



Transfusion-transmissible infections in Australia

# 2012

## Surveillance Report

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**in collaboration with**

**Australian Red Cross Blood Service**



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# Foreword

This report is produced jointly by the Australian Red Cross Blood Service and the Surveillance and Evaluation Program for Public Health at the Kirby Institute. This is the second report that summarises available surveillance data and trends for transfusion-transmissible infections among Australian blood donors. While the report focuses on data collected during the 2011 calendar year, it also assesses for trends against the previously published data for 2005-2010 contained in the inaugural transfusion-transmissible infections surveillance report '*Safe blood – a focus on education, epidemiology and testing.*' Data on malaria testing and surveillance activity for emerging infections are also included in the 2012 report.

Consistent with previous years, the overall number of infections remained low in 2011 with the vast majority (90%) identified in first time donors. Reassuringly, the overall rate of infections has decreased gradually over the past five years. Infected first time donors in 2011 mostly had undiagnosed prevalent infections but we continued to identify a small number of recently acquired (incident) infections among repeat donors. Notably, in 2011 there was an increase in the number of incident HBV infections. While the increase was specific to Queensland and Western Australia and no obvious epidemiological link was established, four of the five infected donors were HBsAg negative/HBV DNA positive highlighting the blood safety contribution of HBV DNA testing implemented by the Blood Service in July 2010. Incident infections are the most concerning from a blood safety perspective as, in contrast to prevalent infections they are more likely to be in the so called testing 'window period' making them undetectable by donation testing. For this reason the pre-donation questionnaire remains a critical safety procedure and its effectiveness is directly dependent on the accuracy (termed 'compliance') of the donor's answers.

Optimal compliance is therefore a blood safety imperative and it is encouraging that the non-compliance rate among TTI positive donors has been gradually declining since 2008 (24.4%), and the rate of 12.9% recorded in 2011 is the lowest recorded to date. The importance of monitoring and understanding non-compliance was highlighted in May 2012 when the Blood Service was presented with the final report from the '*Review of Australian Blood Donor Deferrals relating to sexual activity*'. This comprehensive report recommended that the Blood Service consider reducing the length of the period since last contact for sexual activity-based deferrals from 12 to 6 months. Importantly, this recommendation was dependent on supporting evidence that non-compliance would not increase as a result of the policy change. Accordingly, the Blood Service has commenced targeted research with the aim of estimating the current rate of non-compliance among donors testing negative for transfusion-transmissible infections and gauging opinion among donors and prospective donors on future policy change with respect to donor deferral.

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# Summary of the main findings

## General characteristics of blood donors in Australia

1. Over the period 2005-2011, there were more than 8.6 million blood donations in Australia with an average of 1.2 million donations per year. The numbers of blood donations have been increasing since 2005.
2. About 3.4% of the Australian population aged between 16-80 years donated blood during 2011.
3. First time and repeat donors comprised 17% and 83% of all blood donors in Australia over the period 2005-2011, respectively. As in previous years, this ratio remained relatively stable nationally and across all states and territories. Male donors constitute approximately 49% of all donors.

## Trends in transfusion-transmissible infections in Australian blood donors

1. A total of 217 blood donors were detected as having at least one transfusion-transmissible infection (HBV, HCV, HIV, HTLV or syphilis) in 2011; more than 91% of these donors were infected with either HBV or HCV. This gives a total count of 1 700 TTI-positive donors in 2005-2011. In 2011, no donors had more than one transfusion-transmissible infection.
2. HTLV was the least common infection among both first time and repeat donors in 2011. Overall in 2005-2011, HIV and HTLV were the least common infections among first time and repeat donors, respectively.
3. Although only representing 17% of the donor population, first time blood donors contributed 90% of all donors with transfusion-transmissible infections in Australia during 2005-2011, highlighting the importance of promoting education of potential new donors.
4. No transfusion-transmitted HIV, HCV, HTLV or syphilis infections were reported during 2008-2011. Three probable cases of transfusion-transmitted HBV infection were reported in the 2008-2011 period, two in 2009 associated with the same donor and one further case in 2011.

## HBV infection among Australian blood donors

1. The prevalence of HBV among first time donors decreased by 15.5% from 85.4 per 100 000 donations in 2010 to 72.2 per 100 000 donations in 2011. However, of all transfusion-transmissible infections, HBV continued to have the highest prevalence among first time donors since 2007.
2. HBV incidence increased during 2010-2011 and this directly correlated with the implementation of HBV NAT in July 2010. Highlighting this, four of the seven seroconverters in the 2010-2011 period were HBsAg negative but had detectable HBV DNA and thus would not have been identified by HBsAg screening alone.
3. The most common infective risk factor for donors with HBV infection during 2008-2011 was ethnicity/country of birth (82%) which is consistent with the findings of a previous Blood Service study for the period 2000-2006.
4. In 2011, HBV positive donors were slightly younger (mean age 38 years versus 40 years for all donors), more likely to be male (67% versus 49% male donor proportion) and only 13% were born in Australia. These characteristics remain fairly similar compared with previous years.



## HCV infection among Australian blood donors

1. The prevalence of HCV infection among first time donors has been gradually declining over the past seven years.
2. After HBV, HCV was the most common infection found in first time blood donors.
3. HCV had the highest incidence rate among previously negative repeat donors during 2006 to 2011.
4. The most common infective risk factor for donors with HCV infection during 2008-2011 was intravenous drug use (25%) which was also the predominant route (60%) of exposure in cases of newly acquired HCV infection in the general population in 2011.
5. In 2011, the mean age of donors with HCV infection was 42 years. Like HBV, male donors were over-represented (68% versus 49% male donors overall) but in contrast to HBV, the majority (63%) were born in Australia. The key attributes of HCV-positive donors in 2011 remained similar to HCV-positive donors in the previous three years.

## HIV infection among Australian blood donors

1. The prevalence of HIV infection among first time donors during 2005-2011 remained very low (2 per 100 000 donations) in comparison to HBV (83.9 per 100 000 donations) and HCV (73.9 per 100 000 donations).
2. After HCV, HIV had the highest incidence rate among previously negative repeat donors during 2006-2010. However, in 2011, HBV incidence exceeded HIV incidence among previously negative blood donors. Although remaining very low compared to the general population, the incidence rate of HIV in donors steadily, but not significantly increased between 2005-2009 then subsequently declined in 2010-2011. Overall, the donor HIV incidence rate was relatively stable in 2005-2011. Diagnoses of newly acquired HIV infection in Australia were also relatively stable in 2005-2010 but increased by more than 20% in 2011.
3. The two most common routes of exposure for donors with HIV infection during 2008-2011 were partners with known risk or known to be positive (37%) followed by male-to-male sexual contact (30%)<sup>1</sup>. This is consistent with the general population where men who have sex with men accounted for 67%, and men and women with a history of heterosexual contact, either in Australia or overseas, accounted for 25% of new HIV diagnoses in Australia in 2008-2011.
4. As in 2008-2010, HIV positive donors in 2011 were generally younger (36 years versus 40 years for all donors) and male (71% versus 49% male donors overall). However, unlike previous years, most donors (71%) were born in a country other than Australia.

## HTLV infection among Australian blood donors

1. The prevalence of HTLV among first time donors has remained very low over the past seven years.
2. No donor seroconverted for HTLV in 2011. There was only one incident case of HTLV among previously negative repeat donors during 2005-2011.
3. The most common infective risk factor for donors with HTLV infection during 2008-2011 was ethnicity or country of birth (65%).
4. In 2011, the mean age of donors with HTLV infection was 38 years. Among the HTLV positive donors in 2011, 33% were male and all of them were born overseas.

## Active syphilis infection among Australian blood donors

1. The prevalence of active syphilis among blood donors has remained low (overall prevalence of 0.37 per 100 000 donations) in 2005-2011.
2. However, the rate among first time donors has gradually increased over the past five years, paralleling the trend for increased diagnoses in the general population.

## Malaria testing

1. In 2011, 116 610 donations were tested for malaria antibody of which 2 411 (2.1%) were found to be repeat reactive. None of these antibody repeat reactive donors had evidence of current infection since all were negative for both plasmodial antigen and DNA by supplementary testing. This is consistent with past infection.
2. There were no reported cases of transfusion transmitted malaria during 2011, with the last Australian case occurring in 1991.

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<sup>1</sup> Includes declaration form compliant and non-compliant donors (see section *Non-compliance among positive donors*, page 22).

## Emerging infections

1. During the period January – March 2011, four dengue fever outbreaks totalling 55 reported cases were declared in Queensland: one outbreak each in Townsville and Cairns, and two in Innisfail. To mitigate the transmission risk, donors visiting or residing in these areas were restricted to donating plasma for fractionation only. Restrictions were lifted 28 days after the last case onset date.
2. In 2011 the Blood Service monitored the risk associated with West Nile virus (WNV) outbreaks in the European Union (EU) and surrounding countries during the European transmission season (July to November 2011). The risk of a donor returning and donating while viraemic was monitored on a weekly basis but unlike in 2010 did not exceed the threshold requiring additional donor selection measures.
3. A variant WNV strain (WNV<sub>NSW2011</sub>) closely related to the prototype Australian WNV strain (Kunjin virus or WNV<sub>KUN</sub>) caused a large equine outbreak. While there were no associated human cases reported, the proximity to major urban centres and increased virulence compared to the prototype WNV<sub>KUN</sub> strain warranted a close watching brief.
4. In 2011 the first presumed case of locally acquired human babesiosis in Australia was reported. There are potential blood safety implications as transfusion transmitted babesiosis is well documented in North America and Europe. The Blood Service has already initiated targeted research to assess the threat level.

## Key messages

1. Supporting the effectiveness of donor education and selection, the prevalence of transfusion-transmissible infections is substantially lower among both first time blood donors (12 to 39 times) and all donors (99 to 225 times) than in the general population in 2011 and shows a stable or declining trend since 2005.
2. The prevalence of transfusion-transmissible infections among first time donors was much higher than their prevalence among all donors, highlighting the importance of promoting donor education of potential new donors and ensuring first-time donors read the pre-donation information and understand the importance of self deferral.
3. The incidence of newly acquired infection measured by the rate of seroconversion in repeat blood donors is also much lower than in the general population. This supports the general effectiveness of the donor questionnaire and specifically that repeat donors understand what constitutes 'risk behaviour' for acquiring infection.
4. Infective risk factors identified in blood donors with transfusion-transmissible infections closely parallel those for the general population with no 'unique' risk factors identified to date among blood donors.
5. Almost one-fifth of the positive donors in 2008-2011 were 'non-compliant' in that they had risk factors identified during their post-donation interview that would have deferred them from donating had they disclosed them at the pre-donation interview. Reassuringly, the rate of non-compliance among TTI positive donors has been gradually declining since 2008 and notably in 2011 was the lowest recorded to date (12.9%). Understanding the reasons for, and minimising the rate of non-compliance is important because it reduces the risk of collecting blood from a potentially infected donor whose infection may not be detected by testing.
6. The estimated residual risk of transmission for HIV, HCV, HBV HTLV and syphilis in Australia is very low, less than one in one million per unit transfused for all. The residual risk of transmission of HBV is higher (approx 1 in 764 000). This supports the claim that Australia's blood supply is among the safest worldwide in respect of transfusion-transmissible infections for which testing is conducted. Despite this, there remains a minimal but real risk of transfusion-transmissible infections which must be carefully considered before any transfusion.
7. In addition to established transfusion-transmissible infections, emerging infectious diseases continue to demand vigilant surveillance. Mosquito-borne agents such as dengue virus and West Nile virus are currently the principal threats but many other novel or emerging infectious diseases are constantly monitored by the Blood Service to assess their threat to the safety of the blood supply.

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# Glossary

**Active syphilis**

Defined by reactivity on treponemal and non-treponemal syphilis testing and/or clinically apparent infection (i.e. excluding past treated infections).

**First time donor**

A donor who has not previously donated in Australia.

**Intravenous drug user**

Defined as ever “used drugs” by injection or been injected, even once, with drugs not prescribed by a doctor or a dentist.

**Incidence**

The rate of newly acquired infection among repeat donors.

**Infective risk factor**

A potential route of infection in positive donors reported at the post-donation interview.

**Non-compliance**

Disclosure of information post donation that would have led to deferral from donation had it been disclosed at the pre-donation interview.

**Prevalence**

The frequency of infection in the first time donor population.

**Positive donor**

A donor confirmed (by additional testing) to have the relevant transfusion-transmissible infection.

**Repeat donor**

A donor who has donated in Australia on at least one occasion prior to the current donation.

**Seroconverter**

A positive repeat donor whose last donation tested negative for the same transfusion-transmissible infection.

**Transfusion-transmissible infection**

A virus, parasite, or other bloodborne infectious agent in donated blood that can be transmitted by transfusion to a recipient.

**Transfusion-transmitted infection**

Any infection that has been transmitted to a recipient through a transfusion.

**Window period**

The duration of the period from infection to the point of first detection in the bloodstream. The window period differs dependent on the infection and the test used.

# Abbreviations

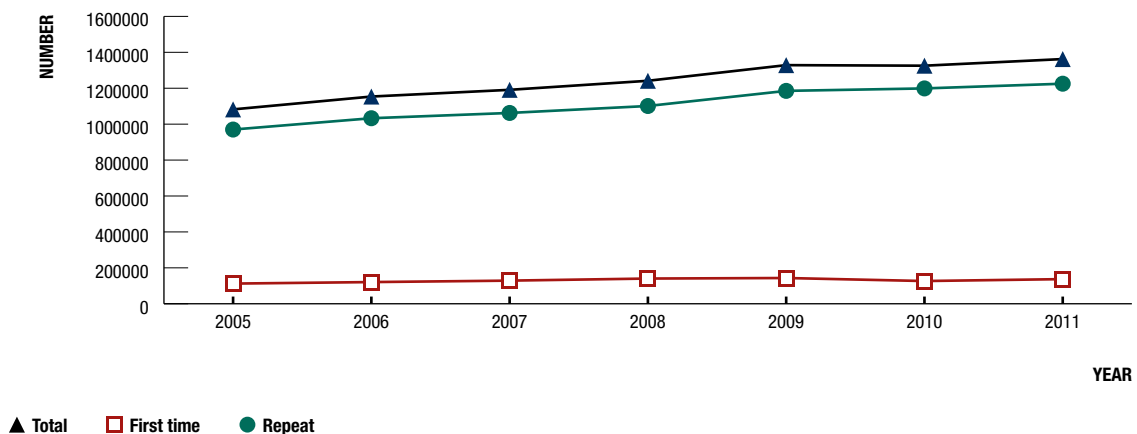
<b>anti-HBc</b>	antibody to hepatitis B core antigen
<b>anti-HBe</b>	antibody to hepatitis B e antigen
<b>anti-HBs</b>	antibody to hepatitis B surface antigen
<b>anti-HeV</b>	antibody to Hendra virus
<b>HBsAg</b>	hepatitis B surface antigen
<b>Blood Service</b>	Australian Red Cross Blood Service
<b>CFS</b>	chronic fatigue syndrome
<b>HBeAg</b>	hepatitis B e antigen
<b>HBsAg</b>	hepatitis B surface antigen
<b>HBV</b>	hepatitis B virus
<b>HCV</b>	hepatitis C virus
<b>HeV</b>	Hendra virus
<b>HIV</b>	human immunodeficiency virus
<b>HTLV</b>	human T-cell lymphotropic virus
<b>IDU</b>	intravenous drug user
<b>NAT</b>	nucleic acid testing
<b>STIs</b>	sexually transmissible infections
<b>TTVI</b>	transfusion-transmissible viral infections
<b>TTIs</b>	transfusion-transmissible infections
<b>WNV</b>	West Nile virus
<b>WP</b>	window period
<b>XMRV</b>	xenotropic murine leukaemia virus-related virus

# Main findings

## Blood donors in Australia

More than 8.6 million donations were tested for transfusion-transmissible infections in Australia during 2005-2011 with an average of about 1.2 million donations per year. Overall, the number of blood donations increased by more than 25% over the past seven years (Figure 1). During 2005-2010, about 3.6% of the general population who were aged between 16-80 years donated blood in Australia. This ratio remained fairly similar in 2011 (3.4%). As in previous years, more than 85% of all donations in 2011 were from repeat donors and 90% of all positive donations were made by first time donors.

**Figure 1** Number of blood donations in Australia by year of donation, 2005-2011

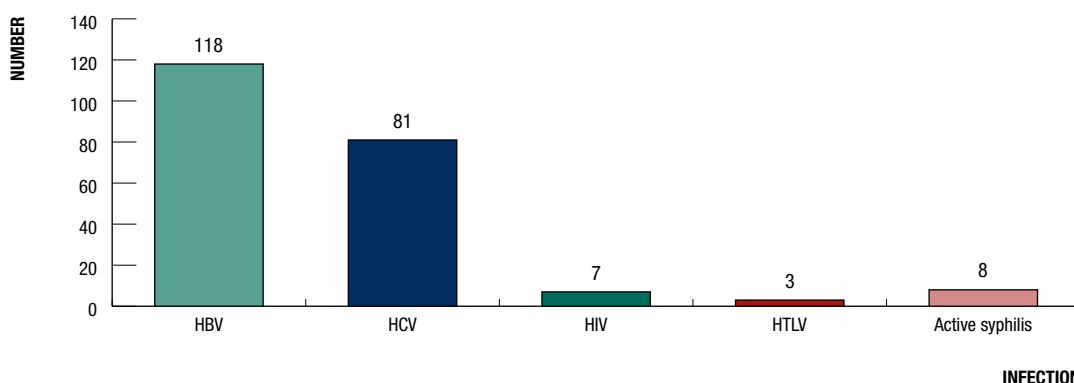


Among all blood donors who donated in 2011, 51% were female, 30% were younger than 30 years and 32% were from New South Wales. Median ages of both male and female donors in 2011 ranged between 40 and 49 years. Together New South Wales, Queensland and Victoria accounted for more than 75% of all blood donations in Australia in 2011.

## Trends in incidence and prevalence of transfusion-transmissible infections

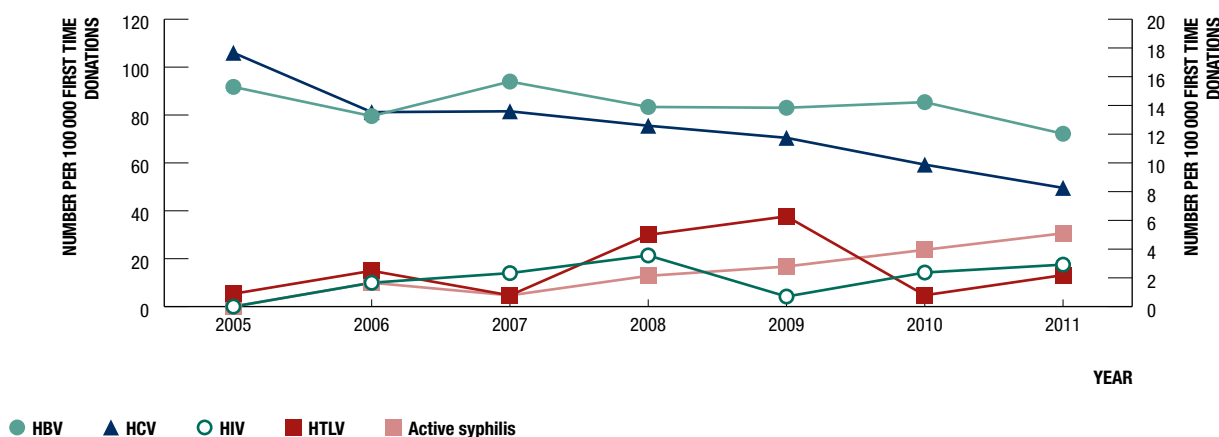
In 2011, a total of 217 (15.8 per 100 000 donations) were found positive for at least one of the transfusion-transmissible infections – HBV, HCV, HIV, HTLV and active syphilis. In 2011, no donors had more than one transfusion-transmissible infection. Overall, HCV and HBV were the two most common infections identified in Australian blood donors in 2011, together contributing more than 91% of all infections (Figure 2). HBV and HCV were the most common infections in first time and repeat donors, respectively. In general, the presence of any transfusion-transmissible infection among Australian blood donations has remained low during 2005-2011 and has decreased gradually over the past four years, from 22.3 per 100 000 donations in 2008 to 15.8 per 100 000 donations in 2011.

**Figure 2** Number of blood donors with transfusion-transmissible infections in Australia, 2011, by infection



Among all donors during 2005-2011, the prevalence of HCV infection has been declining significantly<sup>2</sup> with an overall 50% reduction from 2005 to 2011; however, prevalence of active syphilis infection increased significantly. Both HIV and HTLV prevalence showed a slight, non-significant overall increase and HBV prevalence remained relatively stable.

**Figure 3** Prevalence of transfusion-transmissible infections in first time blood donors in Australia, 2005- 2011, by infection<sup>1</sup> and year of donation



<sup>1</sup> Prevalence of HIV, HTLV and active syphilis are provided according to the scale on the secondary axis on the right hand side.

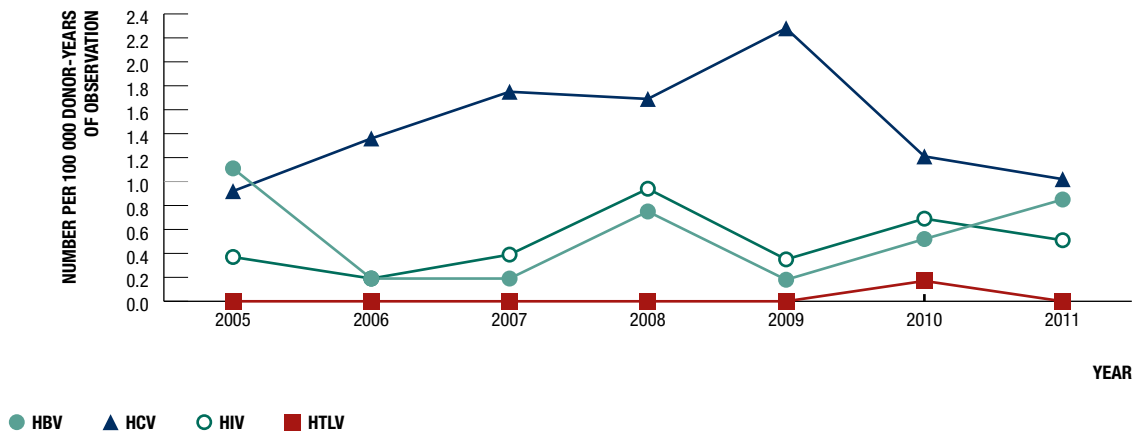
The prevalence of HBV in first time donors has substantially declined from 85.4 per 100 000 donations in 2010 to 72.2 per 100 000 donations in 2011 after remaining steady at around 80 per 100 000 donations since 2008 (Figure 3). During 2005-2011, there has been a significant decrease in HCV prevalence in first time donors in Australia. This trend is also apparent in the per capita rate of diagnosis of HCV infection reported through the National Notifiable Disease Surveillance System<sup>3</sup> which declined in the period 2006-2011.

In contrast with HBV and HCV, the prevalence of HIV, HTLV and active syphilis in first time donors remained very low over the last seven years. Apart from an increase in 2008, HIV prevalence has been stable over the 2005-2011 period. During 2005-2011, HTLV prevalence demonstrated a slight, non-significant increased trend in first time donors in Australia. The prevalence of active syphilis in first time donors significantly increased during 2005-2011 (Figure 3). The annual number of diagnoses of infectious syphilis reported through the National Notifiable Diseases Surveillance System peaked at 1 418 in 2007 and has remained above 1 000 in 2008-2011.

<sup>2</sup> Throughout the document the term ‘significant’ is used only where a statistical test has a p value <0.05

<sup>3</sup> The Kirby Institute. *HIV, viral hepatitis and sexually transmissible infections in Australia Annual Surveillance Report 2012*. The Kirby Institute, the University of New South Wales, 2012.

**Figure 4** Incidence of transfusion-transmissible infection in repeat blood donors in Australia, 2005-2011, by infection and year of donation



HBV was the most frequent infection in repeat donors in Australia in 2011 (Table 1). The incidence of HCV among repeat donors continued to reduce further after it sharply declined from 2.3 per 100 000 donor-years of observation in 2009 to 1.2 per 100 000 donor-years of observation in 2010 (Figure 4). However, although not significant, there was an overall increase in both HCV (by 10%) and HIV (by 38%) incidence in repeat blood donors over the past seven years. There has been a substantial increase in diagnoses of newly acquired HIV infection in the general population in 2011. Nonetheless, diagnoses of newly acquired HCV infection in the general population remained fairly stable or declined over the past decade<sup>4</sup>. The HTLV incidence among repeat Australian donors in 2011 was zero. During 2005-2011, HTLV incidence remained very low with only one incident case identified in 2010.

#### Trends in HBV infection by state/territory

In 2011, the prevalence of HBV among first time donors differed markedly across Australia. While the national prevalence was 72.2 per 100 000 donations this ranged from 27.88 to 388.6 per 100 000 donations (Table 1). From 2010 to 2011, the prevalence of HBV has reduced in all states/territories except Northern Territory and Western Australia. In New South Wales/Australian Capital Territory, HBV prevalence among first time donors gradually declined during the past four years from 92.6 per 100 000 donations in 2008 to 75.7 per 100 000 donations in 2011. In Victoria, the prevalence of HBV in first time donors varied during 2005-2011. Overall, Queensland had a lower HBV prevalence than both New South Wales/Australian Capital Territory and Victoria and the rate remained relatively stable across the study period. In Western Australia, HBV prevalence in first time donors has been decreasing steadily since 2009.

There was no obvious trend in blood donor HBV incidence in any state/territory except in Queensland and Western Australia, both jurisdictions showing a recent increasing trend. An investigation of the five seroconverting donors identified in 2011 failed to find any obvious epidemiological link. Notably, the index donations from four of the five donors were HBV DNA positive but HBsAg negative, highlighting the value of implementing HBV NAT during 2010. Among donors in New South Wales/Australian Capital Territory, HBV incidence remained zero since 2008 following a steady decline from 2005 to 2007.

#### Trends in HCV infection by state/territory

In New South Wales/Australian Capital Territory, the prevalence of HCV in first time donors has steadily decreased from 102.9 per 100 000 donations in 2008 to 58.2 per 100 000 donations in 2011. In both Victoria and Queensland, HCV prevalence in first time donors remained fairly stable over the last three years following a gradual decline over the period of 2005-2009. From 2010 to 2011, the rates have decreased in all jurisdictions except in Queensland and Western Australia.

In contrast to the declining prevalence across most jurisdictions HCV incidence in repeat donors varied during the past seven years. There was a gradual decline in New South Wales/Australian Capital Territory from 1.8 per 100 000 donor-years of observation in 2008 to 1 per 100 000 donor-years of observation in 2011. In contrast to the previous years, the rate in Queensland was lower and reduced gradually from 4.6 per 100 000 donor-years of observation in

<sup>4</sup> The Kirby Institute. *op.cit.*



2008 to 0.9 per 100 000 donor-years of observation in 2011. The rate in Victoria continued to decline since 2009 and the rate in South Australia, Tasmania and Western Australia remained unchanged during the past two years.

### Trends in HIV infection by state/territory

The prevalence of HIV infection in first time donors remained very low in comparison with HBV and HCV in 2005-2011, with the national average prevalence being 2 per 100 000 donations. In 2011, the prevalence of HIV in first time donors remained zero in all jurisdictions except in New South Wales/Australian Capital Territory, Queensland and Western Australia. In 2010-2011, HIV prevalence was stable around 2 and 7 per 100 000 first time donations in New South Wales/Australian Capital Territory and Queensland, respectively. There was a gradual decline in HIV prevalence in first time donors in Victoria since 2007 but no obvious trends in other jurisdictions.

Nationally there was a 38% increase in HIV incidence since 2005 but no clear jurisdictional trends were observed over the period of 2005-2011. The rate in Queensland declined gradually by 50% from 1.8 per 100 000 donor-years of observation in 2009 to 0.9 per 100 000 donor-years of observation in 2011 following an increase during 2006-2010. The rate in Victoria stayed relatively unchanged in the past two years at around 0.7 per 100 000 donor-years of observation.

### Trends in HTLV infection by state/territory

In 2011, only three donors were found to be HTLV-positive and all were first time donors. HTLV prevalence remained zero in all jurisdictions in 2011 except in New South Wales/Australian Capital Territory, South Australia and Western Australia. HTLV incidence remained very low with only one incident case reported during 2005-2011.

### Trends in active syphilis infection by state/territory

The rate of active syphilis infection remained very low in blood donors across Australia over the seven year period. In both Queensland and Victoria, the prevalence of active syphilis infection in first time blood donors decreased in 2011 following a substantial increase from 2008-2010. Overall, the prevalence of active syphilis infection has increased progressively in the past five years with a national prevalence of 5.1 per 100 000 donations in 2011. This trend may be in part explained by an increase in diagnoses of infectious syphilis in the general population from 2004<sup>5,6</sup>.

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5 The Kirby Institute. *op.cit.*

6 National Centre in HIV Epidemiology and Clinical Research. *HIV, viral hepatitis and sexually transmissible infections in Australia Annual Surveillance Report 2010*. National Centre in HIV Epidemiology and Clinical Research, The University of New South Wales, Sydney, NSW, 2010.

**Table 1 The number and rate of transfusion-transmissible infections in Australia by type of donation and state/territory, 2011**

State/Territory of donation	All accepted donations						HIV			HTLV			Syphilis			Total positive donations						
	First time		Repeat		All		First time		Repeat		All		First time		Repeat		All					
	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations	Number	Rate per 100 000 donations				
<b>NSW/ACT</b>	51 528	390 455	441 983	42	5	47	30	3	33	1	0	1	1	0	1	0	1	1	1	74	9	83
<i>Number (Number per 100 000 donations)</i>				81.51	1.28	10.63	58.22	0.77	7.47	1.94	0.00	0.23	1.94	0.00	0.23	0.00	1.94	0.23	0.23	143.61	2.31	18.78
<b>NT</b>	772	10 782	11 554	3	0	3	0	1	1	0	1	1	0	2	0	2	0	2	2	5	2	7
<i>Number (Number per 100 000 donations)</i>				388.60	0.00	25.97	0.00	9.27	8.66	0.00	9.27	8.66	0.00	259.07	0.00	17.31	647.67	18.55	18.55	60.59	18.55	60.59
<b>QLD</b>	28 839	245 975	274 814	13	3	16	13	3	16	2	1	3	0	0	0	0	1	0	1	29	7	36
<i>Number (Number per 100 000 donations)</i>				45.08	1.22	5.82	45.08	1.22	5.82	6.94	0.41	1.09	0.00	3.47	0.00	0.36	100.56	2.85	2.85	100.56	2.85	13.10
<b>SA</b>	10 164	124 199	134 363	3	2	5	4	1	5	0	0	0	1	0	0	1	1	0	1	9	3	12
<i>Number (Number per 100 000 donations)</i>				29.52	1.61	3.72	39.35	0.81	3.72	0.00	0.00	0.00	9.84	0.00	0.74	9.84	0.00	0.74	88.55	2.42	8.93	
<b>TAS</b>	3 587	44 661	48 248	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0	2
<i>Number (Number per 100 000 donations)</i>				27.88	0.00	2.07	27.88	0.00	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.76	0.00	0.00	
<b>VIC</b>	31 286	288 085	319 371	27	4	31	12	2	14	0	1	1	0	0	0	1	1	0	1	40	7	47
<i>Number (Number per 100 000 donations)</i>				86.30	1.39	9.71	38.36	0.69	4.38	0.00	0.35	0.31	0.00	3.20	0.00	0.31	127.85	2.43	2.43	127.85	2.43	14.72
<b>WA</b>	10 992	121 057	132 049	10	5	15	8	3	11	1	0	1	1	2	0	2	0	2	2	22	8	30
<i>Number (Number per 100 000 donations)</i>				90.98	4.13	11.36	72.78	2.48	8.33	9.10	0.00	0.76	9.10	18.20	0.00	1.51	200.15	6.61	6.61	200.15	6.61	22.72
<b>National</b>	137 168	1 225 214	1 362 382	99	19	118	68	13	81	4	3	7	3	0	3	7	1	8	181	36	217	
<i>Number (Number per 100 000 donations)</i>				72.17	1.55	8.66	49.57	1.06	5.95	2.92	0.24	0.51	2.19	0.00	0.22	5.10	0.73	0.59	131.95	2.94	2.94	

## Comparison of prevalence of transfusion-transmissible infections among blood donors and the general population

Consistent with a previous Blood Service study for the period 2000-2006<sup>7</sup>, a marked reduction is evident in the prevalence of HBV, HCV and HIV in blood donors compared with the general population (Table 2). Prevalence of these infections are substantially lower in blood donors than in the general population, with a 12 to 39-fold reduction in first time donors and 99 to 225-fold reduction among all donors in 2011. As in 2005-2010, the greatest comparative reduction among first time donors (39-fold lower) was observed for HIV infection. Given blood donors are drawn from the general population the prevalence reduction observed in first time donors is interpreted to reflect the combined effectiveness of donor education and donor selection policies.

**Table 2 Comparison of prevalence of transfusion-transmissible infections in blood donors with population prevalence by infection, 2005-2011**

Infection	Population prevalence (per 100 000 people)		Prevalence in all blood donors (per 100 000 donations)		Prevalence in first time blood donors (per 100 000 donations)		Overall prevalence reduction in all blood donors		Prevalence reduction in first time blood donors	
	2005-2010	2011	2005-2010	2011	2005-2010	2011	2005-2010	2011	2005-2010	2011
HBV	500-800	856-1 121	9.66	8.66	86.02	72.17	52-83 times	99-129 times	6-10 times	12-16 times
HCV	1 400	1 074-1 748	9.53	5.95	78.24	49.57	147 times	181-294 times	18 times	22-35 times
HIV	96	115	0.41	0.51	1.81	2.92	240 times	225 times	53 times	39 times
HTLV <sup>1</sup>	–	–	0.31	0.22	2.85	2.19	–	–	–	–

1 Population prevalence for HTLV is unknown.

## Demographic factors associated with transfusion-transmissible infections in blood donors

Contrasting the prevalence/incidence data which covers 2006-2011, the risk factor analysis is restricted to 2008 to 2011 where standardised national risk factor data is available. Data on the demographic characteristics (sex, age group, state/territory and year of donation) for all blood donors in 2011 was analysed<sup>8</sup> to determine the association between demographic factors and presence of transfusion-transmissible infections among Australian blood donors (Table 3). Male donors, donors aged less than 20 years and donors from New South Wales were used as reference groups for comparison of positivity rate by sex, age group and state/territory of donation, respectively.

### HBV positivity and associated demographic risk factors

Overall, there were no significant trends in 2008-2011 for HBV positivity among Australian donors by different age group, sex or state/territory of the donor. However, as in 2008-2010, female donors were approximately half as likely to have acquired HBV infection and donors from Queensland and South Australia were significantly less likely to be HBV positive compared with those from New South Wales. There was no significant association with age group and HBV infection among Australian blood donors in 2011.

### HCV positivity and associated demographic risk factors

Overall, there were no significant trends in 2008-2011 for HCV positivity among Australian donors by different age group, sex or state/territory of the donor. However, like HBV, female donors were significantly less likely to be HCV positive. Donors aged between 40-49 years were about 4 times more likely to be HCV positive compared with those younger than 20 years. There was no association with state/territory of the donor and HCV infection among Australian blood donors in 2011.

### HIV and HTLV positivity and associated demographic risk factors

Given the small number of donors with HIV and HTLV infection no meaningful analysis was possible.

7 Polizzotto MN, Wood EM, Ingham H, Keller AJ. Reducing the risk of transfusion-transmissible viral infection through blood donor selection: the Australian experience 2000 through 2006. *Transfusion*. 2008;48(1):55-63. Epub 2007/09/27.

8 See methodological notes for details

**Table 3 Association of demographic characteristics with presence of transfusion-transmissible infection among blood donors in Australia by infection, 2011**

		HBV		HCV		HIV		HTLV	
	Number of donors	Number of positive donors (Number per 100 000 donors)	IRR <sup>1</sup> and their 95% CI <sup>2</sup> (Multivariate adjusted)	Number of positive donors (Number per 100 000 donors)	IRR and their 95% CI (Multivariate adjusted)	Number of positive donors (Number per 100 000 donors)	IRR and their 95% CI (Multivariate adjusted)	Number of positive donors (Number per 100 000 donors)	IRR and their 95% CI (Multivariate adjusted)
<b>Sex</b>									
Male	288 683	79 (27.37)	1 (ref)	55 (19.05)	1 (ref)	5 (1.73)	1 (ref)	1 (0.35)	1 (ref)
Female	304 368	39 (12.81)	0.53 (0.36-0.77)	26 (8.54)	0.48 (0.30-0.77)	2 (0.66)	0.46 (0.09-2.39)	2 (0.66)	2.22 (0.20-24.67)
<b>Age group (years)</b>									
Less than 20	54 814	13 (23.72)	1 (ref)	3 (5.47)	1 (ref)	0 (0)	1 (ref)	0 (0)	-
20-29	125 666	29 (23.08)	0.98 (0.51-1.88)	15 (11.94)	2.21 (0.64-7.64)	4 (3.18)	-	1 (0.8)	-
30-39	92 303	25 (27.08)	1.21 (0.62-2.36)	13 (14.08)	2.75 (0.78-9.68)	0 (0)	-	0 (0)	-
40-49	106 214	22 (20.71)	0.94 (0.47-1.86)	23 (21.65)	4.25 (1.27-14.19)	2 (1.88)	-	2 (1.88)	-
50 and above	214 054	29 (13.55)	0.62 (0.32-1.20)	27 (12.61)	2.51 (0.76-8.30)	1 (0.47)	-	0 (0)	-
<b>State/Territory</b>									
NSW	188 495	47 (24.93)	1 (ref)	30 (15.92)	1 (ref)	1 (0.53)	1 (ref)	1 (0.53)	-
ACT	15 175	0 (0)	-	1 (6.59)	0.4 (0.05-2.91)	0 (0)	-	0 (0)	-
NT	4 621	3 (64.92)	2.58 (0.80-8.30)	1 (21.64)	1.26 (0.17-9.27)	1 (21.644)	37.09 (2.32-593.21)	0 (0)	-
QLD	119 967	16 (13.34)	0.54 (0.31-0.96)	16 (13.34)	0.81 (0.44-1.49)	3 (2.5)	4.6 (0.48-44.19)	0 (0)	-
SA	56 105	5 (8.91)	0.37 (0.15-0.93)	5 (8.91)	0.53 (0.21-1.37)	0 (0)	-	1 (1.78)	3.44 (0.21-55.19)
TAS	17 692	1 (5.65)	0.23 (0.03-1.67)	1 (5.65)	0.33 (0.05-2.45)	0 (0)	-	0 (0)	-
VIC	139 051	31 (22.29)	0.91 (0.57-1.42)	16 (11.51)	0.7 (0.38-1.28)	1 (0.72)	1.27 (0.08-20.24)	0 (0)	-
WA	51 945	15 (28.88)	1.19 (0.66-2.13)	11 (21.181)	1.29 (0.64-2.57)	1 (1.93)	3.46 (0.22-55.40)	1 (1.93)	3.43 (0.21-54.86)
<b>Total</b>	<b>593 051</b>	<b>118 (19.9)</b>		<b>81 (13.7)</b>		<b>7 (1.2)</b>		<b>3 (0.5)</b>	

1 IRR = Incident Rate Ratio

2 CI = Confidence Intervals

## Risk factors associated with infected donors

In 2011, 217 donors were confirmed positive for at least one of the transfusion-transmissible infections with a total of 992 confirmed positive donors over the period of 2008-2011. Among them, 29 donors were positive for active syphilis. As risk factor data was not available for donors with active syphilis, the data on the remaining 963 donors who were positive for any of the other transfusion-transmissible infections (HBV, HCV, HIV and HTLV) were analysed to determine the key attributes of blood donors with transfusion-transmissible infections, stratified by year of donation (Table 4-7).

### Donors with HBV infection, 2008-2011

Of 493 HBV positive donors during 2008-2011, 89% were first time donors, 65% were male, with a mean age of 35 years (Table 4). Most of the HBV positive donors were born overseas which reflects the epidemiology of HBV in the general population. There were only eleven blood donors who seroconverted for HBV during the last four years, consistent with a low incidence rate. Ethnicity or country of birth (82%) was the most frequent risk factor for HBV positivity, followed by having a sexual partner with known risk or known to be positive for any transfusion-transmissible infection (3%).

**Table 4** Attributes of donors positive for HBV infection by year of donation, 2008-2011

Characteristics	2008	2009	2010	2011	2008-2011
Number of positive donors	124	124	127	118	493
Number of positive first time donors (%)	116 (93%)	118 (95%)	108 (84%)	99 (83%)	441 (89%)
% male	78 (63%)	79 (63%)	84 (66%)	79 (67%)	320 (65%)
Mean age (range) in years	32 (16 to 63)	34 (16 to 69)	37 (16 to 71)	38 (16 to 77)	35 (16 to 77)
Number of seroconverters	2	1	2	5	11
% born in Australia	18 (15%)	16 (13%)	17 (13%)	15 (13%)	66 (13%)
<b>Main reported risk factor</b>	Ethnicity/COB <sup>1</sup>	Ethnicity/COB	Ethnicity/COB	Ethnicity/COB	Ethnicity/COB
	87%	77%	83%	85%	82%
<b>Second reported risk factor</b>	Partner with known risk or known to be positive	Household contact	Partner with known risk or known to be positive	TBP <sup>2</sup> , PRP <sup>3</sup> each	Partner with known risk or known to be positive
	2%	6%	4%	3%	3%

1 COB=Country of birth

2 TBP= Tattoo/ Body piercing

3 PRP= Partner with known risk/known to be positive

## Donors with HCV infection, 2008-2011

Of 423 donors positive for HCV in 2008-2011, 73% were first time donors (Table 5). The mean age of HCV positive donors was 43 years which remained fairly steady over the last four years. Male donors represented more than 60% of all donors with HCV infection but unlike HBV where birth overseas predominated, the majority (68%) of HCV positive donors were born in Australia. The number of HCV seroconverters (31 donors) was the highest among all transfusion-transmissible infections. Overall, the most important risk factor for HCV positivity was intravenous drug use (25%) followed by tattoo or body piercing (20%).

**Table 5** Attributes of donors positive for HCV infection by year of donation, 2008-2011

Characteristics	2008	2009	2010	2011	2008-2011
Number of positive donors	134	122	86	81	423
Number of positive first time donors (%)	98 (73%)	83 (68%)	67 (79%)	59 (73%)	306 (73%)
% male	80 (59%)	72 (59%)	53 (62%)	55 (68%)	260 (61%)
Mean age (range) in years	42 (17 to 65)	44 (17 to 71)	42 (16 to 63)	42 (16 to 78)	43 (16 to 78)
Number of seroconverters	4	11	10	6	31
% born in Australia	85 (63%)	90 (74%)	61 (71%)	51 (63%)	287 (68%)
<b>Main reported risk factor</b>	Intravenous drug use 25%	Intravenous drug use 35%	Tattoo/Body piercing 21%	Intravenous drug use 21%	Intravenous drug use 25%
<b>Second reported risk factor</b>	Tattoo/Body piercing 22%	Tattoo/Body piercing 18%	Intravenous drug use 19%	Tattoo/Body piercing 20%	Tattoo/Body piercing 20%

## Donors with HIV infection, 2008-2011

In contrast to the donors with HBV or HCV infection, the majority of donors with HIV infection during 2008-2011 were repeat donors (59%) (Table 6). Most were male (74%) of younger age (mean age 36 years) and Australian born (63%). In respect of country of birth, 2011 was notable as the proportion born in Australia (29%) was markedly lower than the average for 2008-2011 (63%). Overall though, the pattern in donors is very similar to new HIV diagnoses in the general population. According to the recent population data, people born in Australia accounted for 58% of cases of HIV infection newly diagnosed in 2006-2011, most of the newly diagnosed HIV cases were male (86.2%) in 2008-2011 with a mean age of 37 years<sup>9</sup>. Of 16 HIV positive repeat donors, 12 donors seroconverted for HIV during the last four years. Having a sexual partner with known risk or known to be positive for any transfusion-transmissible infection (37%) and male-to-male sexual contact (30%) were the two most important risk factors for HIV positivity in blood donors during 2008-2011.

**Table 6** Attributes of donors positive for HIV infection by year of donation, 2008-2011

Characteristics	2008	2009	2010	2011	2008-2011
Number of positive donors	10	3	7	7	27
Number of positive first time donors (%)	5 (50%)	1 (33%)	1 (14%)	4 (57%)	11 (41%)
% male	8 (80%)	2 (67%)	5 (71%)	5 (71%)	20 (74%)
Mean age (range) in years	35 (19 to 53)	38 (26 to 50)	37 (23 to 57)	36 (22 to 62)	36 (18 to 57)
Number of seroconverters	3	2	4	3	12
% born in Australia	7 (70%)	2 (67%)	6 (86%)	2 (29%)	17 (63%)
<b>Main reported risk factor</b>	Male-to-male sexual contact 60%	Male-to-male sexual contact 33%	Partner with known risk or known to be positive 57%	Partner with known risk or known to be positive 57%	Partner with known risk or known to be positive 37%
<b>Second reported risk factor</b>	Partner with known risk or known to be positive 33%	Partner with known risk or known to be positive 33%	Male-to-male sexual contact 14%	Male-to-male sexual contact 14%	Male-to-male sexual contact 30%

9 The Kirby Institute. *op. cit.*

## Donors with HTLV infection, 2008-2011

Only 21 donors were positive for HTLV infection during the 2008-2011 period, 95% were first time donors and 62% were male, with a mean age of 38 years (Table 10). Most of the HTLV positive donors (86%) were born overseas. There was only one donor who seroconverted for HTLV in 2010. Ethnicity or country of birth (65%) was the most important risk factor for HTLV infection in accepted blood donors in Australia.

**Table 7** Attributes of donors positive for HTLV infection by year of donation, 2008-2011

Characteristics	2008	2009	2010	2011	2008-2011
Number of positive donors	7	9	2	3	21
Number of positive first time donors (%)	7 (100%)	8 (89%)	1 (50%)	3 (100%)	19 (95%)
% male	4 (57%)	6 (67%)	1 (50%)	1 (33%)	12 (62%)
Mean age (range) in years	35 (27 to 49)	38 (18 to 65)	70 (70)	38 (23 to 46)	38 (18 to 70)
Number of seroconverters	0	0	1	0	1
% born in Australia	0 (0%)	3 (33%)	0 (0%)	0 (0%)	3 (14%)
<b>Main reported risk factor</b>	Ethnicity/COB 86%	Ethnicity/COB 44%	Ethnicity/COB 50%	Ethnicity/COB 66%	Ethnicity/COB 65%
<b>Second reported risk factor</b>	Partner with known risk or known to be positive 10%	BTR <sup>1</sup> ,HHC <sup>2</sup> ,HCE <sup>3</sup> each 11%	–	Tattoo/Body piercing 33%	BTR,HHC,HCE,PRP <sup>4</sup> each 5%

1 BTR= Blood/tissue recipient

2 HHC=Household contact

3 HCE=Exposure in healthcare setting

4 PRP= Partner with known risk/known to be positive

## Comparison of major exposure categories between blood donor and the general population

A comparison of major exposure categories between blood donors and the general population was conducted to determine if any unique source of infection exists for Australian donors (Table 8).

Consistent with previous years, the most frequent risk factor for HBV positive donors was ethnicity or country of birth which accounted for 85% of the HBV positive donors in 2011. This finding also parallels the population data that shows that country of birth is the strongest risk factor for chronic HBV infection in Australia<sup>10,11,12</sup>. However, intravenous drug use (31%) was reported to be the most common route of infection for newly acquired HBV infection in the general population in 2011.

The most frequent risk factor for HCV infection in blood donors in 2011 was intravenous drug use followed by tattoo or body piercing. These were also the two most important risk factors for HCV in general population in 2011, both for new HCV diagnoses and for newly acquired HCV infection. Nonetheless, the proportion of individuals reporting intravenous drug use among newly acquired HCV infections in the general population<sup>13</sup> (60%) was comparatively higher than in the donor population (21%) reflecting the impact of the Blood Services' permanent deferral for intravenous drug use.

10 Nguyen VTT, Razali K, Amin J, Law MG, Dore GJ. Estimates and projections of hepatitis B-related hepatocellular carcinoma in Australia among people born in Asia-Pacific countries. *Journal of Gastroenterology and Hepatology*. 2008;23(6):922-9.

11 O'Sullivan BC, Gidding HF, Law M, Kaldor JM, Gilbert GL, Dore GJ. Estimates of chronic hepatitis B virus infection in Australia, 2000. *Australian and New Zealand Journal of Public Health*. 2004;28(3):212-6.

12 Williams S, Vally H, Fielding J, Cowie B. Hepatitis B prevention in Victoria, Australia – the potential to protect. *Euro Surveillance*. 2011;16(22):pii: 19 879.

13 The Kirby Institute. *op. cit.*

Sexual contact that included male-to-male sexual contact, partners with known risk and engagement in sex work, together contributed 71.4% of the risk for HIV positive donors and 79% of newly diagnosed HIV infection in Australia. In 2011, approximately 73.7% of all newly diagnosed HIV infections in the general population were attributed to male-to-male sexual contact compared with 30% of HIV-positive donors, demonstrating the effectiveness of the current donor deferral criteria. Having a sexual partner with known risk or known to be positive for any transfusion-transmissible infection accounted for 57% of all HIV positive donors in 2011.

**Table 8 Comparison between positive blood donors and general population in Australia by infection and major risk categories, 2011**

Major risk category	HBV <sup>1</sup>		HCV <sup>1</sup>		HIV <sup>2</sup>		HTLV	
	General population (%)	Blood donors (%)	General population (%)	Blood donors (%)	General population (%)	Blood donors (%)	General population (%)	Blood donors (%)
Intravenous drug use	31.0	0.0	60.0	21.0	1.9	0.0	–	0.0
Country of birth/Ethnicity	–	84.8	–	13.6	8.9	0.0	–	66.7
Sexual contact <sup>3</sup>	19.0	2.5	3.5	2.5	88.1	71.4	–	0.0
Blood or tissue recipient	0.8	0.0	0.0	11.1	0.2	0.0	–	0.0
Tattoo or body piercing	11.1	2.5	3.5	19.8	0	0.0	–	33.3
Exposure in health care setting	4.0	0.9	1.0	4.9	0	0.0	–	0.0
Household contact	2.4	0.0	0.5	8.6	0	0.0	–	0.0
Other blood to blood contact	–	0.0	–	6.2	0	14.3	–	0.0
Other/undetermined	31.7	8.5	31.5	9.9	0.9	14.3	–	0.0
<b>No risk factors identified</b>	–	<b>0.9</b>	–	<b>2.5</b>	–	<b>0</b>	–	<b>0.0</b>
<b>Not reported</b>	–	<b>0.0</b>	–	<b>0.0</b>	–	<b>0</b>	–	<b>0.0</b>

1 Includes exposure categories for newly acquired HBV and newly acquired HCV infections only

2 Includes exposure categories for new HIV diagnoses

3 Includes three sub-groups: Male-to-male sexual contact, Partner with known risk or known to be positive and Engaged in sex work

Due to the scarcity of reliable data on prevalence of key risk factors for HTLV in the Australian population, no meaningful comparison was possible. However, HTLV is highly endemic in certain geographic regions including Japan, the Caribbean and central Africa and to a lesser extent in Iran, Iraq, southern India and China<sup>14</sup>. This is consistent with our finding that ethnicity or country of birth was the infective risk in the majority (66.7%) of HTLV positive donors in 2011.

## Non-compliance among positive donors

About one-fifth of the positive donors in 2008-2011 had risk factors identified during their post-donation interview that would have deferred them from donating had they disclosed their risk behaviour at the pre-donation interview (Table 9). This is termed 'non-compliance' with donor selection guidelines and the Blood Service remains highly committed to minimise it by developing improved methods of ascertaining donor risk behaviour. A donor who does not appropriately report risk behaviour for a transfusion-transmissible infection poses a potential risk to the safety of the blood supply for two reasons. Firstly, if a donor with a history of risk behaviour for a transfusion-transmissible infection donates blood within the window period, there is a very small but real possibility that infection is not detected by testing and the blood is included in the blood supply. Secondly, even where successfully detected there is an extremely remote risk of erroneously issuing this positive unit (i.e. a process failure). The Blood Service takes measures including the use of computerised release systems to minimise this risk. These are both avoidable risks if a positive donor appropriately discloses their risk (i.e. complies - leading to deferral) since no donation will not be collected.

14 Verdonck K, González E, Van Dooren S, Vandamme A-M, Vanham G, Gotuzzo E. Human T-lymphotropic virus 1: recent knowledge about an ancient infection. *The Lancet Infectious Diseases*. 2007;7(4):266-81



**Table 9 Non-compliance rate among donors who were positive for HBV, HCV, HIV and HTLV, and reason for non-compliance, 2008–2011**

Non-compliance by year and reason for deferral	2008	2009	2010	2011	2008-2011
<b>Number (%) of non-compliant donors by reasons for deferral</b>					
Intravenous drug user	37 (55.2)	47 (77)	30 (66.7)	15 (55.6)	129 (64.5)
Known status : previous positive	18 (26.9)	10 (16.4)	8 (17.8)	8 (29.6)	44 (22)
Male-to-male-sexual contact	6 (9)	1 (1.6)	2 (4.4)	0 (0)	9 (4.5)
Partner with known risk or known to be positive	4 (6)	3 (4.9)	1 (2.2)	3 (11.1)	11 (5.5)
Others	2 (3)	0 (0)	4 (8.9)	1 (3.7)	7 (3.5)
<b>Total number (per 100 positive donors) of non-compliant donors by year</b>	<b>67 (24.4)</b>	<b>61 (23.6)</b>	<b>45 (20.4)</b>	<b>27 (12.9)</b>	<b>200</b>

The rate of non-compliance in positive donors appears to have been stable for the past decade but there is some evidence of a declining trend since 2008. The rate observed in the previous Blood Service study<sup>15</sup> for 2000-2006 was 22%. The number of donors and rates for 2008, 2009, 2010 and 2011 are 67 (24.4%), 61 (23.6%), 45 (20.4%) and 27 (12.9%) respectively, indicating a gradual decline in recent years. Particularly pleasing is the rate in 2011, which is the lowest recorded. However, future annual data will be required to confirm this as a trend. The majority of non-compliant positive donors in 2011 had a history of intravenous drug use (55.5%), which is a permanent donor deferral criterion in Australia irrespective of time since last episode of intravenous drug use. Overall, during the period of 2008-2011, 64.5% of non-compliance was attributed to intravenous drug use followed by known status of previously being positive for a virus (22%), having a sexual partner with known risk or known to be positive for any transfusion-transmissible infection (5.5%) and male-to-male sexual contact within the last 12 months (4.5%).

While the rate of non-compliance among donors with transfusion-transmissible infections is known, the rate in non-positive donors has yet to be measured in the Australian donor population. This rate is arguably even more important as recently infected, window period donors (who would test negative) pose the greatest risk if they fail to self-defer. Based on anonymous surveys of donors in the UK and North America,<sup>16,17</sup> the non-compliance rate among test negative donors ranged from 0.2-11% dependent on the deferral risk question. Perhaps not surprisingly the highest rates of non-compliance were for permanent deferrals, for example intravenous drug use. This reflects the previous observation that non-compliant donors have a high propensity to dismiss remote risk behaviour<sup>18</sup>. The Blood Service is currently undertaking an anonymous Australian donor survey to determine the rate of non-compliance to high risk behaviour-related questions on the pre-donation questionnaire.

## Seroconverters

The Blood Service uses the rate of seroconversion as a measure of the incidence rate of newly acquired infection in donors which correlates directly with the risk of transmission. During 2005-2011, a total of ninety seven donors whose previous donation tested negative were positive for that transfusion-transmissible infection, designating them as 'seroconverters'. Consistent with 2008-2010, the highest number of rate of seroconversion in 2011 occurred for HCV, accounting for 42.9% of all seroconverters. This was followed by HBV and HIV, accounting for 35.7% and 21.4%, respectively. No donors seroconverted for HTLV or active syphilis in 2011.

Similar to the findings from previous years, seroconverters in 2011 were disproportionately male (78.6%). However, unlike 2008-2010, the majority of them were born overseas (64.3%). The mean age of seroconverters in 2011 was 41.6 years (40.8 years for HBV, 41.2 years for HCV and 43.7 years for HIV).

15 Polizzotto. *op. cit.*

16 Grenfell P, Nutland W, McManus S, Datta J, Soldan K, Wellings K. Views and experiences of men who have sex with men on the ban on blood donation: a cross sectional survey with qualitative interviews. *BMJ*. 2011;343.

17 Goldman M, Yi Q-L, Ye X, Tessier L, O'Brien SF. Donor understanding and attitudes about current and potential deferral criteria for high-risk sexual behavior. *Transfusion*. 2011;51(8):1829-34.

18 Polizzotto. *op. cit.*

## Residual risk estimates/estimated risk of window period donation

The rate of seroconversion can be used to estimate the risk of collecting a unit of blood from a donor with very early infection (window period) which might test negative. Individuals donating in the window period (incident infections) pose the majority of the risk in terms of transmission because they may be missed by testing whereas long standing (prevalent) infections are readily detected by modern screening tests.

Using the number of seroconversions reported for the 2010 and 2011 calendar year periods and applying these to three published risk models, residual risk estimates<sup>19</sup> (per unit transfused) were derived for the four transfusion-transmissible viral infections subject to mandatory testing (Table 10). The risk estimate for active syphilis is not derived by the same method but rather assumed from the lack of reported cases of transfusion-transmission for several decades. The estimates for all except for HBV fall below the 'negligible' risk threshold of 1 in 1 million used by the Blood Service to contextualise the risks for transfusion recipients. The HBV residual risk estimate of 1 in 764 000 is lower than internationally comparable data and considered 'minimal' on the risk scale, roughly equating with the risk of death from a train accident. Further information can be obtained from the following website [http://www.transfusion.com.au/adverse\\_events/risks/estimates](http://www.transfusion.com.au/adverse_events/risks/estimates).

Based on the estimates and assuming approximately 1.3 million donations collected per annum (2010-2011) one to two transfusion-transmissions (most likely HBV) would be predicted per annum. The reported frequency of cases of transfusion-transmission supports that the modelled estimates are conservative with no cases of transfusion-transmitted HCV reported in Australia since 1991, none for HTLV since testing commenced in 1993, none for HIV since 1998 and three probable cases of HBV in the 2005-2011 period.

**Table 10 Estimated risk of window period donation/risk of not detecting true infection for HBV, HCV, HIV, HTLV and syphilis in Australian blood donations (2010-2011)**

	HBV	HCV	HIV	HTLV	Active syphilis
Estimated rate of collecting infectious unit (per million donations)	1-2	<1	<1	<1	<1
Residual Risk to recipient - per unit transfused	Approximately 1 in 764 000	Less than 1 in 1 million	Less than 1 in 1 million	Less than 1 in 1 million	Less than 1 in 1 million

## Testing for malaria

In Australia, testing for malaria infection is limited to 'at risk' donors. This includes donors who report at the pre-donation interview travel to or residence in malaria endemic countries, as well as those with a previous history of infection<sup>20</sup>. The availability of malaria antibody testing results in significant recovery of valuable fresh blood components (red blood cells and platelets) as prior to the commencement of testing such donors were restricted to donating plasma for fractionation only for 1-3 years. Annually an estimated 65 000 red cells and 7 000 platelets are recovered as a result of non reactive malaria antibody test results. Since malaria antibodies can indicate both recent and past infection all antibody repeat reactive donors are also tested for malaria antigen and malaria DNA to exclude current infection. Donors positive for one or both supplementary tests are immediately referred for clinical assessment.

In 2011, a total 116 610 donations were tested for malaria antibody of which 2 411 (2.1%) were found to be repeat reactive for malaria antibodies. None of these 2 411 donations were positive for either malaria antigen or malaria DNA indicating all were from donors with past infection and thus posed negligible transmission risk.

19 Seed CR, Kiely P, Keller AJ. Residual risk of transfusion transmitted human immunodeficiency virus, hepatitis B virus, hepatitis C virus and human T lymphotropic virus. *Internal Medicine Journal*. 2005;35(10):592-8.

20 Seed CR, Kee G, Wong T, Law M, Ismay S. Assessing the safety and efficacy of a test-based, targeted donor screening strategy to minimize transfusion transmitted malaria. *Vox Sanguinis*. 2010;98(3p1):e182-e92.



## Xenotropic murine leukaemia virus-related virus

Xenotropic murine leukaemia virus-related virus (XMRV) was initially identified in patients with prostate cancer and this finding was supported by some initial studies reporting the detection of XMRV genomic sequences in prostate cancer patients. However, subsequent studies have either failed to detect XMRV sequences in prostate cancer patients or have found them at the same prevalence as that for non-cancerous prostates. Thus the association between XMRV and prostate cancer remains to be clarified. Subsequently, in 2009 a report was published indicating that XMRV was associated with chronic fatigue syndrome (CFS). At this time the Blood Service already deferred donors with current symptoms of CFS. As a precautionary measure against the possibility XMRV being established as the causative agent CFS and that it might be transfusion transmissible, the Blood Service extended the deferral to blood donors with a history of CFS. Subsequently a number of studies failed to detect XMRV sequences in CFS patients (including patients who were initially found to be infected with XMRV) and the current scientific consensus is that the association, if any, between XMRV and CFS has not been established and the initial findings of XMRV genomic sequences may have been due to laboratory contamination. The original article reporting an association between CFS and XMRV, published in the journal *Science*, was fully retracted by the editor-in-chief in December 2011 who cited a lack of confidence in the report and the validity of its conclusions<sup>25,26</sup>

## First reported case of human babesiosis in Australia

Human babesiosis is an emerging tick-borne parasitic disease and transfusion transmission has been documented in over 170 cases in North America<sup>27</sup>. While animal babesiosis is well recognised in Australian cattle and dogs, no locally acquired human cases had previously been documented. Notably, a transfusion recipient was diagnosed with babesiosis unrelated to known strains in Australian animals in April 2011<sup>28</sup>. Subsequent follow up indicated that the recipient was infected with the parasite prior to entering hospital and the infection was therefore not transfusion related. Subsequent sequencing indicated that the recipient was infected with *B. microti* the organism associated with the vast majority of transfusion associated cases. This is the first human case of babesiosis identified in Australia and is thought to have been locally acquired. The Blood Service has responded by initiating targeted research to identify the extent of any potential threat to the Australian blood supply.

## Hendra virus

Human Hendra virus (HeV) infection is an emerging zoonotic disease associated with high mortality (4/7 infections fatal)<sup>29</sup>. To date all seven recorded cases of HeV transmission to humans have occurred from Pteropus bats (flying foxes) via horses. While no cases of human disease were recorded, in 2011 Australia experienced its largest reported outbreak of equine HeV. Beginning in June, infected horses were reported from a number of properties in NSW and Queensland. More than 20 infected horses were identified along with the first report of a naturally infected dog. The primary mode of human exposure to HeV is thought to be from the respiratory secretions and/or blood of infected horses. HeV has been isolated from the nasopharyngeal secretions, saliva, urine, foetal material and organs of horses<sup>30</sup>. Transfusion transmission has not been reported but is theoretically possible and as a precautionary measure the Blood Service permanently excludes donors with HeV infection. In addition contacts of infected horses are notified they should not donate blood for a period of at least 6 weeks and thereafter are required to provide documented evidence of lack of anti-HeV seroconversion before being accepted to donate.

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25 Dodd RY, Hackett Jr J, Linnen JM, Dorsey K, Wu Y, Zou S, et al. Xenotropic murine leukaemia virus-related virus does not pose a risk to blood recipient safety. *Transfusion*. 2012;52(2):298-306.

26 Alberts B. Retraction. *Science*. 2011;334(6063):1636.

27 Leiby DA. Transfusion-associated babesiosis: shouldn't we be ticked off? *Ann Intern Med*. 2011;155(8):556-7.

28 Senanayake SN, Paparini A, Latimer M, Andriolo K, Dasilva AJ, Wilson H, et al. First Report of Human Babesiosis in Australia. *MJA* 196, 350-353 (2012).

29 Young JR, Selvey CE, Symons R. Hendra virus. *MJA*. 2011;195(5):250-1.

30 Tulsiani SM, Graham GC, Moore PR, Jansen CC, Van Den Hurk AF, Moore FAJ, et al. Emerging tropical diseases in Australia. Part 5. *Annals of Tropical Medicine and Parasitology*, 2011. 105(1): p. 1-11.

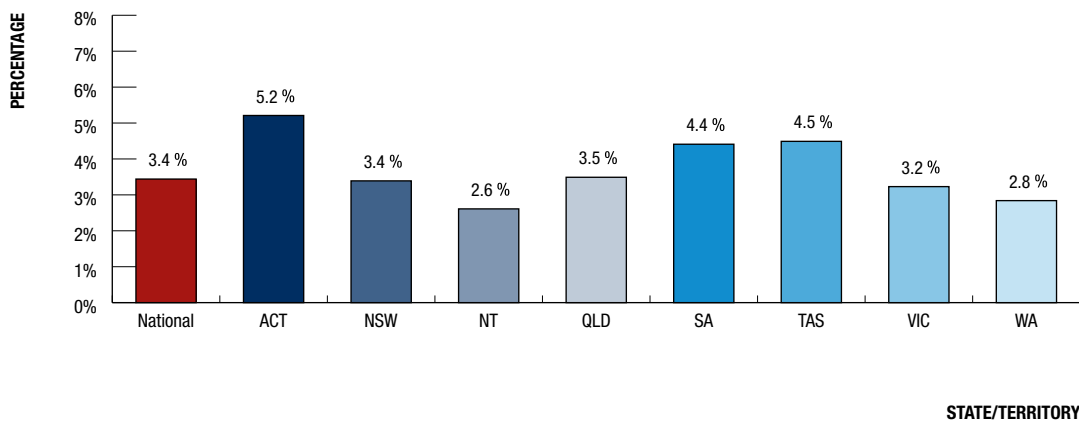
# Conclusions

1. Supporting the effectiveness of donor education and selection, the prevalence of transfusion-transmissible infections is substantially lower among both first time blood donors (12 to 39 times) and all donors (99 to 225 times) than in the general population and shows a stable or declining trend since 2005.
2. The prevalence of transfusion-transmissible infections among first time donors was much higher than the rates among all donors, highlighting the importance of promoting donor education of potential new donors and ensuring first-time donors read the pre-donation information and understand the importance of self deferral.
3. The incidence of newly acquired infection measured by the rate of seroconversion in repeat blood donors is also much lower than in the general population. This supports the general effectiveness of the donor questionnaire and specifically, that repeat donors understand what constitutes 'risk behaviour' for acquiring infection.
4. Infective risk factors identified in transfusion-transmissible infection positive blood donors closely parallel those for the general population with no 'unique' risk factors identified to date among blood donors.
5. Almost one-fifth of the positive donors in 2008-2011 were 'non-compliant' in that they had risk factors identified during their post-donation interview that would have deferred them from donating had they disclosed them at the pre-donation interview. Reassuringly, the rate of non-compliance among positive donors has been gradually declining since 2008 and notably in 2011 was the lowest recorded to date (12.9%). Understanding the reasons for, and minimising the rate of non-compliance is important because it reduces the risk of collecting blood from a potentially infected donor that may not be detected by testing.
6. The estimated residual risk of transmission for HIV, HCV, HBV, HTLV and active syphilis in Australia is very low, less than one in one million per unit transfused for all except HBV (approx 1 in 764 000). This supports the claim that Australia's blood supply is among the safest worldwide in respect of transfusion-transmissible infections for which testing is conducted. Despite this, there remains a real risk to patients which must be carefully considered before any transfusion.
7. In addition to established transfusion-transmissible infections, emerging infectious diseases continue to demand vigilant surveillance. Mosquito-borne agents such as dengue virus and West Nile virus are currently the principal threats but many other novel or emerging infectious diseases are constantly monitored by the Blood Service to assess their threat to the safety of the blood supply.

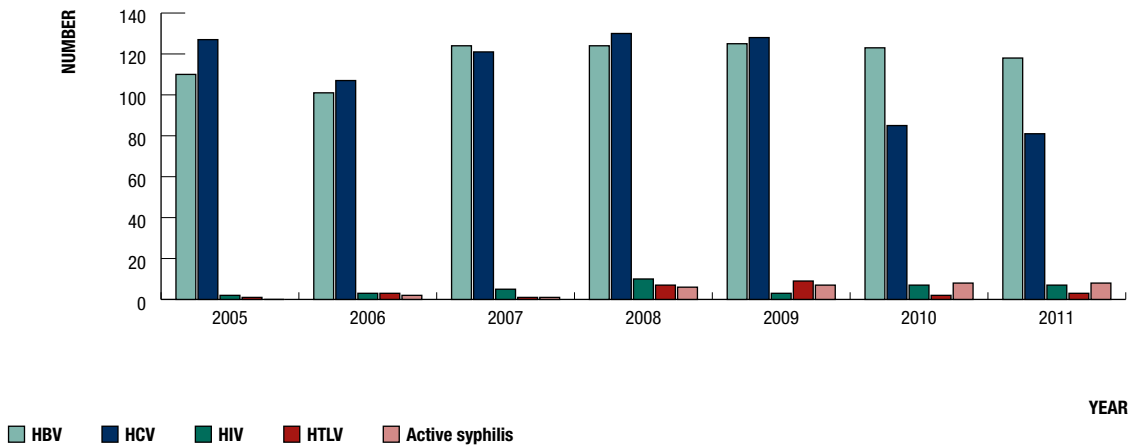
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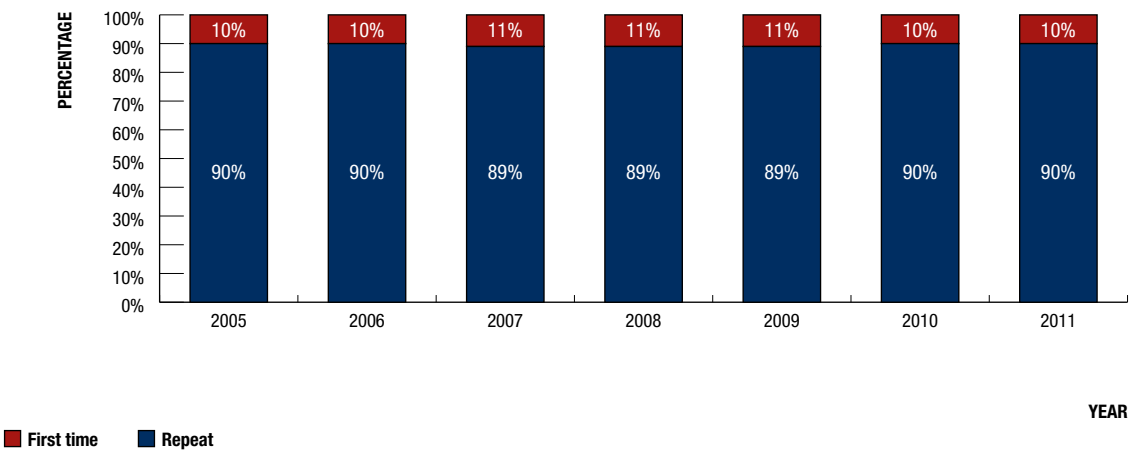
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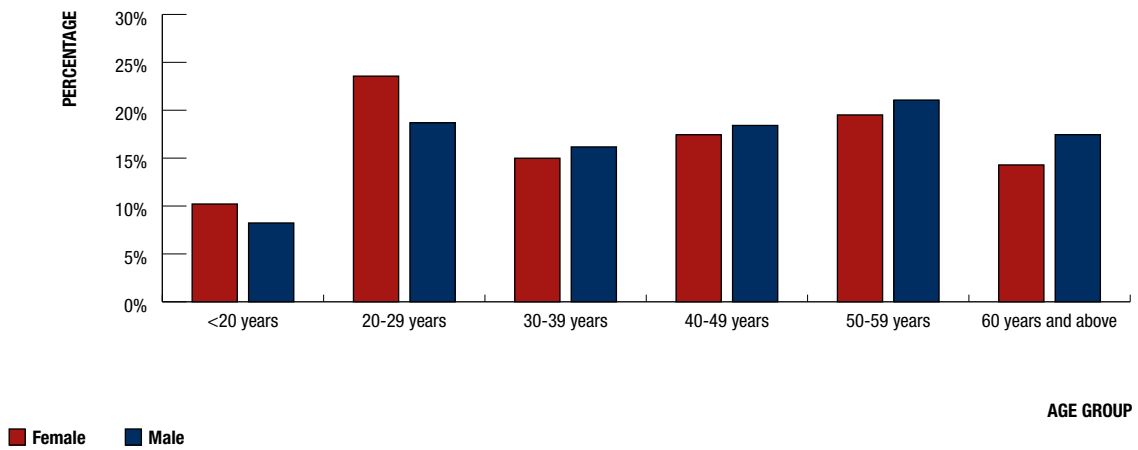
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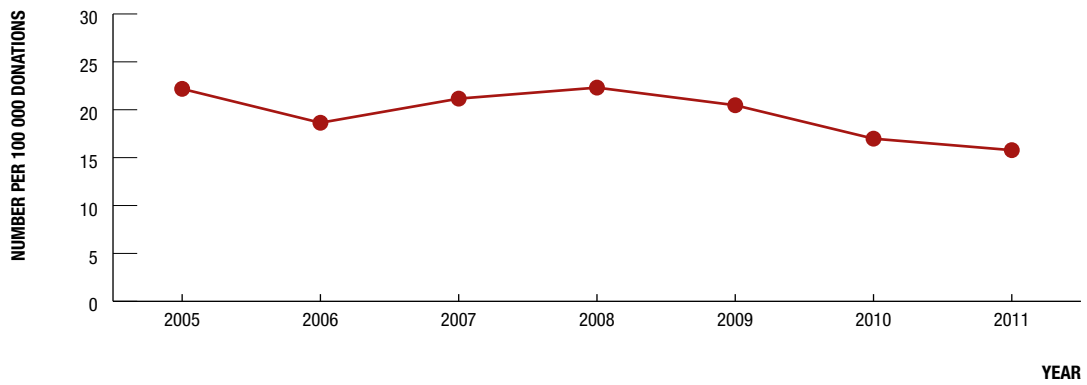
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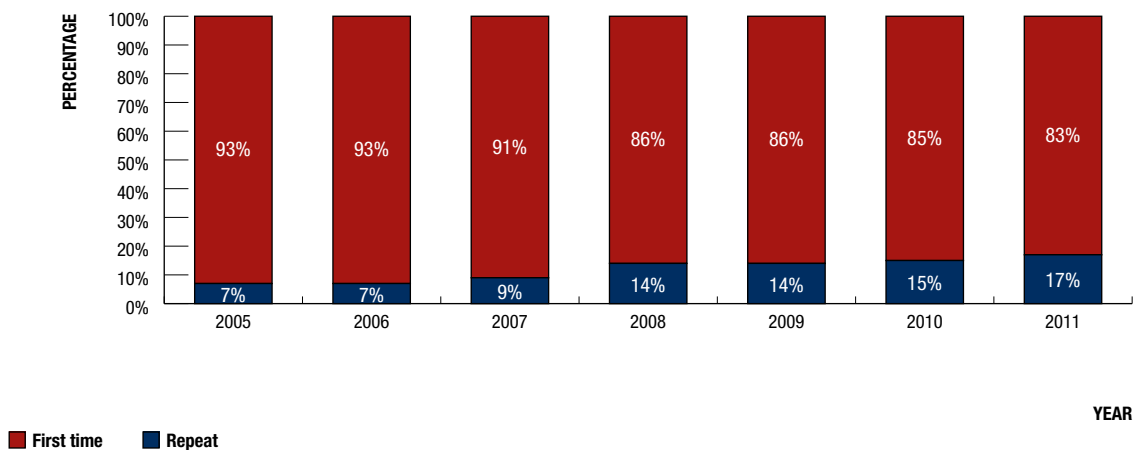
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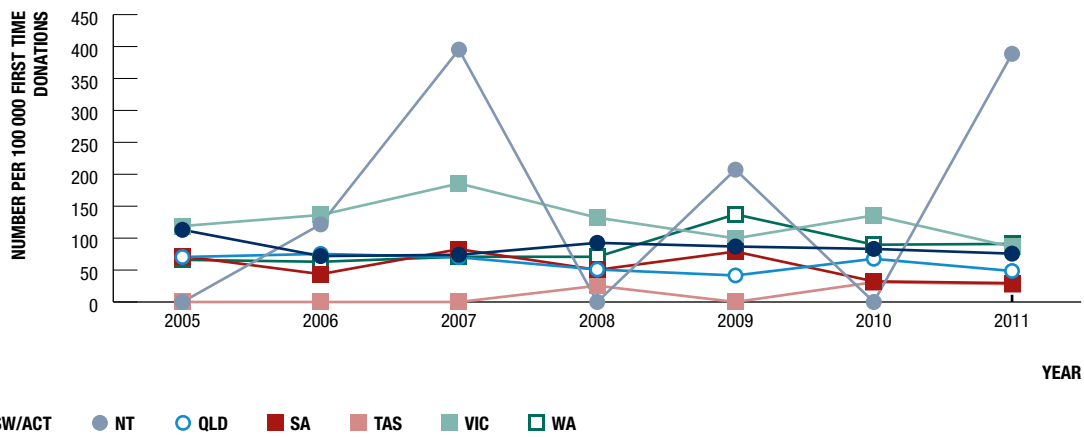


**Figure 6** Percentage of first time and repeat donations among all positive blood donations in Australia, 2005-2011

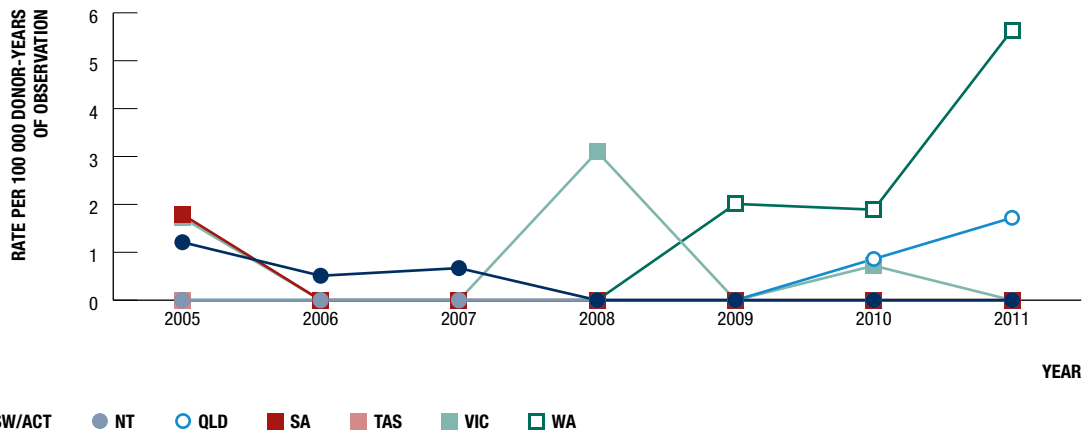




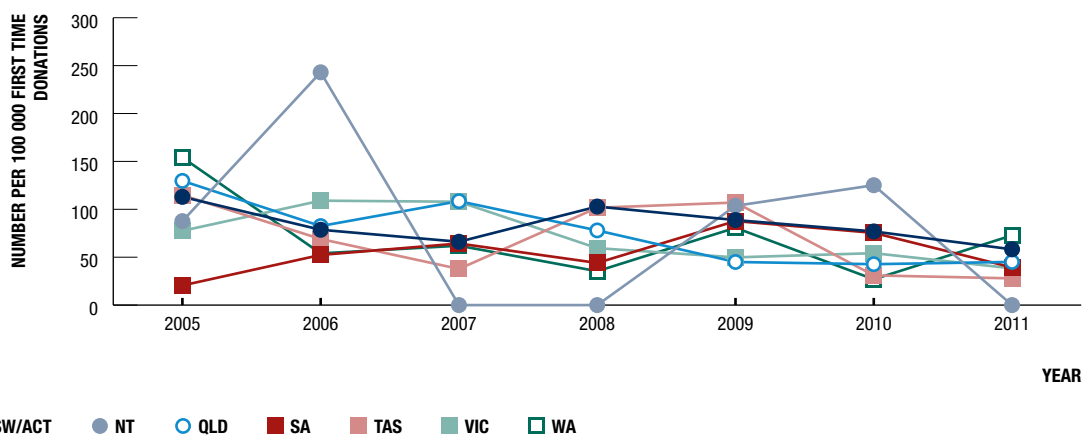
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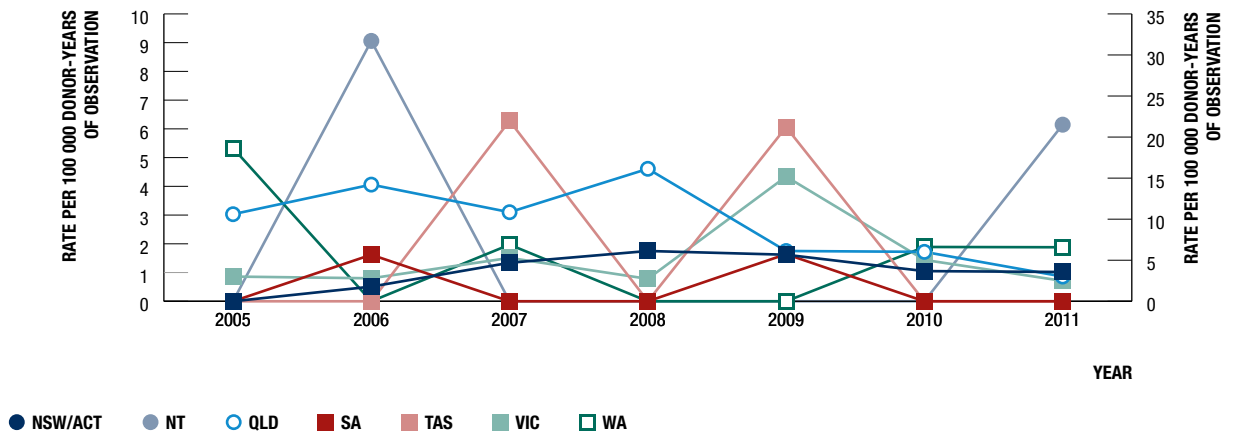
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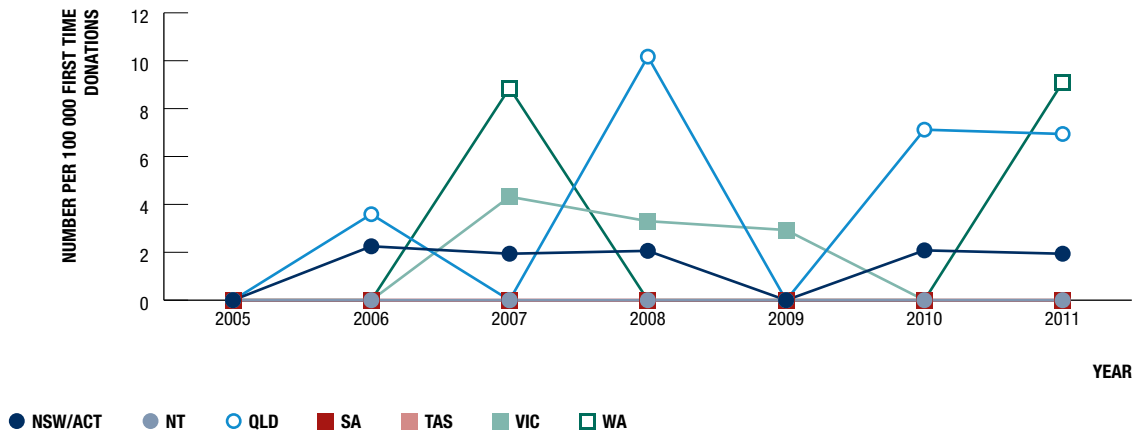
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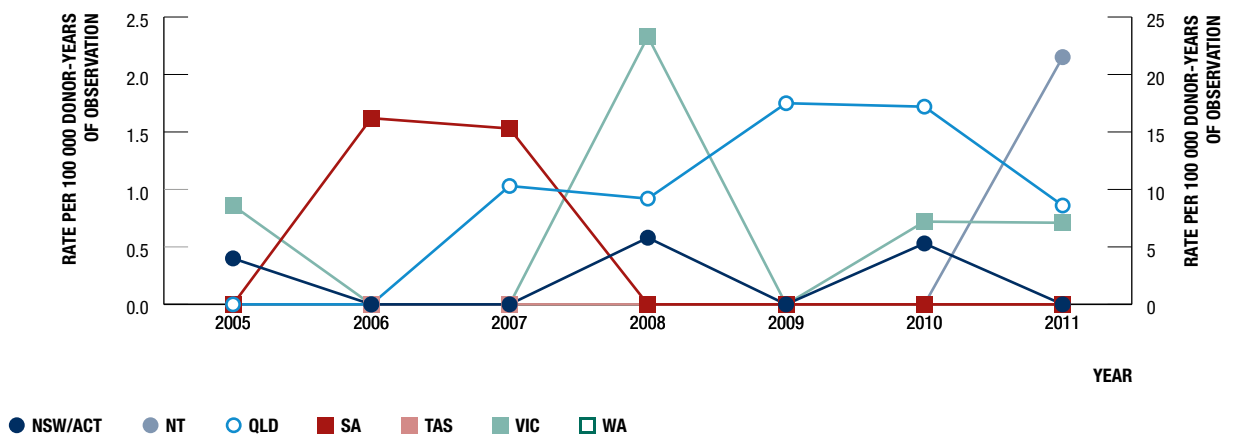
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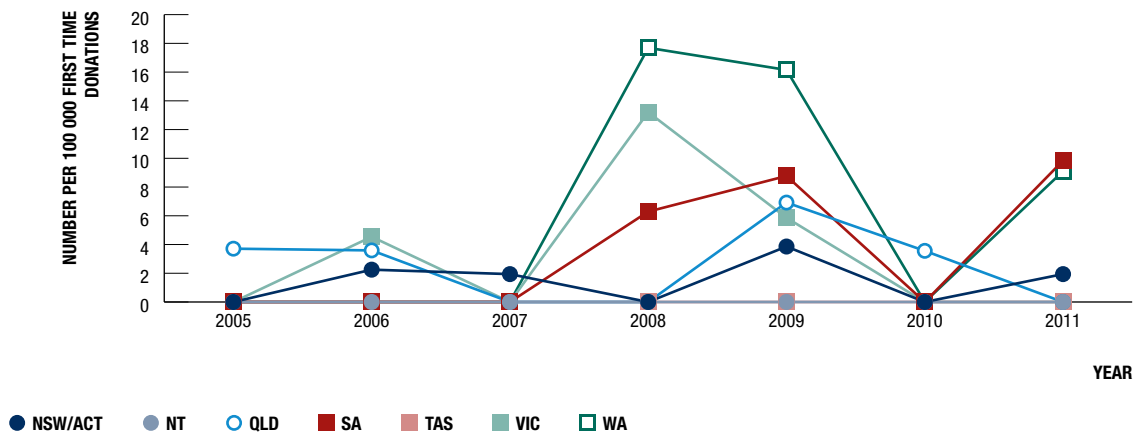


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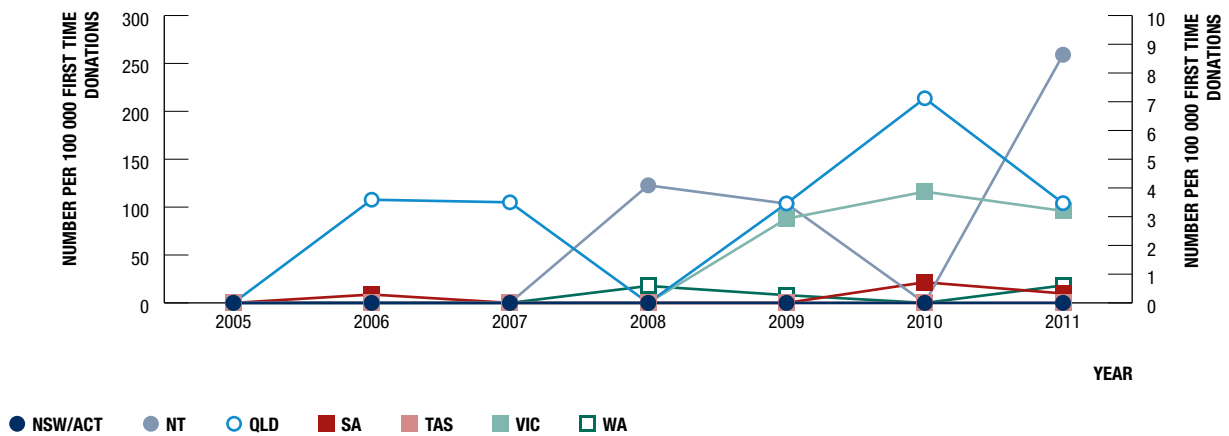


<sup>1</sup> Incidence in NT provided according to the scale on the secondary axis on the right hand side.

**Figure 13** Prevalence of HTLV among first time donors by state/territory and year of donation, 2005-2011

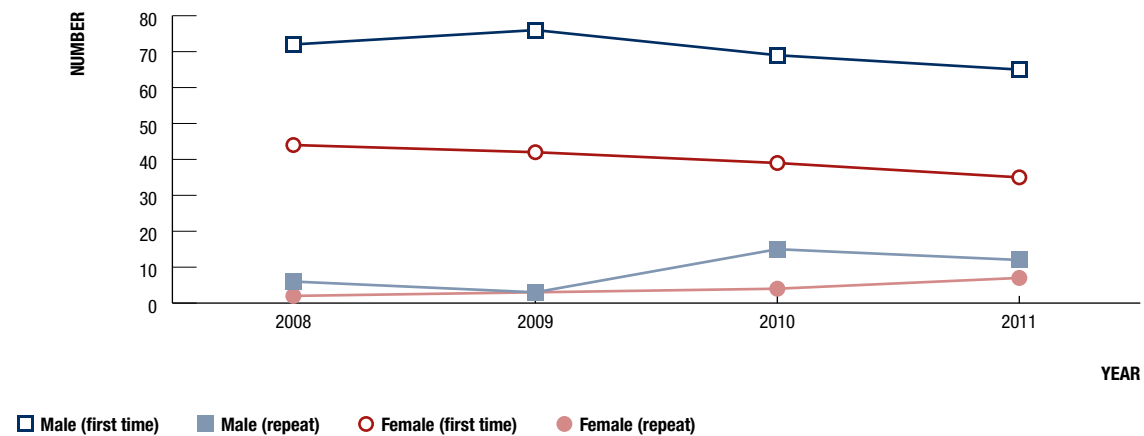


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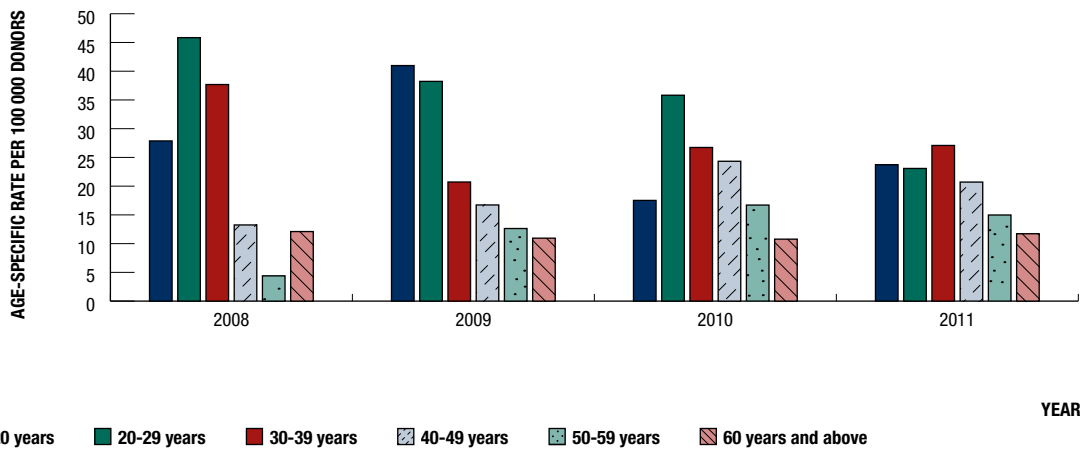


<sup>1</sup> Prevalence in QLD and VIC are provided according to the scale on the secondary axis on the right hand side.

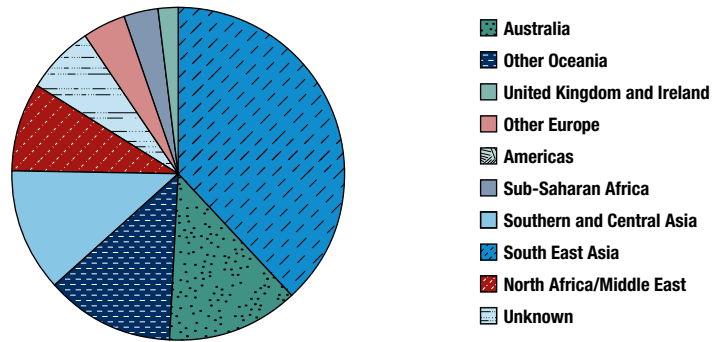
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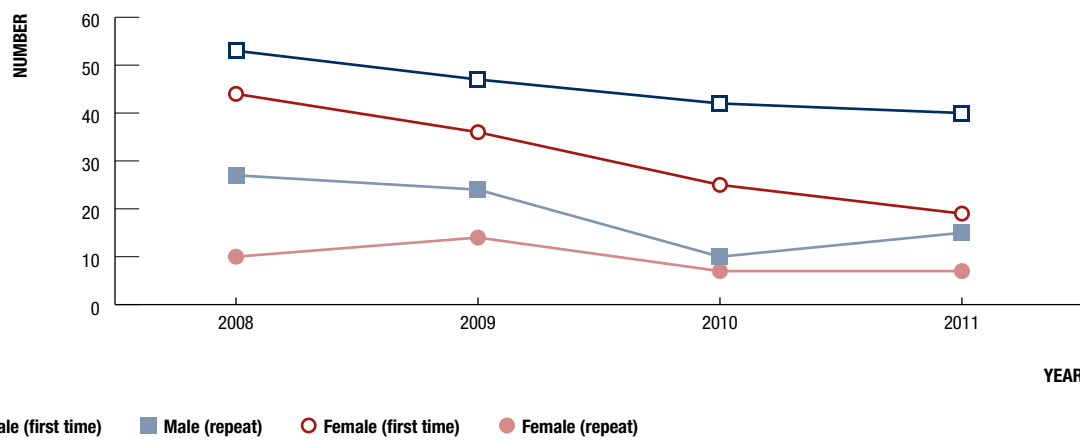
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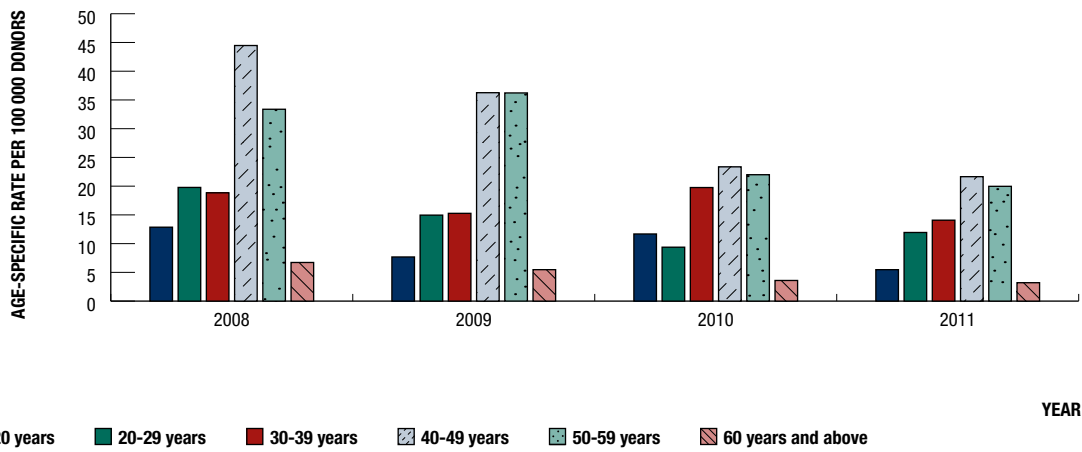
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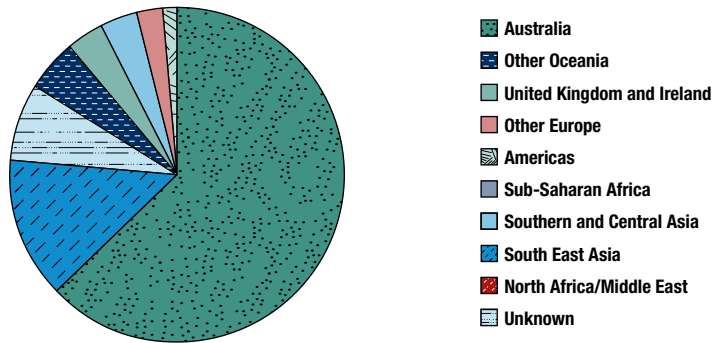
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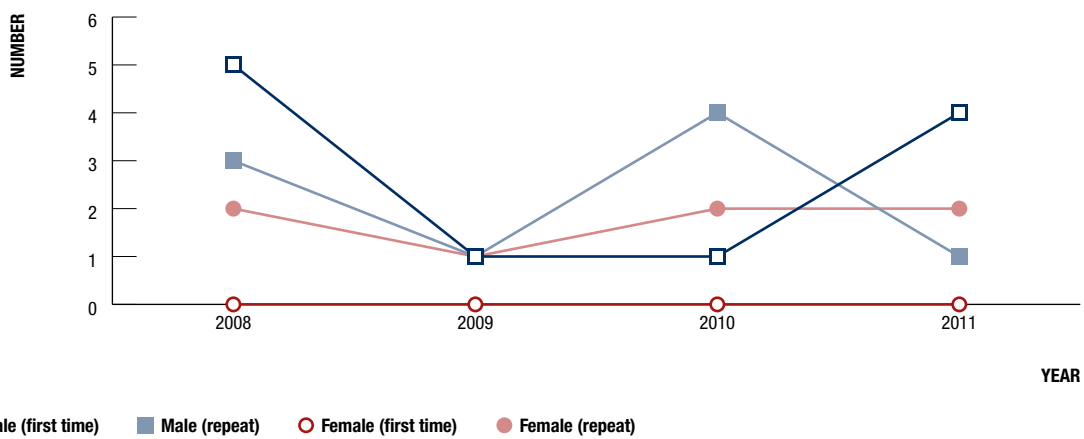
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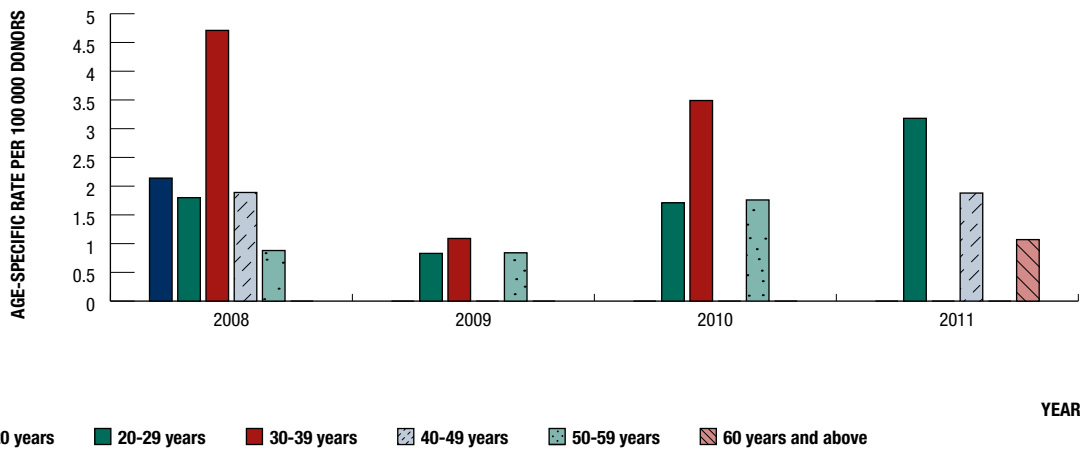
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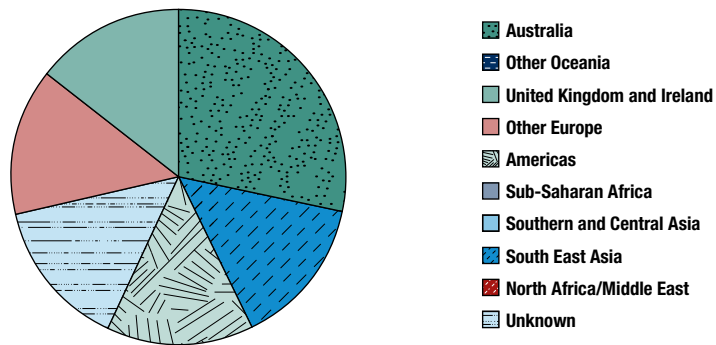
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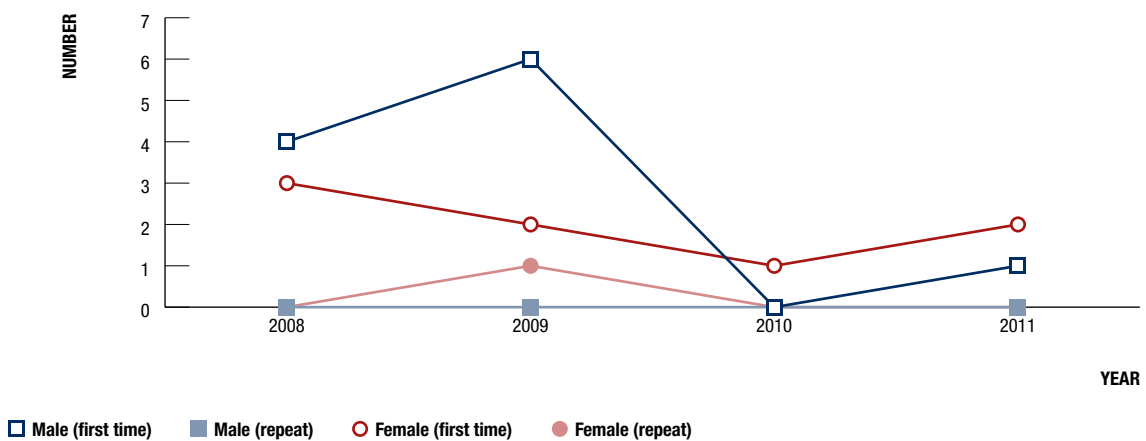
**Figure 22** Rate of HIV infection among blood donors by age group and year of donation, 2008-2011



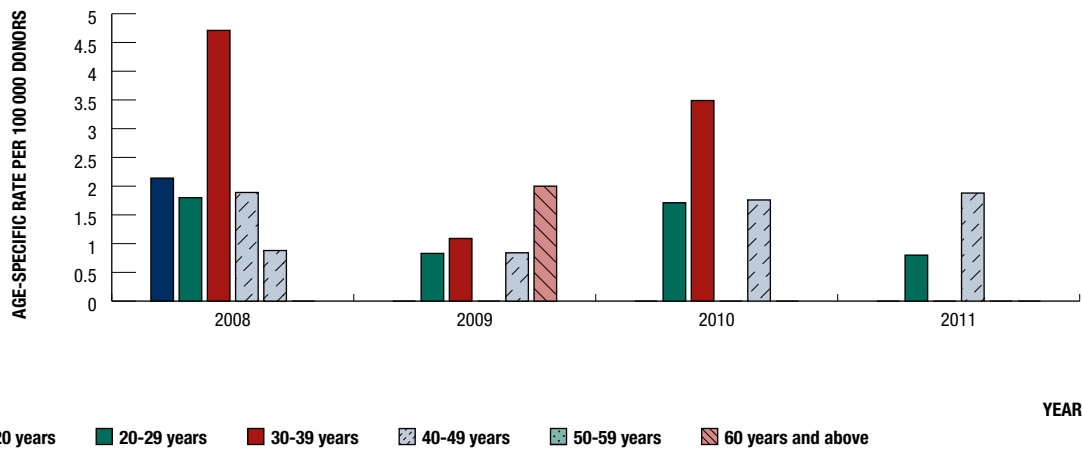
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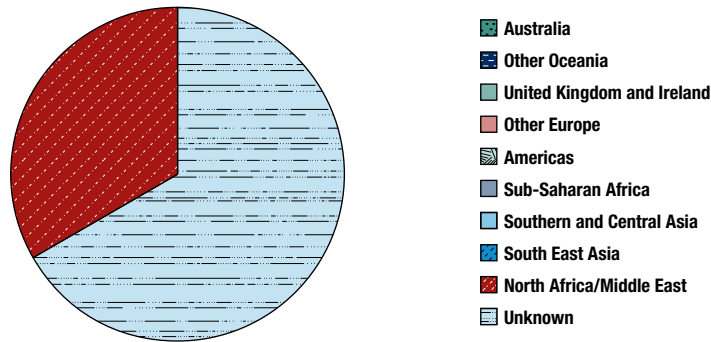
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**Table 1** Screening tests for transfusion-transmissible infections

Transfusion-Transmissible infection	Mandatory screening tests	Test Target	Year of introduction	Median window period estimate	Estimated risk of window period donation (per million transfusion)
<b>Syphilis</b>	<i>Treponema pallidum</i> Haemagglutination Assay (TPHA)	Antibodies to <i>Treponema pallidum</i>	~1949	45 days	<1 in 1 million
	HBsAg <sup>1</sup>	Hepatitis B surface antigen (HBsAg)	1970	38 days	–
<b>HBV</b>	Nucleic Acid Test for HBV	HBV DNA	2010	23.9 days	Approx 1 in 764 000
<b>HIV</b>	anti-HIV-1 <sup>1</sup> anti-HIV-2 <sup>1</sup>	Antibody to both HIV-1 and HIV-2 (anti-HIV-1/2)	1985 (HIV-1) 1993 (HIV-1/HIV-2)	22 days	–
	Nucleic Acid Test for HIV-1 <sup>2</sup>	HIV-1 RNA	2000	5.6 days	<1 in 1 million
<b>HCV</b>	anti-HCV <sup>1</sup>	Antibody to HCV	1990	66 days	–
	Nucleic Acid Test for HCV <sup>2</sup>	hepatitis C RNA	2000	3.1 days	<1 in 1 million
<b>HTLV</b>	anti-HTLV-1 <sup>1</sup> anti-HTLV-2 <sup>1</sup>	Antibody to both HTLV-1 and HTLV-2	1993	51 days	<1 in 1 million

1 Currently Abbott PRISM (Abbott Diagnostics, Wiesbaden-Delkenheim, Germany) Chemiluminescent Immunoassay system.

2 Chiron Procleix HIV-1/HCV (Multiplex) Assay, and the HIV-1 and HCV Discriminatory Assays (Chiron Blood Testing, Emeryville, California) from June 2000 until July 2010. Subsequently replaced by Novartis HIV-1/HCV/HBV Procleix Ultrio assay using a fully automated testing system (Procleix Tigris).

Table 2 The number and rate of transfusion-transmissible infections in Australia by type of donations and state/territory, 2005-2011

State/Territory of donation	All accepted donations												Total positive donations								
	HBV			HCV			HIV			HTLV			Syphilis			First time	Repeat	All			
	First time	Repeat	All	First time	Repeat	All	First time	Repeat	All	First time	Repeat	All	First time	Repeat	All						
<b>NSW/ACT</b>	338 491	2 465 273	2 803 764	290	23	313	280	32	312	5	3	8	5	1	6	3	3	580	62	642	
<i>Number (Number per 100 000 donations)</i>				85.67	0.83	11.16	82.72	1.30	11.13	1.48	0.12	0.29	1.48	0.04	0.21	0.00	0.89	171.35	2.51	22.90	
<b>NT</b>	6 074	71 148	77 222	9	1	10	5	2	7	0	1	1	0	0	0	0	2	18	6	24	
<i>Number (Number per 100 000 donations)</i>				148.17	1.41	12.95	82.32	2.81	9.06	0.00	1.41	1.29	0.00	0.00	0.00	0.00	32.93	296.35	8.43	31.08	
<b>QLD</b>	198 759	1 589 989	1 788 748	119	8	127	150	33	183	8	7	15	5	0	5	6	2	288	50	338	
<i>Number (Number per 100 000 donations)</i>				59.87	0.50	7.10	75.47	2.08	10.23	4.02	0.44	0.84	2.52	0.00	0.28	3.02	1.01	144.90	3.14	18.90	
<b>SA</b>	78 851	808 841	887 692	44	7	51	43	11	54	0	2	2	3	0	3	4	0	94	20	114	
<i>Number (Number per 100 000 donations)</i>				55.80	0.87	5.75	54.53	1.36	6.08	0.00	0.25	0.23	3.80	0.00	0.34	5.07	0.00	119.21	2.47	12.84	
<b>TAS</b>	23 514	238 062	261 576	3	0	3	17	2	19	0	0	0	0	0	0	0	1	20	3	23	
<i>Number (Number per 100 000 donations)</i>				12.76	0.00	1.15	72.30	0.84	7.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25	85.06	1.26	8.79	
<b>VIC</b>	186 059	1 819 225	2 005 284	232	14	246	125	18	143	3	6	9	7	0	7	3	1	370	39	409	
<i>Number (Number per 100 000 donations)</i>				124.69	0.77	12.27	67.18	0.99	7.13	1.61	0.33	0.45	3.76	0.00	0.35	1.61	0.54	198.86	2.14	20.40	
<b>WA</b>	77 330	783 168	860 498	66	9	75	52	9	61	2	0	2	5	0	5	5	2	130	20	150	
<i>Number (Number per 100 000 donations)</i>				85.35	1.15	8.72	67.24	1.15	7.09	2.59	0.00	0.23	6.47	0.00	0.58	6.47	2.59	168.11	2.55	17.43	
<b>National</b>	909 078	7 775 706	8 684 784	763	62	825	672	107	779	18	19	37	25	1	26	22	11	33	1 500	200	1 700
<i>Number (Number per 100 000 donations)</i>				83.93	0.80	9.50	73.92	1.38	8.97	1.98	0.24	0.43	2.75	0.01	0.30	2.42	1.21	165.00	2.57	19.57	



**Table 4 Number and rate<sup>1</sup> of HBV infection among repeat donors, 2005-2011, by state/territory and year of donation**

State/ Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	311 513	4	1.28	333 250	5	1.50	338 173	3	0.89	339 062	1	0.29
NT	8 862	0	0.00	8 496	0	0.00	10 214	0	0.00	11 166	0	0.00
QLD	205 398	0	0.00	216 496	0	0.00	209 556	0	0.00	226 726	1	0.44
SA	93 172	1	1.07	107 934	0	0.00	114 618	0	0.00	118 476	1	0.84
TAS	24 577	0	0.00	28 726	0	0.00	28 019	0	0.00	33 321	0	0.00
VIC	225 332	2	0.89	238 684	0	0.00	252 340	0	0.00	259 052	4	1.54
WA	101 063	0	0.00	99 376	0	0.00	109 425	0	0.00	113 274	0	0.00
<b>Total</b>	<b>969 917</b>	<b>7</b>	<b>0.72</b>	<b>1 032 962</b>	<b>5</b>	<b>0.48</b>	<b>1 062 345</b>	<b>3</b>	<b>0.28</b>	<b>1 101 077</b>	<b>7</b>	<b>0.64</b>
State/ Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	372 806	1	0.27	380 014	4	1.05	390 455	4	1.02	2 132 055	22	1.03
NT	11 158	0	0.00	10 470	1	9.55	10 782	0	0.00	62 653	1	1.60
QLD	242 001	1	0.41	243 837	3	1.23	245 975	3	1.22	1 373 514	8	0.58
SA	126 855	0	0.00	123 587	3	2.43	124 199	3	2.42	700 912	8	1.14
TAS	37 274	0	0.00	41 484	0	0.00	44 661	0	0.00	209 336	0	0.00
VIC	276 835	1	0.36	278 897	3	1.08	288 085	4	1.39	1 580 571	14	0.89
WA	118 327	3	2.54	120 646	1	0.83	121 057	5	4.13	683 799	9	1.32
<b>Total</b>	<b>1 185 256</b>	<b>6</b>	<b>0.51</b>	<b>1 198 935</b>	<b>15<sup>2</sup></b>	<b>1.25</b>	<b>1 225 214</b>	<b>19<sup>2</sup></b>	<b>1.55</b>	<b>6 742 840</b>	<b>62</b>	<b>0.92</b>

1 Rate per 100 000 first time donations

2 The increase is attributed to the introduction of HBV NAT which identified additional acute HBsAg negative and chronic occult HBV cases

**Table 5** Number and percentage of donors with HBV infection, 2008-2011, by year of donation, sex and age group

Donor status	Year of donation										Total	%
	2008		2009		2010		2011		2008-2011			
	M	F	M	F	M	F	M	F	M	F		
<b>First time donors</b>												
<20 years	7	6	10	6	5	4	6	7	28	23	51	10.3
20-29 years	32	18	29	16	23	17	17	12	101	63	164	33.3
30-39 years	23	8	12	6	16	6	17	5	68	25	93	18.9
40-49 years	7	4	10	7	15	4	16	4	48	19	67	13.6
50-59 years	1	4	10	3	7	5	5	5	23	17	40	8.1
60 years and above	2	4	5	4	3	3	4	1	14	12	26	5.3
<b>Repeat donors</b>												
<20 years	0	0	0	0	0	0	0	0	0	0	0	0.0
20-29 years	1	0	0	1	0	2	0	0	1	3	4	0.8
30-39 years	1	0	1	0	1	0	3	0	6	0	6	1.2
40-49 years	1	2	1	0	6	0	2	0	10	2	12	2.4
50-59 years	0	0	0	2	6	1	6	2	12	5	17	3.4
60 years and above	3	0	1	0	2	1	3	3	9	4	13	2.6
<b>Total</b>	<b>78</b>	<b>46</b>	<b>79</b>	<b>45</b>	<b>84</b>	<b>43</b>	<b>79</b>	<b>39</b>	<b>320</b>	<b>173</b>	<b>493</b>	<b>100</b>

**Table 6** Number and percentage of donors with HBV infection, 2008-2011, by year of donation and region of birth<sup>1</sup>

Region of birth	2008		2009		2010		2011		2008-2011	
	Number	%	Number	%	Number	%	Number	%	Number	%
<b>Australia</b>	18	15	16	13	17	13	15	13	66	13
Overseas born										
<i>Other Oceania</i>	11	9	9	7	14	11	15	13	49	10
<i>United Kingdom and Ireland</i>	1	1	1	1	0	0	2	2	4	1
<i>Other Europe</i>	7	6	12	10	8	6	5	4	32	6
<i>Middle East/North Africa</i>	7	6	6	5	3	2	10	8	26	5
<i>Sub-Saharan Africa</i>	3	2	6	5	4	3	4	3	17	3
<i>South East Asia</i>	55	44	54	44	67	53	45	38	221	45
<i>Southern and Central Asia</i>	13	10	16	13	9	7	14	12	52	11
<i>North America</i>	1	1	0	0	0	0	0	0	1	0
<i>South/Central America and the Caribbean</i>	0	0	1	1	0	0	0	0	1	0
<b>Total with a reported country of birth</b>	<b>116</b>	<b>94</b>	<b>121</b>	<b>98</b>	<b>122</b>	<b>96</b>	<b>110</b>	<b>93</b>	<b>469</b>	<b>95</b>
<b>Not reported</b>	<b>8</b>	<b>6</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>7</b>	<b>24</b>	<b>5</b>
<b>Total</b>	<b>124</b>	<b>100</b>	<b>124</b>	<b>100</b>	<b>127</b>	<b>100</b>	<b>118</b>	<b>100</b>	<b>493</b>	<b>100</b>

1 Region of birth from the Australian Bureau of Statistics.

**Table 7** Number and percentage of HBV infection among first time donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	66	39	63	32	62	34	56	32	247	137	384	87.1
Intravenous drug user	0	0	1	0	0	0	0	0	1	0	1	0.2
Tattoo/Piercing	1	0	1	1	0	0	1	1	3	2	5	1.1
Partners with any risks or known to be positive	1	0	2	2	1	0	1	0	5	2	7	1.6
Male-to-male sexual contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Exposure in health care setting	0	0	1	2	0	0	0	0	1	2	3	0.7
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	2	1	1	2	1	0	0	3	4	7	1.6
Household contact	0	0	3	4	0	0	0	0	3	4	7	1.6
Other blood to blood contact	0	0	1	0	0	1	0	0	1	1	2	0.5
Other	1	0	1	0	0	0	1	0	3	0	3	0.7
<b>No risk factors identified</b>	0	0	1	0	1	1	0	0	2	1	3	0.7
<b>Not reported</b>	3	3	1	0	3	2	6	1	13	6	19	4.3
<b>Total</b>	<b>72</b>	<b>44</b>	<b>76</b>	<b>42</b>	<b>69</b>	<b>39</b>	<b>65</b>	<b>34</b>	<b>282</b>	<b>159</b>	<b>441</b>	<b>100</b>

**Table 8** Number and percentage of HBV infection among repeat donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	1	2	0	1	9 <sup>1</sup>	1	10 <sup>1</sup>	2	20	6	26	50.0
Intravenous drug user	0	0	1	1	1	0	0	0	2	1	3	5.8
Tattoo/Piercing	0	0	0	0	1	0	0	1	1	1	2	3.8
Partners with any risks or known to be positive	2	0	2	0	3	1	1	1	8	2	10	19.2
Male-to-male sexual contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Exposure in health care setting	2	0	0	0	1	1	1	0	4	1	5	9.6
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	0	0	0	0	0	0	0	0	0	0	0.0
Household contact	0	0	0	1	0	0	0	0	0	1	1	1.9
Other blood to blood contact	0	0	0	0	0	1	0	0	0	1	1	1.9
Other	0	0	0	0	0	0	2	0	2	0	2	3.8
<b>No risk factors identified</b>	1	0	0	0	0	0	0	1	1	1	2	3.8
<b>Not reported</b>	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	<b>6</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>15</b>	<b>4</b>	<b>14</b>	<b>5</b>	<b>38</b>	<b>14</b>	<b>52</b>	<b>100</b>

1 The increase is attributed to the introduction of HBV NAT which identified chronic occult HBV cases among repeat donors



Table 10 Number and rate<sup>1</sup> of HCV infection among repeat donors, 2005-2011, by state/territory and year of donation

State/Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	311 513	1	0.32	333 250	1	0.30	338 173	7	2.07	339 062	11	3.24
NT	8 862	0	0.00	8 496	1	11.77	10 214	0	0.00	11 166	0	0.00
QLD	205 398	2	0.97	216 496	4	1.85	209 556	3	1.43	226 726	8	3.53
SA	93 172	2	2.15	107 934	2	1.85	114 618	0	0.00	118 476	2	1.69
TAS	24 577	0	0.00	28 726	0	0.00	28 019	1	3.57	33 321	0	0.00
VIC	225 332	1	0.44	238 684	1	0.42	252 340	3	1.19	259 052	2	0.77
WA	101 063	2	1.98	99 376	0	0.00	109 425	2	1.83	113 274	1	0.88
<b>Total</b>	<b>969 917</b>	<b>8</b>	<b>0.82</b>	<b>1 032 962</b>	<b>9</b>	<b>0.87</b>	<b>1 062 345</b>	<b>16</b>	<b>1.51</b>	<b>1 101 077</b>	<b>24</b>	<b>2.18</b>
State/Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	372 806	6	1.61	380 014	3	0.79	390 455	3	0.77	2 132 058	32	1.50
NT	11 158	0	0.00	10 470	0	0.00	10 782	1	9.27	62 654	2	3.19
QLD	242 001	9	3.72	243 837	4	1.64	245 975	3	1.22	1 373 516	33	2.40
SA	126 855	4	3.15	123 587	0	0.00	124 199	1	0.81	700 913	11	1.57
TAS	37 274	1	2.68	41 484	0	0.00	44 661	0	0.00	209 338	2	0.96
VIC	276 835	7	2.53	278 897	2	0.72	288 085	2	0.69	1 580 565	18	1.14
WA	118 327	0	0.00	120 646	1	0.83	121 057	3	2.48	683 798	9	1.32
<b>Total</b>	<b>1 185 256</b>	<b>27</b>	<b>2.28</b>	<b>1 198 935</b>	<b>10</b>	<b>0.83</b>	<b>1 225 214</b>	<b>13</b>	<b>1.06</b>	<b>6 742 842</b>	<b>107</b>	<b>1.59</b>

<sup>1</sup> Rate per 100 000 repeat donations



**Table 11** Number and percentage of donors with HCV infection, 2008-2011, by year of donation, sex and age group

Donor status	Year of donation										Total	%
	2008		2009		2010		2011		2008-2011			
	M	F	M	F	M	F	M	F	M	F		
<b>First time donors</b>												
<20 years	3	2	0	3	6	0	2	1	11	6	17	4.0
20-29 years	14	6	10	4	6	3	8	6	38	19	57	13.5
30-39 years	7	4	9	2	9	5	11	2	36	13	49	11.6
40-49 years	17	14	12	13	12	7	12	4	53	38	91	21.5
50-59 years	10	16	14	12	9	8	6	5	39	41	80	18.9
60 years and above	2	2	2	2	0	2	1	1	5	7	12	2.8
<b>Repeat donors</b>												
<20 years	1	0	0	0	1	0	0	0	2	0	2	0.5
20-29 years	1	1	1	3	1	1	1	0	4	5	9	2.1
30-39 years	3	2	3	0	1	2	0	0	7	4	11	2.6
40-49 years	13	3	11	3	3	1	5	2	32	9	41	9.7
50-59 years	9	3	9	7	5	2	8	5	31	17	48	11.3
60 years and above	0	1	1	1	1	1	1	0	3	3	6	1.4
<b>Total</b>	<b>80</b>	<b>54</b>	<b>72</b>	<b>50</b>	<b>54</b>	<b>32</b>	<b>55</b>	<b>26</b>	<b>261</b>	<b>162</b>	<b>423</b>	<b>100</b>

**Table 12** Number and percentage of donors with HCV infection, 2008-2011, by year of donation and region of birth<sup>1</sup>

Region of birth	2008		2009		2010		2011		2008-2011	
	Number	%	Number	%	Number	%	Number	%	Number	%
<b>Australia</b>	85	63	90	74	61	71	51	63	287	68
<b>Overseas born</b>										
<i>Other Oceania</i>	3	2	4	3	2	2	4	5	13	3
<i>United Kingdom and Ireland</i>	10	7	5	4	2	2	3	4	20	5
<i>Other Europe</i>	8	6	6	5	5	6	2	2	21	5
<i>Middle East/North Africa</i>	3	2	3	2	1	1	0	0	7	2
<i>Sub-Saharan Africa</i>	1	1	1	1	1	1	0	0	3	1
<i>South East Asia</i>	6	4	7	6	2	2	11	14	26	6
<i>Southern and Central Asia</i>	7	5	4	3	4	5	3	4	18	4
<i>North America</i>	1	1	0	0	1	1	1	1	3	1
<i>South/Central America and the Caribbean</i>	0	0	1	1	2	2	0	0	3	1
<b>Total with a reported country of birth</b>	<b>124</b>	<b>93</b>	<b>121</b>	<b>99</b>	<b>81</b>	<b>94</b>	<b>75</b>	<b>93</b>	<b>401</b>	<b>95</b>
<b>Not reported</b>	<b>10</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>22</b>	<b>5</b>
<b>Total</b>	<b>134</b>	<b>100</b>	<b>122</b>	<b>100</b>	<b>86</b>	<b>100</b>	<b>81</b>	<b>100</b>	<b>423</b>	<b>100</b>

1 Region of birth from the Australian Bureau of Statistics.

**Table 13** Number and percentage of HCV infection among first time donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	9	8	7	2	8	2	10	1	34	13	47	15.4
Intravenous drug user	6	13	19	10	10	4	7	2	42	29	71	23.2
Tattoo/Piercing	15	10	5	9	8	7	8	3	36	29	65	21.2
Partners with any risks or known to be positive	4	2	1	4	1	2	1	1	7	9	16	5.2
Male-to-male sexual contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Exposure in health care setting	2	1	5	1	1	1	0	2	8	5	13	4.2
Engaged in sex work	0	0	0	1	0	0	0	0	0	1	1	0.3
Blood or tissue recipient	5	4	7	6	2	5	5	2	19	17	36	11.8
Household contact	3	4	2	2	5	2	1	4	11	12	23	7.5
Other blood to blood contact	3	0	0	0	2	0	3	2	8	2	10	3.3
Other	2	0	1	0	2	0			5	0	5	1.6
<b>No risk factors identified</b>	1	0	0	1	1	0	2	0	4	1	5	1.6
<b>Not reported</b>	3	2	0	0	2	2	3	2	8	6	14	4.6
<b>Total</b>	<b>53</b>	<b>44</b>	<b>47</b>	<b>36</b>	<b>42</b>	<b>25</b>	<b>40</b>	<b>19</b>	<b>182</b>	<b>124</b>	<b>306</b>	<b>100</b>

**Table 14** Number and percentage of HCV infection among repeat donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	0	0	0	0	0	0	0	0	0	0	0	0.0
Intravenous drug user	12	3	9	4	1	1	7	1	29	9	38	32.5
Tattoo/Piercing	2	3	4	4	2	1	3	2	11	10	21	17.9
Partners with any risks or known to be positive	1	2	1	2	1	2	0	0	3	6	9	7.7
Male-to-male sexual contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Exposure in health care setting	1	0	1	1	1	1	0	2	3	4	7	6.0
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	1	5	1	2	1	0	2	7	5	12	10.3
Household contact	3	1	0	0	1	0	2	0	6	1	7	6.0
Other blood to blood contact	2	0	2	0	0	0	0	0	4	0	4	3.4
Other	2	0	0	0	1	0	0	0	3	0	3	2.6
<b>No risk factors identified</b>	1	1	2	2	1	1	0	0	4	4	8	6.8
<b>Not reported</b>	4	0	0	0	0	1	3	0	7	1	8	6.8
<b>Total</b>	<b>28</b>	<b>11</b>	<b>24</b>	<b>14</b>	<b>10</b>	<b>8</b>	<b>15</b>	<b>7</b>	<b>77</b>	<b>40</b>	<b>117</b>	<b>100</b>



**Table 16** Number and rate<sup>1</sup> of HIV infection among repeat donors, 2005-2011, by state/territory and year of donation

State/ Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	311 513	1	0.32	333 250	0	0.00	338 173	0	0.00	339 062	1	0.29
NT	8 862	0	0.00	8 496	0	0.00	10 214	0	0.00	11 166	0	0.00
QLD	205 398	0	0.00	216 496	0	0.00	209 556	1	0.48	226 726	1	0.44
SA	93 172	0	0.00	107 934	1	0.93	114 618	1	0.87	118 476	0	0.00
TAS	24 577	0	0.00	28 726	0	0.00	28 019	0	0.00	33 321	0	0.00
VIC	225 332	1	0.44	238 684	0	0.00	252 340	0	0.00	259 052	3	1.16
WA	101 063	0	0.00	99 376	0	0.00	109 425	0	0.00	113 274	0	0.00
<b>Total</b>	<b>969 917</b>	<b>2</b>	<b>0.21</b>	<b>1 032 962</b>	<b>1</b>	<b>0.10</b>	<b>1 062 345</b>	<b>2</b>	<b>0.19</b>	<b>1 101 077</b>	<b>5</b>	<b>0.45</b>
<b>Total 2005-2011</b>												
State/ Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	372 806	0	0.00	380 014	1	0.26	390 455	0	0.00	2 132 024	3	0.14
NT	11 158	0	0.00	10 470	0	0.00	10 782	1	9.27	62 652	1	1.60
QLD	242 001	2	0.83	243 837	2	0.82	245 975	1	0.41	1 373 494	7	0.51
SA	126 855	0	0.00	123 587	0	0.00	124 199	0	0.00	700 907	2	0.29
TAS	37 274	0	0.00	41 484	0	0.00	44 661	0	0.00	209 336	0	0.00
VIC	276 835	0	0.00	278 897	1	0.36	288 085	1	0.35	1 580 541	6	0.38
WA	118 327	0	0.00	120 646	0	0.00	121 057	0	0.00	683 792	0	0.00
<b>Total</b>	<b>1 185 256</b>	<b>2</b>	<b>0.17</b>	<b>1 198 935</b>	<b>4</b>	<b>0.33</b>	<b>1 225 214</b>	<b>3</b>	<b>0.24</b>	<b>6 742 746</b>	<b>19</b>	<b>0.28</b>

1 Rate per 100 000 repeat donations

**Table 17** Number and percentage of donors with HIV infection, 2008-2011, by year of donation, sex and age group

Donor status	Year of donation										Total	%	
	2008		2009		2010		2011		2008-2011				
	M	F	M	F	M	F	M	F	M	F			
<b>First time donors</b>													
<20 years	1	0	0	0	0	0	0	0	0	1	0	1	3.7
20-29 years	0	0	1	0	0	0	3	0	4	0	4	14.8	
30-39 years	3	0	0	0	1	0	0	0	4	0	4	14.8	
40-49 years	0	0	0	0	0	0	1	0	1	0	1	3.7	
50-59 years	1	0	0	0	0	0	0	0	1	0	1	3.7	
60 years and above	0	0	0	0	0	0	0	0	0	0	0	0.0	
<b>Repeat donors</b>													
<20 years	0	0	0	0	0	0	0	0	0	0	0	0.0	
20-29 years	2	0	0	0	1	1	0	1	3	2	5	18.5	
30-39 years	0	1	0	1	2	0	0	0	2	2	4	14.8	
40-49 years	1	1	0	0	0	0	0	1	1	2	3	11.1	
50-59 years	0	0	1	0	1	1	0	0	2	1	3	11.1	
60 years and above	0	0	0	0	0	0	1	0	1	0	1	3.7	
<b>Total</b>	<b>8</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>5</b>	<b>2</b>	<b>20</b>	<b>7</b>	<b>27</b>	<b>100</b>	

**Table 18** Number and percentage of donors with HIV infection, 2008-2011, by year of donation and region of birth<sup>1</sup>

Region of birth	2008		2009		2010		2011		2008-2011	
	Number	%	Number	%	Number	%	Number	%	Number	%
<b>Australia</b>	7	70	2	67	6	86	2	29	17	63
<b>Overseas born</b>										
<i>Other Oceania</i>	0	0	0	0	1	14	0	0	1	4
<i>United Kingdom and Ireland</i>	1	10	0	0	0	0	1	14	2	7
<i>Other Europe</i>	0	0	0	0	0	0	1	14	1	4
<i>Middle East/North Africa</i>	0	0	0	0	0	0	0	0	0	0
<i>Sub-Saharan Africa</i>	0	0	0	0	0	0	0	0	0	0
<i>South East Asia</i>	1	10	1	33	0	0	1	14	3	11
<i>Southern and Central Asia</i>	1	10	0	0	0	0	0	0	1	4
<i>North America</i>	0	0	0	0	0	0	0	0	0	0
<i>South/Central America and the Caribbean</i>	0	0	0	0	0	0	1	14	1	4
<b>Total with a reported country of birth</b>	<b>10</b>	<b>100</b>	<b>3</b>	<b>100</b>	<b>7</b>	<b>100</b>	<b>6</b>	<b>86</b>	<b>26</b>	<b>96</b>
<b>Not reported</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>14</b>	<b>1</b>	<b>4</b>
<b>Total</b>	<b>10</b>	<b>100</b>	<b>3</b>	<b>100</b>	<b>7</b>	<b>100</b>	<b>7</b>	<b>100</b>	<b>27</b>	<b>100</b>

1 Region of birth from the Australian Bureau of Statistics

**Table 19** Number and percentage of HIV infection among first time donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	0	0	0	0	0	0	0	0	0	0	0	0.0
Intravenous drug user	0	0	0	0	0	0	0	0	0	0	0	0.0
Tattoo/Piercing	1	0	0	0	0	0	0	0	1	0	1	9.1
Partners with any risks or known to be positive	1	0	0	0	1	0	3	0	5	0	5	45.5
Male-to-male sexual contact	3	0	1	0	0	0	1	0	5	0	5	45.5
Exposure in health care setting	0	0	0	0	0	0	0	0	0	0	0	0.0
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	0	0	0	0	0	0	0	0	0	0	0.0
Household contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Other blood to blood contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Other	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>No risk factors identified</b>	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Not reported</b>	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>100</b>

**Table 20** Number and percentage of HIV infection among repeat donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	0	0	0	0	0	0	0	0	0	0	0	0.0
Intravenous drug user	0	0	0	0	0	0	0	0	0	0	0	0.0
Tattoo/Piercing	0	0	0	0	0	0	0	0	0	0	0	0.0
Partners with any risks or known to be positive	0	2	0	1	2	2	0	1	2	6	8	50.0
Male-to-male sexual contact	3	0	0	0	1	0	0	0	4	0	4	25.0
Exposure in health care setting	0	0	0	0	0	0	0	0	0	0	0	0.0
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	0	0	0	0	0	0	0	0	0	0	0.0
Household contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Other blood to blood contact	0	0	0	0	1	0	1	0	2	0	2	12.5
Other	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>No risk factors identified</b>	0	0	1	0	0	0	0	0	1	0	1	6.3
<b>Not reported</b>	0	0	0	0	0	0	0	1	0	1	1	6.3
<b>Total</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>9</b>	<b>7</b>	<b>16</b>	<b>100</b>

**Table 21** Number and rate<sup>1</sup> of HTLV infection among first time donors, 2005–2011, by state/territory and year of donation

State/ Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	42 479	0	0.00	44 499	1	2.25	51 427	1	1.94	48 607	0	0.00
NT	1 141	0	0.00	823	0	0.00	759	0	0.00	815	0	0.00
QLD	26 988	1	3.71	27 873	1	3.59	28 575	0	0.00	29 498	0	0.00
SA	9 752	0	0.00	11 457	0	0.00	10 886	0	0.00	15 908	1	6.29
TAS	3 484	0	0.00	2 899	0	0.00	2 650	0	0.00	3 936	0	0.00
VIC	19 346	0	0.00	22 016	1	4.54	23 172	0	0.00	30 286	4	13.21
WA	9 087	0	0.00	11 116	0	0.00	11 292	0	0.00	11 307	2	17.69
<b>Total</b>	<b>112 277</b>	<b>1</b>	<b>0.89</b>	<b>120 683</b>	<b>3</b>	<b>2.49</b>	<b>128 761</b>	<b>1</b>	<b>0.78</b>	<b>140 357</b>	<b>7</b>	<b>4.99</b>

State/ Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Prevalence
NSW/ACT	51 821	2	3.86	48 130	0	0.00	51 528	1	1.94	338 491	5	1.48
NT	965	0	0.00	799	0	0.00	772	0	0.00	6 074	0	0.00
QLD	28 889	2	6.92	28 097	1	3.56	28 839	0	0.00	198 759	5	2.52
SA	11 400	1	8.77	9 284	0	0.00	10 164	1	9.84	78 851	3	3.80
TAS	3 736	0	0.00	3 222	0	0.00	3 587	0	0.00	23 514	0	0.00
VIC	34 133	2	5.86	25 820	0	0.00	31 286	0	0.00	186 059	7	3.76
WA	12 387	2	16.15	11 149	0	0.00	10 992	1	9.10	77 330	5	6.47
<b>Total</b>	<b>143 331</b>	<b>9</b>	<b>6.28</b>	<b>126 501</b>	<b>1</b>	<b>0.79</b>	<b>137 168</b>	<b>3</b>	<b>2.19</b>	<b>909 078</b>	<b>25</b>	<b>2.75</b>

<sup>1</sup> Rate per 100 000 first time donations

**Table 22** Number and percentage of donors with HTLV infection, 2008-2011, by year of donation, sex and age group

Donor status	Year of donation										Total	%	
	2008		2009		2010 <sup>1</sup>		2011		2008-2011				
	M	F	M	F	M	F	M	F	M	F			
<b>First time donors</b>													
<20 years	0	0	1	0	0	0	0	0	0	1	0	1	5.0
20-29 years	0	1	1	1	0	0	0	1	1	3	3	4	20.0
30-39 years	3	0	3	0	0	0	0	0	6	0	6	6	30.0
40-49 years	1	2	0	0	0	0	1	1	2	3	5	5	25.0
50-59 years	0	0	1	1	0	0	0	0	1	1	2	2	10.0
60 years and above	0	0	0	0	0	1	0	0	0	1	1	1	5.0
<b>Repeat donors</b>													
<20 years	0	0	0	0	0	0	0	0	0	0	0	0	0.0
20-29 years	0	0	0	0	0	0	0	0	0	0	0	0	0.0
30-39 years	0	0	0	0	0	0	0	0	0	0	0	0	0.0
40-49 years	0	0	0	0	0	0	0	0	0	0	0	0	0.0
50-59 years	0	0	0	1	0	0	0	0	0	1	1	1	5.0
60 years and above	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>11</b>	<b>9</b>	<b>20</b>	<b>100</b>	

1 Age of one HTLV positive repeat male donor in 2010 was unknown

**Table 23** Number and percentage of donors with HTLV infection, 2008-2011, by year of donation and region of birth<sup>1</sup>

Region of birth	2008		2009		2010		2011		2008-2011	
	Number	%	Number	%	Number	%	Number	%	Number	%
<b>Australia</b>	0	0	3	33	0	0	0	0	3	14
<b>Overseas born</b>										
<i>Other Oceania</i>	1	14	0	0	0	0	0	0	1	5
<i>United Kingdom and Ireland</i>	0	0	0	0	0	0	0	0	0	0
<i>Other Europe</i>	0	0	0	0	0	0	0	0	0	0
<i>Middle East/North Africa</i>	1	14	0	0	0	0	1	33	2	10
<i>Sub-Saharan Africa</i>	0	0	0	0	0	0	0	0	0	0
<i>South East Asia</i>	0	0	1	11	0	0	0	0	1	5
<i>Southern and Central Asia</i>	5	71	2	22	0	0	0	0	7	33
<i>North America</i>	0	0	0	0	0	0	0	0	0	0
<i>South/Central America and the Caribbean</i>	0	0	0	0	1	50	0	0	1	5
<b>Total with a reported country of birth</b>	<b>7</b>	<b>100</b>	<b>6</b>	<b>67</b>	<b>1</b>	<b>50</b>	<b>1</b>	<b>33</b>	<b>15</b>	<b>71</b>
<b>Not reported</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>33</b>	<b>1</b>	<b>50</b>	<b>2</b>	<b>67</b>	<b>6</b>	<b>29</b>
<b>Total</b>	<b>7</b>	<b>100</b>	<b>9</b>	<b>100</b>	<b>2</b>	<b>100</b>	<b>3</b>	<b>100</b>	<b>21</b>	<b>100</b>

1 Region of birth from the Australian Bureau of Statistics



**Table 24** Number and percentage of HTLV infection among first time donors, 2008-2011, by exposure category and sex

Exposure categories	2008		2009		2010		2011		Total (2008-2011)			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	%
Ethnicity/Country of birth	4	2	3	1	0	1	1	1	8	5	13	81.3
Intravenous drug user	0	0	0	0	0	0	0	0	0	0	0	0.0
Tattoo/Piercing	0	0	0	0	0	0	0	1	0	1	1	6.3
Partners with any risks or known to be positive	0	1	0	0	0	0	0	0	0	1	1	6.3
Male-to-male sexual contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Exposure in health care setting	0	0	0	0	0	0	0	0	0	0	0	0.0
Engaged in sex work	0	0	0	0	0	0	0	0	0	0	0	0.0
Blood or tissue recipient	0	0	0	1	0	0	0	0	0	1	1	6.3
Household contact	0	0	1	0	0	0	0	0	1	0	1	6.3
Other blood to blood contact	0	0	0	0	0	0	0	0	0	0	0	0.0
Other	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>No risk factors identified</b>	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Not reported</b>	0	0	2	0	0	0	0	0	2	0	2	12.5
<b>Total</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>11</b>	<b>8</b>	<b>19</b>	<b>119</b>

Table 25 Number and rate<sup>1</sup> of active syphilis among first time donors, 2005-2011, by state/territory and year of donation

State/ Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	42 479	0	0.00	44 499	0	0.00	51 427	0	0.00	48 607	0	0.00
NT	1 141	0	0.00	823	0	0.00	759	0	0.00	815	1	122.70
QLD	26 988	0	0.00	27 873	1	3.59	28 575	1	3.50	29 498	0	0.00
SA	9 752	0	0.00	11 457	1	8.73	10 886	0	0.00	15 908	0	0.00
TAS	3 484	0	0.00	2 899	0	0.00	2 650	0	0.00	3 936	0	0.00
VIC	19 346	0	0.00	22 016	0	0.00	23 172	0	0.00	30 286	0	0.00
WA	9 087	0	0.00	11 116	0	0.00	11 292	0	0.00	11 307	2	17.69
<b>Total</b>	<b>112 277</b>	<b>0</b>	<b>0.00</b>	<b>120 683</b>	<b>2</b>	<b>1.66</b>	<b>128 761</b>	<b>1</b>	<b>0.78</b>	<b>140 357</b>	<b>3</b>	<b>2.14</b>
<b>Total 2005-2011</b>												
State/ Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Prevalence
NSW/ACT	51 821	0	0.00	48 130	0	0.00	51 528	0	0.00	338 491	0	0.00
NT	965	1	103.63	799	0	0.00	772	2	259.07	6 074	4	65.85
QLD	28 889	1	3.46	28 097	2	7.12	28 839	1	3.47	198 759	6	3.02
SA	11 400	0	0.00	9 284	2	21.54	10 164	1	9.84	78 851	4	5.07
TAS	3 736	0	0.00	3 222	0	0.00	3 587	0	0.00	23 514	0	0.00
VIC	34 133	1	2.93	25 820	1	3.87	31 286	1	3.20	186 059	3	1.61
WA	12 387	1	8.07	11 149	0	0.00	10 992	2	18.20	77 330	5	6.47
<b>Total</b>	<b>143 331</b>	<b>4</b>	<b>2.79</b>	<b>126 501</b>	<b>5</b>	<b>3.95</b>	<b>137 168</b>	<b>7</b>	<b>5.10</b>	<b>909 078</b>	<b>22</b>	<b>2.42</b>

1 Rate per 100 000 first time donations

**Table 26 Number and rate<sup>1</sup> of active syphilis among repeat donors, 2005-2011, by state/territory and year of donation**

State/ Territory	2005			2006			2007			2008		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	311 513	0	0.00	333 250	0	0.00	338 173	0	0.00	339 062	1	0.29
NT	8 862	0	0.00	8 496	0	0.00	10 214	0	0.00	11 166	0	0.00
QLD	205 398	0	0.00	216 496	0	0.00	209 556	0	0.00	226 726	0	0.00
SA	93 172	0	0.00	107 934	0	0.00	114 618	0	0.00	118 476	0	0.00
TAS	24 577	0	0.00	28 726	0	0.00	28 019	0	0.00	33 321	1	3.00
VIC	225 332	0	0.00	238 684	0	0.00	252 340	1	0.40	259 052	0	0.00
WA	101 063	0	0.00	99 376	0	0.00	109 425	0	0.00	113 274	1	0.88
<b>Total</b>	<b>969 917</b>	<b>0</b>	<b>0.00</b>	<b>1 032 962</b>	<b>0</b>	<b>0.00</b>	<b>1 062 345</b>	<b>1</b>	<b>0.09</b>	<b>1 101 077</b>	<b>3</b>	<b>0.27</b>
<b>Total 2005-2011</b>												
State/ Territory	2009			2010			2011			Total 2005-2011		
	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate	Donations	Positive	Rate
NSW/ACT	372 806	0	0.00	380 014	1	0.26	390 455	1	0.26	2 132 023	3	0.14
NT	11 158	1	8.96	10 470	1	9.55	10 782	0	0.00	62 652	2	3.19
QLD	242 001	1	0.41	243 837	1	0.41	245 975	0	0.00	1 373 494	2	0.15
SA	126 855	0	0.00	123 587	0	0.00	124 199	0	0.00	700 908	0	0.00
TAS	37 274	0	0.00	41 484	0	0.00	44 661	0	0.00	209 336	1	0.48
VIC	276 835	0	0.00	278 897	0	0.00	288 085	0	0.00	1 580 541	1	0.06
WA	118 327	1	0.85	120 646	0	0.00	121 057	0	0.00	683 792	2	0.29
<b>Total</b>	<b>1 185 256</b>	<b>3</b>	<b>0.25</b>	<b>1 198 935</b>	<b>3</b>	<b>0.25</b>	<b>1 225 214</b>	<b>1</b>	<b>0.08</b>	<b>6 742 746</b>	<b>11</b>	<b>0.16</b>

<sup>1</sup> Rate per 100 000 repeat donations

# Methodological notes

## Age-specific rate

Age-specific rate is defined as the proportion of blood donors in a particular age group who have the infection, usually expressed per 100 000 donors in the specified age group. Age-specific rate was calculated as follows:

$$\text{Age-specific rate of HBV infection among donors aged 20-29 years} = \left( \frac{\text{Number of donors with HBV infection aged 20-29 years}}{\text{Total number of donors aged 20-29 years}} \right) \times 100\,000$$

## Donor-years of observation

Data on interval between each donation by all donors who donated at least twice in 2008-2010 were available from the Blood Service database. For all donors with negative tests for transfusion-transmissible viral infections, donor-years of observation were calculated as the sum of all inter-donation intervals. For positive donors, donor-years of observation were calculated as the sum of all inter-donation intervals between the first negative and the positive donation.

## Exposure categories

A single most important risk factor for each positive donor was identified using the primary risk factor data from the Blood Service risk factor database. The key exposure categories for positive donors were classified as follows:

1. Intravenous drug use (IDU)
2. Country of birth (COB)/Ethnicity
3. Partners with any risks or known to be positive
4. Engaged in sex work within the previous 12 months
5. Male-to-male sexual contact within the previous 12 months
6. Blood or tissue recipient
7. Tattoo or body piercing
8. Exposure in health care setting (both occupational and non-occupational)
9. Household contact
10. Other blood to blood contact
11. Others
12. No risk factors identified
13. Not reported

For a consistent comparison of the prevalence of major exposure categories between blood donors and the general population, *Partners with any risks or known to be positive*, *Engaged in sex work within the previous 12 months* and *Male-to-male sexual contact within the previous 12 months* were combined to create a broader risk category named *Sexual contact*. Thus, from the above thirteen key categories, the following exposure groups were established to match the main exposure groups in general population for each of the transfusion-transmissible infections.

The key exposure categories modified for comparison with general population were as follows:

1. Intravenous drug use (IDU)
2. Country of birth (COB)/Ethnicity
3. Sexual contact
  - a. Partners with any risks or known to be positive
  - b. Engaged in sex work within the previous 12 months
  - c. Male-to-male sexual contact within the previous 12 months
4. Blood or tissue recipient
5. Tattoo or body piercing
6. Exposure in health care setting
7. Household contact
8. Other blood to blood contact
9. Others
10. No risk factors identified
11. Not reported

Please note that unlike general population the risk categories namely *Engaged in sex work and Male-to-male sexual contact* are time restricted for blood donors in Australia. Any history of engagement in sex work within the past 12 months and history of male-to-male sexual contact within the past 12 months are defined as the risk factors for transfusion-transmissible infections in blood donors.

## Incidence

Incidence of transfusion-transmissible infection is defined as a rate per 100 000 donor-years of observation. It was calculated as follows:

$$\text{Incidence per 100 000 donor-years of observation} = \left( \frac{\text{Number of seroconverters}}{\text{Total donor-years of observation}} \right) \times 100\,000$$

## Newly acquired infection

Newly acquired infection was defined as newly diagnosed infection with evidence of a previous negative or indeterminate test result.

## Newly diagnosed infection

Newly diagnosed infection was defined as the first occasion of diagnosis in Australia.

## Prevalence

Prevalence is defined as the number of positive donations per 100 000 donations. It was calculated as follows:

$$\text{Prevalence in first time donors} = \left( \frac{\text{Number of positive first time donations}}{\text{Total number of first time donations}} \right) \times 100\,000$$

$$\text{Prevalence in all donors} = \left( \frac{\text{Number of donations (both first time and repeat) positive for a TTI marker}}{\text{Total number of accepted donations (both first time and repeat)}} \right) \times 100\,000$$

## Residual risk estimates

Estimates were derived based on minor refinement to the method described in earlier studies<sup>31,32</sup>. Briefly, viral point estimates are derived by determining the probability of an undetected 'window period' donation in a given time period. Three models are applied providing a median and upper and lower plausible estimate. The models essentially assess the rate of seroconversion (i.e. positive donors who have previously tested negative for the same marker) in the repeat donor (RD) population as a measure of viral incidence (i.e. early or acute infection). In order to incorporate the incidence in first time donors (FTD) (who have no previous testing at the Blood Service), one model uses a separate calculation whereas the other two use a correction factor for the RD incidence based on the proportion of NAT positive/antibody negative (i.e. NAT yield) donors in the FTD and RD populations respectively. Two models also incorporate the average inter-donation interval for all seroconverters (in days) between the positive result and previous negative result. The longer this interval for an individual donor, the less risk the donor was in the WP at the time of donation i.e. the inter-donation interval is inversely proportional to the risk.

The models assume that the risk of collecting blood from an infectious donor predominantly relates to them being in the WP (i.e. incident infection) and the best estimate of incidence is the rate of seroconversion in the RD population. While the assumption that WP donors account for the majority of risk seems to hold true for HIV, HCV and HTLV, HBV is problematic because of 'chronic' infection (i.e. HBsAg negative/anti-HBc positive). Whereas one model includes a correction factor for the incidence to compensate for chronic infection the other two do not. This is a potential confounder for HBV RR estimation with the relative impact dependent on the proportion of acute versus chronic HBV infection in the donor population.

The number of seroconverters for the 2009-2011 period used in the models is as shown in tables 4-7 for the appropriate virus. Further information is available at [http://www.transfusion.com.au/adverse\\_events/risks/estimates](http://www.transfusion.com.au/adverse_events/risks/estimates)

## Statistical tests to analyse trends in transfusion-transmissible infections

Trends in prevalence and incidence of transfusion-transmissible infections were examined for the year 2011. Poisson regression analysis was used to calculate incidence rate ratios (IRRs) and their 95% confidence intervals. A p-value of less than 0.05 was considered as statistically significant.

Tabulated count data on the demographic characteristics (sex, age group, state/territory and year of donation) for all blood donors (both positive and negative donors) were retrieved for the year 2011. The association between demographic factors and presence of any transfusion-transmissible viral infections (HBV, HCV, HIV and HTLV) among Australian blood donors were assessed using multivariate Poisson regression model for each infection separately.

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31 Seed CR, Kiely P, Keller AJ. *op. cit.* 2005

32 Seed Clive R, Cheng A, Ismay Susan L, Bolton Wayne V, Kiely P, Cobain Trevor J, et al. Assessing the accuracy of three viral risk models in predicting the outcome of implementing HIV and HCV NAT donor screening in Australia and the implications for future HBV NAT. *Transfusion*. 2002;42(10):1 365-72.



