

# Prevalence of and risk factors for hepatitis C in Aboriginal and non-Aboriginal adolescent offenders

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In 2005, the National Hepatitis C Strategy recognised three populations at greatest risk of the spread of hepatitis C: Indigenous Australians who engaged in risk-taking behaviour, people in custody, and injecting drug users.<sup>1</sup> The focus has been on intervening in adults, and very limited data and attention have focused on adolescents. Recent estimates from Aboriginal communities indicate that over 22 000 Aboriginal Australians (4.4%) have been exposed to the virus, giving a prevalence at least four times that of the total Australian population.<sup>2</sup> The importance of hepatitis C is often overlooked as it is considered an asymptomatic, slowly progressive infectious disease leading to the development of cirrhosis in only 5%–15% of all patients after a mean duration of 30 years.<sup>3</sup> However, in Aboriginal populations, high overall rates of diabetes<sup>4</sup> and alcohol use<sup>5</sup> are likely to be responsible for coexisting liver injury. In this context, there is an increased rate of and reduced time to the development of hepatitis C-related end-stage liver disease. Defining the prevalence of and risk factors for hepatitis C in this population is important and presents an opportunity to prevent transmission and reduce the future burden of this disease.

This study, part of a comprehensive survey of the physical and mental health needs of a large cohort of young offenders in custody or on community orders,<sup>6</sup> provided a unique opportunity to examine the risk factors and prevalence of hepatitis C among high-risk Aboriginal adolescents. Our specific aims were (i) to compare and contrast the health-related behaviour of Aboriginal and non-Aboriginal adolescents; (ii) to determine any differences in the risk factors for hepatitis C positivity; and (iii) to examine participants' understanding of hepatitis C transmission with a view to future educational interventions.

## METHODS

Young offenders aged 12–19 years in custody (242 of a total of 319) or serving community-based supervision orders (800 from a sampling frame of 2822) at 22 of the 36 Department of Juvenile Justice (DJJ) community offices throughout the state of New South

## ABSTRACT

**Objectives:** To define and compare the prevalence, risk factors and understanding of hepatitis C transmission among Aboriginal and non-Aboriginal young offenders.

**Design, participants and setting:** Cross-sectional study of young offenders (aged 12–19 years; median age, 16.6 years) in custody or serving community orders with the New South Wales Department of Juvenile Justice who participated in a physical and mental health survey between March 2002 and December 2005, and who provided blood samples for analysis of biochemistry, bloodborne viruses and sexually transmitted infections.

**Main outcome measures:** Risk factors and prevalence of hepatitis C antibody positivity.

**Results:** Of the 1042 young offenders studied, 709 provided blood samples, 179 (25%) of whom identified as Aboriginal. Aboriginal adolescents had more markers of social disadvantage and higher rates of hepatitis B (9.6% v 5.2%;  $P = 0.04$ ) than non-Aboriginal young offenders. Hepatitis C rates were high in both groups (7.3% v 5.3%;  $P = 0.33$ ). Risk factors for hepatitis C were the same in both groups, the most important being injecting drug use (OR, 19;  $P < 0.001$ ) and prior use of heroin (OR, 15;  $P < 0.001$ ). Current custodial sentence doubled the risk of hepatitis C. Knowledge of hepatitis C transmission was very poor in both groups, with over 50% not knowing how it is transmitted and fewer than 10% able to identify sharing needles as a risk.

**Conclusions:** Hepatitis C rates are extremely high in all young offenders, and interventions to halt its spread are urgently needed. Aboriginal adolescents, who are over-represented in this population, are particularly at risk.

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Wales participated in a wide-ranging health survey between March 2002 and December 2005. Fourteen offices were not sampled on account of geographical distance or low numbers of eligible participants. Adolescents (50 from the custody sample; 100 from the community orders sample) were excluded if they had serious mental health problems, were experiencing substance withdrawal, were considered to be too violent or disruptive by DJJ staff, or had court appearances or were admitted into custody on the day of the survey. These exclusions may have resulted in underestimation of some outcomes. People eligible but unwilling to participate (27 from the custody sample; 1922 from the community orders sample) did not differ from participants on the basis of age, sex, ethnicity, length of order or type of offence, although they tended to be older and cited study or work commitments as impediments to participation.

Sixty-five per cent of the custody sample had spent 1 year or less in custody at the time of the study. Aboriginal and non-Aboriginal

offenders had each spent an average of 306 days in custody.

The survey investigated a number of health-related behaviours, including alcohol and drug use, exercise, diet, sexual practices and body piercing. Standard demographic data were collected, as were medical and social histories. All participants were asked to give blood samples for assay for bloodborne viruses and sexually transmitted infections. Hepatitis C antibody was measured by an enzyme immunoassay on an Abbott AxSYM instrument (Abbott Diagnostics, Abbott Park, Ill, USA). Given the importance of preventable risk factors in reducing hepatitis C transmission, such as sharing needles, we also assessed adolescents' understanding of how the virus is transmitted.

Ethical approval was independently granted by the University of Sydney's Human Research Ethics Committee, the Research Applications Subcommittee of the DJJ's Collaborative Research Unit, the Human Research and Ethics Committee of Justice Health (formerly Corrections Health) and the Aboriginal Health

**1 Comparison of baseline characteristics of 179 Aboriginal and 530 non-Aboriginal adolescents**

	Aboriginal	Non-Aboriginal	P
Mean age (years)	16.3 (±1.3)	16.7 (±1.3)	<0.001
Male	146 (81.6%)	472 (89.1%)	0.01
Current sentence			
On community order	95 (53.1%)	417 (78.7%)	<0.001
In custody	84 (46.9%)	113 (21.3%)	
Social disadvantage			
Parents ever in custody	100 (58.1%)	126 (24.4%)	<0.001
One or both parents deceased	22 (12.6%)	48 (9.2%)	0.21
Ever placed in care	61 (35.3%)	116 (22.4%)	<0.001
Drug use			
Injected drugs	32 (18.6%)	70 (13.4%)	0.09
Heroin	28 (16.3%)	79 (15.1%)	0.72
Amphetamines	80 (46.5%)	263 (50.4%)	0.38
Cocaine	25 (14.5%)	106 (20.3%)	0.09
Alcohol use			
Safe or none	75 (43.6%)	138 (26.6%)	<0.001
Hazardous	97 (56.4%)	381 (73.4%)	
Bloodborne virus serological status			
Hepatitis B sAg positive	6 (3.4%)	6 (1.1%)	0.05
Hepatitis B cAb positive	17 (9.6%)	27 (5.2%)	0.04
Hepatitis C Ab positive	13 (7.3%)	28 (5.3%)	0.33
HIV positive	0	0	—
Any sexually transmitted infections	37 (21.5%)	113 (21.6%)	0.99
Body piercings or tattoos	97 (56.7%)	298 (57.3%)	0.89

sAg = surface antigen. cAb = core antibody. Ab = antibody.



and Medical Research Council of NSW Ethics Committee. Written informed consent was required as a condition of participation. Parental consent was required for participants under the age of 14 years.

### Statistical analyses

Statistical analyses were performed using SPSS, version 15.0 (SPSS Inc, Chicago, Ill, USA), and a significance level of 5% was used throughout. Results are reported as means ± standard deviation or number (percentage) as appropriate. Continuous variables were compared using the two-tailed Students' *t* test, and categorical data were compared using the  $\chi^2$  test. Pairwise interactions measured by binary logistic regression were analysed to determine whether Aboriginality was a significant interactor when risk factors for hepatitis C were considered. Factors with  $P \leq 0.1$  on univariate analysis were further analysed with a multiple logistic regression model with stepwise elimination of variables to identify the independent determinants of outcome.

### RESULTS

Of the 1042 adolescents studied, 709 (68%) provided blood samples and full survey data. The most common reason for refusing a blood test was not liking needles or the sight of blood, uncertainty about how the blood would be used despite reassurances, and having undergone recent blood tests. There were no significant differences in the factors outlined above between those tested and those who refused. The baseline characteristics of those undergoing full serological testing are shown in Box 1. Aboriginal adolescents accounted for 25% of the total cohort and were, overall, younger and more likely to be in custody than non-Aboriginal adolescents. They were significantly more likely to have been placed in care before the age of 16 years (35% v 22%;  $P < 0.001$ ) and to have a parent who had been in custody (58% v 24%;  $P < 0.001$ ), factors suggestive of greater social disadvantage. Rates of intravenous drug use were similar in the two groups, but alcohol misuse was more common in non-Aboriginal adolescents. Hepatitis B

exposure and current infection were more prevalent in the Aboriginal adolescents, with rates of 9.6% and 3.4% respectively ( $P \leq 0.05$  for both). Hepatitis C exposure rates were very high in both groups, but not statistically different (Aboriginal, 7.3%; non-Aboriginal, 5.3%). There were no cases of HIV infection.

### Associations with hepatitis C positivity

Factors associated with hepatitis C antibody positivity were analysed and compared between Aboriginal and non-Aboriginal adolescents. When pairwise interactions between risk factors and Aboriginality were considered, no significant interactions were found ( $P > 0.1$  in all cases). This confirms that risk factors for hepatitis C were the same in Aboriginal and non-Aboriginal adolescents, and hence the two subgroups could be analysed together. Therefore, we report the odds ratios (ORs) and *P* values for each risk factor adjusted for Aboriginality (Box 2). The most significant risk factor for hepatitis C was injecting drug use (OR, 19). Being female was a significant risk, with an OR of 3.0, although this may reflect the small sample size of girls. A current custodial sentence or having parents who had been in custody doubled the risk of hepatitis C. Co-exposure to hepatitis B was an important factor, with an OR of 4.0, but there was no association between hepatitis C exposure and alcohol misuse, presence of piercings or tattoos, or incidence of sexually transmitted infections. The logistic regression model (significance level,  $P < 0.1$ ) showed that the only factors that remained independent predictors of hepatitis C positivity were injecting drug use (OR, 7.6; 95% CI, 3.2–18.3;  $P < 0.001$ ) and prior use of heroin (OR, 5.0; 95% CI, 2.1–11.9,  $P < 0.001$ ). Co-exposure to hepatitis B did not reach statistical significance (OR, 2.6; 95% CI, 0.95–7.4;  $P = 0.06$ ).

### Understanding of hepatitis C transmission

Overall knowledge of how hepatitis C virus is transmitted was poor (Box 3), with most having no idea how hepatitis C is transmitted. Knowledge in this area was equally poor in the non-Aboriginal group, and there were no significant differences between the two groups.

### DISCUSSION

As in previous studies,<sup>7,8</sup> we found very high rates of hepatitis C in the adolescent criminal justice setting, with Aboriginal adolescents having a rate seven times that of the national average. Risk factors for the development of hepatitis C did not vary significantly between

**2 Univariate analysis of factors associated with hepatitis C antibody positivity in Aboriginal and non-Aboriginal adolescents**

	HCV antibody positive				Adjusted OR* (95% CI)	P
	Aboriginal (n= 179)		Non-Aboriginal (n= 530)			
	n	% anti-HCV positive	n	% anti-HCV positive		
Age						
< 16 years	45	6.7%	95	1.1%		
≥ 16 years	134	7.5%	435	6.2%	2.5 (0.86–7.0)	0.09
Sex						
Male	146	6.8%	472	4.0%		
Female	33	9.1%	58	15.5%	3.0 (1.5–6.1)	0.003
Current sentence						
On community order	95	5.3%	417	4.3%		
In custody	84	9.5%	113	8.8%	2.1 (1.1–4.0)	0.03
Parents ever in custody						
No	72	4.2%	390	4.4%		
Yes	100	9.0%	126	7.9%	2.0 (1.0–3.9)	0.05
One or both parents deceased						
No	152	6.6%	464	5.2%		
Yes	22	9.1%	48	6.3%	1.3 (0.49–3.4)	0.60
Ever placed in care						
No	112	8.9%	401	5.0%		
Yes	61	3.3%	116	6.0%	0.8 (0.38–1.8)	0.62
Ever injected drugs						
No	140	2.9%	452	1.5%		
Yes	32	21.9%	70	28.6%	19 (9.0–40.0)	< 0.001
Used heroin						
No	144	2.1%	443	2.0%		
Yes	28	28.6%	79	22.8%	15 (7.5–31.6)	< 0.001
Used amphetamines						
No	92	2.2%	259	2.3%		
Yes	80	11.3%	263	8.0%	4.1 (1.9–9.2)	< 0.001
Used cocaine						
No	147	3.4%	416	4.1%		
Yes	25	24.0%	106	9.4%	3.5 (1.8–6.9)	< 0.001
Hazardous alcohol use						
No	75	6.7%	138	7.2%		
Yes	97	7.2%	381	4.5%	0.7 (0.37–1.4)	0.35
Hepatitis B cAb positive						
No	160	6.3%	494	4.7%		
Yes	17	17.6%	27	18.5%	4.0 (1.7–9.5)	0.001
Any sexually transmitted infections						
No	135	6.7%	409	4.2%		
Yes	37	5.4%	113	8.8%	1.7 (0.85–3.5)	0.13
Any body piercings or tattoos						
No	74	6.8%	222	3.6%		
Yes	97	6.2%	298	6.0%	1.4 (0.70–2.8)	0.33

HCV = hepatitis C virus. cAb = core antibody.

\* Odds ratio and P value associated with each risk factor are adjusted for Aboriginality, and thus compare categories.



Aboriginal and non-Aboriginal adolescents. In both groups, use of injectable drugs and heroin were the only risk factors independently associated with exposure to the virus. Hepatitis B co-exposure was associated in both groups, but did not reach statistical significance on multiple regression analysis. Rather than being a risk factor, the presence of hepatitis B may simply be a reflection of its similar modes of transmission to hepatitis C. Factors such as sexual promiscuity, social disadvantage and tattooing were not important in this population, consistent with our previous report<sup>9</sup> and those of others.<sup>7,8</sup>

Although there were no differences in the risk factors for hepatitis C positivity, the baseline characteristics of the two groups varied considerably. Aboriginal adolescents were younger, were substantially more likely to be in custody, and had more markers of social disadvantage such as a parent in custody or having been placed in care. Rates of drug use were similar in the two groups, and non-Aboriginal adolescents were more likely to drink at hazardous levels than their Aboriginal peers. It is of concern that the prevalence of hepatitis B virus was higher in this study among Aboriginal adolescents. Universal hepatitis B virus vaccination for Aboriginal Australians was introduced in 1988 (later for non-Aboriginal Australians), and participants in this study born in 1988 were aged 14 years in 2002 and 17 in 2005, implying that most if not all *should* have been protected.

The lack of knowledge and understanding of hepatitis C transmission clearly forms a barrier to effective prevention strategies. Overall, the knowledge of how the virus is transmitted was very poor, with well over half having no idea, and fewer than 10% being aware that sharing needles was a likely cause. A similar survey of incarcerated adults showed only marginally better understanding of transmission,<sup>10</sup> and reflects the potential value of simple educational interventions at an early stage. Although there was no difference in the knowledge of risk factors between Aboriginal and non-Aboriginal adolescents, care needs to be taken in prescribing a uniform education program. In particular, a number of issues unique to Aboriginal groups require special attention. These include deeply ingrained cultural values of sharing and kinship, and practices involving tattooing and blood-to-blood contact that are not common in other groups. When this is combined with strong community stigma and shame about injecting drug use, there is often denial that the problem exists, and thus there are additional hurdles to overcome.<sup>11</sup> A number of these issues have been addressed at a recent workshop with a

### 3 Understanding of the modes of hepatitis C transmission among Aboriginal and non-Aboriginal adolescents

Suggested mode of hepatitis C transmission	Aboriginal (n = 95)	Non-Aboriginal (n = 417)	P*
Unprotected sex	13 (13.7%)	54 (12.9%)	0.98
Blood to blood	10 (10.5%)	52 (12.5%)	0.73
Sharing needles	7 (7.4%)	41 (9.8%)	0.58
Saliva	4 (4.2%)	10 (2.4%)	0.53
Smoking/sharing cigarettes	2 (2.1%)	4 (1.0%)	0.68
Kissing	1 (1.1%)	5 (1.2%)	0.68
Tattooing	0	4 (1.0%)	0.75
Razors	1 (1.1%)	2 (0.5%)	0.93
Food and drink	0	4 (1.0%)	0.75
Contaminated water	0	2 (0.5%)	0.81
Don't know	56 (58.9%)	237 (56.8%)	0.79

\* For the difference between Aboriginal and non-Aboriginal.

view to planning and implementing culturally specific and relevant education programs.<sup>11</sup> Moreover, other initiatives such as the National Indigenous Australians' Sexual Health Strategy<sup>12</sup> and its follow-up program continue to implement vital strategies aimed at combating sexually transmitted infections such as hepatitis C in Aboriginal communities. It is now vital that similar initiatives be introduced in the juvenile justice setting, where large numbers of at-risk Aboriginal adolescents can be reached and where the chance to stem future infections is greatest.

The rate of hepatitis C in those who were incarcerated was almost double the rate in those on community orders. This was highly significant when the whole cohort was considered ( $P=0.03$ ). Similar findings have been widely demonstrated in adult prison populations,<sup>13,14</sup> as have high rates of new infection within prisons,<sup>15</sup> reflecting the reality that needle sharing and "dirty" tattooing occur in prison. Simple measures, like those suggested in an editorial in this Journal over 10 years ago,<sup>16</sup> such as providing sterile injecting and tattooing equipment to prisoners, have yet to be implemented. Alternatives to custodial sentences must also be considered where feasible.

In conclusion, rates of hepatitis C are extremely high in all young offenders, and interventions aimed at prevention, education and treatment are urgently needed. Aboriginal adolescents, who are over-represented in this population, are particularly at risk.

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### COMPETING INTERESTS

None identified.

### AUTHOR DETAILS

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