HCV Infection in South Australian Prisoners: Prevalence, Transmission, Risk Factors and Prospects for Harm Reduction

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Contents

Figures

Tables

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Abstract

This thesis aimed to describe the epidemiology of HCV in South Australian prisons - prevalence, transmission and risk factors. This thesis also aimed to determine the impact of incarceration on reported risk behaviours. A related objective was to evaluate the epidemiological effectiveness of the ELISA-3 HCV antibody test using PCR as the gold standard. Finally, this thesis aimed to explore the potential for minimising HCV risk in the South Australian prison population.

Methods

Two case note audits were conducted at each of eight publicly operated SA prisons (in summer and winter) to identify any documented HCV-antibody test results. Prisoners recruited at entry to prison were offered tests for HCV-antibody and completed a pre-entry risk factor survey. Participants completed additional risk factor surveys and (if HCV-negative at last test) underwent further antibody tests at three-monthly intervals for up to 15 months. A sample of participants also provided blood specimens for HCV-RNA testing. Limited stakeholder consultations with prison officers and nurses were also conducted. Quantitative data were analysed using univariate and multivariate techniques.

Results

1347 case notes were audited in summer, and 1347 in winter and an overall HCV prevalence of 42% was estimated. In both univariate and multivariate analyses, HCV prevalence was significantly higher in female prisoners (65%), those aged above 28 years (48%), and in Indigenous prisoners originating from metropolitan areas (56%). Indigenous prisoners originating from remote areas had significantly lower HCV prevalence (20%).

666 prisoners were recruited at entry, and 42% were estimated to be HCV-antibody positive. Three seroconversions were noted in 151 initially HCV-seronegative negative individuals followed up for a median time of 121 days – a rate 4.6 per 100 person years – but community exposure could not be ruled out. Overall agreement between HCV-antibody and HCV-RNA assays was 86% (100% in the HCV negative samples) – kappa = 0.71.

Injecting history was highly prevalent in prison entrants (70%) and both community and prison injecting (but not tattooing) were independent predictors of entry HCV status. Prison

history was also independently associated with entry HCV status. Injecting in prison during the study was infrequently reported, but significantly more likely in those testing HCV-antibody positive at prison entry (risk ratio = 2.48, P=0.046).

Stakeholders were most supportive of strategies to increase education and to minimise risks associated with hair clippers, but did not support most other suggested preventive strategies. Other issues related to communicable diseases and infection control were explored in the stakeholder interviews.

Conclusions

HCV prevalence in South Australian prisoners is extremely high and may have contributed to a 'ceiling effect', minimising the seroconversion rate observed in this population. Injecting is relatively infrequently reported in prison, but more likely in those already infected with HCV. Thus, contaminated injecting equipment represents a significant threat to other prisoners and prison staff. Strategies aimed at reducing HCV risk in prisons, which address the concerns of those expected to implement them, are proposed in this thesis.

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being made available in all forms of media, now or hereafter known.

Name: Emma Ruth Miller Signed: _____ Date: _____

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Introduction

Hepatitis C virus (HCV) infection is one of the most commonly notified communicable diseases in Australia with an estimated prevalence of approximately one to one and a half percent and around 20,000 infections newly notified each year (Communicable Diseases Australia, 2004; Dore et al, 2003; Speers, 1999). There have been around 14,000 notifications to the South Australian surveillance system since this jurisdiction introduced mandatory notifications in 1995.[*] Worldwide, between 170 and 300 million people are estimated to be infected with HCV (Keeffe, 2003; Lauer and Walker, 2001; Sanchez et al, 2000). The high chronicity rate of the infection contributes to its climbing prevalence, with up to 85% of those initially infected failing to clear the virus (Farrell, 2002; Hoofnagle, 1997; Tillmann and Manns, 1996).

Approximately 20% of those chronically infected are likely progress to liver cirrhosis within 20 years of exposure and up to 10% of these may progress to hepatocellular carcinoma (Law, 1999). There are also several extrahepatic manifestations (such as cryoglobulinaemia and sialadenitis) noted in HCV-infection (Coates et al, 2000; Hadziyannis, 1996; Hoofnagle, 1997) and significantly reduced health status has been found in HCV-infected populations irrespective of clinical signs and stage of disease progression (Foster et al, 1998; Kimber and Day, 2003; Lee et al, 1997; Miller et al, 2001). HCV treatments are available, but uptake remains low across the country - much of which is thought to be due to perceptions concerning the side effects that are frequently associated with interferon-based therapies, long duration of treatment and perceived low rates of successful treatment outcome (Batey, 2003; Collier and Chapman, 2001; Hoofnagle, 1998).

History of imprisonment has been independently associated with infection with the hepatitis C virus - HCV (Crofts et al, 1996; Dolan, 2000b; Stark et al, 1997). Over 10% of all South Australian notifications for HCV in 2002 were received from prisons. Of those notifications confirmed as new infections (as opposed to those which may have been newly diagnosed cases of chronic infection), 25% were notified from South Australian prisons – 40% of all

[*] Communicable Disease Control Branch, South Australian Department of Health, surveillance data 2006

male incident cases for that year (STD Services of SA, 2002). Nonetheless, the prevalence of HCV infection within prison populations has so far proven to be difficult to estimate and direct evidence of transmission, and of the rate at which it might be occurring, within the prison setting has been even more elusive. No investigations of HCV infection have previously been undertaken in South Australian prisons. From the work that has been done in this field elsewhere, it is clear that the prevalence of infection is many times higher than that of the general population (Dolan, 2000a). The high background prevalence combined with limited access to preventive resources and educative materials in this setting may further heighten the risk of infection for all persons entering, and working within, the prison system. Ultimately, uncontrolled HCV transmission combined with relatively rapid prison population turnover could be contributing to transmission among the non-incarcerated population by essentially providing a perpetually replenishing reservoir for infection. Clearly, HCV infection in prisons is a significant public health issue requiring urgent investigation.

This thesis was designed to identify the prevalence and incidence of HCV infection within the South Australian prison system. The thesis also aimed to identify patterns of injecting and tattooing behaviours within prison (the main risk factors for HCV infection in prison settings) and whether these behaviours change over the period of incarceration. The epidemiological effectiveness of the ELISA-3 HCV antibody test as also evaluated as a related objective of this thesis. Finally, this thesis has identified future directions for minimising HCV risks within the prison population.

1 HCV: a brief overview

There is a number of historical and virological features about HCV that present problems for research that do not necessarily beset the study of other communicable diseases. The magnitude of the public health problem presented by HCV is also compounded by these factors. While the existence of another hepatic pathogen (in addition to hepatitis A and B) had been known for some time, the relatively recent identification of the hepatitis C virus itself and the fast pace of diagnostic technology development since that time has overshadowed the need for new and/or confirmatory epidemiological investigations. As it is now known, once people become infected with HCV they tend to stay that way – with most people remaining in a state of lifelong infectiousness. This is not only due to the high chronicity rate of the virus, but also to an apparently widespread lack of enthusiasm towards the current range of available treatments. The aim of anti-viral therapy is to achieve viral clearance, which could potentially reduce the overall prevalence of disease and the upward momentum it exerts on transmission, were enough of the infected population treated. The genetic features of HCV determine both the treatment regimen and its outcome, and this (as shall be seen below) has serious implications in the Australian context.

This section provides an overview of some of the historical, virological and clinical characteristics of HCV, since many of the complexities for research introduced by them tend to be magnified in prison contexts. For instance, the low level of interest in undertaking epidemiological investigation in this area in general is further dampened where the target is a relatively inaccessible and politically unpopular population. The virological and immunological features of HCV increase the likelihood of transmission through sheer force of numbers while further complicating the picture for the study of HCV transmission within a highly mobile population. Treatments aimed at viral clearance may help to reduce the period of time an infected individual poses a transmission risk. Current antiviral treatments are also available to prisoners in South Australia, however, they must be prepared to remain in higher security (and less hospitable) metropolitan prisons to access them. Treatment is generally only offered to those facing relatively long periods of incarceration. Although not specifically dealt with in this section, it is also important to reflect on the personal impact of treatment side effects in the tightly regulated prison environment with little in the way of social support, as well as how all of these factors might impact on treatment uptake.

1.1 Infection with HCV

According to previously modelled estimates, around 210,000 Australians would by now have been infected by HCV, with around 1600 new infections projected for 2001 alone (Law and Batey, 2003). The overall prevalence of HCV infection in Australia has been estimated at between one and one and half percent (Farrell, 2002; Speers, 1999). Figures from the World Health Organization (WHO) suggest that the Australian prevalence is similar to other industrialised countries, but extremely high rates of infection are experienced in some regions and this contributes to world wide prevalence of approximately 3% (World Health Organization, 1999; World Health Organization Consultation and Viral Hepatitis Prevention Board, 1999). Perhaps the area with the highest HCV infection rates is Egypt – the mean of various regional prevalence estimates calculated for HCV in Egypt is approximately 22% (Lauer and Walker, 2001). It is difficult to find evidence that public health interventions to date have had a measurable effect on HCV transmission in Australia or around the world. Table 1.1-1 summarises the global prevalence of HCV according to WHO region (World Health Organization, 1999). It is important to note that there are large inconsistencies in the population groups studied and the data collection methods used, with many countries not able to provide data at all.

The precise picture for individuals infected by HCV is still very uncertain. Our ability to predict health outcomes or transmission risks even on a population or sub-population level remains limited. Much of the reason for this is that the research underpinning our understanding of the epidemiology of HCV was carried out with the earliest and least sensitive assays relative to those that are now available. It would seem that the primary focus of research in recent years has been on the development of more sensitive diagnostic technology and more efficacious treatments and this has left very little room for further, or confirmatory, epidemiological investigation.

Table 1.1-1: Global prevalence of HCV-infection by World Health Organization region – 1999 – compared to Australia

*WHO regions *(no. of countries)* and **Australia	Population size *(million)*	HCV prevalence *(%)*	Number infected *(million)*	No data available *(number of countries in region)*
Australia	**20**	**1.05**	**0.21**	**-**
Africas (25)	602	5.3	31.9	12
Americas (23)	785	1.7	13.1	7
Eastern Mediterranean (23)	466	4.6	21.3	5
Europe (52)	858	1.03	8.9	19
South-East Asia (10)	1500	2.15	32.3	3
Western Pacific (18)	1600	3.9	62.2	11
†Total (151)	**5811**	**2.9**	**169.7**	**57**

** WHO (1999) Hepatitis C - global prevalence (update), Weekly Epidemiological Record 74: 425-6*
***Farrell GC (2002).Hepatitis C other liver disorders and liver health, NSW: MacLennan and Petty; Law MG, Batey RG (2003) Injecting drug use in Australia: needle/syringe programs prove their worth, but hepatitis C still on the increase, Medical Journal of Australia 178: 197-8*
†Totals exclude row describing Australian rates (already included in Western Pacific estimates).

1.1.1 The virus

Formerly associated with post-transfusion hepatitis and known as non-A, non-B hepatitis, the hepatitis C virus was first isolated in 1989 (Choo et al, 1989). The hepatitis C virus, an RNA virus, has been characterised as *hepacivirus* - a member of the *flaviviradae* family - and classified into six major HCV genotypes (and over 50 subtypes) which are distributed differentially around the world (Busch, 2001; Flamm, 2003; Thomson and Finch, 2005). For instance, genotype 4 is largely restricted to the Middle East, genotype 5 to South Africa and genotype 6 to South East Asia (Lauer and Walker, 2001; Simmonds, 1997). In Australia, as in other western countries, the predominant HCV genotype is type 1 (approximately 55% of cases), followed by type 3 (around 35%) and then type 2 (around 8%) – with genotypes 4 to 6 being identified mainly in persons born overseas (Batey, 2003; Dore et al, 2003; Farrell, 2002). There is no consistent evidence linking disease transmission or progression with HCV genotype, but genotype is clinically important in determining treatment regimens and predicting treatment response (Keeffe, 2003; Pawlotsky, 2002).

1.1.2 The test

The relatively recent identification of the hepatitis C virus heralded an explosion in the development of diagnostic technology over the past fifteen years. The first generation enzyme-linked immunosorbent assay (ELISA), which detected epitopes of antibody to HCV in serum, had a sensitivity of between 70 and 90% (Lin et al, 1992). ELISA-2, improving on the first generation assays by detecting both structural and non-structural viral proteins, was more sensitive and able to detect antibodies earlier in the infection (Puoti et al, 1992). The currently used third generation ELISAs have a sensitivity of 99% or greater and a specificity of 100% (Colin et al, 2001; Pawlotsky, 2002; Pawlotsky, 2003).

The 'window period', the time from initial infection to seroconversion, is known to be long in HCV infection and much longer in the case of severely immuno-compromised persons who may not seroconvert at all (Pawlotsky, 2002). While circulating viral particles can be detected in blood within a week to ten days using much more expensive nucleic acid amplification techniques – such as polymerase chain reaction (PCR) – HCV antibody seroconversion may be delayed for months (Widell et al, 2002). The ability to 'close the window' on the time between initial infection and the identification of early antibody production has been an important aim of researchers interested in improving the safety of the blood supply. With each successive ELISA generation, the average window period length has shortened. Schiff et al (1999) proposed that ELISA-1 detected HCV-antibody in an average of 16 weeks from exposure, ELISA-2 in ten weeks and ELISA-3 in seven to eight weeks. Marinos and Post (2003) suggest that approximately 90% of those infected will have measurable antibodies to HCV by three months of exposure using ELISA-3. Other estimates of the average window period for later generation ELISAs range from 40 days to 82 days (Allain, 2000; Ansaldi et al, 2006; Busch, 2001; Fabrizi et al, 2005; Forcic et al, 2005; Glynn et al, 2002; Icardi et al, 2001; Katsoulidou et al, 2004; Laperche et al, 2005; McCullough et al, 2000; Peterson et al, 2000; Tobler et al, 2005).

It is difficult to get a sense of the proportion of newly infected individuals who experience delayed seroconversion, since variance estimates are seldom (if ever) reported along with average reported HCV window period length in the recent literature. In their study aimed at updating the residual risks from blood transfusions that might be attributable to window period infections, Dodd et al (2002) make the point that the published estimate of 70 days for

low-prevalence populations (blood donors) hasn't been updated despite increasingly sensitive ELISAs having become available. For this reason they conclude (page 978):

> *"...it doesn't appear possible to develop contemporary estimates of the variances of window periods."*

As shall be seen (in chapter 4, section 4.4.1.5), this thesis incorporated a feature which was designed to measure one aspect of the performance of third generation ELISAs against the quoted window period estimates, using PCR as the gold standard.

ELISAs detecting HCV-antibody in saliva, rather than serum, have recently become available and are increasingly being used, particularly by researchers in the United Kingdom (see chapter 2, section 2.1.1). Greater ease of collection is a clear advantage offered by salivary tests over venous blood tests. However, the test has a lower sensitivity than the serum assays – reported sensitivities for saliva assays have ranged from 69.6% to 88.2% compared to sensitivities of around 99% reported for serum assays as discussed above – and while appropriate for epidemiological investigations they are not considered suitable for diagnostic use (Judd et al, 2003; Van Doornum et al, 2001).

1.1.3 The natural history

Replication of the hepatitis C virus primarily occurs within host hepatocytes and is a prolific, but relatively inaccurate, process in which many trillions of viral particles are generated per day (Lauer and Walker, 2001). This rapidly gives rise to high rates of viral mutation in which multiple quasi-species are formed within a single infected individual, providing an important method of immune system evasion for the virus and resulting in a very low rate of viral clearance (Farrell, 2002; Flamm, 2003; Purcell, 1997). It is the activity of the host immune system itself, rather than direct viral activity, which is thought to cause much of the damage to liver cells seen in chronic HCV infection (Farrell, 2002; Lauer and Walker, 2001).

The prognostic pathway for HCV infected populations has been well accepted and is presented in Figure 1.1-1. Generally, up to 85% of those initially infected will develop chronic hepatitis infection. Approximately 20% of those chronically infected will develop cirrhosis of the liver after 20 years. Five to ten percent of those with cirrhosis for a period of up to ten years will progress to end-stage liver disease or develop hepatocellular carcinoma (Batey, 2003; Farrell, 2002; Flamm, 2003; Isaacson et al, 1997; Lauer and Walker, 2001; Sharara, 1997). It is important to recognise that it is not yet possible to determine which

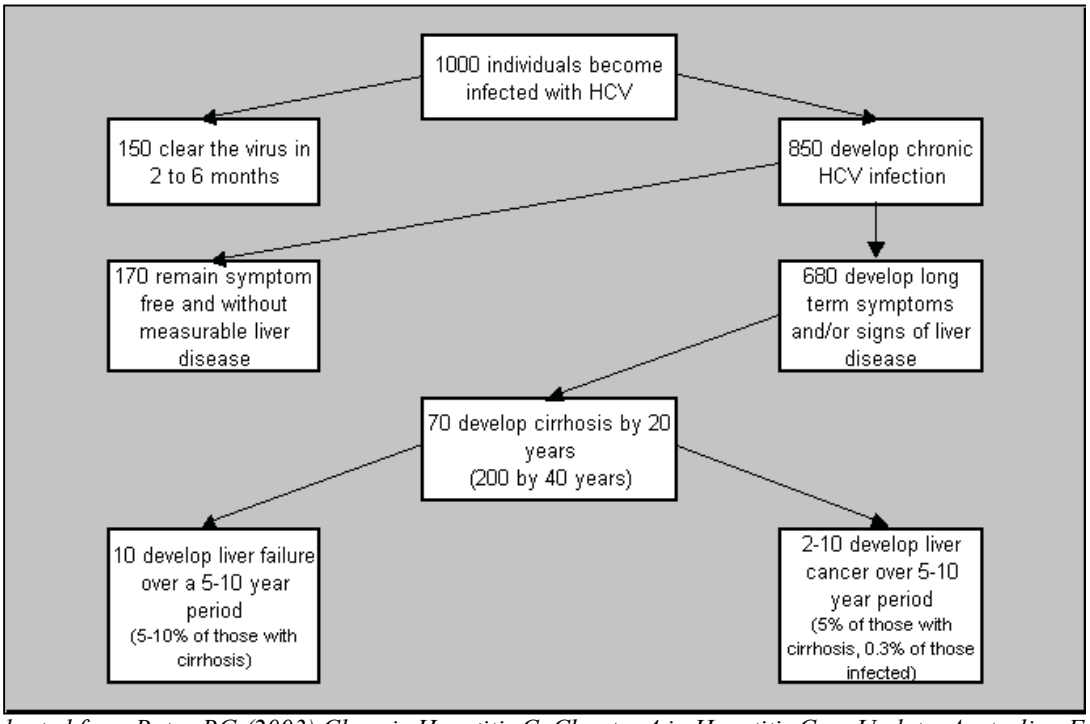
pathway will apply on an individual basis. Additionally, disease progression may not always be a linear process. Progression of liver fibrosis, for instance, is known to accelerate with advancing age and this has been shown to be independent of duration of infection (Thomson and Finch, 2005).

Liver transplant is currently the only available treatment for end-stage disease and HCV infection has now become the most common indication for liver transplants in Australia and the US (Farrell, 2002; Hoofnagle, 1998; Jaeckel et al, 2001; Keeffe, 2003). While most people infected with HCV will never develop some of its more serious sequelae, the sheer number of those infected with HCV has serious implications for future health resource allocation in Australia and the world.

There are also a number of 'extrahepatic manifestations' (non-liver related conditions) associated with chronic HCV infection – many of which are thought to result through immunological mechanisms, although some may be directly due to viral invasion. Examples of conditions associated with chronic HCV infection include skin disorders, kidney disease and joint damage (related to cryoglobulinaemia - common in chronic HCV), seronegative arthritis, non-Hodgkin's lymphoma and diabetes (Batey, 2003; Engels et al, 2004; Flamm, 2003; Gumber and Chopra, 1995; Hadziyannis, 1996; Lauer and Walker, 2001; Sharara, 1997; Tillmann and Manns, 1996). Xerostomia (dry mouth) has been noted in people with chronic HCV infection, resulting in more advanced dental caries and periodontal disease and greater tooth losses than occurs in non-infected people (Coates et al, 2000).

Even in the absence of hepatic or extrahepatic disease, many people report various symptoms including fatigue, depression, nausea, abdominal discomfort, arthralgia and muscle pain (Batey, 2003; Farrell, 2002; Flamm, 2003; Gifford et al, 2003; Hoofnagle and Di Bisceglie, 1997; Lee et al, 1997; Wodak, 1998). Studies of untreated clinic populations have found that health-related quality of life in HCV infection is significantly reduced in people with HCV infection but is not correlated with histological evidence of liver damage or other measurable signs of disease activity (Bonkovsky et al, 1999; Foster et al, 1998; Miller et al, 2001; Spiegel et al, 2005). In addition, there are some indications that there may be a social dimension to some of the reduced quality of life associated with HCV (Gill et al, 2005; Rodger et al, 1999).

Figure 1.1-1: Prognosis of HCV infection



Adapted from Batey RG (2003) Chronic Hepatitis C, Chapter 4 in Hepatitis C an Update, Australian Family Physician, 32 (10): 807-11

1.1.4 The available treatment

The only treatments so far shown to be effective in chronic HCV infection have been interferon-based therapies. Interferons are a group of naturally occurring glycoproteins which exhibit antiviral activity (Pardo et al, 1995; Sharara, 1997). Initially, monotherapy with interferon alfa (IFN-α) was introduced for chronic HCV, but success rates (as measured by sustained viral clearance) were disappointing – only around 20% of all of those treated and lower in patients infected with HCV genotype 1 (Hoofnagle, 1998; Saracco and Rizzetto, 1995; Semour, 1994). IFN-α in combination with daily doses of the oral antiviral agent, ribavirin, achieved overall success rates of around 40% but only around 20% in genotype 1 (Isaacson et al, 1997; Lauer and Walker, 2001). The more recent pegylated IFN-α and ribavirin combination treatment is reported to have considerably higher overall success rates (approximately 60% overall), but the differential remains across genotypes (Craxi and Licata, 2003; Flamm, 2003; Majid and Gretch, 2002; Pawlotsky, 2002; Thomson and Finch, 2005). Side effects to treatment have been well-documented and have not improved with successive treatment modalities (Dieperink et al, 2003; Flamm, 2003; Hoofnagle and Di Bisceglie, 1997; Lauer and Walker, 2001; Watson, 2000).

Even among eligible patients, the uptake of treatment has been low across Australia (Batey, 2003). Lack of knowledge about available treatments, fear of liver biopsies and waiting periods for specialist services have been variously and widely proposed as possible explanations for low treatment uptake. The commonly reported, and sometimes debilitating, treatment side effects are also likely to be a deterrent. HCV genotype 1 is the most common genotype in Australia - associated with the longest treatment regimen (twelve months), at the highest doses and with the lowest rates of treatment success. There is some evidence that treatment uptake may be even lower among prisoners. An observational study of the pathway from diagnosis to eventual treatment in prisoners entering Dartmoor prison in the UK, noted very high attrition rates through all steps of the process – particularly at the point of referral from prison to specialist care (Horne et al, 2004).

1.2 HCV: overview conclusion

As can be seen, the high prevalence of HCV infection is due to a range of virological, immunological, political, social and clinical factors and the complex interactions between them. Rapid advancement in diagnostic technology has occurred in the short time since the identification of the hepatitis C virus, together with a strong research focus on clinical treatment. Much of the epidemiological work underpinning the current understanding of HCV was completed in the absence of the current generation of sensitive assays, and there appears to be relatively low motivation to undertake new epidemiological investigations or confirm previous findings. Not surprisingly, this has left some gaps in the understanding of the epidemiology of HCV. This has particular implications for research in prison populations where other issues affecting accessibility can present problems that further increase the complexity of investigation.

Despite the relative paucity of research in prisons so far, it has emerged that a high proportion of the incarcerated population is infected with HCV. The prison population essentially represents an uncontrolled and undiluted model of the impact of the forces that maintain the HCV epidemic in the community context. These forces, both virological and non-virological, encompass factors such as high viral mutation rates and immune system escape and relatively low treatment uptake in infected individuals. Additional influencing forces include difficulty in obtaining access to the population as well as to appropriate research resources.

2 Literature review

There is a number of factors which contribute to the difficulty of studying HCV-infection in the prison setting. One of the chief difficulties is the existence of at least two distinct population groups within prisons which are defined by their behaviour with respect to injecting drugs – the main risk factor for HCV infection (Dolan, 1997). The relatively short duration of sentences associated with non-violent, drug-related offences may impact on the ability of studies of prison entrants to generate prevalence estimates for the whole prison population. That is, injecting drug users (IDU) tend to be over-represented on admission, which could result in an over-estimation of overall HCV prevalence. Macalino et al (2004b) support this view in noting that the point at which prevalence studies occur – such as at entry, or as a cross-sectional census of the entire population – might influence the size of the prevalence estimate. Designs incorporating serial testing over time will, on the other hand, tend to lead to an under-estimation of the transmission rate, since those serving shorter sentences tend to be under represented in the follow up sample.

Dolan (1997) discussed the difficulty obtaining valid and generalisable risk factor data in prisons – noting that there is a degree of overlap in the risk behaviours of prisoners. For instance, injecting and tattooing are not mutually exclusive practices in prison. The risk associated with tattooing is likely to be even higher in prison because of the high HCV-prevalence in IDU who may share the tattooing equipment (Crofts et al, 1996). In addition, the level of security in each prison setting may also influence risk behaviour. For example, self reports of IDU in minimum security prisons have been found to be significantly more likely than in prisons with higher security levels (Dolan, 1997).

2.1 HCV prevalence in prisons

There have been relatively few national or international published studies of HCV prevalence in custodial settings. This section describes the work published in this area at time of writing (summarised in Table 2.1-1 and Table 2.1-2). Much of the literature was identified through Medline searches, although this review does include an unpublished investigation previously conducted by the current writer and PhD candidate. While many of the studies looked at other blood borne diseases, only the results concerning HCV-infection are reported here. Similarly,

where non-adult prisoners were included in the samples, only results pertaining to adult populations are presented.

2.1.1 International literature

Almost 4000 prisoners in eight (of 135) prisons in England and Wales participated in a cross-sectional study of risk factors and prevalence of antibodies to HIV, hepatitis B virus (HBV) and HCV (Weild et al, 2000). Participants from juvenile male, adult male and adult female correctional facilities completed an anonymous risk factor survey and provided a saliva sample for viral antibody tests. Only 8% of adult prisoners overall tested positive for HCV antibody, but the prevalence of HCV antibody rose to 31% in those reporting a history of IDU. The prevalence of HCV in adult male IDU increased with duration of injecting and was higher in those reporting injecting in prison. In females, HCV prevalence was 11% and was 34% in those reporting IDU. Logistic regression modelling showed that the 'number of previous incarcerations' and 'ever having injected in prison' were significant predictors of HCV infection in adult male prisoners in this study.

Using the methods previously utilised in HIV studies by the same research team (Gore et al, 1997), a cross-sectional study in five Scottish prisons used their 'willing anonymous salivary hepatitis C' (WASH-C) surveillance technique, linked to self-completed risk factor surveys, to estimate HCV prevalence (Gore et al, 1999). Overall, HCV prevalence was estimated to be 20%, but was 49% in those reporting a history of IDU (compared to never-injectors). Of prisoners reporting IDU history, only a moderate difference in HCV prevalence was found in those who reported injecting in prison relative to those who reported only outside injecting (53% vs 44%). The study found that the time period of commencing injecting drugs was important, with lower HCV prevalence in those commencing injecting from 1992, compared to earlier time periods (31% and 55% respectively). As the authors suggest, this is likely to reflect greater exposure to prevention education and greater opportunity to adopt safer injecting practices increasingly available outside of prisons in recent years.

The saliva-based test and similar anonymous survey methods were used to establish the prevalence of HBV, HCV and HIV and risk factor behaviour in 1193 prisoners (including 57 females) in the Republic of Ireland (Allwright et al, 2000). The survey was conducted in five high security and four medium security prisons in 1998, although only pooled data from all prison settings were reported. While the prevalence of other blood borne viruses was

relatively low, 37% of prisoners overall were found to be infected with HCV and was 81% in those reporting IDU. Multivariate analysis indicated that history of IDU was the most important predictor of HCV antibody positivity.

The same research team (Long et al, 2001) repeated the methods described above in 596 Irish prison entrants, and found the overall prevalence of HCV (according to salivary ELISA) was 22%, but very much higher in female prisoners relative to males (56% vs 19%). HCV prevalence rose to 72% of those reporting IDU history on entry, but lower amongst IDU who had never previously been incarcerated (36%). This is suggestive of an association between IDU and prison exposure. Compared to males, female prisoners had a seven-fold increased risk of HCV infection. Female prisoners reporting IDU history were 89 times more likely than non-IDU females to be infected. While its direction is consistent with the literature, the greater magnitude of the sex differential observed may reflect geographical differences in incarceration rates for women charged with drug related crimes (see chapter 3 section 3.1.1). Logistic regression analysis indicated that IDU was the most important predictor of HCV-infection.

It is important to acknowledge that the previous four studies utilised a salivary ELISA, rather than a more sensitive serum assay. As discussed in chapter 1 (section 1.1.2), sensitivities as low as 70%, but up to 88%, have been reported for salivary assays. Thus, it is possible these studies have underestimated the true prevalence of HCV in the prison populations studied. All four studies collected risk factor information obtained through anonymous questionnaires that were linked only to the test results. This allowed the investigators to stratify their analyses according to a variety of variables. Since this would have required active recruiting of prisoners, it is possible that shorter stay prisoners and those still undergoing court proceedings might have been under-represented in the sample. The exception is the study by Long et al (2001), which recruited only prison entrants and presumably included short stay prisoners. Since shorter prison stays are associated with conviction of drug-related offences, it is surprising that a relatively low overall prevalence of HCV infection was identified in this population.

In a medium security prison for males in Denmark, 325 prisoners participated in a study investigating the prevalence and incidence of blood borne viruses (Christensen et al, 2000). Prisoners were interviewed about their risk factors for transmission and underwent a blood

test - for antibody to HCV, HIV, HBV and human T lymphotropic virus (HTLV) as well as HCV RNA (by PCR) - at the time of recruitment and 142 of these were also followed up at the end of the study (conducted over a period of 12 months) or at the time of release (whichever came first). Most participants had been multiply incarcerated, with the median being six periods of imprisonment for a total of 30 months. IDU history was reported by 43% and this was correlated with HCV-infection. Overall, the prevalence of HCV-antibody at recruitment was 43% and HCV-RNA was 29%. Among IDU, the prevalence of HCV antibody was 87% and 56% had detectable HCV-RNA. For non-IDU, the prevalence estimates were 10% and 8% respectively. The odds ratio for HCV-antibody in IDU relative to non-IDU was 62.9 and was 14.4 for HCV-RNA. The authors did not provide an explanation for what appears to be a higher viral clearance rate amongst IDU. After multivariate analysis - with a model including the variables age, tattoos, sexual and IDU behaviour – only duration of IDU remained a significant predictor of HCV infection. 142 of the participants (of whom 74 were HCV-negative at recruitment) were followed up after a median length of around 4.5 months. These results are reported in section 2.2.1, below.

A Texan study looked at HCV-seroprevalence in 3,712 male and female prisoners entering the various types of prison facilities that make up the Texas Department of Correctional Services (Baillargeon et al, 2003). The study compared HCV prevalence in those entering Substance Abuse Felony Punishment (SAFP) facilities, state jails and prisons as well as according to prisoner sex and ethnicity. While rates were considerably higher in all prison entrants than those in the non-incarcerated population, those entering SAFP facilities did not have higher rates than those entering other facilities. This may reflect the level of sensitivity in the targeting of individuals for treatment in SAFP facilities. Male entrants to all three types of facility had comparable HCV antibody prevalence (around 28%). The highest rates for women were in those entering prisons (49%) but similar rates were observed in those entering SAFP facilities and state jails (around 37%). African Americans of both genders had the lowest prevalence of infection, and age was positively correlated with HCV-seropositivity.

In California, 4513 male and female prison entrants to six reception facilities during 1994 were tested for HCV antibodies by ELISA-2 (Ruiz et al, 1999). Overall, 41% of prisoners tested positive for HCV-antibody. The prevalence of HCV was higher in females compared to males (54% versus 40%) and for females and males aged 25 years and older (55% and 46% respectively). There were complex relationships between ethnicity and HCV prevalence with

white males having higher prevalence than African-American males and Latino females having higher prevalence than white females. After multivariate analysis, HCV-positivity in males was associated with hepatitis B core antibody (HBcAb) positivity, age 25 years or older and previous incarceration. For females, HCV-positivity was associated with HIV positivity, HBcAb positivity, and being Latino. Because this information was incomplete, IDU was not entered into the multivariate modelling. Nonetheless, among the prison entrants for whom these data were available, 97% reported injecting drugs since 1978. Among this group, 78% of males and 71% of females were anti-HCV positive. The strikingly high proportion of inmates reporting IDU history prior to entry may be a feature of the potentially long period of time between exposure and the time of the study (1978 to 1994).

The results from a repeat survey in 1999 was compared in correspondence by the same authors (Ruiz et al, 2002) which suggested a trend to significantly decreased HCV prevalence in entrants to the Californian Correction system overall and for women entrants in particular. For males, entry prevalence of HCV dropped 13% to 34% and there was a 54% drop for women who were found to have prevalence of only 25%. The correspondents suggest that safer injecting practices and increased utilisation of clean needle programs in the Californian community may explain the decreases observed. It is worth noting, however, that while the correspondents state that blood screening was mandatory for all prison entrants in California in by 1999, HCV testing in the earlier survey (described above) appears to have been conducted on a more voluntary or ad hoc basis.

Again in California, 467 males and females entering three State prisons were screened for HCV antibody (Fox et al, 2005). To identify those who might have been in the pre-seroconversion period, those testing HCV-antibody negative were also screened for HCV-RNA by PCR. One hundred and sixty (of 467) prisoners were HCV-antibody positive by ELISA-3, but one of these cases could not be confirmed with a confirmatory antibody assay - recombinant immunoblot assay (HCV-RIBA). One (of 307) participants testing antibody negative was PCR positive. Thus, the overall prevalence was estimated at 34% - a figure that includes 159 RIBA-confirmed antibody positive and one HCV-RNA positive individuals. Univariate analyses revealed that HCV infection was associated with age, race/ethnicity, sexual orientation and previous history of imprisonment (i.e. cumulative years incarcerated). HCV prevalence was 66% in those reporting IDU history but 10% in those who did not. The respective HCV-prevalences were 50% and 32% in those reporting same-sex partners and

those with different sex partners. In contrast to much of the published literature, the authors report that gender was not significantly associated with HCV infection in this population - the prevalence in males was 33% versus 38% for females. Significant differences in HCV prevalence were seen, however, in females who reported having sex with an injecting drug user relative to females who had a non-IDU sexual partner (61% versus 11%). This differential remained even after adjustment for history of IDU and cumulative years of incarceration (OR = 4.47) and no such association was noted in male prisoners. Tattooing was also not found to be significantly associated with HCV in this population.

An older study investigated HCV-seroprevalence in 265 male prison entrants in Maryland, in the US (Vlahov et al, 1993). The prisoners had participated in an earlier HIV study, and stored, paired serum samples for two time periods (one to two years apart) remained with some linked demographic data. The authors tested the paired samples with ELISA-2 to estimate entry prevalence and seroconversion rates (the seroconversion findings are reported section 2.2.1, below). The study found that 38% prisoners had tested HCV positive at entry, but there were significant differences in prevalence according to univariate analyses of available linked data. Age 25 years and over, having been convicted of a non-violent offence and (interestingly) having been convicted of a non-drug related offence, and HIV positive status were all associated with higher HCV prevalence. In contrast to later US studies, the Vlahov et al study found that African American prisoners were more likely to be anti-HCV positive. It is possible that incarceration patterns may be different among the jurisdictions involved or have changed over the decade or so between the earlier and later studies.

A study in Rhode Island prisons (in the US) recruited 4269 sentenced male prisoners at entry and investigated entry prevalence of HIV, HBV and HCV (Macalino et al, 2004a). Incidence of all viruses was also studied in continuously incarcerated prisoners, and these results are discussed in section 2.2.1 below. Prisoners entering Rhode Island's single intake centre already underwent mandatory HIV testing at the time of the study. HIV data were linked to risk factor data, however HCV and HBV testing occurred after identifiers were removed. Serum HCV-antibody tests revealed that 23% of prisoners were infected at entry. HCV prevalence was 83% of those reporting IDU history, compared to 15% of non-IDU. Those with HCV-infection were more likely to be white, aged 40 to 49 years of age, to be IDU and to have been previously incarcerated. After multivariate analysis, only age over 30 years and IDU were significantly associated with HCV-antibody positivity. This study found a

relatively low overall prevalence of HCV because only sentenced prisoners were recruited and persons charged with drug offences tend to make up a larger proportion of remand prisoners. The IDU-specific prevalences identified were consistent with other published estimates.

The same research team later investigated HCV and HBV prevalence and incidence in 297 recidivist women prisoners (defined as women multiply medically assessed at the prisons intake facility during the nearly two-year study period) at the Rhode Island Department for Corrections (Macalino et al, 2005b). Blood samples taken during mandatory HIV screening at each entry were stored and later tested for HCV antibody and the results then linked to demographic and risk history data collected during the facility's standard intake health assessment. During the study period 2006 women entered the prison, of whom 526 were classified as 'recidivists'. Among the 297 women for whom blood samples were available, HCV prevalence was 40% (119/297) overall. No analyses of risk factors and HCV-antibody prevalence were reported, however a summary of the reported risk factor analyses in relation to HCV seroconversion is presented below (section 2.2.1). It is important to note that only HIV negative blood specimens were available for subsequent HCV testing. As the authors note, this may have resulted in an underestimation of the true HCV prevalence in this population given the degree of overlap between HIV and HCV risk factors.

Prisoners entering the Maryland Correctional System, in the US, were routinely tested for syphilis on entry up until 2002. Solomon et al (2004) tested excess sera from those admitted or detained during 2002 for HCV, HIV and HBV and linked these results to demographic data and syphilis results. Overall, 30% of the total prison population tested anti-HCV positive (26% of new inmates and 31% of detainees). Multivariate analyses identified that HCV prevalence was significantly higher in detainees relative to inmates (OR 1.49), in females relative to males (OR 1.32), and in white individuals relative to black or Hispanic Americans (OR 4.48). There was a positive linear association between HCV-antibody status and age. During voluntary counselling with 382 participants who provided risk factor information, the authors found that white Americans were significantly more likely to report IDU history. In further multivariate modelling, which included IDU, race was no longer significantly associated with HCV-infection. The authors also noted that females, who had higher HCV prevalence, were more likely to have been convicted with drug-related offences, however they

did not find a difference in HCV prevalence overall between those convicted of drug-related offences and those convicted of other offences.

A repeated cross-sectional survey of HIV, HCV and risk behaviour among existing male prisoners in a medium security prison facility in Canada allowed for estimates of prevalence to be compared with a study conducted three years earlier (Ford et al, 2000). In the later study, 355 prisoners provided a blood sample and completed a risk factor questionnaire. These data were compared to the previous study, in which 408 inmates of the same facility participated. Thirty three percent tested positive for anti-HCV, representing an increase on the previous study when 28% were found to be anti-HCV positive. Interestingly, and not consistent with other studies, the logistic regression indicated that only injecting drugs *outside* of prison was independently associated with HCV infection. The authors state that there had been an increase in the incarceration rate among IDU and suggest (on page 116) they may be "bringing their habit with them". It is possible that, against a relatively large proportion of 'ever outside IDU' (68% of respondents), small overall numbers may have impacted on the ability of the study to demonstrate independent relationships between HCV and other IDU behaviours in prison.

In another cross-sectional study in Canada, voluntary HCV (and HIV) antibody tests were undertaken by 3423 male and female entrants and existing residents of 53 prisons with various security levels (De et al, 2004). The tests were performed as part of the routine, system-wide surveillance system operating from 2000. Testing uptake was around 30% for both new admissions and existing residents. There was differential uptake according to sex, with a higher proportion of female entrants accepting testing and higher proportion of existing resident males accepting testing. Around 10% of all new entrants and 7% of existing residents were HCV-antibody positive. The cumulative prevalence at years end (an estimate which took into account prisoner discharges and deaths during the year) was calculated at 26% but was higher in female prisoners (34% versus 26% in males). Since there was little difference in the HCV-prevalence noted in prison entrants and residents, this study was not able to demonstrate an increased risk for HCV associated with imprisonment. However, the relatively low proportion of testing uptake in this study and possible bias associated with self-selection for testing were limitations which were noted by the authors. It was also not possible to identify prisoners moving in and out of prison, with the result that it was possible for the one individual to be categorised as both a new entrant and an existing resident. As De et al point

out, this could have led to reduced confidence in the seropositivity estimates in the existing resident population.

A random sample of existing prisoners in Mexico completed a risk factor questionnaire and were serologically tested for HCV, hepatitis A virus (HAV), HBV, hepatitis D virus (HDV) and HIV (Alvarado-Esquivel et al, 2005). Seven female and 173 male prisoners participated, but only results for the total sample were reported. Overall, only 18 (10%) of all prisoners were found to be infected with HCV. The small overall prevalence may have been due to the relatively small proportion of prisoners reporting IDU – only 5% of prisoners (9/180) – of whom six (67%) were HCV-antibody positive. Perhaps reflecting cultural practices with respect to drug taking, 49% of this prison population reported a history of taking non-injecting drugs and 83% were reported to have "excessive alcohol consumption" (Alvarado-Esquivel et al, 2005, page 681). HCV was also found in 14% (17/118) of those reporting not using condoms, but in only one of the 18 cases (6%) who reported wearing condoms. While an odds ratio of 10.3 was calculated for unprotected sex, the authors point out that the wide confidence interval calculated for this estimate (1.5 to 436) indicates that this result should be interpreted cautiously. Not discussed by the authors, sexual activity is not generally considered to be an efficient mode of transmission for HCV (Farrell, 2002; MacDonald and Wodak, 2003; Thomson and Finch, 2005).

Babudieri et al (2005) investigated correlates of HCV (as well as HIV and HBV) in eight Italian prisons. The study population was a convenience sample representing approximately 18% of those incarcerated in the eight prisons at the time of the study. The study population consisted of 847 males (87%) and 126 females (13%) among whom the overall prevalence of IDU history and tattoos was around 30% and 48% respectively. Overall, 30% tested HCV-antibody positive as did 75% of those reporting IDU history and 51% of those with tattoos. The researchers found large variations in HCV prevalence according to the area from where the person originated, with significantly higher prevalence noted in those reported to be Italian relative to non-Italians even after those with IDU history were excluded (25% versus 14%). While this finding is not discussed by the authors, Italy has long been identified as a country of high background HCV prevalence compared to other countries (Guadagnino et al, 1997; Maio et al, 2000; Sagnelli et al, 1997). Perhaps in another indication of geographical specific factors, univariate analysis demonstrated that female prisoners had significantly lower HCV prevalence than males – 21% versus 41% - and no association between sex and HCV

status at all was found on multivariate analysis. These findings are also not discussed by the authors, despite their apparent inconsistency with the international literature. Interestingly, the authors found a U-shaped relationship between age and HCV status – with the highest risk associated with the middle age group, 31 to 45 years. Lower prevalences were found in those aged under 31 years and even lower risks in those over 45 years. This is also inconsistent with the majority of the literature (much of which is reported in this chapter) where a more linear and positive relationship between age and HCV status is more commonly reported. It is possible that IDU history may have influenced this finding.

A cross-sectional study of 362 prisoners with a history of IDU entering two prisons in Northern Spain looked at the prevalence of co-infection with HCV, HBV and HIV as well as risk factors for co-infection (Pallas et al, 1999). The average duration of injecting was 8.6 years; most (69%) reported sharing needles and half (50%) had tattoos. The most common infection was HCV with 92% infected overall. HCV-HBV was the most prevalent co-infection (43%), followed by the triple infection of HCV-HBV-HIV (37%). Only 13% were mono-infected overall, with only 10% infected with HCV alone. It is important to note that the epidemiology of HIV and HBV infection is very different in these Spanish IDU prison populations when compared to elsewhere. For instance, and as previously mentioned, the prevalence of HIV in imprisoned IDU in Australia is thought to be less than five percent (Makkai and McAllister, 2001).

A Greek cross-sectional study of 544 male and female prisoners convicted of drug offences in Athens and Patra investigated the prevalence of a number of blood-borne viruses including HCV infection (Malliori et al, 1998). The study also looked at risk factors for HCV seropositivity among imprisoned IDU and these are discussed below (see section 2.3.1.2). HCV prevalence was 58% overall, 81% in IDU and 10% of non-IDU.

A cross-sectional study in 756 inmates of a Brazilian prison looked at the seroprevalence of HCV compared to that of other communicable diseases such as HBV, HIV and syphilis as well as risk factors for infection with each disease (Guimaraes et al, 2001). Overall, 41% were positive for anti-HCV. After analysis of a range of variables including socio-demographic status, sexual behaviour, and drug use history, the four most predictive risk factors for HCV infection were co-infection with syphilis, expected duration of imprisonment longer than 130 months, previous incarceration at the same correctional facility and illicit drug use prior to

imprisonment. The study also found that the simultaneous presence of all four risk factors was associated with an 82% probability of HCV antibody positivity.

An earlier Brazilian study investigated HIV, HCV and syphilis prevalence in 631 randomly selected prisoners (Massad et al, 1999). The prevalence of HCV-antibody (with positive ELISAs confirmed by immunoblot assay) was 34%. Although risk factors were investigated, the reported results were restricted to correlates of HIV infection. Interestingly, HCV and HIV seroprevalences were strongly correlated in this study, even in the absence of reported IDU history. Syphilis infection and sexual practices were not as strongly correlated with HIV. The authors acknowledged the possibility of reporting bias in relation to injecting practices. They conclude that, due to the legal implications of admitting injecting behaviour, HCV seropositivity was a good proxy indicator of parenteral exposure to HIV in this population. In later analyses of these same data (Burattini et al, 2000) the conclusion that the predominant mode of transmission for HIV in this prison was parenteral rather than sexual was further supported. As is indicated in a later section (see chapter 3, section 3.1), HIV in Australian prisons is also thought to be transmitted parentally rather than through sexual practices (Dolan et al, 1998).

A study in Iran compared the prevalence of selected blood borne viruses in incarcerated IDU and non-incarcerated IDU and among local blood donors from the local area who donated during the same year of the study (Rahbar et al, 2004). Unfortunately, only HIV data were reported for non-incarcerated IDU. The study was conducted in Mashhad (in north eastern Iran) and investigated a convenience sample of prisoners in the central Mashhad prison. The prevalence of HCV-antibody was 59% (60/101) in incarcerated IDU compared to 0.1% (59/60892) in blood donors.

Also in Iran, 427 prisoners (397 men and 30 women) participated in a cross sectional study of HCV (and HIV) prevalence and related risk factors (Alizadeh et al, 2005). All participants were reported to use illicit drugs, and 35% also reported injecting drugs. The mean age was reported at 38 years, but ranged from 15 to 77 years. The overall prevalence of HCV antibody was 30% and there was no difference according to sex (both 30%) or IDU history (IDU 32%, non-IDU 29%). The authors suggest that this may indicate the presence of an unknown an unidentified risk factor for HCV infection in this population. In my view, it is possible that there may have been some misclassification in this study (for example, due to

reporting bias), particularly when one contrasts the prevalence estimate calculated for IDU in another prison in Iran of 59% (Rahbar et al's study described above). There was very little variation in HCV prevalence according to age group, although the authors did note a positive correlation between HCV prevalence and duration of imprisonment.

In Taiwan, Liao et al (2006) screened 297 newly sentenced prisoners for HCV and HBV and all participants completed a risk factor questionnaire. All of the prisoners were male and had no IDU history. The mean age was 37.5 years, ranging from 16 to 69 years, and the overall prevalence of HCV was estimated at 8%. There were no significant associations found between HCV status and age or sexual history, but tattooing was significantly associated with a greater than two-fold increase for HCV status – 15% versus 7% in those with no tattoos. The increased risk associated with tattooing in this non-IDU population may reflect cultural differences in infection control practices. Tattooing (as well as other skin penetration practices) has been identified as a major risk factor for HCV in Taiwan (Chang et al, 1998). Liao et al (2006) suggest that improperly sterilised needles and the sharing of ink and other tattooing implements increase the risk for HCV.

Many of the studies described here were conducted in prison populations in countries likely to have political and socio-cultural contexts which differ substantially from more westernised countries. It is interesting to note that while there are clear geographical differences in the prevalence of other blood borne viruses in prisons, HCV-infection seems to present a similar epidemiological picture in prisons across the world. Where exceptions occur, the differences appear to relate to specific drug taking practices in the communities from where the prison population was sourced. For instance, a study of sexually transmitted and blood borne infections in an Indian prison, found only 5% (12/240) of male prisoners and none of nine female prisoners were HCV-antibody positive (Singh et al, 1999). While around 18% of this prison sample was reported to be "addicted" to heroin (page 476), inhalation was the predominant method of administration. Only 3% reported injecting drugs at all (morphine), but nearly 53% were reported to be "addicted" to alcohol (page 476).

Table 2.1-1: International HCV prison prevalence studies (24 studies)

Author	Year	Participants	Location	Test	Results
Alizadeh et al	2005	497 male and female prisoners reported to have used illicit drugs (cross-sectional)	Central prison of Hamedan, Iran	Serum, anti-HCV	HCV in 30% overall; 30% in both males and females; 32% in IDU; 29% in non-IDU
Allright et al	2000	1193 imprisoned males and females (cross-sectional)	9 medium and high security prisons in the Republic of Ireland	Salivary, anti-HCV	HCV in 37% overall; 81% in IDU
Alvrarado-Esquivel et al	2005	180 imprisoned males and females (cross sectional)	Prison in Durango, Mexico	Serum, anti- HCV & HCV-RNA	HCV in 10% overall; 67% in IDU; 27% in tattooed; 19% in ear pierced; 14% in those not using condoms
Babudieri et al	2005	973 imprisoned males and females (cross-sectional)	8 prisons in various areas of Italy	Serum, anti-HCV	HCV in 38% overall; 75% in IDU; 51% in tattooed; 41% in males; 21% in females; 25% in non-IDU Italians; 14% in non-IDU non-Italians
Baillargeon et al	2003	3712 male and female prison entrants	Various types of correctional facilities in Texas, USA	Serum, anti-HCV	HCV in males entrants average 28%; 48% of females entering prison, but around 37% in jails and substance abuse settings.
Christensen et al	2000	325 male prisoners (including entrants during the study period)	Medium security prison in Denmark	Serum, anti-HCV & HCV-RNA	HCV in 43% overall; 87% in IDU; 10% in non-IDU HCV-RNA in 29% overall; 56% in IDU; 8% in non-IDU
De et al	2004	3423 male and female resident and 2307 male and female prison entrants (cross-sectional	53 all-level security Canadian prisons	Serum, anti-HCV	HCV in 26% overall; 26% in males; 34% in females; 10% of all entrants; 8% of residents
Ford et al	2000	355 imprisoned males (cross-sectional)	Medium security Canadian prison	Serum, anti-HCV	HCV in 33% overall - main risk factor IDU outside of prison
Fox et al	2005	467 male and female prison entrants	3 state prisons in California, USA	Serum, anti-HCV (& HCV-RNA for anti-HCV-negatives only)	HCV in 34% overall; 66% in IDU; 10% in non-IDU
Gore et al	1997	1864 adult males and females (cross-sectional)	5 prisons in Scotland, UK	Salivary, anti-HCV	HCV in 20% overall, 49% in IDU and 3% in non-IDU.
Guimaraes et al	2001	756 imprisoned males (cross-sectional)	Prison in Sao Paulo, Brazil	Serum, anti-HCV	HCV in 41% overall

Author	Year	Participants	Location	Test	Results
Liao et al	2006	297 sentenced male prison entrants with no IDU history	Male prison in Mid-Taiwan	Serum, anti-HCV	HCV 8% overall (all non-IDU) ; 15% in ever tattooed; 7% in never tattooed
Long et al	2001	596 male and female prison entrants	5 committal prisons in the Republic of Ireland	Salivary, anti-HCV	HCV in 22% overall; 3% in never previously incarcerated; 72% in IDU; 19% in males; 56% in females
Macalino et al	2004	4269 sentenced male prison entrants	Intake processing centre, Rhode Island, US	Serum, anti-HCV	HCV in 23% overall; 83% in IDU; 15% in non-IDU
Macalino et al	2005	297 recidivist women prison entrants	Intake processing centre, Rhode Island, US	Serum, anti-HCV	HCV in 40% overall
Malliori et al	1998	544 male and female prisoners convicted of drug-related crimes (cross-sectional)	2 prisons in Greece (Athens and Patra)	Serum, anti-HCV	HCV in 58% overall; 81% in IDU10% in non-IDU; 30% in previously incarcerated; 22% in never previously incarcerated
Massad et al	1999	631 male prisoners (randomly selected)	Prison in Sao Paulo, Brazil	Serum, anti-HCV	HCV in 34% overall
Pallas et al	1999	362 male and female prison entrants reporting IDU history	2 prisons in Cantabria, northern Spain	Serum, anti-HCV	All IDU - HCV in 92% overall; 43% HBV-HCV co-infected; 37% HIV-HBV-HCV co-infected; 10% HCV mono-infected
Rahbar et al	2004	101 male prisoners reporting IDU history (cross sectional)	Central prison in Mashhad, Iran	Serum, anti-HCV	HCV in 59% overall
Ruiz et al	1999	4513 prison entrants	6 reception centres in California, US	Serum, anti-HCV	HCV in 41% overall; 39% in males; 54% in females; 78% in male IDU; 71% in female IDU
Singh et al	1999	240 males and 9 females (randomly selected from 1000 volunteers)	Ghaziabad District Jail (India)	Serum, anti-HCV	HCV in 5% in males; 0% in females
Solomon et al	2004	2223 males and female prison entrants (inmates and detainees)	Maryland Reception Center and Maryland Correctional Institution-Women, US	Serum, anti-HCV	HCV in 30% overall; 28% in males; 38% in females; 30% in drug offenders; 28% in non-drug offenders; 8%in aged <25 years; 37% in aged 25 and older

Author	Year	Participants	Location	Test	Results
Vlahov et al	1993	265 male prison entrants (stored sera used)	Maryland State prisons, USA	Serum, anti-HCV	HCV in 38% overall. age over 24 years (55%), African American (43%), non-violent offences (44%) and HIV co-infection (87%)
Weild et al	2000	3942 adult males and females (cross-sectional)	8 prisons in England and Wales, UK	Salivary, anti-HCV	HCV in 8% overall; 31% of IDU; 11% in females; 34% in female IDU

2.1.2 Australian literature

There have only been a few published studies of HCV-prevalence in Australian prisons and these are summarised in Table 2.1-2. 408 male prison entrants in Sydney, a convenience sample representing 28% of the total intake during the study period, provided a blood sample for HBV and HCV antibody testing and completed a nurse-administered, risk factor questionnaire (Butler et al, 1997). 37% of prisoners were positive to HCV-antibody, but HCV prevalence rose to 66% in those reporting IDU history and to 77% in those reporting having injected drugs during a previous imprisonment. 48% of those reporting having tattoos were also positive for anti-HCV. Indigenous and non-Indigenous prisoners were similar with respect to HCV antibodies. After multivariate analysis, history of IDU, presence of HBcAb and previous imprisonment emerged as the only significant predictors of HCV infection.

A later study, by the same principal author, utilised a cross-sectional, stratified random sample design to establish the prevalence of HBV, HCV and hepatitis G in male and female inmates of 27 correctional centres in New South Wales (Butler et al, 1999). 789 prisoners (657 males and 132 females) provided a blood sample and completed a nurse-administered questionnaire. Overall, 39% of prisoners were anti-HCV positive, but this was much higher in females compared to males (67% versus 34%). In this study, Indigenous prisoners had slightly lower rates of HCV relative to non-Indigenous prisoners (36% versus 41%). 64% of females and 41% of males reported IDU history, among whom the prevalence of HCV was 90% and 66% respectively. While studies have consistently found that HCV prevalence is higher in female prisoners, this is usually explained by the higher prevalence of IDU history in this group. Butler et al's finding of higher HCV prevalence in female relative to male IDU, suggests that there may be other factors related to injecting behaviour that increase the risk for HCV in females. Multivariate analysis indicated that being female, being non-Indigenous, previous imprisonment, time spent in juvenile detention and injecting in prison were independent predictors of HCV-infection. Amongst non-IDU, having more than 11 tattoos was associated with increased HCV prevalence.

An earlier study in Victorian prison entrants was aimed at assessing the spread of blood borne viruses within the system (Crofts et al, 1995). Three thousand, four hundred and twenty nine male and 198 female entrants to major prisons in Victoria completed a risk factor questionnaire and underwent HCV and HIV tests – which were added to the existing HBV

and syphilis screening program. Just fewer than 10% of these participants were also retested during the 10-month data-collection period and this part of the study is described in a later section (see 2.2.2). Overall, 39% were found to be HCV-antibody positive.

A later study by the same author interviewed a small number (51) of prisoners with IDU history to investigate risk behaviours for blood-borne viruses in a Victorian prison (Crofts et al, 1996). Eighty eight percent (45/51) tested positive to HCV-antibody and 67% of these (30/45) were also HCV-RNA positive. Since two of the six antibody negative prisoners nonetheless tested HCV-RNA positive – the authors concluded that 92% (47/51) demonstrated evidence of HCV-infection. Antibody positivity was associated with older age and longer duration of IDU. Risk factor behaviours identified in the study are reported in section 2.3. Despite the very small sample group in this study, the results remain consistent with the literature.

A study of HCV prevalence and risk factors for infection was conducted in male and female prisoners in Victoria (Hellard et al, 2004). Six hundred and thirty prisoners (including 124 females) completed a questionnaire and provided three blood spots for antibody detection. According to one recent evaluation (Judd et al, 2003), dried blood spots specimens are a viable alternative to venous specimens and achieve comparable sensitivity and specificity. 362 participants (58%) were HCV-antibody positive - 55% of males and 67% of females. Risk factor findings are reported in more detail elsewhere (see section 2.3). In contrast to other published work, this study was not able to demonstrate a significant association between sharing needles and HCV positivity, although sharing a spoon (used for dissolving drugs in water) was found to be significantly associated (OR = 3.0). Tattooing in prison was an important risk factor in this study (OR = 2.7). Tattoos were significantly associated with HCV infection in those reporting IDU (OR = 2.2) and in those reporting no IDU (OR = 3.5). Overall, prisoners with HCV infection were younger, reported longer IDU history and reported having injected in prison. Recruitment to this study was affected by access issues with the result that the sample represented only around 29% of the eligible population. It is possible that the very high prevalences found overall and in males in this study (relative to other studies) reflects an under-representation of prisoners convicted of more serious offences residing in higher security sections of the prisons. Although the differences were not significant, the study population had a slightly higher proportion of unsentenced prisoners (17% versus 14%) and prisoners sentence for drug possession/dealing (16% versus 11%), as

well as lower proportions of prisoners sentenced for violent offences (39% versus 44%) relative to the total Victorian incarcerated population.

Miller and Bunting (2002) conducted a case note audit in the Adelaide Women's Prison (unpublished work by the current author). Of 71 prisoners accommodated in the prison, 30 individuals had a documented HCV-positive antibody test result (42%). Excluding those with no or unclear evidence of HCV testing in their case notes, HCV-prevalence rose to 64%. It is important to note that those with lower perceived risk for HCV infection may have been less likely to request testing.

Table 2.1-2: Australian HCV prison prevalence studies (7 studies)

Author	Year	Participants	Location	Test	Results
Butler et al	1997	408 male prison entrants	Reception Centre - Sydney, NSW	Serum, anti-HCV	HCV in 37% overall; 66% in IDU
Butler et al	1999	789 male and female prisoners (cross-sectional)	27 prisons in NSW	Serum, anti-HCV	HCV in 39% overall; 36% in Indigenous; 41% in non-Indigenous; 34% in males; 67% in females; 66% in male IDU; 90% in female IDU
Butler et al	2005	612 male and female prison entrants	7 reception prisons in NSW, Queensland, Tasmania and WA	Serum, anti-HCV	HCV in 35% overall; 56% in IDU; 83% in female IDU; 54% in male IDU; 37% in Indigenous; 34% in non-Indigenous
Crofts et al	1995	3429 male and female prison entrants	2 prisons in Victoria	Serum, anti-HCV	HCV in 39% overall; 64% in male IDU; 85% in female IDU
Crofts et al	1996	51 male prisoners with IDU history (cross-sectional)	Prison in Victoria	Serum, anti-HCV & HCV-RNA	Anti-HCV in 88%; HCV-RNA in 63%; either in 92%
Hellard et al	2004	630 male and female prisoners (cross-sectional)	5 prisons in Victoria	Serum, anti-HCV (blood spot test)	HCV in 57.5% overall; 55% in males; 67% in females
*Miller & Bunting	2002	71 female prisoners (case note audit)	Adelaide Women's prison	Serum, anti-HCV	HCV in 64% of those with documented results

* *Unpublished study*

A recent blood borne virus survey was conducted among prisoners entering seven prisons in NSW, Western Australia (WA), Tasmania and Queensland (Butler et al, 2005b). The survey was conducted over a two-week period and recruited 612 of 739 males and females entering prisons in the four jurisdictions during that time. As well as screening for antibodies to HIV, HBV and HCV, data on risk factors and demographic information were collected. Seventy seven percent of participants completed a questionnaire, and 63% underwent serology testing. While only three previously diagnosed HIV cases were noted in the sample, 156 of 451 (35%) who underwent testing were found to be HCV-antibody positive. Fifty six percent of those reporting IDU tested HCV-antibody positive, and (similar to an earlier finding by the same principal author, discussed above) HCV prevalence was higher among female IDU relative to male IDU (83% versus 54%). It is important to note, however, that only a small number of females underwent testing (35 in total) and this may have influenced the accuracy of the estimate. Indigenous status did not appear to be associated with HCV status with 37% of Indigenous and 34% of non-Indigenous entrants testing HCV-antibody positive.

2.2 HCV transmission in prisons

At the time of writing, the following international and Australian studies are the only available published studies concerning HCV transmission in prison settings. An unpublished investigation by this author is also included below. As discussed, indirect evidence is suggestive of high rates of transmission in prisons, however direct evidence has so far been difficult to obtain.

2.2.1 International literature

Vlahov et al's 1993 study of 165 prison entrants in Maryland investigated entry prevalence as well as seroconversion to HCV over one to two years of imprisonment using paired stored blood samples (Vlahov et al, 1993). Overall HCV prevalence was 38% (see section 2.1.1), with 164 testing HCV-negative at entry. Of those initially HCV-negative, only two had seroconverted by the time of the second blood test – with the prison incidence rate calculated at 1.1 per 100 person years (PY). No risk factor data were available to allow for the calculation of risk-specific incidence rates. The authors suggested that the low incidence rate observed might have been due to 'saturation' of the susceptible population, in that most of those who tended to engage in IDU behaviours had seroconverted prior to entry.

A Rhode Island study (Macalino et al, 2004a) recruited sentenced male prisoners at entry and tested them for HIV, HBV and HCV. Prevalence results from this study are reported above (section 2.1.1). 337 HCV-negative entrants were retested after a period of 12 months continuous incarceration. Stored entry blood specimens were tested for HCV-RNA by PCR to ensure they were not sampled during the window period. The authors did not report the extent of agreement between the two tests. Only two seroconversion cases were noted at the 12-month follow-up, and an overall seroconversion rate of 0.4 per 100 PY was calculated. The fact that only sentenced prisoners were recruited may have contributed to the low rate of transmission seen in this population. As mentioned previously, prisoners charged with drug-related crimes - those most likely to engage in risk behaviours - tend to be more highly represented in remand populations. Additionally, the cohort only included prisoners continuously incarcerated for 12 months or more, when sentences for drug offences tend to attract shorter sentences.

In their study of HCV and HBV prevalence and incidence in recidivist women prisoners in Rhode Island, the same authors used stored blood samples (collected through a mandatory HIV screening program) to determine seroconversion between admissions (Macalino et al, 2005b). HCV prevalence results are summarised in section 2.1.1. Recidivist prisoner were defined as women who were multiply admitted to the same intake centre during the period of study. Over the two years, 1996 and 1997, 526 women were identified as 'recidivists' and blood samples were available for 297 of these. Only HIV negative samples were stored and remained available for subsequent HCV testing. The mean period of time between first and final admissions to prison was 302 days, of which a mean of 219 days (73%) were spent in the community and 83 days (28%) imprisoned. A total of 24 HCV seroconversions were noted in the 297 women – an overall seroconversion rate of 18.2 per 100 PY. Given the relatively large proportion of time these prisoners had spent in the community between periods of incarceration, the authors attributed the seroconversions primarily to community exposures. The authors state (on page 1001):

> *"...we are unable to say with any certainty whether infection occurred in the community or in the correctional facility. It takes 30-60 days for markers of...HCV infection to appear in serum, so it is possible that infection acquired during a precious incarceration would not become apparent until a subsequent incarceration"*

One hundred and forty two (of 325) Danish prisoners recruited to a study investigating the prevalence and incidence of blood borne viruses were followed up after a median length of 143 days for repeat blood tests and risk factor interviews (Christensen et al, 2000). At baseline, 68 had tested positive to HCV-antibody leaving 74 prisoners (8 IDU and 66 non-IDU) at risk for infection. Over the period of follow-up, only one prisoner (who reported IDU) seroconverted. The authors calculated an incidence rate of 2.7 per 100 PY overall and 25.2 per 100 PY amongst IDU. As discussed by the authors, however, this single seroconverter had been a very late recruitment to the study. With antibody results being the criterion defining case status, the individual had actually tested HCV-RNA positive but antibody negative at the first test after only six weeks of incarceration. There was some uncertainty, therefore, about whether he had actually been exposed prior to imprisonment. In addition to this difficulty, the small number of HCV-negative prisoners that were available for follow-up may have impacted on the ability of this study to identify seroconverters during the study period.

In Scotland, salivary HCV-antibody tests and linked anonymous questionnaires were administered twice (at a six month interval) to investigate transmission in a male, maximum security, long-stay prison (Champion et al, 2004). At the six-month follow-up, just over half of the 612 initially recruited participants remained in prison. Excluding those who had tested positive at recruitment or who had not provided a valid sample at follow-up, five HCV seroconversions were identified among the remaining 307 prisoners. The incidence rate was calculated at 3.3 per 100 PY. Incidence rates for those who had never injected, ever injected, injected during the six month follow up period and shared needles during follow up were calculated at (respectively) 0.9, 11.9, 19.1 and 26.7 per 100 PY. In univariate analyses, ever having injected drugs and having shared needles or syringes during follow up were associated with seroconversion. Ever having injected drugs, however, was the only risk factor independently associated after adjusting for other factors. The use of the less sensitive salivary assay and a relatively short period of follow-up may be considered possible limitations of this study.

2.2.2 Australian literature

Butler et al (2004) compared HCV seroprevalence data obtained from 181 inmates who had participated in both of two inmate health surveys conducted five years apart for the NSW Corrections Health Service (Butler, 1997; Butler and Milner, 2003). Among 90 prisoners who

had tested negative in the first survey, 16 had seroconverted to HCV by the time of the second survey – giving an overall seroconversion rate (using the mid-point of the follow-up period to calculate person time) of 7.1 per 100 PY. Not all of the 90 prisoners had been continuously incarcerated between surveys, with 37 (of 90) having spent at least some time in the community before re-entering prison. There were ten seroconverters who were re-entrants and six who had been continuously incarcerated between surveys, with higher seroconversion rates observed in the re-entrants (10.8 versus 4.5 per 100 PY). IDU was significantly associated with HCV seroconversion (19.3 per versus 1.5 per 100 PY). All ten re-entrant seroconverters reported IDU history, with four of these also reporting IDU in prison. Among the six continuously imprisoned seroconverters, four reported IDU in prison at the time of the second survey and five reported tattooing in prison. Three of those reported prison IDU in the second survey had reported no history of IDU when previously surveyed – thus, they were apparently initiated into injecting practice while incarcerated. Two of the other six reported tattooing in prison as their only risk factor.

Butler et al (2004) suggest that that the relatively low seroconversion rates seen in their sample, particularly for the continuously incarcerated group, may be due to corrections drug supply reduction strategies and injecting abstinence among prisoners. It is possible that the small number of initially HCV negative prisoners who had participated in both surveys may also have resulted in relatively low observed seroconversion rates. Being cross-sectional surveys, it was also not possible to confirm the HCV-negative status of those prisoners participating in the first survey period. It is possible, for instance, that those later identified as seroconverters may have been in the window period when initially tested. Since it was not possible to determine the precise point at which seroconversion may have occurred, the midpoint between the two surveys was used to calculate person-time at risk. As discussed by the authors, this may also have impacted on the ability of the study to determine the true incidence of HCV in this population.

In their study of blood borne viruses in Victorian prisons, discussed above, Crofts et al (1995) serially tested 312 of the 3429 prisoners they had recruited at entry and who were still available for retesting during the study period. Ninety one percent of those followed up had been discharged and readmitted at least once. One hundred and nineteen of the 312 participants followed up had been negative at entry, but ten of these had seroconverted at subsequent testing. A seroconversion rate of 18.3 per 100 PY was calculated overall among

these prisoners. Eight of the ten seroconverters reported IDU and two were non-IDU, with seroconversion rates per 100 PY calculated at 38.2 and 5.9 respectively. On univariate analysis, seroconversion to HCV was significantly associated with IDU, being under 30 years old and prison stays of one month or less. It is important to note that all ten seroconverters spent at least three months outside of prison between HCV tests. Thus, it was not possible to conclude that these transmissions occurred within the prison. Speculating about the possible timing of transmission in these cases, the authors state (on page 287):

> *"There were three possible periods: before first prison entry; during imprisonment, and after initial imprisonment but before second entry."*

The unpublished South Australian study by the current author, also discussed above, identified four documented HCV-seroconversions identified in a case note audit in the Adelaide Women's Prison (Miller and Bunting, 2002). All cases had an HCV-antibody negative result recorded at least five months after entry to prison (range five to 87 months) but positive results were subsequently recorded in their notes. All four prisoners reported having injected drugs in prison. Since 17 other prisoners had only negative HCV-antibody results recorded since entry, it was possible to calculate an HCV seroconversion rate of 25.3 per 100 PY. It is important to note that this may be an under-estimation of the true rate, since the cross-sectional design of the study did not allow for confirmation testing in the 17 prisoners last recorded as HCV-negative. HCV testing is voluntary in South Australia, but at-risk prisoners are offered testing at entry and may undergo HCV testing on request at any time during incarceration. Serial testing may be requested following a known risk event or following identification of a seroconversion occurring in the injector's network. Thus, conversely, the seroconversion rate observed in this study may have *over*-estimated the true rate occurring in this population.

After two prisoners in separate prisons in New South Wales were identified with HIV and HCV (one also had HBV) and reported defined periods of needle sharing in prison – the previous five days and the previous three weeks – a cohort study was conducted to determine whether transmission of these viruses to other prisoners had occurred (O'Sullivan et al, 2003). Through assessing the risk practices and viral status of inmates at both prisons, 104 participants were identified as having shared needles with the two index cases during the period of interest and were followed up (with repeat antibody testing and, where appropriate, HIV post-exposure prophylaxis) over a 14-month period. At baseline 75 (72%) were already

infected with HCV, 72 (69%) were immune or previously infected with HBV and no prisoners were infected with HIV. During follow-up there were no seroconversions to HIV or HBV, but there were four HCV-seroconversions in the 29 initially sero-negative participants (14%). Person-time at risk and incidence rates for HCV were not reported in this study.

The only other two published studies examining HCV transmission within Australian prisons were both case studies. Four cases of newly-acquired HCV infection were identified in individuals who had tested negative at entry to a prison in New South Wales, but had subsequently seroconverted after 4 to 52 months of continuous incarceration (Haber et al, 1999). All four male prisoners had tattoos, but had not acquired them within two years prior to testing HCV-antibody positive. Two of the cases, aged 27 and 35 years reported IDU in prison – one had been initiated into the practice several years after being imprisoned. Of the other two cases, who both denied IDU, one 25-year-old had blood-to-blood contact with a prisoner known to be HCV-infected while being assaulted, and the other (23 years old) had received a scalp laceration while having a close haircut with electric barber shears which had been recently used to cut the hair of other prisoners, at least one of whom was confirmed to have been HCV-infected.

A single HCV seroconversion case in a New South Wales prison was also described (Post et al, 2001). This case study involved a 25-year-old male prisoner who presented with acute HCV-infection (jaundice and other hepatic symptoms including biochemical abnormalities) and with no other risk factors but recent tattooing in prison.

Table 2.2-1: HCV prison transmission studies - Australian and international (11 studies)

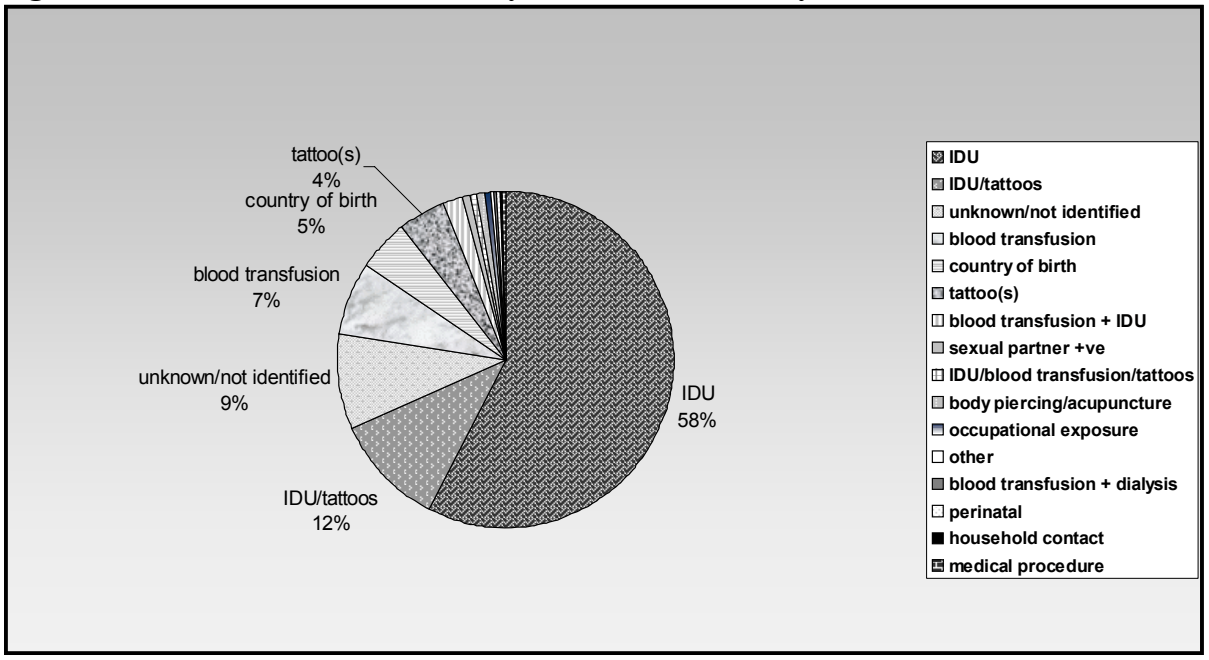
Author	Year	Participants	Location	Test	Results
Butler et al	2004	90 inmates HCV- negative at recruitment	29 prisons in NSW, Australia	Serum, anti-HCV	16 seroconversions in 5 years = 7.1 per 100 PY overall; in continuously detained = 4.5; in re-entrants = 10.8; in ever IDU = 19.3; in prison IDU = 24.2; in prison only tattooers = 10.0; in community tattooers = 5.
Champion et al	2004	307 males testing HCV-negative at recruitment	Prison in Lanarkshire, Scotland, UK	Salivary, anti-HCV	5 seroconversions within 6 months = 3.3 per 100 PY overall; in never IDU = 0.9; in ever IDU = 11.9; in IDU during study = 19.1; in shared during study = 26.7
Christensen et al	2000	74 males testing HCV-negative at recruitment	Prison in Nyborg, Denmark	Serum, anti-HCV	1 seroconversion in a median 143 days = 2.7 per 100 PY overall; in IDU = 25.2
Crofts et al	1995	119 male and females testing HCV-negative at entry to prison	2 prisons in Victoria, Australia	Serum, anti-HCV	*10 seroconversion within 10 months of entry = 18.3 per 100 PY; in IDU = 38.2; in non-IDU = 5.9
Haber et al	1999	Case studies of 4 newly-acquired HCV cases occurring in male prisoners	Prison in NSW, Australia	Serum, anti-HCV	2 prisoners IDU; 1 physical assault; 1 barber shears
Macalino et al	2004	337 sentenced male prisoners testing HCV-negative at entry	Prison in Rhode Island, US	Serum anti-HCV	2 seroconversions within 12 months of entry = 0.4 per 100 PY
Macalino et al	2005	297 recidivist females between entries to prison	Prison in Rhode Island, US	Serum anti-HCV	*24 seroconversions within 10 months between prison entries = 18.2 per 100 PY
**Miller & Bunting	2002	21 females testing negative at entry to prison (case note audit)	Adelaide Women's prison, Australia	Serum, anti-HCV	4 seroconversions within 5 to 87 months of entry = 25.3 per 100 PY
O'Sullivan et al	2003	29 male prisoners (all IDU) testing negative at time of exposure to index cases	2 prisons in NSW, Australia	Serum, anti-HCV	4 seroconversions within 14 months of follow up (13.8% of those susceptible)
Post et al	2001	Case study of one acute HCV case	Prison in NSW, Australia	Serum, anti-HCV	Association with tattooing in prison
Vlahov et al	1993	164 males testing HCV-negative at entry to prison	Maryland State prisons, US	Serum, anti-HCV	2 seroconversion within 2 years of entry = 1.1 per 100 PY in prison

** HCV- seroconversion occurred during the study period, but it was not possible to determine if the transmission occurred in prison since each prisoner had spent a proportion of time outside of prison between testing. ** Unpublished study.*

2.3 Risk factors for HCV

Although believed to be theoretical risks for HCV, sharing hair clippers and other grooming instruments (such as nail clippers and toothbrushes) are only rarely proposed as primary routes of transmission in community settings. Blood-to-blood contact through fighting or other physically aggressive behaviours is also infrequently proposed as a primary risk factor in the community. Haber et al's (1999) well-documented case studies of transmission in a New South Wales prison (see section 2.2.2) demonstrate how those activities considered a low risk for transmission in the community can pose an increased risk when they occur in a higher prevalence population. Figure 2.3-1 presents pooled HCV notifications in South Australia by risk factor for the years 1995 to 2005.

Figure 2.3-1: SA HCV notifications by risk factor - January 1995 to December 2005



Source: Communicable Disease Control Branch, South Australian Department of Health, surveillance data 2006

There has been a small number of published studies that have looked at risk factors for HCV-transmission within prisons as well as a larger volume of published work on HIV risk factors. The World Health Organization has published guidelines on the management of HIV in prisons (World Health Organization Global Programme on AIDS, 1993). The guiding principle of the document is the importance of providing inmates with the same standard of health care, including access to preventive resources (such condoms, bleach and sterile injecting equipment), as is available to the community. Evaluations of the extent to which the

international guidelines have been adopted, however, have yielded disappointing results - particularly with respect to the provision of syringes and bleach (Bollini et al, 2002). While many of the reasons for this are related to legislative and administrative restrictions, a number of authors have also described a lack of acceptance among prison officers and other correctional staff to the introduction of particular harm reduction strategies (Cregan, 1998; Dolan et al, 1998; Leh, 1999; Levy, 1999; Niveau, 2006). A Canadian study, for instance, found that only around 21% of correctional staff supported making preventive tools accessible to prisoners (Godin et al, 2001).

The following section provides an overview of the continuing risks for HCV infection in prisons, IDU and tattooing, and compares and contrasts these risk behaviours as they occur in community and prison settings.

2.3.1 Injecting drug use

IDU is the principal risk factor for HCV in both community and prison settings. 58% of all HCV notifications to the South Australian Surveillance system report IDU as the primary risk factor, with another 14% of all notifications reporting IDU as a co-risk factor for HCV infection.[*] Worldwide, estimates of the prevalence of HCV in community-dwelling IDU have been as low as 50%, but most estimates cluster around 80% to 85% - and demonstrate a positive relationship with age and/or duration of injecting (Australian National Council on Drugs, 2003; Freeman et al, 2000; Samuel et al, 2001; Stark et al, 1997; Stark et al, 1996; Taylor et al, 2000). Studies investigating HCV transmission amongst community-dwelling IDU report HCV incidence rates of nine to 29.1 per 100 PY (Day, 2003; Garfein et al, 1998; Lucidarme et al, 2004; Patrick et al, 2001; Widell et al, 2002). One recent study estimated an HCV incidence rate as high as 41.8 per 100 PY in community-dwelling IDU in London and Brighton (UK) as well as a baseline prevalence of 44% (Judd et al, 2005a). A study looking at survival of time to HCV seroconversion in IDU attending various correctional and drug services in Seattle estimated an incidence rate of 11.6 per 100 PY (Hagan et al, 2004). The weighted-average time an HCV-negative injector took to seroconversion from first injection was estimated to be 3.4 years.

[*] Communicable Disease Control Branch, SA Department of Health, surveillance data (2006)

The prevalence estimates and incidence rates calculated for HCV in community-dwelling IDU are of a similar magnitude to those reported for IDU in prisons (see sections 2.1 and 2.2). It is important to note, however, that history of imprisonment is very common in IDU – around 40% of IDU have spent at least some time in prison - and prison history has been identified as an independent predictor for HCV infection in IDU populations (Cregan, 1998; Judd et al, 2005b; Stark et al, 1997; Stark et al, 1995; Taylor et al, 2000).

2.3.1.1 Injecting in the community

Despite the existence of nation-wide needle and syringe programs (NSPs) in Australia, high risk injecting behaviours – such as sharing and reusing needles and syringes - continue to occur extremely frequently. The National NSP survey is conducted annually at 54 NSP sites across Australia to monitor trends in HIV, HCV and risk behaviour in IDU (Buddle et al, 2003). In 2001, 2738 NSP clients participated in the survey across Australia and 276 clients of seven NSP sites participated in South Australia (MacDonald et al, 2003). In the 2001 survey, 43% of all participants reported having re-used somebody else's syringe and 13% reported having done so in the previous month. Importantly, this high frequency of sharing was reported by participants who were actually *accessing* NSP services. While most participants reported re-using syringes at residential locations, those reporting prison history in the past 12 months were more likely to report syringe sharing on the streets – a rushed and, therefore, riskier injecting practice both in terms of the potential for overdose and reduced opportunities for cleaning equipment effectively. A logistic regression analysis found independent associations between sharing syringes and being aged less than 20 years and between sharing and being Indigenous Australian. Sharing was, however, more strongly predicted by outdoor injecting (OR = 1.8). As shall be described (section 4.4.3), the South Australian component of National NSP survey has provided important information to this thesis about HCV testing practices in NSP attendees.

In their study of health care centre attendants in Sydney's Kings Cross, van Beek et al (1998) identified 31 HCV-seroconversions occurring in 152 initially HCV-negative IDU. The overall incidence rate was calculated at 20.9 per 100 PY. 13 of the cases were in individuals less than 20 years of age, for whom the incidence rate was calculated at 75.6 per 100 PY. Age less than 20 years and history of imprisonment were identified as independent predictors for HCV seroconversion after multivariate analysis. van Beek et al also estimated that 47% reported

sharing injecting equipment - again, a striking estimate in a population which would appear to have adequate access to preventive resources.

Frequent needle and syringe sharing amongst young Indo-Chinese IDU in Sydney and Melbourne has also been identified (reported by 36% of participants) despite high perceived awareness of the existence of easily available sterile injecting equipment (Maher et al, 2001). It is possible that likelihood of sharing is linked to frequency of injecting. In Baltimore, US, 50% of 229 young IDU with HCV-infection were found to inject at least once each day (Garfein et al, 1998). As with the Kings Cross study, 47% reported sharing syringes. Forty four percent reported that the syringes they used were not always new. Among IDU in London and Glascow, the likelihood of HCV infection in daily injectors was nearly two times the likelihood in those injecting less frequently (Judd et al, 2005b). Interestingly, one study found that frequent NSP attendance and injecting at least once a day were independently correlated with HCV-seroconversion in a 1345 IDU in Vancouver (Patrick et al, 2001).

Despite the high prevalences noted, only 16 HCV seroconversions were observed over 12 months in 165 initially HCV seronegative injectors attending drug services in Northern and Eastern France (Lucidarme et al, 2004). The seroconversion rate was calculated at 9 per 100 PY which, while representing 10% of the cohort, was lower than rates reported for drug service attendees elsewhere. The researchers did, however, rely primarily on salivary-based anti-HCV assays with blood samples taken only when the salivary assay returned a positive result. Low HCV incidence (1.3 per 100 PY) was also noted in clients receiving continuous opiate replacement therapy in a primary care drug dependency treatment clinic in Sydney (Hallinan et al, 2004). The authors did note that clients who adhered to long-term treatment tended to have less engagement with HCV risk practices. Nonetheless, relatively low HCV incidence (3.8 per 100 PY) was also reported in clients who had undergone interrupted treatment.

A persistence of HCV-transmissions occurring in injectors in the absence of re-use or sharing of needles or syringes has been noted (Day, 2003). Sharing other injection paraphernalia - such as swabs, mixing spoons, mixing water sources and tourniquets – that may have come into contact with small quantities of blood is the main explanation put forward to explain the excess cases (Crofts et al, 1999; Hagan et al, 2001; Rosenthal et al, 2003; Stark et al, 1996).

2.3.1.2 Injecting in prison settings

Compared to injecting in the community, injecting in prison is likely to be a more solitary experience which tends to be carried out in haste and secrecy due to the need to avoid detection. For this reason, there is a reduced probability of injecting paraphernalia (other than needles and syringes themselves) being implicated in transmission of HCV in this setting. Injecting in prison also tends to be less frequent than in the community (Cregan, 1998) with frequency of injecting in prison generally measured by units of weeks or months rather than by day (see Calzavara et al, 2003 for example). Any improvements in transmission rates that might otherwise result from these factors, however, may be negated by the increased risk associated with the scarcity of preventive resources available to prisoners.

In prison, needles and syringes are likely to be passed on as inconspicuously as possible when they are to be used by other prisoners and are often 'cut down' (modified to make them easier to hide) or 'made-up' (from available resources). In a study on IDU and cleaning of equipment, Hughes (2000) cites one prisoner's description of a made-up needle and syringe to interviewers in the UK (page 25):

> *"The thing they had was a weapon, it weren't a works, it was a proper weapon. ...It was a bookies pen, you know, the little blue bookies pen* [a type of biro]*, it was one of them with a two ml needle with a blue end that was pushed onto the end of the bookies pen with a load of blue tack sealing it where it nibbed off. And where the threaded end was that was cut off and then there was a bit of a two ml plunger chopped in half inside the bookies pen with a hole pushed through like half way down the plunger, they'd put a hole through it. They put a bit of wire, a two ml needle and blue tack."*

Hughes found that most prisoners who re-used or shared appreciated the importance of cleaning equipment but that the resources and knowledge to do so effectively were quite limited in the prison context. Even where bleach was provided, some prisoners expressed reluctance to use it as it was considered to cause deterioration in syringe rubber plungers – a problem when extending the life of syringes is a principal concern. Hughes also found that injectors were unlikely to re-use a syringe that appeared dirty or contained visible blood when injecting outside, but did not tend to be so discerning once incarcerated. An earlier South Australian study assessed the wear and tear on 58 syringes which had been identified in cell searches of three metropolitan prisons (Seamark and Gaughwin, 1994). The worn appearance of half of the syringes indicated they had been used a multiple of times, with 86% used more

than once. Sixty six percent of the syringes were cut down and blood was visible in 24%. In a qualitative study of prisoners' views of drug use, one Irish prisoner estimated that around four or five syringes were shared repeatedly among approximately 45 prisoners (Long et al, 2004). Other estimates on the number of prisoners sharing one syringe in prison have ranged from two to100 (Hughes, 2000).

There is a number of published studies that investigated injecting behaviours in prison, some of these studies are described in more detail in sections 2.1 and 2.2. In Denmark, 60% of prisoners (n=325) reported ever injecting in prison and 39% reported doing so during their current period of incarceration (Christensen et al, 2000). 81% of IDU reported sharing injecting equipment at last injection but only 21% reported having attempted to clean the injecting equipment effectively (i.e. by using bleach or boiling water). Weild et al's (2000) study on HIV, HBV and HCV prevalence and risk factors in prisoners in England and Wales, found that 24% of prisoners reported a history of IDU, of which 30% reported continuing injecting in prison. Of those injecting in prison, 75% reported sharing needles or syringes.

In a study of 1193 Irish prisoners, 60% of females and 42% of males reported an IDU history (Allwright et al, 2000). Seventy one percent of those reporting an IDU history also reported sharing injecting equipment in prison and 20% of all IDU (104/501) reported having been initiated into the practice in prison. In another Irish study of prison, 29% of participants (173/593) reported ever having injected drugs - although only 7% of those entering prison for the first time did so compared to 40% of those who had been previously incarcerated (Long et al, 2001). In a later qualitative study exploring Irish prisoners' views of drug use (conducted by the same principal author), a "small but significant … number of them [the respondents] started to inject in prison" (Long et al, 2004, page 142). In their study of HIV and risk factors in Scottish prisoners, Gore et al (1997) found that approximately 50% (10/21) of male prisoners with IDU history reported having started injecting inside prison.

Ford et al (2001) found that any injecting practice was associated with HCV infection in those incarcerated in Canadian prisons, however injecting *outside* of prison was the only variable found to be independently predictive after logistic regression analysis. As discussed previously, it is possible that an over-representation of prisoners reporting ever having injected outside prison (68%) may have impacted on the ability of this study to demonstrate independent relationships between HCV and other risk behaviours. Nonetheless, 64 of 350

participants reported injecting both inside and outside prison (of which 85% were anti-HCV positive) and 21 of 350 reported only injecting in prison (HCV antibody detected in 52%). Sharing injecting equipment was reported by 26% of prisoners. Among sharers, 44% reported sharing both inside and outside prison, 30% reported sharing only inside prison and 26% reported sharing only outside of prison. Compared with an earlier survey in the same institution, the proportion of prisoners reporting ever having injected drugs in prison rose from 12% to 24% in three years. The authors suggest that this may be due to increasing imprisonment of people convicted for drug-related offences.

In another Canadian study of 597 male and female prisoners (Calzavara et al, 2003), 32% of those surveyed reported a history of injecting, of whom 11% (20/189) reported having injected in prison during the last 12 months. Independent correlates of continuing to inject in prison were heroin use prior to prison entry (OR = 6.4), use of other types of opiates prior to entry (OR = 7.9) and ever having been imprisoned before (OR = 5.3). Not having re-used needles in the previous 12 months prior to prison entry was apparently protective for prison injecting (OR = 0.2). IDU was more frequently reported in female relative to male prisoners. In a cross-sectional study of 104 female prisoners in Canada, 74% of whom reported having been incarcerated for drug-related offences, history of IDU was reported by 70% (Martin et al, 2005a). Twenty one percent reported having injected in prison – of whom, 86% reported sharing with and without using bleach to clean the syringe.

Among prisoners who were convicted of drug related offences in Greece, needle sharing, injecting in prison and multiple imprisonments proved to be the most important risk factors for HCV infection after adjusting for age, gender and duration of injecting (Malliori et al, 1998). The adjusted odds ratio for IDU who shared relative to those who didn't share injecting equipment was 5.5. Among those who continued to inject in prison relative to those who stopped after they were imprisoned, the adjusted odds ratio was 3.8.

In a study of HCV, HBV and hepatitis G virus in the New South Wales prison system, 44% of prisoners reported a history of IDU and approximately half of these reported having injected in prison (Butler et al, 1999). Two of four prison seroconversion cases described by Haber et al (1999) were attributed to IDU in prison. The older of the two cases, a 35-year-old male, had never injected outside of prison but had spent a six-month period injecting two or three times a week several years after entering prison. He reported frequent sharing of needles with

people he thought were HCV-infected, but claimed to have routinely sterilised his injecting equipment with bleach used in the recommended way. The authors suggest that this may indicate that bleach may be less effective against HCV than other blood borne viruses.

In Croft et al's 1996 study of risk behaviours for blood borne viruses in a prison in Victoria, 51 prisoners reporting IDU history completed a questionnaire on injecting and tattooing behaviour. Sixty five percent (33/51) of those interviewed reported injecting in prison at any time and 97% of these (32/33) reported sharing their injecting equipment at that time. While the majority also reported sharing outside of prison (usually only with their sexual partners), nine (18%) reported only having shared injecting equipment in prison. Ninety two percent (47/51) of these prisoners demonstrated evidence of HCV-infection (see section 2.1.2). When asked about their current period of incarceration, 24 (47%) reported having injected inside in the last month a mean of 5.5 times, and 8 (14%) reported having injected in the last week an average of 1.9 times. With one exception, all inside injectors reported having shared equipment with between one and four other inmates at last injection and could not estimate the number of people who might have used that equipment previously. All reported re-using injecting equipment, with most reporting having used a cut down syringe. The majority reported using bleach to clean their equipment before use but four used water only. No bleach is provided to prisoners in South Australian prisons.

Hellard et al (2004) found that 69% of prisoners in Victoria reported IDU history, 74% of whom had injected in prison. Those who injected in prison tended to do so less safely than when in the community – being more likely to share needles and syringes and less likely to use new equipment. A case-control study of risk factors for HCV infection in 121 male prison entrants in New South Wales found that duration of IDU history and injecting whilst incarcerated were associated with HCV infection (Gates et al, 2004).

As these studies demonstrate, injecting and sharing injecting equipment in prison is very common in prisons in Australia and around the world and a substantial proportion of those injecting prior to imprisonment continue to do so after prison entry. Additionally, there is disturbing evidence that a proportion of individuals begin injecting for the first time while incarcerated. For instance 25% of IDU (18/72) in a Scottish prison were initiated to the practice after being incarcerated (Gore et al, 1995) and 20% of Irish prisoners reporting IDU reported first injecting in prison (Allwright et al, 2000). Three of six HCV seroconverters in

New South Wales prisons were also reported to have commenced injecting whilst incarcerated (Butler et al, 2004).

There is also some evidence that a proportion of prisoners only ever share injecting equipment in prison (Crofts et al, 1996; Ford et al, 2000). According to recently released prisoners who were interviewed about their risk behaviours, sharing may even be a social expectation in prison (Day et al, 2003). The authors state (on page 74):

> *"…the demand for syringes results in a situation where all syringes are deemed communal. Thus, maintaining a syringe for the use of one person is not feasible and…can result in violence."*

For some prisoners, however, it appears that risk behaviours learnt while incarcerated continue after release (Dolan et al, 1998; MacDonald et al, 2003; Niveau, 2006).

Thus, one of the objectives of this thesis was to investigate the impact of imprisonment on risk behaviour over time (see section 4.4.2).

2.3.2 Tattooing

Approximately four percent of all notifications in SA report tattooing as a primary risk for HCV and a further twelve percent report tattooing in conjunction with IDU and/or other risk factors (see Figure 2.3-1). The greatest risk associated with tattooing currently occurs in the context of imprisonment, where there tends to be limitations on the provision of sterile tattooing equipment. All Australian jurisdictions have legislated age restrictions for commercial tattooing (the earliest limits range from 16 to 18 years) and there can be substantial fines and/or imprisonment associated with a conviction for applying tattoos on minors. While there is a number of jurisdictional-specific 'codes of practice' for tattooist (developed by various State and Territory Health Departments in collaboration with the Professional Tattooing Association of Australia), there is no legislation concerning other aspects of commercial tattooing (such as infection control practices) in South Australia. Tattooing in prisons is illegal in all Australian States and Territories (Makkai and McAllister, 2001). This section explores the risks associated with tattooing in the community and prison settings.

2.3.2.1 Tattooing in the community

According to Makkai and McAllister (2001), around 10% of Australians have been tattooed at some time in their lives – with fewer females than males reporting tattoos (9% and 12% respectively). Tattooing has been becoming increasingly popular among young people (those aged 20 years or less), which is reflected in a higher lifetime tattooing prevalence in this group of around 25% - with only a small difference between male and females. As discussed by the authors, the evidence for an association between commercial tattooing and the acquisition blood-borne viruses has been inconclusive in Australia. They suggest, however, that transmission of HCV may increase due to increasing tattooing in young people and evidence for an overlap between tattooing and IDU in this group.

In contrast, a study in consecutive spinal patients in Texas, US (Haley and Fischer, 2001), found a strong association between commercial tattooing and HCV infection (RR = 6.3). Interestingly, a lower and non-significant relative risk was calculated for patients who were tattooed in prison (RR = 4.8). The authors report a dose-relationship with the size of individual tattoos rather than the number of tattoos, with larger tattoos being more likely to have been applied by commercial than non-commercial tattooists.

The Texan study may provide evidence of a break down in infection control procedures in commercial tattoo parlours in the US. There is no evidence that Australian commercial tattooists have had similar lapses. Nonetheless, a study of attitudes and knowledge of the recommended standards of practice for tattooists among registered commercial premises in Victoria (Goudey and Thompson, 1997b) demonstrated that there were some deficiencies in the infection control knowledge and training. In a related paper, the same authors found that there was a substantial discrepancy between reported infection control practice and what was observed in a random sample of registered tattooing premises (Goudey and Thompson, 1997a). They report that only very few tattooists understood or implemented 'Universal Precautions' and sterilising equipment (eg autoclaves and ultrasonic cleaners) was either absent or tended to be improperly operated and maintained.

In another study from the US, the association between viral hepatitis (HBV, HCV and hepatitis G virus) and tattooing was investigated by antibody testing 212 patients admitted to a tertiary hospital in Michigan – 106 patients with tattoos and 106 with none (Silverman et al,

2000). No significant difference in prevalence of viral hepatitis was found between the two groups. An earlier Australian study investigated the prevalence of HBV and HCV in stored sera of Victorian tattooists (Thompson et al, 1997). Of 35 samples, only two (6%) were found to HCV-antibody positive, despite high HBV prevalence (49%) as well as a high incidence of needle stick injuries reported in this group. The researchers concluded that HCV is not efficiently transmitted by fine, solid bore commercial tattoo needles and that this may also pertain to the recipients of commercial tattoos.

2.3.2.2 Tattooing in prison

While the case for tattooing as an HCV risk in the community appears to be debatable on current evidence, there is far stronger evidence for an association between HCV infection and tattooing in prison. As with injecting, tattooing is a clandestine activity in prisons that is frequently performed using shared equipment in the context of little or no access to adequate sterilisation resources. Since IDU behaviour is common in prison populations, and high HCV prevalence is associated with IDU, tattooing in this environment becomes an even riskier proposition. As discussed by Dolan (1997), there is a large degree of overlap between the tattooing and IDU behaviours in prison. Hellard et al (2004) found prison tattooing was an important HCV risk factor - with significant associations between HCV-antibody positivity and tattooing in prison found in both IDU and non-IDU prisoners. Boredom is commonly reported as the principal motivation for tattooing in prison (Post et al, 2001).

Ford et al (2000) found a small but non-significant increased risk of HCV in Canadian prisoners with tattoos who denied ever having injected drugs. However HCV prevalence was lower in those reporting only *inside* tattooing than in those reporting receiving tattoos outside of prison only (5% versus 16%). This analysis, however, excluded those prisoners reporting IDU history and, as mentioned, there is known to be a degree of overlap between IDU and tattooing behaviour in prison (Dolan, 1997).

Community dwelling IDU in New Mexico (US) were found to have significantly increased risk of HCV infection compared to those with no tattoos (Samuel et al, 2001). After adjustment for a range of injecting practices including duration of injecting the OR for history of prison tattooing was 3.4 while the adjusted OR for tattoos done elsewhere was 1.7. In an update, the authors report on further analyses of their IDU cohort which focused on the incarceration history (Samuel et al, 2005). Using different multivariate techniques, the authors

report that the independent risk associated with tattooing in prison (seen in their earlier report), may have been confounded by duration of injecting.

Long et al (2001) found that 60% of entrants to Irish prisons had tattoos, and those reporting IDU were significantly more likely than non-IDU to have tattoos (80% versus 51%). The authors also discovered that the likelihood of having a tattoo increased with duration of imprisonment – 41% of never imprisoned, 45% of those previously imprisoned for between one day and three months, 74% of those previously imprisoned for between three months and five years and 89% of those who had previously spent more than five years in prison. Amongst those with tattoos who had been previously imprisoned, 37% had been tattooed while incarcerated.

In NSW, Butler et al (1999) found that around 54% of prisoners had one or more tattoos – and 45% of these had five or more tattoos. Of those with tattoos, 49% reported acquiring some or all of them whilst incarcerated. Sixty one percent (369/602) of prison entrants in NSW, WA, Queensland and Tasmania reported ever having been tattooed (Butler et al, 2005b). Also in NSW, two of six HCV seroconverters observed in a population continuously incarcerated over a five-year period had no IDU history, but reported tattooing in prison (Butler et al, 2004). Thirty three prisoners with IDU history completed a tattooing survey in a study of risk behaviours for blood borne viruses in Victoria (Crofts et al, 1996). Thirty two had been tattooed - with 20 (61%) having applied at least one tattoo in prison and others reporting having applied them while incarcerated in juvenile correctional facilities. Many of the prisoners had multiple tattoos - five had acquired 50 tattoos in prison – and half of those tattooed had acquired their last tattoo in prison. The prisoners all reported using a sewing needle to apply their tattoos - either used on its own or, more frequently, attached to a small motor which can be obtained from a 'walkman' (a small, transportable cassette player) or electric shaver. Indian ink, biro ink and printers' ink were some of the reported sources of dye used.

In their report of an acute HCV case in a New South Wales prison, Post et al (1999) described the history of one individual's tattooing behaviour in prison. The male prisoner had no tattoos prior to his imprisonment, but had acquired four over the two years between entering prison and the time of infection. The prisoner reported that other inmates had tattooed him with sewing needles that had been in ordinary use prior to the tattooing events. He recalled that

bleach was used to sterilise the needle on at least one occasion of tattooing, but didn't know if the needle had been used to tattoo another person before him. He reported that his most recent tattoo had been performed with a needle not used for tattooing previously, but he was unclear whether the ink stock had been used for tattooing anyone else.

One of the objectives of this thesis was to investigate tattooing behaviour in prisons and the impact of incarceration on tattooing behaviour over time. It was also designed to examine the relationships between tattooing, alone and in combination with IDU behaviours, and HCV infection.

2.4 Literature Review: conclusion

The international and Australian literature describes a relatively consistent picture with respect to trends in HCV prevalence in prison populations geographically. In general, the proportion of prisoners infected with the virus is extremely high compared to source populations. By and large, most studies found an overall HCV prevalence of around 38%. Nearly all the studies that included female prisoners reported substantially higher prevalence estimates in this group – most reporting around 55% to 60%. HCV prevalence estimates in those reporting IDU history were characteristically above 80%, and the greater proportion of females incarcerated for drug offences is generally proposed as the basis for higher rates of infection in this group. Interestingly, Butler et al (1999) also noted a sex differential amongst those reporting IDU, with 66% of male IDU and 90% of female IDU testing anti-HCV positive. This sex differential was also observed in a later prison entrant survey by the same principal author (54% of male IDU and 83% of females IDU). The literature from the US demonstrates a differential risk for HCV according to ethnicity, however Australian studies have reported that Indigenous prisoners appear to be at a similar risk of HCV as non-Indigenous prisoners (Butler et al, 2005b; Butler et al, 1999; Butler et al, 1997).

It is important to note that studies in prison entrants could potentially overestimate prison population HCV-prevalence because of a greater concentration of shorter staying prisoners – with shorter sentences associated with drug-related offences (Dolan, 1997). On the other hand, it is possible that single point, cross-sectional studies of existing prisoners could potentially under-estimate prevalence due to an under-representation of the same at risk group. For instance, a distinct seasonal variation in imprisoned populations has been noted in

New South Wales in which greater numbers of unsentenced prisoners (or remandees) are admitted during the winter months followed by decreases in such admissions during summer (Department of Justice and Community Safety, 1999). This thesis was designed to address some of these potential limitations.

There have been only a few studies investigating HCV-transmission in prison. The small amount of work in this area experienced (perhaps unavoidable) problems imposed by factors such as small sample sizes or (in some cases) difficulty in controlling for prisoners entering and leaving the prison during the follow-up period. The Scottish study by Champion et al (2004) identified five seroconversions among 307 prisoners in six months of follow-up, however it is possible that the use of the less sensitive salivary antibody test may have resulted in some cases being misclassified. The individual cases described in prisons in New South Wales, while in all likelihood representing only a small proportion of the true number of transmissions in prison, provide good evidence that transmission is occurring in Australian prisons. Butler et al's (2004) analysis of changes in HCV status among participants of two cross-sectional surveys, likewise, demonstrated some transmission is occurring within correctional facilities. No other Australian studies have been able to establish the rate of transmission occurring in prison.

All studies demonstrate very strong evidence of the link between IDU behaviour, particularly sharing injecting equipment in prison, and HCV infection in prisoners. Despite the clear overlap between injecting and tattooing practices amongst prisoners, most studies that have looked at tattooing were able to establish an excess of cases in prisoners who acquire tattoos while incarcerated after controlling for IDU. While there is wide acknowledgement of IDU and tattooing as risk factors for HCV in prison, there continues to be reluctance among correctional staff for implementing preventive strategies that are currently accessible to the non-incarcerated population.

Sharing injecting equipment is the principal risk factor for HCV infection inside and outside of prison. Nonetheless, prison history has been found to independently predict HCV infection in IDU, a substantial proportion of whom have spent at least some time in prison. The National NSP Survey (MacDonald et al, 2003) provides some evidence that IDU reporting prison history engage in riskier injecting behaviours than those who have not been previously incarcerated. Sharing and re-using injecting equipment is extremely common in community-

dwelling IDU, even when there is good access to sterile equipment. It is possible that frequency of injecting may play a role in likelihood to engage in unsafe injecting practices.

Injecting in prison is a less frequent but far riskier practice relative to injecting in the community. Due to the scarcity of new injecting equipment, syringes must be used a multiple of times by a very large number of prisoners. Although prisoners report awareness of the need to clean syringes, they frequently lack the resources and/or knowledge to do so effectively. There is evidence that a small but substantial proportion of prisoners are initiated into sharing whilst incarcerated and a number of individuals report first injecting in prison. The literature indicates that for some, the risk behaviours learnt in prison continue after release.

Tattooing has been identified as a potential risk for HCV infection in the community, but the evidence for the association has not been consistent. There is some evidence that the solid bore needle used by commercial tattooists does not allow for efficient transmission of the virus. Nonetheless, the increased number of people becoming tattooed and the large number of IDU who are tattooed may make commercial tattooing a more important risk factor in the future.

Tattooing in prison is commonly reported, with boredom thought to be the greatest motivation. Given the lack of sterile tattooing equipment in prison (and the impact this has on rates of sharing and reusing equipment), the high background prevalence of HCV in prison populations may greatly increase the risk of disease transmission in this environment. The evidence that prisoners reporting IDU are more likely to have tattoos than non-IDU even further increases the exposure risk posed by each tattooing application.

This thesis was designed to describe the prevalence and incidence of HCV infection in the South Australian prison population. The study identified HCV risk behaviours with respect to IDU and tattooing at entry to prison and assessed the impact of imprisonment on risk behaviour over time. The study also identified the attitudes of prison officers and prison nursing staff to HCV related issues in prison, particularly with respect to currently available preventive resources. This evidence assisted in the development of recommendations aimed at reducing HCV risks in prison and beyond.

The specific research questions of this thesis were as follows:

1. What is the prevalence of HCV-infection in South Australian prisons?
2. What is the rate of HCV-seroconversion in South Australian prisons?
3. What specific HCV risk behaviours are reported by prison inmates and how do these behaviours differ from those reported:
    - prior to entrance;
    - during the course of current incarceration; and
    - after release from prison?
4. How does the prison HCV-seroconversion rate compare to rates in those at risk in the community?
5. How might strategies aimed at reducing HCV risk in prisons be implemented in a way which is acceptable to both prisoners and prison staff?

A related objective of the research was to evaluate the impact of the 'window period' (see section 1.1.2) on the effectiveness of the ELISA-3 antibody assay as an epidemiological tool in HCV research.

3 Prison

This chapter provides an overview of current global and local trends in imprisonment and the repercussions of these trends with respect to the spread of communicable diseases. As well as describing the dimensions of incarcerated populations in industrialised countries, this overview includes the identification of those population groups most affected by national and international imprisonment trends. As it is the population which is the target of this thesis, the South Australian prison system is described in detail in this section.

3.1 Prison populations and communicable disease

World wide, prison settings are associated with the increased transmission of a variety of communicable diseases. Tuberculosis (TB) amongst prisoners in Madrid, for instance, has been identified as a significant contributor to overall TB prevalence in the urban Madrid population (Fernandez de la Hoz et al, 2001). Another Spanish study found that 44% of prisoners reporting injecting drug use (IDU) in Spain had TB, 44% had HIV infection and 20% were co-infected with HIV and TB (March et al, 2000). The increased prevalence of HIV in prisoners (particularly in female prisoners) in Northern American and European countries has also been well reported (Arriola et al, 2002; Baillargeon et al, 1999; De Groot, 2000; Gore et al, 1995; Laurence, 2000; Rotily et al, 2001; Sabin et al, 2001). Outbreaks of syphilis in Alabama prisons have been investigated with the authors concluding that urgent measures were required to protect inmates from an HIV outbreak since the prison environment and policies in place at the time of study provided a setting in which "…conditions were favourable for STD and HIV transmission" (Wolfe et al, 2001, page1224). HIV was found to be a factor in recent outbreaks of TB in correctional facilities in the US - along with other environmental and demographic factors such as overcrowding, inadequate ventilation, malnourishment and ethnicity and low socio-economic status (Laniado-Laborin, 2001).

Prison populations in Australia have also been found to have an increased prevalence of some communicable diseases relative to the general Australian community. While TB and most sexually transmissible diseases tend to be low in Australian prisons (Butler and Levy, 1999; Butler et al, 2001; MacIntyre et al, 1999), a study in New South Wales prisons found that 21% of male prisoners and 58% of female prisoners were infected with Herpes Type 2 virus

(Butler et al, 2000). In contrast to HIV rates in US prisons, reported to be five to fourteen times that of the community-dwelling population (Ehrmann, 2002; Jurgens, 2000; Kassira et al, 2001; Miller and Rundio, 1999; Sabin et al, 2001), HIV rates in Australian prisons are still relatively low, albeit higher than those rates experienced in the non-incarcerated population (Dolan and Wodak, 1999; McDonald et al, 1999). While HIV is primarily transmitted through unprotected sex amongst homosexually active men in Australia (National Centre in HIV Epidemiology and Clinical Research, 2003), HIV transmission in the prison setting is thought to occur mainly through IDU and tattooing rather than sexual practice (Dolan et al, 1998). An increased rate of infection has been observed in community-dwelling Australian IDU, however Australia is yet to experience the explosion of HIV among IDU that has been noted elsewhere in the world (Stark et al, 1997; Thiede et al, 2001; UNIADS, 2002). Up to 27% of IDU in the US are infected with HIV, yet only two to five percent of Australian IDU are thought to be infected with the virus (Makkai and McAllister, 2001). The prevalence of HIV in Australian prisoners, therefore, tends to reflect that of non-incarcerated IDU in the general community (Cregan, 1998).

3.1.1 Imprisonment rates and trends

Imprisonment rates have been escalating in most industrialised countries, although the rate has grown most rapidly in the United States (US). According to Lazzarini and Altice (2000), between 1985 and 1995 the rates of imprisonment in the US population rose from 313 per 100,000 per year to 600 per 100,000 per year. The authors state that 5.7 million adults (or 3% of the male residents of the US) were under correctional supervision in 1997, with 1.8 million held in custody. The increasing incarceration rates have disproportionately affected particular population groups. For instance, 10% of the total population of African American men aged 25 to 29 years were incarcerated by 2000, compared to 1% of white males of the same age. While the overall rate of imprisonment has doubled in the US over the past decade, the rate had quadrupled for women in the same period (Ehrmann, 2002). Approximately one million women are incarcerated in the US every year, usually for drug-related offences - the majority being African American or Hispanic, under 35 years of age and tending to be mothers from low income, high unemployment areas (Richie et al, 2001). In the US, one in 109 women are under correctional supervision on any given day with around 100,000 imprisoned (De Groot, 2000; Heines, 2005). The US policy of mandatory sentencing for drug-related offences (itself a manifestation of the US led 'War on Drugs') is driving the increasing imprisonment rates generally and for women and minority groups in particular (Boutwell et al, 2005; Braithwaite

et al, 2005; Crouch, 1996; De Groot, 2000; Richie et al, 2001; Vlahov et al, 2001). The Centers for Disease Control and Prevention estimate that 31% of State prisoners and 60% of Federal prisoners in the US are incarcerated for drug-related offences (Macalino et al, 2004b).

While not yet approaching those in the US, imprisonment rates across Europe have also soared in recent years - with 350,000 prisoners, or 94 per 100,000 population, in custody on any given day in 1997 across the 15 European Union member states (Rotily et al, 2001). In the United Kingdom (UK), the average number of people incarcerated in England and Wales prisons in 2000 was 64,000 and approximately 200,000 admissions per year – with 15% of men and 37% of women incarcerated for drug offences (Skipper et al, 2003). In the Republic of Ireland, fifteen prisons accommodated an average incarcerated population of 2,680 in 2000 (Allwright et al, 2000).

In Australia, imprisonment rates have been increasing in the order of seven pecent each year, with around 20,000 people incarcerated on any given day by the end of 1999 and approximately 20,000 additional individuals admitted and released during the same year (Dolan, 2001; Levy, 1999).

According to the Australian Bureau of Statistics (2003), the size of the prisoner population in Australia increased by 50% in the 10 years to the middle of 2003 – representing a 45% increase in the number of males prisoners and a 110% increase in females. This increase outstripped the 15% adult Australian population size increase during the same period and resulted in an the imprisonment rate increasing from 119 to 153 per 100,000 adult population between 1993 and 2003. By 30 June 2005, there was a total of 25,353 prisoners in Australia – which continued the increasing trend of imprisonment and represented a 5% increase from the same time in 2004 (Australian Bureau of Statistics, 2005). In 2005, Indigenous people made up around 22% of the incarcerated population – rising from 15% in 1993 (Australian Bureau of Statistics, 2003) – with Indigenous people more than 12 times more likely to be imprisoned than non-Indigenous people (Australian Bureau of Statistics, 2005). The median time expected to be served after sentencing was 23 months. For unsentenced (or remand) prisoners, the median duration of incarceration (prior to release or sentencing) was 2.8 months - 1.9 months for Indigenous and 3.2 months for non-Indigenous prisoners. This was, however, heavily dependent on the seriousness of the offence charged with. Among those charged with homicide, for instance, the median duration of pre-sentence incarceration was 7.6 months. In

2005, 34% of South Australian prisoners were unsentenced – the largest proportion of unsentenced prisoners in any other Australian State. Table 3.1-1 summarised some of ABS data for Australia in 2005 (Australian Bureau of Statistics, 2005).

Table 3.1-1: Australian prisoners by jurisdiction* – 2005

	SA n (%)	NSW n (%)	Vic n (%)	Qld n (%)	WA n (%)	Tas n (%)	NT n (%)	ACT in ACT n (%)	ACT in NSW n (%)	ACT** total n (%)	Aus† n (%)
Males	1379 (93.6)	9126 (92.9)	3435 (93.0)	4994 (93.3)	3214 (92.3)	523 (94.9)	794 (96.8)	154 (95.1)	108 (95.6)	262 (95.3)	23619 (93.2)
Females	94 (6.4)	693 (7.1)	257 (7.0)	360 (6.7)	268 (7.7)	28 (5.1)	26 (3.2)	8 (4.9)	5 (4.4)	13 (4.7)	1734 (6.8)
Indigenous	265 (18.0)	1682 (17.1)	220 (6.0)	1331 (24.9)	1408 (40.4)	70 (12.7)	663 (80.9)	17 (10.5)	9 (8.0)	26 (9.5)	5656 (22.3)
Non-Indigenous	1054 (71.6)	7853 (80.0)	3472 (94.0)	3969 (74.1)	2074 (59.6)	476 (86.4)	157 (19.1)	136 (84.0)	104 (92.0)	240 (87.3)	19191 (75.7)
Unknown	154 (10.5)	284 (2.9)	-	54 (1.0)	-	5 (0.9)	-	9 (5.6)	-	9 (3.3)	506 (2.0)
Sentenced	977 (66.3)	7832 (79.8)	3043 (82.4)	4235 (79.1)	2928 (84.1)	420 (76.2)	686 (83.7)	99 (61.1)	113 (100.0)	212 (77.1)	20220 (79.8)
Unsentenced	496 (33.7)	1987 (20.2)	649 (17.6)	1119 (20.9)	554 (15.9)	131 (23.8)	134 (16.3)	63 (38.9)	-	63 (22.9)	5133 (20.2)
All prisoners	**1473**	**9819**	**3692**	**5354**	**3482**	**551**	**820**	**162**	**113**	**275**	**25353**

* *Adapted from ABS (2005) Prisoners in Australia; Australian Bureau of Statistics: Canberra, (ABS No. 4517.0)*
** *The majority of full-time prisoners sentenced in the ACT are held in NSW prisons.*
† *The ACT in NSW figures are a subset of the NSW figures and are not separately counted in the Australian totals.*

By June 2005, the rate of incarceration in South Australia was 123.2 per 100,000 adult population. Per 100,000 adult population, the rates of incarceration for males and females were 235.2 and 15.4 respectively. Indigenous persons were at far greater risk for incarceration, with South Australia recording the nation's second highest age standardised ratios for Indigenous versus non-Indigenous prisoners – with the former 13.2 times more likely to be imprisoned (Australian Bureau of Statistics, 2005).

3.1.2 The South Australian prison system

There are up to 1,500 people in custody on any given day in South Australia (Australian Bureau of Statistics, 2003; Australian Bureau of Statistics, 2004; Australian Bureau of

Statistics, 2005) and approximately 270 enter the state custodial system each month (Department for Correctional Services, 2005). After sentencing, prisoners participate in an assessment and induction process that allows for the development of a 'sentence plan' – incorporating individual education needs, work capacity and skill levels, and health or protection needs.* The plan may involve accessing education programs, pitched at various levels, which are offered in the prison system (from literacy and numeracy programs to recognised certificates in vocational areas) and participation as appropriate in the Prison Rehabilitation Industries and Manufacturing Enterprise (PRIME). The Department for Correctional Services, through PRIME, has a number of contracts to produce furniture, lighting fittings and agricultural produce for private industry. There are a range of programs on topics including victim awareness, anger management, literacy and numeracy, alcohol and other drugs and domestic violence which may also be available to prisoners.

Prisoner behaviour in the SA prison system is regulated through incentives rather than sentence remissions, which was the method prior to the recent introduction of 'truth in sentencing' policies of the current administration. 'Compliant' behaviour is rewarded by gradually increasing access to more freedoms and privileges. The basic cell at entry is about the same size as a small bathroom with only a bed, table and chair. Televisions are permitted but, as with all other luxuries, the prisoner must supply them. With prisoner pay ranging from a bit over two dollars to approximately six dollars per day (depending on the work performed), some of which may go towards a victims of crime levy or other criminal compensation, many prisoners may forgo saving for a television in order to be able to purchase cigarettes, shampoo, feminine hygiene products (not provided routinely) and other items. Other incentives include provision of cottage accommodation or transfer to lower security prisons. The average cost of keeping a single prisoner incarcerated in South Australia is estimated at approximately $60,000 a year.*

There are nine prisons in South Australia, all accommodating adult persons – either on remand (awaiting judicial proceedings which might or might not result in a conviction) or serving a court imposed sentence (see Table 3.1-2 for a description of each prison). The

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* South Australian Department for Correctional Services http://www.corrections.sa.gov.au

Mount Gambier Prison is the newest and only privately managed South Australian correctional institution. Due to legislative requirements, the General Manager is a Department for Correctional Services position, but the UK-based international corporation, 'Group 4', operates the prison on a day-to-day basis. The approximate geographical location of each prison within the South Australian Correctional system is illustrated in Figure 3.1-1.

Table 3.1-2: South Australian Prisons

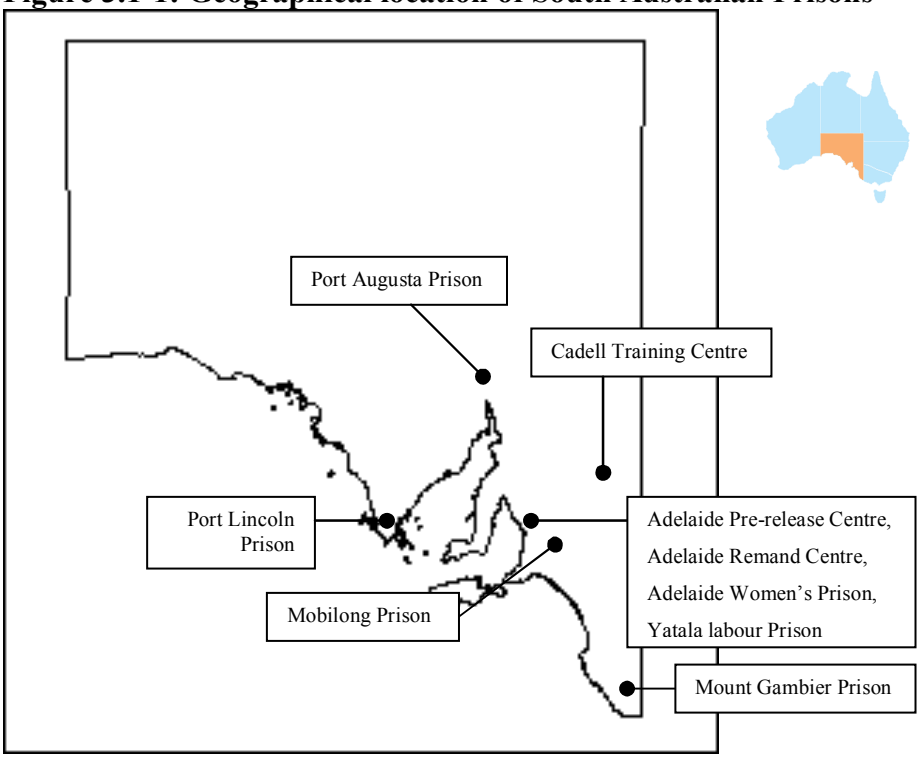
Prison	Capacity (individuals)	Sex of prisoners	Security level	Location
Adelaide Pre-Release Centre	70	Male	Low	Grand Junction Road, Northfield
Adelaide Remand Centre	247	Male	High	208 Currie Street, Adelaide
Adelaide Women's Prison	71	Female	High to low	Peter Brown Drive, Northfield
Cadell Training Centre	140	Male	Low	Boden Road Cadell (180 km N-E of Adelaide)
Mobilong Prison	240	Male	Medium to low	Maurice Road Murray Bridge (75 km east of Adelaide)
Mount Gambier Prison	110	Male and female	Medium to low	Benara Road Moorak
Port Augusta Prison	280	Male and female	High to low	Port Augusta
Port Lincoln Prison	64	Male	Medium to low	Pound Lane Port Lincoln
Yatala Labour Prison	406	Male	High to medium	Peter Brown Drive, Northfield

Source: South Australian Department for Correctional Services website http://www.corrections.sa.gov.au

The South Australian Prison Health Service (SAPHS) was operated by the Royal Adelaide Hospital when this study commenced, but is now being administered directly by the Department of Health. SAPHS provides most health services in each prison centre with the exception of Mount Gambier Prison, where health staff from the local area are employed. The services provided by SAPHS include general medical, surgery, pharmacy, nursing, dental, psychiatric clinics and drug and alcohol programs. Twenty four-hour medical infirmaries are established at the Adelaide Remand Centre and Yatala Labour Prison and these also admit

male and female patients who are transferred for long-term medical attention from other prisons. All of the other prisons do, however, have nursing staff on duty each day and medical practitioners visit these centres regularly and as required (Department for Correctional Services, 2001).

Figure 3.1-1: Geographical location of South Australian Prisons



Unlike elsewhere in Australia, where state correctional health services need to be able to work in partnership with multiple area health services, the centralised public health care system in South Australia allows SAPHS to coordinate and uniformly implement its health service objectives in all eight public prisons.

SAPHS also coordinates and operates the prison opioid replacement program. Prison-based methadone maintenance and buprenorphine therapies are currently available in the publicly operated South Australian prison centres, including the Adelaide Remand Centre. Mount Gambier Prison currently facilitates limited provision of methadone by community sources but is yet to introduce the state program. The prison opioid replacement program has been well established and is well utilised (Cowie and Alberti, 2001), but is currently the only systematic strategy in place with the capacity to reduce the transmission of blood-borne viruses such as HCV (Department for Correctional Services, 2002).

The Department for Correctional Services also employs a number of full time prison psychologists based at Adelaide Remand Centre, Port Lincoln Prison, Port Augusta Prison and Yatala Labour Prison. Half time psychologists positions are placed at the Adelaide Women's Prison and additional psychiatric services are provided by the Department of Health in the high security mental facility, James Nash House (Department for Correctional Services, 2001).

3.2 Prison: conclusion

Around the world, prisons appear to be relatively unhealthy places. In association with overcrowding, poor nutrition, low socio-economic status and limited access to preventive resources, prison populations are at particular risk for communicable diseases such as TB, HIV and range of sexually transmitted infections. The size of the problem has been escalating in recent years due to worldwide trends of increasing imprisonment rates, which appear to be related to the US-led 'war on drugs'.

Incarceration rates have increased most sharply in women – a greater proportion of whom are convicted of drug related offences. In Australia, the size of the imprisoned adult population has increased by 50% over the ten years to 2003 – representing a 45% increase in the number of male prisoners at any one time and an increase of 110% in the population of incarcerated females. This increase is against a background increase of only 15% in the Australian adult population over the same period.

In addition to imprisonment trends, this section has provided an overview of the context for the South Australian prison population. It has described the location and circumstances of each of the nine prisons that make up the custodial system and outlined the health and other services available to prisoners across the state. The centralised public health care system in South Australia allows SAPHS to coordinate and uniformly implement its health service objectives in all eight of the publicly operated prisons. It is this aspect of the South Australian system that has simplified the task of conducting this study as well as enhance the generalisability of its results (see Chapter 4)

4 Methods

This thesis aimed to describe the epidemiology of HCV infection within the South Australian prison system and identify future directions for minimising transmission risks within prison and beyond release. The study had two major quantitative components, utilising cross-sectional and cohort designs, and also had a smaller qualitative element in the form of limited consultations with stakeholders. The principal populations of interest were prisoners of the South Australian correctional system during the fifteen-month study period and consultations were with prison officers and prison health staff working within the system during the same period. Information was also obtained from injecting drug users participating in the South Australian component of the national needle and syringe survey.

4.1 Research questions

In order to describe the epidemiology of HCV infection within the South Australian prison system, the research questions posed were as follows:

1. What is the prevalence of HCV-infection in South Australian prisons?
2. What is the rate of HCV-seroconversion in South Australian prisons?
3. What specific HCV risk behaviours are reported by prison inmates and how do these behaviours differ from those reported:
    - prior to entrance;
    - during the course of current incarceration; and
    - after release from prison?
4. How does the prison HCV-seroconversion rate compare to rates in those at risk in the community?
5. How might strategies aimed at reducing HCV risk in prisons be implemented in a way which is acceptable to both prisoners and prison staff?

Additionally, the impact of the 'window period' on the effectiveness of the ELISA-3 antibody assay as an epidemiological tool in HCV research was evaluated, using PCR as the gold standard.

4.2 Study design

As described in chapter 3 (section 3.1.2), there are nine South Australian prisons, including the Adelaide Remand Centre and the Adelaide Pre-Release Centre. All but the privately managed Mount Gambier Prison was included in this study. Figures provided by SAPHS indicated that there were approximately 300 admissions and discharges each month in the eight remaining prison centres in the period immediately prior to the start of data collection (see Table 4.2-1) and an average daily number of prisoners of around 1400. Participation was initially offered to prisoners entering the five prisons receiving new entrants but enrolled prisoners were followed up in all prison centres. Prison officers and nursing staff working within metropolitan prisons were invited to participate in the more qualitative arm of the study.

Table 4.2-1: South Australian monthly admissions and discharges by prison*

Prison	Capacity	Indigenous (%)	Admissions per month**	Discharges per month†
Adelaide Pre-Release Centre	70	15	0	3
Adelaide Remand Centre	247	14	150	90
Adelaide Women's Prison	71	22	28	28
Cadell Training Centre	140	3	0	10
Mobilong Prison	240	17	0	17
Port Augusta Prison	280	36	35	35
Port Lincoln Prison	64	11	4	4
Yatala Labour Prison	406	13	100	100

**excludes Mount Gambier Prison*
***refers to admissions from the community (not transfers from other correctional facilities within SA)*
†refers to releases to the community (not transfers to other correctional facilities within SA)
Source: South Australian Prison Health Service – 2004

4.3 The cross-sectional stage

This arm of the investigation was designed to address the research question:

1. What is the prevalence of HCV-infection in South Australian prisons?

The cross-sectional stage involved conducting medical case note audits in each prison health centre to identify documented HCV test results. In addition to providing important information about prevalence, this arm of the study assisted with the validation of data obtained through the cohort component of the study (see section 4.4 below).

4.3.1 The prevalence of HCV in prison

All published studies to date have relied on data obtained from samples drawn at a single point to estimate the prevalence of HCV in prison – usually recruiting new prisoners at entry, or recruiting existing prisoners during a defined period of time. Due to the shorter durations of imprisonment associated with drug-related offences, injecting drug users (those most at risk for HCV) tend to be over-represented in samples of prison entrants. Conversely, samples of current prisoners tend to under-recruit short stay prisoners (Dolan, 1997). A seasonal pattern for prison entries has been noted in New South Wales, in which the numbers of unsentenced prisoners (or remandees) admitted to prison regularly decline in summer before recovering again during the winter months (Department of Justice and Community Safety, 1999). While a consistent pattern has not been noted in South Australia, increased proportions of particular prisoner subpopulations could potentially affect the representativeness of samples drawn at a single point.

4.3.1.1 Prison health care centre case note audits

Similar to the hospital system, health records (or case notes) are created for each prisoner when they are first admitted into the prison system. These records are updated and maintained by health staff and remain exclusively the property of the Department of Health. They are not made available to staff of the Department for Correctional Services. Audits of prisoner case notes were conducted at each prison centre on two occasions, once in the SA summer (January 2005) and once in winter (July 2005). The case notes of all prisoners incarcerated at each setting on a nominated single day were included in the sample frame. In reality, the audits were conducted over a two to three week period. Due to frequent prisoner movements

(into and out of the prison system, as well as from prison to prison), the information collected on a number of prisoners then had to be retrospectively attributed to the location of the prisoner on the nominated audit day. Unique prisoner identification numbers (described below), prison specific occupant and movement lists were utilised to ensure there was no duplication and that the audit was as complete as possible. To protect confidentiality, prisoner identification numbers were removed at the time of analysis.

Copies of serology results from the Institute of Medical and Veterinary Science (IMVS – the officially nominated medical laboratory) which were filed within each health record, were considered evidence of HCV-antibody status. All serological tests performed by the IMVS were second or third generation ELISAs, depending on when they were conducted (from 1996 to 2005). These data were used to estimate the prevalence of HCV in the South Australian prison system. A small number of additional variables was also collected to allow for analyses according to season, prison centre, duration of imprisonment, age, sex and Indigenous status. The data collection sheet for the case note audits is provided in Appendix A. Audit data were entered into an Access (Microsoft 2000, version 9.0.8944 SP-3) database and analysed using Stata (release 8, Stata Corporation, College Station Texas, 2003).

4.4 The cohort stage

This section describes the arm of the study which was designed to answer the following research questions:

2. What is the rate of HCV-seroconversion in South Australian prisons?
3. What specific HCV risk behaviours are reported by prison inmates and how do these behaviours differ from those reported:
    - prior to entrance;
    - during the course of current incarceration; and
    - after release from prison?
4. How does the prison HCV-seroconversion rate compare to rates in those at risk in the community?

Assessment of the ability of third generation ELISAs to confirm the absence of HCV-infection within the average window period lengths quoted (range from 40 to 82 days) was also a related objective of this arm of the study.

Briefly, eligible and available individuals entering the SA prison system were offered HCV-antibody testing and completed a risk factor survey about their injecting and tattooing practices. Repeat tests and risk factor surveys were offered at three-monthly intervals for up to 15 months or until release from prison (whichever came first). Some of the antibody negative blood samples from the three-month point were PCR tested. Prison seroconversion rates and risk behaviour were compared with seroconversion rates among those at risk in the South Australian community (see section 4.4.3).

4.4.1 HCV-seroconversion in prison

HCV transmission in prisons has so far proven to be difficult to document and relatively few studies have been published on this topic worldwide. Serial testing of a cohort of prisoners over time suggests itself as a reasonable approach and a handful of studies have utilised such a design. Small sample sizes, difficulties in controlling for periodic releases from prison, loss to follow up of short stay prisoners and the use of assays of lower than standard sensitivity are some of the limitations of the published cohort studies on HCV transmission in prison. The following sections describe the features of the study that were intended to assist with addressing some of these limitations.

4.4.1.1 Prisoner recruitment

All entrants to the eight publicly operated prisons in SA participate in a routine health assessment, conducted by SAPHS, within their first few days of imprisonment. The primary purpose of the health assessment is to rapidly identify and refer persons at risk of self harm, those requiring medical management of existing medical or psychiatric illnesses and those requiring treatment for drug dependencies. The standardised process also includes assessment of patterns of illicit drug use and those identified at risk for blood-borne infections during this part of the assessment are frequently offered blood tests, although tests are not mandatory. In addition, those reporting existing infections at admission are offered follow up blood tests to monitor their health status.

Initially, it was envisaged that the recruitment protocol would be incorporated within the current admission health assessment. Ongoing consultation with health staff within the metropolitan prisons, however, resulted in a number of changes to the proposed protocol. Every effort was made to standardise the recruitment process, while also taking into account a range of site-specific factors (such as induction policies for new prison entrants, number of new entrants and geographical location) that determined the relative degree of researcher and health staff involvement. Recruitment involved providing information about the study, obtaining a signed consent and administering a risk factor questionnaire. When data collection commenced, the researcher was responsible for recruitment at the Adelaide Remand Centre and Yatala Labour Prison. As determined by prison policies on access and lockdowns, weekly sessions of two to three hours were conducted at these facilities. During these sessions, an attempt was made to access all those admitted to these facilities within the previous week. Because of a relatively small number of admissions (approximately six per week), SAPHS staff at the Adelaide Women's Prison had initially agreed to manage the entire recruitment process. Since these were the most remote SA prisons, SAPHS staff at Port Lincoln Prison also initially agreed to undertake recruitment, while at Port Augusta Prison responsibility for recruitment was to be shared between the Aboriginal Liaison Officers (of the Department for Correctional Services) and SAPHS staff. Recruitment began on 18 October 2004 and continued over the 42 weeks to 4 August 2005.

In practice, SAPHS staff found it difficult to complete the recruitment process during the admission health assessment. Despite several meetings to discuss possible strategies for addressing some of the concerns raised by SAPHS staff, most of which pertained to the time demands involved, it was decided that recruitment would no longer be undertaken at Port Augusta Prison (receiving approximately 35 prison entrants per month) and Port Lincoln Prison (receiving around four admissions each month) from 19 November 2004. SAPHS staff in these facilities did, however, continue to be involved in the follow-up of participants they had already recruited to the study as well as those participants transferred from other prisons. After three months of recruitment, SAPHS staff at the Adelaide Women's Prison also indicated they were struggling with the recruitment process and, as with the other two metropolitan prisons, the researcher commenced weekly sessions and assumed all responsibility for recruitment from 12 January 2005.

A limitation of the recruitment process, in its final form, was that an estimated 40 persons admitted each month to the prisons at Port Lincoln and Port Augusta were not offered recruitment. In addition, there was a number of extremely short-term prisoners (including some 'overnighters' and some of those only in custody for less than a few days between recruiting sessions) that would have entered and been discharged between the weekly recruitment sessions. It was, however, necessary for participants to remain in the system long enough after recruitment to organise for them to have a blood test. Thus the exclusion of a proportion of the very short stay prisoners may not have ultimately impacted on the overall sample size. Moreover, and depending on their admission date in relation to the weekly recruitment session, not all very short stay prisoners were missed. Nonetheless, it was often not possible to arrange for such participants to undertake a blood test before they were discharged. Because of these and other difficulties (such as the relatively high number of ineligible prisoners, see section 5.2.1) the overall number recruited was smaller than initially expected. Due to rapid population turnover, extending the recruitment period would not have substantially increased the overall size of the sample using the process as described. By the final months of recruitment, equilibrium of approximately 250 participants in prison on any given day was reached and no improvement in recruitment rates could be achieved with the available resources – i.e. with a single recruiter. In order to provide some compensation for the smaller than expected number, the total follow up period was extended from 12 to 15 months. The final recruitment protocol is provided in Appendix B.

4.4.1.2 Prisoner participants

The target population was all male and female prisoners entering the SA prison system, via three major metropolitan prisons (the major reception centres), over the ten-month period October 2004 to August 2005. As discussed in the previous section, data collection occurred over a total period of fifteen months in all eight publicly operated prisons.

- **Selection criteria**:

Participants had to be 18 years or over and have the mental capacity to understand the purpose of the study and provide a valid, signed consent. Participants had to be prepared to provide a blood sample for the purposes of testing on at least one occasion and up to five additional times at three-monthly intervals.

- **Exclusion criteria:**

Individuals less than 18 years of age and those with reduced/altered mental capacity such that the purpose of the study could not be sufficiently understood with the result that an informed, signed consent could not be provided.

4.4.1.3 DCS dossier numbers

The Department for Correctional Services (DCS) issues a unique 'dossier' number to each new prisoner entering the SA prison system. The dossier number remains linked to the individual, no matter how often they might be imprisoned during their lifetime or how many names they might be known by. Because multiple names (or 'aliases') are common in prison populations (Martin et al, 2005b), the prisoner number can be considered a more specific identifier than names alone. The dossier number is of either five or six digits, depending on how long ago the number was issued. With administrative support provided by the DCS, it was possible to monitor participant movements between prisons using the dossier number but without using the individual's name. This made it possible to advise SAPHS staff when and where participants were due for follow-up. The number also provided a means to identify participants who had been discharged as well as to identify those who were readmitted to the SA correctional system during the course of the study. According to a recent report on government services, the return to prison (recidivism) rate in SA during 2001 to 2002 was nearly 30% (Steering Committee for the Review of Government Service Provision, 2005). Thus, up to 15% of prisoners might be expected to enter prison more than once during the recruitment period. During recruitment sessions, all new prison entrants were offered participation - even if they had been previously enrolled in the study before being discharged and then re-entering prison. The unique dossier numbers (confirmed by other details, such as date of birth) allowed for the identification of those individuals prior to analysis. Person-time at risk was calculated from the overall amount of incarcerated time spent by participants while remaining HCV antibody-negative. The progress sheet used by SAPHS staff to collect test results and demographic and other details is reproduced in Appendix C.

Due to privacy concerns, it was not possible to collect specific demographic information from prison entrants in order to make direct comparisons between those accepting and those declining participation. It seemed a reasonable assumption that persons entering prison for the first time might be more anxious about their incarceration than individuals who had been

imprisoned previously, which could ultimately impact on their willingness to participate in the study. In addition to having had less previous prison exposure, it seemed likely that 'first timers' would tend to be younger on the whole. As highlighted in the literature review, history of imprisonment and increasing age are both factors associated with higher HCV prevalence. Thus it was important to have some capacity to identify the proportion of first timers in both participant and non-participant groups. Because they are generally assigned serially (although earlier numbers are sometimes re-issued to new prisoners, where aliases of existing prisoners have been identified freeing up a previously issued number), it was possible to use the dossier numbers to broadly indicate for the proportion of first timers among those refusing participation. This allowed for some comparison between refusers and acceptors (see chapter 5, section 5.2.1.6). Because of some adjustments to the recruitment protocol during the first three months of recruitment (described in section 4.4.1.1), this part of the analysis concerned those refusing participation from January to August 2005 at the Adelaide Women's Prison, the Adelaide Remand Centre and Yatala Labour Prison.

4.4.1.4 Serial HCV-antibody testing

All participating prisoners were offered HCV-antibody testing during their first week of incarceration. Confirmatory tests were offered even where the participant self reported existing infection or their previous positive results had been documented more than three months previous to the time of recruitment. Where participants were re-recruited to the study, HCV-positive results from their previous period of enrolment were accepted (even if the time from first test exceeded three months). In addition, participants with poor veins for blood sampling (as occurs sometimes in long term IDU), previous serial HCV-Positive results were accepted as evidence of HCV-antibody status. All participants testing HCV-negative at recruitment then agreed to undergo further antibody tests at three-monthly intervals for up to 15 months, or should they seroconvert to HCV, or until their release from prison or until the end of the data collection period (whichever came first).

Generally, it was proposed that participating prisoners underwent HCV-antibody testing according to the following study pathways:

i. Participants testing antibody-positive at entry were not to be offered further testing;
ii. Participants testing antibody-negative at entry were to be tested three-monthly until they tested positive, after which they would not undergo further testing;
iii. Participants testing antibody-negative at entry, but were discharged prior to three months

would not contribute to person-time at risk. However, if they re-entered prison and remained HCV negative to at least three months after their initial entry (but still during the study period) the duration of imprisonment from the first entry to first discharge could contribute to overall person-time at risk.

The proposed serial testing of the same cohort of prisoners over time and the ability to identify and re-enrol short stay prisoners when and if they re-entered prison was aimed at minimising some of the generalisability problems associated with other prison cohort studies. Figures from the DCS indicated that a large proportion of prisoners are discharged within three months - approximately 80%. Information provided by participants from this group who were not readmitted during the course of the study was only included in the analysis of prison entry data and did not contribute person-time in further data analyses. A flow chart describing the various participant pathways is provided in Appendix D.

4.4.1.5 PCR testing for HCV-RNA

Due to the long window period associated with HCV seroconversion (see chapter 1, section 1.1.2), it was not possible to confirm HCV antibody negative results observed at entry until the follow-up test at three months. Since large losses to follow up were expected in this highly mobile population, it was not considered desirable to delay the first follow up for a longer period. It was important, however, to have some degree of confidence in the negative serostatus of the remaining participants in order to include them in the cohort study, and to be able to attribute any seroconversions occurring beyond this point to exposure in prison rather than prior community exposures. Some of the literature on the topic suggests that identifiable HCV-seroconversion could be delayed in a small number of individuals for up to six months from exposure, especially where earlier generation ELISAs are used. In contrast, the much more expensive PCR test can detect circulating viral particles in blood within a week to ten days. While later generation ELISAs are thought to have shortened the window period considerably, there remains uncertainty about the variance of window periods. The average window period lengths that are quoted in the literature range from 40 to 82 days. Marinos and Post (2003) suggest that approximately 90% of those infected will have measurable antibodies to HCV by three months of exposure, but no other estimates of variance have been reported.

At their first three-month follow up, separate blood specimens for qualitative PCR testing and for HCV antibody were collected from a small sample of participants. The participants

offered PCR testing at this time were selected on the basis of having tested HCV-antibody negative at entry to prison and who were still incarcerated at the three-month point. All such participants who were enrolled into the study during the final three months of recruitment (from May to August 2005) were offered PCR testing in addition to antibody testing. The purpose of this exercise was not to identify seroconversion in initially HCV-antibody negative prisoners. Rather, this part of the study aimed to measure the extent of agreement between the two test results at the three-month point in order to assess the appropriateness of the three month follow up interval for confirming HCV negative status by ELISA-3 testing alone. While the cost of PCR testing for HCV RNA has decreased from $120 to approximately $93 in Australia since this study was conducted (Australian Government Department of Health and Ageing, 2006), the cost is significantly higher than the $15 cost associated with HCV antibody tests. Given the disparity between the costs, quantifying the degree of agreement between the two tests may also have implications for future epidemiological investigations in highly mobile populations with high HCV prevalence, such as current IDU and other marginalised, ethnic or cultural groups.

4.4.2 Risk factors for HCV in prison

The main risk factors for HCV in prison have been identified as IDU and tattooing – principally due to the need to share equipment in the prison environment. As identified in the literature review (see chapter 2) and specifically discussed in chapter 3 (see section 3.1), there is little evidence for sexual transmission as an efficient mode of HCV transmission in the Australian context. In SA, the opioid replacement program is currently the only strategy in place that is aimed at reducing the transmission of blood-borne viruses between prisoners. Some information about risk factors is routinely provided to prisoners by health staff and through irregular health promotion activities, but no practical prevention resources (such as bleach or sterile injecting equipment) are provided. Prisoners are generally advised not to participate in risky activities (such as injecting and tattooing) while incarcerated and are required to sign an agreement to this effect during their early induction period. This part of the study was aimed at identifying the specific risk behaviours of prisoners and how those behaviours change over time – from prior to prison entry, during the period of imprisonment and beyond release.

4.4.2.1 Risk factor questionnaires

Along with HCV-antibody testing, all participants completed a brief risk factor questionnaire on entry and were offered further questionnaires three-monthly thereafter. A small proportion of prisoners incarcerated for three months or more were also asked to complete a further risk factor survey after they were released from prison. The questionnaires were very short and were designed to be easily self-administered or completed with only minimal assistance. Although their prison dossier number appeared on the questionnaire, prisoners were not required to provide their names. The questionnaires were purpose-designed for this study and developed in consultation with representatives from SAPHS, DCS and non-Government organisations involved in the provision of prisoner support services.

Questionnaire design was significantly influenced by the logistic requirements of the project. Entry and follow up questionnaires were intended to be administered by nursing staff during the prison entrant health assessment and all follow-up questionnaires during specific recalls to the prison health centre. Decisions about questionnaire content were primarily based on the specific aims of the questioning and involved unavoidable tradeoffs in data comprehensiveness made in favour of data completeness. For instance, the primary aim of the entrance questionnaire was to establish whether the entrant had previously engaged in risk behaviour prior to enrolling in the study in order to provide some baseline for subsequent comparison. While not representing a complete assessment of drug use and tattooing history, the questionnaires were capable of identifying changes in reported risk behaviour occurring during the participant's observed period(s) of incarceration.

The prison entry questionnaire asked six questions aimed at establishing participants' previous tattooing and injecting histories - while in the community or while in prison (if previously incarcerated). The follow-up survey asked two questions about tattooing and two about injecting behaviour during the present episode of imprisonment. There was also a question about methods of cleaning injecting equipment. This survey was readministered at each follow up while the participant remained in prison. SAPHS staff administered nearly all of the follow up questionnaires and from August 2005 (the end of recruitment), the researcher administered all follow up questionnaires at the Adelaide Remand.

The five-item, post-release survey was aimed at establishing if behaviours reported during imprisonment were continued after release. As with the follow-up survey, it also contained a question about cleaning methods. This part of the study was severely impacted by the loss of a key contact within DCS, which resulted in lengthy delays in implementing the follow up protocol. The majority of participants were lost to follow up as a result, and only very few participants were contactable after release. Post-release participants were contacted via their Community Corrections supervisor and those agreeing to provide their contact details completed a questionnaire over the telephone. Participants were not offered further HCV-antibody testing. The entry, follow-up and post-release questionnaires are reproduced in Appendix E.

4.4.3 HCV-seroconversion in those at risk in the community

The aim of this part of the study was to estimate the rate of HCV-transmission occurring in those at risk in the community for comparison with any that might be observed in the study participants. While there have been a small number of studies which have estimated seroconversion rates in community-dwelling IDUs, these studies have all drawn their samples from drug service attendees. As discussed in the literature review, however, there is evidence that drug service attendees have higher rates of HCV-infection than non-attendees – many of whom report a history of incarceration. Thus, previous comparisons of HCV observed in prison and IDU populations have not necessarily been useful so far.

There is a number of other groups in the community, in addition to current and frequent IDU, that are at actual or perceived risk for HCV including occasional IDU, health care workers and sexual partners of HCV-infected persons or of IDU. Presumably, the HCV seroconversion rates in these groups are higher than the general population, but lower than those seen in drug service attendees. The rate of HCV seroconversion in the *overall* at risk population would provide an appropriate comparison for rates of HCV seroconversion observed in prison populations.

Described in more detail below, using state surveillance data on HCV-incidence, published laboratory data on HCV-antibody tests performed in SA and data collected via the SA component of the National Needle and Syringe Program survey it was possible to estimate a seroconversion rate among those at risk in the community. The estimated community

seroconversion rate and risk practices also identified in the National survey has also allowed for comparisons with the prison cohort being investigated.

4.4.3.1 South Australian notification data

There is a dual notification system in place for HCV in SA – requiring a notification from the laboratory of all HCV-antibody positive test results as well as the submission of a completed notification form from the treating physician. The surveillance system does not collect data on source of notification, thus there is currently no mechanism for routinely differentiating between notifications made from prison or community settings. STD Services (who collect HCV notification data for the Department of Health), however, have estimated that approximately 25% of all notifications of newly acquired HCV infections in SA are made from prisons (STD Services of SA, 2002).

The current SA case definition for newly *acquired* HCV cases, as opposed to simply newly *notified* cases (which may or may not be long-standing infections), relies on the person being tested on a regular basis. That is, the individual must have had a negative HCV-antibody test within the 12 months prior to testing positive for the first time. Persons identified with a seroconversion illness who also test positive for the first time may also be classified as new infections, however this is extremely rare since most seroconversion illnesses are very mild, when they occur at all, and therefore usually go unrecognised. Thus, there might be a bias in the current surveillance of HCV in SA that favours identification of newly acquired infections in those populations considered to be of sufficient risk as to recommend serial testing. In SA, nearly 90% of all newly acquired infections are reported to be associated with injecting drug use.[*]

This analysis has utilised the number of newly acquired infections notified to the state surveillance system over a two-year period, excluding the proportion of those notifications estimated to have been made from prisons during that time.

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[*] Communicable Disease Control Branch, SA Department of Human Services, surveillance data (2006)

4.4.3.2 South Australian HCV-antibody testing data

Aggregate data on the absolute number of HCV-antibody tests performed in public and private laboratories are published quarterly in SA (Sexually Transmitted Disease [STD] Services of SA, 2004). While they are stratified according to sex, it is not possible to determine the size of the population tested from these data since individuals being tested more than once are not identified. As mentioned, there is a number of groups in the community with a perceived risk status making them likely to consider, or be recommended for, serial HCV testing and, therefore, could be represented more than once in the annual testing data.

The frequency of antenatal screening for HCV antibody has been increasing in SA. This is despite very low prevalence in this population, the lack of any known intervention for minimising mother-to-infant transmission during pregnancy or birth and the existence of specific recommendations against routine antenatal testing from the national HCV testing guidelines (Australian National Council on AIDS Hepatitis C and Related Diseases, 2003).

While the practice has had little measurable impact on HCV notifications (and no impact on incident notifications), antenatal screening programs do contribute to the absolute number of tests performed. For instance, the Adelaide Women and Children's Hospital (which provides antenatal care to approximately 4000 mothers a year) has routinely screened every individual presenting for her first antenatal since 1999 (Adelaide Women and Children's Hospital, 2004). Antenatal HCV screening has gradually been introduced by many other antenatal care providers in SA, including GPs involved in shared care programs. With the establishment of a Medicare Benefit Schedule (MBS) item for antenatal HCV testing in November 2003, female testing numbers increased by nearly 20% during 2003-04 from the relatively stable numbers in previous years – from approximately 39000 to 47000 – while testing numbers in males have remained stable at approximately 34500 per year (Sexually Transmitted Disease [STD] Services of SA, 2004).

Also not recommended by the national testing guidelines, HCV screening in patients undergoing orthopaedic surgery has also been routinely undertaken in public and private hospitals across the state for some years. Around 42300 principal orthopaedic surgical procedures are carried out each year in SA (Australian Medical Workforce Advisory Committee, 1999).

In order to control for the recent impact of antenatal screening, only the number of tests performed in the years prior to 2003 (when the antenatal testing MBS item was introduced) formed part of this analysis. Correspondingly, the estimated number of antenatal tests performed in the relevant years was deducted from the numbers of HCV antibody tests reported to have been performed in females during the same period. The estimated number of orthopaedic HCV screening tests was also deducted from the total number of tests reported for both sexes. As well as excluding these major blocks of 'single testers', the number of 'non-incident' cases (cases that did not meet the case criteria for newly acquired infections) identified through the SA surveillance system during the period of interest was deducted – since these individuals would generally have only been tested once in a 12-month period, by virtue of their case classification. That is, they did not meet the criteria for newly acquired HCV cases as described above

4.4.3.3 National NSP survey data

Several of the larger clean needle outlets in SA participate in the regularly conducted National Needle and Syringe Program (NSP) Survey (Australian National Council on Drugs, 2003). This survey collects data on risk behaviour among injecting drug users accessing NSPs across the country. The NSP-attending population and IDU who undergo serial HCV testing (and ultimately contribute to incident notifications) appear to be similarly motivated to access preventive and/or drug-related services. HCV, and testing for blood borne viruses, is also a strong focus of the health information provided by NSP staff and IDU peer workers.

Based on an assumption of some similarity between NSP-attendees and IDU and other at risk persons who are serially tested, a question on the frequency of HCV testing was added to the SA component of the National NSP survey – which took place in October 2005. In 2001, over 2500 participants completed the survey nationally, of which 276 were attending South Australian sites. The national survey collects information on Indigenous status, age and sex and a range of risk factors for HCV including injecting behaviours, tattooing and prison history. The following question was included into the survey:

"How many times have you had a test for hepatitis C in the last 2 years?"

This allowed for the estimation of the average number of tests performed annually in IDU which can then be applied to the absolute number of tests and assist with the calculation of an HCV incidence rate in those at risk in the community during 2001 and 2002 as described in Figure 4.4-1.

Figure 4.4-1: Calculating HCV-seroconversion rates for those at risk in the community

$$\frac{\textbf{(notified incident cases – prison originating incident notifications)}}{\textbf{(Total tests – (antenatal screens + orthopaedic screens + non-incident notifications)) ÷ no. of tests in IDU*}}$$

$$= \frac{\textbf{Community-arising seroconversions}}{\textbf{Those at risk (serial testers) in the community}}$$

**average estimated from responses to the additional question proposed in the NSP survey*

Dividing the overall number of tests performed in SA by the average number of tests performed in IDU would have tended to underestimate the size of the population tested over two years (and the estimate of person-years at risk) since it is likely that a number of single testers would have remained in the denominator even after controlling for antenatal and orthopaedic surgery screening. Furthermore, it is possible that the average number of tests over time in NSP attendees could be higher than other at-risk groups. Ultimately, this may have resulted in the calculation of a community at risk incidence rate that is higher than the true rate. Since the primary purpose of this part of the study was to provide comparative data, an over-estimated HCV incidence rate for those at risk in the community would most likely result in a reduced estimate of relative risk for prisoners. This is, perhaps, less concerning than a bias toward the other direction.

As mentioned, although a handful of studies have estimated the rate of HCV transmission in drug service attending IDU, there have been no attempts to measure HCV-incidence rates in the wider at risk community, including frequent and infrequent injectors as well as others who may be at risk for HCV (or perceive they may be at risk). This part of the study represents the first effort to estimate an at risk community HCV seroconversion rate.

4.4.4 Sample size calculations

The literature guided the development of the sample size estimate for the study. Where incarcerated populations were required to provide blood samples and participate in HCV risk factor surveys, international prison studies reported participation rates of between 68% and 79% (Christensen et al, 2000; Ford et al, 2000; Murray et al, 2003). Butler et al (1999) achieved a participation rate of 90% among prison entrants in New South Wales, however the prisoners were offered an incentive of ten dollars – much more than what a prisoner can usually earn in a day and more than three times the daily income of a new prison entrant in SA. It is important to note, however, that the questionnaire and health assessments in this study were comprehensive and took a considerable length of time to complete. In another Australian study, Crofts et al (1995) reported that over 99% of prison entrants accepted blood testing and responded to risk factor surveys. However, the investigators had appended their HCV-related investigations to a voluntary HBV and syphilis screening program which was already being successfully operated by prison health staff.

Despite the sensitive nature of many of the questions asked, some studies reported participation was higher for the risk factor questionnaire than for the serum sampling (Ford et al, 2000; Pallas et al, 1999). A number of risk factor surveys inquired about sexual as well as injecting behaviours, especially where HIV and other sexually transmissible infections were also being investigated. Several recent studies in prisoners and current IDU from the UK have utilised salivary testing and have achieved very high response rates – around 90% or more (Allwright et al, 2000; Champion et al, 2004; Gore et al, 1999; Long et al, 2001; Taylor et al, 2000). While collecting saliva might be less invasive than blood samples, the risk surveys used in these studies tended to be quite extensive - with one study reporting survey completion times of between 30 and 45 minutes (Taylor et al, 2000). The risk surveys for this thesis were very brief and were intended to take participants less than 60 seconds to complete (see Appendix E). Based on the literature, and allowing for the potential for access issues, it did not seem unreasonable to anticipate a participation rate of up to 60%.

Mental health problems are very common in prison populations overall, and may be even more so in prison entrants. Around 46% of 953 entrants to a prison in New South Wales were found to meet the diagnostic criteria for at least one mental illness and 12% had experienced psychotic symptoms within the previous 12 months – although this estimate was likely to include psychosis that was drug-caused as well as due to other causes (Butler et al, 2005a).

Thus sample size calculations allowed for the possibility that up to 20% of prison entrants in SA may not meet the study eligibility criteria due to mental illness.

As presented in Table 4.2-1, SAPHS figures suggested that there are approximately 270 prison admissions each month across the three prisons where active recruitment was taking place. Therefore, around 2600 entries were expected during the period of recruitment - 42 weeks at Yatala and the Adelaide Remand Centre and 30 weeks at the Adelaide Women's Prison. Taking projected participation and eligibility rates into account (60% and 80% respectively), the total number of participants expected was approximately 1240 (120 per month). This estimate included a proportion of individuals who were expected to enter prison and be enrolled more than once.

According to the Commonwealth government, the recidivism rate for South Australia in the two years 2001 and 2002 was nearly 30% (Steering Committee for the Review of Government Service Provision, 2005). Assuming a recidivism rate of around 15% per year, it was possible that up to 13% of recruited prisoners might be enrolled more than once over the ten months of recruitment. Thus, the 1240 anticipated enrolments would actually represent approximately 1095 individuals overall (145 being repeat enrolments). Because each entrant was newly recruited, up to 1240 antibody tests might have still been required (although participants who had undergone an antibody test in the previous three months were not retested at enrolment).

Estimates provided by SAPHS and the DCS suggested that approximately 80% of participants would have been discharged prior to their first three-month follow-up. This would leave approximately 248 participants potentially available for follow-up - all of whom would be asked to complete a follow-up risk factor survey. Since around 87 (35%) may have tested HCV-positive at entry, up to 161 would be offered retesting at three months.

Assuming at least 90% of those testing HCV-negative at entry would have remained so at the three-month follow-up, the incarcerated population at risk was estimated at approximately 145 confirmed HCV-negative prisoners continuously incarcerated from three to fifteen months.

Based on the estimated annual recidivism rate of 15%, approximately 145 prisoners previously enrolled to the study would have re-entered prison and been re-recruited during the ten months of recruitment (who could be identified using the unique prisoner dossier numbers). Again assuming 35% HCV antibody-positivity at re-entry, it may be possible to confirm antibody-negative status in up to around 94 additional individuals who might otherwise have been lost to follow up. Once negative status was confirmed (by a repeat antibody negative test occurring no earlier than three months after the first), any time spent incarcerated prior to the second test contributed to overall person-time at risk after excluding the intervening time spent by the individual in the community.

Thus the estimated sample size for the prison population at risk was approximately 145 – comprised of all those participants testing HCV-antibody negative at least three months after initial entry to prison.

Prior to 2003, there was a relatively stable number of around 35000 HCV-antibody tests performed on males and 39000 tests performed on females in public and private laboratories in South Australia each year – a total of 148000 tests performed in two years. There are also approximately 17700 antenatal patients and 42300 orthopaedic surgical procedures performed in public and private SA hospitals annually. Thus, around 35400 and 84600 HCV tests might have been performed in antenatal and orthopaedic patients respectively over a two-year period. In 2002, there were an unusually small number of newly acquired infections notified, so only notifications prior to this year will be considered. During the two years 2000 and 2001 there were 183 incident cases notified to the state surveillance system and approximately 25% of all newly acquired HCV infections are notified from SA prisons (STD Services of SA, 2002). There were 2012 non-incident notifications to the state surveillance system during the same period. Individuals must have a minimum of two tests in one year to be identified as incident cases under the current case criteria. The average number of tests in two years will be confirmed with the additional question proposed for the NSP survey. Using the formula described in Figure 4.4-1:

$$\frac{183\ (1 - 0.25)}{(148000 - (35400 + 84600 + 2012)) \div 2 \text{ tests per person*}}$$

$$= \frac{138}{12994}$$

= **138** observed new infections arising in approximately **12994** people at risk in the community during 2000 and 2001**

**depending on the average number of tests reported in IDU from the additional NSP survey question*
***calculation of person time would assume that each person spent at least one year at risk (the mid-point of the observation period)*

As illustrated above, the size of the community population at risk could be (depending on the average number of tests calculated per person from the NSP data) approximately 12990 people over a two-year period. The estimated sample size of the prison population at risk (i.e. those confirmed as HCV-negative at three months from initial entry) is about 145. The average estimate of HCV-prevalence in Australia is 1.5% and in Australian, community-dwelling IDU (the main at-risk group) the average estimate is 50% (Australian National Council on Drugs, 2003). The average estimate for prisoners overall in Australian prisons is around 38% and 66% for prisoners reporting IDU (Butler et al, 1999; Butler et al, 1997; Crofts et al, 1995; Crofts et al, 1996). Sample size calculations (using EpiInfo version 6) were based on prison and community-dwelling IDU – the groups with the least difference in reported HCV prevalence (66% and 50% respectively). Provided the sample group ratio was as proposed (90:1), and assuming all other parameters as described, this study had the capacity to demonstrate a relative risk of 1.3 for IDU reporting prisoners (compared to those at most at risk in the community) with a confidence level of 95% and a power of 95%.

In addition to data on HCV-status, all individuals recruited to the study (an expected 1095 participants, 1240 admissions) would provide baseline risk behaviour data at entry. All participants remaining incarcerated or who were available post-release, were offered follow-up risk factor surveys to enable evaluation of the impact of incarceration on risk behaviour. In this sense, for this part of the study, the sample included all prisoners recruited regardless of their HCV status at entry.

4.5 The consultation stage

This arm of the investigation was designed to address the research question:

5. How might strategies aimed at reducing HCV risk in prisons be implemented in a way which is acceptable to both prisoners and prison staff?

This part of the study involved undertaking limited stakeholder consultations with prison and health staff to identify any concerns they may have about the management of HCV infection in prisons or about the currently suggested harm reduction strategies to minimise transmission. As identified above, this was seen as an important phase in the development and implementation of appropriate strategies recommended by the findings of the study.

4.5.1 Developing harm reduction strategies

As highlighted in the literature review (see chapter 2, section 2.3), despite wide agreement on the need to provide prison populations with the same standard of health care as is available to the community, there has been little practical demonstration of this agreement in terms of prisoner access to preventive resources. Condoms have only recently been introduced in some SA prisons for HIV prevention, and (with the exception of the opioid replacement program) no practical preventive resources aimed at reducing the harms associated with injecting are provided to prisoners at present. There is evidence that the currently suggested range of harm reduction strategies has little acceptance among prison officers. Acquiring a good understanding of the potential barriers and incentives to change in organisations is considered a crucial stage in the implementation of new practices (Gollop et al, 2004; Grol and Wensing, 2004).

4.5.1.1 Limited stakeholder consultations

During the months of data collection among prisoners, the progress of the study was regularly reported to correctional and health staff via email. Brief presentations were made at DCS staff meetings and four comprehensive presentations were made to health staff on specific SAPHS training and education days. As well as providing an avenue for advertising the stakeholder consultations (which were held towards the end of the fifteen-month data collection period), it is likely that these measures helped to foster a level of awareness and interest in the study among prison officers and nursing staff. The data collection period in prisons also necessitated relatively long periods of waiting time (for escorted prisoners, for

example), which was spent observing and conversing with both correctional and nursing staff. During this time it was possible to become familiar with the prison as a working environment and to identify a number of areas of concern with which to generate an appropriate schedule for the stakeholder consultations (reproduced in Appendix F).

Participants were first asked to discuss the importance of HCV as a workplace issue as well as to elaborate on the adequacy of any infection control measures currently in place. After being provided with a summary of the case note audit data (providing estimates of HCV prevalence in the SA prison system) - and after allowing time for discussion - the participants were then asked if this information changed their views of HCV as a priority issue in their work place. Participants were then invited to discuss any concerns they might have about communicable diseases in general, before being asked for their views on a range of specific prevention strategies. Suggestions for alternative strategies were also encouraged.

Three consultation groups for prison officers were held in the largest metropolitan prisons – Adelaide Remand Centre and Yatala Labour Prison. SAPHS staff were interviewed at the 24-hour infirmary at Yatala Labour Prison. The consultations were held during paid work time, with cover arranged for participating correctional and health staff, and light refreshments were offered. The groups were audio taped and ranged from one to one and a half hours.

4.6 HCV test methods

All blood samples were analysed at the Institute for Medical and Veterinary Science (IMVS) in Adelaide, SA. Anti-HCV was identified in serum using the Abbott 3rd generation serologic assay. A sample of HCV-negative specimens (from prisoners who had been incarcerated for three months) was investigated for the presence of HCV-RNA using the Roche Amplicor nucleic amplification system, also at the IMVS.

4.7 Data analysis

Quantitative data were analysed using Stata (release 8, Stata Corporation, College Station Texas, 2003). Chi-square, Mann-Whitney tests, kappa statistics, Kaplan Meier survival estimates and log binomial models also formed part of the analysis. Risk ratios with of 95% confidence intervals were generated and other statistical methods were utilised as appropriate. All statistical tests were performed at the 0.05 alpha level.

HCV prevalence in the prison population was determined by the number of documented HCV-antibody positive results (from health records) divided by the number of individuals with documented positive or negative HCV results, averaged between two time periods (summer and winter). The lower limit of HCV prevalence was determined by using the total prison population size (including those with or without documented HCV-antibody results) as the denominator. HCV prevalence at entry was calculated from confirmed HCV-antibody status at recruitment. Risk ratios, 95% confidence intervals and log binomial models were utilised to analyse the impact of demographic variables collected.

HCV incidence (seroconversion) rates in the prison were determined by identifying HCV-antibody positive results occurring in all participants who had previously tested HCV-antibody negative. Person-time at risk was calculated from the combined incarcerated time spent by participants while remaining HCV-antibody negative – and the seroconversion rate was expressed per 100 person years at risk.

HCV- seroconversion rates in those at risk in the SA community were determined using the formula described in detail at Figure 4.4-1. Essentially, state surveillance data on community-arising incident cases notified during the years 2000 and 2001 provided numerator data. Person-time at risk was calculated from estimates of the number of persons who were serially tested during the two years. The community at-risk seroconversion rate was compared to the seroconversion rate seen within the prison population.

Reported HCV risk behaviour was analysed descriptively at the time of entry, at three-monthly follow-ups and post release. Univariate analyses of associations between specific risk behaviour reported while incarcerated and HCV infection were performed and significantly associated variables were entered into a log binomial model to determine which risk behaviours were predictive of HCV seroconversion in prison. Kaplan Meier survival estimates were used to assess the impact of time incarcerated on reported risk behaviour in prison.

Tape-recorded stakeholder interview data were transcribed, grouped according to themes and then summarised. These data provided a rich source of context in analysing the current

barriers to introducing harm reduction strategies within the prison setting as well as for the development of appropriate recommendations for the future.

4.8 Ethical considerations

Although prison officers and SAPHS nurses also took part in the stakeholder consultations, the prisoner population was the main group of interest in this study. As well as being required to have the greater involvement, prisoner participants were associated with the greatest ethical implications. What follows is a brief description of the some of the ethical implications of the study and the strategies implemented to address them.

4.8.1 Prisoner participants

Participating prisoners were asked to submit to at least one blood test with some individuals having up to six tests at three-monthly intervals. A brief survey, about injecting and tattooing behaviour was also required at entry and three-monthly thereafter.

4.8.1.1 Consent

One of the principal ethical issues concerned the population of interest being, in a very real sense, a 'captive' audience and was essentially related to the ability of the participants to willingly provide consent. As well as the possibility of perceived coercion, there is a number of other factors inherently associated with incarcerated populations which might have limited the ability of individuals to absorb information about the study and, thus, provide a valid consent. As well as any reactive anxiety that might be associated with a recent incarceration, the prevalence of mental health problems is known to be relatively high in this population. Prison populations are also known to have high illiteracy levels and drug and alcohol dependency is also highly prevalent.

The consent process involved the provision of an information sheet outlining, in simple terms, the purpose and process of the study followed by the signing of a consent form. The researcher was able to assist those individuals with literacy difficulties by explaining the information sheet and providing assistance completing the risk factor surveys. Recruitment occurred following the routine initial nursing and medical assessment of each new prison entrant. Conducted by SAPHS, the assessment covered all aspects of health - including psychiatric history, psychological status and substance use profile. Thus, admitting health

staff were ideally placed to assess the mental competency and receptivity of each potential participant and could also refer prisoners for appropriate treatment if required.

Prior to the study, just under half of all prisoners ordinarily required or requested some type of blood test on entry to prison. While some tests were undertaken at the time, the nursing staff generally made a second appointment for these individuals within a week of their initial assessment to have a blood test. In the intervening time, a medical practitioner also assessed all prisoners. Recruitment for the study took place after the initial health assessment and usually preceded at least one medical appointment before the participant was required to submit to blood test. Thus, there was opportunity for newly recruited participants to reconsider their participation in the study after which time anxiety related to being newly incarcerated may have moderated somewhat.

4.8.1.2 Confidentiality

Another issue related to confidentiality, since prisoners were asked to provide information about activities that would ordinarily attract sanctions were they to be revealed to prison authorities.

SAPHS is operated by the Department of Health and is separated, by function and by organisational responsibility, from correctional services officers (who report to the Department for Correctional Services). The main focus of nursing staff is the health of individual prisoners and there is a long appreciated understanding that information obtained through the health centre is not automatically passed on to correctional staff. This arrangement was stressed to prisoners at the time of recruitment. Meetings with the General Managers of all the participating prisons prior to the commencement of the study resulted in widespread agreement that correctional staff would require only summarised information obtained through the study. In most cases, prisoners self-completed the risk factor surveys and their responses were immediately folded and inserted in a sealed box. SAPHS staff or the researcher assisted some individuals to complete the survey (where there were literacy or other communication difficulties) and prisoners were assured that their confidentiality would be maintained at all times.

DCS dossier numbers were utilised to link questionnaires and test results and to monitor prisoner movements and the names of individuals were not retained. Completed surveys were

kept in a secure location outside of the prison system and electronic data were kept in a password protected computer data base, on a password protected network within the password protected and fire-walled computing environment of the Discipline of Public Health, University of Adelaide. The dossier numbers of participants were destroyed at the time of analysis and were not reported, presented or published.

It was possible that linkages between the information obtained during the study and individual prisoners could have been made during the data-collection period - three to fifteen months depending on when the participant was enrolled. Although it has never happened in a prison study, it was possible that a civil court could subpoena the information obtained through the study during that period. However unlikely this event, the possibility was specifically proposed in the participant information sheet. The removal of dossier numbers at analysis ensured the data were not vulnerable to subpoena beyond that point.

4.8.1.3 Diagnoses with HCV infection

The other important ethical implication was the potential for harm at the time of diagnosis with HCV infection. Ordinarily, 42% of prisoners are tested for HCV-antibody at the time of entry. Prisoners who return a positive result are brought back to the health care centre to discuss the implications of the result. Indigenous people are over-represented in prison settings as well as in the state surveillance data on HCV-infection (Department for Correctional Services, 2005; Sexually Transmitted Disease [STD] Services of SA, 2005). The diagnostic process may have additional, culturally specific implications for this group.

SAPHS staff already had considerable knowledge about HCV infection and had regularly participated in education in which the psychological aspects of a diagnosis with HCV-infection, and ways to minimise the negative impact, were an important component. This topic was frequently raised with SAPHS staff prior to the study starting and during its conduct. Two prisoner health reference groups, one focusing specifically on issues arising in Indigenous participants and one focused more generally on prisoner health were set up prior to the study commencing. These reference groups were intended convene on an as-needed basis to advise on issues related to HCV and/or the study if they were to arise.

Membership of the Indigenous reference group was drawn from prison health staff, Indigenous health promotion and Aboriginal health services. Several people agreed to

participate as a member, including representatives from the Aboriginal Services Unit (DCS), Health Promotions Unit (DCS), SAPHS, SA Department for Aboriginal Affairs and Reconciliation and Prison Aboriginal Liaison Officers (DCS). Neither the Prisoner Health nor Indigenous reference groups were required to convene during the conduct of the study.

4.8.2 Stakeholders consulted

The other groups of interest to the study were the prison officers and SAPHS nurses, took part in limited stakeholder consultations aimed at identifying attitudes to HCV in prisons and strategies for minimising its transmission. It is possible that some participants might have been concerned that individual comments might be attributed to them.

The names of those participating interviewed were not recorded. Generally, only the broad themes were presented or published at the end of the study. Where particular comments were quoted, any information tending to identify the individual was altered. During the consultations, participants were also be asked to respect the confidentiality of all those participating. Tapes were kept in a securely locked location outside of the prison. All electronically transcribed data were stored in the manner described above. Tapes were destroyed at the time of transcription.

Consent forms for prisoner, prison officer and SAPHS participants are provided in Appendix G and the information sheets are provided in Appendix H.

4.8.3 Formal approvals

This study received approval from the following SA ethics and research committees:

- Aboriginal Health Research Ethics Committee
- Department for Correctional Services Research Management Committee
- Department of Health Human Research Ethics Committee
- The Royal Adelaide Hospital Research Ethics Committee
- The University of Adelaide Human Research Ethics Committee

4.9 Funding and other resources

A University of Adelaide Divisional scholarship together with a supplementary amount paid by the Primary Health Care Branch (South Australian Department of Health) was provided to

the researcher, as a full time PhD candidate within the Discipline of Public Health, School of Population Health and Clinical Practice. The increase in the expenditure by prisons for pathology services as a result of increased requests for HCV-antibody tests was estimated at approximately $10,300 and the Primary Health Care Branch (Department of Health) also agreed to compensate the South Australian Prison Health Service for this amount. The Communicable Disease Control Branch (also of the Department of Health) provided additional funds ($3,000) towards PCR testing of a sample of the blood specimens obtained through the study.

Administrative assistance and ongoing practical advice was also provided by the Department for Correctional Services, the South Australian Prison Health Service and the Drug and Alcohol Services SA (Department of Health).

4.10 Methods: summary

This thesis was aimed at describing the epidemiology of HCV infection within the South Australian prison system and identifying future directions for minimising transmission risks within prison and beyond release. There were two major cross-sectional and cohort components as well as a series of limited stakeholder consultations. The thesis was designed to answer the following research questions:

1. What is the prevalence of HCV-infection in South Australian prisons?
2. What is the rate of HCV-seroconversion in South Australian prisons?
3. What specific HCV risk behaviours are reported by prison inmates and how do these behaviours differ from those reported:
    - prior to entrance;
    - during the course of current incarceration; and
    - after release from prison?
4. How does the prison HCV-seroconversion rate compare to rates in those at risk in the community?
5. How might strategies aimed at reducing HCV risk in prisons be implemented in a way which is acceptable to both prisoners and prison staff?

The study also assessed the extent agreement between the ELISA-3 HCV antibody assay against the PCR gold standard.

4.10.1 Summary of design

The thesis involved conducting case note audits at all eight participating prisons as well as active recruitment of male and female prisoners entering the SA prison system during a ten-month period. Prison officers and SAPHS nurses working in the prisons during the study period were invited to participate in the stakeholder interviews.

Two case note audits were conducted at each prison (summer and winter) to identify any documented HCV-antibody test results. These data were used to estimate the overall proportion infected with HCV in the prison.

Prisoners recruited at entry to prison were offered tests for HCV-antibody and completed a brief questionnaire about their pre-entry risk factors. Participants completed a similar survey and (if HCV-negative at last test) further antibody tests at three-monthly intervals for up to 15 months or until they were released. A small proportion of those released from prison during the study period were followed up with a post-release, risk-factor survey.

A sample of participants undergoing HCV antibody testing at the three-month point also provided additional blood specimens for PCR testing for HCV-RNA.

Prison HCV rates were compared with the rates experienced in the at-risk, community-dwelling population using State surveillance data and published data on testing in public and private laboratories. A question was also added to the annual SA component of the National NSP survey that assisted with estimating the average number of HCV tests IDU undergo over time.

Limited stakeholder consultations with prison officers and SAPHS nurses were also conducted, to enable stakeholder concerns about HCV and strategies to minimise transmission in prison to be discussed.

5 Results

In this chapter, the results of all components of the study are presented according to specific project stage. Commencing with the cross-sectional stage, in which the results of the two case note audits are presented, followed by the cohort study of HCV seroconversion and risk factors (including the antibody versus PCR test evaluation and the result of the community at risk comparison population), this chapter will also present the outcome of the limited stakeholder consultations before concluding with a summary of the findings.

5.1 The cross-sectional stage

The results are presented here according to audit with the first audit providing the baseline for comparison. For instance, the median duration of imprisonment at the time of the first audit is dichotomised ("above" and "below" the median of 0.78 years) for both audit populations. Age categories were based on thirds of the age distribution of the population at the time of the first audit – i.e. 18 to 28 years, 29 to 36 years and older than 36 years – and the same age groups were used in analysing the second audit. A report based on part of the analyses presented in this section has been published (Miller et al, 2006).

5.1.1 The prevalence of HCV in prison

The main mechanism for assessing the prevalence of HCV in SA prisoners was the case note audits, although additional data on HCV antibody prevalence in new entrants was provided through the cohort stage (see section 5.2.2.1.1).

5.1.1.1 The case note audits

Specific prison occupant lists generated on the scheduled audit days were used to assist with retrospectively 'relocating' prisoners to their originating prison on the nominated day. According to the lists, 1351 prisoners were incarcerated in the eight prisons on 10 January 2005 and 1350 on 4 July 2005. On both occasions, 1347 (99.7%) case notes were available for auditing and 803 prisoners were present at both audits. A small number of health records not available for retrospective audit due to movements to non-participating facilities such as Mount Gambier Prison and the psychiatric prison facility, James Nash House. Other unavailable case notes included those belonging to one individual who had escaped from prison shortly after the nominated audit day and whose case notes were with the investigating

team. Nonetheless, it was possible to ensure that every case note located within each facility at the time of the audits and (with the small number of exceptions noted above) all those appearing on prisoner movement lists during the auditing period were retrospectively audited or otherwise accounted for during data entry and prior to analysis.

5.1.1.2 Demographic characteristics

The age and sex distribution was very similar for both audits. In summer, 6.1% of the prisoners were female and 93.9% were male, while in winter the respective proportions were 6.5% and 93.5%. The median ages of prisoners were virtually identical in summer and winter at 32.9 and 32.8 years respectively with some prison specific variation. In both audits, the Adelaide Remand Centre had the youngest populations (median approximately 31 years) and the oldest population were at Port Lincoln (median approximately 38 years).

Table 5.1-1: Selected characteristics in SA prisoners – summer 2005 (n=1347)

Prison	Number of prisoners n (% total)	Sex (%)	Indigenous n (%)	Median age – *in years* (range)	Median time incarcerated* – *in years* (range)
Adelaide Pre-release Centre	43 (3.2)	Males (100)	3 (7.0)	37.0 (22.0-60.8)	3.1 (0.9-14.8)
Adelaide Remand Centre	227 (16.9)	Males (100)	53 (23.4)	30.8 (18.2-69.4)	0.2 (0.0-4.1)
Adelaide Women's Prison	90 (6.7)	Females (100)	17 (18.9)	33.0 (18.9-73.3)	0.6 (0.0-14.8)
Cadell Training Centre	111 (8.2)	Males (100)	10 (9.0)	35.6 (20.3-65.4)	1.4 (0.1-18.9)
Mobilong Prison	225 (16.7)	Males (100)	33 (14.7)	31.8 (18.9-66.9)	1.0 (0.0-17.9)
Port Augusta Prison	249 (18.5)	Males (98.8) Females (1.2)	115 (46.2)	33.0 (18.8-67.5)	1.3 (0-24.1)
Port Lincoln Prison	60 (4.5)	Males (100)	7 (11.7)	38.0 (21.0-71.9)	3.1 (0-16.9)
Yatala Labour Prison	342 (25.4)	Males (100)	67 (19.6)	33.6 (18.6-77.4)	0.6 (0-21.8)
Total	1347 (100)	Males (93.1) Females (6.9)	305 (22.6)	32.9 (18.2-77.4)	0.8 (0-24.1)

**current period of incarceration at time of audit*

The median duration of imprisonment (from the beginning of the current period of incarceration until time of audit) also varied across institutions with the shortest incarcerated times (both audits) at the Adelaide Remand Centre (median 0.2 years), while the longest times served were noted at Port Lincoln Prison and the Adelaide Pre-release Centre (medians approximately three years). Median duration of imprisonment was only slightly longer in winter - 0.83 years versus 0.78 years – with the difference between audits almost entirely due to the large proportion of prisoners (nearly 60%) who had remained incarcerated for both audits. Selected characteristics according to prison are presented in Table 5.1-1 and Table 5.1-2.

Table 5.1-2: Selected characteristics in SA prisoners – winter 2005 (n=1347)

Prison	Number of prisoners n (% total)	Sex (%)	Indigenous n (%)	Median age – *in years* (range)	Median time incarcerated* – *in years* (range)
Adelaide Pre-release Centre	55 (4.1)	Males (100)	7 (12.7)	36.8 (21.3-67.8)	2.7 (0.5-18.3)
Adelaide Remand Centre	249 (18.5)	Males (100)	54 (21.7)	30.9 (18.3-69.9)	0.2 (0.0-2.5)
Adelaide Women's Prison	84 (6.2)	Females (100)	19 (22.6)	32.4 (21.6-73.7)	0.6 (0.0-15.2)
Cadell Training Centre	104 (7.7)	Males (100)	11 (10.6)	34.1 (19.4-65.9)	1.6 (0.1-19.4)
Mobilong Prison	212 (15.7)	Males (100)	40 (18.9)	32.1 (19.3-67.3)	1.1 (0.0-22.7)
Port Augusta Prison	248 (18.4)	Males (98.4) Females (1.6)	97 (39.1)	31.9 (18.9-65.4)	1.4 (0.0-13.0)
Port Lincoln Prison	57 (4.2)	Males (100)	5 (8.8)	38.2 (22.6-72.4)	3.4 (0.2-17.3)
Yatala Labour Prison	338 (25.1)	Males (100)	50 (14.8)	33.4 (18.8-77.8)	0.8 (0.0-31.2)
Total	1347 (100)	Males (93.5) Females (6.5)	283 (21.0)	32.8 (18.3-77.8)	0.8 (0.0-31.2)

**current period of incarceration at time of audit*

Relative to the summer audit, a smaller proportion of prisoners were identified as Indigenous in winter, as well as a smaller proportion with undocumented Indigenous status. Overall, 22.6% were Indigenous in summer (67.6% were documented as non-Indigenous) and 21.0% were Indigenous in winter (76.1% non-Indigenous). Port Augusta prison had the highest proportion of Indigenous prisoners, however the proportion there identified as Indigenous was

substantially smaller in winter (46.2% versus 39.1%). After excluding prisoners with unknown Indigenous status, 51.1% of the Port Augusta population were Indigenous in summer versus 39.6% in winter. Demographic characteristics of prisoners are summarised according to audit in Table 5.1-3.

Table 5.1-3: Demographic characteristics according to audit in SA prisoners during summer 2005 (n = 1347) and winter 2005 (n=1347)

Characteristic	Summer n (%)	Winter n (%)
Sex:		
Female	93(6.9)	88 (6.5)
Male	1254 (93.1)	1259 (93.5)
Indigenous status:		
Indigenous	304 (22.6)	283 (21.0)
Non-Indigenous	910 (67.6)	1025 (76.1)
Not documented	133 (9.9)	39 (2.9)
Age group (in years):		
18-28	432 (32.1)	450 (33.4)
29-36	452 (33.6)	395 (29.3)
>36	463 (34.4)	502 (37.3)
Time served +/- summer median (0.78 years)		
Above	676 (50.2)	692 (51.4)
Below	671 (49.8)	655 (48.6)

5.1.1.3 Documented HCV-antibody test results

Overall, 73.1% (985/1347) of prisoners in summer and 78% (1052/1347) of prisoners in winter had undergone HCV antibody testing at some time while imprisoned (not necessarily during the current period of incarceration). Of these, 30.2% (407/1347) in summer and 33.0% (444/1347) in winter had tested HCV-antibody positive and there were substantial, but relatively consistent, differences according to prison. The summer to winter proportions who had tested HCV antibody positive ranged from 21.7% (54/249) to 24.2% (60/248) at Port Augusta Prison, to 44.4% (40/90) to 51.2% (43/84) at the Adelaide Women's Prison. The overall proportions of prisoners with no testing histories were 26.9% (362/1347) in summer and 21.9% (295/1347) in winter, ranging from 18.6% (8/43) to 12.7% (7/55) at the Adelaide Pre-release Centre to 35.1% (39/111) at the Cadell Training Centre in summer and 31.7% at the Adelaide Remand Centre in winter. The proportion of prisoners with no testing history at Cadell Training Centre had improved to 18.3% (19/104) by the time of the winter audit.

After excluding those with no testing history or only indeterminate results (three cases in summer and five in winter), 41.4% (407/982) in summer and 42.3 % (443/1047) in winter had tested positive for HCV antibody – ranging from 27.8% to 30.3% at Port Augusta, to 66.7% to 64.6% at the Adelaide Women's prison. Overall, the proportion testing positive increased by 2.2% from summer to winter. There were very large discrepancies between audits according to prison, ranging from a decrease of 23.4% (at Mobilong Prison) to an increase of 19.4% (Port Lincoln Prison). Only for Mobilong Prison, however, did the confidence interval not include the possibility of both a relative increase and a decrease between audits. The proportions testing HCV-antibody positive according to prison and audit are presented in Table 5.1-4. Stratified by prison, the Mantel Haenszel test for homogeneity demonstrated that seasonal differences in HCV prevalence were not significantly different across prisons (P=0.239).

Table 5.1-4: Positive HCV-antibody test results according to audit in SA prisoners – summer (n=982*) and winter (n=1047*)

Prison	Summer HCV-antibody positive n (%)	Winter HCV-antibody positive n (%)	Relative percent change (+/-) (95% Confidence interval)
Adelaide Pre-release Centre	16 (45.7)	19 (39.6)	- 13.3 (-48.1 – 50.8)
Adelaide Remand Centre	66 (39.8)	72 (43.1)	+ 8.4 (-16.0 – 42.8)
Adelaide Women's Prison	40 (66.7)	42 (64.6)	- 3.1 (-25.8 – 26.2)
Cadell Training Centre	31 (43.1)	36 (42.4)	- 1.6 (-32.4 – 43.6)
Mobilong Prison	88 (50.3)	67 (38.5)	- 23.4 (-40.7 – -2.6)
Port Augusta Prison	54 (27.8)	59 (30.3)	+ 8.7 (-20.4 – 49.0)
Port Lincoln Prison	20 (46.5)	25 (55.6)	+ 19.4 (-20.4 – 90.2)
Yatala Labour Prison	91 (38.4)	122 (45.7)	+ 19.0 (-3.7 – 47.7)
Total	407 (41.4)	443 (42.3)	+ 2.2 (-7.6 – 13.6)

** excludes those with no test histories or only indeterminate results recorded (362 in summer, 300 in winter)*

5.1.1.4 Univariate analyses

There was little difference in the sex distribution between audits – females making up 6.9% and 6.5% of the summer and winter audits respectively (summer to winter ratio = 1.06, 95% CI: 0.80 – 1.40, *P*= 0.700). Although a slightly greater proportion of those in the winter audit were more likely to have served above the baseline of 0.78 years at the time of the audit (the median duration of imprisonment in summer), this difference was not statistically significant either overall (summer to winter ratio = 0.98, 95% CI: 0.91 – 1.05, *P*= 0.538) or at Port Augusta Prison (summer to winter ratio = 0.88, 95% CI: 0.73 – 1.04, *P*= 0.147), where those having served above 0.78 years had higher risk for HCV in the summer audit.

Among those with documented Indigenous status, there was a significantly larger proportion of prisoners identified as Indigenous overall in the summer audit - 25.1% versus 21.6% (summer to winter ratio = 1.16, 95% CI: 1.01 – 1.34, *P*= 0.039). After excluding Port Augusta Prison, however, the proportions reported as Indigenous were more comparable - 19.2% in the summer audit versus 17.5% in winter (summer to winter ratio = 1.10, 95% CI: 0.91 – 1.32, *P*= 0.316). Using age groups based on thirds of the age distribution in summer (the baseline), those in middle age group (aged between 29 and 36 years) made up a larger proportion of the overall population in summer – 33.7% versus 29.3% in winter. Although small, the difference was statistically significant (summer to winter ratio = 1.10, 95% CI: 1.02 – 1.19, *P*= 0.018).

5.1.1.4.1 History of HCV-antibody testing

As mentioned, there was a proportion of prisoners with no documented history of testing. Overall, prisoners were significantly less like likely to have a testing history in the summer audit than they were in winter - 26.9% (362/1347) had no documented test results in the summer audit versus 22.1% (297/1347) in the winter (risk ratio = 0.88, 95% CI: 0.81 – 0.96, P= 0.004). By prison, however, large differences in testing histories were seen at only two prisons - Cadell and Pt Lincoln. Once these were excluded, the testing history differences between audits were no longer statistically significant.

At Cadell, 35.2% (39/111) had no testing history in summer, but only 18.3% (19/104) had not been tested in the winter audit (risk ratio = 0.68, 95% CI: 0.53 – 0.87, P= 0.005). Testing rates had also improved at Yatala Labour Prison, with the untested population decreasing from

30.7% (105/342) in summer to 21.0% (71/338) in winter (risk ratio = 0.79, 95% CI: 0.68 – 0.92, P= 0.004).

Women were slightly over-represented (although not significantly so) among those with no testing histories in the summer audit. In contrast, there was no difference in the sex distribution between those tested and those with no testing history in winter - with females making up 6.6% of tested and 6.4% of the untested populations. In summer, 33.3% (31/93) of female prisoners had not been tested (58% of whom were aged between 29 and 36 years) compared to 21.6% (19/88) in the winter audit. Although females in the summer audit (particularly those in the middle age group) were less likely to have been tested relative to the winter audit, the difference was not significant (risk ratio = 0.85, 95% CI: 0.71 – 1.02, *P*= 0.077).

Indigenous prisoners were slightly less likely to belong to the never tested group in summer, there was no difference in the proportions identified as Indigenous between tested and untested groups in winter – 21.6% and 21.8% respectively. Those never tested were more likely to have served below the summer median duration of imprisonment (the baseline of 0.78 years) than those with testing histories – 52.1% versus 47.6% - but this difference was also not significant (risk ratio = 1.04, 95% CI: 0.98 – 1.10, *P*= 0.164). These data are presented in Table 5.1-5.

In both audits, only age was significantly associated with test history. In summer, those in the upper third of the age distribution, above 36 years) were significantly less likely to have been tested than prisoners aged below 36 years and below (risk ratio = 0.87, 95% CI: 0.81 – 0.94, *P*<0.001). In winter, those in the oldest age group (above 36 years) were also significantly less likely to have been tested than younger prisoners (risk ratio = 0.89, 95% CI: 0.84 – 0.95, *P*< 0.001) and compared to the younger and older prisoners, those in the middle age group (29 to 36 years) were significantly *more* likely to have been tested (risk ratio = 1.10, 95% CI: 1.04 – 1.17, *P*= 0.001). Those in the youngest age group were no more or less likely to belong to either tested or untested groups.

Table 5.1-5: Characteristics of SA prisoners with no documented history of testing in summer (n=1347) and winter (n=1347) – 2005

Characteristic	Never tested in summer n (%)	Never tested in winter n (%)
Sex:		
Female	31 (33.3)	19 (21.6)
Male	331 (26.4)	278 (22.1)
Indigenous status:		
Indigenous	69(22.6)	64 (22.61)
Non-Indigenous	251 (27.6)	230 (22.4)
Not documented	42 (31.6)	3 (7.7)
Age group (in years):		
18-28	103 (28.5)	103 (28.5)
29-36	105 (29.0)	105 (29.0)
>36	154 (42.5))	154 (42.5)
Time served +/- median (0.78 years)		
Above	167 (46.1)	167 (46.1)
Below	195 (53.9)	195 (53.9)
TOTAL	362 (26.9)	295 (21.9)

5.1.1.4.2 Factors associated with HCV-antibody status

After excluding those with no testing history, being imprisoned during summer was associated with a slightly lower risk for HCV antibody overall (41.4% versus 42.3%) but the difference was not statistically significant (risk ratio = 0.98, 95% CI: 0.88 –1.09, *P*=0.693). Only in Mobilong Prison (a medium to low-security facility), did HCV prevalence differ significantly between audits, where *higher* HCV prevalence was noted in summer (risk ratio = 1.31, 95% CI: 1.03 – 1.66, *P*= 0.027).

In both audits, sex, age and Indigenous status were all significantly associated with HCV-antibody status in univariate analyses (see Table 5.1-6). Being Indigenous was associated with decreased HCV antibody prevalence in Port Augusta, but with increased risk elsewhere. Being female was also associated with a higher risk for HCV in both audits as was age, however the pattern of risk associated with age varied somewhat between time periods. The youngest age group remained associated with lower risk, while the relationship between age and HCV status changed from one that was an inverted 'U'-shape in summer (with the

greatest risk associated with the middle age group) to one that looked more linear (i.e. increasing risk was associated with increasing age).

Table 5.1-6: Factors associated with HCV-antibody status in SA prisoners – summer 2005 (n=982*) and winter 2005 (n=1047)**

Factor	HCV-antibody (%)		Risk ratio		95% Confidence Interval		*P*-value (Chi^2)	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Sex:								
Female	66.1	63.8	1.66	1.52	1.37 – 2.02	1.29 – 1.90	<0.001	<0.001
Male	39.8	40.8						
Age group (years):								
18 to 28	28.4	30.7	1.00	1.00				
29 to 36	51.9	47.9	1.83	1.56	1.50 – 2.23	1.29 – 1.89	<0.001	<0.001
>36	43.7	48.6	1.54	1.58	1.24 – 1.91	1.31 – 1.91	<0.001	<0.001
Indigenous status:								
Pt Augusta Prison only								
Indigenous	19.8	19.7	0.54	0.52	0.33 – 0.88	0.31 – 0.87	0.012	0.008
Non-Indigenous	36.8	37.9						
Excluding Pt Augusta Prison								
Indigenous	56.6	55.2	1.39	1.27	1.17 – 1.65	1.07 – 1.51	0.001	0.009
Non-Indigenous	40.7	43.3						
Time served +/- summer median (0.78 years)								
Pt Augusta Prison only								
Above	35.9	37.0	2.30	2.71	1.30 – 4.09	1.43 – 5.17	0.002	<0.001
Below	15.6	15.0						
Excluding Pt Augusta Prison								
Above	45.4	44.5	1.24	0.98	0.87 – 1.18	0.84 – 1.13	0.877	0.742
Below	44.3	45.6						
Security level:								
All prisons								
Low†	47.7	41.8	1.24	0.98	1.07 – 1.44	0.84 – 1.14	0.005	0.798
High§	38.4	42.6						
Excluding Pt Augusta Prison								
Low†	47.7	41.8	1.12	0.88	0.95 – 1.30	0.76 – 1.03	0.717	0.103
High§	42.8	47.4						

* *excluding 365 individuals with no documented test history or only indeterminate results*

** *excluding 295 individuals with no documented test history or only indeterminate results*

†*prisons incorporating no high security section*

§*prisons incorporating a high security section*

At both time points, duration of imprisonment was found to be associated with HCV-antibody status only at Port Augusta prison, where those who had served over 0.78 years (the median duration of imprisonment in summer) at the time of the audits had a higher risk for HCV infection. However, and also in both audits, Indigenous prisoners at Port Augusta were significantly more likely to have served below 0.78 years. Once Indigenous prisoners from Port Augusta Prison were excluded from the analysis, duration of imprisonment was no longer associated with HCV antibody status in any other prison (specifically or overall) at either time point.

Compared to prisons incorporating a high security section, HCV prevalence was significantly higher in lower security prisons in summer (risk ratio = 1.24) but not winter. However, it is likely this was again confounded by the prison-specific factors related to Port Augusta Prison. As reported, this low to high security prison had a high proportion of Indigenous prisoners, particularly in summer – an Indigenous population with low HCV prevalence relative to Indigenous prisoners elsewhere (see above). Once Port Augusta Prison was excluded, HCV prevalence was no longer significantly associated with prison security level in either audit.

5.1.1.4.3 Factors associated with Indigenous status

Sex, age and Indigenous status were all significantly associated with HCV antibody status in univariate analyses in both audits (see Table 5.1-6). Being Indigenous was associated with decreased HCV antibody prevalence in Port Augusta, but with increased risk elsewhere. Being female was also associated with a higher risk for HCV in both audits. The pattern of risk associated with age, however, varied somewhat between time periods. The youngest age group remained associated with lower risk, while the relationship between age and HCV status changed from one that was an inverted 'U'-shape in summer (with the greatest risk associated with the middle age group) to one that looked more linear.

There is evidence that the relationship between age and HCV risk may be mediated by Indigenous status. In both audits, Indigenous prisoners were younger than non-Indigenous prisoners. The difference in median ages was more than two years in summer (30.8 years versus 33.1 years) and nearly three in winter (30.6 years versus 33.3 years). The Mann-Whitney test produced z statistics associated with the distribution of ranked ages in Indigenous and non-Indigenous prisoners for both audits ($z = 4.450$ in summer, $z = 4.451$ in winter) that were both highly significant ($P < 0.0001$). Table 5.1-7 presents the age

distributions of the Indigenous and non-Indigenous summer and winter populations together with the HCV antibody prevalences of the respective age groups (which were based on thirds of the age distribution of the summer audit). Because of the distinctly different risks associated with Indigenous status there, the data from Port Augusta are excluded here.

The previously noted inverted U-shaped relationship between age group and HCV-antibody status is highly evident when univariately considering Indigenous prisoners, with the peak risk associated with the middle age group – 79% and 69% in summer and winter respectively. Conversely, there is no longer any indication of increased risk for the middle age group in non-Indigenous prisoners, where the peak incidence occurs in the oldest age group – 47% in summer and 52% in winter. Nonetheless, as is demonstrated below (see section 5.1.1.5), multivariate modelling revealed that the summer peak of prevalence in the middle age group persisted after adjustment for both Indigenous status and sex.

Table 5.1-7: Age distribution and HCV antibody prevalence by Indigenous status in SA prisoners* - summer (n=1098) and winter (n=1099) 2005

Audit		Indigenous prisoners		Non Indigenous prisoners	
		n (%)	*HCV positive – n (%)	n (%)	*HCV positive – n (%)
Summer					
Age group (in years):					
	18-28	86 (45.3)	23 (37.1)	254 (31.8)	52 (27.5)
	29-36	64 (33.7)	42 (79.3)	268 (33.5)	97 (47.1)
	>36	40 (21.1)	17 (56.7)	277 (34.7)	82 (47.4)
Winter					
Age group (in years):					
	18-28	77 (41.4)	22 (38.6)	280 (31.9)	70 (31.3)
	29-36	61 (32.8)	33 (68.7)	255 (29.1)	99 (46.3)
	>36	48 (25.8)	24 (63.2)	342 (39.0)	124 (52.1)

**excludes data from Port Augusta Prison*
*** excludes 310 in summer and 247 in winter with no or indeterminate results recorded*

5.1.1.5 Multivariate analyses

While the populations without a history of HCV-antibody testing were found be fairly similar to the population with documented HCV test results, it is possible that the two groups differed with respect to a number of risk factors (such as injecting and tattooing history) for which no data were collected. In addition, univariate analyses indicated that the population at Port

Augusta Prison differed from the other prisons in a number of important respects. For these reasons, the multivariate analyses were restricted to those with documented test histories who were not accommodated at Port Augusta Prison at the time of the audit (summer n = 713, winter n = 819). An independent analysis of data from Port Augusta prison is reported in a later section (see 5.1.1.8)

Indigenous status, age and sex were all significantly associated with HCV-antibody status on univariate analysis, in summer and winter. Table 5.1-8 presents the adjusted risk estimates for all factors in both audits. For both sex and Indigenous status, the winter adjusted rates were considerably smaller than the summer unadjusted rates – although the associations retain their statistical significance. The adjusted risk estimates according to age group also remained significant for the winter audit, although the greatest risk is associated with the oldest age group (over 36 years) rather than the middle age group (between 29 and 36 years) as was noted in the summer audit. Nonetheless, the multivariate analyses indicates that these factors were all independent risk factors for HCV-antibody positivity in the SA prison system irrespective of the season.

Table 5.1-8: Factors associated with HCV-antibody status in SA prisoners in summer (n=713*) and winter (n=819*) 2005 – multivariate analysis

Factor	Risk Ratio (95% confidence interval)	Risk Difference (95% confidence interval)	*P*-value
Female sex:			
Summer	1.52 (1.34 - 1.73)	0.23 (0.10 - 0.35)	< 0.001
Winter	1.32 (1.08 – 1.60)	0.18 (0.06 – 0.30)	0.006
Indigenous:			
Summer	1.50 (1.31 - 1.72)	0.18 (0.09 - 0.26)	< 0.001
Winter	1.28 (1.09 – 1.60)	0.12 (0.04 – 0.21	0.003
Age (years):			
Summer			
18-28	[Reference category]		
29 - 36	1.88 (1.53 - 2.31)	0.27 (0.19 - 0.35)	< 0.001
>36	1.55 (1.23 - 1.94)	0.19 (0.11 - 0.28)	< 0.001
Winter			
18-28	[Reference category]		
29 - 36	1.54 (1.26 - 1.89)	0.18 (0.10 - 0.26)	< 0.001
>36	1.62 (1.33 - 1.97)	0.21 (0.13 - 0.29)	< 0.001

**excludes data from Port Augusta Prison, those with no test histories or only indeterminate results and those with unknown Indigenous status*

5.1.1.6 Single audit subpopulations

There was a proportion of prisoners only present for a single audit – either in summer or in winter. These were individuals who had either been admitted at some time between the two audits, or had been discharged (and not re-admitted) after the time of the summer audit. These single audit groups might be regarded as more transient subsets of the total populations. Excluding the 803 individuals who were represented in both audits, there were exactly 544 prisoners uniquely imprisoned in the eight prisons in summer and 544 in winter.

5.1.1.6.1 Demographic characteristics

The demographic characteristics of the single audit subpopulations (see Table 5.1-9) were similar to those of the total summer and winter populations. Male prisoners made up 91.7% (499/544) of the summer subpopulation and 92.7% (504/544) of the winter subpopulation. The median ages in summer and winter were 32.7 and 34.3 years respectively. Also very similar to the total audit populations, there was a larger number of non-Indigenous prisoners in the winter – 75.0% versus 66.2% in summer – but also fewer prisoners with unknown Indigenous status – 1.5% versus 6.3% in summer.

Table 5.1-9: Demographic characteristics of SA prisoners present for only one audit in summer 2005 (n = 544) and winter 2005 (n=544)

Characteristic	Summer n (%)	Winter n (%)
Sex:		
Female	45(8.3)	40 (7.4)
Male	499 (91.7)	504 (92.7)
Indigenous status:		
Indigenous	150 (27.6)	128 (23.5)
Non-Indigenous	360 (66.2)	408 (75.0)
Not documented	34 (6.3)	8 (1.5)
Age group (in years):		
18-28	181 (33.3)	204 (37.5)
29-36	180 (33.1)	161 (29.6)
>36	183 (33.6)	179 (32.9)
Time served +/- total population summer median (0.78 years)		
Above	184 (33.8)	93* (17.1)
Below	360 (66.2)	451 (82.9)

** these individuals may be assumed to represent prisoner transfers from Mount Gambier Prison subsequent to the summer audit*

Not surprisingly, since one would expect to find a greater proportion of recently admitted prisoners in the second audit (although in contrast to the total audit populations), those present for only a single audit had a longer duration of imprisonment in *summer* - when the median duration of imprisonment was 0.41 versus 0.25 years in winter. Both audit subpopulations, however, were associated with shorter incarceration periods than were noted in the total populations. Using the Mann-Whitney test, the z statistics associated with the distribution of duration of imprisonment for the single populations versus those present for both audits in summer (z = -11.012) and winter (z = -21.666) were both highly significant ($P < 0.001$). There were 93 individuals only present in the winter audit who had been imprisoned above the total summer population median time of 0.78 years (the baseline) that may be assumed to represent individuals transferred from Mount Gambier Prison subsequent to the first audit. Excluding these individuals, the median duration of imprisonment in the winter audit was 0.19 years - or just under 10 weeks.

5.1.1.6.2 Documented HCV-antibody results

In both summer and winter, approximately 26% of the single audit subpopulations had tested HCV-antibody positive. Once those with no record of testing and those with only indeterminate results were excluded, HCV prevalences for summer and winter were also virtually identical at 36.8% (140/381) and 36.3% (141/388) respectively. Compared to the total audit populations, single audit subpopulations had lower HCV antibody prevalence – almost significantly so in winter (risk ratio = 0.86, 95% CI: 0.74 – 1.00, $P = 0.005$). Comparing the HCV-status of the single audit summer and winter subpopulations directly with that of the 803 individuals present for both audits (in isolation) yielded significant differences for both time periods. In summer the risk ratio associated with the single audit subpopulation was 0.82 (95% CI: 0.70 – 0.96, $P = 0.014$) and the risk ratio was 0.79 in winter (95% CI: 0.68 – 0.93, $P = 0.003$).

Univariate analyses of the factors associated with HCV status among those present for only the summer audit (see Table 5.1-10) reflected the patterns observed in the total audit populations (refer back to Table 5.1-6). There were some variations for the subpopulation present for only the winter audit, where the only significant associations with HCV antibody status were for Indigenous status at Port Augusta Prison exclusively (risk ratio = 0.12) and for those aged 36 years and over (risk ratio = 1.95).

Table 5.1-10: Factors associated with HCV-antibody status among SA prisoners present for only one audit – summer (n=381*) versus winter (n=388*) 2005

Factor	HCV-antibody (%)		Risk ratio		95% Confidence Interval		*P*-value (Chi^2)	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Sex:								
Female	53.3	48.5	1.51	1.38	1.05 – 2.17	0.94 – 2.01	0.050	0.129
Male	35.3	35.2						
Age group (years):								
18 to 28	22.1	26.4	1.00	1.00				
29 to 36	46.9	33.9	2.13	1.29	1.48 – 3.06	0.89 – 1.86	<0.001	0.179
>36	42.6	51.3	1.93	1.95	1.32 – 2.82	1.41 – 2.68	<0.001	<0.001
Indigenous status:								
Pt Augusta Prison only								
Indigenous	8.7	3.6	0.29	0.12	0.09 – 0.88	0.02 – 0.88	0.034*	0.013*
Non-Indigenous	30.4	30.0						
Excluding Pt Augusta Prison								
Indigenous	51.6	40.7	1.44	1.02	1.07 – 1.93	0.73 – 1.44	0.029*	1.000*
Non-Indigenous	35.8	39.8						
Time served +/- summer median (0.78 years)								
Pt Augusta Prison only								
Above	25.0	29.4	2.40	2.41	0.81 – 7.07	0.80 – 7.27	0.163**	0.139**
Below	10.4	12.2						
Excluding Pt Augusta Prison								
Above	46.0	43.2	1.18	1.10	0.90 – 1.54	0.76 – 1.59	0.232**	0.623**
Below	38.9	39.2						
Security level:								
All prisons								
Low	46.7	30.7	1.46	0.81	1.12 – 1.89	0.57 – 1.14	0.006	0.210
High	32.1	380						
Excluding Pt Augusta Prison								
Low	46.7	30.8	1.21	0.71	0.93 – 1.58	0.51 – 1.01	0.152	0.044
High	38.5	43.0						

* *excluding 163 individuals in summer and 256 in winter with no test history or only indeterminate results*
** *2-sided Fisher's exact test used*

HCV antibody was more common in female prisoners and in Indigenous prisoners accommodated in prisons other than Port Augusta Prison, where Indigenous prisoners were *less* likely to be HCV antibody positive, but this was only significantly so in the summer

subpopulation. Similar to what was noted when considering the total audit populations, the differences between sex and Indigenous status were less extreme in winter. Neither the time served at the time of the audit, nor the security level of the prisons was associated with HCV status for either of the single audit subpopulations. The differences noted for Port Augusta Prison in the total audit populations were less apparent in the single audit populations.

5.1.1.7 New prison entrants

The literature suggested that IDU tend to be incarcerated more frequently than non-IDU, but for relatively brief periods. Because of the association between IDU and HCV infection, prisoners incarcerated for two weeks or less at the time of each audit represented another subpopulation of interest.

5.1.1.7.1 Demographic characteristics

Selected demographic details of the 174 new entrants (78 in summer and 96 in winter) are presented in Table 5.1-11. The sex distribution (8.6% female) of new entrants did not differ significantly from the total prison populations (average 6.7% female over both audits) and the single audit subpopulations (average 7.8% female). The proportion identified as Indigenous (28.7%) was greater than seen in the total population (21.8% average) but was closer in size to the average proportion noted in the single audit subpopulations (25.5%).

The trend for greater numbers of Indigenous prisoners in summer was more pronounced in new entrants, 33.3% of new entrants were identified as Indigenous in summer compared to 25% in winter, although the difference did not reach significance. After excluding data from Port Augusta Prison (25 individuals, 18 of whom were Indigenous) the proportions of new entrants identified as Indigenous fell to 21.5% overall, and 25.8% and 18.1% in summer and winter respectively.

New entrants were younger than the total audit populations, with 40.2% overall belonging to the youngest age group (ranging from 38.5% in summer to 41.7% in winter). An average of 32.7% of the total audit populations (over both audits) belonged to the youngest age group. The median age of new entrants did not differ between audits (31.2 years in summer and 31.6 years in winter) however median ages were lower relative to those incarcerated for longer periods (i.e. imprisoned for more than two weeks) in the total populations (33.0 years in

summer and 32.9 years in winter). In winter, there was no difference in the median ages of new entrants and those in the single audit subpopulation incarcerated for longer than two weeks (31.6 years and 31.9 years respectively). Using the Mann-Whitney test, the z statistic associated with the distribution of median ages in summer was significant when comparing new entrants with longer stayers in the total population (z = 2.395, *P*=0.0166).

Table 5.1-11: Demographic characteristics of SA prisoners imprisoned for two weeks or less during summer and winter 2005 (n=174)

Characteristic	Summer n (%)	Winter n (%)	Total n (%)
Sex:			
Female	7 (9.0)	8 (8.3)	15 (8.6)
Male	71 (91.0)	88 (91.7)	159 (91.4)
Indigenous status:			
Indigenous	26 (33.3)	24 (25.0)	50 (28.7)
Non-Indigenous	51 (65.4)	72 (75.0)	123 (70.8)
Not documented	1 (1.3)	0 (0.0)	1 (0.6)
Age group (in years):			
18-28	30 (38.5)	40 (41.7)	70 (40.2)
29-36	26 (33.3)	22 (22.9)	48 (27.6)
>36	22 (28.2)	34 (35.4)	56 (32.2)

Given the lack of evidence for seasonally based demographic differences among new prison entrants, both summer and winter new entrant subpopulations are combined in the following analyses. The remainder of the data from the summer audit are used as the comparator population.

5.1.1.7.2 History of HCV-antibody testing

As might be expected, a significantly larger proportion of new entrants had no testing history compared to those incarcerated for longer periods – 43.1% (75/174) versus 25.7% (325/1267) – risk ratio = 0.77 (95% CI: 0.67 – 0.87, *P*<0.001. Those identified as Indigenous were not differentially distributed among tested and untested new entrants, with 28.3% (28/99) of those tested and 29.7% (22/74) of those never tested identified as Indigenous (risk ratio = 0.93, 95% CI: 0.46 – 1.92, *P*<0.886). There was also no difference in the sex distribution according to testing history (risk ratio = 0.93, 95% CI: 0.57 – 1.52, *P*<0.771). The median age of new entrants with testing histories was 32.1 years, which was significantly older than those with no testing histories 29.3 years (z = -2.334, *P*= 0.0196). Indeed, the median age of new entrants with testing histories did not differ significantly from those with testing histories in the

remainder of the summer audit population – 32.1 years versus 32.4 years (z = 0.080, *P*= 0.9363).

5.1.1.7.3 Factors associated with HCV-antibody status

The overall prevalence of HCV-antibody in new entrants was 46.9% (46/98) compared to 41.1% (386/939) in those incarcerated for longer periods. The increased risk was not statistically significant (risk ratio =1.14, 95% CI: 0.91 – 1.03, *P*<0.265) but did reflect a consistent (if non-significant) pattern of higher HCV-prevalence for all strata of each variable investigated (see Table 5.1-12). The greatest difference in prevalence was between new entrants and longer stayers aged over 36 years (59.4% versus 42.7%). Since shorter periods of incarceration are associated with drug-related offences, this difference may reflect an increased HCV risk associated with duration of IDU – i.e. the highest HCV prevalence in an older group of long-term IDU who may have a history of brief but relatively frequent periods of incarceration.

Table 5.1-12: HCV-antibody status in prison entrants* (n=98) compared to longer stayers from the summer audit (n = 939†) in 8 publicly operated prisons in SA - 2005**

Characteristic	New Entrants HCV-antibody n (%)	Longer stayers HCV-antibody n (%)	Risk ratio	95% Confidence Interval	*P*-value (Chi^2)
Sex:					
Female	6 (75.0)	39 (66.1)	1.13	0.73 – 1.76	0.615
Male	40 (44.4)	347 (39.4)	1.13	0.88 – 1.44	0.355
Indigenous status:					
All prisons:					
Indigenous	12 (42.9)	91 (40.8)	1.05	0.67 – 1.66	0.835
Non-Indigenous	34 (48.6)	251 (40.2)	1.21	0.93 – 1.57	0.175
Excluding Pt Augusta Prison					
Indigenous	12 (60.0)	73 (54.5)	1.10	0.75 – 1.63	0.643
Non-Indigenous	32 (48.5)	221 (40.9)	1.18	0.91 – 1.55	0.240
Age group (in years):					
18-28	10 (29.4)	90 (28.4)	1.04	0.60 – 1.63	0.900
29-36	17 (53.1)	170 (52.0)	1.02	0.73 – 1.44	0.902
>36	19 (59.4)	126 (42.7)	1.39	1.01 – 1.91	0.072
Total populations:	46 (46.9)	386 (41.1)	1.14	0 .91 – 1.43	0.265

* *prisoners incarcerated for 2 week or less (both audits combined)*

** *excluding 76 individuals with no documented test history or only indeterminate results*

† *excluding 328 individuals with no documented test history or only indeterminate results*

Looking at stratum specific factors associated with HCV prevalence among 98 new entrants with documented HCV testing histories (see Table 5.1-13), the broad pattern of increased risk for females, Indigenous prisoners in all but Port Augusta Prison and for older age groups was consistent with that seen in longer stayers, although the smaller numbers made it difficult to achieve statistical significance in most cases. Being a new entrant aged over 36 years, however, was associated with a statistically significant two-fold increase in risk relative to new entrants under 29 years (*P*= 0.023).

Table 5.1-13: Factors associated with HCV-antibody status among new prison entrants* (n = 98) versus longer stay prisoners† (n=939§) in SA – 2005**

Factor	HCV-antibody (%)		Risk ratio		95% Confidence Interval		*P*-value¥	
	New entrants	Longer stayers	New entrants	Longer stayers	New entrants	Longer stayers	New entrants	Longer stayers
Sex:								
Female	75.0	64.2	1.69	1.60	1.06 – 2.68	1.39 – 1.85	0.142	<0.001
Male	44.4	40.1						
Age group (years):								
18 to 28	29.4	28.4	1.00	1.00				
29 to 36	53.1	52.0	1.80	1.68	0.98 – 3.34	1.46 – 1.94	0.084	<0.001
>36	59.4	42.7	2.02	1.55	1.12 – 3.71	1.34 – 1.79	0.023	<0.001
Indigenous status:								
All prisons								
Indigenous	42.9	40.8	0.88	1.02	0.54 – 1.44	0.84 – 1.22	0.659	0.937
Non-Indigenous	48.6	40.2						
Excluding Pt Augusta Prison								
Indigenous	60.0	54.5	1.24	1.33	0.80 – 1.91	1.11 – 1.60	0.448	0.006
Non-Indigenous	48.5	40.9						

* *prisoners incarcerated for 2 week or less (both audits combined)*
** *excluding 75 individuals with no documented test history or only indeterminate results*
† *prisoners incarcerated for more than two weeks at the time of the summer audit*
§ *excluding 325 individuals with no documented test history or only indeterminate results*
¥ *2-sided Fisher's exact test used*

5.1.1.8 Port Augusta Prison

As indicated in previous analyses, the characteristics of the population at Port Augusta Prison varied from those incarcerated in the other prisons in a number of respects, making it

important to consider this population separately. The specific demographic characteristics (and associated HCV antibody status) of prisoners incarcerated in summer and winter at Port Augusta are presented in Table 5.1-14. There were very few females imprisoned in this prison at the time of both audits (only three in summer and four in winter). Although the prison does accept both male and female prisoners, its average daily number of females is only five, ranging from three to five over the last two years (Department for Correctional Services, 2005). The HCV-antibody prevalences for female prisoners at Port Augusta Prison should therefore be interpreted very cautiously.

Compared to the other prisons, Port Augusta Prison had a large proportion of Indigenous prisoners who also had a different risk profile to Indigenous prisoners incarcerated elsewhere. Univariate analyses previously revealed that Indigenous prisoners in Port Augusta were almost half as likely to have tested HCV-antibody positive than were non-Indigenous prisoners (see Table 5.1-6). While there was a clear seasonal difference in the proportion of Indigenous prisoners at Port Augusta during the two audits, the HCV risk according to Indigenous status was unchanged. There was also very little variation in stratum-specific HCV prevalence for age and duration of imprisonment.

Table 5.1-14: Demographic characteristics and HCV-antibody status in Port Augusta prisoners - summer (n=249) and winter (n=248) 2005

Characteristic	Summer		Winter	
	n (%)	HCV positive* n (%)	n (%)	HCV positive* n (%)
Sex:				
Female	3 (1.2)	1 (50.0)	4 (1.6)	1 (33.3)
Male	246 (98.8)	53 (27.6)	244 (98.4)	58 (30.2)
Indigenous status:				
Indigenous	115 (46.2)	18 (19.8)	97 (39.1)	15 (19.7)
Non-Indigenous	110 (44.2)	32 (36.8)	148 (59.7)	44 (37.9)
Not documented	24 (9.6)	4 (25.0)	3 (1.2)	0 (0.0)
Age group (in years):				
18-28	81 (32.5)	13 (19.1)	92 (37.1)	16 (21.9)
29-36	80 (32.1)	24 (38.1)	69 (27.8)	24 (40.7)
>36	88 (35.3)	17 (27.0)	87 (35.1)	19 (30.2)
Time served +/- total population summer median (0.78 years)				
Above	149 (59.8)	42 (35.6)	164 (66.1)	50 (38.2)
Below	100 (40.2)	12 (15.8)	84 (33.9)	9 (14.1)

**excluding 55 in summer and 53 in winter with no or indeterminate results recorded*

There were slight variations in the age distribution in the Port Augusta Prison population relative to that of the total prison populations. As with elsewhere, the Indigenous prisoners were younger than the non-Indigenous prisoners, particularly at the time of the winter audit. Non-Indigenous prisoners at Port Augusta tended to be older relative to Indigenous prisoners and also to the general population over all with little seasonal change in the age distribution.

While the numbers were very small, the HCV risk estimates were similar for each audit, demonstrating a peak risk for Indigenous and non-Indigenous prisoners in the middle age group (29 to 36 years) in both audits. In winter, there was a larger proportion of younger Indigenous prisoners, although there was little variation in the HCV risk according to age group between audits. As noted, the Indigenous prevalence estimates were substantially lower than in other prisons, however age-specific estimates for non-Indigenous prisoners were broadly comparable to those seen elsewhere (given the small numbers involved).

Table 5.1-15: Age distribution and HCV-antibody prevalence by Indigenous status in Port Augusta prisoners - summer (n=249) and winter (n=248) 2005

Audit	Indigenous prisoners		Non-Indigenous prisoners	
	n (%)	HCV positive* N (%)	n (%)	HCV positive* n (%)
Summer				
Age group (in years):				
18-28	40 (34.8)	4 (12.1)	33 (30.0)	6 (21.3)
29-36	40 (34.8)	8 (25.8)	35 (31.8)	16 (53.3)
>36	35 (30.4)	6 (22.2)	42 (38.2)	10 (34.5)
Winter				
Age group (in years):				
18-28	43 (44.3)	5 (15.1)	48 (32.4)	11 (28.2)
29-36	26 (26.8)	7 (31.8)	43 (29.1)	17 (46.0)
>36	35 (30.4)	3 (14.3)	57 (38.5)	16 (40.0)

**excluding 55 in summer and 53 in winter with no or indeterminate results recorded*

5.2 The cohort stage

The recruitment details and results from the cohort stage are presented in this section. The demographic characteristics of participants and their relationship to the HCV status of prisoners at entry and at follow up are described, followed by analyses of the risk factor data

collected at entry and at each follow up. This section also presents the results of the HCV-antibody and PCR test comparison.

5.2.1 Prisoner recruitment

Recruitment was conducted during the period 18 October 2004 to 4 August 2005. Based on annual figures provided by the DCS to the end of June 2005, there would have been a total intake of approximately 2500 prisoners, at all SA prisons including Mount Gambier Prison, during the ten months of the recruitment period (Department for Correctional Services, 2005) This estimate is less than the 3000 (excluding Mount Gambier Prison) suggested by the monthly admission figures initially provided by SAPHS (see Table 4.2-1). Approximately 80% of SA admissions are to the three metropolitan prisons – Adelaide Remand Centre, Adelaide Women's Prison and Yatala Labour Prison – to which, based on the DCS figures, approximately 2000 prisoners may have been admitted (from the community) during the 42 weeks of recruitment. As detailed in the previous chapter (section 4.4.1.1), recruitment ceased completely at Port Augusta and Port Lincoln by 19 November 2004 and the researcher assumed responsibility for recruitment at the Adelaide Women's Prison from 13 January 2005.

Table 5.2-1: Identified prison admissions* by response category – October 2004 to August 2005

Response	Admission 1	Admission 2	Admission 3	Admission 4	Total
Accepted	634	84	5	1	724
Declined	281	31	1	0	313
No access	199	9	2	1	211
Totals	1114	124	8	2	1248

**defined as entries to prison from the community (excludes 325 individuals not meeting the study eligibility criteria)*

DCS and SAPHS staff listed 1573 separate new admissions during the 10-month recruitment period. The majority of these were prisoners entering the three metropolitan prisons who remained imprisoned at the time of the weekly recruitment sessions, but also included a small proportion of admissions to the prisons at Port Augusta and Port Lincoln over the eight weeks

recruitment was occurring in those settings. Excluding Port Augusta and Port Lincoln data, and those prisoners who were listed as new admissions in error (see the following section - 5.2.1.1) the listed admissions represent 73.4% of the estimated number of admissions to the metropolitan prisons during this period. The remaining proportion not listed (26.6%) may largely represent those short stay prisoners who were admitted and discharged between recruitment sessions. The absolute numbers of individuals identified as new admissions by DCS staff (for whom contact was attempted at each admission) according to response categories are presented in Table 5.2-1.

5.2.1.1 Prisoners not eligible

Among the 1573 listed admissions, 325 of prisoners were ineligible for the study. One hundred and six (32.6%) of these were actually transferred from other correctional facilities in the State (such as Mount Gambier Prison and James Nash House) and from interstate prisons. While these were not new admissions (i.e. they were listed as new admissions in error), they were often processed as such and underwent a similar prison induction period. A further 84 (25.8%) of the 325 ineligible prisoners were transferred to higher security sections within the prison on the day of the session and 76 (23.4%) were discharged on the day of the recruitment session – frequently after having only been incarcerated for two days or less and therefore unable to complete the study protocol. Forty five (13.8%) had significant mental health problems and could not provide a valid consent. The remaining 14 prisoners (4.3%) had communication difficulties or were considered physically too unwell to interview.

5.2.1.2 Prisoners not accessible

Access was not possible for 211 (16.9%) of the remaining 1248 admissions over the 42 weeks due to the following reasons:

- 78 (37.0%) prisoners were at court during the recruitment session;
- 62 (29.4%) were missed due to time restrictions;
- 37 (17.5%) were 'locked down' or on infirmary or other visits; and
- 34 (16.1%) were otherwise occupied with exercise or other recreational activities.

Within these overall statistics was a proportion of individuals who were admitted more than once during the recruitment period. One individual was admitted to prison four times in the 42 weeks. Thus, while there were 211 occasions where no access was possible, some of these

individuals were accessed (and either accepted or declined participation) during another admission. For instance, the actual number of people not accessed on their first admission to prison was 199. Of these, 25 individuals were subsequently discharged and admitted a second time during the 42 weeks, among whom 14 accepted and 8 declined participation. On a third admission, two of these accepting individuals were re-enrolled again but access was not possible for one individual who had previously accepted. It was also not possible to access one person admitted on a fourth occasion during the recruitment period, however this individual had accepted participation on his second and third admissions (these data are summarised in Table 5.2-2). In addition, seven more individuals were accessed on their first admit - at which time they either accepted or declined - but contributed to the 'no access' category on subsequent admissions. Thus, while access was not achievable on a total of 211 occasions, this actually represents 180 individuals who could not be accessed at any stage during the recruitment period.

Table 5.2-2: Prisoners multiply admitted after not being accessed on first admission* by response category – October 2004 to August 2005

Response	Admission 1	Admission 2	Admission 3	Admission 4	Total
Accepted	0	14	2	0	16
Declined	0	8	1	0	9
No access	25	3	2	1	30
Totals	25	25	8	2	55

**excludes 174 individuals not accessed on first admission and who were not subsequently readmitted during the recruitment period*

5.2.1.3 Prisoners declining participation

Three hundred and thirteen of the 1248 potentially eligible admissions (25.1%) declined participation, which includes a proportion that had participated during another period of incarceration. For instance, 281 individuals declined participation on their first admission, of whom 31 were subsequently discharged and readmitted. 17 of these then accepted when admitted a second time during the recruitment period (these data are summarised in Table 5.2-3). Conversely, 20 participants enrolled or not accessible at the time of their first

admission, declined to re-enrol at subsequent admissions – contributing to the total number of refusers. Thus, while there were 313 occasions in which participation was offered but declined, this actually represents 276 individuals who declined during the recruitment period.

Overall, 61.7% (193/313) of those refusing did not provide a reason. Reluctance to undergo a blood test was the most common expressed reason, and was provided by 27.5% (86/313) of refusers. 16 (5.1%) reported feeling unwell (physically or mentally) and 17 (5.4%) declined on the basis they were anticipating imminent release. One person reported being concerned about the civil court warning in the information sheet, in which participants are informed that information they provide might be subpoenaed by a court of law (see Appendix H).

Table 5.2-3: Prisoners multiply admitted after declining on first admission* by response category – October 2004 to August 2005

Response	Admission 1	Admission 2	Admission 3	Total
Accepted	0	17	0	17
Declined	31	11	0	42
No access	0	3	1	4
Totals	31	31	1	63

**Excludes* 250 *individuals* declining *on first admission who were not subsequently readmitted during the recruitment period*

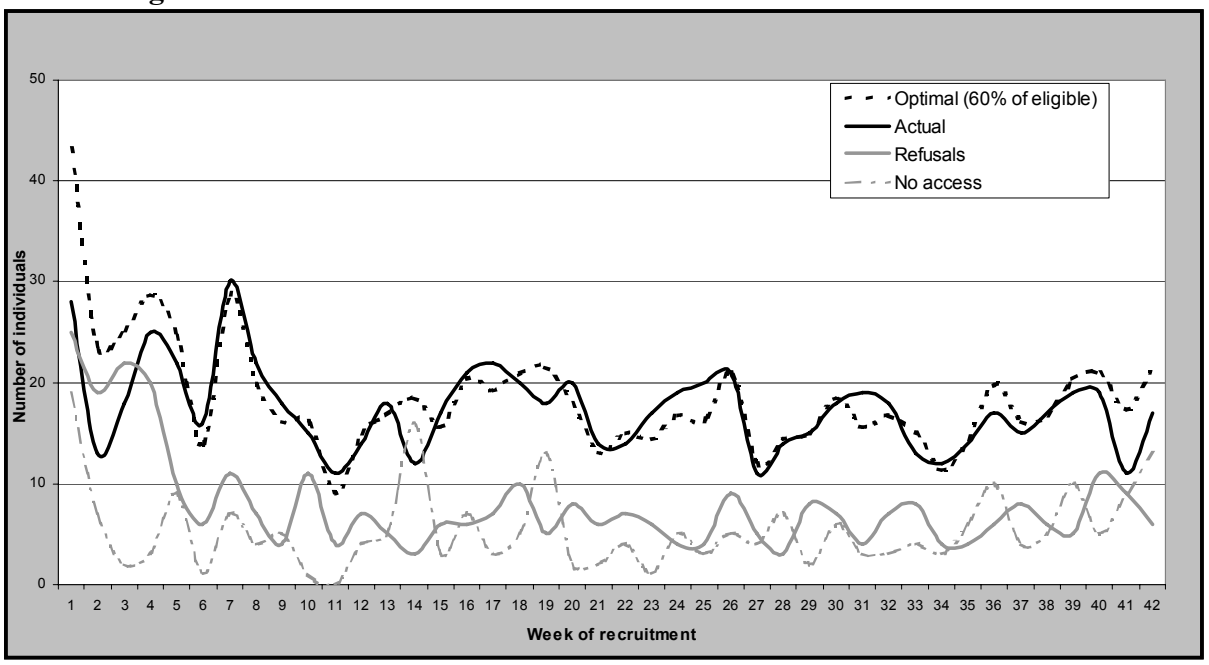
5.2.1.4 Prisoners accepting participation

Overall, 724 consents were signed during the recruitment period and the median number of days since entry to prison was 5 days. The 724 consents actually relate to 666 individuals, since 55 participants were enrolled twice and three were enrolled three times. The response rate (the proportion of those participating among all admissions accessed) was 69.8% overall and ranged from 12.1% (4/33) at Port Augusta Prison (during eight weeks of recruitment) to 75.1%(223/297) at Yatala Labour Prison. At the Adelaide Women's Prison, where weekly recruitment sessions replaced recruiting by SAPHS staff in late January 2005, the response rate was 62.1% (72/116) and 71.9% (425/591) of all new admissions asked at the Adelaide Remand Centre were enrolled in the study. One person admitted to Port Lincoln Prison during

eight weeks of recruitment declined participation. This individual was not included in the analyses, since SAPHS staff did not provide their dossier number and other details.

It is difficult to estimate the participation rate, or the proportion of those accepting among all those eligible, since it was not possible to assess the eligibility of the 211 total admissions who could not be accessed at the time of recruitment. Nonetheless, assuming that all those not accessed *were* eligible, the overall participation rate can be estimated at 58.0% - representing only a small decrease on the proposed participation rate of 60% (see chapter 4, section 4.4.4). The week-by-week numbers of admissions (as identified by DCS staff at the time of the weekly recruitment sessions) and their respective response categories are presented in Figure 5.2-1 relative to the proposed optimal participation rate of 60%.

Figure 5.2-1: Weekly recruitment numbers according to response category* - October 2004 to August 2005



**60% optimal rate assumes that all those not accessed met study eligibility criteria*

5.2.1.5 Prisoner participants

Progress sheets containing the demographic details and results of HCV tests (see Appendix C) were associated with the case notes of each of the 724 enrolments, 721 (99.6%) of which were retrieved by the end of the study. There were six individuals who died in custody due to suicide within the SA prison system over the financial year 2004-05 (Department for Correctional Services, 2005), three of whom were study participants. While the progress sheet belonging to one of these participants was retrieved prior to his death, two remain with the

coroner's office. One of these individuals had been enrolled in the study previously and therefore some details (such as birth date and Indigenous status) were known. One other progress sheet was mislaid when a participant was discharged and then immediately readmitted to a non-metropolitan prison. Only the completed questionnaires of this participant were available for analysis.

Table 5.2-4: Demographic characteristics of participating new prison entrants* by prison (n=666)

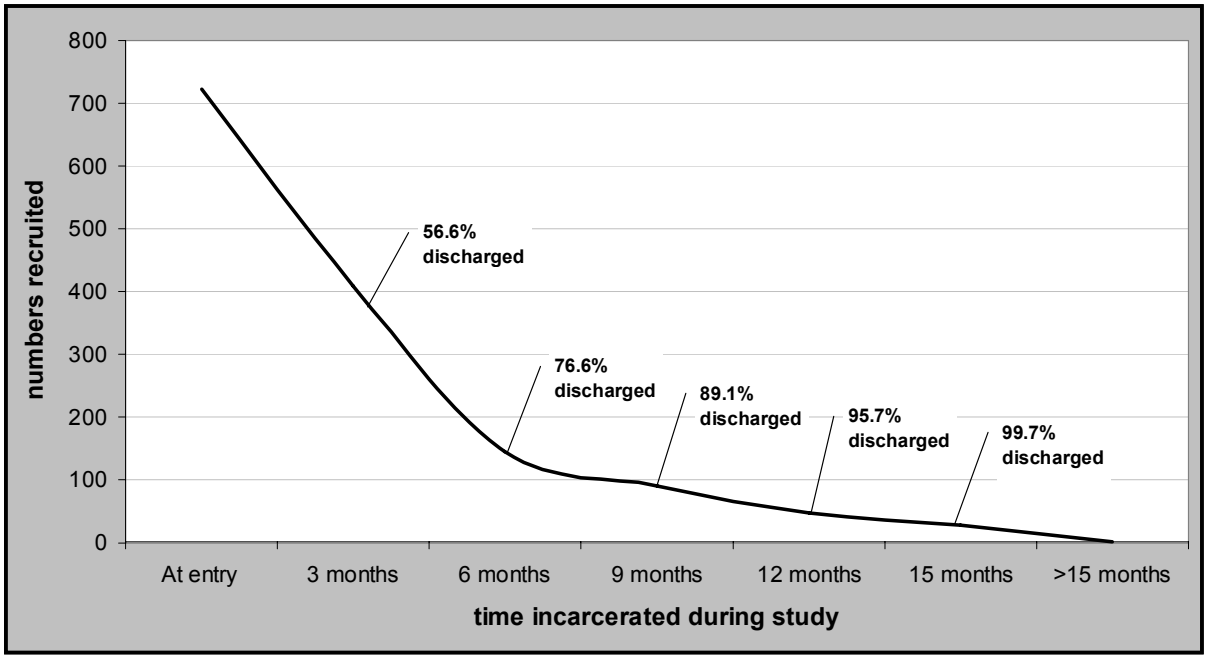
Characteristic	Adelaide Remand Centre	Adelaide Women's Prison	Yatala Labour Prison	Port Augusta Prison	Total
Sex:					
Female - n (%)	0 (0.0)	66 (100.0)	0 (0.0)	0 (0.0)	66 (9.9)
Male - n (%)	386 (100.0)	0 (0.0)	210 (100.0)	4 (100.0)	600 (90.1)
Indigenous status:					
Indigenous - n (%)	77 (20.0)	15 (22.7)	23 (11.0)	3 (75.0)	118 (17.7)
Non-Indigenous - n (%)	304 (79.0)	51 (77.3)	186 (88.6)	1 (25)	542 (81.5)
Not documented - n (%)	4 (1.0)	0 (0.0)	1 (0.5)	0 (0.0)	5 (0.8)
Age (years):**					
median	30.7	35.3	31.6	37.8	31.4
(range)	(18.0 – 69.3)	(18.0 – 56.1)	(18.2 – 63.4)	(18.7 – 42.4)	(18.0 – 69.3)
Duration of imprisonment (weeks): †					
median	7.0	12.3	14.9	12.3	9.3
(range)	(0.1 – 63.6)	(0.3 – 54.6)	(0.3 – 70.4)	(0.3 – 63.6)	(0.1 – 70.4)

** at time of first enrolment (54 subsequently re- enrolled one or more times)*
***age at prison entry*
† observed during the period of study

The demographic characteristics of participants at the time of entry to prison on their first enrolment are presented in Table 5.2-4. According to the DCS, 9.9% of total admissions for 2004-05 were female (Department for Correctional Services, 2005) – as was the proportion among the study population. DCS also reports that 23.9% of total admissions in 2004-05 were Indigenous compared to only 17.7% of the study population. The difference may be explained by the exclusion of Port Augusta Prison from the recruitment protocol, where a large proportion of Indigenous prisoners are admitted. The median age of participants at entry to prison was 31.4 years (range 18 to 69.3 years) – comparable to the median age of 32.0 years reported for all Australian prisoners during 2005 (Australian Bureau of Statistics, 2005). In the cross-sectional stage (described in section 5.1.1.2), approximately 7% of the audited populations were female, around 22% were Indigenous and median age was 32.8 years.

The median time that participants were incarcerated during the study period was 9.3 weeks – ranging from periods of one day to 70 weeks - with the majority of participants discharged within three months of entry. Initial estimates provided by SAPHS and DCS suggested that up to 80% of prisoners are discharged within three months of prison (see section 4.4.4). In this study population, however, discharge prior to three months occurred in 56.6% (409/723) of cases. 76.6% (554/723) of prisoners were discharged within six months of entry and 4.3% (31/723) were incarcerated for 12 months or longer during the study period. Only two participants (0.3%) remained incarcerated 15 or more months after entry to prison. These data are presented in Figure 5.2-2.

Figure 5.2-2: Time from prison entry to discharge in 723* study enrolments over 42 weeks – October 2004 to August 2005



** represents 665 individuals (excluding one individual with unavailable discharge date), with 55 enrolled more than once during the study*

5.2.1.6 Analysis of non-participants

Because recruitment data were more complete during this period, this analysis is restricted to those admissions to the three metropolitan prisons that occurred between 1 January and 4 August 2006. Eight hundred and forty seven (67.9%) of the 1248 potentially eligible total admissions occurred after 1 January. Among these, 60.9% (516/847) accepted, 20.5% (174/847) declined and 18.5% (157/847) were inaccessible. Excluding those not accessed, the

‘accepted’ versus ‘declined’ response categories were 74.8% (516/690) and 25.2% (174/690) respectively.

There was only limited information available about prisoners who declined participation, however it was possible to compare the sex and admission prison of acceptors versus decliners, as well as to compare the groups for previous prison history using DCS dossier numbers as an indicator.

To preserve the anonymity of prisoners, DCS dossier numbers were replaced at analysis with unique, but corresponding sequential numbers in a manner that preserved the absolute differences between the original numbers (eg the fictional dossier numbers 478 and 480 might have been replaced by 1 and 3). For the prisoners admitted during the study period, the absolute difference from the lowest dossier number to the highest dossier number was 149911. That is, these prisoners belonged to a population to which 149911 DCS dossier numbers had been serially allocated at some stage (at the current or previous admissions). From January to August 2005, 138668 dossier numbers had been serially allocated (range 11244 to 149912). Although not completely without exception (see chapter 4, section 4.4.1.3) those entering prison for the first time during the study may generally be assumed to have higher numbers than those with prior imprisonment histories. As presented in Table 5.2-5, the Mann-Whitney statistic associated with the distribution of ranked ID numbers for prisoners admitted from January was not significant, suggesting there was little difference in previous incarceration history between those accepting and declining participation.

Compared to the overall population of participating prison entrants (refer back to Table 5.2-4), females were slightly over represented (although not significantly so) among the acceptors during this period (12.4%), but not among those declining (9.8%).

There were no significant differences in the proportions of acceptors and refusers entering the Women’s Prison and Yatala, however prisoners entering the Remand Centre made up a significantly larger proportion of those declining participation than those accepting. 28.4% of ARC entrants declined relative to 20.2% of prisoners entering Yatala (risk ratio = 1.14, 95% CI: 1.02 – 1.27, P=0.032). Since the Remand Centre admitted a larger proportion of unsentenced prisoners relative to other centres, and in the absence of differences for other variables available, it is possible that this is a prison-specific difference. It is possible, for

example, that reluctance to participate may be associated with anxiety related to uncertainty of legal outcome.

Table 5.2-5: Characteristics of admissions to metropolitan prisons in SA - January to August 2005 - participants versus non-participants

Characteristic	Accepted	Declined	*P*-value*
Serially allocated ID (*proxy for previous imprisonment*): median (range)	123055.5 (16489 – 149912)	128470.5 (29905 – 149897)	0.745
Sex: Female - n (%) Male - n (%)	64 (12.4) 452 (87.6)	17 (9.8) 157 (90.2)	0.351
Male only Prisons:** Adelaide Remand Centre - n (%) Yatala Labour Prison - n (%)	298 (65.9) 154 (34.1)	118 (75.2) 39 (24.8)	0.032

** Chi^2 or Mann-Whitney tests where appropriate*
***compares male prisons only, see comparison of males and female prison entrants in previous cell*

5.2.2 HCV-seroconversion in prison

This part of the study was designed to identify any HCV seroconversions occurring within the SA prison system. To achieve this objective, all participants were offered antibody testing at the time of enrolment (if they had not already undergone testing in the previous three months) and then HCV-antibody negative individuals were offered repeat testing at three-month intervals for as long as they remained incarcerated during the study period. While identifying transmission was the main aim, this process has also provided useful data on HCV-prevalence at entry.

5.2.2.1 Serial antibody testing

Most of the 724 enrolments (666 individuals) were offered antibody testing at entry. Two hundred and twenty five (31.1%) were available for at least one three monthly follow up. While most of the 225 participants subsequently available for at least one three monthly follow up completed a risk questionnaire at follow up (see section 5.2.3.3), additional antibody tests were offered only to those testing HCV-antibody negative at their last test or who had failed to undergo a test at entry.

5.2.2.1.1 HCV-antibody status at entry

As is presented in Table 5.2-6, of the 665 individuals recruited at the time of first admission during the study period for whom progress information was available, 9.8% (65/665) subsequently refused the test and tests were not undertaken (reason not defined) for another 14.3% (95/665). The median age of refusers did not differ significantly from that of those accepting testing, and neither did the median age of those not tested for undefined reasons. Female prisoners, however, were significantly less likely to refuse testing – only one of the 65 refusers was female (2-sided Fisher's exact test, P=0.008) – but neither more nor less likely to remain untested for undefined reasons. A similar proportion (11.1%) of those re-enrolled on second admission refused testing and a smaller proportion (7.4%) did not get tested. Only three participants were re-enrolled a third time, none of whom refused testing.

Table 5.2-6: HCV-antibody status at prison entry in SA (n=665*) – October 2004 to August 2005

HCV-antibody test result	Admission 1 n (%)	Admission 2 n (%)	Admission 3 n (%)
Positive	212 (31.9)	20 (37.0)	2 (66.7)
Negative	289 (43.5)	21 (38.9)	1 (33.3)
Indeterminate	4 (0.6)	0 (0.0)	0 (0.0)
Refused test	65 (9.8)	6 (11.1)	0 (0.0)
Positive at previous admission	N/A	3 (5.6)	0 (0.0)
Test not done (not defined)	95 (14.3)	4 (7.4)	0 (0.0)

**excludes one individual whose progress sheet (containing demographic details and HCV test results) was not returned for analysis (see section 5.2.1.5)*

Thirty-one point nine percent (95% CI: 28.3% – 35.6%) of all participants tested HCV-antibody positive at first enrolment (see Table 5.2-6). Although prevalences apparently increased in participants subsequently re-enrolled, the numbers were small and chance couldn't be ruled out. At second enrolment, 37.0% (95% CI: 24.3% – 51.3%) tested HCV-antibody positive and 66.7% (95% CI: 9.4% – 99.2%) tested positive at third enrolment. It

was subsequently possible to confirm the entry HCV-antibody status of 22 individuals who were not tested at first entry (12 refusers and 10 others not tested for undefined reasons) when they were offered testing again at first follow up. Excluding those for whom no results were available and others with indeterminate results, the overall entry prevalences of HCV-antibody at first, second and third enrolment were 41.6% (95% CI: 37.3% – 45.9%), 52.3% (95% CI: 36.7% – 67.5%) and 66.7% (95% CI: 9.4% – 99.2%) respectively. The increases in HCV prevalence at second and third enrolment were not statistically significant. The overall estimate at first entry was consistent with those calculated for both summer and winter audits. It is important to note, however, that the entry cohort included only a very small proportion of prisoners recruited from Port Augusta Prison. Overall HCV prevalence estimates for the entry cohort (first admission), summer and winter audits increased to 41.8% (95% CI: 37.5% – 46.1%), 44.7% (95% CI: 41.2% – 48.2%) and 45.0% (95% CI: 41.6% – 48.4%) respectively after excluding data from Port Augusta Prison. While higher prevalence were estimated from the audit data, the differences between entry and audit prevalence estimates were not statistically significant.

5.2.2.1.2 Factors associated with HCV-antibody at entry

As was seen in the summer and winter audit data, sex, age and Indigenous status were all associated with HCV-antibody status at entry. Among the 528 participants for whom entry status could be confirmed (at first enrolment), HCV prevalence was significantly higher in females (risk ratio = 1.50, P=0.004) and in older age groups (29 to 36 years and above 36 years) relative to those aged 18 to 28 years (risk ratios were approximately 1.8 for both older age groups, P<0.001). As these were all metropolitan prison entrants, it was also not surprising to observe significantly higher HCV prevalence in Indigenous prisoners (risk ratio = 1.56, P<0.001). These prevalence estimates did not differ significantly from those noted in the audits, although the prevalence in female prison entrants (59.3%) was lower than those estimated from the summer and winter audits (66.1% and 63.8% respectively).

There was also significantly higher HCV prevalence in entrants to the Adelaide Remand Centre relative to Yatala Labour Prison (risk ratio = 1.34). This differential was not noted in the total population case note audits but does reflect the differential seen when the audit data from those incarcerated for less than two weeks were compared with those incarcerated for longer periods (see section 5.1.1.7.3). That is, entrants to Adelaide Remand Centre (all unsentenced prisoners) tend to be incarcerated for shorter periods overall than entrants to

Yatala, with those charged with drug related offences (those most at risk of HCV infection) moving more quickly in and out of the custodial system.

Table 5.2-7: Factors associated with HCV-antibody status among prison entrants* (n = 528) in publicly operated prisons in SA – October 2004 to August 2005**

Factor	HCV-antibody (%)	95% Confidence Interval (%)	Prevalence ratio	95% Confidence Interval	*P*-value (Chi^2)
Sex:					
Female	59.3	45.7 – 71.9	1.51	1.19 – 1.92	0.004
Male	39.3	34.9 – 43.9			
Age group† (years):					
18 to 28	27.6	21.4 – 34.4	1.00		
29 to 36	50.0	42.6 – 57.4	1.81	1.39 – 2.37	<0.001
>36	49.7	41.2 – 58.1	1.80	1.36 – 2.39	<0.001
Indigenous status:					
Indigenous	58.3	47.8 – 68.3	1.56	1.26 – 1.92	<0.001
Non-Indigenous	37.5	32.9 – 42.3			
Prison:§					
Adelaide Remand Centre	44.1	38.2 – 50.1	1.34	1.05 – 1.72	0.015
Yatala Labour Prison	32.8	26.1 – 40.0			

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
*** excludes 143 individuals for whom entry HCV status could not be confirmed*
† *age groups based on thirds of the age distribution in the summer audit (the baseline in previous analyses)*
§ *female prison not included to prevent confounding by sex*

5.2.2.1.3 HCV-antibody status at follow up

Among the 308 individuals testing HCV-antibody negative at entry, 152 were subsequently available for follow up during a single or consecutive periods of incarceration. This compares favourably with the 145 initially proposed as the at-risk population in sample size calculations (see chapter 4 see section 4.4.4). Overall, 196 follow-ups that involved HCV-antibody testing were conducted during the study – the majority of which (52.6%) occurred at three months.

The median time of follow up, from entry date to time of last contact, was 121 days (range 2 to 419 days) and the total person time at risk (incarcerated time while remaining HCV-antibody negative) was 23657 days, or 64.8 person-years. During the time of follow up, only three HCV seroconversions were noted – a seroconversion rate of 4.6 per 100 person years (95% CI: 3.4 – 6.1 per 100 person years). Two of the seroconversions were noted in participants being followed up at three months – both were non-Indigenous males, aged 34

and 26 years at prison entry. Although they had both spent approximately 106 days in prison since testing negative at entry, it was not possible to rule out that their exposure occurred in the community. That is, they could have been in the seroconversion window period when testing HCV-antibody negative at prison entry. Both of these individuals reported no history of tattooing in the community or in prison, and reported having injected in the community "sometimes" but never in prison. The third seroconversion was observed in a non-Indigenous male, aged 38 years, who was HCV-antibody negative when first enrolled but tested antibody positive when enrolled a second time after having spent 34 days in the community between admissions. Given the relatively long seroconversion period for HCV infection, it is feasible that his exposure occurred prior to his release to the community (following 80 days of incarceration), however the possibility of early seroconversion cannot be excluded. This individual had a history of community and prison tattooing and community IDU. He reported having injected in prison for the first time during his first enrolment in the study. The seroconversion rate for those reporting IDU in prison was at 6.1 per 100 person years (95% CI: 4.7 – 7.8 per 100 person years). For those reporting no prison IDU, the seroconversion rate was 4.1 per 100 person years (95% CI: 2.9 – 5.6 per 100 person years). The relative risk for those reporting prison IDU compared to those who didn't inject in prison was 1.48, but was not significant (95% CI: 0.25 – 28.39, P=0.742).

5.2.2.2 PCR testing for HCV-RNA

Twenty participants who had tested HCV antibody negative at entry provided serum specimens for HCV-PCR testing (in addition to specimens provided for further HCV antibody testing) at their first three-month follow-up. All 20 (100%) of the participants agreeing to antibody testing at three months also agreed to provide a sample for PCR testing. The median time between recruitment and first follow up was 90.5 days (range 64 to 117 days). Some PCR results (from specimens taken a median of 93.5 days from recruitment, but ranging widely from 3 to 180 days) were also available from 16 participants who were seropositive at entry and these results were used for comparative purposes. These PCR results were passively collected, having been obtained from the case records of study participants who had undergone testing during the normal course of their health management. As presented in Figure 5.2-3, the overall agreement between the two tests was a relatively high 86.1%, but with a kappa coefficient of 0.71 – due to the disagreement between tests for seropositive individuals. While 68.8% (11/16) seropositive participants also had detectable HCV-RNA by PCR, 100% (20/20) of the seronegative individuals were also PCR negative.

Figure 5.2-3: Agreement between HCV antibody and HCV-PCR tests at three months from prison entry (n=36)

	HCV-RNA (by PCR)		
	Negative	**Positive**	**Agreement**
HCV-Antibody (by ELISA) **Negative**	20	0	100.0%
Positive	5	11	68.8%
Total	25	11	86.1%

$\chi^2 = 19.80$, $P = 0.000$
Kappa = 0.71 (95% CI 0.40 to 0.87), $P = 0.000$

5.2.3 Risk factors for HCV in prison

Associated with the 724 enrolments (representing 666 individuals), 719 (99.3%) entry risk factor questionnaires and 376 (51.9%) follow up questionnaires were completed. Among those completing follow-up questionnaires, 182 (48.4%) were completed at three months, 110 (29.3%) were completed at six months, 51 (13.6%) at nine months and 19 (5.1%) at 12 months. Two participants (0.5%) also completed a questionnaire when followed up at other (opportunistic or unscheduled) times and 12 (3.2%) were followed up post-release.

5.2.3.1 Risk factor history at prison entry

Risk survey responses about IDU history at time of entry are presented in Table 5.2-8 for each period of incarceration. Seventy point four percent (465/661) of prison entrants at first admission reported having injected drugs in the community, of whom 63.2% (294/465) reported having done so frequently ("heaps" or "all the time"). A significantly greater proportion of those entering prison a second time during the study reported IDU in the community relative to the first admission cohort, 83.6% verses 70.4% (risk ratio = 1.19, 95% CI: 1.05 – 1.35, P=0.037).

Among those reporting IDU, 46.0% (214/465) reported having shared needles in the community. 53.3% (114/214) of sharers reported at least infrequent ("hardly ever") sharing of needles but 40.7% (87/214) reported occasional sharing and 6.1% (13/214) reported frequent

or constant sharing in the community. Although those admitted a second time during the study reported greater frequency of sharing than did first admissions (54.4% versus 46.0%), the difference was not statistically significant (risk ratio= 1.18, 95% CI: 0.89 – 1.57, *P*=0.280).

Table 5.2-8: IDU history at prison entry (n=719) - October 2004 to August 2005

Injecting history	**Admission 1 n (%)**	**Admission 2 n (%)**	**Admission 3 n (%)**
IDU history in the community:			
Frequency of injecting			
"never"	196 (29.7)	9 (16.4)	1 (33.3)
"hardly ever"	42 (6.4)	5 (9.1	2 (66.7)
"sometimes"	129 (19.5)	16 (29.1)	0 (0.0)
"heaps"	147 (22.2)	14 (25.5)	0 (0.0)
"all the time"	147 (22.2)	11 (20.0)	0 (0.0)
Frequency of sharing (IDU only):			
"never"	251 (54.0)	21 (45.7)	1 (50.0)
"hardly ever"	114 (24.5)	14 (30.4)	1 (50.0)
"sometimes"	87 (18.7)	7 (15.2)	0 (0.0)
"heaps"	7 (1.5)	2 (4.4)	0 (0.0)
"all the time"	6 (1.3)	2 (4.4)	0 (0.0)
IDU history in prison			
Frequency of injecting (previous prison history only):			
"never"	376 (72.9)	39 (70.9)	2 (66.7)
"hardly ever"	48 (9.3)	3 (5.5)	0 (0.0)
"sometimes"	72 (14.0)	11 (20.0)	0 (0.0)
"heaps"	17 (3.3)	2 (3.6)	1 (33.3)
"all the time"	3 (0.6)	0 (0.0)	0 (0.0)
Frequency of sharing (prison IDU only):			
"never"	37 (25.7)	2 (12.5)	0 (0.0)
"hardly ever"	39 (27.1)	4 (25.0)	0 (0.0)
"sometimes"	58 (40.3)	8 (50.0)	0 (0.0)
"heaps"	6 (4.2)	2 (12.5)	1 (100.0)
"all the time"	4 (2.8)	0 (0.0)	0 (0.0)

Previous prison history was reported by 78.1% (516/661) of participants on first admission, among whom 72.9% (376/516) reported never having injected in prison. Twenty seven point one percent (140/516) of participants reported injecting in prison, of whom 85.7% (120/140) reporting infrequent injecting ("hardly ever" or "sometimes"), and 14.3% (20/140) reporting frequent injecting in prison ("heaps" or "all the time"). Among those reporting a history of injecting while incarcerated, 76.4% (107/140) reporting sharing needles – 90.7% (97/107) reporting seldom or occasional sharing and 9.3% (10/107) more frequent sharing. Frequency of injecting or sharing needles in prison did not appear to be related to number of times admitted during the study period.

As might be expected, sharing needles was significantly more likely among prison IDU relative to community IDU, with a risk ratio (on first admission) of 3.8 (95% CI: 2.43 – 6.04, $P<0.001$). While one prisoner reported injecting in the prison but not having done so in the community, he also reported having shared needles at least once ("hardly ever") in the community. No other prison entrant reported injecting in prison who didn't also report injecting in the community. Excluding those not previously incarcerated, 34.7% (139/401) of first admission prison entrants who reported injecting in the community also reported a history of injecting in prison and a similar proportion was observed in those admitted a second or third time during the study (34.8% and 50% respectively).

On first admission during the study, 59.6% (394/661) of all prison entrants reported having tattoos which were applied in the community, of whom 29.1% (115/394) had five or more tattoos (see Table 5.2-9). 40.4% (267/661) had no tattoos applied outside of prison on first admission. Although a larger proportion of prisoners admitted for a second time during the study had community applied tattoos relative to the first admissions (67.3% versus 59.6%), the difference was not significant (risk ratio= 1.13, 95% CI: 0.93 – 1.37, $P=0.264$).

Excluding those incarcerated for the first time, the majority of prison entrants reported no history of prison applied tattoos – 77.2% (396/513) of first admissions and 75.9% (41/54) of second admissions. Twenty two point eight percent (117/513) of prison entrants (at first admission) reported having tattoos applied when incarcerated previously and 41.0% (48/117) of these had three or more prison applied tattoos. People with community applied tattoos (when first admitted during the study) were significantly more likely to have prison applied tattoos (risk ratio= 1.48, 95% CI: 1.32 – 1.65, $P<0.001$). However, 14.5% (17/117) of

participants with prison applied tattoos reported having prison applied tattoos only, while reporting none that were applied in the community.

Table 5.2-9: Tattooing history at prison entry (n=719) - October 2004 to August 2005

Tattooing history	Admission 1 n (%)	Admission 2 n (%)	Admission 3 n (%)
Tattoos applied in the community:			
"none"	267 (40.4)	18 (32.7)	1 (33.3)
"1 or 2 tats"	176 (26.6)	15 (27.3)	2 (66.7)
"3 to 5 tats"	103 (15.6)	10 (18.1)	0 (0.0)
"more than 5 tats"	115 (17.4)	12 (21.8)	0 (0.0)
Tattoos applied in prison (*previous prison history only*):			
"none"	396 (77.2)	41 (75.9)	1 (33.3)
"1 or 2 tats"	69 (13.5)	6 (11.1)	1 (33.3)
"3 to 5 tats"	30 (5.9)	3 (5.6)	0 (0.0)
"more than 5 tats"	18 (3.5)	4 (7.4)	1 (33.3)

As suggested by the literature, there was a great deal of overlap between tattooing and IDU both in the community and in prison. People with a history of community IDU were significantly more likely to have community applied tattoos (risk ratio = 1.44, 95% CI: 1.22 – 1.71, $P<0.001$) and people with a history of prison IDU were significantly more likely to have prison applied tattoos (risk ratio= 4.56, 95% CI: 3.31 – 6.29, $P<0.001$).

5.2.3.2 Risk factors and HCV-antibody status at entry

The following univariate and multivariate analyses concern the relationship between reported risk factors and HCV-antibody status at entry. To prevent duplication, only the data from the first admission are considered.

5.2.3.2.1 Univariate analyses

Univariate associations between entry HCV-antibody status and IDU history in the community and during previous periods of incarceration are presented in Table 5.2-10. There

was a positive linear relationship between frequency of injecting in the community and HCV-antibody status. HCV-antibody prevalence ranged from 9.4% (17/180) in “never” or “hardly ever” injectors to 69.4% (86/124) in those reporting constant injecting. Compared to those reporting only seldom or no community IDU, risk ratios associated with those reporting IDU “sometimes”, “heaps” and “all the time” were 4.60, 6.26 and 7.34 respectively.

Sharing needles in the community also demonstrated a positive linear relationship with HCV-antibody status at prison entry, with increasing risk associated with increasing frequency of sharing. HCV-antibody prevalence rose from 26.2% (89/340) in those reporting community IDU but with no sharing of needles, to 91.7% (11/12) in those reporting constant needle sharing. Respectively, risk ratios for those reporting sharing “hardly ever” “sometimes”, “heaps or all the time” (compared to never sharers) were 2.28, 3.07 and 3.50.

HCV-antibody prevalence was 35.4% (105/297) among those previously imprisoned who reported no prison IDU. HCV risk rose in a linear fashion according to the reported frequency of injecting in prison, with 94.7% (18/19) of those reporting frequent IDU in prison testing HCV-antibody positive at entry. The respective risk ratios for those reporting prison IDU “hardly ever” “sometimes”, “heaps or all the time” (compared to no prison IDU) were 2.12, 2.50 and 2.68.

Although there appeared to be a slight linear relationship between frequency of sharing needles in prison and HCV-antibody prevalence, only non-significant associations for most categories of exposure were demonstrated. This may be due to the relatively small numbers in each exposure category of sharing frequency, combined with high background HCV-antibody prevalence. For example, even in the ‘non-exposed’ group (prison injectors reporting no history of sharing needles), 69.0% (20/29) tested HCV-antibody positive at entry. One hundred percent (10/10) of those reporting frequent needle sharing in prison were HCV-antibody positive. Dichotomising the variable made it possible to demonstrate a significantly increased risk for those reporting needle sharing in prison (90% were HCV-antibody positive – 81/90) when compared to those reporting prison IDU but no needle sharing (risk ratio= 1.31, 95% CI: 1.01 – 1.68, P=0.006).

Table 5.2-10: IDU history and HCV-antibody status at prison entry* (n=523) - October 2004 to August 2005**

Injecting history	HCV – antibody positive (%)	Risk ratio	95% Confidence Interval	*P*-value†
IDU history in the community:				
Frequency of injecting				
"never" or "hardly ever"	9.4	1.00		
"sometimes"	43.4	4.60	2.78 – 7.62	<0.001
"heaps"	59.2	6.26	3.89 – 10.09	<0.001
"all the time"	69.4	7.34	4.60 – 11.72	<0.001
Frequency of sharing (IDU only):				
"never"	26.2	1.00		
"hardly ever"	59.8	2.28	1.79 – 1.90	<0.001
"sometimes"	80.3	3.07	2.48 – 3.79	<0.001
"heaps" or "all the time"	91.7	3.50	2.74 – 4.48	<0.001
IDU history in prison				
Frequency of injecting (previous prison history only):				
"never"	35.4	1.00		
"hardly ever"	75.0	2.12	1.68 – 2.69	<0.001
"sometimes"	88.3	2.50	2.09 – 2.99	<0.001
"heaps" or "all the time"	94.7	2.68	2.22 – 3.23	<0.001
Frequency of sharing (prison IDU only):				
"never"	69.0	1.00		
"hardly ever"	87.9	1.27	0.97 – 1.68	0.116
"sometimes"	89.4	1.30	1.00 – 1.69	0.035
"heaps" or "all the time"	100.0	1.45	1.14 – 1.85	0.079

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
*** excludes 143 individuals for whom entry HCV status could not be confirmed*
†2-sided *Fisher's exact test used*

The univariate associations for tattooing history and HCV-antibody status at prison entry are presented in Table 5.2-11. As presented in the previous section (see section 5.2.3.1), there was a great deal of overlap between IDU and tattooing behaviour both in the community and in prison. Nonetheless, HCV-antibody prevalence was a relatively high 29.2% (61/209) in prisoners reporting no community applied tattoos, and while there was little difference in risk

for those with between one and five tattoos (although HCV prevalence was higher than in those reporting no tattoos), the risk escalated in those reporting more than five tattoos. 61.5% (56/91) of those reporting more than five community applied tattoos were HCV-antibody positive, and the risk ratios for those reporting "1 to 2", "3 to 5" and "more than 5" tattoos (relative to those reporting no tattoos) were 1.55, 1.51 and 2.12 respectively.

Table 5.2-11: Tattooing history and HCV-antibody status at prison entry* (n=523) - October 2004 to August 2005**

Tattooing history	HCV – antibody positive n (%)	Risk ratio	95% Confidence Interval	*P*-value†
Tattoos applied in the community:				
"none"	29.2	1.00		
"1 or 2 tats"	45.3	1.55	1.17 – 2.05	0.003
"3 to 5 tats"	44.1	1.51	1.10 – 2.08	0.020
"more than 5 tats"	61.5	2.12	1.62 – 2.75	<0.001
Tattoos applied in prison (*previous prison history only*):				
"none"	42.0	1.00		
"1 or 2 tats"	71.9	1.71	1.39 – 2.1	<0.001
"3 to 5 tats"	84.6	2.01	1.64 – 2.48	<0.001
"more than 5 tats"	76.9	1.83	1.32 – 2.53	0.020

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
*** excludes 143 individuals for whom entry HCV status could not be confirmed*
†2-sided Fisher's exact test

Significant relationships between HCV-antibody status and number of prison applied tattoos were indicated on univariate analyses. HCV prevalence ranged from 41.8% (134/319) in those with prison history but no prison applied tattoos, to 84.6% (22/26) in those with three to five prison applied tattoos. Prevalence in those with more than five tattoos decreased to 76.9% (10/13), however this may have been a consequence of relatively small numbers in this category.

HCV-antibody status could be confirmed in 416 prison entrants with a history of previous incarceration, among whom 49.5% (206/416) were antibody positive. Relative to an HCV prevalence of 10.3% (11/107) in those imprisoned for the first time, previous prison history

overall was associated with a risk ratio of 4.82 (95% CI: 2.73 – 8.50, *P*<0.001). Univariate analyses revealed that for every strata of community risk history, previous imprisonment was significantly associated with increased HCV-antibody prevalence (see Table 5.2-12).

Table 5.2-12: HCV-antibody prevalence according to community risk behaviour and previous prison history at entry* (n=523)**

Community risk	HCV-antibody (%)	Risk ratio	95% Confidence Interval	*P*-value†
Injecting drugs:				
No IDU				
No prison history	3.0			
Prison history	13.2	4.34	1.02 – 18.40	0.032
IDU				
No prison history	22.0			
Prison history	63.3	2.88	1.61 – 5.16	<0.001
Needle sharing:				
No sharing				
No prison history	7.8			
Prison history	32.8	4.22	2.03 – 8.78	<0.001
Sharing				
No prison history	23.5			
Prison history	74.7	3.17	1.34 – 7.51	<0.001
Tattooing:				
No tattoos				
No prison history	9.7			
Prison history	37.4	3.9	1.76 – 8.51	<0.001
Tattoos				
No prison history	11.1			
Prison history	56.1	5.1	2.20 – 11.62	<0.001

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
*** excludes 143 individuals for whom entry HCV status could not be confirmed*
†2-sided Fisher's exact test

The unexpectedly high HCV prevalence of 9.7% (6/62) in prison entrants with no history of community applied tattoos and no prison history is due to the high prevalence of IDU in this group. Once those reporting community IDU are excluded, no HCV cases remain in those with no tattooing or prison history, although the prevalence among those with a prison history but no tattoos still remains relatively high at 10.7% (6/56). Excluding IDU from those with community applied tattoos also decreases the magnitude of the prevalence estimates of, and the relative risk between, those with and without prison history to 15.5% (9/58) and 7.4% (2/27) respectively, with a non-significant risk ratio of 2.09 (95% CI= 0.49 to 9.04, *P*=0.490).

In Table 5.2-13, the entry risk factors reported by participants who had been incarcerated previously are cross-tabulated with HCV-prevalence estimated per cross-tabulation. The lowest prevalence of 10.7% (95% CI = 2.4% to 19.1%) was estimated in previously incarcerated individuals reporting no community IDU or tattooing (as reported above). The highest prevalence was estimated at 87.3% (95% CI = 78.8% to 95.8%) in those reporting both tattooing and IDU when previously imprisoned. Reported history of community IDU was associated with an HCV prevalence of 63.3% (95% CI = 57.8% to 68.7%) as a single risk factor, but this rose to 85.2% (95% CI = 78.6% to 91.8%) in those also reporting previous prison IDU and 80.5% (95% CI = 72.0% to 89.0%) in those also reporting prison tattooing.

Table 5.2-13: Risk factors reported in previously incarcerated participants and HCV status at entry (n=416*)

		Ever IDU in community (HCV %)		Ever tattooed in community (HCV %)		Ever IDU in prison (HCV %)		Ever tattooed in prison (HCV %)	
		Y	N	Y	N	Y	N	Y	N
Ever IDU in community (HCV %)	Y	302 (63.3)	-	211 (67.3)	114 (48.3)	115 (85.2)	187 (49.7)	87 (80.5)	213 (56.8)
	N	-	114 (13.2)	58 (15.5)	56 (10.7)	4 (75.0)	110 (10.9)	9 (33.3)	103 (11.6)
Ever tattooed in community (HCV %)	Y			269 (56.1)	-	91 (86.8)	178 (40.5)	82 (75.6)	185 (48.1)
	N			-	147 (37.4)	28 (78.6)	119 (27.7)	14 (78.6)	131 (33.6)
Ever IDU in prison (HCV %)	Y					119 (84.9)	-	63 (87.3)	56 (82.1)
	N					-	297 (35.4)	33 (54.6)	260 (33.5)
Ever tattooed in prison (HCV %)	Y							96 (76.0)	-
	N							-	316 (42.1)

*** excludes 100 individuals for whom entry HCV status could not be confirmed*

5.2.3.2.2 Multivariate analyses

High correlations between IDU and needle sharing (in the community and in prison) made it necessary to examine these risk behaviours separately by fitting log binomial models. Despite significant univariate associations, neither community nor prison applied tattoos (whether considered separately or combined) were significant predictors of HCV antibody status at entry once adjusted for prison IDU and community IDU (see Table 5.2-14). Adjusted risk ratios for prison IDU and community IDU were 1.79 and 4.23 respectively.

Table 5.2-14: IDU, tattoos and HCV-antibody status in SA prison entrants* – multivariate analysis – (n=416)**

Factor	Risk Ratio (95% confidence interval)	Risk Difference (95% confidence interval)	*P*-value
Tattoos†	1.15 (0.96 – 1.38)	0.05 (-0.03 – 0.13)	0.136
Prison IDU	1.79 (1.51 – 2.11)	0.34 (0.24 – 0.45)	< 0.001
Community IDU	4.23 (2.31 – 7.75)	0.35 (0.26 – 0.45)	< 0.001

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
***excludes those for whom entry HCV-status could not be confirmed and those with no previous prison history*
†combines community and prison applied tattoos

A further model included prison tattooing, sharing needles in prison and sharing needles in the community (data not shown). Only sharing needles in prison was a significant predictor of HCV-antibody positivity with an adjusted risk ratio of 1.33 (95% CI: 1.02 – 1.72, *P*=0.036). Univariate analyses suggested that prison history was associated with HCV-antibody status at entry to prison, with increased risk associated with community risk behaviours dependent on whether the individual had been in prison before. In a model including prison history, community IDU and community tattooing, but which excluded those who reported a history of IDU in prison, adjusted rates for community applied tattoos continued to be non-significant but community IDU was significantly associated with HCV-antibody status at prison entry. Prison history was independently associated with HCV-antibody status even after adjusting for other community risk factors (see Table 5.2-15).

Table 5.2-15: Community risks, prison history and HCV-antibody status in SA prison entrants* – multivariate analysis – (n=523)**

Factor	Risk Ratio (95% confidence interval)	Risk Difference (95% confidence interval)	*P*-value
Community applied tattoos	1.22 (0.90 – 1.66)	0.10 (0.04 – 0.16)	0.194
Community IDU	4.25 (2.42 – 7.47)	0.27 (0.20 – 0.35)	< 0.001
Previous prison history	2.63 (1.49 – 4.66)	0.16 (0.10 – 0.23)	0.001

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
***excludes those for whom entry HCV-status could not be confirmed and those with a previous prison history reporting IDU in prison*

Indigenous status, age and sex were all found to be significantly associated with HCV-antibody status at entry in univariate analyses. A final model including these factors and prison and community IDU demonstrated that each of these factors were independent predictors of HCV-antibody positivity (see Table 5.2-16). Community IDU remained associated with the greatest HCV risk (adjusted risk ratio = 4.20), followed by injecting in prison (adjusted risk ratio = 1.64).

Table 5.2-16: Demographic and risk factors and HCV-antibody status in SA prison entrants* – multivariate analysis – (n=412)**

Factor	Risk Ratio (95% confidence interval†)	Risk Difference (95% confidence interval†)	*P*-value
Indigenous	1.21 (1.211 – 1.212)	0.13 (0.125 – 0.126)	< 0.001
Above median age (*31.4 years*)	1.27 (1.270 – 1.271)	0.12 (0.116 – 0.117)	< 0.001
Female	1.38 (1.295 – 1.479)	1.18 (0.122 – 0.240)	< 0.001
Prison IDU	1.64 (1.418 – 1.892)	0.36 (0.279 – 0.448)	< 0.001
Community IDU	4.20 (2.304 – 7.662)	0.29 (0.204 – 0.384)	< 0.001

** at time of first enrolment (55 individuals re-enrolled on subsequent admissions)*
***excludes those for whom entry HCV-status could not be confirmed and those with no previous prison history*
† 3 decimal places presented due to the narrowness of some confidence intervals

5.2.3.3 Risk factors and HCV-antibody status at follow up

Of the 725 enrolments (666 individuals), 224 (30.9%) three-month follow ups were conducted, 131 (18.1%) six-month follow ups, 58 (8.0%) nine-month follow ups, 21 (2.9%) 12-month and 1 (0.1%) 15-month follow ups. Seven (1.0%) participants were also followed up at opportunistic times during the study and 12 (1.7%) were followed up post-release. At follow up, all participants were offered a risk factor questionnaire and, for those still imprisoned, HCV-antibody testing if antibody negative when last tested. Not all participants completed the questionnaire and/or underwent testing when it was offered. For instance, the one participant followed up at 15 months underwent antibody testing, but did not complete a questionnaire.

One hundred and eighty one (80.9%) questionnaires were completed during 224 follow ups occurring at three months. Eighty four percent (110/131) of questionnaires were completed at the six month point, 87.9% (51/58) at nine months and 90.5% (19/21) at 12 months. In order to examine the impact of incarceration on risk behaviour, this part of the analyses considers pooled data at each point of follow up, despite a small number of individuals having been multiply enrolled and subsequently contributing to the follow up data more than once. This is because the questionnaires focused on the *current* period of incarceration, irrespective of previous prison history.

As presented in Table 5.2-17, 5.5% (10/181) participants reported having applied tattoos within their first three months of imprisonment, 7.3% (8/110) had done so within six months, 11.8% (6/51) within nine months and 10.5% (2/19) within 12 months of imprisonment. One of the two reporting prison tattoos at 12 months had applied no tattoos when interviewed at nine months. Thirty percent (3/10) of participants reporting tattoos at three months also reported having shared tattooing equipment, none at six months, 50% (3/6) at nine months and 50% (1/2) at twelve months.

Eight point eight percent (16/181) of participants reported having injected in prison by three months since entry, of whom 68.7% (11/16) reported sharing needles. By six months, 13.8% (15/109) had injected with 86.7 (13/15) of these reporting needles sharing. Fourteen percent (7/50) had injected by nine months (all reporting needles sharing) and 26.3% (5/19) had injected by the 12-month point, of whom 40.0% (2/5) had also shared needles in prison.

Table 5.2-17: HCV risk behaviour reported at each three monthly follow up – (n=181*)

Risk behaviour	Time of follow up (months) – n (%)			
	3	6	9	12
Tattoos applied since entry:				
None	172 (94.5)	102 (92.7)	45 (88.2)	17 (89.5)
1 or 2	8 (4.4)	7 (6.4)	4 (7.8)	1 (5.3)
3 to 5	2 (1.1)	0 (0.0)	2 (3.9)	1 (5.3)
More than 5	0 (0.0)	1 (0.9)	0 (0.0)	0 (0.0)
Sharing tattooing equipment: (*prison tattooers only*)				
"never"	7 (70.0)	8 (100.0)	3 (50.0)	1 (50.0)
"only once or twice"	2 (20.0)	0 (0.0)	3 (50.0)	1 (50.0)
"3 to 5 times"	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)
IDU since entry:				
"never"	165 (91.2)	94 (86.2)	43 (86.0)	14 (73.7)
"only once"	1 (0.6)	6 (5.5)	3 (6.0)	3 (15.8)
"2 times"	5 (2.8)	2 (1.8)	1 (2.0)	1 (5.3)
3 to 5 times"	7 (3.9)	4 (3.7)	2 (4.0)	0 (0.0)
"more than 5 times"	3 (1.7)	3 (2.8)	1 (2.0)	1 (5.3)
Sharing needles: (*prison IDU only*)				
"never"	5 (31.3)	2 (13.3)	0 (00.0)	3 (75.0)
"only once"	0 (0.0)	7 (46.7)	4 (57.1)	1 (12.5)
"2 times	3 (18.8)	0 (0.0)	0 (0.0)	1 (12.5)
"3 to 5 times"	5 (31.3)	4 (26.7)	3 (42.9)	0 (0.0)
"more than 5 times"	3 (18.8)	2 (13.3)	0 (0.0)	0 (0.0)

**includes individuals multiply enrolled in study (164 individuals followed up at least once)*

Reported entry risk factors and risk behaviours engaged in by participants during their current sentence are cross-tabulated along with HCV-prevalence (per cross-tabulation) at the three month point in Table 5.2-18. HCV prevalences tended to be higher in the participants remaining inside at three months relative to those in prison entrants. The lowest prevalence of 11.1% (95% CI = 3.1% to 19.1%) was estimated in individuals reporting no community IDU or tattooing. HCV prevalence was estimated at 77.8% (95% CI = 43.9% to 100.0%) among nine participants who reported having tattooed in prison during their first three months. This estimate was greater than the prevalence of 69.3% (95% CI = 61.1% to 77.7%) estimated for participants reporting having ever injected in the community prior to entry, although not

significantly so (risk ratio = 1.12, 95% CI = 0.77 to 1.62, *P* = 0.598). All 15 prisoners reporting any injecting in prison during three months between entry and follow up tested HCV-antibody positive.

Table 5.2-18: Risk factors reported in participants at three month follow up and HCV status at entry (n=185*)

		Ever IDU in community (HCV %)		Ever tattooed in community (HCV %)		IDU in prison during study (HCV %)		Tattooed in during study (HCV %)	
		Y	N	Y	N	Y	N	Y	N
Ever IDU in community (HCV %)	Y	121 (69.3)	-	82 (70.7)	39 (66.7)	13 (100.0)	88 (70.5)	6 (100.0)	95 (72.6)
	N	-	63 (11.1)	28 (17.9)	35 (5.7)	0 -	48 (12.5)	2 (0.0)	47 (12.8)
Ever tattooed in community (HCV %)	Y			110 (57.3)	-	11 (100.0)	80 (56.3)	7 (85.7)	84 (59.5)
	N			-	74 (37.8)	2 (100.0)	56 (41.1)	1 (0.0)	58 (43.1)
IDU in prison during study (HCV %)	Y					15 (100.0)	-	1 (100.0)	14 (100.0)
	N					-	150 (50.7)	8 (75.0)	142 (49.3)
Tattooed in during study (HCV %)	Y							9 (77.8)	-
	N							-	157 (53.5)

***excludes 20 individuals for whom HCV status at three months could not be confirmed*

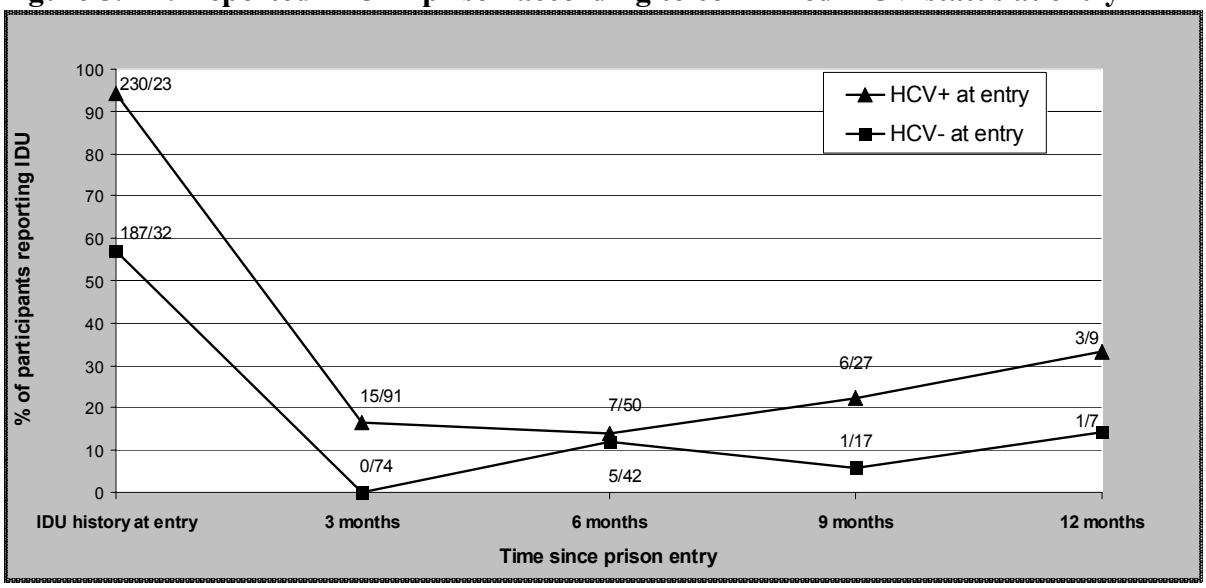
Three individuals (0.45%) were apparently initiated into injecting while in prison, having reported no previous community or prison IDU prior to being recruited at entry. One of these participants (all of whom were males) reported injecting drugs within six months of entry to prison, and the other two within 12 months. Two of the new IDU initiates (aged 31.0 and 43.7 years at entry) had previous prison histories – one HCV-antibody positive and one negative at prison entry. The other individual (aged 20.4 years at entry) had never been in prison previously, and tested HCV-antibody negative when admitted. Overall, 13.5% (28/201) of the study cohort reported having injected drugs at some stage while incarcerated, and 82.1% of these (23/28) reported having shared needles in prison. Risk factor histories reported by the three injecting initiates are compared to those of the three participants who seroconverted to HCV during the study in Table 5.2-19.

Table 5.2-19: Test and risk factors histories reported by new injecting initiates and HCV seroconverters.

Factor	Sex & age (*in years*)	HCV status (*at entry/ at discharge*)	Community risk factors at entry	Previous imprisonment risk factors at entry	Reported risk factors during study (*when reported*)
IDU initiates:					
#1	M – 43.7	-/-	Tattoos	NIL	IDU (6 months)
#2	M – 31.0	+/+	Tattoos	NIL	IDU (12 months)
#3	M – 20.4	-/-	NIL	No previous imprisonment	IDU (12 months)
Seroconverters:					
#1	M – 38.3	-/+	IDU & tattoos	Tattoos	IDU (3 months)
#2	M – 34.1	-/+	IDU	NIL	NIL
#3	M – 26.3	-/+	IDU	NIL	NIL

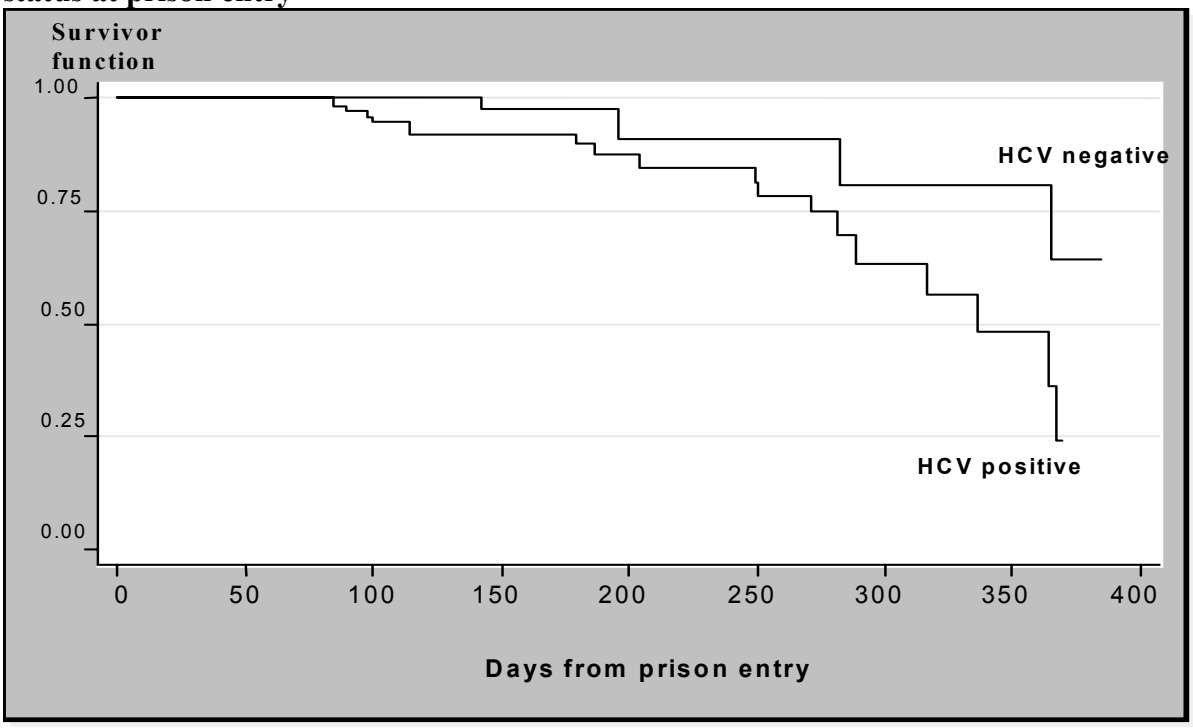
Ninety four point three percent (230/244) of participants found to be HCV-antibody positive at entry reported a previous IDU history, as did 57.0% (143/328) of those testing HCV-antibody negative. Prison IDU behaviour reported at follow up according to whether the participant had tested HCV positive or negative at entry is represented in Figure 5.2-4.. With the exception of the six-month point, where some convergence of injecting behaviour occurred (14.0% of HCV-positive participants and 11.9% of HCV-negative participants reported IDU in prison), those testing antibody positive at entry to prison appeared to be more likely to report prison IDU at each follow up. As well, the likelihood of IDU in prison appeared to increase as a function of time incarcerated for both groups, although the numbers were very small by the time of 12 month follow up.

Figure 5.2-4: Reported IDU in prison according to confirmed HCV-status at entry



Overall, 14.4% (24/167) of the participants in whom it was possible to confirm antibody status, reported IDU at some stage while incarcerated during the study. The prevalence of HCV-antibody among this group was 79.2% (19/24). HCV-antibody prevalence was 57.3% (82/143) in those reporting no prison IDU. On univariate analysis, those testing positive at entry were significantly more likely to report prison IDU than HCV-antibody negative participants (risk ratio = 2.48, 2-sided Fisher's exact test *P*=0.046).

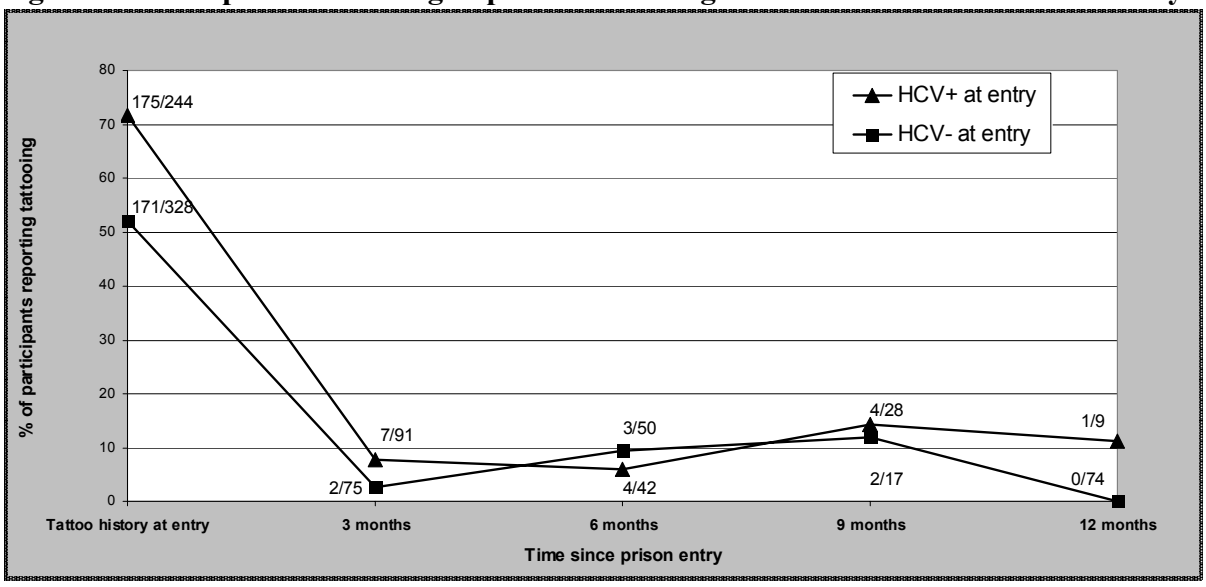
Figure 5.2-5: Kaplan Meier survival estimates for IDU in prison according to HCV status at prison entry



Using the Kaplan Meier method, survival functions for incarceration time until the first report of IDU in prison differed according to HCV status at entry. As can be seen in Figure 5.2-5, those testing HCV-antibody positive at entry to prison tended to be more likely to commence prison IDU and appeared to continue to be at greater risk of commencing IDU over time, although the differences in 'survival' was not significant at the time each of the five HCV-negative persons commenced IDU. Nonetheless, the log-rank test for equality of survivor functions (for the whole period of incarceration) was statistically significant (Chi^2=5.99, *P*=0.0214).

Seventy one point seven percent (175/244) of participants found to be HCV-antibody positive at entry reported having community or prison applied tattoos, as did 52.1% (171/328) of HCV-antibody negative prison entrants. Reported prison tattooing behaviour at follow up is presented in Figure 5.2-6 according to entry HCV-antibody status. Unlike prison IDU behaviour, prison tattooing behaviour did not seem to differ according to entry antibody status and also did not appear to be increasingly reported over time. Overall, 8.5% (14/165) of the individual participants with confirmed HCV-antibody status reported tattooing at some stage while incarcerated during the follow up period. The prevalence of HCV-antibody among these prison tattooers was 71.4% (10/14) and was 58.9% (89/151) in those reporting no prison tattooing. On univariate analysis, those testing positive at entry were more likely to report prison tattooing than HCV-antibody negative participants, but the difference was not statistically significant (risk ratio = 1.67, 2-sided Fisher's exact test *P*=0.409).

Figure 5.2-6: Reported tattooing in prison according to confirmed HCV-status at entry



Pooled data for those followed up suggested that tattooing in prison was not more commonly reported in those interviewed in lower security prisons compared to those incorporating (or wholly consisting of) a high security section (2-sided Fisher's exact test, P=0.189). Reports of injecting in prison were, similarly, no more likely from lower relative to higher security prisons (2-sided Fisher's exact test, P=0.128). Due to a high rate of prisoner transfers from prison to prison, however, it was not possible to determine the length of time exposed to high or lower security environments and whether this had any impact on reported risk behaviours in prison.

5.2.3.4 Risk factors and HCV-antibody status post-release

Due to difficulties briefly described in chapter 4 (section 4.4.2.1), it was not possible to interview post-release participants in numbers sufficient to examine the impact of imprisonment on risk behaviours beyond release. Administrative delays resulted in the majority of post release participants being lost to follow up since they were no longer in contact with Community Corrections (the intended point of contact). The majority of the participants had been discharged from supervision by the time contact was attempted, a substantial proportion had been re-incarcerated and a small number had absconded from supervision. Thus, the 12 participants followed up post-release tended to be those living in more stable environments in the community and were possibly skewed towards those less inclined to engage in risk behaviour.

Nine males (one Indigenous) and three females completed the post-release risk factor questionnaire, among whom the median age at study enrolment was 35.2 years (the median age of the total cohort was 31.4 years). All 12 participants reported having had applied no tattoos during their recent imprisonment. Of the six reporting that they would consider applying tattoos in the community, all stated they would only go to a commercial tattooist and would not consider sharing other people's tattooing equipment. Only one participant reported IDU whilst last in prison (a female aged 35.4 years who was HCV-antibody positive at prison entry) and having shared needles in prison more than five times. Of the eight participants who reported that they would consider IDU in the community, five (62.5%) said they would use a new needle every time, two (25.0%) said they would only re-use one of their own needles and one (13.0%) said they would re-use someone else's needle but only after cleaning it.

The final question in the post-release questionnaire asked participants what methods they would use to clean needles and syringes if they had to re-use or share them with someone else (multiple answers were permitted). Five (41.7%) responded that they wouldn't inject drugs at all, three (25.0%) would use cold or warm water alone, three (25.0%) would use soap or detergent and water, three (25.0%) would boil the injecting equipment in water, two (16.7%) would use bleach. Six (50.0%) responded "you can never really clean gear [needles and syringes]." No respondents said they wouldn't attempt to clean the injecting equipment if they had to re-use or share it.

5.2.4 HCV-seroconversion in those at risk in the community

The National NSP survey was conducted in October 2005 across Australia. In SA, 211 NSP attendees of seven SA metropolitan NSP services participated. The number of attendees interviewed at each centre ranged from 11 to 55, and the mean was approximately 30 participants per centre. 39.8% (84/211) of the participants were female, 59.7% (126/211) were male and one participant was transgender. 8.1% (17/211) of the participants were Indigenous and the median age was 33 years. Up to 46.0% of participants reported having ever been in prison, 24.7% (24/97) of whom had been imprisoned in the previous calendar year (January to December 2004). A full report of the NSP data will soon be available (National Centre in HIV Epidemiology and Clinical Research, 2006). Of relevance to this thesis, however, some higher risk injecting practices were significantly associated with having ever been imprisoned. These practices included injecting in the streets, parks or on the beach within the previous month was more frequently reported by those with a prison history (risk ratio = 2.12, 95% CI: 1.12 – 4.02, P=0.017). The same was true for injecting in public toilets in the last month (risk ratio = 2.00, 95% CI: 1.01 – 3.95, P=0.040). Sharing needles and syringes in the past month was not associated with history of imprisonment.

To allow for the estimation of the average number of tests performed annually in community IDU, the following question was added to the SA component of the National NSP 2005 Survey:

"How many times have you had a test for hepatitis C in the last 2 years?"

One hundred and ninety five (of 211) participants responded to this question, of whom 28.9% (58.195) reported having no tests at all in the previous two year. After excluding these

observations, the median number of tests reported was two, ranging from one (48.2%) to five (8.0%)

This estimate of two tests in two years was applied to data on the absolute number of HCV-antibody tests performed by public and private laboratories in SA, using the formula described in chapter 4 (see Figure 4.4-1) and confirming the calculation made later in the same chapter (see section 4.4.4):

$$\frac{\mathbf{183\ (1 - 0.25)}}{\mathbf{(148000 - (35400 + 84600 + 2012)) \div 2\ tests\ per\ person^{*}}}$$

$$= \frac{\mathbf{138}}{\mathbf{12994}}$$

= **138** observed new infections arising in approximately **12994** people at risk in the community during 2000 and 2001

** the average number of tests reported in IDU from the additional NSP survey question*

Assuming that each person spent at least one year at risk (the mid-point of the observation period), the seroconversion rate for those at risk in the community can be calculated at 1.1 per 100 person years (95% CI: 0.9 – 1.3 per 100 person years). The seroconversion rate observed in the prison cohort was 4.6 per 100 person years (95% CI: 3.2 – 6.5 per 100 person years) and, compared to the community cohort, the relative risk was 4.36 (P=0.034).

5.3 The consultation stage

This section summarises some of the views of the DCS and SAPHS staff who took part in the limited stakeholder consultations. The data collected in the interviews provided a great deal of contextual information; however, it is important to note that this is not intended to be a comprehensive qualitative analysis of the data. Rather the summaries are intended to provide a sense of the importance of HCV as a workplace issue among those on the 'coal face' of prisoner management and their level of acceptance of various prevention strategies. Other relevant issues emerging during the interviews are also summarised in this section.

5.3.1 Developing harm reduction strategies

The consultations were conducted with the aim of guiding the development of appropriate recommendations aimed at reducing the risks associated with HCV in the prison setting – the

final research question. After a brief description of the participants, summaries according to each section of the interview schedule (see Appendix F) are presented below. Where appropriate, key statements are provided.

5.3.1.1 Limited stakeholder consultations

Eight prison officers and seven SAPHS nurses participated in audiotape recorded group interviews. Two prison officers were interviewed together at Adelaide Remand Centre and three officers participated in each of two interviews conducted at Yatala Labour Prison. Two of the prison officers were female and six were male, with level of experience ranging from early career to veteran. The nurses were interviewed in one session held within the infirmary at Yatala Labour Prison. Four of the nurses were female and three were male and, as with the prison officers, level of prison health experience ranged from relative newcomer to veteran.

5.3.1.1.1 Importance of HCV as a workplace issue

HCV was considered an important issue among both prison officers and nursing staff. While both groups indicated their understanding of the high prevalence of disease in prisoners, for officers the issue focused on the possibility of disease transmission. In contrast, and perhaps indicative of increased knowledge about HCV, the nurses were focused on the management and care of the prisoners and unanimously rejected the potential for disease transmission.

Prison officer:

> *"I think for most people it's more about precautions for ourselves than it is about concern for prisoners… …I mean there is an assumption that the prisoner health service educates them and provides information they need about that and hep C. So…my focus isn't really on them it's more on universal precautions for ourselves…Things like wearing gloves when searching cells…taking extra precautions with people who have known illnesses…"*

Prison nurse:

> *"Forty percent of the clients are hep C positive, so it's something we're very aware of... We offer testing to everybody and…we put forward clients… for treatment to the Royal Adelaide. …A lot of work goes on there."*

While prison officers expressed some concerns about the possibility of HCV transmission from infected prisoners, the overwhelming sentiment from officers and nurses alike was that

adherence to 'universal precautions' was sufficient to protect themselves from HCV infection. Nonetheless, the wearing of disposable gloves was the principal prevention strategy put forward by both groups.

Prison officer:

> *". ...if you do a unit search, the first thing we do… everybody's putting on a couple of pairs of gloves – because you're using your hands and you don't want to have to ...change the gloves. So, you put on a pair of pat-down gloves, then the surgical gloves, then another pair…"*

The perceived limitations of this single strategy were also discussed in all officer interview groups, particularly in the context of emergency situations:

Prison officer:

> *"...I had an instance where a guy came out of the cell from an unlock, and…he slashed up* [cut himself deliberately] *whilst doing the unlock. He then took the blade and went for his neck. Now I thought "I'm not going to run away and go and get gloves on so I can grab him" because if he actually cuts the neck and blood spurts everywhere its… more danger anyway, so we literally grabbed him. We couldn't get the gloves on, we couldn't go "No wait, we'll just put the gloves on and then we'll come back and stop you then"…"*

Circumstances such as described in the previous quotation often resulted in prison officers undertaking a 'blood protocol'. When officers come into contact with blood, or other bodily fluids, they immediately undergo serology tests and then receive two further tests at three-monthly intervals. Since the system is initiated on slightest risk, most officers had experience undergoing blood protocols that they were able to describe. These experiences were negative ones on the whole – with a perceived lack of support and information a common complaint:

Prison officer:

> *"Well I think the fact that there's no support at all... I guess, counselling support about feelings of anger and frustration about processes that are followed… There was no counselling support…no intervention from management, no nothing... It was just "well, take the time off, come back when you're ready." And I think to send somebody*

away from work for a period of time and not provide them with any support in the meantime, then all they're going to do is go home and think about it…"

5.3.1.1.2 Provision of information about HCV in prisons

The stakeholders were provided with a summary of some of the findings from the case note audits – indicating that up to 41% of all prisoners (40% of males and 66% of females) showed serological evidence of HCV infection – and were then asked for their reaction and if this information changed their perspectives of HCV as an issue in their workplace. Most prison officers expressed surprise at the high HCV prevalence, especially in female prisoners, but didn't believe that this knowledge would impact on their practice. Prevalence information had not previously been provided to them, however there was a commonly expressed assumption that all prisoners were infected with something and that caution was advised in all cases. Some prison officers also made the connection between HCV, drug use and increasing proportions of incarcerations due to drug related offences:

Prison officer:

"I don't think that those numbers on the outside show those at risk with the drug taking…sharing needles, etcetera…that's half the reason they're here… …and the drug issue is getting worse and worse so we're getting more eighteen to twenty-five year-olds in…I've been here for…about six years…and the last three, four years we have had, I have seen the increased eighteen to twenty-five year-olds in here…"

Prison nurses, who had a considerable involvement in the study and had other opportunities to become aware of the size of the problem, were not surprised by the case note audit summary.

5.3.1.1.3 The importance of communicable diseases as a workplace issue

Views concerning communicable diseases in general in the workplace were polarised between prison officers and nursing staff. Other communicable diseases clearly exceeded HCV as an important issue for prison officers, who expressed concern about perceived high prevalences of a range of parasitical, fungal and bacterial infections such as scabies, nits, tinea and gastrointestinal illnesses in prisoners. Fear of contracting a respiratory disease, in particular, and then presenting a transmission risk to family members were frequently expressed concerns. Recirculating air from what was perceived as difficult to clean air conditioning systems was singled out as the most serious transmission risk.

According to the officers, HBV vaccinations were formerly provided by the DCS during the six weeks training provided to all new employees as an outreach service of local government. All employees were now required to seek vaccination (and follow up antibody titres) from their local GPs. While the DCS offered reimbursement for this process, the requirement to visit the GP on up to four occasions on one's own time was seen as a significant barrier to obtaining adequate vaccination coverage.

Prison officers:

> *"…People don't have time to do that… we had a … system in place before that was very effective and … now I would say that there are people who wouldn't even know where they are up … with their actual inoculation with hepatitis B."*
>
> *"…I think to a certain degree our staffing population is a bit ignorant towards infectious diseases, and if you don't put the information and provide the support to them, you don't go to them with it, then they don't take it up because it's just too hard."*
>
> *"It's wrong* [restrictions on HBV vaccination]*, …you know to me, it's almost like "Well, we don't care about you officers. Our main concern is the prisoners, but we don't care about the people looking after the prisoners.""*

Prison officers also expressed resentment about new restrictions on influenza vaccinations for prison staff, with those not meeting priority vaccination criteria having to contribute to the cost. In the influenza season preceding the interviews, there had also apparently been a delay in starting the vaccination program.

Prison officers:

> *"That was when we had that big one* [influenza season]*…this year …and it was one really that knocked your socks off. And as soon as it hit, we all got it. And what annoyed me was they gave the old people and the Aboriginals the flu shot and we weren't allowed to get it. …We had to wait two months after the flu season actually went past and they decided "yeah", and we had to pay half of it…"*
>
> *"Why can't the officers get the influenza shots for free, or their hep B? Why do we have to pay for it? …We are just as vulnerable here for that. And … the other thing that's on all the officer's minds at the moment is the bird flu. Now if that keeps…are*

we going to get, going to be inoculated for it? If prisoners are all going to get it, what about the officers? You know, these things are running across our minds."

Nurses were unsympathetic about the provision of flu vaccinations to prison officers, although it was provided for nurses, but were concerned about the officers' reduced access to HBV vaccination:

Prison nurse:

"Yeah, well…I wasn't aware that flu vax, I wasn't aware that was ever allowed at all [for prison officers]*…and as far as hep B vax, yes I've heard that before that…they're* [prison officers] *expected to pay. I certainly don't understand the hep B. Flu vax…we're OK, we've got a small staff, so…it's not a drama for us to afford to do that sort of thing, but I mean…again, from a prison point of view, I…get a lot more colds from kids in child care than I do from catching them off the boys in here."*

5.3.1.1.4 Suggested strategies for HCV prevention in prison settings

Prison officers and nursing staff were asked to comment on a range of strategies that had been suggested to minimise HCV transmission in prison settings. The discussion uncovered a number of areas of concern, particularly for prison officers, and these are summarised in the following section (see section 5.3.1.1.5).

The previously suggested strategies discussed in the interviews included: education strategies (for prisoners and staff); provision of bleach to prisoners (for cleaning injecting/tattooing equipment); provision of single use/sterilisable hair clipper guards for prisoners; training prisoners to provide tattoos to other prisoners; provision of professional tattooing services to prisoners; *ad hoc* provision of injecting equipment to prisoners; formal prison NSP services; and supervised injecting rooms. Prison officers and nurses were also invited to discuss their own suggestions for HCV prevention.

5.3.1.1.4.1 Education strategies (prisoners and staff) on infection control

Of all suggested strategies, education met with the greatest support among both officers and nurses. There was, however, disagreement on who required the education. Nurses described at length the information about blood borne viruses that they and medical officers provided to prisoners at admission. As well, nurses described the pre and post-test counselling processes

undertaken with all prisoners having a blood test, and other opportunities for information provision which arose during other clinic visits. The nurses were confident that prisoners were well informed during this process, although some would value a program (one not limited to clinic visits) that could provide sustained harm reduction messages to prisoners.

Prison nurses:

> *"But they all made aware. They all know when they come in, absolutely everybody. And…there's no children here, they're all adults, at the end of the day they've got to be responsible for what they do when they get in here. … to put themselves at risk, you know, well that's a choice…"*

> *"The one thing I'd like to see improved is perhaps the knowledge of the details. Like, they know "don't share needles" "don't" you know "tattoos and fits". But the one guy who came through that…turned out to be hep C positive didn't realise that sharing out of a spoon…"*

> *"…you've got a captive audience here, how about…you know, they've got speakers, you know, little information things… that…point out to them. Just…once a day they hear this message saying "this is what happens if you do this"…in all areas of health…'cause they have to hear, they can't close their ears off…"*

Nurses felt very confident in their own education level about HCV, having undertaken regular education sessions on HCV and other blood borne viruses. It was clear that they had not given much thought to education for prison officers, but agreed that education for officers might be useful when the matter was raised at the interview. One nurse cited a possible example of the need for increased prison officer education:

Prison nurse:

> *"…we had that one last week when a fellow slashed up and they* [prison officers] *came in with the white suits and, a complete enclosed white suit, and… It's almost an extreme though, isn't it really? As opposed to just gloves and goggles."*

Prison officers were less convinced that adequate HCV eduction was provided to prisoners, while at the same time conceding a lack of knowledge about what education actually took place in the medical centre. Officers suggested that prisoners might not be sufficiently

receptive to information provided to them by nursing staff at admission. Moreover, prison officers commonly believed that their own education about blood borne viruses and infection control was inadequate, with most supporting the idea of increased prison officer training and regular infection control updates.

Prison officer:

> *"… most of what I know is only really what you hear from the outside and what you read. …I think it would be good for us to…have updates or have regular…meetings and talk about communicable diseases. Because that's alright if the prisoners are getting this knowledge and these pamphlets and blah, blah, blah, but what about…we've got so many new officers coming through us and we need more…"*

5.3.1.1.4.2 Bleach provision to prisoners

Suggested either as a means to sterilise injecting and tattooing equipment or as a general-purpose cleaning agent, prison officers and nursing staff almost universally condemned the idea of bleach provision to prisoners. The main concern was the potential for prisoners to use the chemical as a weapon.

Prison officer:

> *"I don't particularly like the idea of giving them any sort of chemical. Bleach is a pretty strong chemical. …I just think I don't want to wear it in the face. Anything you give to prisoners can become a weapon"*

Prison nurse:

> *"I think they would be more likely to use bleach as a weapon …"*

While sceptical about the possibility, some of those interviewed were nonetheless willing to entertain the idea of providing bleach to prisoners if it was possible to design a safe storage and delivery mechanism.

Prison officer:

> *"Well, if there is, if we could use bleach in a safe manner – certainly, not a problem… Finding a safe manner is a problem."*

Prison nurse:

> *"Perhaps little pots* [of bleach] *that have to be exchanged before you got another little pot."*

5.3.1.1.4.3 Hair clipper guards

Many prisoners opt to have their hair cut while imprisoned, usually undertaken using communal electric hair clippers generally wielded by another prisoner. As described by the officers, staff restrictions made it difficult to fully supervise this activity, but sterilising sprays (described by one of the officers as being *"effective against the HIV virus"*) were provided to prisoners for use between haircuts. The prison officers were not aware about the precise routine for cleaning the hair clippers, but assumed they were disinfected at the end of each shift.

The officers reported that removable blade guards/combs were provided with the clippers, but most prisoners did not use them – preferring to achieve a closer haircut with the bare clipper blades. As were the officers, nurses were concerned about this practice, pointing out that they had seen many prisoners with cuts and grazes on their heads resulting from the use of bare blades.

Prison officer:

> *"...we have one set of clippers per unit. ...So you have a prisoner cutting forty odd prisoners with his hair cutting. Sometimes they won't have the comb on, so it's just a straight clipper and ...they cut that prisoner then they go and work on the next one and they haven't...sterilised it."*

Prison nurse:

> *"Put it like this, I wouldn't like them* [prisoners] *to cut my hair with that after they've cut everyone else's hair..."*

Prison officers and nurses were receptive to the idea of providing more sterilisable clipper guards/combs and increased enforcement of their use. The nurses also suggested that one prisoner be appointed as a 'unit barber,' who would then have responsibility for ensuring adequate infection control procedures were adhered to.

5.3.1.1.4.4 Professional tattooing services

There was considerable resistance to the idea of providing subsidised professional tattooing services for prisoners. One nurse did explain that the ongoing care of newly applied tattoos was a problem in that they constituted an infection risk. One of the prison officers suggested that commercial tattooists are commonly affiliated with bikie gangs, and allowing them into the prison could *"open up channels of communication."* Nonetheless, the principal concern expressed was that it would represent another privilege for prisoners. One prison officer, however, did concede that professional tattooing services might be appropriate for lower security facilities.

Prison officers:

> *"No. No, no, no. ...we give them too much, anyway. It just seems…they want, want, want and we give, give, give. There's no, no stopping it… ... we're lucky in this division. They keep asking for 'Play Stations', 'Nintendos', and we've said "no" all along and we're sticking with "no". Other divisions should do the same as well. They're in jail to serve what they've done to society and…it's like a holiday camp for a lot of these guys here…Come for their three meals a day and then go out drugged out again, come back…Come back here, come back here skinny – leave fat."*
>
> *"Maybe at Mobilong or Cadell or somewhere like that, I think. But I, again, I don't think it would be appropriate here. When they're working and that…I personally could see in lower security jails, but not here."*

Prison nurse:

> *"Subsidised? Why should they get it?…Why should they get a tat?"*

5.3.1.1.4.5 Training prisoners as tattooists

While some prison officers acknowledged that training prisoners as tattooist might be a way of reducing HCV transmission as well as providing a possible avenue of employment for prisoners once released, this strategy was uniformly rejected by both stakeholder groups. The risk of "stand over" (forcing other prisoners to perform tattooing services) and forced tattoo applications were cited as security related concerns. Both officers and nurses, however, were uncomfortable about providing what was perceived as privileges, such as "cheap tattoos," to prisoners.

Prison officers:

"Well… it's a bit like prostitution on the outside – if you legalise it you can control it. …The problem then is also coming up with ways of controlling it and putting boundaries in place to say what you can and can't have, who's going to do it what they're gonna put on, etcetera. So it's like bleach, if there's a safe way of doing it – fine, I'm not going to stop them, but how are you going to police it?"

I think…that also comes back to...how would society in general see that and how much support would it gain. I mean, that's where funding comes from - government work on a popularity base – if there's no reason to be popular about providing a tattooing system in prisons, then the government's not going to provide the funding to do it appropriately. And then it will be done half-arsed and that's where the issues are created."

"I could imagine that if something like that did come into place, well then…if they were going to charge, they'd have to charge a lower price anyway. So then it would be like "Oh, go to jail and get a cheap tattoo," when really that's not what jail's supposed to be about, is it?"

"I don't agree with it…I don't, I don't agree with giving them anything."

Prison nurse:

"I don't think it's something that should be encouraged in a prison environment. I think there's enough things going on, your blood borne viruses…and to introduce something like that, that's not actually necessary. Like a haircut is necessary, having a shave's necessary, but having a tattoo is not a necessary thing…I don't think that's really appropriate. I understand what you are saying about the equipment being clean, etcetera, and it's something they're going to do anyway, like so many other things, they're going to do it anyway, but I don't think…it should be condoned."

5.3.1.1.4.6 Providing injecting equipment to prisoners on request

Neither stakeholder group found the *ad hoc* provision of injecting equipment (by health staff) to be an acceptable prevention strategy in prisons. The main concern raised by prison officers was that it would be seen as condoning drug use. Interestingly, the sole concern raised by nurses was related to security (not raised by prison officers). The following comment achieved universal agreement among the nurses interviewed:

Prison nurse:

> *"Well the main issue…it becomes a safety issue for the officers. At the moment…needles and syringes that are around…are worth their weight in gold because there are so few of them and so there's…no way they're gonna be wasted in threatening to…assault. And if all of a sudden you can get your hands on them relatively easily, they're not worth that much more, so they might be used …*

5.3.1.1.4.7 Prison Needle and Syringe Program

This part of the discussion was preceded by a description of a hypothetical prison NSP, similar to those piloted (and evaluated favourably) in European prisons (Dolan et al, 2003). Essentially, each prison cell door has a cabinet containing a syringe that is visible at all times. Each night the syringe is replaced by a new syringe – whether or not it has been used. The program allows for the anonymous provision of clean syringes while ensuring that prison officers do not enter into a potentially dangerous situation without prior warning.

While one prison officer did claim to approve of NSPs in the community, both prison officer and nurse groups were united in their opposition to the proposal for NSPs in prison. This opposition was partially related to security concerns, but mostly stemmed from an unwillingness to be perceived as condoning drug use. Some nurses raised their concern that community NSPs might also be facilitating drug use. Although much maligned by prisoner officers (see section 5.3.1.1.5), the opiate replacement program was seen as an adequate substitute for all other drug use in prison.

The discussion on prison NSPs was heated, with people in both stakeholder groups expressing strongly held and surprisingly unified views. Despite an apparent lack of integration in the operations of stakeholder groups, it is interesting to note some of the similarities in the concerns of, and the language used by, prison officers and nurses.

Prison officers:

> *"And things like needle sharing…the idea of… having needle exchange in prisons that they've toyed with…at the moment, needles are like gold. If they start getting needles, that becomes a weapon. That's straight away giving them weapons. And one of our big things here, one of the reasons we pat down is to catch needles. So as long as you can keep them…they'd be worth more than gold in here. Because there'd probably be one floating around."*

"And the systems are working for us…at least while we say "No". Because very rarely we find a needle, very rarely…cause they are hard to get in. If you had them on an exchange, God knows where they would hide them."

Prison nurses:

"It's more or less condoning drug use. People are… doing crime to get hold of the drugs. So it's banned on the outside, you come to prison… it's OK we're doing it. It's almost like…we're saying what you're doing is OK here. And …someone's gotta bring the drugs in…so they've got to be smuggled in. So then you're setting up a drug culture, drug dealers…and then you're gonna go to the drug dealers and you'll have gangs of people. I think I could see, just would be a horrendous type of environment."

"But is that not reinforcing the…use of illicit drugs in the prison, though? Of visitors being encouraged more and more to bring it in because they have that ready access to the syringes?"

"But then when we've got other programs in place to take away that whole needle problem. You know we've got methadone, and your bup [Buprenorphine, an opiate replacement medication]*, I think we should be pushing that rather than, before we go down the needle line."*

5.3.1.1.4.8 Supervised injecting rooms

As with the concept of prison NSPs, there was virtually no acceptance of supervised injecting rooms in prison. The issue of being seen to condone drug use was, again, the major concern. The potential security issues associated with increasing the availability of syringes which would then make them a more expendable weapon was (clearly) a widely held theory, and was proposed again as a concern of prison officers and nurses in relation to supervised injecting rooms. Also, both officers and nurses proposed the idea of the prison as a drug free environment that presents an opportunity to 'get straight'.

Prison officers:

"They're in prison for drugs in the first place…you're rewarding behaviour that's found unacceptable by society."

"I always think, well – say if it was one of my kids who, you know, got into drugs or whatever – I just think well, in a way if they came to jail it'd be a relief cause you'd think "Phew, they're gonna get off it". And I think that if you start…condoning it in here…"

Prison nurse:

"Well, I think one of the best things about coming here is that they can be in a drug-free environment when they come in. …it's very difficult to get drugs through here…so, at least it's an opportunity to live in a drug-free environment in prison. And when you start bringing all this in [injecting rooms]*…they can't get away from the cycles on the outside. And they're in this continuous cycle, chasing drugs, chasing drugs, chasing drugs. At least they can sit back here and have some opportunity to reflect upon their lives in a drug-free…some of them…been stoned every single day of their lives…"*

5.3.1.1.5 Other issues arising from the stakeholder interviews

As mentioned, the stakeholder interviews uncovered a number of areas of concern, particularly for prison officers, that expanded on those raised by the interview schedule. Some of these concerns are summarised in this section.

5.3.1.1.5.1 Ongoing education about communicable diseases and infection control

The prison officers interviewed appeared to be concerned (even anxious) about communicable diseases in general, frequently expressing their need for ongoing education and training around infection control issues. There was no such concern expressed by the nurses, which may be indicative of their increased understanding of communicable diseases. The nurses registered no awareness of the importance of this issue for prison officers.

The main area of concern for prison officers was the possibility of contracting communicable diseases from the work place. Along with what they perceived as limited opportunity for education and restricted access to vaccine programs, several officers discussed the need for improved hand washing facilities for staff – with the provision of an alcohol-based hand gel frequently proposed as a solution.

Prison officers:

> *"I also think around prison… there's a definite lack of hand washing facilities. … So you just end up, you just don't wash your hands half the time. Whereas if it was there* [hand gel]*, I know damn well I'd wash my hands a lot more…"*

> *"Hepatitis C is not really that contagious – it's blood-to-blood, right? So…I'm more concerned around here with other skin diseases and things like that and I'd like to see…like all medical sectors have that…like the gel…I would love to see that in our toilets…"*

> *"I think that - definitely update on training…I think that's a huge thing that we don't get here. And, you know…some more, easy, convenient way of washing your hands. So…that's always been an issue for me. Even just, you know, go downstairs and hold onto a stair rail and then you get to the bottom and think "oh, how many hands have been on that rail", you know?"*

> *"And the toilet…and everything, our cup* [washed where the hand washing facilities are]*. I mean the Department aren't even looking after the officers, I don't feel…"*

Officers also spoke at length about the risk of airborne diseases, their fears about gastrointestinal illness (for prisoners and officers), difficulties obtaining sufficient clean clothing and towels for prisoners and what they saw as inadequate cleaning of cells and shared bathroom areas by prisoners. Officers were at pains to point out that the inadequate cleaning was actually due to the unavailability of appropriate cleaning solutions, such as bleach (which were on the banned substances list), and time demands, which meant that the same bucket of water had to be used to by a number of prisoners to clean their cells. One officer suggested providing thongs for prisoners to reduce the potential for transmission of disease in common bathroom areas. Nursing staff did not corroborate prison officer perceptions of frequent outbreaks of nits, scabies and tinea.

Prison officers:

> *"No, they've got to buy them* [thongs to wear in the bathroom]*...they purchase them…But then, you might wait a couple of weeks until they get some money in their account and get a buy* [an authorised purchasing period]*...And usually they're more interested in tobacco and, you know, soft drinks and things…"*

"But they [prisoners] *also do a good job cleaning what they can… and they generally spend a lot of time scrubbing…in the showers with lots of chemicals that…yeah, it's not really suitable chemicals what they do. But what the answer is who knows? …But then they bring that on themselves, don't they? You can't trust them."*

The matter of first aid training was raised in all prison officer interview groups. A current First Aid Certificate was an employment prerequisite for officers, but they were not subsequently supported to renew these certificates when they lapsed. Officers felt ill equipped to deal with emergency situations, but at the same time felt obligated to assist. Anxiety about liability issues was common and most officers were not clear about the level of support they could expect from the DCS in the case of legal action.

5.3.1.1.5.2 Us and them – an adversarial system

There seemed to be a great deal of resentment expressed by prison officers towards the prisoners, involving the stereotyping of prisoners as unclean, unintelligent and deserving of their plight. It is possible that this was symptomatic of the officers feeling generally undervalued by the department, other agencies working within the prison and by society in general. Although an extreme example, the following quotation exemplifies some of these expressed resentments:

Prison officer:

And I think if you speak… to anyone out of our unit…you'll find…aside from all the wage issues and so forth that came through the jails, there's the fact that you have, at the same time as you have police, teachers, people who are always getting pay rises…and nurses…and firees [fire fighters], *OK? Police and firees, they do a wonderful thing for the community, nurses do wonderful things for the community - we need them, they're wonderful people. Teachers, they're our future, lazy bastards, alright? But, when it came to us no one wants to know us. No one likes us in this society, because we're jailers, we're…turnkeys and so, consequently, when it came to us saying "we want something for what we do" – looking after all these bloody mentals that the government's given us and all these diseased people and all the rest of the crap we've got to put up with – they don't want to know us, and that. So the government doesn't show us that we're…valued – even by our own Department, our own employer."*

While one might expect to see some degree of collaboration between prison officers and nursing staff in their management of prisoners, and there did appear to be a great deal of similarity in their views on some topics, there seemed to be a striking lack of integration in their operations. The lack of integration was characterised by a general absence of awareness of the role and concerns of the other agency. Nurses openly acknowledged their poor understanding about the role of prison officers (*"I'm just not as familiar with what they do…only our side."*). On the other hand, officers appeared to misunderstand the nurses' role – with miscommunication of clinical assessments sometimes adding to the confusion:

Prison officer:

> *"…you'll have the infirmary staff come and there's no* [mental health] *issue with them* [prisoners]*, when we clearly know there is cause we're the ones working with them day in and day out and we can see what it is about their behaviour and other things. We keep referring them back to medical support, all of a sudden the prisoner does something seriously wrong they then decide to assess and react to it. When…I just think that in a lot of ways the process has failed both staff and prisoners, because…what is in place is very subjective and people can make their own decisions about…how things are dealt with, so. The nursing staff are working within the prison system and eventually it ends up working against them…and I guess you could probably say they're working against us in a lot of ways. We identify behaviours and they claim there's no issues..."*

This lack of integration also manifested itself in the respective perceptions of the prison opiate replacement program. While some officers cautiously approve of the program, most expressed the view that it is overused and exploited by the prisoners. There were a number of claims by officers of prisoners coming into prison 'clean' (not addicted to opiates) but then entering the opiate replacement program – either by choice, or due to coercion by other prisoners (who then required them to smuggle out their doses). Prison nurses, who comprehensively assess all prisoners in the program and observe all doses being administered, vehemently denied this.

Prison nurses:

> *"You hear those stories all the time at all the prisons and I guess it all boils down to they don't just go straight on. They're assessed, and they're very thoroughly assessed. Certainly there's some get through the net, you know – they know the right things to say. But in general, there are people that are* assessing *them and they don't just* see

them. And there'd be very, very few – I'm not saying there's none, but there would be very few that that was the case. And, but you know, that's the perception they have, but they don't do the assessment, they don't get to know the guys…"

"I think it's a bit of ignorance on the officers' part about what the benefits of the program are. They just see it as another waste of taxpayers' money".

5.3.1.1.5.3 Mental health issues

The increasing prevalence of mental health problems in the incarcerated population was identified as a major issue for prison officers. In general, officers felt under trained and ill equipped to deal with prisoners presenting with complex problems that included drug withdrawal and/or psychosis as well as a range of serious psychiatric disorders.

Prison officers:

"I suppose the other worrying factor is now that we're getting more mental patients in and the fact that our…in terms of infectious diseases is so high, I think it's even probably more worrying for now, because these…people with mental problems are becoming more violent… And so therefore, it's actually being even more stress on us because we are looking after these mental patients and we do not know what they are going to do when we open the door."

"For [induction unit] *officers, I feel that we're in the firing line…because this is where prisoners first come to from the holding cells. They are usually coming down off something or they've gone out and got involved in drugs all over again and then to court. This is the first port of call. …So for the first three, two three days they're pretty spun out and you don't know which way they're gonna go. And then it's going to be a longer period of time before they get stabilised on their medication."*

"… it comes down that we're looking after the…mentally disabled, we're not given any training there, we're not given any training in the first aid, we're not given any training…in medications – ongoing after what we get told in a quick spiel in the… course – and yet we're meant to be experts on it, you know, and we're meant to…handle these people."

Prison officers ascribe much of the difficulties described in this section to a perception of inadequate resources in the prison system. Inadequate staffing levels are also cited as the

main reason that activities such as hair cutting, or (potentially) prisoner tattooing couldn't be appropriately supervised. There was a generally expressed view that officers were required to do increasingly more with reducing departmental support.

Prison officers:

"… all the whole situation comes back to money. The fact…the staffing levels we have, the fact the mental side of things on our side…are based on…stats that are ten years old. And you sense the number of mental patients we have in, the infectious disease prisoners coming in has increased, but our staffing levels to support that hasn't come through. So we're still working down…at a base staff level, but we're having more and more problems."

"I think one of the primary problems in corrections in South Australia is it's being run as a business instead of a human service, and that is creating issues everywhere."

"…if we're not here to look after them [prisoners] *then why are we here? If it's about money for people there's other places they can earn money."*

5.3.1.1.5.4 Theories on incarceration and recidivism

Frequently seeing the same faces come back into prison, some of the more experienced officers had formed relationships with recidivist prisoners over time and developed theories about factors influencing re-incarceration. In discussing these ideas, the possibility of inadequate through-care for prisoners was raised by prison officers in two of the officer interview groups. While acknowledging that rehabilitation programs appeared to be ineffective, prison officers pointed out that there appeared to be a lack of resources for prisoners once they were released. They also suggested that inadequate attention to the family and social circumstances of prisoners meant that they went out into the same situation that caused them to offend in the first place – often with the addition burden of having a criminal record, which made employment very difficult to attain.

Prison officers:

"…they can have the rehabilitation, they can have the study and when they leave here they go back in the same circles…Social circles. To me it's not so much the rehabilitation, it's the fact that, generally speaking, they've nowhere else to go. And until we change the system that they're going to, all the rehabilitation in the world's not going to change anything."

"I think it's the perception of prisons. I mean you've got the society that just that…condemns behaviour such as the things these people are in here for, but what does society do about providing the support for them? I mean, if they condemn the behaviour they condemn the people and where else have they got to go when they get out but back to what they know."

While the particular topic of recidivism and through-care did not arise in the nurses' group interview, drug use was clearly seen as the main causal factor in incarceration and they suggested strategies aimed at diminishing drug supply to prisoners and the community. Banning all contact visits was discussed as the main strategy to reduce supply in prison, with the benefits of the strategy specifically endorsed despite any psychosocial problems that might arise from its implementation. It was clear that these nurses, confronted on a daily basis with the worst possible consequences of drug use and misuse, found it difficult to be sympathetic to harm reduction philosophies currently propounded by other health professionals:

Prison nurse:

"Look, I think drugs are destroying lives…if anything, they should up security at all those prisons and they should stop it, stop it. They should send the bloody US marines into freaking Burma, and wherever the hell it is, burn all the fields up. …after nine eleven when there was a drought …the heroin stopped. People stopped dying… people stopped screwing their lives, you know? Hang a few more in Singapore, shoot a few more in Bali. Stop them…bringing it in …"

While some of the views expressed by prison officers and nurses may appear to be 'extreme' ones, they should be considered in the context of the very challenging working environment from which they emanate. Some of the specific and ongoing frustrations described by the stakeholders potentially serve to exacerbate their feelings of resentment and may, ultimately, impact on the well being of prison officers, prison nurses and prisoners.

5.4 Summary of results

A summary of the results as they are presented in this chapter (see above) is provided in this section.

5.4.1 Cross-sectional stage

Two case note audits conducted in summer and winter demonstrated a similar age (median 33 years) and sex (6% female) distribution in the two seasons. Median duration of imprisonment at the time of the audits was also similar – approximately 9.5 months. Indigenous persons were over represented in both audits but made up a significantly higher proportion of the summer population (25% versus 22% overall). This difference was largely driven by data from Port Augusta Prison, which had the largest proportion of Indigenous prisoners, and the largest seasonal variation – 51% in summer and 40% in winter.

After excluding those with no history of testing, the prevalence of HCV-antibody was 41% in summer and 42% in winter (a relative proportional increase of 2% from summer to winter). While not significantly different overall, there were very wide discrepancies among prisons – ranging from a decrease in HCV-antibody prevalence of 24% to an increase of 20% between summer and winter.

Univariate analyses demonstrated that sex and age were significantly associated with HCV status in both audits, with higher prevalence in female prisoners (approximately 65%) and those aged above 28 years (approximately 48%) with an inverted U-shaped age relationship noted in summer. Being Indigenous was associated with decreased HCV antibody prevalence in Port Augusta (approximately 20%), but with increased risk elsewhere (approximately 56%). Duration of imprisonment and the security level of the prisons were not associated with HCV status.

Univariate analyses of age and HCV risk stratified by Indigenous status suggested that the inverted U-shape peak in the middle age group in summer, seen in the overall audit population, may have been due to a large proportion of Indigenous prisoners in this age group at that time – with higher HCV prevalence noted in urban-dwelling Indigenous prisoners than non-Indigenous prisoners. However, the summer inverted U-shaped age relationship, and the

winter linear relationship, persisted in multivariate models that also demonstrated significant independent relationships with Indigenous status and sex in each season.

The two audit populations were comprised of prisoners present at both time periods and subpopulations of prisoners only present for one. Apart from lower duration of imprisonment in the subpopulations compared to the total audit populations, the populations did not differ significantly in age, sex or Indigenous status. HCV status, however, was significantly lower in those present for only a single audit (approximately 37%). Conversely, in an even more transient subsection of the total audit populations, those who had been imprisoned two weeks or less, the prevalence of HCV-antibody was higher (although not significantly so) overall and for each demographic variable collected (age, sex and Indigenous status). The patterns of HCV risk for females, Indigenous persons and age already noted in the total population also existed among new entrants, but HCV-antibody was only significantly associated with being aged above 36 years.

The population at Port Augusta Prison demonstrated a number of site-specific variations which resulted in these data being excluded from much of the univariate and multivariate analyses. Specifically, the population had a large proportion of Indigenous prisoners, with lower HCV-antibody prevalence combined with a non-Indigenous population that tended to be older than non-Indigenous prisoners elsewhere. Although fewer older Indigenous prisoners were incarcerated in winter, there were no other seasonal trends noted in either Indigenous or non-Indigenous prisoners at Port Augusta. HCV-antibody prevalence increased with age, with a peak prevalence in those aged in the middle age group (29 to 36 years) for Indigenous and non-Indigenous prisoners in both audits.

5.4.2 The cohort stage

Overall, 774 individual consents were signed (by 666 individuals) during 10 months of recruitment – representing an estimated participation rate of 58% and a response rate of 70%. The demographic characteristics of the participants were comparable to data on intakes reported by the DCS and participants did not vary significantly from those refusing participation on most demographic indicators available. Approximately 10% of the participants were female, 18% were Indigenous, and their median age was 31 years. The median period of observation was 9.3 weeks – although observation time ranged from one day

to 70 weeks, with 57% of the participants discharged before three months of incarceration and only 23% remaining beyond the six-month point.

5.4.2.1 HCV status at entry

HCV-antibody prevalence at entry was estimated at 42% at the time of first admission (55 individuals were admitted more than once during the study). This estimate was consistent with both summer and winter audits overall, although there were some non-significant differences once data from Port Augusta Prison were excluded. Also consistent with the audit data, HCV-antibody was significantly more prevalent in female prisoners, those aged above 28 years and Indigenous prisoners. Prisoners entering the Adelaide Remand Centre also had significantly higher HCV prevalence relative to Yatala Labour Prison. This difference was not noted in the case note audit data, however analyses of the audit data for the subpopulation imprisoned for less than two weeks suggested higher HCV prevalence and the Adelaide Remand Centre is likely to accommodate a high proportion of short-term prisoners.

5.4.2.2 HCV seroconversion

One hundred and fifty one prisoners testing HCV-antibody negative at entry were followed up for a median time of 121 days, during which time three seroconversions were noted. Although it was not possible to determine if the three prisoners who seroconverted had been exposed in prison or while in the community, a seroconversion rate of 4.6 per 100 person years was calculated. Among those reporting IDU in prison (one case) and among those reporting no IDU in prison, the seroconversion rates were 6.1 and 4.1 per 100 person years respectively – with a non-significant relative risk of 1.5.

5.4.2.3 PCR testing for HCV-RNA

Serum samples from those testing HCV-antibody negative at entry to prison were tested for HCV antibody and HCV RNA (by PCR) at three months. The level of agreement between the two tests was compared to that of a small number of PCR results from participants testing HCV-antibody positive at entry. The agreement between PCR and HCV-antibody negative tests was 100%. The overall agreement was 86% (69% in the HCV-antibody positive samples) with a kappa of 0.71.

5.4.2.4 Risk factor history at prison entry

When first admitted and enrolled in the study, over 70% of prison entrants reported a history of community IDU, with almost half of these reporting having shared needles. Seventy eight percent of prison entrants had been imprisoned previously, among whom 27% reported IDU in prison. Sharing needles was significantly more likely in prison IDU than in community IDU. Sixty percent of prison entrants reported having community applied tattoos, and 23% of those imprisoned previously reported having prison-applied tattoos.

There was a substantial degree of overlap in IDU and tattooing behaviours. Community IDU were significantly more likely to have community applied tattoos, and prison IDU were significantly more likely to have tattoos that were applied in prison. Thirty five percent of community IDU imprisoned previously also injected drugs in prison, although no participants reported prison IDU without also reporting community IDU. People with community applied tattoos were significantly more likely to have prison applied tattoos, however 15% of those with prison applied tattoos reported having no community applied tattoos.

A positive linear relationship between HCV-antibody and frequency of injecting (in the community and in prison was demonstrated in univariate analyses, and also between HCV-antibody and frequency of sharing needles in the community. High frequency of sharing needles in prison was also associated with higher antibody prevalence. Univariate associations were also found between community and prison tattooing and HCV antibody status, although IDU was frequently a co-risk for HCV. Univariate analyses revealed that for every strata of community risk history, previous imprisonment was significantly associated with increased HCV-antibody prevalence.

Neither community nor prison tattooing were found to be significant predictors of HCV status at entry to prison on multivariate analyses, but adjusted rates for community and prison IDU were significant. Further modelling demonstrated that sharing needles in prison was significantly associated with entry HCV status, but not sharing in the community. Prison history was independently associated with HCV-antibody status even after adjusting for other community risk factors and controlling for previous prison IDU. Adjusted risks for sex, age, Indigenous status, prison IDU and community IDU were all significant, with community IDU associated with the greatest risk for HCV.

5.4.2.5 Risk factor history at follow up

361 follow up questionnaires were completed overall, 50% of which occurred at the three month point. 30% of the follow ups occurred at six months, 14% at nine months and 5% at 12 months. Only 14% of participants reported injecting during the study, 82% of whom reported sharing needles. Three individuals were apparently initiated into injecting while in prison, having reported no previous community or prison IDU history. Only 9% of participants reported applying tattoos during the study, 24% of whom reported sharing equipment.

Participants apparently modified their risk behaviour coming into prison, with most of those with IDU and tattooing history reporting neither risk behaviour during the study. Nonetheless, reported prison IDU was significantly more likely in those testing HCV-antibody at the time of entry. Kaplan Meier survival estimates (until time of first report of IDU) differed significantly according to HCV status at prison entry. No relationship between entry HCV status and prison tattooing was demonstrated. Level of prison security also did not appear to be associated with reported risk behaviours in prison.

5.4.3 HCV seroconversion in those at risk in the community

Two hundred and eleven NSP attendees participated in the SA component of the National NSP survey in October. In SA, 211 NSP attendees of seven SA metropolitan NSP services participated. Approximately 40% of the participants were female, 8 % (17/211) were Indigenous and the median age was 33 years. Forty six percent of participants reported having ever been in prison, and these were significantly more likely to report injecting in public places, such as on the streets or in public toilets, during the previous month. Sharing needles, however, was not more frequently reported in NSP attendees with prison histories.

Median reported frequency of HCV testing in SA NSP attendees was two tests in two years. Using this estimate and data from public and private laboratories on the number of HCV-antibody tests performed in two years, a seroconversion rate for those at risk in the community was calculated at 1.1 per 100 person years, which was significantly lower than the seroconversion rate of 4.6 per 100 person years observed in the prison cohort – the relative risk was 4.36 ($P<0.034$).

5.4.4 Stakeholder consultations

Nurses and prison officers perceived HCV to be an important issue in the prison workplace. While officers were more concerned than nurses about the possibility of transmission, both stakeholder groups were confident that 'universal precautions' were sufficient to prevent exposure. The wearing of disposable gloves was the sole HCV prevention strategy identified by either group.

For prison officers, the importance of communicable diseases in general clearly exceeded HCV alone as a workplace issue. Officers were concerned about transmission of a range of parasitical, fungal, bacterial and viral diseases – with fear of disease transmission to family and friends commonly expressed. Provision of ongoing education about infection control and support to renew First Aid Certificates were strongly recommended strategies. Improved hand washing facilities and provision of alcohol-based hand gels for officers was also commonly proposed.

Participation in 'blood protocol' was a common experience in prison officers, who reported a lack of information and support during the waiting period involved. New restrictions on the provision of HBV and influenza vaccinations were seen as a significant barrier to complete immunisation and officers expressed frank resentment about the new arrangements. Nurses supported the need for prison officers to have easy access to HBV vaccinations.

The prison officer interviews uncovered a common feeling of being undervalued and resentment about increased pressures in the work place combined with perceptions of inadequate resources and staffing levels. Officers felt ill equipped to deal with what they saw as increasing prevalence of mental health and drug related problems in the prison population. Some of this may have manifested in a tendency to stereotype prisoners negatively. Nurses too, demonstrated considerable frustration about the increasing prevalence of drug-related harm in the prison setting. There was a surprising lack of integration between nursing and correctional staff with little awareness of the others' roles, duties and concerns.

In terms or HCV prevention strategies, education achieved the greatest degree of support, with both stakeholder groups agreeing that some form of sustained prisoner education would be appropriate. While nurses were confident of their own knowledge, officers stated their own

understanding about blood borne viruses and infection control was inadequate, with most supporting the idea of increased prison officer training and regular infection control updates.

The provision of more hair clipper guards was also a widely supported prevention strategy and nomination of a prisoner as 'unit barber' was also suggested. Provision of bleach to prisoners was seen by both groups as undesirable, unless a method of delivery and storage could be developed. Provision of syringes in any form – *ad hoc* provision, prison NSP or safe injecting room – was rejected by all those interviewed, with fear of condoning drug use the principal reason proposed followed by the fear of providing a weapon to prisoners (regardless of suggested safeguards). Strategies to provide prisoners with safer tattooing alternatives were also roundly rejected. Reluctance to provide prisoners with what they perceived as further privileges was the most common reason for rejecting tattooing strategies, although security concerns were also cited.

6 Discussion

After a brief discussion of the specific factors that contributed to the challenges of doing research in this specific setting, the results of the study are discussed in this chapter according the specific research questions posed.

1. What is the prevalence of HCV-infection in South Australian prisons?
2. What is the rate of HCV-seroconversion in South Australian prisons?
3. What specific HCV risk behaviours are reported by prison inmates and how do these behaviours differ from those reported:
    - prior to entrance;
    - during the course of current incarceration; and
    - after release from prison?
4. How does the prison HCV-seroconversion rate compare to rates in those at risk in the community?
5. How might new strategies aimed at reducing HCV risk in prisons be implemented in a way which is acceptable to both prisoners and prison staff?

Additionally, mindful of the potential impact of the relatively long serologic 'window period' in HCV, the epidemiological effectiveness of the ELISA-3 antibody assay was evaluated, using PCR as the gold standard. The results of this analysis are also discussed below.

6.1 Doing research in prison

This section describes the environment in which this cohort stage was undertaken and discusses some of the unique challenges presented by the prison setting. Specific challenges ranged from the characteristics of new prison entrants themselves to the restrictions imposed by prison-specific policies and security issues – all of which impacted on the receptiveness of, and access to, the target population.

6.1.1 The prison environment

Recruitment for the cohort study took place in three metropolitan prisons, which are also the main reception prisons for the SA prison system. Situated within the central business district of the city of Adelaide, the Adelaide Remand Centre accommodates up to 250 high security,

male prisoners. Remand prisoners are yet to be convicted and are frequently held in custody for less than one month, and sometimes as short as a 24-hour period. However, depending on the seriousness of the charge and/or the anticipated complexity of impending court proceedings, a substantial proportion are held for longer than six months and some in excess of two years. The Adelaide Remand Centre has six main living units as well as two isolation units which are utilised for behavioural management purposes. Study recruitment and follow up interviews were conducted in all six living units. There is a similar layout within each living unit, most having two decks of cells surrounding a common recreation area. Each unit was originally designed to house up to 20 prisoners in single-cell accommodation in a floor space of approximately four by 2.5 metres per cell (including a shower and toilet). Following the installation of bunk beds, each unit now houses up to 35 people in mostly double accommodation (for up to 17 hours per day), but there are a small number of single cells put aside for non-smokers or prisoners regarded as inappropriate cell mates (for example, due to behavioural problems). While prohibited in common areas, smoking is a relatively constant activity within the cells, which are deemed 'residential' areas and therefore do not constitute a 'workplace' under the SA Occupational Health, Safety and Welfare Act 1986. Smoking prevalence in Australian prisoners has been estimated at between 83% and 88% (D'Souza et al, 2005; Young et al, 2005).

Yatala Labour Prison is the largest prison in SA, accommodating up to 400 males in high, medium and low security facilities. Yatala chiefly accommodates sentenced prisoners, but also receives a number of remandees, especially when the Adelaide Remand Centre is at capacity. There is a number of different living sections providing medium to high security accommodation for general prisoners and 'protectees' (those prisoners requiring protection from the general prison population) and a high security induction and assessment unit for all new admissions and transfers from other prisons – where recruitment for this thesis took place. G-Division, which is the highest security section in the SA prison system, houses those considered to be the most dangerous prisoners and those protectees considered in need of constant supervision. In the observation cells within this section, the prisoners are not provided with any personal comforts and are under constant scrutiny while remaining locked in their cells for 23 out of every 24 hours. The practice of transferring 'difficult' (and often mentally ill) female prisoners to this section for observation has been the subject of public criticism in recent times (Graham, 2005).

There are approximately 90 women accommodated at the Adelaide Women's Prison, which 'mainstreams' remand and sentenced prisoners of all ages and security level primarily within four main wings. A potential criticism of the mainstream arrangements is that remandees as young as eighteen years are accommodated with older and more experienced prisoners, regardless of the offence concerned. There is also an induction wing, in which women stay up to a week at entry (and sometimes longer if exhibiting behavioural or drug withdrawal problems), which is under electronic observation at all times. Recruitment for the thesis was conducted in the 'movements area,' which sat at the intersection of the entrance to most of the mainstream wings. Recruitment was also conducted in the 'protectee' section – a small section for a handful of those with existing 'enemies' in the mainstream sections, those who might be perceived as informants, or who were likely to be victimised as a result of the offences with which they were charged. A garden area was provided for protectees but the women generally avoided using it, since it was adjacent to the mainstream yard and separated only by a wire fence. The Adelaide Women's Prison has been singled out for criticism in recent times. Concerns raised have included over crowding, limited support for mental health problems and ageing infrastructure – prompting the SA Parol Board chief, Ms Frances Nelson QC, to label the facility a "a blot on civilisation"(Graham, 2005).

From a researcher's perspective, there is a number of challenges involved in undertaking fieldwork in settings such as the prison environments just described. Personal safety, for example, is not ordinarily a high priority when undertaking research in other settings. Another example is the challenge of establishing a rapport with a unique population, while maintaining good working relationships with various members of the governing agencies (the DCS and the Department of Health) whose own operational aims can at times appear divergent.

6.1.2 The prison entrant population

Entering prison could ordinarily be anticipated to be a period of high anxiety for most, but this may be compounded by relatively high rates of pre-existing mental impairment in this particular population. Prison populations are known to have high prevalences of psychiatric illnesses (such as schizophrenia, clinical depression and serious personality disorders) but even higher prevalences have been noted in prison entrants when compared to the overall prison population (Butler et al, 2005a). In this SA prison entrant population, up to 20.5% of those prisoners correctly identified as 'new admissions' (see chapter 5, section 5.2.1.1) were ruled ineligible for the study on the basis of mental incapacity.

Withdrawal from opiates and other drugs also influenced the mental status of a substantial proportion of the prison entrants interviewed. SA prisoners have access to the prison opiate replacement program, but large starting doses of either methadone or buprenorphine can produce sedation, which made it challenging to discuss study objectives with people thus affected. Since there is currently no effective pharmacologic therapy for amphetamine dependency or withdrawal, amphetamine related withdrawal symptoms are also common in prison entrants. Additionally, many of the younger prisoners had been previously diagnosed with behavioural disorders such as Attention Deficit Disorder, with many prescribed dextroamphetamine or methylphenidate (such as Ritolin® or Dexodrine®). No amphetamine-like pharmacologic therapies are provided in SA prisons. Withdrawing from long-term treatment with these medications can also impact on mental health status.

As has been noted elsewhere in prisoners (Schofield et al, 2006), brain injuries were common in the study population with subsequent consequences on the intellectual status of some prisoners. These injuries were often related to the prisoners' past involvement in violent incidents, particularly motor vehicle accidents. For instance, some of the prisoners described past (remote or recent) involvement in high-speed police chases. It would be fair to describe many of the prison entrants as 'worse for wear' at the time of recruitment. Contusions and abrasions, dog bites, bone fractures and dislocations – injuries frequently incurred during the arrest process – were relatively common in the prison entrants interviewed.

An additional factor impacting on mental alertness in these prison entrants was the high prevalence of sleeping difficulties. A combination of anxiety, lack of physical activity (up to 17 hours locked in their cells per day) and nightly disturbances associated with sharing accommodation with unfamiliar people contributed to many new entrants complaining of inadequate sleep and exhaustion. While literacy rates were high in the female prisoners interviewed, approximately 40% of male prison entrants had some degree of reading difficulty. For some male prison entrants, considerable assistance was required in going through the information sheet and (if agreeing to participate) completing the consent form and entry risk factor questionnaire.

These new prison entrants were a population of people in crisis who were often very agitated at time of interview. The few hours in which they were not locked in their cells per day were

often spent negotiating with prison officers about details such as arranging final 'Centrelink' payments (unemployment or disability benefits) and organising telephone access. Prisoners in SA must pay for telephone access to particular numbers, but often have no money available at time of entry to enable them to access the system. Moreover, problems associated with establishing a new account with allowable phone numbers were relatively frequent. Thus, at a time when access to the outside world is most required (for instance, for family contact or legal advice), prisoners may find they actually have very limited access.

From a researcher's perspective, a great deal more time can be spent interviewing new prison entrants than might ordinarily be anticipated, precisely because many of the population are in a state of crisis. While most individuals appreciated (as they were reminded) that the researcher was not in a position to provide legal advice or any other advice or practical assistance, many prisoners clearly relished the opportunity to discuss their fears and concerns with an 'outsider' to the correctional system. Frustrations associated with being recently and, often, unexpectedly incarcerated were the main themes expressed, as were concerns about the loss of jobs and relationships as well as about the welfare of dependents – even the welfare of pets.

Many of these stresses can be compounded in female prisoners who tend to be principal carers for children. In addition to stresses associated with fear for the welfare of dependents, female prisoners have been found to have increased prevalence of mental health problems, such as depression and post-traumatic stress disorder (often related to sexual or physical abuse), drug misuse and drug-related risk behaviour (Braithwaite et al, 2005; Butler et al, 2005a; Johnson, 2004; White, 2002; Young et al, 2005). As observed in the Adelaide Women's Prison, scarce correctional resources may be strictly proportionally allocated to a relatively small overall population. It is possible that limited resources may result in the implementation of strategies such as the mainstreaming approach for most prisoners in maximum security and, potentially, reduced access to rehabilitative programs.

Imprisonment is an extreme event for many individuals, and this is an important consideration for research in this setting. One individual committed suicide shortly after his interview, despite having agreed to participate in the study and completing a questionnaire. A further two participants committed suicide during the course of the study. The DCS reports that six inmates (new and long term prisoners) committed suicide during the financial year 2004-2005

(Department for Correctional Services, 2005). Given the relatively high coverage achieved by this study, the mortality due to suicide seen among participants (recruited at a highly vulnerable time) is probably not completely surprising. Also as might be expected, these deaths had a considerable impact on the researcher. This situation underscores the importance of planning for adequate counselling and other support systems for researchers in prison settings, as would be the case when researching all populations at high risk of mortality.

6.1.3 The correctional system

Other specific features of the prison environment that increased the complexity of this investigation were related to the correctional and justice systems themselves. These features primarily impacted on access to the study population. For instance, newly admitted prisoners may spend entire days away from the prison to make court appearances which are not set down for particular times during the day. Court-related absences can be frequent, especially if prisoners have been charged with multiple offences. The pace of prisoner movements in general was very rapid. Some individuals may be imprisoned overnight, spend the entire of the following day in court only to be released immediately. Prisoners are frequently transferred from facility to facility with little warning, which can also present difficulties for recruitment and follow up.

Any available access time was tightly regulated by the specific schedules of each prison. In Yatala Labour Prison, the prisoners are permitted only two hours of recreation in the afternoon (1.30 pm to 3.30 pm) which was also the only time available for the purposes of recruitment. Irrespective of the number of new entrants appearing on admission lists or the length of time each interview took, there was no exception to the two hour access window. This recreation time was also the only time the prisoners had each afternoon for receiving visitors, making telephone calls, exercising or simply taking in the outside air – all serious competing claims on precious interview time.

It sometimes occurred that a security breach of some kind resulted in an entire prison being ‘locked down’ and no access to prisoners was possible. Particular prisoners were sometimes unavailable after being placed in behavioural management. When behavioural offences occurred in a common area, the movements of all prison visitors were restricted for the time it took to subdue and remove the offender.

The restrictions on free movement within the prison environment also limited access time to the study population. In Yatala Labour Prison, for example, a prison officer must escort all visitors at all times as they move from section to section. Due to other work demands on the time of correctional staff, there were often considerable delays before an escort became available. This time, too, was deducted from the time that access to the prison population was allowed.

Despite these issues, it is important to note that both prison and health staff were supportive of the study throughout, as were the prisoners themselves. Prison officers regularly provided information, prepared admission lists and cheerfully undertook the extra prisoner escorting duties, while nursing staff performed all of the required blood tests and administered follow up questionnaires in most centres.

6.1.4 Other operational and administrative factors

The primary administrative challenge in undertaking this research was in establishing the cooperation of all stakeholders. Preparatory work involved delivering a number of presentations to Departmental committees, and consulting with Directors and Managers from Custodial and Health Services, as well as with the General Managers and Unit Managers of each participating prison. Consultations with SAPHS senior and clinical staff were ongoing, as were discussions with prison case managers and prison officers. Once a shared sense of purpose was achieved, maintaining interest and cooperation among all key personnel was accomplished by circulating regular reports on the progress of the study and taking advantage of all opportunities to present information to staff – such as staff education sessions and committee meetings.

As discussed in chapter 4 (see section 4.4.1.1), there were a number of difficulties in establishing a recruitment protocol which could be accepted by SAPHS nurses but which remained standardised across all reception prisons. Ongoing negotiations resulted in a number of adjustments to the protocol in the metropolitan prisons and it was not possible to continue recruiting at all in the rural prisons despite exhaustive consultations. The major difficulty for nurses was in trying to incorporate study recruitment into their thorough nursing assessment of all new prison entrants, already a considerably time consuming process. Extra demands on clinic time were made following major incidents, such as prisoner suicides, within the prison system. Prisoners thought to be at risk of self-harm are admitted into a clinic program

involving compulsory daily presentation to SAPHS staff for psychological assessment. The number of people on the daily assessment program greatly increases after a death or serious injury, as entry criteria for the program become increasingly sensitive in an effort to minimise the possibility of further incidents. Increases in program numbers have the greatest impact on clinic time at the Adelaide Remand Centre, since it houses the largest number of new entrants – those most likely to be in a crisis state. To reduce time demands, the researcher assumed responsibility for administering follow up questionnaires at this facility. Nonetheless, SAPHS nurses in all prisons did endeavour to undertake all blood tests requested for the study, and (with the exception of Adelaide Remand Centre) administered follow up questionnaires throughout the 15 months of fieldwork.

DCS dossier numbers were utilised to monitor prisoner movements during the study period. While maintaining confidentiality is an essential consideration for any study, the legal implications involved in prisoners admitting to illicit activities whilst incarcerated necessitated the use of an approach that was, to the greatest possible extent, a 'hands off' process. SAPHS is an agency of the Department of Health and, as such, operates almost entirely separately from the DCS. While health case notes include DCS dossier numbers, SAPHS staff operate on the basis of prisoner names. The system of follow up required the administrative assistance of DCS. Each week a list of DCS dossier numbers belonging to participants who were due for follow up was provided to DCS staff, who supplied the name and location of the participants at that time. SAPHS staff at the relevant prisons were then supplied with an identified list of participants housed in that facility, following which the original DCS identified list was destroyed. Though complicated, the system worked exceedingly smoothly through much of the conduct of the fieldwork. It was intended that this same system be used to contact a sample of post-release participants who remained in contact with the correctional system and were supervised by Community Corrections (also of the DCS). As described in chapter 4 (see section 4.4.2.1), this part of the study was severely impacted by the loss of a key contact person within the DCS, whose role it was to approve and facilitate all research projects in the prison system. Despite numerous meetings, telephone calls and a variety of electronic and written correspondence with the new DCS contact, the vast majority of released participants were lost to follow up by the time contact with Community Corrections was made. It is possible that this situation resulted from the late entry of this individual in to the project, which may serve to highlight the critical importance of promoting a sense of 'buy in' from all stakeholders. Nonetheless, such delays are of

concern and, if ongoing, could potentially limit the prospects of further research in the important area of prison health in SA.

6.2 The prevalence of HCV in SA prisons

This thesis has found that the prevalence of HCV-antibody is very high in the South Australian prison system. In high prevalence populations, the presence of HCV-antibody is known to correlate well with HCV infection (Erensoy, 2001). From the case note audits, overall HCV prevalence was estimated at approximately 42% (among those with documented test results). The overall prevalence of HCV-antibody estimated in the prison entrants recruited to the cohort study was also 42%. Other Australian studies have estimated an overall prison prevalences of between 37% to 58%(Butler et al, 2005b; Butler et al, 1999; Butler et al, 1997; Crofts et al, 1995; Hellard et al, 2004). International estimates have ranged from 8% to 43% in general prison populations, but prevalences comparable to this thesis were estimated in Danish and Californian prison entrants – 43% and 41% respectively (Christensen et al, 2000; Ruiz et al, 1999).

6.2.1 Demographic factors associated with HCV

While the overall prevalence of HCV was high, data from the cross sectional and cohort stages of the study confirmed that there was significantly increased risk for female prisoners, those aged above 28 years, and Indigenous prisoners who originated from areas other the remote far north of SA. Risk behaviours such as injecting and tattooing are thought to be more frequently reported in minimum security settings (Dolan, 1997). High levels of prisoner mobility between prisons, however, may have impacted on the ability of this thesis to demonstrate any relationship between HCV status and prison security level. Duration of imprisonment at the time of the audits was also not found to be associated with HCV status in this investigation.

6.2.1.1 HCV and sex status

Consistent with the international and Australian literature, HCV-antibody prevalence was significantly higher in female prisoners (Butler et al, 1999; Crofts et al, 1995; Fox et al, 2005; Hellard et al, 2004; Jurgens, 2003). The greater proportion of female prisoners charged with drug-related offences relative to males (Boutwell et al, 2005; Ehrmann, 2002; Richie et al, 2001) is commonly proposed to explain the HCV-sex differential in prisons. This thesis, however, found that female sex was independently associated with HCV-antibody status in

prison entrants after adjusting for prison and community IDU history (as well as Indigenous status and age). Other authors have also identified excess HCV cases in female prisoners after controlling for other factors. In NSW, Butler et al (1999), found that HCV prevalence was higher in female prison entrants reporting IDU compared to male IDU. In the US, Solomon et al (2004) noted that female prisoners (in whom they also found higher HCV prevalence relative to male prisoners) were more likely to have been convicted of drug-related offences, but found no difference in HCV prevalence between those convicted of drug-related offences and of those convicted of other offences. It is possible that there are factors, behavioural or other, that increase the HCV risk associated with injecting in females. Further investigation of this is clearly required.

6.2.1.2 HCV and age

Also consistent with the literature (Crofts et al, 1996; Macalino et al, 2004b; Vlahov et al, 1993), this thesis found that increasing age was associated with HCV-antibody status in SA prisoners. In the summer audit, and among prisoners at Port Augusta Prison in both audits, HCV prevalence was highest in those aged in the middle third of the age distribution (29 to 36 years), with lower prevalence in those aged above 36 years – although both age groups had significantly higher HCV prevalence than those aged below 29 years. One other study recently found a similar risk pattern in Italian prisoners – with the highest HCV prevalence in those aged 31 to 40 years, lower prevalence in those aged above 40 years but lowest in those aged below 31 years (Babudieri et al, 2005). With the exception of this international study, this thesis' finding of an inverted 'U'-shaped relationship between age and HCV-antibody status, which persisted in multivariate analyses, has not been described elsewhere.

In 1995, HCV screening at entry to SA prisons became part of an existing mandatory screening program for HIV and HBV. This program was discontinued in 1998, when it was replaced by a voluntary testing program that has remained in place to the current time. Given that the median duration of imprisonment at the time of the summer audit was 9.5 months, and older inmates were *less* likely to have a history of HCV testing, it is unlikely that changes in screening practice could account for the noted age-related variations in HCV prevalence. In addition, there was no evidence for an inverted U-shaped relationship in the winter audit or among the cohort of prison entrants, where a more linear association between HCV-antibody and age was observed. It is possible that the summer audit population incorporated a distinct population subset, perhaps with some similarities to the population accommodated at Port

Augusta Prison, which cannot be fully characterised on the information collected. Additionally, historical trends in injecting practices within specific drug using communities may account for the differences seen.

6.2.1.3 HCV and Indigenous status

In contrast to other Australian studies (Butler et al, 2005b; Butler et al, 1999; Butler et al, 1997), this thesis found a significant association between Indigenous status and HCV-antibody prevalence in the audited populations and in the cohort recruited at entry. Prison-specific prevalence indicated a significantly lower HCV risk for Indigenous prisoners at Port Augusta Prison and significantly increased risk for Indigenous prisoners elsewhere. Port Augusta Prison has a large proportion of Indigenous prisoners who generally originate from the remote far north of the State. There are known to be geographical differences in the risk behaviours of Indigenous communities. Larson et al (1999), for example, found that Indigenous persons in the city of Brisbane reported high rates of IDU with greater frequency of needle sharing relative to non-Indigenous IDU. Injecting drug use is less common among remote Indigenous communities, where volatile substance abuse (such as petrol sniffing) and alcohol misuse constitute more important public health issues (d'Abbs, 1998; d'Abbs and Maclean, 2000). The results of this thesis suggest the

It is not clear why studies in prisoners elsewhere in Australia have not noted differential HCV prevalence according to Indigenous status. A stratified random sampling approach was used to recruit 789 prisoners (nearly 30% of whom were Indigenous) from 27 of NSW facilities – on the basis of age, sex and Indigenous status (Butler et al, 1999). It is possible that estimating a single overall prevalence for Indigenous prisoners may have masked any geographically based differentials that may have existed. In this thesis, for example, the overall prevalence estimate for audited Indigenous prisoners did not differ significantly from the overall prevalence in non-Indigenous prisoners. Only when Port Augusta-specific and Port Augusta-exclusive HCV prevalence estimates were considered did the differential become apparent. There is some international evidence that geographically and/or culturally specific risk behaviours may also have impacted on HCV prevalence in prisoners. Low HCV prevalences were found in Mexican and Indian prisoners, which may have been due to the local practices of drinking or inhaling opiates (Alvarado-Esquivel et al, 2005; Singh et al, 1999) in preference to injecting, which is the norm in western IDU communities. Complex relationships between ethnicity and HCV prevalence have also been noted in prisoners in the

US (Baillargeon et al, 2003; Macalino et al, 2004a; Vlahov et al, 1993).

6.2.2 HCV and seasonal or other trends

The overall prevalence estimated in this thesis proved to be particularly robust against possible seasonal factors and sampling methods. There were, however, interesting variations noted between particular subpopulations in the audits and among the cohort recruited at entry. Notably, there were wide discrepancies in prison-specific HCV prevalence between audits, and (from the cohort study) significantly different HCV prevalence among male prison entrants to the Adelaide Remand Centre and Yatala Labour Prison. Prisoners present for only one of the audits (either in summer or winter) had significantly lower overall prevalence than the total populations, despite not differing significantly in age, sex or Indigenous status. Because shorter periods of incarceration are known to be associated with drug-related offences, audit data for those incarcerated for two weeks or less were also specifically analysed. While not statistically significant, there was a uniform trend for increased HCV prevalence overall and for each demographic variable collected – age, sex and Indigenous status. This seems to be reflective of the increased proportion of injecting drug users and their associated increased HCV risk (Australian National Council on Drugs, 2003; Freeman et al, 2000; Samuel et al, 2001; Stark et al, 1997; Stark et al, 1996; Taylor et al, 2000).

In prison populations, which are characterised by distinct subgroups combined with rapid population turnover, sampling on more than one occasion and place can provide useful indications of the variability of prevalence estimates, while single point estimates may miss important seasonal and other variations. On the other hand, it is also useful to develop an accurate HCV prevalence estimate for the overall population. The apparent robustness of the overall estimate of HCV prevalence in SA prisoner (42%) developed in this thesis stems from its representativeness. That is, it was derived from case note data from the majority of the prisons making up the jurisdiction's custodial system (accommodating approximately 93% of the State's incarcerated population) and from entry data from a large proportion of entrants to the main reception prison in SA over a relatively long period of time (approximately 58% of all admissions). Estimating overall prevalence in prison from smaller proportions of the population would clearly require careful characterisation of the various population subgroups and other prison-specific factors.

6.3 HCV seroconversion in SA prisoners

A relatively low rate of HCV transmission was observed in SA prisoners with uncertainty surrounding the location of exposure in all three of the seroconversions noted. Nonetheless, the calculated rate of 4.6 per 100 person years (6.1 per 100 person years in those reporting IDU in prison) was broadly comparable to the limited published literature in this area. Australian and international studies report HCV seroconversion rates per 100 person years ranging from 0.4 (Macalino et al, 2004a) to 25.3 (Miller and Bunting, 2002), with most estimates being below 7.0 per 100 person years (see chapter 2, section 2.2).

Prior to the beginning of this project, SAPHS and DCS proposed that up to 80% of prisoners would be discharged within three months of entry. While this overestimated the actual losses observed, 56% of participants were discharged by three months and the median time of observed incarceration was approximately 2.3 months, with the majority of prisoners being on remand. This was comparable to the Australian median time of 2.8 months for unsentenced prisoners in 2005 which was reported by the ABS who, incidentally, also report that SA had the highest proportion (34%) of unsentenced prisoners in the nation during that year (Australian Bureau of Statistics, 2005). Gore and Bird (1998) proposed that a study of 3000 prisoners followed over ten weeks should be able to detect 5.6 HCV seroconversions – assuming the sample contained at least 10 novice injectors and 30 initially seronegative current IDU, and each injected approximately one time per week. In this thesis, the seroconversion rate was substantially below what might have been expected despite a person-time at risk in the susceptible population that greatly exceeded that proposed by Gore and Bird.

It is possible that the low rate of seroconversion observed may be due to a 'ceiling effect', given the very high background prevalence of HCV in this population. At entry, up to 42% of prison entrants were positive for HCV-antibody (around 40 times the prevalence of disease estimated for the general SA population) and a large proportion (70%) reported having an IDU history. Gore and Bird (1998) proposed an injecting history rate at entry of 30%. As suggested in one US study (Vlahov et al, 1993), low HCV incidence rates in prisoners may be due to a 'saturation' of the susceptible population – with most persons likely to inject in prison already having seroconverted prior to entry. Supporting this theory, this thesis found that HCV-antibody positive prison entrants were significantly more likely to engage in prison

IDU during the study period (discussed in more detail below, section 6.5.2). It has been reported that injecting in prisons occurs less frequently in prison than in community settings (Cregan, 1998) and a relatively low frequency of prison injecting was a characteristic of the study population. This may also have also resulted in a lower than expected seroconversion rate.

It is important to note that while no seroconversions related to prison exposure were confirmed in this study population, prison exposure cannot be ruled out as a contributor to overall HCV prevalence in this at risk group. This is because many participants were lost to follow up once they were discharged to the community, where it was no longer possible to assess their HCV serostatus. Drug-related offences are associated with relatively short incarceration periods relative to other offences. Thus, losses to follow up were greater in the group with, potentially, the greatest risk for HCV. Some of those discharged prior to first follow up may have been exposed while incarcerated. While not possible to confirm, this could have conceivably been the history of one of the seroconversions observed in this thesis.

6.4 HCV seroconversion in those at risk in the community

The community at risk seroconversion rate was calculated at 1.1 per100 person years, which was significantly lower than the 4.6 per 100 person years observed in the prison cohort (a relative risk of 4.4). The community at risk rate was substantially lower than the rate of 20.9 per 100 person years observed in current IDU (van Beek et al, 1998), but similar to the rate of 1.3 per 100 person years observed in clients receiving continuous opiate replacement therapy (Hallinan et al, 2004).

This thesis represents the first effort to estimate an overall HCV seroconversion rate for those at risk in the community, although there have been a small number of studies that have investigated HCV seroconversion in community-dwelling IDU. In the main, these studies have investigated populations of drug service attendees. There is some evidence, however, that drug service attendees may have higher HCV seroconversion rates than non-attending IDU (Patrick et al, 2001). There are also a number of other groups in the community that may be at perceived or actual increased risk for HCV infection relative to the general population but with lower HCV risk than current IDUs attending drug services. The population studied by Hallinan et al (2004), comprised mainly of former IDU, might be considered an example

of a community at risk group. History of imprisonment is commonly reported by community-dwelling IDU (Cregan, 1998; Judd et al, 2005b; Stark et al, 1997; Stark et al, 1995; Taylor et al, 2000). For example, 46% of participants in the SA component of the National NSP survey reported ever having been in prison. The HCV community at risk seroconversion rate was considered an appropriate comparison for that observed in the SA prison population, to avoid some of the potential for confounding that may have been presented by the high prevalence of prison history reported by community-dwelling IDU.

6.5 Risk factors of HCV in SA prisoners

As with the case note audits, sex age and Indigenous status were all significantly associated with HCV-antibody status at entry. Consistent with other prison studies (Butler et al, 2005b; Ford et al, 2000; Long et al, 2001), a large proportion of the participants reported a history of IDU and tattooing, with a significant degree of overlap between the two risk behaviours. There was a clear relationship between reported frequency of injecting and sharing behaviours and HCV-antibody status at entry in univariate analyses. While tattooing was also univariately associated with entry HCV-antibody status, neither community nor prison applied tattoos proved to be important after adjusting for IDU risk. Community IDU emerged as the most important independent predictor of HCV-antibody positivity at entry, followed by prison IDU.

6.5.1 Risk factors at entry

This thesis found that any IDU history, in the community or during previous imprisonments, independently predicted HCV-antibody status at prison entry, however, community IDU was associated with the greatest HCV risk after adjusting for age, sex and Indigenous status. A substantial proportion of prison entrants reported an IDU history (70%), but only participants reporting community IDU reported having injected when previously imprisoned. A Canadian cross sectional study also found that community IDU was the most important risk for HCV in prisoners (Ford et al, 2000). The authors point out that incarceration rates for IDU had been increasing in Canada and state (on page 116) that new prison entrants may have been "…bringing their habit with them."

Sharing needles is considered to be the greatest exposure risk involved in injecting, and this thesis demonstrated a positive relationship between entry HCV status and reported frequency of sharing on univariate analysis. In multivariate modelling, however, only sharing needles

while previously in prison was significantly associated with entry HCV status. While some under-reporting of community sharing behaviour may have occurred, it is possible that sharing of other injecting paraphernalia (such as spoons, tourniquets and water) may represent a more important HCV risk in the community (Crofts et al, 1999; Hagan et al, 2001; Rosenthal et al, 2003). As discussed in chapter 2 (section 2.3.1.2), injecting in prison is likely to be a relatively solitary event, where the opportunity for sharing injecting paraphernalia tends to be limited. Sharing needles in prison, however, was reported by 76% of prison entrants reporting a history of prison IDU. In this study population, history of sharing needles in prison was associated with entry HCV-status on both univariate and multivariate analyses.

Sixty percent of prison entrants reported a history of community-applied tattoos and, as has been reported elsewhere (Dolan, 1997; Samuel et al, 2005), there was a significant degree of overlap between IDU and tattooing behaviours. Significant relationships were found between community IDU and community tattooing, prison IDU and prison tattooing, and between community and prison risk behaviours. On univariate analysis, prison tattooing was significantly associated with entry HCV-antibody status and 15% of those with tattoos applied when previously in prison had no history of community applied tattoos. However, neither community nor prison applied tattoos were associated with entry HCV-antibody status after adjustment for community and prison IDU. Although other Australian studies have concluded tattooing in prison is associated with HCV infection (Hellard et al, 2004; Post et al, 2001), tattooing has not been found to be an important exposure in prisoners elsewhere in the world (Fox et al, 2005; Samuel et al, 2005).

Also consistent with the literature (Crofts et al, 1996; Dolan, 2000b; Fox et al, 2005; Stark et al, 1997), this thesis found that previous imprisonment was an independent risk for HCV-antibody status at entry. It is not clear what the precise mechanism for HCV acquisition might be, but it is possibly associated with the high background rate of HCV prevalence in this population which could conceivably result in greater exposure during what would ordinarily be regarded as relatively low risk practices in the general community. These might include incidental exposures from sharing toothbrushes or from physical altercations resulting in laceration injuries. As is suggested by Crofts et al (Crofts et al, 1999), increased transmission may occur as an inevitable consequence of the 'force of numbers.' People with prison history are known to engage in riskier practices while in the community (Niveau, 2006). Thus, it is also possible that risk behaviours such as inadequate cleaning of injecting equipment might be

more prevalent in released prisoners. In the SA NSP Survey data, however, attendees with a history of imprisonment did not more frequently report sharing needles or other injecting paraphernalia in the previous month.

6.5.2 Risk factors at follow up

This thesis found that SA prisoners modified their risk behaviour when they were incarcerated. Seventy percent of participants reported a history of IDU in the community, but only 14% reporting any injecting in prison during the study. Although injecting in prison was not commonly reported overall, injecting was significantly more frequently reported by prisoners identified as HCV-antibody positive at entry. Given that sharing needles in prison was reported by up to 82% of prison injectors, there appear to be a number of implications for prisoners and prison officers.

Since they are currently difficult to replace, syringes and needles in prison tend to be retained for long periods of time and can be used a multiple of times by a large number of prisoners (Hagan, 1998; Seamark and Gaughwin, 1994). The results suggest that each needle currently in circulation within the SA prison population will almost certainly be contaminated with HCV. For prison officers, who are regularly involved in cell searches and 'pat downs' of prisoners, there is a clear exposure risk from needle stick injuries. The risk of transmission from a needle stick injury involving a needle known to be contaminated with HCV has been estimated at three percent (Lauer and Walker, 2001). This estimate, however, is derived from data on needle stick injuries occurring in health settings. Needles in prison are more likely to contain a greater number and variety of viral contaminants, which may potentially increase the probability of transmission of HCV and other blood borne viruses.

It is possible that prisoners feel less constrained about injecting in prison if they believe that they are already infected, which indicates a lack of awareness about the possibility of re-infection. Re-infection is feasible if an individual is HCV-antibody positive but HCV-RNA negative, or is exposed to a genotype of the HCV virus that is different to one with which they are already infected. For instance, the predominant HCV genotypes circulating in Australia are type 1 and type 2 (Batey, 2003). As discussed in chapter 1 (see section 1.1.1), the prognostic relevance of HCV genotype is uncertain, however the genotype is important in determining treatment regimens and predicting treatment response (Keeffe, 2003; Pawlotsky, 2002). In recent years there has been increasing migration from the Middle East and Africa

(Australian Bureau of Statistics, 2006), where the predominant HCV genotypes are type 4 and type 5 (Lauer and Walker, 2001). Thus, the diversity of HCV genotypes in prison populations, as in the community, is likely to increase into the future.

Injecting in prison was also reported by HCV-negative participants, albeit less frequently than did HCV-antibody positive participants. The HCV risk associated with susceptible individuals sharing contaminated needles in prison cannot be overstated. As discussed (see section 6.3), while the observed transmission rate was relatively low in this prison cohort, there remains the possibility that prisoners may be exposed to HCV in prison and not seroconvert until after release. There is also some evidence that a proportion of prisoners become initiated into injecting while in prison. This thesis found that three participants were apparently initiated into injecting while in prison, having reported no previous history of IDU. Two of these individuals were HCV-antibody negative at entry, one of whom was only 20 years of age and had never been previously imprisoned. Other studies have reported that a small proportion of prisoners begin injecting for the first time in prison (Allwright et al, 2000; Butler et al, 2004; Gore et al, 1995; Long et al, 2004). Although it was not possible to confirm that their only exposure occurred in the prison setting, one of three seroconverters did report having injected in prison during the study period. It seems clear that contracting a chronic communicable disease should not be simply tolerated as just one of the many negative consequences of imprisonment.

Tattooing behaviour was also apparently modified by incarceration. Sixty percent of prison entrants reported having community applied tattoos, but only nine percent reported tattooing during the study. While participants who injected during the study commonly reported sharing needles, 76% of the prison tattooers reported that they didn't share tattooing equipment. There was also no association between HCV status at prison entry and subsequent reports of tattooing in prison. It is has been suggested that boredom is a principle motivation for prison tattooing (Post et al, 2001). Since SA prisoners spend many hours locked in their cells, it is conceivable that some might use this time engaging in solitary tattooing activities. In addition to low rates of sharing tattooing equipment, it is possible that the usual method of application may further reduce the HCV risk associated with this activity. Sewing needles have been reported as the most common needle used for prison tattooing, often attached to a small motor (Crofts et al, 1996). It is possible that solid needles may not efficiently transmit

HCV, as was proposed in an Australian study of commercial tattooers (Thompson et al, 1997).

As has been discussed (see section 6.1.4), the follow up of post-release participants was severely impacted upon by the loss of a key contact person within the DCS. Only 12 participants were ultimately available for contact through Community Corrections, and this sample may have been skewed towards those less inclined to engage in risk behaviour. None of these participants reported having applied tattoos when in prison during the study, and only one (who was HCV-antibody positive at entry) reported prison injecting. Only one participant responded they would use someone else's needles and no respondents said they wouldn't attempt to clean the injecting equipment if they had to re-use or share it.

Due to the difficulties described, it was not possible to answer the research question on the impact of incarceration on risk behaviour beyond release from prison. From the SA component of the 2005 National Needle and Syringe Program (NSP) Survey, however, NSP attendees with prison history were significantly more likely to report injecting in public places (such as parks and public toilets) than those never incarcerated. A report on the Australian data from an earlier NSP survey had also found those reporting prison history in the past 12 months were more likely to report syringe sharing on the streets (MacDonald et al, 2003). Compared to injecting in a private home, injecting in public places is often a rushed affair, and therefore riskier due to the potential for overdose and reduced opportunities for cleaning equipment effectively.

6.6 HCV-antibody and PCR assays at three months

This part of the thesis represented the first attempt to evaluate the usefulness of a relatively short follow up period in prison populations for confirming HCV-antibody status using ELISA-3. The results of the comparative analysis of HCV-antibody and PCR assays in individuals seronegative at entry suggests that later generation HCV-antibody assays are epidemiological sufficient for confirming seronegativity in high prevalence populations for periods of follow up as short as three months. The findings have relevance to epidemiological studies of other high prevalence populations where the opportunity for follow up may be limited – such as injecting drug users and urban Indigenous communities.

While the appropriateness of a three-month follow up interval for epidemiological investigations of HCV infection in high-risk populations is supported by the findings, it is important to note that they do not argue for the *diagnostic* accuracy of HCV antibody tests at three-months after exposure, particularly in low prevalence populations.

It was not possible to determine the average length of time since last potential exposure to HCV prior to prison entry, and this uncertainty about the precise length of the exposure-diagnosis interval may be regarded as a limitation of this analysis. This prison population, however, had a 70% prevalence of IDU at entry – 54% of those testing PCR negative. This may provide an epidemiologically sufficient basis for the claim that the exposure occurred at least three months prior to the confirmatory test at first follow up. In other highly mobile populations at risk for HCV, it seems reasonable to assume high HCV prevalence would correlate with relatively high prevalence of risk behaviour.

6.7 Planning strategies for change

This thesis has identified that HCV infection is a significant public health problem in SA prisons – a view that was shared by prison officers and prison nurses participating in the stakeholder consultations. Key findings from the study and stakeholder interviews are discussed in this section in the context of developing appropriate strategies for reducing the risk of HCV in SA prisons.

6.7.1 Prison opiate replacement program

Although information is provided to prisoners at entry, the prison opiate replacement program is currently the only systematic prevention strategy for blood borne viruses in the SA prison system. This well established and well utilised program is coordinated by SAPHS, and has been positively evaluated (Cowie and Alberti, 2001). Although the program appears to be accepted by nurses and some prison officers, most prison officers expressed some reservations about the possibility of exploitation. It is possible that some of the suspicions expressed by prison officers may have arisen from inadequate information provision about the aims and processes of the prison opiate replacement program. As the following quotes from prison officers demonstrate, this may have led to a level of suspicion and a general undervaluing of the need for the program.

"It's not just the…medications, it's the bloody methadone they're on. You don't know, we don't know what they're on. So they could be mixing that many things here and we're not trained, we're not trained in it. But they're keeping it, smoking it…we know it's happening."

"Yeah…that's what I think is our big problem with our, like, the methadone program. If the methadone program was actually run and backed up with…full on support and education I think we'd have a lot more success than what it does. Whereas, as it is now it really is just, they're just… they're just getting a buzz throughout the day…"

Addressing this problem will become increasingly important if the long term sustainability of the program is to be assured.

6.7.2 HCV in female prisoners

Although HCV prevalence was high for all prisoners, there was a clearly increased risk for some prisoner groups. HCV prevalence in female prisoners was significantly higher in both audits and the entry cohort – a further health disparity noted in this particular group. The impact of imprisonment is known to be greater for female prisoners, who are often the principal carers for children and other family members. As discussed in section 6.1.2, female prisoners have been found to have higher prevalences of drug misuse and addiction, depression and other mental health disorders (Braithwaite et al, 2005; Butler et al, 2005a; Johnson, 2004; White, 2002; Young et al, 2005). Given the increased need, far greater targeting of female prisoners for education and other prevention services is clearly required. When provided with information on HCV prevalence during the stakeholder interviews, prison officers were surprised at the increased risk for female prisoners. Increased allocation of correctional resources for female prisoners may gain acceptance if accompanied by appropriate information and education for prison staff.

6.7.3 HCV in Indigenous prisoners

Indigenous prisoners originating from urban areas were another group at increased risk for HCV infection in the SA prison population. This is the first time that differential HCV risk has been identified in this group, however other disparities and health disadvantages for Indigenous prisoners have been described elsewhere. Indigenous Australians are 16 times more likely to be imprisoned than non-Indigenous Australians, and tend to be imprisoned more frequently for shorter periods of time (Australian Bureau of Statistics, 2005). This rapid

'churning' in and out of the correctional system has implications for their ability to access any preventive or rehabilitative services while incarcerated. There are also implications for appropriate discharge planning, or 'through-care', once these prisoners are released. According to a recent survey at the Adelaide Remand Centre, 36% of Indigenous prisoners were homeless prior to entering prison and 73% had no secure housing or were homeless on release (Kreig, 2006). When prisoners are released into social situations that are the same or worse than those that contributed to their offending in the first place, with little improvement in their understanding or capacity to reduce risk, it seems unrealistic to expect any real reduction in HCV infection. Dedicated preventive services that are sensitive to the complex needs of Indigenous prisoners are urgently required.

6.7.4 Discharge planning and 'through-care'

In this thesis, 78% of prison entrants reported a history of previous imprisonment, which was independently associated with HCV-antibody status at entry. Prison officers participating in the stakeholder interviews discussed the social determinants of offending and re-offending. For example:

> *"And…it's affecting this place for a number of years – for decades. And all of the systems and all of the supports that have been put in place to address these issues have failed for, what I see, as a fundamental reason that they are going back to … a situation that hasn't changed."*

While nurses focused more specifically on drug misuse as the principal determinant of offending and incarceration, there did seem to be some recognition by both stakeholder groups of the need for strategies that also addressed some of the social difficulties that await prisoners at the time of release. The ability of released prisoners to deal with some of these intractable problems may be further reduced by the experience of incarceration. The dependent lifestyle in prison may reduce individual's self-efficacy, resulting in less ability to live independently once released (Rhodes, 2005). Addressing some of the social causes of offending and re-offending would clearly have an impact on reducing HCV risk associated with prison history.

6.7.5 Suggested HCV prevention strategies

Specific harm reduction strategies, suggested and piloted previously in prison settings, were proposed for discussion in the stakeholder interviews. These included: education strategies (for prisoners and staff); provision of single use/sterilisable hair clipper guards for prisoners; provision of bleach to prisoners (for cleaning injecting/tattooing equipment); training prisoners to provide tattoos to other prisoners; provision of professional tattooing services to prisoners; *ad hoc* provision of injecting equipment to prisoners; formal prison NSP services; and supervised injecting rooms.

Of all of the strategies proposed, education for prisoners and prison officers achieved the greatest support from both stakeholder groups. The lack of prisoner awareness of the possibility of reinfection, suggested by the higher frequency of injecting in prison by participants who were HCV-antibody positive at prison entry, does indicate that increased targeting of prevention education for this group is warranted. A substantial amount of information is provided by nursing staff to prisoners at entry, and is provided regularly to persons admitted to the prison opiate replacement program. Questions remain about the receptivity of newly admitted prisoners to preventive messages. In addition, there seems to be a lack of sustained education on blood borne viruses and drug use for most prisoners not regularly accessing health clinic staff.

While nurses were confident about their knowledge of HCV, prison officers almost universally expressed concern that their own knowledge about HCV and infection control was inadequate. There was wide support for ongoing education and training for officers. As discussed below (see section 6.7.6), it is possible that the perceived inadequacy of staff training was seen as symptomatic of a general lack of concern for the well being of prison officers.

The other suggested strategy achieving a high level of support by both stakeholder groups was the provision of sufficient hair clipper guards and greater enforcement of policies regarding their use. There has only been one documented case of HCV transmission in prison related to hair clippers (Haber et al, 1999). According to the interviewed stakeholders, however, the use of un-sterilised hair clipper blades (without guards) and related scalp lacerations are very

common in SA prisoners. It seems reasonable to expect that some unidentified HCV transmission would be occurring via this mechanism.

Bleach has been accepted as a feasible preventive strategy in NSW prisons, with many prisoners successfully adopting this strategy without incident (Dolan et al, 1998). The possibility of bleach provision in SA prisons was generally seen as undesirable by both stakeholder groups, both of which expressed concern about the ability of prisoners to use the chemical as a weapon. After some consideration of possible delivery methods, however, some stakeholders did concede that bleach might be appropriate if a safe system could be adopted. An enquiry into the custodial system in NSW specifically recommended the provision of bleach to prisoners freely and anonymously through the use of dispensing machines (NSW Anti-Discrimination Board, 2004).

The NSW enquiry also recommended that sterile tattoo application be provided for in prisons. This should be by either providing visits from commercial tattooers or by providing adequate infection control education to prisoners, together with supplying single use ink ampoules and access to autoclaves. However, neither of these suggestions were supported by the stakeholders. Tattooing was not found to be an important predictor for HCV entry status in this thesis, and sharing of tattooing equipment was also not frequently reported.

In 1993, the World Health Organization issued a set of infection control guidelines for prisons to reduce the transmission of HIV (World Health Organization Global Programme on AIDS, 1993). The guidelines set out the need for prisoners to be provided with the same education and preventive resources that are available to community members within the country involved. Among other strategies such as education and condom provision, the guidelines state that clean injecting equipment should be made available to prisoners, if it is available to injectors in the community. As discussed in chapter 2 (section 2.3), it is clear that many of the guidelines, particularly the provision of injecting equipment, are yet to be implemented, even though it has now been over a decade since the guidelines were issued (Bollini et al, 2002; Gatherer et al, 2005). Other authors have attributed this to the lack of acceptance of prevention strategies among prison officers and others in corrections (Cregan, 1998; Dolan et al, 1998; Godin et al, 2001; Leh, 1999; Levy, 1999; Niveau, 2006). This same lack of acceptance towards providing prisoners with injecting equipment was apparent among both stakeholder groups interviewed.

This thesis has concluded that the HCV seroconversion rate within SA prisoners was relatively low (although significantly higher than that of the community at risk). This thesis has, however, proposed the near certainty that each needle and syringe circulating within the SA prison system is contaminated, possibly with multiple strains and subtypes of HCV. This greatly increases the risk of exposure for prison officers and nursing staff, yet there was universal rejection among stakeholders for providing syringes in any form – including *ad hoc* provision, regulated NSP or supervised injecting rooms. While much of this was due to the widely held view that providing syringes would be tantamount to condoning drug use, the fear of providing a weapon to prisoners was another concern frequently raised. Several pilots of NSP programs have been positively evaluated in European prisons (Dolan et al, 2003; Stark et al, 2006). No amount of explaining the safeguards employed in these European programs was persuasive to the stakeholders. The current low availability of needles and syringes was seen as a virtue rather than a danger to prison staff.

> *"And the systems are working for us…at least while we say "No". Because very rarely we find a needle, very rarely…cause they are hard to get in. If you had them on an exchange, God knows where they would hide them."*

6.7.6 Other issues related to prevention in prisons

The limited stakeholder consultations indicated that prison officers and nurses regarded HCV to be an important issue, but it was clear that other issues had a greater impact on their work and practice, particularly for prison officers. Communicable diseases in general – fungal, parasitical, bacterial and viral – and infection control clearly out-trumped HCV as an important workplace issue for prison officers. Prison officers talked of a range of specific concerns ranging from what they perceived as inadequate hand washing facilities to new restrictions on vaccinations provided to prison staff. The evidence for what essentially amounts to reduced access to HBV and influenza vaccinations (as described by prison staff) is not clear. It does seem that the requirement for co-payments for flu vaccinations and self directed GP attendance for the HBV vaccination program could be considered significant barriers to complete vaccination for prison staff. Influenza vaccination is recommended for persons providing essential community services likely to be disrupted during influenza outbreaks, and HBV vaccination is specifically recommended for staff of long-term correctional facilities (National Health & Medical Research Council, 2003).

Much of the resentment of officers seemed to stem from a general sense of being undervalued by their Department (the DCS) in particular and society in general. Many officers talked about the lack of support they received when undertaking blood protocols and perceptions of inadequate staffing levels were frequently expressed. It is known that the prevalence of mental health problems among prisoners is high and has increased in recent years (Butler et al, 2005a; Cox et al, 2001; Pippos, 2005). Prison officers felt ill equipped to deal with the increasingly complex needs of their charges. It seems clear that prison officers can not be expected to deal with the issues society has evidently found too difficult, without some increase in education and other resources. The tendency to negatively stereotype prisoners and a lack of sympathy for rehabilitative and preventive programs seem inevitable outcomes in the context of the resentments described by prison officers.

Finally, there was a surprising lack of integration between the operations of correctional and nursing staff. While nurses were confident in their knowledge and understanding about HCV and other communicable diseases, officers were very concerned about their lack of education and frequently expressed the need for ongoing training and education. Nurses were unaware of this major concern of prison officers. Prison officers were convinced that nurses were providing opiate replacement therapy to prisoners who had entered 'clean.' Nurses were able to provide comprehensive descriptions of the processes that they undertook to ensure that this doesn't happen, but this clearly wasn't communicated to prison officers. Prison nurses did not know about the new restrictions to the officer vaccination program, and there were frequent misunderstandings about the assessments that nurses made about the mental health status of prisoners. It seems that if the well being of prisoners and the work environment of both nurses and prison officers are to be improved, a much more integrated approach to prisoner management ought to be achieved than currently exists.

6.8 Limitations of this thesis

It has been acknowledged that determining the appropriate point to conduct a seroprevalence study in prisoners can be problematic (Dolan, 1997; Macalino et al, 2004b). As discussed previously (see chapter 2), IDU may be over-represented in samples of prison entrants since they tend to be incarcerated frequently but for relatively short periods of time. Samples drawn from existing prison populations, on the other hand, may systematically exclude shorter stay

prisoners who may not be incarcerated for long enough periods to complete the study protocol. The case note audits did not require active recruitment of participants and all prisoners who happened to be incarcerated on the nominated days (whether they were long or short stay, or undergoing court proceedings) could feasibly be represented in the sample. In combination with the entry data obtained in the cohort study, the case note audit method addressed some of the difficulties pertaining to the under or over-representation of IDU.

One limitation of the case note audits, however, was that the method didn't allow for the identification of HCV-status in those who hadn't been tested while in prison. Prior to the current investigation, prisoners would presumably have requested or be offered testing on the basis of their perceived risk status. Thus, there was a risk of introducing a bias which might have resulted in an over-estimation of HCV prevalence in the prison population. The potential for bias may have been minimised by the impact of implementing the cohort component of the study, since the majority of prison entrants (regardless of HCV risk status) were offered testing during this period.

Prior to the commencement of the study, information provided by SAPHS indicated that around 42% of prison entrants were tested for HCV at entry. SAPHS staff noted that the proportion of prison entrants tested had increased during the conduct of the study and they attributed this, both directly and indirectly, to the project itself. Increased testing occurred directly as a result of prisoner participation in the cohort study, and indirectly as a consequence of increased awareness of HCV among health staff and prisoners. The first audit was conducted after the first three months of recruitment for the cohort study, and the second took place towards the end of the recruitment period. Although the relatively rapid turnover of the prison population is likely to have minimised differences in the proportion of prisoners tested between the two audit periods, a significantly smaller proportion of prisoners had no history of testing in winter.

As noted in chapter 5 (section 5.1.1.3), much of the increase in testing rates between audits occurred in specific prisons, with Cadell Training Centre and Port Lincoln Prison being the only prisons to have significantly more prisoners with testing histories in winter relative to the summer audit. This was possibly due to greater compliance with the cohort study protocol (among SAPHS staff) that occurred in one of the major reception prisons, Yatala Labour Prison, from which the majority of the prison populations at Cadell and Port Lincoln were

sourced. SAPHS staff at Yatala play a major role in assessing newly sentenced prisoners before transferring lower security individuals to these rural centres, and also undertook a large proportion of follow ups for the cohort study.

Another limitation of the cross-sectional part of the study was that data on injecting drug use were not collected. Although drug use history forms part of the prison entrant health assessment routinely undertaken by SAPHS staff, this part of the assessment form was not always completed. Individual practitioners might note relevant information elsewhere in the health record. Since the SA Prison system is yet to convert to digital health records, validly identifying injecting drug use from extensive paper records was not feasible given the time and resources available to the project. The same logistical constraints applied to the collection of additional data on number and dates of prison based HCV antibody tests. More comprehensive information may have allowed for further analyses of frequency of testing relative to exposure risk. Nonetheless, the method used was able to address the research question related to the prevalence of HCV in this population as well as providing some useful information on the risk factors that were measurable at the time of the audits.

Necessary changes to the recruitment protocol for the cohort study resulted in the loss of up to 40 prisoners per month who were admitted to Port Augusta and Port Lincoln Prisons. Since recruitment was conducted in weekly sessions, some very short-term prisoners (incarcerated for 48 hours or less) being discharged before they could be offered recruitment. Participants were required to remain within the system long enough to undertake a blood test. This meant that even those very short-term prisoners it was possible to access were often discharged prior to completing the protocol. Thus, missing access to a proportion of short-term prisoners may not have ultimately impacted on the size of the sample. The age and sex profile of enrolled study participants was similar to that that reported by the DCS for admissions during that period (Department for Correctional Services, 2005). There was a smaller proportion of study participants identified as Indigenous, but this difference could be accounted for by the exclusion of Port Augusta Prison from the recruitment protocol. There was also a small but significant difference in the proportion of prisoners declining study participation on entry to the two male metropolitan prisoners, with those entering the Adelaide Remand Centre more likely to decline than those entering Yatala Labour Prison. Since the Remand Centre admitted a larger proportion of unsentenced prisoners relative to other centres, it is possible that reluctance to participate may have been associated with anxiety related to uncertainty of legal

outcome. Nonetheless, given the absence of differences for other variables available, the cohort sample was fairly representative of prison entrants to the major reception prisons during the study period, although the number were smaller than initially anticipated.

Due to the high prevalence of HCV prevalence in this prison population, the number of susceptible individuals may have been too few to detect prison-exposed HCV seroconversions. Combined with the relatively small size of the SA total incarcerated population and rapid population turnover, the 'ceiling effect' may represent an almost insurmountable problem for studying transmission in this particular population. Despite these difficulties, three seroconversions were detected in the susceptible population – although community exposure could not be ruled out. Their detection (and the confirmation of HCV status in a number of other returning participants) was made possible by the study design, which allowed for the 'recapture' of participants when and if they came back into the custodial system. It is possible that this design could be effectively employed in larger prison populations on this or other issues of public health importance.

In estimating the community at risk seroconversion rate, the overall number of tests performed in SA was divided by the average number of tests performed in IDU, after excluding the population known to have been tested on a single occasion. This is likely to have underestimated the person-time at risk since it is likely that a number of single testers would have remained in the denominator even after controlling for antenatal and orthopaedic surgery screening. Ultimately, this may have resulted in the calculation of a community at risk incidence rate that is higher than the true rate. Nonetheless, the rate calculated was similar to that calculated for former injecting drug users on opioid replacement, a population which might be expected to have higher HCV risk than the general community, but lower than current IDUs (Hallinan et al, 2004).

As has been discussed, administrative delays resulted in the majority of post-release participants being lost to follow up before they could be contacted through the Community Corrections system. While some data from the SA component of the National NSP 2005 Survey did provide some indication of the risk behaviours of former prisoners, this thesis was not able to fully describe the impact of incarceration on risk behaviour once prisoners are released.

Questionnaire design was significantly influenced by the logistic requirements of the project, including limited project resources (see discussion in Chapter 4, section 4.4.2.1). Entry and follow up questionnaires were intended to be administered by nursing staff which imposed substantial limitations on the range of data collected. Ultimately, questionnaire content was based on the specific aims of the questioning with unavoidable tradeoffs in data comprehensiveness made in favour of data completeness to a level that might still provide the ability to observe variations between reporting periods. The imperative for protocol simplicity resulted in a common format for follow up questionnaires, which meant that the longer a participant was observed the more likely they would have reported a risk behaviour in the highest possible category (i.e. injecting "more than five times"). While only a very small number of participants reported having injected more than five times in prison during the study (only three reported having done so by three months and only one by twelve months), more precise questioning may have allowed for estimations of injecting rates per week. Despite these limitations, the questionnaire design made it possible to establish an overall pattern for reported risk behaviours in this incarcerated cohort while being sensitive enough to allow for the identification of three prisoners apparently initiated into injecting during the study period.

Finally, there is a possibility that this thesis has under-estimated the prevalence of IDU and tattooing in prison. As discussed by Macalino et al (2005a), self reporting illegal or clandestine activity may be difficult for some prisoners. SAPHS nurses administered the majority of follow up questionnaires. With high rates of illiteracy among male prisoners, it was not always possible to respond to the questionnaire anonymously. While prisoners were made aware that information obtained by SAPHS staff through the study would not be passed on to correctional staff, it is possible that some prisoners might not have appreciated the degree of separation between the two agencies. It is important to note that any under-reporting of risk behaviour that may have occurred was likely to have been consistent for all prisons. In lower security prisons in SA, the interaction between prisoners and SAPHS staff tends to be less restricted than in higher security facilities, often allowing for more trusting relationships to develop between nurses and their patients. In this thesis, however, frequency of injecting and tattooing in prison did not differ significantly according to prison security level.

6.9 Significance of this thesis

This thesis is the first investigation of HCV in the South Australian prison system and one of relatively few studies in prisons elsewhere in Australia and around the world. In addition, this thesis was the first investigation of the impact of incarceration on risk behaviour over time Although a handful of studies have estimated the rate of HCV transmission in drug service attending IDU, there have been no attempts to measure HCV-incidence rates in infrequent injectors or others who may be at risk for HCV (or perceive they may be at risk) in the community. This part of the study represents the first effort to estimate an at risk community HCV seroconversion rate.

The finding of extremely high HCV prevalence in SA prisoners, particularly in female and older prisoners, confirms the findings of studies elsewhere and provides valuable baseline data for future program evaluation. Also the first to describe geographically based differences in HCV risk for Australian Indigenous prisoners; this thesis has the potential to guide the development of appropriately targeted preventive activity.

This thesis is the first study to identify an association between HCV status at prison entry and subsequent injecting practice whilst incarcerated. While this information should allow for better targeting of preventive education among prison entrants, it also provides much needed evidence for increased access to preventive resources for prisoners and prison staff.

This thesis has provided valuable information on the performance of the ELISA-3 (against the PCR gold standard) during a relatively short follow up period in prison populations. The findings have implications for reducing both the cost and complexity of epidemiological studies of HCV in highly mobile, high-risk populations – such as injecting drug users and other marginalised, ethnic or cultural groups.

Nationally, efforts to introduce new harm reduction strategies within prisons have been met with various levels of formal and informal resistance from prison staff (Levy, 1999). This thesis has attempted to establish some the attitudes of prison officers and prison health staff in order to promote a more collaborative approach to developing and implementing harm reduction strategies.

The results of this thesis may also have policy implications for HCV risk reduction in the SA prison system. Specific recommendations, based on these findings, are presented in the following chapter.

7 Conclusions and Recommendations

This thesis has found that the prevalence of HCV is very high in SA prisoners, and in female prisoners and those aged above 28 years in particular. Indigenous prisoners had significantly higher HCV prevalence than non-Indigenous prisoners, except in Indigenous prisoners originating from the far north of SA – where lower HCV prevalence was estimated. Although there were interesting variations among the many subgroups making up the prison population, there was little evidence for a seasonal impact on overall HCV prevalence.

A relatively low rate of HCV seroconversion was observed in SA prisoners with uncertainty surrounding the location of exposure in all three of the seroconversions noted. Nonetheless, the prison seroconversion rate was significantly higher than that calculated for those at risk in the community. Since losses to follow up were more likely in those most at risk for HCV, prison exposure could not be ruled out as contributor to the overall HCV prevalence in this at risk group.

This thesis found that IDU history, but not tattooing history, was an important independent predictor of HCV-antibody status at prison entry. History of IDU in the community, prison IDU and sharing needles in prison were all independently associated with entry HCV status. Having a history of previous imprisonment at all also independently predicted HCV status at prison entry. The study participants reduced their risk behaviour whilst in prison, with only a small proportion reporting any injecting or tattooing during the study. Those who were HCV-antibody positive at prison entry, however, were significantly more likely to report injecting while in prison. This result suggests that each needle currently in circulation within the SA prison system will almost certainly be contaminated with HCV. This has implications for prison staff and also for susceptible prisoners. Three participants were initiated into injecting during the study.

The results of a the comparative analysis of HCV antibody and PCR assays suggested that the antibody assay is sufficient for epidemiological investigations in high prevalence populations with limited opportunity for follow up.

The risk associated with contaminated needles in prison presents a persuasive argument for a clean needle program of some description, on occupational health and welfare grounds as much as on the grounds of the unacceptable individual risk to prisoners. It seems highly unlikely, however, that this strategy would be accepted in the current culture within DCS and SAPHS. The success of pilot prison NSPs internationally has resulted in increasing dialogue about their usefulness in prisons around the world, and it is important that South Australia participate in this debate. While recognising the impracticalities of implementing a prison NSP in SA at this time, to facilitate pragmatic and open dialogue, the first recommendation from this thesis is:

1. The commissioning of an investigation and report on options for piloting a prison needle and syringe program in the SA prison system.

The prison opiate replacement program, which is well utilised has been positively evaluated, is currently the only systematic prevention strategy for blood borne viruses in the SA prison system. There is evidence that prison officers regard the program with some suspicion, and this may ultimately impact on the effectiveness and sustainability of the program. In order to reduce the probability of this outcome, the second recommendation of this thesis is:

2. Continue to develop and strengthen the prison opiate replacement program and increase confidence in the program. This might be facilitated by:
    i. Ensuring information about the program is shared between SAPHS and DCS staff;
    ii. Reviewing security arrangements involved in the operation of the program and ensuring adequate staffing resources are provided to appropriately undertake these arrangements.

In addition to very high HCV prevalence, the proportion the SA prison population with drug-related and mental health problems is known to be increasing. There is evidence that prison officers feel under educated and ill equipped to deal with infection control issues in their workplace as well as the increasingly complex needs of prisoners in their care. Additionally, there is evidence that recent changes to the staff vaccination program and concern about the adequacy of hand washing facilities are resulting in a general sense of being undervalued among prison officers. The tendency to negatively stereotype prisoners and a lack of

sympathy for rehabilitative and preventive programs seem inevitable outcomes in the context of such resentments. To address some of these issues, the following recommendations of this thesis are:

3. Improve the confidence of DCS staff in their management of communicable disease and infection control issues in their workplace. This might be facilitated by:
    i. Providing increased training and education for prison officers at regular intervals;
    ii. Providing staff with adequate hand washing facilities and encouraging them to wash their hands frequently. Hand washing instructions should be prominently displayed wherever hand washing facilities exist. An appropriate alcohol-based (up to 66%) hand washing gel should be provided where other hand washing facilities are unavailable.

4. Improve the confidence and competence of DCS staff in their management of prisoners with mental and other health issues. This might be facilitated by:
    i. Clearly defining the roles of prison officers and health staff in assessing and managing mental health problems in prisoners;
    ii. Providing correctional staff with specific education on the management of prisoners with mental health problems at regular intervals;
    iii. Supporting correctional staff to update their knowledge of first aid and other emergency procedures.

5. Remove the barriers to prison staff completing their HBV and influenza vaccinations. This might be facilitated by:
    i. Reinstating previous vaccination programs or by otherwise facilitating staff access to immunisation providers.

While one might expect to see some degree of collaboration between DCS and SAPHS in their management of prisoners, there appeared to be a lack of integration between nursing and correctional staff with little awareness of the others' roles, duties and concerns. The contrary perceptions of the prison opiate replacement program and the importance of other issues related to communicable diseases in the prison could be considered manifestations of the lack of integration between the two services. Promoting more integration between the DCS and

SAPHS may achieve a more consistent approach to improve the management of infection control in the prison system. As well improving the well being of prisoners, reducing some of the points of conflict and frustration (as expressed by stakeholders) may potentially improve the working environment of nurses and prison officers. Therefore, the sixth recommendation of this thesis is:

6. Promote a more integrated approach to the management of communicable disease and infection control within the prison system. This might be facilitated by:
    i. Promoting greater communication through regular meetings between key representatives from all stakeholders groups;
    ii. The DCS and the Department of Health working towards the establishment of a prison infection control service that can provide information (including specific advice on relevant aspects of prisoner management), education and training as required to all correctional and health staff.

Stakeholders universally accepted the concept of providing increased and sustained eduction programs about HCV to prisoners, and this thesis found evidence that awareness about HCV transmission was inadequate among the study population. Reducing the number of scalp lacerations associated with hair clippers has the potential to reduce HCV risk in prisons, and the stakeholders also accepted strategies aimed at addressing this issue. Not accepted by the stakeholders, however, was the strategy of providing bleach to prisoners for the purpose of cleaning injecting equipment – although this strategy has been successfully adopted in some Australian prisons. On occupational health and safety as well as on humanitarian grounds, it seems clear that prisoners must be provided with some method of sterilising injecting equipment – especially given a prison NSP is unlikely to be established in SA in the near future.

This thesis has described the increased HCV risk for female and Indigenous prisoners, who may have a number of specific social and mental health issues that may impact on their receptiveness or access to preventive activities. The need to address some of the social causes of offending and re-offending was also identified as an important strategy for reducing the HCV risk associated with imprisonment. To address some of these issues, the following recommendations of this thesis are:

7. Increase the level of specifically targeted HCV prevention education to SA prisoners. This might be facilitated by:
    i. Developing programs that provide information in a sustained way to all prisoners – at entry, throughout the period of imprisonment and prior to release;
    ii. Targeting HCV positive individuals for prevention and education activities. Specifically, the possibility of reinfection (after treatment or with another strain) and prevention of transmission to others should be emphasised;
    iii. Target dedicated preventive services for female prisoners, which are responsive to the social and mental health concerns noted in this group;
    iv. Develop dedicated preventive services for Indigenous prisoners that are sensitive and responsive to the complex needs of this particular group.

8. Provide specific preventive resources within prison to minimise the risk of HCV infection in prison. This might be facilitated by:
    i. Increasing the number of hair clipper guards available to prisoners;
    ii. Providing adequate staffing levels to appropriately supervise prisoners and enforce the use of hair clipper guards at all times;
    iii. Providing a mechanism for the anonymous provision of small quantities of bleach solution to prisoners together with information on adequate sterilising technique.

9. Promote an across-population approach to the management of prisoners within the correctional system. This might be facilitated by:
    i. Commissioning an investigation to report on the social determinants of offending and re-offending in SA;
    ii. Considering developing dedicated 'through-care' services that address the specific social and health disadvantages associated with priority populations, such as female and Indigenous offenders.

This thesis has also identified some areas for further investigation in relation to HCV in prison populations. For instance, an independent association between female sex and HCV

infection was noted in prison entrants after adjusting for prison and community IDU history. Other Australian studies in prison entrants have noted increased HCV risk in female IDU compared to male IDU (Butler et al, 1999). The behavioural, or other factors, that may be increasing the HCV risk for female injectors are yet to be identified. This thesis found that HCV risk varied with age in the summer audit, perhaps reflecting historical trends in injecting practices within distinct population subsets which remain to be fully characterised. The limited stakeholder consultations identified a number of ongoing concerns for prison officers and nurses and highlighted the difficulty in implementing harm reduction strategies successfully in the context of these unresolved issues. A comprehensive qualitative investigation would assist with developing a greater understanding of the concerns touched upon in the stakeholder interviews.

Minimising some of the HCV risk associated with imprisonment also requires an understanding of the impact of incarceration on risk behaviours once prisoners are released into the community. While describing some of the risk behaviours of released prisoners was one of the objectives of this thesis, this important objective could not be met due to a breakdown in administrative processes. The delays experienced resulted from the loss of a key contact within the DCS. It was apparent that the commitment to facilitating ethical research in the SA prison system was not necessarily a uniform ethos. If ongoing, difficulties of this type may severely limit the prospects of further research in the important area of prison health in SA. To address this issue, the final recommendation of this thesis is:

10. Promote a consistent and supportive approach to the management of ethical research within the prison system. This might be facilitated by:
    i. Promoting a greater awareness among the DCS staff of the ability of research to assist the DCS in achieving its corporate objectives and achievement of correctional best practice.
    ii. Considering a formal review of the current processes of the DCS Research Management Committee with a view to improving its ability to guide and facilitate future prison studies.

This thesis has demonstrated that HCV in SA prisons is a significant public health issue. The prison opiate replacement program is the only systematic strategy currently in place in SA prisons. The opiate replacement program is important, but cannot be considered a sufficient approach. Ongoing discussion of any and all strategies beyond this current single strategy is clearly urgently required given the findings in this thesis.

Appendix A Case note audit data collection sheet

Prison______________________

Audit Date __/__/____

Dossier	Entry date	Sex (M/F)	D.O.B.	Indigenous (Y/N)	Test result (+/-/0)

Appendix B Recruitment and follow-up protocol

Hepatitis C in Prisons Study

Recruitment and follow up process

Contact Emma Miller- (08) 8303 3585
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ADELAIDE REMAND CENTRE, YATALA LABOUR PRISON, ADELAIDE WOMEN'S PRISON

Each eligible individual should be offered participation in the study

Each eligible individual should be treated as a NEW recruit, even if they have previously been enrolled

The DOSSIER NUMBER must be inserted on each questionnaire and progress sheet

Participant eligibility:

- Must be 18 years or over
- Must have the mental capacity to understand the purpose of the study and provide signed consent.
- Must be prepared to provide a blood sample for the purposes of HCV testing

Instruments and other components:

1.	Information sheet for prisoners	[*once read, stored in case notes*]
2.	Consent form	[*once signed, stored in case notes*]
3.	Entrance risk factor survey	[*once completed, inserted in sealed box*]
4.	Green progress sheet	[*attached inside case note cover until discharge*]
5.	Follow-up risk factor survey	[*once completed, inserted in sealed box*]
6.	Plastic storage pocket	[*stored in case notes*]
7.	Green study sticker	[*adhered close to spine of case notes*]
8.	Sealed cardboard study box	[*stored in safe location*]

Recruitment session (Researcher)

1. Provide **Information sheet** to each prisoner and discusses project → Prisoner declines → Record date, prison dossier number and sex, as well as the reason for refusal (if provided)

2. Provide **Consent form** to participant
   - Observe (or assist) participant reading and signing form
   - Sign and complete "witness" section

   → Retain signed **Consent form** and **Information sheet** (for inclusion in health case notes)

3. Provide **Entrance risk factor survey** to participant
   - Participant completes survey (assist if necessary)

   → Enter prison dossier number on completed survey
   - Fold and insert survey into **sealed study box**

4. **Prepare participant case notes**
   - Place green sticker prominently on outside spine of case notes
   - Staple **Progress sheet** to inside of front cover

   → Insert signed **Consent form** and **Information sheet**
   - Enter date of enrolment, prison dossier number and tick consent box at top of **Progress sheet**
   - Complete section 1. ("recruitment") of **Progress sheet**

Hepatitis C in Prisons Study

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After recruitment (SAPHS staff)

5. Take blood sample from participant (researcher to provide list) →
   - Enter date of test (or tick "refused") in section 1. ("recruitment") of **Progress sheet**
   - Send blood sample off to IMVS in usual manner
   - When test result returns administer in normal manner, but also tick test result box in section 1. ("recruitment") of **Progress sheet**

Three-monthly follow-ups (SAPHS staff)

1. Recall participant for follow-up (researcher to advise) in health centre → Prisoner declines →
   - Enter date of contact in section 2. ("three-month follow-up") of **Progress sheet** and tick "refused"

2. Provide **Follow-up risk factor survey**
   Participant completes survey (assist if necessary) →
   - Enter prison **dossier number** and **date** on completed survey
   - Fold and insert survey in **sealed study box**
   - Enter date of follow up in section 2. ("three-month follow-up") of **Progress sheet**

3. **Only if HCV-negative at last test**
   Take blood sample from participant →
   - Enter date of test (or tick "refused") in section 2. ("three-month follow-up") of **Progress sheet**
   - Send blood sample off to IMVS in usual manner
   - When test result returns administer in normal manner, but also tick test result box in section 2. ("three-month follow-up") of **Progress sheet**

Repeat process at each follow up completing the details at the relevant section of the ***Progress sheet*** *(ie section 3 "six-month follow-up", section 4 "nine-month follow-up", section 5 "twelve-month follow-up")*

- If participant is discharged, complete discharge date on **Progress sheet,** remove sheet from case notes and insert in sealed box
- Enter prison dossier number and date on **Participation sheet** (on clipboard) and tick "DISCHARGED"

Appendix C Participant progress sheet

Date of study enrolment (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

Consent signed (please tick) ☐

DCS Dossier No.

Hepatitis C in Prisons Study – progress sheet

1 Recruitment

1.1. Date of entry/admission to correctional facility (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

1.2. Participant date of birth (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

4.3. Does the participant identify as Aboriginal or Torres Strait Islander?

1.4. Date of HCV-antibody test (dd/mm/yyyy): _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **anti-HCV** ☐ **Pos⁺**

---

2 Three -month follow-up

2.1. Date of follow-up (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

Only complete 2.2 and where the participant tested HCV-negative at time of recruitment:

2.2. Date of HCV-antibody test (dd/mm/yyyy): _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **anti-HCV** ☐ **Pos⁺**

2.3. Date of PCR-RNA test **if applicable**: _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **PCR** ☐ **Pos⁺**

---

3 Six -month follow-up

3.1. Date of follow-up (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

Only complete 3.2 where the participant tested HCV-negative at time of three-month follow-up:

3.2. Date of HCV-antibody test (dd/mm/yyyy): _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **anti-HCV** ☐ **Pos⁺**

---

4 Nine -month follow-up

4.1. Date of follow-up (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

Only complete 4.2 where the participant tested HCV-negative at time of six-month follow-up:

4.2. Date of HCV-antibody test (dd/mm/yyyy): _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **anti-HCV** ☐ **Pos⁺**

---

5 Twelve -month follow-up

5.1. Date of follow-up (dd/mm/yyyy): _ _ /_ _ /_ _ _ _

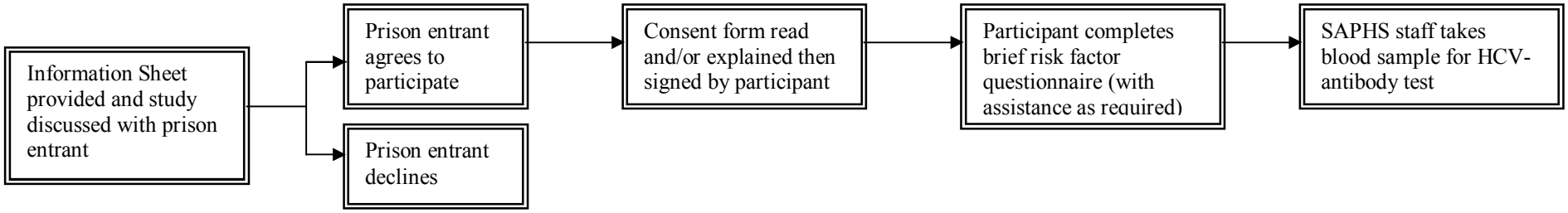
Only complete 5.2 where the participant tested HCV-negative at time of nine-month follow-up:

5.2. Date of HCV-antibody test (dd/mm/yyyy): _ _ /_ _ /_ _ _ _ **RESULT**: ☐ **Refused** ☐ **Neg⁻** **anti-HCV** ☐ **Pos⁺**

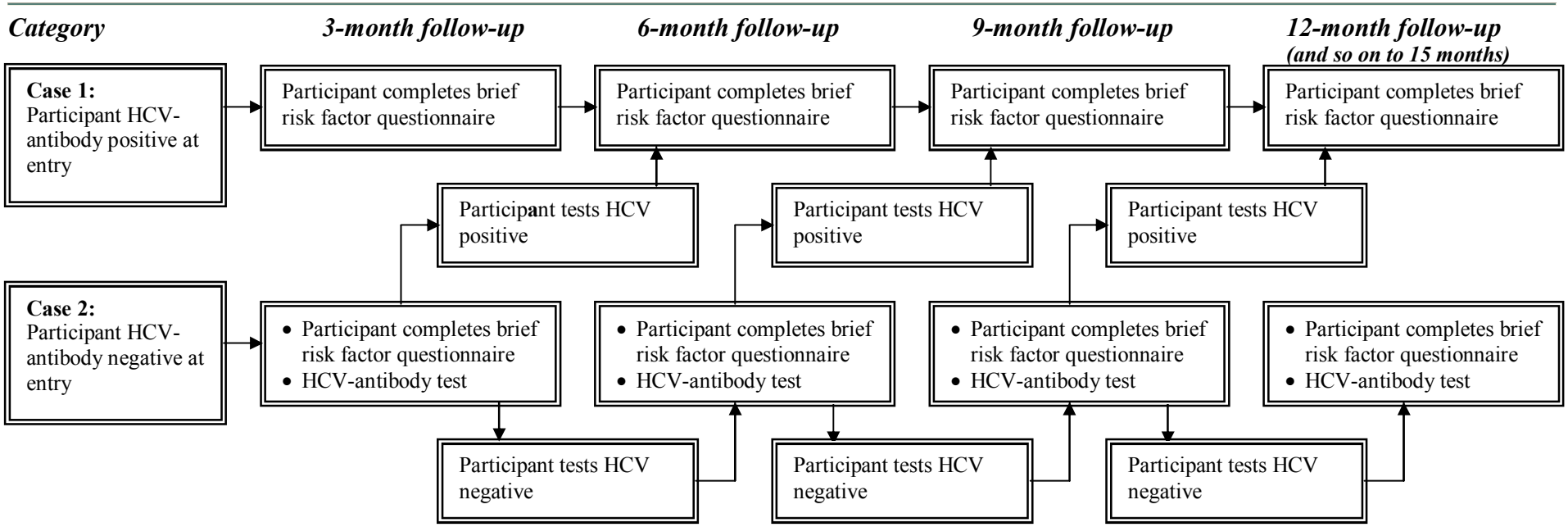
DISCHARGE DATE (dd/mm/yyyy): _ _ / _ _ / _ _ _ _

Appendix D Prison participant pathways

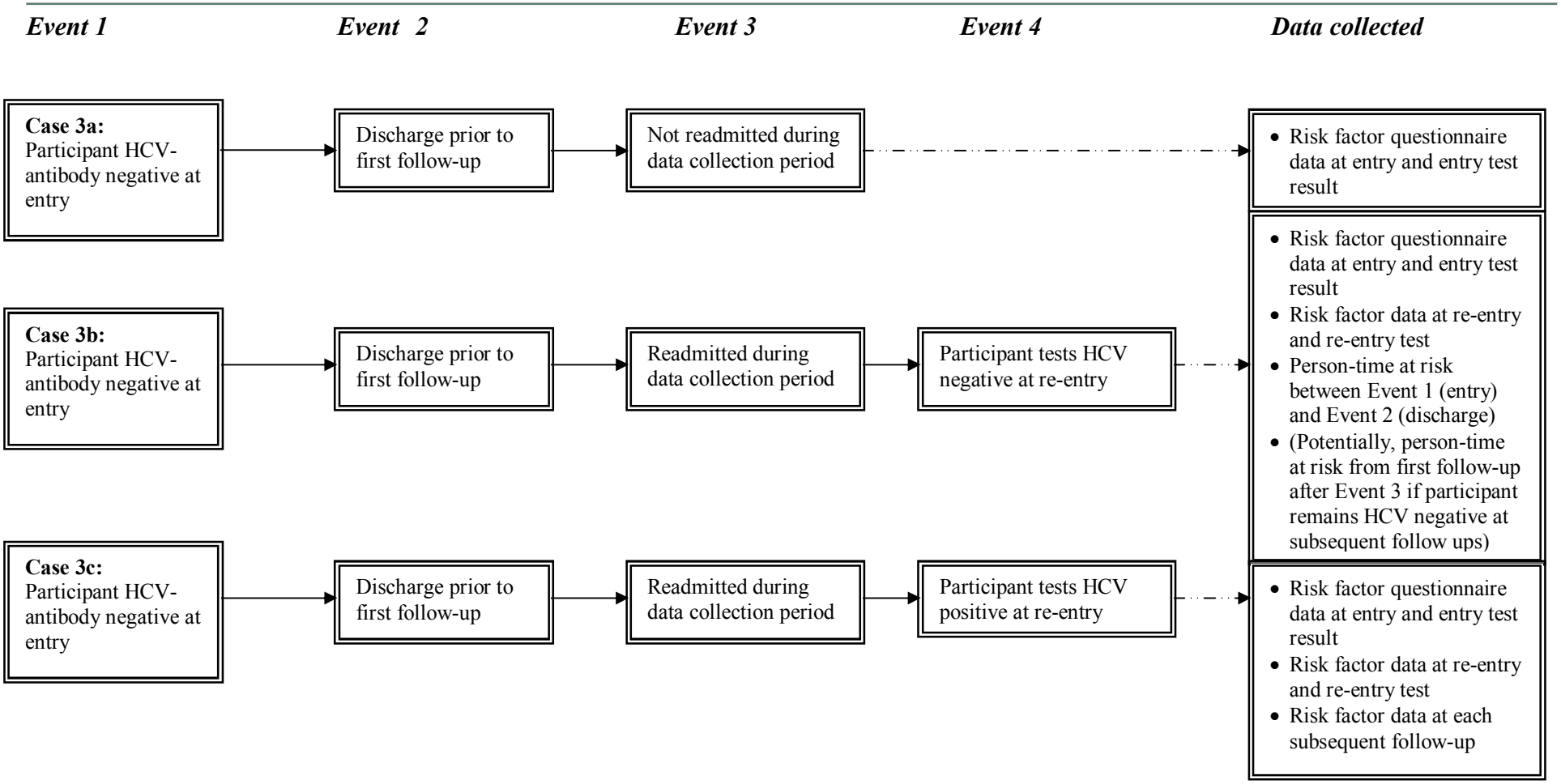
Recruitment: during period of initial health assessment for all prison entrants



Study pathways: from recruitment for all participants



Alternate study pathways: from recruitment



Appendix E Risk factor surveys

Office Use only	DCS Dossier No.

Hepatitis C in Prisons Study

Entrance risk factor survey

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Date (dd/mm/yyyy)**:** _ _/_ _/_ _

For each question, please tick the box over the most correct answer ✓

Question 1. Have you got any tattoos that were done outside of prison?

☐ none ☐ 1 or 2 tats ☐ 3 to 5 tats ☐ more than 5 tats

Question 2. If you have been in prison before, did you ever get tattoos done (or do them yourself) while you were locked up (including on remand)?

☐ this is my first time in prison ☐ none ☐ 1 or 2 tats ☐ 3 to 5 tats ☐ more than 5 tats

Question 3. Have you ever injected drugs outside of prison?

☐ never ☐ hardly ever ☐ sometimes ☐ heaps ☐ all of the time

Question 4. Have you ever shared needles (or fits, pins, works) outside of prison?

☐ never ☐ hardly ever ☐ sometimes ☐ heaps ☐ all of the time

Question 5. If you have been in prison before, did you ever inject drugs while you were locked up (including on remand)?

☐ this is my first time in prison ☐ never ☐ hardly ever ☐ sometimes ☐ heaps ☐ all of the time

Question 6. If you have been in prison before, did you ever share needles (or fits, pins, works) while you were locked up (including on remand)?

☐ this is my first time in prison ☐ never ☐ hardly ever ☐ sometimes ☐ heaps ☐ all of the time

Thankyou for completing this survey

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Hepatitis C in Prisons Study

Follow-up risk factor survey

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Date (dd/mm/yyyy)**:** _ _/_ _/_ _

For each question, please tick the box over the most correct answer

REMEMBER, YOUR ANSWERS ARE STRICTLY CONFIDENTIAL AND WIL NOT BE PASSED ON TO ANYONE BUT THE RESEARCHER, EMMA MILLER, UNIVERSITY OF ADELAIDE

Question 1. Since you've been in prison (*only this time, even if you've been locked up before*) have you got any tattoos done or do them for yourself?

- ☐ none
- ☐ 1 or 2 tats
- ☐ 3 to 5 tats
- ☐ More than 5 tats

Question 2. If you have done any tattoos done since you've been in prison, did you use the same tattooing equipment that some else had used?

- ☐ I haven't done tats in prison
- ☐ never
- ☐ only once or twice
- ☐ 3 to 5 times
- ☐ more than 5 times

Question 3. Since you've been in prison (*only this time, even if you've been locked up before*) have you injected (or hit up) drugs?

- ☐ never
- ☐ only once
- ☐ 2 times
- ☐ 3 to 5 times
- ☐ more than 5 times

Question 4. If you have injected drugs since you've been in prison, did you ever use the same needles (or fits, pins, works) that someone else had used?

- ☐ I haven't hit up in prison
- ☐ never
- ☐ only once
- ☐ 2 times
- ☐ 3 to 5 times
- ☐ more than 5 times

Question 5. If you have shared or re-used injecting gear (needles and syringes) since you've been in prison, how did you clean them? (*for this question you can tick more than one box*)

- ☐ I haven't hit up in in prison
- ☐ I don't clean my gear
- ☐ cold or warm water only
- ☐ boil in water
- ☐ soap or detergent and water
- ☐ bleach

Thankyou for completing this survey

Office Use only	DCS Dossier No.

Hepatitis C in Prisons Study

Post-release risk factor survey

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Date (dd/mm/yyyy)**:** _ _/_ _/_ _

For each question, please tick the box over the most correct answer

REMEMBER, YOUR ANSWERS ARE STRICTLY CONFIDENTIAL AND WIL NOT BE PASSED ON TO ANYONE BUT THE RESEARCHER, EMMA MILLER, UNIVERSITY OF ADELAIDE

Question 1. If you got any tattoos done when you were last in prison, did you ever use the same tattooing equipment that some else had used?

- ☐ I didn't get tats in prison
- ☐ never
- ☐ only once or twice
- ☐ 3 to 5 times
- ☐ more than 5 times

Question 2. Since you've been outside, have you used or would you use someone else's tattooing equipment?

- ☐ I wouldn't get tats outside
- ☐ No, I'd go to a tat shop
- ☐ Yes, but only after cleaning it
- ☐ Yes, and I wouldn't bother cleaning it

Question 3. If you ever injected drugs when you were last in prison, did you ever use the same needles (or fits, pins, works) that someone else had used?

- ☐ I didn't hit up in prison
- ☐ never
- ☐ only once
- ☐ 2 times
- ☐ 3 to 5 times
- ☐ more than 5 times

Question 4. Since you've been outside, have you used or would you use the same needles that someone else had used?

- ☐ I wouldn't hit up outside every time
- ☐ No, I'd use a new one of my own
- ☐ No, I'd only re-use one cleaning it
- ☐ Yes, but only after cleaning it
- ☐ Yes, and I wouldn't bother

Question 5. Now you're outside, if you had to share or re-use injecting gear (needles and syringes) how would you clean them? (*for this question you can tick more than one box*)

- ☐ I wouldn't hit up outside gear
- ☐ I wouldn't clean my
- ☐ cold or warm water only
- ☐ soap or detergent and water
- ☐ boil in water
- ☐ bleach
- ☐ you can never really clean gear

Thankyou for completing this survey

Appendix F Stakeholder consultation interview schedule

Hepatitis C in Prisons Study
Stakeholder interview

THE UNIVERSITY OF ADELAIDE AUSTRALIA

1. Welcome and introductions (3 minutes)
    a. Aims of the study and aim of the focus group
    b. House keeping (tape recording, speaking one at a time etc)

2. How important is hepatitis C as an issue in their work place (7 minutes)
    a. Can you elaborate on why HCV is or is not an issue?
    b. Are the infection control measures currently in place in your work environment sufficient to protect you from HCV transmission?

3. Provide summary of HCV prevalence results so far and go through the results with the group (5 minutes)

> In 2005, a complete case note audit was undertaken in all SA prisons, with the exception of Mount Gambier Prison.
>
> From the audit, up to 42% of all prisoners were found to have serological evidence of hepatitis C infection.
>
> Broken down by sex, 40% of male prisoners and 66% of female prisoners had at some stage tested positive for hepatitis C antibodies.
>
> In the general community, about 1% of people have hepatitis C.

4. Does anybody have any thoughts about the summary (10 minutes)
    a. Is there any surprise about the numbers or is this what people expected?
    b. Have you been provided with this sort of information previously?
    c. Does having this information now change your views about the priority of HCV as an issue in your work place?

5. How important are the following as issues in your work place (10 minutes)
    a. Communicable diseases in general (eg respiratory /gastro / blood borne)
        - Elaborate?
    b. Infection control in particular (eg HBV vaccination / blood protocols / laundry handling)
        - Elaborate?

6. Briefly explain that a number of people working in the area, including correctional staff, have been concerned for some time about the high prevalence of HCV in prisons – particularly from an occupational health and safety perspective (10 to 15 minutes):
    a. Comment on the range of strategies suggested for reducing the transmission of HCV and other blood borne virus:
        - Education strategies (prisoners and staff) on infection control
        - Bleach provision
        - Providing single use/sterilisable hair clipper guards
        - Training prisoners to provide tattoos to other prisoners
        - Providing professional tattooing services
        - Ad hoc provision of injecting equipment (eg on request)
        - European-style, regulated prison NSP services
        - Supervised injecting rooms
    b. Have you thought of any other strategies, not named above, which might help to reduce HCV transmission in prisons?

7. Do you have any other concerns in relation to HCV or other communicable diseases that you would like to discuss (up to 10 minutes)?

Appendix G Consent forms

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Hepatitis C in Prisons Study

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

CONSENT TO PARTICIPATE IN THE STUDY

1. I, ……..... *(please print your name)* consent to take part in the research project called:

   Hepatitis C in Prisons Study

2. I acknowledge that I have read the Information Sheet called:

   Information about the Hepatitis C in Prisons Study

3. The whole project has been explained to me and I am giving my consent freely.

4. I have been informed that I will need to have one or more blood tests as a part of my participation in the study

5. Although I understand that the purpose of this study is to improve the health of people in prison settings, it has been explained to me that I may not get any direct benefit from my participation.

6. I have been informed that my name and personal information will not be passed on to anyone outside of the health team, even if the overall results of the study are published.

7. I have the right to refuse to provide any piece of information that I don't wish to give

8. I understand that I can withdraw from the study at any time, and this will not affect my management in the prison system or after I'm released, now or in future.

9. I am aware that a copy of this consent form, after it has been signed, as well as the Information Sheet I was given will be kept with my health centre notes for future reference.

……

(please sign here) *(please write date)*

WITNESS

I have described to …… *(name of participant)*

the nature of the procedures to be carried out. In my opinion she/he understood the explanation

Position: ……

Name *(please print)*: ……..

……

(please sign here) *(please write date)*

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Hepatitis C in Prisons Study

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

CONSENT TO PARTICIPATE IN THE PRISON OFFICER CONSULTATION

1. I, ……..... *(please print your name)*

   consent to take part in the research project called:

   Hepatitis C in Prisons Study

2. I acknowledge that I have read the Information Sheet called:

   Information about the Hepatitis C in Prisons Study

3. I have had the project, so far as it affects me, fully explained to my satisfaction by the researcher. My consent is given consent freely.

4. Although I understand that the purpose of this study is to reduce the number of people infected with hepatitis C in prison settings, it has been explained to me that my involvement may not be of any benefit to me.

5. I have been informed that my name and personal information will not be passed on to anyone, even if the overall results of the study are published.

6. I am aware that some of proceedings within the focus group will be audio-taped

7. I have the right to refuse to provide any piece of information that I don't wish to give

8. I understand that I am free to withdraw from the project at any time, and this will not affect my working relationships in the prison system, now or in future.

9. I am aware that I should retain this consent form, when completed, and the attached Information Sheet.

……..

(please sign here) *(please write date)*

WITNESS

I have described to …… *(name of participant)*

the nature of the procedures to be carried out. In my opinion she/he understood the explanation

Position: ……

Name *(please print)*: ……..

……..

(please sign here) *(please write date)*

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Hepatitis C in Prisons Study

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

CONSENT TO PARTICIPATE IN THE SA PRISON HEALTH CONSULTATION

10. I, ……..... *(please print your name)*

    consent to take part in the research project called:

    Hepatitis C in Prisons Study

11. I acknowledge that I have read the Information Sheet called:

    Information about the Hepatitis C in Prisons Study

12. I have had the project, so far as it affects me, fully explained to my satisfaction by the researcher. My consent is given consent freely.
13. Although I understand that the purpose of this study is to reduce the number of people infected with hepatitis C in prison settings, it has been explained to me that my involvement may not be of any benefit to me.
14. I have been informed that my name and personal information will not be passed on to anyone, even if the overall results of the study are published.
15. I am aware that some of proceedings within the focus group will be audio-taped
16. I have the right to refuse to provide any piece of information that I don't wish to give
17. I understand that I am free to withdraw from the project at any time, and this will not affect my working relationships in the prison system, now or in future.
18. I am aware that I should retain this consent form, when completed, and the attached Information Sheet.

……

(please sign here) *(please write date)*

WITNESS

I have described to …… *(name of participant)*

the nature of the procedures to be carried out. In my opinion she/he understood the explanation

Position: ……

Name *(please print)*: ……..

……

(please sign here) *(please write date)*

Appendix H Information sheets

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Information about the Hepatitis C in Prisons Study

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

What and why?
Hepatitis C is a virus that gets into the blood and can cause liver damage in some people. There are treatments available, as well as some other things people who are infected can learn to keep well and not spread the virus on to other people. But it's also a good idea to find out if you might be doing things that make you more likely to become infected so that you don't get it in the first place.

Although heaps of people on the outside have hepatitis C, nearly everyone realises that people are even more likely to get infected if they have been locked up. Nobody really knows just how many people in prison have hepatitis C when they come in or during the time they are inside. Nobody is even exactly sure about how they are passing it around inside, but sharing needles and tattoo equipment is thought to be the main way.

The Hepatitis C in Prisons Study is being done (by Emma Miller, who is doing a PhD at the University of Adelaide) to find out all about these things – who has it, who gets it while they're locked up (or is likely to) and how. Once these things are known for sure, it will be a big help in working out how to stop so many people becoming infected when they've already got lots of other things to worry about.

How can you help?
You can be the biggest help by agreeing to participate in the *Hepatitis C in Prisons Study*, which will be going on for about a year. I'm afraid there is no payment, or other immediate reward, but your involvement may help to make being locked up far less dangerous for everyone that comes inside in the future. People who turn out to have hepatitis C can get a start on keeping healthy and avoiding infecting others inside and after they're released. Of course, you can get a test whether or not you agree to join the study, but by just answering a few questions you could make a big difference when it comes to making the right changes in the future.

What do you have to do to be in the study?
In the first place, all you have to do is answer a few questions about tattoos and drugs and have a blood test for hepatitis C. You will need a test even if you think you already have the virus. The questions are not hard and should take you only a couple of minutes or less. The nurse can help you if you have any trouble at all.
If you are still inside then, it would be good if you could answer a few very similar questions every three months and you may have to have another blood test. If you get released during the 12 months of the study, it would be great for the researchers to catch up with you on the outside. The best place would be to meet when you meet with a parole officer (if you have one) or at your local community health centre at a time that suits you. This visit would involve you answering the same few questions but with no blood test.

You don't have to answer any question that makes you feel uncomfortable.

This is a research project and you do not have to participate in it. Even if you start participating in the study, you can stop at any time.

The South Australian Health Department requires notification of all positive hepatitis C results, from inside or outside prison. You can be assured, however, that none of your answers to the questionnaire will be passed on to the Department with the notification. The notification will not be linked to this study in any way.

What can go wrong?
Some people may find out that they have hepatitis C already, or find out they get it at some time during the study – this might be a bit of a shock. If this happens to you, prison health centre nurses know a lot about hepatitis C and can provide you with good advice about how to look after yourself, what you need to do next and who you can contact for support.

Having a blood test can sting a bit at the time the sample is taken, but not much blood is taken and there are no other side effects. Some people may be taking medications (such as aspirin, warfarin, some anti-inflammatory drugs or herbal extracts such as gingko) that make their blood thinner than usual and this can lead to a little bit of bleeding or bruising after a blood test. Just to be on the safe side, ask the nurse if any medications or herbal therapies you are taking can thin your blood. The nurse can also tell you if you need to stop taking these medications for a few days before the test or if it is more important for you to keep taking them.

Some people might be concerned that the information that they provide will be passed on. The researcher will use your prison identification number (but not your name) so that you can be followed up during the period information is still being collected – between 3 to 12 months, depending on when you agree to join the study. In principle, the information obtained about you during this period could be used in a civil case, as is the situation with any other study. I must emphasise, however, that this is extremely unlikely – in fact it has never happened in a prison study.

The information you provide will be stored away from the prison in a secure place at the University of Adelaide. At the end of the data collection period, prison identification numbers will be removed. After this time, no one will be able to link any information you have provided with your name or identity. Only the information provided by all participants lumped together will ever be presented or reported at the end of the study.

If you have a question or a problem or even want to make a complaint, the health staff will pass your message to Emma Miller (the Researcher) who will try to make sure you get an answer right away.

How do I join up?
If you would like to participate, a Consent Form is attached for you to sign. The Information Sheet and the Consent Form will be kept with your health centre case notes if you want to look at them again.

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Information about the Hepatitis C in Prisons Study
- For Prison Officers

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

Background and aims

Hepatitis C is a blood-borne virus that can eventually cause liver damage in some people. While there are treatments available, preventing it spreading in the first place is almost certainly the best strategy – especially since most people who become infected will stay that way.

Hepatitis C is a very common infection - around 1.5% of people in the general Australian community have it. In the prisons, however, it is thought that 50% or more of the population might be infected. So far, there have been very few studies of hepatitis C in Australian prisons, and even less in South Australia. Because of this, it has been difficult to estimate the number of prisoners actually infected or exactly how they might be spreading it around. Generally, sharing un-sterilised injecting and tattooing equipment is thought to be the most common way people become infected. Social contact, sharing food, drinks or cigarettes does not spread the virus and sexual transmission hardly ever occurs. Even sex with someone who already has hepatitis C doesn't seem to be a common way of getting infected.

The Hepatitis C in Prisons Study is being done by Emma Miller, as a PhD project for the University of Adelaide, to find out the patterns of hepatitis C infection in the South Australian prison system: who has it already; who gets it while they're inside (or is likely to); and how they are actually passing it around. It's hoped that finding the answers to these questions will help to create appropriate and effective recommendations for reducing the number of hepatitis C infections in prisons. An important part of the study will be to talk with prison officers about hepatitis C to seek their input in the development of strategies for the future.

The study

The study has three main parts in the prison setting, which will be held over a 12-month period:

1. Participating prisoners will have an HCV test when and complete a risk factor surveys at they time they come inside and then every three months until they are released or the study period ends (whichever comes first). Some will also be followed up after they released.
2. Two prison health care centre case note audits will occur in each prison centre (with the exception of Mount Gambier) in which documented history of previous HCV-testing will be determined.
3. A discussion group with prison officers is planned where I will present brief scenarios about situations where hepatitis C might be an issue, but otherwise let people freely discuss any concerns they might have about hepatitis C and how they believe would be the best ways to help minimise its spread in prison.

How can you help?
The best way that you can help the Hepatitis C in Prisons Study is by agreeing to participate in the Prison officer consultation. There will be three identical groups held in a central location, so that hopefully everyone who wants to will be able to attend. It is expected that they will take about an hour and a half each. The main discussion will be tape-recorded, with your permission, so that I don't miss any of your comments. After the discussion has been transcribed into text, the original tape will be destroyed.

I'm afraid there is no payment available for your participation, but your involvement may help to create a far safer environment for prisoners and prison officers in the future. Your comments and ideas will make an important contribution to the development (and implementation) of policies aimed at reducing the number of prisoners becoming infected with hepatitis C.

You don't have to discuss anything that makes you feel uncomfortable.

Please be assured that no information you give will be passed on to anyone else (in the prison system or outside of it) and your identity will remain completely confidential.

This is a research project and your participation is voluntary. Even if you agree to participate you may withdraw from the study at any time.

Is there a catch?
Some people might be concerned that the information they provide will be passed on to others in a way that might identify them. The names of focus group participants will not be recorded and no comments will be attributed to anyone in particular. Mainly, only the broad themes and ideas of all participants lumped together will be presented or reported at the end of the study. If particular comments are quoted, this will be done in a way that does not lead to the identification of the participant or even which focus group they attended. Even so, the information will be kept in a secure place outside of the prison at the University of Adelaide where only the researcher can access it.

If you have a question or a problem or even want to make a complaint, a form providing all the contact details you might need is attached to this Information Sheet.

How do I join up?
If you would like to participate, a Consent Form is attached for you to sign. You should keep this Information Sheet and the Consent Form for your records

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Information about the Hepatitis C in Prisons Study
- For SA Prison Health staff

Ms Emma Miller, Dr Peng Bi, Associate Professor Phil Ryan -University of Adelaide

Background and aims

Hepatitis C is a blood-borne virus that can eventually cause liver damage in some people. While there are treatments available, preventing it spreading in the first place is almost certainly the best strategy – especially since most people who become infected will stay that way.

Hepatitis C is a very common infection - around 1.5% of people in the general Australian community have it. In the prisons, however, it is thought that 50% or more of the population might be infected. So far, there have been very few studies of hepatitis C in Australian prisons, and even less in South Australia. Because of this, it has been difficult to estimate the number of prisoners actually infected or exactly how they might be spreading it around. Generally, sharing un-sterilised injecting and tattooing equipment is thought to be the most common way people become infected. Social contact, sharing food, drinks or cigarettes does not spread the virus and sexual transmission hardly ever occurs. Even sex with someone who already has hepatitis C doesn't seem to be a common way of getting infected.

The *Hepatitis C in Prisons Study* is being done by Emma Miller, as a PhD project for the University of Adelaide, to find out the patterns of hepatitis C infection in the South Australian prison system: who has it already; who gets it while they're inside (or is likely to); and how they are actually passing it around. It's hoped that finding the answers to these questions will help to create appropriate and effective recommendations for reducing the number of hepatitis C infections in prisons. An important part of the study will be to talk with prison health staff about hepatitis C to seek their input in the development of strategies for the future.

The study

The study has three main parts in the prison setting, which will be held over a 12-month period:

1. Participating prisoners had an HCV test and completed a risk factor surveys at the time they came inside and then every three months until they are released or the study period ends (whichever comes first). Some will also be followed up after they released.
2. Two prison health care centre case note audits occurred in each prison centre (with the exception of Mount Gambier) in which documented history of previous HCV-testing were determined.
3. Discussion groups with prison officers and SA Prison Health nurses are planned where we can discuss any concerns people might have about hepatitis C and how they believe would be the best ways to help minimise its spread in prison.

How can you help?
The best way that you can help the Hepatitis C in Prisons Study is by agreeing to participate in the SA Prison Health consultation. The main discussion will be tape-recorded, with your permission, so that I don't miss any of your comments. After the discussion has been transcribed into text, the original tape will be destroyed.

I'm afraid there is no payment available for your participation, but your involvement may help to create a far safer environment for prisoners, prison officers and SA Prison Health staff in the future. Your comments and ideas will make an important contribution to the development (and implementation) of policies aimed at reducing the number of prisoners who are infected with hepatitis C in your work environment.

You don't have to discuss anything that makes you feel uncomfortable.

Please be assured that no information you give will be passed on to anyone else (in the prison system or outside of it) and your identity will remain completely confidential.

This is a research project and your participation is voluntary. Even if you agree to participate you may withdraw from the study at any time.

Is there a catch?
Some people might be concerned that the information they provide will be passed on to others in a way that might identify them. The names of focus group participants will not be recorded and no comments will be attributed to anyone in particular. Mainly, only the broad themes and ideas of all participants lumped together will be presented or reported at the end of the study. If particular comments are quoted, this will be done in a way that does not lead to the identification of the participant. Even so, the information will be kept in a secure place outside of the prison at the University of Adelaide where only the researcher can access it.

If you have a question or a problem or even want to make a complaint, a form providing all the contact details you might need is attached to this Information Sheet.

How do I join up?
If you would like to participate, a Consent Form is attached for you to sign. You should keep this Information Sheet and the Consent Form for your records

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