the provision of sterile tattooing facilities in prison.

Sexually Transmitted Infections

One sixth of injecting drug users reported treatment for sexually transmitted infections, and, in the committal survey were more likely to sell sex for income than non injectors. Other sexually transmitted infections generally are associated with HIV and hepatitis B and their presence increases susceptibility to HIV. Sexually transmitted infections can be easily treated in sentenced prison populations.

Impact of this Research on Infection Control and Drug Services in Prison

The official reports [121 124] of this study and subsequent peer reviewed publications [122 123] have not only been a catalysts for dialogue internationally [141] but also at a national level. As a result there has been reluctant agreement by the prison services that a comprehensive and compassionate approach is required to address the use of illicit heroin and its consequences in the Irish prison setting.

Since the submission of these reports [121 124] to the Department of Justice, Equality and Law Reform by the research team, a Steering Group on Prison Based Drug Treatment Services has been instituted. The Report of this Steering Group [142] outlines ten intentions that will result in the introduction of prison based drug treatment services. Two statements are particularly relevant to the prevention and treatment of hepatitis C and HIV. The first and most significant is that "*the prison service must replicate in prison, the level of medical and other supports available in the community for drug dependent people to the maximum extent possible.*" This is a formal statement of support for the principle of equivalence of care with community drug services. It permits criticism of prison services if they fail to fulfil this intention. The second intention outlined indicates that the Department of Justice, Equality and Law Reform intends to employ a multi-disciplinary team of professionals supported by a drugs services co-ordinator (employed by the Eastern Regional Health Authority) to provide drug treatment services in the prisons. This is the strongest formal link yet with the statutory health service authority and will help endorse the principle of a seamless drug service. There is a drug services plan proposed for four of the six Dublin prisons and an intention to review needs in the other two prisons. These services include prevention, detoxification, methadone maintenance, counselling and education. The intentions of the Steering group for Prison Based Drug Treatment Services are

encouraging. The plan developed by them seems reasonable, although the report does not specify deadlines or targets.

Since the publication of the findings of the two prevalence surveys in Irish prisoner populations, [121] [122] [124] [123] methadone maintenance has been introduced in three Dublin prisons. Between January and April 2001, 98 individuals have been commenced on methadone maintenance in Dublin prisons; of these 68 individuals were currently taking methadone maintenance at the end of April 2001. (Dr Joseph Barry, Personal communication -information taken from the Central Methadone List 2001).

There have been two attempts to introduce the formal distribution of full strength household bleach in Irish prisons and these have been rejected by the Prison Officers' Association on both occasions. The provision of bleach tablet distributions in London prisons [143] and needle exchange interventions in Swiss prisons [114] have not led to an increase in attacks on prisoners or prison officers.

Stakeholders in Irish Prisons

A serious shortcoming of the Report of this Steering Group for Prison Based Drug Treatment Services [142] was the lack of consultation with the prisoners who will use these services and with the prison officers who are key to supporting and sustaining these services.

Little research has been conducted to examine the potential strengths and weakness of the large number of prison officers working in Irish prisons. We need to know what this important group of people know, believe and would be prepared to do about illicit drug use in prisons and the prevention and control of blood borne viruses. In 2000 Dillon, [144] a prison officer, conducted a survey of prison officers' (from the Mountjoy Complex) knowledge and perception of four infectious diseases (hepatitis B, hepatitis C, HIV and tuberculosis). He reported that their knowledge of infectious diseases in the workplace was poor and many officers did not know how these diseases could be transmitted. For example, one sixth of the prison officers thought that hepatitis C could be contracted through shaking hands, handling prisoners' personal items, and their cell doors. Almost half of the prison officers thought that hepatitis C could be contracted through coughing and sneezing. Many officers (87.2%) admitted that they did not know enough to protect themselves from the infections. Junior officers were

more likely to spend most of their day working with prisoners, and reported the highest perception of risk and worry. These findings indicate that a new approach to training is required for prison officers if they are to be involved in the prevention and control of infection in the prison environment. A further study, also by a prison officer, is being conducted in the Dublin prisons to determine prison officers' knowledge, attitudes and beliefs in relation to drug users, illicit drugs and drug services.

Consultation with prisoners indicated that* a number of respondents (both injectors and non-injectors) felt that heroin could be removed from the prisons through screened visits. Screens could be provided in two ways: physical screens or random urine tests. Some respondents mentioned that screened visits punished non drug users as well as drug users. Respondents also thought that removing heroin would lead to disquiet unless it was replaced with methadone detoxification or maintenance programmes. They recommended that the main prison in Mountjoy follow the detoxification programme available in its medical unit. They pointed out that only a very small number of prisoners could access the programme in the medical unit thereby limiting its effect. They also reported that St Patrick's and Wheatfield had recently introduced methadone maintenance and detoxification programmes. There was some questioning by respondents as to why the prison with the most serious problem (Mountjoy Male) has the poorest response. They also felt that methadone maintenance ought to be provided to those on maintenance at the time of committal as these people would definitely recommence injecting as withdrawals from methadone were very severe, more severe than withdrawals from heroin. Respondents thought that prisoners on maintenance or detoxification should be placed in 'special units' and have random urine testing. Incentives should be given for those with 'clean urine' and those breaking the rules should be removed from the drug free unit. Some incentives suggested were increased access to gym, the school, or a reduced sentence. The respondents, both injectors and non injectors, had some criticisms of methadone programmes. Firstly they thought that methadone was more addictive than heroin.

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*Preliminary results of in-depth interviews with 31 prisoners (16 of whom reported they were injecting drug users) in Portlaoise and Wheatfield prisons to determine drug use practices inside *versus* outside prisons and also their knowledge, beliefs and practices in relation to Hepatitis B, Hepatitis C and HIV. These interviews were done by JL.

Secondly respondents mentioned that many people prescribed methadone used heroin as well, some even sell their methadone for heroin. On the good side many mentioned that methadone maintenance decreased the total cost of the drug habit and reduced the number of times people injected.

Respondents also stated some people would not stop injecting in prison and for these it would be better to have a controlled needle exchange. They stated that this would require very strict controls. They did admit the prison officers and some prisoners would not like it and might fear attacks. Some respondents thought the current injecting equipment was more dangerous as it was blunt, rusty and used by several drug users. Respondents felt that overall the needle exchange programmes worked well on the outside in particular the one in Merchants Quay. Some respondents thought that this prevented the spread of infections although other respondents said that they or their friends were often too lazy to go and exchange their injecting equipment.

Counselling services were also considered another important strategy for those with addictions, although none of the respondents who had accessed counselling outside the prison found it useful. These respondents thought that this was because they were not ready to give up drugs or they were trying to give up drugs to please their mother, partner or other person. Many respondents stated that one has to give up heroin because one sees the benefit for oneself. Most respondents stressed a preference for individual rather than group counselling.

Respondents did mention that alcohol and other drugs also led to serious addiction problems that lead to crime, either robbing or assault, and these addictions also required attention within the prison system.

Health Services

Mental health, suicide, premature death and illicit drug use are words commonly used in connection with Irish prisoners. In 1986, 31% of the prisoners surveyed described themselves as ill. [92] Almost one fifth of the sample (18%) had been admitted to a psychiatric hospital and/or reported having attempted suicide. In 1999 a general health care study of the Irish prisoner population was conducted by the Department of Health Promotion at the National University of Ireland, Galway. [94] The four most

common conditions reported by prisoners in the 12 months prior to the interview were depression (22% of male prisoners and 42% of female prisoners), anxiety (14% male and 11% female), skin diseases (12% male and 15% female), and asthma (10% male and 36% female). All mental health indicators were much worse for the Irish prison population than for the general population. Mental health indicators were particularly high in women prisoners, 75% of women prisoners and 48% of men were classified as psychologically distressed. Prisoners reported a high lifetime drug utilisation rate (72% of males and 89% of females compared with 14% of males in the SLAN survey). One quarter of the men and just under two-fifths of the women drank daily outside prison. All women respondents and 91% of men reported current cigarette smoking. These findings imply that when addressing the problems of injecting drug use in prison one needs to consider other addictive substances and the mental health issues affecting this vulnerable population.

A Steering Group on Prison Health Services has been convened but this group has not yet reported. As highlighted in Chapters 1 and 4 of this thesis, prisoners suffer from a range of sensitive and serious medical conditions. In addition to medical treatment, confidentiality, counselling and education are required to deal with these conditions. The provision of these skills in the interests of prisoner health and well being requires a multidisciplinary team, independent of the prison security function.

4.4.2 Health Service and Research Questions

The United Nations document '*Standard Minimum Rules for the Treatment of Prisoners*' [145] states that the medical services should be organised in close relationship to the general health administration of the community or nation. The United Nations document '*Principle of Medical Ethics relevant to the role of Medical Personnel in the Protection of Prisoners and Detainees against Torture and other Cruel, Inhuman and Degrading Treatment or Punishment*' [146] states that medical personnel should not be involved in any other duties outside their health remit. In Irish prisons neither of these principles is observed. The prisoners' health care is provided through the prison services/authorities and the medical orderlies are often requested to perform security duties during periods when security staff numbers are below accepted coverage levels. The management and staffing of the Irish prison health services require restructuring in order to comply with the United Nations guidelines .

This study provides valuable information relating to the proportion of prisoners infected with each of the viruses and the main risk factors for infection. It quantifies an appalling situation in Irish prisons which requires urgent intervention. Both immediate intervention and rigorous surveillance are required to develop and monitor appropriate harm reduction services in the Irish prison setting.

The prison environment and culture is unfamiliar to the author and to other health professionals who are interested in advocating for and providing interventions that would achieve humane and safe containment. Therefore, the health professionals need to learn from and consult with the prisoners and prison staff in order to develop appropriate drug services. The use of validated qualitative and quantitative research methods will enhance this learning process.

The following questions and issues were raised during this study:

Are infection control procedures for the three blood borne viruses in Irish prisons adequate?

The infection control policy is not clearly documented in relation to preventing and controlling the spread of hepatitis C in Irish prisons. Once policy and procedures are documented, these should be reviewed in line with current evidence based practice and where necessary revised policy and procedures developed. A surveillance system is required to identify disease trends throughout Irish prisons. The design and implementation of this surveillance system must ensure confidentiality for individual prisoners.

What are the implications of testing for hepatitis B, hepatitis C and HIV in prison?

If testing is offered to all high risk prisoners, the resources required, such as counselling and therapy for hepatitis C and HIV, need to be itemised and secured. Procedures relating to the confidentiality of individual prisoners' test results need to be reviewed and where required revised procedures put in place, particularly in relation to confidentiality.

What is the impact of harm reduction on risk practices and blood borne virus transmission rates in the prison environment?

In other prison settings the incidence rates of hepatitis C and HIV were reduced following the introduction of harm reduction interventions. The negative consequences expected by prison officers in these prisons did not happen. In Ireland the highest prevalence of hepatitis C was found in respondents aged 20 to 24 years old. Innovative harm reduction approaches are required in our prisons to prevent the spread of this infection to future cohorts of drug users coming on stream. Such approaches will be more effective if based on the prisoners' and prison officers' ideas. The effect of any new approaches requires systematic monitoring and evaluation. The risk factors for infection in Irish drug users both in prison and outside require further exploration. Prisoners' knowledge about the blood borne viruses and their perceptions of routine testing also require investigation.

The Department of Justice, Equality and Law Reform and the Department of Health and Children ultimately have a responsibility to ensure that statutory institutions such as the Prison Services Authority and the relevant health boards provide a service that meets minimum standards and that is accountable to its recipients. Currently the Department of Justice, Equality and Law Reform and the Prison Service Authority lack the research skills required to gather baseline data and the health service development experience necessary to prevent the transmission of bloodborne viruses and, as well as the epidemiological skills to institute a disease surveillance system. But they could commission research through academic institutions and invite health boards to design and assist with the implementation of appropriate interventions. The would help them address the afore mentioned research questions and health service issues

Would high hepatitis B vaccination coverage reduce the prevalence of hepatitis B infection in Irish prisoners?

The hepatitis B vaccination coverage reported in this survey is based on self reported vaccination status. Its accuracy is not known. There is a case for using laboratory tests to assess coverage. Although coverage is better than reported elsewhere proactive interventions are needed to further improve coverage. Recipients require handheld records to reduce the administration of unnecessary doses of the vaccine.

Finally, it would be important to develop and institute a surveillance system to monitor incidence of hepatitis B infection and vaccination coverage.

What is the potential of prisoners and prison staff in reducing the prevalence of blood borne viruses and providing drug services in Irish prisons?

The potential roles of the prisoners, prisoner officers, nurses and doctors in supporting and sustaining drug services in prison could be usefully explored and the resources required to utilise this potential estimated. Investigation of the prisoners' role as peer educators may prove valuable.

CHAPTER 5 Conclusions

Infection with hepatitis C secondary to injecting drug use is endemic in Irish prisons. The prevalence of hepatitis B core antigen is lower than expected, partially due to the hepatitis B vaccination programme in Irish prisons. The prevalence of HIV antibodies was low and this is in line with findings in other countries.

In the Irish prison populations antibody prevalence rates for all three infections were linked to the proportion reporting injecting drug use. Women prisoners and women prison entrants were more likely to report injecting drug use than men. Those who reported increasing time spent in prison over the previous ten years appeared to have an increased risk of contracting hepatitis C virus. The increased risk associated with time spent in prison is possibly due to large and varied cohorts of injectors sharing injecting equipment. A large proportion of first time prisoner entrants had never injected and belonged to a different sub-population. Tattooing may be a risk factor for non injectors.

This study quantifies an appalling situation in Irish prisons and this situation urgently requires intervention. Large scale harm reduction interventions are required in the Irish prison setting such as the provision of drug free units, methadone maintenance, methadone detoxification, limited needle exchange and sterile tattooing equipment. These harm reduction services will be more effective if developed considering input from the users (prisoners) and providers (prison staff). Alongside harm reduction interventions, disease surveillance is required to ensure that the interventions are successful in preventing transmission of the three blood borne viruses. In Irish prisons, there are opportunities to treat inmates for hepatitis C, to stabilise those with HIV and to screen for and treat sexually transmitted infections.

Prison environment and culture are unfamiliar to health professionals who are advocating for and providing interventions that would achieve humane and safe containment. The health professionals therefore, need to learn from and consult with the prisoners and prison staff. The use of validated qualitative and quantitative research methods will enhance this learning process. The power in prisons lies with the Department of Justice,

Equality and Law Reform, prison management and officers, and without their support harm reduction services will not be sustainable.

This thesis does not have a recommendations section as these have been submitted in the two reports to the Department of Justice, Equality and Law Reform. [121] [124]

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APPENDICES

APPENDIX 1
ORAL FLUID SENSITIVITY AND SPECIFICITY ESTIMATION

Parry estimated the sensitivity and specificity of the Ortho HCV 3.0 eSAVE ELISA for the salivary anti-HCV assay used in this study. The Ortho HCV 3.0 eSAVE ELISA was selected for the development of a salivary anti-HCV assay on the basis of its superior sensitivity to serum testing. Dilutions were prepared of well-characterised anti-HCV positive and negative serum specimens in which the IgG content was similar to that found in oral fluids. These dilutions were used to optimise anti-HCV assay conditions such that the discrimination between positive and negative specimens was maximised. Specimen volume and the duration, temperature and effect of agitation on incubation of the specimen, conjugate and substrate were studied. Employing the optimum conditions identified, oral fluid specimens collected by Orasure from 291 anti-HCV negative blood donors were tested to establish the cut-off for the assay. Tests on Orasure specimens from 318 serologically anti-HCV negative subjects were all negative (specificity 100%; 95% CI 98.8-100%). Of 216 Orasure specimens from seropositive subjects, 188 were positive (sensitivity 87.0%; 95% CI 82.6-91.5%). However, of the 216 oral fluid specimens from seropositive patients, 126 had been collected from patients with liver disease and 116 of these were positive (92%; 95% CI 85.9-96.1%). The remaining 90 seropositive specimens came from a randomly sampled population of London injecting drug users. Of these, 72 were reactive (sensitivity 80.0%; 95% CI 70.2-87.7%). As this latter group are likely better to represent the population of prisoners at risk of HCV infection, this latter observation was used as a guide to the sensitivity of salivary anti-HCV testing in the population of prisoners described in this study'. [125]

Cameron *et al* [147] estimated the sensitivity and specificity for oral fluid assay when detecting the presence of anti-HCV. She reported high specificity (over 99%) and low sensitivity (85%) compared to paired blood samples. Cameron's sensitivity estimations were higher than those found by Parry (Appendix 1) although specificity estimations were similar. Both authors suggest that oral fluid assay is suitable for epidemiological assessment (although the prevalence of anti-HCV will be underestimated) and have practical advantages compared to blood samples but caution that the process is still in the development stage. Confirmatory serological tests are required for diagnostic purposes.

APPENDIX 2

REQUEST FOR RPOPOSAL AND TERMS OF REFERENCE

Department of Justice, Equality and Law Reform

PRISONS DIVISION RESEARCH PROGRAMME

REQUEST FOR PROPOSAL (RFP)

---

2. LEVEL OF HIV AND HEPATITIS INFECTION AMONG PRISONER POPULATION

1 BACKGROUND

- The Department of Justice, Equality and Law Reform is embarking on a research programme in relation to various matters within its area of responsibility. Several of these matters fall under the remit of the Prisons Division. Prisons Division has responsibility for the provision and maintenance of a secure, efficient and progressive system of containment and rehabilitation for offenders committed to custody. The Division aims to treat offenders while in custody with care, justice, dignity and respect with particular emphasis on health, education, training and offender welfare.

2 PROJECT

- In this context, the Prisons Division is seeking to establish levels of HIV and Hepatitis infection among the prisoner population. The project involves
- the design of an appropriate anonymous questionnaire;
- the organisation of the completion of this questionnaire across a wide representative sample of the prisoner population;
- the organisation of a complimentary programme of saliva testing;
- the compilation of the results of the questionnaire; and
- the study of those results and the production of a finished report on the findings.

Accordingly the Department hereby invites proposals for the provision of the above service.
Proposals should include:

- a detailed outline of the methodology
- timescale; and
- total cost of the research exercise

INVITATION TO TENDER

APPENDIX 3

INFORMATION LEAFLETS FOR PRISONERS AND PRISON OFFICERS

Appendix 3a Information sheet for prison officers
Appendix 3b Information sheet for participants
Appendix 3c Poster

TRINITY COLLEGE DUBLIN

Voluntary, Unlinked Anonymous HIV & Hepatitis Survey in Irish Prisons

Information sheet for prison officers

The survey is being conducted by the Department of Community Health and General Practice, TCD.

Aims

The aim of the survey is to quantify levels of HIV, hepatitis B and hepatitis C in Irish prison inmates. The survey also aims to collect data on the HIV and hepatitis risk behaviour. The results of the survey will be used to provide recommendations on improving educational, preventative and medical services within the prison.

Method

Survey data collection will take the form of a self-completed risk factor questionnaire and collection of saliva samples. The saliva samples will be tested for antibodies (the body's reaction) to HIV and hepatitis, not the viruses themselves. It will be stressed to inmates that there are no confirmed cases of HIV being transmitted by saliva (kissing, spitting etc.) and that saliva is safe for survey purposes.

On the survey day a group of doctors and researchers will set up a survey area(s) in the prison. Groups of inmates will be escorted to this area where they will receive a briefing about the survey and then be invited to participate. For this survey to be useful, it is very important that most (or all) of those invited to take part do so, whether or not they think they are at risk.

Participation in the survey is voluntary, anonymous and confidential. Those who choose not to participate will take no further part in the survey procedure. Those who do choose to take part will be instructed on how to fill in an anonymised questionnaire, and provide a sample of saliva using a special absorbent pad. Prison officers will not be involved in the data collection. The survey will be planned so as to cause as little disruption to routine as possible.

Dissemination of results

We will take the questionnaires and enter the answers on to a database where the results will be analysed. The results will be presented in such a way that no individual can be identified either directly or by looking at other lists. The findings will be reported both to the Minister for Justice and published in an international medical journal.

If you would like to know more or discuss the study

We can arrange to visit the prison a few days before starting the survey. There will also be opportunities to talk to members of the research team during the survey.

It is hoped that the results of this survey will make prison a safer and healthier place for all, and reduce the subsequent transmission of HIV and hepatitis in communities outside prison when inmates are released.

TRINITY COLLEGE DUBLIN

Voluntary, Unlinked Anonymous HIV & Hepatitis Survey in Irish Prisons
Information sheet for respondents

Who is doing the survey?
Doctors from Trinity College (Department of Community Health and General Practice).

Why is the survey being done?
The aim of the survey is to get the information needed to plan better health care for inmates and make prison a healthier place. To do this, we need to know more about HIV and hepatitis in prisons. Also, good information about risky behaviour in prison is needed to plan ways of reducing the spread of HIV and hepatitis. (Examples of risky behaviour are sharing injecting works or unprotected sex)

- This kind of survey is much more meaningful if all (or most) of those invited to take part do so, whether you think you are at risk or not.

For us to give prisoners good advice and good health care, we need good information.

How is the survey being done?
The survey will be done in groups. We will be selecting, at random, about half the inmates in this prison. If you agree to take part, all you do is answer some questions on a short questionnaire and give us a sample of spit (saliva). Giving saliva is done very quickly and easily with a special mouth swab - it's not unpleasant.

Remember: you will not catch HIV (AIDS) from spit. We test the spit for antibodies (the body's reaction) to HIV, not for HIV itself.

How can I be sure if it is safe to take part?

- The survey is unlinked and **anonymous**: it is designed so that no one, including us, can know any person's results. To ensure this, we do not want to know your name, address or number, so no one will know who provided what sample.
- All individual answers we receive are **confidential**; no one other than the researchers will see the data.
- The data collected will never be cross-referenced with any other data.
- The spit samples will be tested for HIV and hepatitis and not for drugs.

Because the survey is unlinked and anonymous we cannot give your test results back to you.

All inmates will get a full briefing on the survey day. The researchers will be happy to answer any questions.

THE SURVEY IS VOLUNTARY - YOU DO NOT HAVE TO TAKE PART.

Attention!

A voluntary survey of hepatitis and HIV levels in Irish prisons will be carried out here shortly.

The aim of the survey is to get the information needed to plan better health care for inmates and make prison a healthier place. Within the next few weeks you will receive an information leaflet.

Your participation will be greatly appreciated.

APPENDIX 4

SURVEY TEAMS

CENSUS SURVEY TEAM

Dr Shane Allwright	Senior Lecturer in Epidemiology*
Dr Joseph Barry	Public Health Doctor*
Dr Geira Baruda	Medical Doctor*
Dr Fiona Bradley	General Practitioner*
Ms Marlen Carvalho	Research Associate*
Dr Tara Conlon	General Practitioner
Mr Derek Duggan	4th year Dental Student
Dr Emer Feely	Public Health Doctor
Mr Killian Forde	ENN Administrator*
Ms Carrie Garavan	Research Nurse, MPH
Ms Anne Halpin	Laboratory Technician, M.Sc.*
Ms Deirdre Handy	Executive Officer*
Dr Derval Igoe	Public Health Doctor
Ms Jean Long	Research Nurse, M.Sc.*
Dr Frank Lule	Medical Doctor*
Ms Geraldine McCullough	Research Nurse, M.Sc.*
Dr Paul McKeon	Public Health Doctor
Ms Mary McSweeney	Research Associate*
Ms Ailbhe Mealy	Executive Officer*
Ms Louise Mullen	Psychologist, M.Sc.*
Dr Joan O'Donnell	Public Health Doctor
Prof Tom O'Dowd	General Practitioner*
Dr Jill O'Leary	Public Health Doctor
Ms Hilda O'Neill	Research Nurse, M.Sc.*
Dr Patrick O'Sullivan	Public Health Doctor
Ms Sheilagh Reaper-Reynolds	Education Officer
Ms Eimear Simms	Environmental Health Officer, M.Sc.*
Dr Lelia Thornton	Public Health Doctor
Dr Aregay Weldegebriel	Medical Doctor*

COMMITTAL SURVEY TEAM

Dr Shane Allwright	Senior Lecturer in Epidemiology*
Dr Joseph Barry	Public Health Doctor
Dr Fiona Bradley	General Practitioner
Ms Una Cronin	Research Nurse, MSc
Ms Carrie Garavan	Research Nurse, MPH
Ms Jean Long	Research Nurse, MSc*
Ms Geraldine McCullough	Research Nurse, MSc*
Ms Ailbhe Mealy	Executive Officer*
Ms Sheilagh Reaper-Reynolds	Education Officer, MSc*
Dr Leila Thornton	Public Health Doctor

*affiliated with the Department of Community Health and General Practice, Trinity College Dublin.

APPENDIX 5

PROCEDURES EMPLOYED TO ENSURE GOOD ETHICAL PRACTICE

The main ethical problems associated with the research project are as follows:

- The need to ensure informed consent among the prison population, and to be particularly careful that there is no element of coercion to participate
- The need to ensure confidentiality
- The need for the researchers to remain independent of the prison authorities

The following measures were taken to deal with these issues:

Informed Consent

Each prison governor was sent a letter detailing the purpose of each survey, the data collection methods and the proposed dates.

Information leaflets describing the purpose of each study, the data collection methods, the study population, and the use of results were provided for prison officers' notice-boards.

An information leaflet describing the purpose of the study, the data collection methods, the study population, and the use of results was given to each prisoner before the survey.

In anticipation of poor levels of literacy among the study population a verbal explanation of the study was given according to pre-set guidelines. The pre-survey explanation covered the following topics:

- the purpose of the survey
- the importance of an adequate response rate
- the voluntary and anonymous nature of the survey
- that respondents are free to leave out questions they did not wish to answer

The respondents were then asked if they wish to take part. No inducements were offered. The questionnaire was completed by those who agreed. Agreement to complete the questionnaire was taken as consent in the prevalence surveys.

Those respondents who did not fully comprehend the explanation, e.g. those with language difficulties or mental problems, were excluded from the survey.

Prisoners who declined to participate returned to their cell or activities, or if the survey was conducted in a group waited until the group was finished. There were no negative sanctions imposed on those who did not wish to take part.

Maintaining Confidentiality

Confidentiality was assured as no prisoners' names were recorded on the questionnaires or oral fluid samples. Each respondent placed his or her questionnaire and oral fluid sample in an envelope and sealed it. Later each pair (questionnaire and oral fluid sample) were assigned a matching number. This number was not traceable to any individual.

Independence from Prison Authorities

The data collectors were independent of the prison authorities.

Data collection was conducted separately from other prison activities.

The prison officers invited the prisoners to meet with the researchers, but had no involvement in obtaining consent.

Only the respondents and researchers were present during the survey. Prison officers were asked to wait outside a closed door.

In most cases, prison officers were not aware of who had or had not agreed to the survey.

APPENDIX 6

MALE AND FEMALE QUESTIONNAIRES FOR THE CENSUS AND COMMITTAL SURVEY

Appendix 6a Men's Questionnaire for the Census Survey
Appendix 6b Women's Questionnaire for the Census Survey
Appendix 6c Men's Questionnaire for the Committal Survey
Appendix 6d Women's Questionnaire for the Committal Survey

DEPARTMENT OF COMMUNITY HEALTH
AND GENERAL PRACTICE, TCD

Appendix 6a Men's Questionnaire for the Census Survey

ANONYMOUS HIV & HEPATITIS SURVEY IN IRISH PRISONS

1 ***What age are you? (in years)*** _____

PLEASE ANSWER BY FILLING IN THE CIRCLES LIKE THIS ..... O

2 ***How long is your prison sentence from beginning to end?***

Remand ..... O
3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

3 ***How long have you been in prison on this sentence/remand?***

3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

4 ***Approximately how much of the last 10 years have you spent in prison (including this sentence or remand)?***

3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

5 ***In the last year have you smoked (chased) heroin?***

Yes ..... O
No ..... O

6 ***Have you EVER INJECTED drugs?***

Yes ..... O
No ..... O

If YES, please turn to next page
If NO, please go to Question 14* on Page 3 ➔

7 ***How old were you when you first injected drugs?*** _____
(in years)

8 ***Were you in prison the FIRST time you ever injected?***

Yes ..... O
No ..... O

9 ***BEFORE coming into prison, when was the <u>last</u> time you injected?***

On the day you came into prison ..... O
In the week before ..... O
In the month before ..... O
In the year before ..... O
More than 1 year before ..... O
Does not apply to me ..... O

10 ***In the month BEFORE coming into prison, had you shared any of these works with someone else:***

- needles (spikes)? Yes ..... O
No ..... O

- syringes (barrels)? Yes ..... O
No ..... O

- other? Yes ..... O
(filters, spoons etc.) No ..... O

11 ***Were you on a methadone programme at the time of committal?***

Yes ..... O
No ..... O

12 ***While IN PRISON, have you ever shared any of these works with someone else:***

- needles (spikes)? Yes ..... O
No ..... O

- syringes (barrels)? Yes ..... O
No ..... O

- other? Yes ..... O
(filters, spoons etc.) No ..... O

13 ***How many times have you injected in the last month?*** _____

HALF WAY THERE!!!

☺

14* ***In the 12 months before coming into prison, did you have sexual intercourse with women?***

Yes ..... O
No ..... O

If yes, did you use condoms?
Always/Sometimes ..... O
Never ..... O

15 ***Did you EVER have anal sex with another man?***

Yes ..... O
No ..... O

If yes, did you use condoms?
Always/Sometimes ..... O
Never ..... O

16 ***Have you had anal sex while in prison?***

Yes ..... O
No ..... O

17 ***Have you ever been treated for an STD?*** *(sexually transmitted disease)*

Yes ..... O
No ..... O

18 ***Have you ever had a blood test for HIV***

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result ?
Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

Please turn to last page ➔ ➔

19 *Have you ever had a blood test for hepatitis B?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result?

Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

20 *Have you been vaccinated against hepatitis B?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, were you vaccinated in prison?

Yes ..... O
No ..... O

If vaccinated, have you had the complete course of 3 injections?

Yes ..... O
No ..... O
Don't know ..... O

21 *Have you ever had a blood test for hepatitis C?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result?

Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

THANKS FOR TAKING PART 

PLEASE PUT THE SALIVA AND QUESTIONNAIRE IN THE ENVELOPE 

DEPARTMENT OF COMMUNITY HEALTH
AND GENERAL PRACTICE, TCD

Appendix 6b Women's Questionnaire for the Census Survey

ANONYMOUS HIV & HEPATITIS SURVEY IN IRISH PRISONS

1 ***What age are you? (in years)*** _____

PLEASE ANSWER BY FILLING IN THE CIRCLES LIKE THIS ..... O

2 ***How long is your prison sentence from beginning to end?***

Remand ..... O
3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

3 ***How long have you been in prison on this sentence/remand?***

3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

4 ***Approximately how much of the last 10 years have you spent in prison (including this sentence or remand)?***

3 months or less ..... O
More than 3 months but less than 12 months .. O
1 to 3 years ..... O
More than 3 years ..... O

5 ***In the last year have you smoked (chased) heroin?***

Yes ..... O
No ..... O

6 ***Have you EVER INJECTED drugs?***

Yes ..... O
No ..... O

If YES, please turn to next page

If NO, please go to Question 14* on Page 3 ➔

7 ***How old were you when you first injected drugs?*** _____

(in years)

8 ***Were you in prison the FIRST time you ever injected?***

Yes ..... O
No ..... O

9 ***BEFORE coming into prison, when was the last time you injected?***

On the day you came into prison
..... O
In the week before
..... O
In the month before
..... O
In the year before
..... O
More than 1 year before
..... O
Does not apply to me ..... O

10 ***In the month BEFORE coming into prison, had you shared any of these works with someone else:***

- needles (spikes)? Yes ..... O
No ..... O

- syringes (barrels)? Yes ..... O
No ..... O

- other? Yes ..... O
(filters, spoons etc.) No ..... O

11 ***Were you on a methadone programme at the time of committal?***

Yes ..... O
No ..... O

12 ***While IN PRISON, have you ever shared any of these works with someone else:***

- needles (spikes)? Yes ..... O
No ..... O

- syringes (barrels)? Yes ..... O
No ..... O

- other? Yes ..... O
(filters, spoons etc.) No ..... O

13 ***How many times have you injected in the last month*** _____

HALF WAY THERE!!!

☺

14* ***In the 12 months before coming into prison, did you have sexual intercourse with men?***

Yes ..... O
No ..... O

If yes, did you use condoms?

Always/Sometimes ..... O
Never ..... O

15 ***Have you ever been treated for an STD?***
(sexually transmitted disease)

Yes ..... O
No ..... O

16 ***Have you ever had a blood test for HIV?***

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result ?

Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

Please turn to last page ➔ ➔

17 *Have you ever had a blood test for hepatitis B?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result?

Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

18 *Have you been vaccinated against hepatitis B?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, were you vaccinated in prison?

Yes ..... O
No ..... O

If vaccinated, have you had the complete course of 3 injections?

Yes ..... O
No ..... O
Don't know ..... O

19 *Have you ever had a blood test for hepatitis C?*

Yes ..... O
No ..... O
Don't know ..... O

If yes, what was the result?

Positive (infected) ..... O
Negative (not infected) ..... O
Don't know ..... O

THANKS FOR TAKING PART 

PLEASE PUT THE SALIVA AND QUESTIONNAIRE IN THE ENVELOPE 

Appendix 6c Men's Questionnaire for the Committal Survey

ANONYMOUS SURVEY OF HIV & HEPATITIS IN IRISH PRISONS

Please answer by filling in the circles like this..... o

1 Have you taken part in this survey BEFORE?

Yes..... o
No..... o

If yes, how many times on committal _____

as an inmate _____

2 How OLD are you ? (in years) _____

3 Are you

On remand..... o
Sentenced..... o

Other _____

4 How many TIMES have you been in prison BEFORE?

Never..... o
1-5 times..... o
More than 5 times..... o

5 How much of the last 10 YEARS have you spent in prison? _____

6 Do you have a tattoo?

Yes..... o
No..... o

If yes, did you have it done in prison..... o
outside..... o

Who did it? .....Self..... o
Friend / Relative..... o
Tattoo Artist..... o

7 In the LAST YEAR have you smoked (chased) heroin?

Yes..... o
No..... o

8 Have you EVER INJECTED drugs?

Yes..... o
No..... o

***If YES*, please turn to next page**
***If NO*, please go to Question 16* on Page 3 ➔**

9 How OLD were you when you first injected drugs? _____
(in years)

10 Were you in prison the FIRST time you ever injected?

Yes..... O
No..... O

11 How many TIMES have you injected in the last month? _____

12 When was the LAST time you injected BEFORE coming into prison?

On the day you came into prison..... O
In the week before..... O
In the month before..... O
In the year before..... O
More than 1 year before..... O

13 In the MONTH BEFORE coming into prison, had you SHARED any of these works with someone else:

- needles (spikes) Yes..... O
No..... O

- syringes (barrels) Yes..... O
No..... O

- other (filters, spoons etc.) Yes..... O
No..... O

14 Are you on a methadone programme?

Yes..... O
No..... O

15 If you were IN PRISON BEFORE did you ever SHARE any of these works with someone else during your sentence:

- needles (spikes) Yes..... O
No..... O

- syringes (barrels) Yes..... O
No..... O

- other (filters, spoons etc.) Yes..... O
No..... O

HALF WAY THERE!!!

☺

16* In the 12 MONTHS BEFORE coming into prison did you have vaginal sex with a woman?

Yes..... O
No.....

O

If yes, with how many women

1-2..... O
3-9..... O
more than 9..... O

Did you use condoms?

Always/Sometimes..... O
Never..... O

17 Did you EVER have anal sex with another man?

Yes..... O
No..... O

If yes, did you use condoms ?

Always/Sometimes..... O
Never..... O

18 Did you ever have anal sex IN PRISON with another man?

Yes..... O
No..... O
Does not apply..... O

19 Have you ever PAID money, goods or drugs for any type of sex ?

Yes..... O
No..... O

20 Have you ever BEEN PAID money, goods or drugs for any type of sex ?

Yes..... O
No..... O

21 Have you ever been treated for an STD? (sexually transmitted disease)

Yes..... O
No..... O

Please turn to last page ➔ ➔

22 **Have you ever had a blood test for HIV ?**

Yes..... O
No..... O
Don't know..... O

If yes, what was the result ?

Positive (infected)..... O
Negative (not infected)..... O
Don't know..... O

23 **Have you ever had a blood test for hepatitis B?**

Yes..... O
No..... O
Don't know..... O

If yes, what was the result?

Positive (infected)..... O
Negative (not infected)..... O
Don't know..... O

24 ***Have you been vaccinated against hepatitis B?***

Yes..... O
No ..... O
Don't know ..... O

If yes, were you vaccinated in prison?

Yes..... O
No ..... O

If vaccinated, have you had the complete course of 3 injections?

Yes..... O
No ..... O
Don't know ..... O

25 ***Have you ever had a blood test for hepatitis C?***

Yes..... O
No ..... O
Don't know ..... O

If yes, what was the result?

Positive (infected)..... O
Negative (not infected)..... O
Don't know ..... O

THANKS FOR TAKING PART 👍
PLEASE PUT THE SALIVA AND QUESTIONNAIRE IN THE ENVELOPE ✉

Appendix 6d Women's Questionnaire for the Committal Survey

ANONYMOUS SURVEY OF HIV & HEPATITIS IN IRISH PRISONS

Please answer by filling in the circles like this..... O

1 Have you taken part in this survey BEFORE?

Yes..... O
No..... O

If yes, how many times on committal _____

as an inmate _____

2 How OLD are you? (in years) _____

3 Are you

On remand ..... O
Sentenced ..... O

Other _____

4 How many TIMES have you been in prison?

Never..... O
1-5 times..... O
More than 5 times..... O

5 How much of the last 10 YEARS have you spent in prison? _____

6 Do you have a tattoo?

Yes ..... O
No ..... O

If yes, did you have it done in prison..... O
outside..... O

Who did it? ..... Self..... O
Friend / Relative..... O
Tattoo Artist..... O

7 In the LAST YEAR have you smoked (chased) heroin?

Yes..... O
No..... O

8 Have you EVER INJECTED drugs?

Yes..... O
No..... O

If YES, **please turn to next page**
If NO, **please go to Question 16* on Page 3** ➔

9 **How OLD were you when you first injected drugs?** _____
(in years)

10 **Were you in prison the FIRST time you ever injected?**

Yes..... O
No..... O

11 **How many TIMES have you injected in the last month?** _____

12 **When was the LAST time you injected BEFORE coming into prison?**

On the day you came into prison..... O
In the week before..... O
In the month before..... O
In the year before..... O
More than 1 year before..... O

13 **In the MONTH BEFORE coming into prison, had you SHARED any of these works with someone else:**

- needles (spikes) Yes..... O
No..... O

- syringes (barrels) Yes..... O
No..... O

- other (filters, spoons etc.) Yes..... O
No..... O

14 **Are you on a methadone programme?**

Yes..... O
No..... O

15 **If you were IN PRISON before did you ever SHARE any of these works with someone else during your sentence:**

- needles (spikes) Yes..... O
No..... O

- syringes (barrels) Yes..... O
No..... O

- other (filters, spoons etc.) Yes..... O
No..... O

HALF WAY THERE!!!

16* **In the 12 MONTHS BEFORE coming into prison did you have vaginal sex with a man?**

Yes..... O
No..... O

If yes, with how many men

1-2..... O
3-9..... O
More than 9..... O

Did you use condoms?

Always/Sometimes..... O
Never..... O

17 **Have you ever BEEN PAID money, goods or drugs for any type of sex?**

Yes..... O
No..... O

18 **Have you ever been treated for an STD?** (sexually transmitted disease)

Yes..... O
No..... O

Please turn to last page ➔ ➔

20 Have you ever had a blood test for HIV?

Yes..... O
No..... O
Don't know..... O

If yes, what was the result ?

Positive (infected)..... O
Negative (not infected)..... O
Don't know..... O

21 Have you ever had a blood test for hepatitis B?

Yes..... O
No..... O
Don't know..... O

If yes, what was the result?

Positive (infected)..... O
Negative (not infected)..... O
Don't know..... O

22 Have you been vaccinated against hepatitis B?

Yes..... O
No..... O
Don't know..... O

If yes, were you vaccinated in prison?

Yes..... O
No..... O

If vaccinated, have you had the complete course of 3 injections?

Yes..... O
No..... O
Don't know..... O

23 Have you ever had a blood test for hepatitis C?

Yes..... O
No..... O
Don't know..... O

If yes, what was the result?

Positive (infected)..... O
Negative (not infected) ..... O
Don't know ..... O

THANKS FOR TAKING PART 👍
PLEASE PUT THE SALIVA AND QUESTIONNAIRE IN THE ENVELOPE ✉

APPENDIX 7

TABLE 7A PREVALENCE WITH 95% CONFIDENCE INTERVALS OF ANTI-HBC, ANTI-HCV AND ANTI-HIV IN THE CENSUS AND COMMITTAL SURVEYS BY SELECTED CHARACTERISTICS AND RISK FACTORS

	Respondents		Anti-HBc						Anti-HCV						Anti-HIV					
			Census			Committal			Census			Committal			Census			Committal		
	Census	Committal	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI
Total Sample	1193	596	104	8.7	(9.9-14.8)	37	6.2	(4.4-8.5)	442	37	(34.3-39.9)	130	21.8	(18.6-25.4)	24	2.0	(1.3-3.0)	12	2.0	(1.0-3.5)
Prison																				
High risk	713	473	87	12.2	(9.9-14.8)	35	7.4	(5.2-10.1	363	50.9	(47.2-54.6)	129	27.3	(23.3-31.5)	20	2.8	(1.7-4.3)	10	2.1	(1.0-3.8)
Medium risk	480	123	17	3.5	(2.1-5.6)	2	1.6	(0.2-5.7)	79	16.5	(13.3-20.1)	1	0.8	(0.0-4.4)	4	0.8	(0.2-2.1)	2	1.6	(0.2-5.7)
Gender																				
Men	1136	555	97	8.5	(7-10.3)	28	5.1	(3.4-7.2)	418	36.8	(34-37.7)	107	19.3	(16.1-22.8)	23	2.0	(1.3-3.0)	8	1.4	(0.6-2.8)
Women	57	41	7	12.3	(5.1-23.7)	9	22.0	(10.6-37.6	24	42.1	(29.1-55.9)	23	56.1	(39.8-71.5)	1	1.7	(0.04-9.4)	4	9.8	(2.7-23.1)
Age in years																				
<30	797	427	52	6.5	(4.9-8.5)	24	5.6	(3.6-8.2)	327	41	(37.6-44.5)	109	25.5	(21.5-29.9)	8	1.0	(0.4-1.8)	6	1.4	(0.5-3.0)
≥ 30	340	166	47	13.8	(10.3-18)	12	7.2	(3.8-12.3	91	26.8	(22.1-31.8)	19	11.5	(7.0-17.3)	15	4.4	(2.7-7.5)	6	3.6	(1.3-7.7)
Time spent in prison in the previous ten years																				
<3 months	136	261	7	5.2	(2.1-10.3)	7	2.7	(1.1-5.5)	20	14.7	(9.2-21.8)	13	5.0	(2.7-8.4)	0	0.0	(0.0-2.7)	1	0.4	(0.0-2.2)
3-12 months	197	64	13	6.6	(3.6-11.0)	7	10.9	(4.5-21.3	39	19.8	(14.5-26.1)	16	25.0	(15.0-37.4)	0	0.0	(0.0-1.9)	2	3.1	(0.4-10.8)
12-36 months	299	107	23	7.7	(4.9-11.3)	10	9.4	(4.6-16.5	102	34.1	(28.8-39.8)	38	35.5	(26.5-45.4)	3	1.0	(0.2-2.9)	2	1.9	(0.2-6.6)
> 36 months	538	87	61	11.3	(8.8-14.3)	10	11.5	(5.7-20.1	277	51.5	(47.2-55.8)	53	60.9	(49.9-71.2)	21	3.9	(2.4-5.9)	7	8.1	(3.3-15.9)
Ever Injected drugs																				
Yes	509	173	94	18.5	(15.2-22.1)	31	17.9	(12.5-24.5	414	81.3	(77.7-84.6)	124	71.7	(64.3-78.3)	18	3.5	(2.1-5.5)	10	5.8	(2.8-10.4)
No	669	420	10	1.5	(0.7-2.9)	5	1.2	(0.4-2.8)	25	3.7	(2.4-5.5)	6	1.4	(0.5-3.1)	6	0.9	(0.3-1.9)	2	0.5	(0.1-1.7)

*Analyses refer to the 1193 participants in the census survey and 596 participants in the committal survey who provided analysable oral fluid. Denominators vary because not all respondents answered all questions.

APPENDIX 8

PREVALENCE AND INDEPENDENT RISK FACTORS FOR INJECTORS WHO SPENT TIME IN PRISON STRATIFIED BY PRISON LOCATION

As expected and in accordance with the sampling strategy for the surveys, the prevalence rates for each of the antibodies were much higher in injectors in prisons in Dublin (high risk) than in injectors in prisons outside Dublin (medium risk). The prevalence of anti-HBc was 19% (110/566) in Dublin prisons compared to 13% (13/100) in prisons outside Dublin. For anti-HCV, 82% (464/566) of injector respondents in Dublin prisons tested positive compared to 67% (67/100) of injector respondents in prisons outside Dublin. The prevalence of anti-HIV was five times higher in injectors prisoners in Dublin than in injectors in non Dublin prisons (5%, 27/566 *versus* 1% 1/100).

In order to determine if the risk factors for each of the antibodies differed by prison location, the injector population were separated into respondents imprisoned in Dublin *versus* respondents imprisoned outside Dublin at the time of the surveys. This allowed us to examine the risk factors informally. Stratified logistic regression models were then computed to adjust for the effect of prison location.

The models presented in this section were computed using the estimation commands for complex survey data in Stata (Stata Corp., Version 7, 2001). The models are presented in three tables by antibody type (8.1 to 8.3) and each table is divided into three sections (Section 1: risk factors for injectors located in a Dublin prison; Section 2: risk factors for injectors located in a non-Dublin prisons; and Section 3: risk factors for injectors stratified by prison location). For comparative purposes, the same risk factors are retained in both the anti-HBc and anti-HCV models.

Since heroin misuse is mainly associated with the deprived areas of Dublin City, the number of injectors imprisoned outside Dublin was much lower than the numbers imprisoned in Dublin (100 *versus* 566) and as already stated the prevalence of each of the antibodies was also much lower. The risk factors identified for injectors imprisoned in Dublin for each of the antibodies were similar to those identified in each of the models when formally stratified by prison location (Tables 8.1 to 8.3 sections 1 and 3). Similar proportions of injectors in prisons outside Dublin reported

each of the risk factors and tested positive for each of the antibodies, although due to the small numbers in each of the models they were not usually significant (Tables 8.1 to 8.3 sections 2 and 3). Therefore, this section will concentrate on presenting the findings of the stratified logistic regression models (Section 3 of Tables 8.1 to 8.3)

After stratifying for prison location and adjusting for other risk factors, injectors aged 30 or over were four and a half times more likely to test positive for anti-HBc than injectors under 30 years old (adjusted OR 4.5, 95% CI 2.7-7.4). Injectors who had spent between three and eleven months in prison were almost four times more likely to test positive for anti-HBc than those who had spent between one day and three months in prison (adjusted OR 3.7, 95% CI 1.1-11.9). Injectors who had received one or more doses of hepatitis B vaccine were 50% less likely to test positive for anti-HBc than those who had not received any doses of the vaccine (adjusted OR 0.5, 95% CI 0.3-0.7). Injectors who started injecting more than three years prior to the surveys were two times more likely to test positive for anti-HBc than respondents who started injecting within the three years prior to the surveys (adjusted OR 2.0, 95% CI 1.0-4.1). None of the sexual risk factors was identified as an independent risk factors for testing positive for anti-HBc in this model.

After stratifying for prison location and adjusting for other risk factors, injectors who had shared needles in prison were over four times more likely to test positive for anti-HCV than injectors who had not shared needles in prison (adjusted OR 4.4, 95% CI 2.6-7.3). Injectors who had received one or more doses of hepatitis B vaccine were two times more likely to test positive for anti-HCV than those who had not received any doses of the vaccine (adjusted OR 2.1, 95% CI 1.2-3.4). Respondents who are anti-HCV positive should be prioritised for administration of hepatitis B vaccine to prevent co-morbidity, therefore this finding indicates appropriate targeting of the vaccine. Time spent in prison during the ten preceding years was no longer significant when hepatitis B vaccine status was included to the model. In bi-variate analysis, increasing time spent in prison in the preceding ten years was associated with having received one or more doses of hepatitis B vaccine. This indicates confounding between the two variables.

After stratifying for prison location and adjusting for other risk factors, almost twice the number of injectors tested positive for anti-HIV in the committal survey than in

the census survey although the numbers in both surveys were small (adjusted OR 2.5, 95% CI 1.0-6.0). This implies sympathetic short sentencing bias for those who are HIV positive (see Discussion). Injectors aged 30 years or over were more than eight times more likely to test positive for anti-HIV than those less than 30 years old (adjusted OR 8.5, 95% CI 3.7-19.3). Injectors who shared needles in the month prior to imprisonment were over two times more likely to test positive for anti-HIV than those who did not share in the month prior to imprisonment (adjusted OR 2.5, 95% CI 1.1-5.8). None of the sexual risk factors was identified as an independent risk factors for testing positive for anti-HIV in this model.

In conclusion formal stratification by prison location produced similar results when compared to the non stratified models presented in Table 3.21. This confirms that our sampling strategy (which was based on prison location) was appropriate.

Table 8.1 Logistic regression model to identify the determinants of anti-HBc in injectors (census and committal) who had spent time in prison by prison location at the time of the survey

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen					
Section 1 - Prisons situated in Dublin (110/566)					
Survey					
Census	410	81	20.0	1	
Committal	156	29	18.6	1.1 (0.6-1.7)	0.8
Age group					
<30 years	443	64	14.5	1	
≥30 years	101	40	39.6	4.8 (2.8-8.4)	<0.0001
Missing	*22*				
Months spent in prison over the last 10 years					
<3 months	49	6	12.2	1	
3-11 months	60	17	28.3	4.7 (1.2-17.6)	0.02
12-36 months	143	25	17.5	2.6 (0.7-8.9)	0.1
> 36 months	297	61	20.5	2.5 (0.8-8.3)	0.1
Missing	*27*				
Years since first injecting					
<3 years	113	12	10.6	1	
≥3 years	422	91	21.6	2.3 (1.1-4.9)	0.03
Missing	*31*				
Sharing needles in prison					
No	204	35	17.2	1	
Yes	354	75	21.2	1.2 (0.7-2.1)	0.5
Missing	*8*				
One or more doses of hepatitis B vaccine					
No	217	44	20.3	1	
Yes	321	59	18.4	0.5 (0.3-0.8)	0.009
Missing	*28*				
Whole model F = 5.0 p <0.0001					
Section 2 - Prisons situated outside Dublin (13/100)					
Survey (excluded by Stata 7)					
Census	99	13	13.1	_	
Committal	1	0	0.0	_	
Age group				_	
<30 years	71	7	9.9	1	
≥30 years	24	6	25.0	3.4 (0.9-12.9)	0.08
Missing	*5*				
Months spent in prison over the last 10 years					
<3 months	7	1	14.3	1	
3-11 months	8	2	25.0	0.4 (0.0-7.9)	0.6
12-36 months	28	5	17.9	0.4 (0.0-5.5)	0.5
> 36 months	56	5	8.9	0.3 (0.0-4.9)	0.4
Missing	*1*				
Years since first injecting					
<3 years	17	2	11.8	1	
≥3 years	71	11	15.5	1.0 (0.1-6.7)	1.0
Missing	*12*				
Sharing needles in prison					
No	35	5	14.3	1	
Yes	55	8	14.6	2.0 (0.3-11.6)	0.4
Missing	*10*				
One or more doses of hepatitis B vaccine					
No	41	10	24.4	1	
Yes	52	2	3.9	0.1 (0.0-0.7)	0.02
Missing	*7*				
Whole model F = 1.2 p = 0. 1					

Table 8.1 Logistic regression model to identify the determinants of anti-HBc in injectors (census and committal) who had spent time in prison by prison location at the time of the survey (cont)

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis B core antigen					
Section 3 *- Stratified by and adjusted for prison location (123/666)*					
Survey					
Census	509	94	18.5	1	
Committal	157	29	18.5	1.2 (0.7-2.0)	0.6
Age group					
<30 years	536	75	14.0	1	
≥30 years	103	42	40.8	4.5 (2.7-7.4)	<0.0001
Missing	*27*				
Months spent in prison over the last 10 years					
<3 months	56	7	12.5	1	
3-11 months	68	19	27.9	3.7 (1.1-11.9)	0.03
12-36 months	171	30	17.5	2.0 (0.7-5.9)	0.2
> 36 months	353	66	18.7	2.0 (0.7-5.6)	0.2
Missing	*18*				
Years since first injecting					
<3 years	130	14	10.8	1	
≥3 years	493	102	20.7	2.0 (1.0-4.1)	0.05
Missing	*43*				
Sharing needles in prison					
No	239	40	16.7	1	
Yes	409	83	20.3	1.4 (0.9-2.3)	0.3
Missing	*18*				
One or more doses of hepatitis B vaccine					
No	258	54	20.9	1	
Yes	373	61	16.4	0.5 (0.3-0.7)	0.002
Missing	*35*				
Whole model F = 5.5 p <0.0001					

Table 8.2 Logistic regression model to identify the determinants of anti-HCV in injectors (census and committal) who had spent time in prison by prison location at the time of the survey

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis C virus					
Section 1 - Prisons situated in Dublin (464/566)					
Survey (excluded by Stata 7)					
Census	410	347	84.6	1	
Committal	156	117	75.0	1 (0.6-1.8)	1.0
Age group					
<30 years	443	362	81.7	1	
≥30 years	101	81	80.2	0.7 (0.4-1.5)	0.4
Missing	*22*				
Months spent in prison over the last 10 years					
<3 months	49	24	49.0	1	
3-11 months	60	46	76.7	2.3 (0.9-5.6)	0.08
12-36 months	143	116	81.1	2.0 (0.9-4.4)	0.1
> 36 months	297	268	90.2	2.7 (1.2-6.2)	0.02
Missing	*17*				
Years since first injecting					
< 3 years	113	74	65.5	1	
≥ 3 years	422	361	85.6	1.6 (0.9-3.0)	0.1
Missing	*21*				
Sharing needles in prison					
No	204	131	64.2	1	
Yes	354	325	91.8	4.1 (2.3-7.3)	<0.0001
Missing	*8*				
One or more doses of hepatitis B vaccine					
No	217	162	74.7	1	
Yes	321	279	86.9	1.4 (0.8-2.5)	0.2
Missing	*28*				
Whole model F=8.7, p<0.0001					
Section 2 - Prisons situated outside Dublin (67/100)					
Survey					
Census	99	67	67.7		
Committal	1	0	0.0		
Age group					
<30 years	71	49	69.0	1	
≥30 years	24	16	66.7	0.8 (0.2-2.8)	0.7
Missing	*5*				
Months spent in prison over the last 10 years					
<3 months	7	2	28.6	1	
3-11 months	8	4	50.0	0.7 (0.0-16.0)	0.8
12-36 months	28	19	67.7	0.4 (0.0-9.0)	0.5
> 36 months	56	42	75.0	0.2 (0.0-3.3)	0.2
Missing	*1*				
Years since first injecting					
< 3 years	17	9	52.9	1	
≥ 3 years	71	53	74.7	2.2 (0.4-12.0)	0.4
Missing	*12*				
Sharing needles in prison					
No	35	18	51.4	1	
Yes	55	46	83.6	6.3 (1.6-24.9)	0.009
Missing	*10*				
One or more doses of hepatitis B vaccine					
No	41	19	46.3	1	
Yes	52	46	88.5	14.6 (3.0-0.7)	0.001
Missing	*7*				
Whole model F=2.0, p=0.07					

Table 8.2 Logistic regression model to identify the determinants of anti-HCV in injectors (census and committal) who had spent time in prison by prison location at the time of the survey (cont.)

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to hepatitis C virus					
Section 3 *- Stratified by and adjusted for prison location (531/666)*					
Survey					
Census	509	414	74.5	1	
Committal	157	117	81.3	1.1 (0.7-2.0)	0.6
Age group					
<30 years	514	411	80.0	1	
≥30 years	125	97	77.6	0.7 (0.4-1.3)	0.3
Missing	*27*				
Months spent in prison over the last 10 years					
<3 months	56	26	46.4	1	
3-11 months	68	50	73.5	2.0 (0.8-4.7)	0.1
12-36 months	171	135	79.0	1.6 (0.8-3.6)	0.2
> 36 months	353	310	87.8	1.8 (0.8-4.1)	0.1
Missing	*18*				
Years since first injecting					
< 3 years	130	83	63.9	1	
≥ 3 years	493	414	84.0	1.5 (0.9-2.7)	0.1
Missing	*43*				
Sharing needles in prison					
No	239	149	62.3	1	
Yes	409	371	90.7	4.4 (2.6-7.3)	<0.0001
Missing	*18*				
One or more doses of hepatitis B vaccine					
No	258	181	70.2	1	
Yes	373	325	87.1	2.1 (1.2-3.4)	0.006
Missing	*35*				
Whole model F=10.3, p<0.0001					

Table 8.3 Logistic regression model to identify the determinants of anti-HIV in injectors (census and committal) who had spent time in prison by prison location

	Total	Positive	Prevalence	Odds ratio (95% CI)	p-value
Antibodies to HIV					
Section 1 - Prisons situated in Dublin (27/566)					
Survey					
Census	410	17	4.2	1	
Committal	156	10	6.4	2.2 (0.9-5.4)	0.08
Age group					
<30 years	443	10	2.3	1	
≥30 years	101	16	15.8	10.5 (4.5-24.3)	<0.0001
Missing	*22*				
Shared needles in the month prior to imprisonment					
No	319	12	3.8	1	
Yes	230	15	6.5	2.8 (1.2-6.7)	0.02
Missing	*17*				
Whole model F = 11.0, p <0.0001					
Section 2 - Prisons situated outside Dublin (1/100) Stata 7 unable to compute model					
Survey					
Census	99	1	1.0		
Committal	1	0	0.0		
Age group					
<30 years	71	1	1.4		
≥30 years	24	0	0.0		
Missing	*5*				
Shared needles in the month prior to imprisonment					
No	50	1	2.0		
Yes	40	0	0.0		
Missing	*10*				
Whole model F =, p <0.0001					
Section 3 - Stratified by and adjusted for prison location (28/666)					
Survey					
Census	509	18	3.5	1	
Committal	157	10	6.4	2.5 (1.0-6.0)	0.04
Age group					
<30 years	536	16	2.1	1	
≥30 years	103	11	12.8	8.5 (3.7-19.3)	<0.0001
Missing	*25*				
Shared needles in the month prior to imprisonment					
No	369	13	3.5	1	
Yes	270	15	5.6	2.5 (1.1-5.8)	0.04
Missing	*27*				
Whole model F = 9.5, p <0.0001					