

# TUBERCULOSIS NOTIFICATIONS IN AUSTRALIA, 2008 AND 2009

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## Abstract

The National Notifiable Diseases Surveillance System received 1,194 tuberculosis (TB) notifications in 2008 and 1,322 notifications in 2009. The incidence of TB in Australia was 5.6 cases per 100,000 population in 2008 and 6.0 per 100,000 in 2009, similar to rates since 1986. In both 2008 and 2009, more than 85% of cases occurred in the overseas-born population. The incidence in the Australian-born Indigenous population was 6.2 per 100,000 population in 2008 and 4.8 per 100,000 in 2009. By contrast, the incidence of TB in the Australian-born non-Indigenous population was 0.9 per 100,000 in both 2008 and 2009. Household or other close contact with TB or past residence in a high risk country were the most commonly reported risk factors for TB infection. In 2008, 83 cases of TB were reported in health care workers; this decreased to 75 in 2009. There were no reports of TB transmission in Australian health care settings. Outcome data of the 2007 and 2008 TB cohort indicate that treatment success was attained in more than 95% of cases. As Australia continues to contribute to global TB control it is important to maintain good centralised reporting of TB to identify populations at risk and for early detection of reversal in trends in TB. *Commun Dis Intell* 2012;36(1):82–94.

Keywords: tuberculosis, annual reports

## Introduction

The World Health Organization (WHO) has restated its commitment to reducing the global burden of tuberculosis (TB) by 2015 in the *Global Plan to Stop TB 2011–2015*.<sup>1</sup> Through the implementation of the Stop TB Strategy and the Global Plan to Stop TB, the incidence rate of TB worldwide is in gradual decline, with overall prevalence and death rates falling. Despite this, more than 9 million people still develop active TB globally each year and nearly 2 million people die. WHO has called for intensified efforts in scaling up existing interventions for the diagnosis and treatment of TB and research and development to achieve the 2015 targets.<sup>1</sup>

Australia sits within the WHO Western Pacific Region (WPR). The WPR contains four of the 22 high-burden countries that have received particular attention at the global level since 2000. Cambodia, China, the Philippines and Vietnam account for 19% of incident TB cases worldwide, and 95% of the incident TB cases

in the WPR.<sup>2</sup> WHO data show that the WPR is on track to meet the goals to halve the TB prevalence and mortality rates from those of the year 2000.<sup>2</sup>

As a large proportion of TB cases diagnosed in Australia are people born outside of Australia, the ongoing success of the Stop TB Strategy in our region and globally has a significant impact on TB control in Australia. Surveillance of TB in Australia is overseen by the National Tuberculosis Advisory Committee (NTAC), a subcommittee of the Communicable Diseases Network Australia (CDNA). NTAC has the key role of providing strategic, expert advice to CDNA on a coordinated national approach to TB control. NTAC also has the role of developing and reviewing nationally agreed strategic and implementation plans for the control of TB in Australia. NTAC relies on quality surveillance data to inform these evidence-based policies.

This report should be considered in conjunction with the Australian Mycobacterium Reference Laboratory Network report on bacteriologically proven cases.<sup>3</sup>

## Methods

TB is a nationally notifiable disease in Australia. Medical practitioners, public health laboratories and other health professionals are legally required to report cases of TB to state and territory health authorities. Notifications of TB are reported regularly to the National Notifiable Diseases Surveillance System (NNDSS). The primary responsibility for public health action resulting from notification resides with state and territory health departments.

Data presented in this report represent a point in time analysis of cases of TB notified to the NNDSS. Analyses of these cases were finalised in June 2011. Due to the dynamic nature of the NNDSS, data in this report may vary from data reported in other NNDSS reports and reports of TB notifications at the jurisdictional level. Detailed notes on case definition, data collection, quality control and the derivation of population subgroups are available in the 2007 annual report.<sup>4</sup>

Rates of notifications were calculated using the mid-year estimated resident population supplied by the Australian Bureau of Statistics. Rates specific to population subgroups were based on experimental estimated resident population as at 30 June 2006.

TB drug susceptibility data on bacteriologically confirmed cases are collected, analysed and reported by the Australian Mycobacterial Reference Laboratory Network in a companion report.<sup>3</sup>

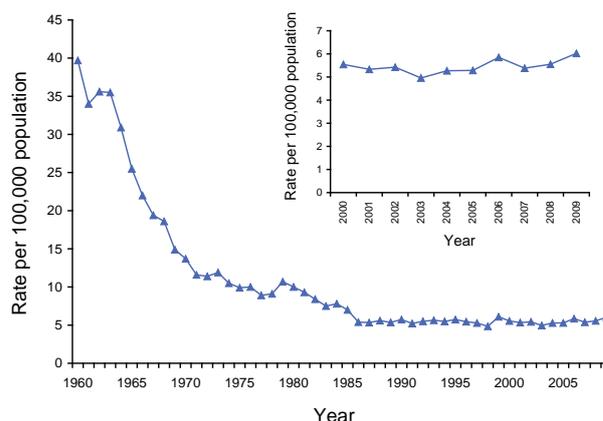
## Results

### Overall numbers and rates

In 2009, a total of 1,322 cases of TB were notified in Australia, representing a rate of 6.0 cases per 100,000 population (Figure 1 and Table 1). This was an increase of 11% in the number of notified cases and an increase of 8% in the rate compared with 2008 (1,194 and 5.6 per 100,000 population, respectively). The rate of TB reported in 2009 is the highest rate since 1999.

Of the cases reported with a case classification, the majority of cases in both 2008 (97%, 1,157/1,192) and 2009 (96%, 1,259/1,315) were classified as new cases – a patient who has never been treated for TB or a patient who was treated for less than 1 month (Table 1). Of the 36 cases reported in 2008 as a relapse case—TB after a patient has deemed to have completed a partial or full course of treatment—11 relapsed after full treatment in Australia, one following partial treatment in

**Figure 1: Notification rate for tuberculosis, Australia, 1960 to 2009**



Australia and 24 following full or partial treatment overseas. Of the 56 cases reported in 2009 as a relapse, 17 relapsed after full treatment in Australia, three following partial treatment in Australia and 36 following full or partial treatment overseas. A small number of cases were notified to the NNDSS without this information, one in 2008 and seven in 2009.

**Table 1: Notified cases and notification rates per 100,000 population for tuberculosis, Australia, 2008 and 2009, by case classification and state or territory**

	New cases	New cases rate	Relapse cases	Relapse case rate	Total cases*	Total rate
<b>2008</b>						
ACT	13	3.8	0	0.0	13	3.8
NSW	467	6.7	16	0.2	484	6.9
NT	32	14.5	0	0.0	32	14.5
Qld	121	2.8	9	0.2	130	3.0
SA	62	3.9	3	0.2	65	4.1
Tas	8	1.6	0	0.0	8	1.6
Vic	360	6.8	6	0.1	366	6.9
WA	94	4.3	2	0.1	96	4.4
<b>Australia</b>	<b>1,157</b>	<b>5.4</b>	<b>36</b>	<b>0.2</b>	<b>1,194</b>	<b>5.6</b>
<b>2009</b>						
ACT	22	6.2	1	0.3	23	6.5
NSW	492	6.9	28	0.4	523	7.3
NT	27	11.9	0	0.0	27	11.9
Qld	148	3.3	7	0.2	155	3.5
SA	54	3.3	4	0.2	58	3.6
Tas	8	1.6	1	0.2	9	1.8
Vic	409	7.5	8	0.1	417	7.7
WA	99	4.4	7	0.3	110	4.9
<b>Australia</b>	<b>1,259</b>	<b>5.7</b>	<b>56</b>	<b>0.3</b>	<b>1,322</b>	<b>6.0</b>

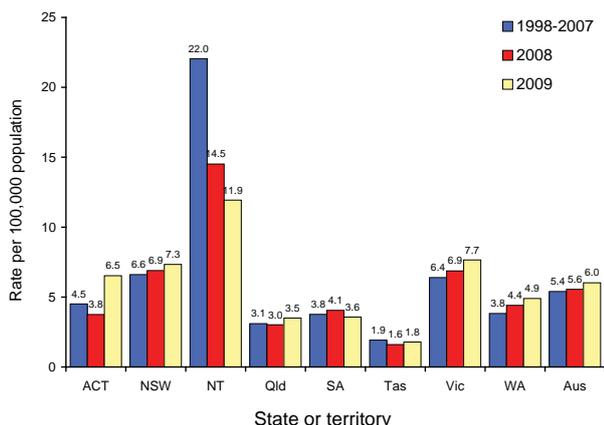
\* New or relapse cases were not reported for 1 case in 2008 and 7 cases in 2009.

### Tuberculosis cases by state or territory

As in previous years, New South Wales accounted for the largest proportion of cases notified by a state or territory in both 2008 (41%, 484/1,194) and 2009 (40%, 523/1,322). The highest notification rates in 2008 were reported by the Northern Territory (14.5 per 100,000 population), New South Wales (6.9 per 100,000 population) and Victoria (6.9 per 100,000 population). Similarly, the highest notification rates by state and territory in 2009 were reported in these same jurisdictions (Table 1).

Figure 2 presents TB notification rates for 2008 and 2009, compared against the average rate over the preceding 10 years for each state and territory. The Australian Capital Territory, New South Wales, Queensland, Victoria and Western Australia all reported a rate in 2009 that exceeded the rate in 2008 and the average rate of the 10 years preceding.

**Figure 2: Rate for tuberculosis, Australia, 1996 to 2009, by state or territory**



### Tuberculosis in the Australian-born population

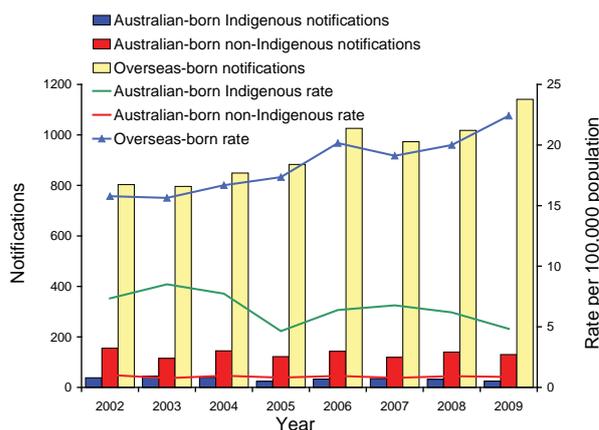
Indigenous status was reported for each of the 172 Australian-born cases reported in 2008 and 155 in 2009 (Table 2). The incidence rate of TB in the Australia-born population for 2008 was 1.1 cases per 100,000 population. The rate in the Australian-born Indigenous group was 6.2 cases per 100,000 population (n = 32) and in the Australian-born non-Indigenous group was 0.9 cases per 100,000 population (n = 140). The incident rate in the Australian-born Indigenous population was almost 7 times the rate seen in the Australian-born non-Indigenous population in 2008.

The incidence rate of TB in the Australia-born population for 2009 (1.0 per 100,000 population) was slightly lower than that reported in 2008. The rate in the Australian-born Indigenous group was 4.8 cases

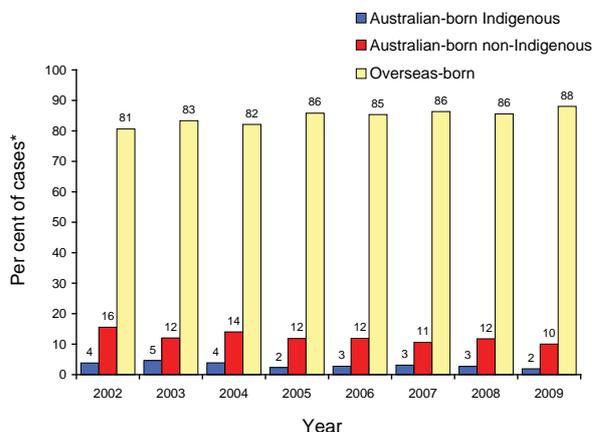
per 100,000 population (n = 25) and the Australian-born non-Indigenous population maintained the rate reported in 2008 (0.9 per 100,000 population, n = 130). The disparity in rates experienced in the Australian-born Indigenous and Australian-born non-Indigenous groups narrowed in 2009, with the Australian-born Indigenous rate reported just greater than 5 times the rate in the Australian-born non-Indigenous population.

The rate of TB in the Australian-born non-Indigenous population has remained relatively stable since 2002 (Figure 3), while the rate in the Australian-born Indigenous population tends to be trending downwards over this period. The caseload attributable to the Australian-born non-Indigenous population has decreased from 16% in 2002 to 10% in 2009 (Figure 4).

**Figure 3: Notified cases and rate for tuberculosis, Australia, 2002 to 2009, by population subgroup**



**Figure 4: Notified cases of tuberculosis as a percentage of all cases with a reported population subgroup, Australia, 2002 to 2009, by population subgroup**



\* Where country of birth is reported.

### Tuberculosis cases in the overseas-born population

Country of birth was known for nearly all (1,190/1,194) cases in 2008 and 98% (1,296/1,322) in 2009. Of the cases reported with a known place of birth in 2008, 86% (1,018/1,190) were born overseas (Table 2). This proportion of cases reported as overseas-born ranged by state and territory from 38% (3/8) in Tasmania to 92% (88/96) in Western Australia. The rate of TB among the overseas-born population in 2008 was over 18 times the rate in the Australian-born (20.0 per 100,000 population versus 1.1 per 100,000 population).

Of the cases reported with a known place of birth in 2009, 88% (1,141/1,296) were born overseas (Table 2). This proportion of cases reported as overseas-born ranged by state and territory from 67% (6/9) in Tasmania to 95% (55/58) in South Australia. The rate of TB among the overseas-born population in 2009 was almost 23 times the rate in the Australian-born (22.4 per 100,000 population versus 1.0 per 100,000 population).

The number of cases and the rate of TB in the overseas-born population has steadily increased since 2002 (Figure 3), noting that completeness of reporting country of birth and Indigenous status has improved over this period. The case load attributable to the overseas-born population has increased from 81% in 2002 to 88% in 2009 (Figure 4).

Among overseas-born cases, the most frequently reported country of birth was India (2008: 20%, 206/1,018; 2009: 27% 310/1,141; Table 3), followed by Vietnam (2008: 10%, 104/1,018; 2009: 11% 122/1,141), the Philippines (2008: 8%, 84/1,018; 2009: 8% 90/1,141) and China (2008: 6%, 65/1,018; 2009: 6% 74/1,141). These countries have consistently been reported as the most frequent countries of birth in recent years. The number and proportion of cases reported against these countries has remained relatively stable over recent years, except cases reported with a country of birth of India. India has increasingly been reported as a country of birth since 2002, when 13% (107/803) of overseas-born cases were reported as born in India.

Data on the year of arrival were available for 98% of the cases reported as overseas-born in 2008

**Table 2: Notified cases and rate for tuberculosis, Australia, 2008 and 2009, by population subgroup and state or territory**

	Indigenous		Australian-born				Overseas-born	
	cases	rate	non-Indigenous cases	non-Indigenous rate	Total Australian-born cases	Total Australian-born rate	Overseas-born cases	Overseas-born rate
<b>2008</b>								
ACT	0	0.0	4	1.6	4	1.6	9	11.4
NSW	5	3.3	57	1.2	62	1.2	422	23.4
NT	16	25.0	2	1.8	18	10.1	14	42.6
Qld	9	6.2	12	0.4	21	0.6	106	13.2
SA	1	3.6	9	0.8	10	0.8	55	16.0
Tas	0	0.0	5	1.2	5	1.2	3	5.3
Vic	0	0.0	44	1.2	44	1.2	321	23.8
WA	1	1.4	7	0.5	8	0.6	88	14.3
<b>Aust</b>	<b>32</b>	<b>6.2</b>	<b>140</b>	<b>0.9</b>	<b>172</b>	<b>1.1</b>	<b>1,018</b>	<b>20.0</b>
<b>2009</b>								
ACT	0	0.0	3	1.2	3	1.2	20	25.4
NSW	5	3.3	48	1.0	53	1.1	470	26.0
NT	8	9.4	2	1.8	10	4.5	17	51.7
Qld	11	7.6	19	0.6	30	0.9	103	12.8
SA	0	0.0	3	0.3	3	0.2	55	16.0
Tas	0	0.0	3	0.7	3	0.7	6	10.7
Vic	0	0.0	38	1.0	38	1.0	379	28.1
WA	1	1.4	14	1.0	15	1.0	91	14.8
<b>Aust</b>	<b>25</b>	<b>4.8</b>	<b>130</b>	<b>0.9</b>	<b>155</b>	<b>1.0</b>	<b>1,141</b>	<b>22.4</b>

Indigenous status and country of birth were not reported for 4 cases in 2008 and 26 cases in 2009.

**Table 3: Notifications and notification rates for tuberculosis for selected countries of birth, Australia, 2008 and 2009**

Country of birth	Cases				Estimated resident population <sup>†</sup>	Estimated rate per 100,000 population	
	2008		2009			2008	2009
	n	%*	n	%*			
India	206	20	310	27	180,130	114.4	172.1
Vietnam	104	10	122	11	185,450	56.1	65.8
Philippines	84	8	90	8	140,020	60.0	64.3
China <sup>‡</sup>	65	6	74	6	259,180	25.1	28.6
Nepal	35	3	53	5	5,020	697.2	1,055.8
Indonesia	52	5	39	3	59,380	87.6	65.7
Papua New Guinea	31	3	36	3	27,800	111.5	129.5
Burma (Myanmar)	21	2	25	2	14,060	149.4	177.8
Sri Lanka	17	2	23	2	71,730	23.7	32.1
Sudan	26	3	22	2	21,550	120.6	102.1
Afghanistan	26	3	21	2	19,610	132.6	107.1
Thailand	14	1	18	2	35,560	39.4	50.6
Ethiopia	22	2	18	2	6,540	336.4	275.2
Somalia	14	1	18	2	5,040	277.8	357.1
Republic of Korea	7	1	17	1	60,310	11.6	28.2
Pakistan	15	1	17	1	19,410	77.3	87.6
Bangladesh	16	2	16	1	18,310	87.4	87.4
Other overseas-born	263	26	222	19	3,960,965	–	–
Total overseas-born	1,018	–	1,141	–	5,090,065	–	–
Australian-born	172	–	155	–	15,607,815	–	–
Country of birth not reported	4	–	26	–	–	–	–
Total	1,194	–	1,322	–	20,697,880	–	–

\* Proportion of all overseas-born cases.

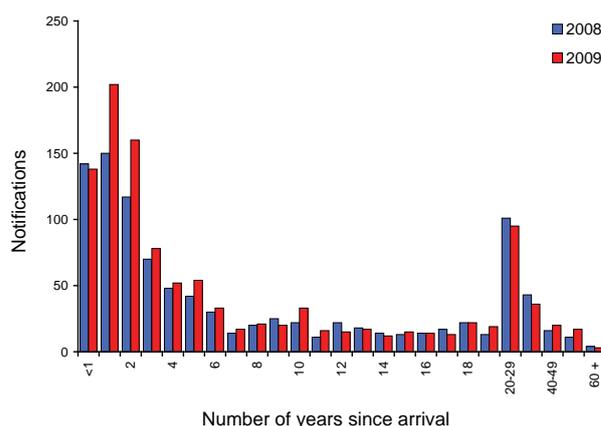
† The Australian Bureau of Statistics estimated resident population at 30 June 2006.

‡ China excludes the Special Administrative Region and Taiwan.

– Not applicable.

(999/1,018) and 2009 (1,122/1,141). Of the overseas-born cases notified in 2008 and 2009 that were reported with a year of arrival, 30% (632/2,121) presented within 2 years of arrival in Australia and 84% (1,776/2,121) within 20 years of arrival (Figure 5). The median length of time in Australia between arrival and diagnosis was 4 years (interquartile range, IQR: 1–14).

The residency status was available for 63% (644/1,018) of the cases reported as overseas-born in 2008 and 91% (1,033/1,141) in 2009. The collection of residency status was introduced in New South Wales during 2008, therefore completeness of these data is expected to improve from 2009 onwards. Residency status should be interpreted with caution as it is self-reported by each case and is not verified. Of the cases reported with a residency status, the majority in both years were reported as permanent residents (2008:

**Figure 5: Tuberculosis cases in the overseas-born population, by number of years since arrival, Australia 2008 and 2009**

58%, 372/644; 2009: 59%, 610/1,033), followed by overseas students (2008: 18%, 117/644; 2009: 20%, 204/1,033). Refugees (2008: 7%, 48/644; 2009: 5%, 55/1,033) and overseas visitors (2008: 7%, 46/644; 2009: 6%, 66/1,033) represented similar proportions within the subgroup.

There was a total of 21 cases of TB among Papua New Guinea (PNG) nationals accessing health care in the Torres Strait Treaty Zone in 2008 and 19 in 2009. These cases were all reported by Queensland and represented 14% (40/285) of the state's caseload across 2008 and 2009. There were 10 illegal fishermen detained by Australian Customs, diagnosed with TB and commenced on TB treatment in 2008, with only 1 case reported with this residency status in 2009. These cases were all reported by the Northern Territory and represented 19% (11/59) of the Northern Territory caseload across the 2 years.

### Tuberculosis cases by age and sex

Information on the sex and age of TB cases was available for all cases reported to the NNDSS in 2008 and all but 1 case reported in 2009. The male to female ratio for both 2008 and 2009 was 1:0.8, a similar ratio as reported in previous years.

The age group incidence rates for TB in overseas-born, Australian-born Indigenous and Australian-born non-Indigenous populations are shown in Table 4 and Figure 6. The rate in the overseas-born population was highest in the 25–34 years age group (45.8 per 100,000 population, n = 665). In the Australian-born Indigenous group the highest age-specific rate was reported in the 45–54 years age group (13.4 per 100,000 population, n = 12), while in the Australian-born non-Indigenous group the age-specific rate increased throughout adult life. The highest notification rate in this group was reported in the 65 years or over age group (2.3 per 100,000 population, n = 79). The median age in the overseas-born cases was 32 years (IQR 25–50)

**Table 4: Notified cases and notification rate per 100,000 population for tuberculosis, Australia, 2008 and 2009, by population subgroup and age group**

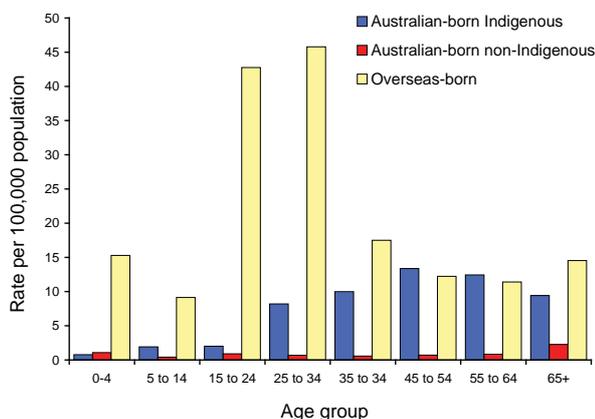
	Australian-born Indigenous		Australian-born non-Indigenous		Total Australian-born		Overseas-born		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases*	Rate
<b>2008</b>										
0–4	1	1.6	13	1.1	14	1.1	10	20.4	24	1.8
5–14	2	1.5	11	0.5	13	0.5	17	7.2	30	1.1
Subtotal < 15 years	3	1.5	24	0.7	27	0.7	27	9.5	54	1.3
15–24	3	3.0	18	0.8	21	0.9	220	42.9	241	8.3
25–34	8	10.9	11	0.5	19	0.9	288	39.7	307	10.6
35–44	7	10.8	10	0.5	17	0.8	153	16.8	171	5.6
45–54	6	13.4	14	0.7	20	1.0	105	11.5	127	4.4
55–64	5	20.7	17	1.2	22	1.5	97	12.0	119	5.3
65+	0	0.0	46	2.6	46	2.6	128	13.7	175	6.5
Total	32	6.2	140	0.9	172	1.1	1,018	20.0	1,194	5.8
<b>2009</b>										
0–4	0	0.0	13	1.1	13	1.0	5	10.2	18	1.4
5–14	3	2.3	9	0.4	12	0.5	26	11.1	39	1.4
Subtotal < 15 years	3	1.5	22	0.6	25	0.7	31	10.9	57	1.4
15–24	1	1.0	23	1.0	24	1.0	219	42.7	245	8.5
25–34	4	5.5	18	0.9	22	1.0	377	51.9	406	14.0
35–44	6	9.2	14	0.7	20	0.9	165	18.2	192	6.3
45–54	7	15.6	13	0.7	20	1.0	118	12.9	142	5.0
55–64	1	4.1	7	0.5	8	0.6	88	10.9	98	4.3
65+	3	18.9	33	1.9	36	2.0	144	15.4	182	6.8
Total	25	4.8	130	0.9	155	1.0	1,142	22.4	1,322	6.4

\* Country of birth and Indigenous status not reported for 4 cases in 2008 and 26 cases in 2009.

compared with 40 years in the Australian-born Indigenous cases (IQR 28–48) and the Australian-born non-Indigenous cases (IQR 19–68).

One of the most important measures of TB control is the incidence in children aged less than 15 years because these cases represent recent TB infection. TB was notified in 54 children aged less than 15 years in 2008, which represented 5% of the total number of notified cases (Table 4). Of these, 27 were Australian-born and 27 were born overseas. In 2009, 57 children aged less than 15 years were notified with TB; 4% of the total number of notified cases. Of these, 25 were Australian-born and 31 were born overseas. Of the Australian-born children three were identified as Indigenous Australians.

**Figure 6: Average rate for tuberculosis, Australia, 2008 and 2009, by population subgroup and age group**



### Tuberculosis and selected risk factors

Information on selected risk factors for TB, excluding HIV, is reported in Table 5. Selected risk factor data were provided for 76% (913/1,194) of cases in 2008 and 74% (982/1,322) of cases reported in 2009. Of the cases with completed selected risk factor, 91% (828/913) of cases in 2008 and 98% (964/982) of cases in 2009 were reported with at least one risk factor.

Household member or other close contact with TB was a common risk factor in all 3 population subgroups in both 2008 and 2009. Past travel to or residence in a high-risk country was a common risk factor in both the Australian-born non-Indigenous and overseas-born cases. Interpretation of this risk factor in overseas born subjects is difficult, because at the time of this data collection there was no clarification as to whether this risk factor included a country of birth that has high TB incidence, or exclusively those subjects that visit such a country. NTAC has now agreed to record this risk factor

only in those visiting a new high incidence setting, aiming to identify travel related TB, and therefore subsequent reports of this risk factor will be clearer.

A total of 83 cases of TB in 2008 were reported in people who had previously worked or were currently working in a health care setting either in Australia or overseas: 17 of these cases were known to have worked in an Australian health care setting at some point within the 12 months prior to diagnosis. In 2009, the total number of cases who had previously worked or were currently working in a health care setting decreased to 75. Of these cases, 24 cases were known to have worked in an Australian health care setting at some point within the 12 months prior to diagnosis. None of the cases were deemed to have acquired TB in an Australian health care setting, nor were there any reports of active TB transmission to patients from health care workers in Australia in 2008 and 2009.

The number of health care workers reported has increased since 2000 (Figure 7). The majority of these cases are overseas-born.

### Tuberculosis and HIV status

HIV status reporting was complete in 94% (1,127/1,194) of cases in 2008 and 95% (1,257/1,322) of cases in 2009. A case was considered to have complete HIV status data if it was reported as HIV positive, HIV negative, HIV tested – result unknown, not tested or refused testing.

Testing was made available to 80% (906/1,127) of cases in 2008 and 81% (1,024/1,257) in 2009. Testing was reported to be refused by a small number of cases – 5 cases each in 2008 and 2009. Of the cases nationally with a known HIV test outcome, 3% of cases were reported as HIV positive in both 2008 (13/506) and 2009 (17/635).

**Figure 7: Tuberculosis cases reported in health care workers, Australia, 2002 to 2009, by country of birth**

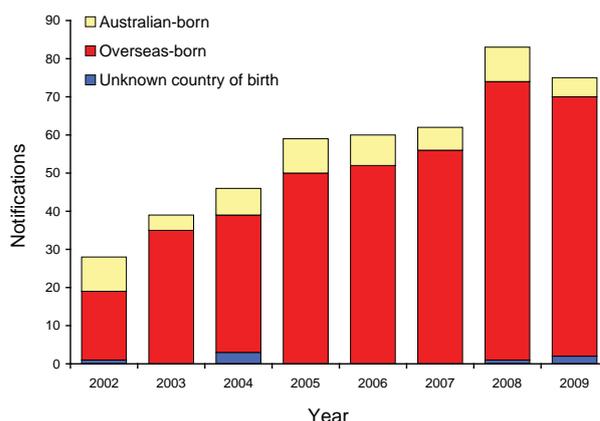


Table 5: Notifications of tuberculosis, Australia, 2008 and 2009, by selected risk factors\*,† and population subgroup

Risk factor	2008				2009			
	Australian-born Indigenous cases	Australian-born non-Indigenous cases	Overseas-born cases	Total‡	Australian-born Indigenous cases	Australian-born non-Indigenous cases	Overseas-born cases	Total‡
Household or other close contact with TB	19	37	133	191	11	38	127	178
Ever resided in a correctional facility§	0	0	5	5	1	1	0	2
Ever resided in an aged care facility§	0	1	0	1	0	2	2	4
Ever employed in an institution§	0	2	11	13	2	0	14	16
Currently or previously employed in health industry in Australia or overseas§	0	9	73	83	0	5	68	75
Ever homeless	2	3	9	14	2	0	3	5
Past travel to or residence in a high-risk country	0	21	563	587	2	23	610	657
Chest X-ray suggestive of old untreated TB	1	2	6	9	0	1	10	11
Currently receiving immunosuppressive therapy	0	3	8	11	0	3	4	8
Australian-born child with one or more parent born in a high-risk country	0	5	n.a.	5	0	9	n.a.	9
None of the above risk factors	10	44	31	85	7	36	37	80
Not assessed/ no risk factor reported	1	28	252	281	2	17	317	340

\* Excludes HIV status.

† More than 1 risk factor may be reported for each notified case.

‡ Country of birth and Indigenous status not reported for 4 cases in 2008 and 26 cases in 2009.

§ Within the preceding 5 years.

n.a. Not applicable.

### Anatomical site of disease

The anatomical site of TB infection was recorded in all notified cases in 2008 and in all but 5 cases in 2009 (Table 6). In 2008, pulmonary disease was reported in 718 cases, of which 80% (572/718) were reported as having pulmonary disease only and the remaining 20% (146/718) were reported as having pulmonary disease plus disease at an extrapulmonary site. Of the pulmonary TB cases, the smear positive proportion was 36% (255/718). Extrapulmonary disease was reported in 40% (476/1,194) of cases, with lymph nodes reported as the most frequent extrapulmonary site (n = 185).

In 2009, pulmonary disease was reported in 757 cases, of which 78% (587/757) were reported as having pulmonary disease only and the remaining 23% (170/757) were reported as having pulmonary disease plus disease at an extrapulmonary site. Of the pulmonary TB cases, the smear positive propor-

tion was 39% (298/757). Extrapulmonary disease was reported in 42% (560/1,322) of cases, with lymph nodes reported as the most frequent extrapulmonary site (n = 256).

### Treatment outcomes of 2007 and 2008 tuberculosis patient cohort

Table 7 presents treatment outcome data for all TB cases reported in 2007 and 2008. Treatment success, including those with bacteriologically confirmed cure and those who completed treatment, was reported in 95% of cases with assessable outcomes reported in 2007 (964/1,010) and 2008 (1,018/1,068). Only 84% (27/32) of Australian-born Indigenous cases were reported with treatment success in 2007, however this increased to 90% (27/30) of Australian-born Indigenous cases in 2008. There were no cases of a treatment failure reported in 2007 and 2008.

**Table 6: Notified cases of tuberculosis, Australia, 2008 and 2009, by site of disease and case classification**

Site	New cases	Relapse cases	Total cases*	Per cent of cases
<b>2008</b>				
Total pulmonary disease	696	22	718	60.1
Pulmonary only	552	20	572	47.9
Pulmonary plus other sites	144	2	146	12.2
Extrapulmonary only*	461	14	476	39.9
Pleural	86	0	86	7.2
Lymph nodes	177	8	185	15.5
Bone/joint	29	0	30	2.5
Genito/urinary	27	1	28	2.3
Miliary	28	1	29	2.4
Meningeal	4	0	4	0.3
Peritoneal	37	0	37	3.1
Other	104	6	110	9.2
<b>2009</b>				
Total pulmonary disease	713	42	757	57.3
Pulmonary only	552	33	587	44.4
Pulmonary plus other sites	161	9	170	12.9
Extrapulmonary only*	545	14	560	42.4
Pleural	72	1	73	5.5
Lymph nodes	246	10	256	19.4
Bone/joint	48	2	50	3.8
Genito/urinary	33	1	34	2.6
Miliary	24	2	26	2.0
Meningeal	9	0	9	0.7
Peritoneal	29	3	32	2.4
Other	84	2	87	6.6

\* New/relapse case was not reported in 1 case in 2008 and 7 cases in 2009.

**Table 7a: Notified cases of tuberculosis, Australia, 2007, by treatment outcome and population subgroup**

Assessable outcomes	Australian-born Indigenous		Australian-born non-Indigenous		Overseas-born		Total cases <sup>  </sup>	
	Cases	%	Cases	%	Cases	%	Cases	%
Treatment success	27	84.4	94	93.1	839	96.2	964	95.4
Cured (bacteriologically confirmed)*	10	31.3	3	3.0	46	5.3	59	5.8
Completed treatment	17	53.1	91	90.1	793	90.9	905	89.6
Interrupted treatment <sup>†</sup>	0	0.0	0	0.0	4	0.5	4	0.4
Died of tuberculosis	2	6.3	3	3.0	6	0.7	11	1.1
Defaulted <sup>‡</sup>	3	9.4	2	2.0	16	1.8	21	2.1
Failure <sup>§</sup>	0	0.0	0	0.0	0	0.0	0	0.0
Not followed up, outcome unknown	0	0.0	2	2.0	7	0.8	10	1.0
Total assessable	32	100.0	101	100.0	872	100.0	1,010	100.0
<b>Non-assessable outcomes</b>								
Transferred out of Australia	1	2.9	0	0.0	70	7.2	72	6.3
Died of other causes	2	5.7	17	14.3	28	2.9	48	4.2
Still under treatment	0	0.0	1	0.8	3	0.3	4	0.4
Total	35	100.0	119	100.0	973	100.0	1,134	100.0

\* Cured is defined as the bacteriologically confirmed sputum smear and culture positive at the start of treatment and culture negative in the final month of treatment and on at least 1 previous occasion.

† Interrupted treatment means treatment interrupted for two months or more but completed.

‡ Defaulted means failed to complete treatment.

§ Failed means sputum culture positive at 5 months or later.

|| Population subgroup unknown in 7 cases.

**Table 7b: Notifications of tuberculosis, Australia, 2008, by treatment outcome and population subgroup**

Assessable outcomes	Australian-born Indigenous		Australian-born non-Indigenous		Overseas-born		Total cases <sup>  </sup>	
	Cases	%	Cases	%	Cases	%	Cases	%
Treatment success	27	90.0	125	94.7	863	95.6	1,018	95.3
Cured (bacteriologically confirmed)*	3	10.0	10	7.6	41	4.5	56	5.2
Completed treatment	24	80.0	115	87.1	822	91.0	962	90.1
Interrupted treatment <sup>†</sup>	0	0.0	2	1.5	3	0.3	5	0.5
Died of tuberculosis	2	6.7	1	0.8	13	1.4	16	1.5
Defaulted <sup>‡</sup>	0	0.0	3	2.3	17	1.9	20	1.9
Failure <sup>§</sup>	0	0.0	0	0.0	0	0.0	0	0.0
Not followed up, outcome unknown	1	3.3	1	0.8	7	0.8	9	0.8
Total assessable	30	100.0	132	100.0	903	100.0	1,068	100.0
<b>Non-assessable outcomes</b>								
Transferred out of Australia	0	0.0	0	0.0	71	7.0	72	6.0
Died of other causes	2	6.3	7	5.0	38	3.7	47	3.9
Still under treatment	0	0.0	1	0.7	6	0.6	7	0.6
Total	32	100.0	140	100.0	1,018	100.0	1,194	100.0

\* Cured is defined as the bacteriologically confirmed sputum smear and culture positive at the start of treatment and culture negative in the final month of treatment and on at least 1 previous occasion.

† Interrupted treatment means treatment interrupted for 2 months or more but completed.

‡ Defaulted means failed to complete treatment.

§ Failed means sputum culture positive at 5 months or later.

|| Population subgroup unknown in 4 cases.

## National performance indicators

Performance criteria for incidence (less than 1 per 100,000 population) were met only for the crude incidence rates in Australian-born non-Indigenous cases (Table 8). Incidence rates in the age groups under 15 years exceeded the performance criteria (less than 0.1 case per 100,000 population) in all population groups. Outcome reporting came close to meeting the target of 100% for the 2007 and 2008 patient cohorts, with less than 1% of cases with assessable outcomes reported with an unknown outcome. The performance indicator for cases that reported treatment success was met in both 2007 and 2008. Additionally this performance indicator was met in each of the population subgroups, including Australian-born Indigenous cases.

## Discussion

While the overall rate of TB in Australia remains low by global standards, the modest rate increases in 2008 and 2009 suggest that we still face challenges to maintaining TB control. The current epidemiology of TB in Australia is largely a direct effect of the global TB situation with overseas-born persons contributing to a steadily increasing number and proportion of notifications since 2002 (Figure 3). Based on feedback from state TB services, the increase in skilled migrants and students from high burden countries is likely to be a key contributing factor to the recent trend.

It is important to identify target populations for whom specific strategies are required to better control TB in the community. Two populations that experience greater morbidity from TB than the overall Australian population, are migrants from high TB incidence countries and Indigenous Australians. There are smaller subgroups identified in Table 5 that also warrant further evaluation. Table 5 provides data on risk factors selected for further evaluation by NTAC. The data do not reveal homelessness or residence within correctional facilities to be significant risk factors for TB in Australia, unlike the experience of other countries.<sup>5,6</sup> Similarly, there is no strong evidence that TB is a significant problem in people with HIV infection.

Over the past decade there has been a decline in the rate of TB in Indigenous Australians but their rates are still more than 5 times those of Australian-born non-Indigenous persons. This suggests that despite access to treatment and prevention, social and economic conditions likely remain a significant barrier to closing the gap. However the data for Indigenous Australians need to be interpreted with caution due to the small case numbers. By contrast rates for Australian-born non-Indigenous persons have remained relatively static since 2002 at less than 1 per 100,000 population. The highest proportion of cases, as expected, is in the older age groups reflecting reactivation of remote infection.

**Table 8: National tuberculosis performance indicators, performance criteria\* and the current status of tuberculosis, Australia, 2007, 2008 and 2009**

National tuberculosis performance indicator	Performance criteria	2007†	2008	2009
<b>Annual incidence of TB (cases per 100,000 population)</b>				
Australian-born Indigenous Australians	<1	6.8	6.2	4.8
Australian-born non-Indigenous Australians	<1	0.8	0.9	0.9
Overseas-born persons	*	19.1	20.0	22.4
<b>Incidence in children &lt;15 years, by risk group (per 100,000 population)</b>				
Australian-born Indigenous Australians	<0.1	3.6	1.5	1.5
Australian-born non-Indigenous Australians	<0.1	0.4	0.7	0.7
Overseas-born persons	*	12.0	9.5	10.9
Collection of HIV status in tuberculosis cases‡	100%	87%	94%	95%
<b>Treatment outcome measures (%)</b>				
Cases evaluated for outcomes	100%	99.0	99.2	TBA
Cases that have treatment completed and are cured	>90%	95.4	95.3	TBA
Cases recorded as treatment failures	<2%	0.0	0.0	TBA

\* Performance criteria currently under review.

† Evaluation of indicators for the 2007 patient cohort was re-assessed in August 2011.

‡ HIV status is considered complete if case is reported as HIV positive, HIV negative, HIV tested-result unknown, not tested or refused testing.

TBA To be assessed: 2009 patient cohort outcomes to be reported in 2010 annual report.

Specific overseas-born population groups that do not have the same privileges of access to public health care as the general population and who also have a greater incidence of TB can experience diagnostic delays. This can result in personal suffering for them as individuals and also increase the risk for transmission of TB to the general public. One particular group of temporary visa entrants that has been highlighted by studies in Victoria and Queensland is international students (Brown L, personal communication, 24 March 2011; Walpola H, personal communication, 24 March 2011). In addition to experiencing diagnostic delays these students are often in settings of large classrooms resulting in large contact screenings. Given that international students are a significant source of revenue for educational institutions and the Australian economy, it is important to ensure they have equitable access to health care. Among other things, this would then ensure they do not suffer more from TB than the general population, as well as decrease the need for costly contact screening by ensuring earlier diagnosis of TB.

While refugees are screened for active TB disease before coming to Australia, they are at high risk for latent TB infection and are resettled to diverse settings throughout Australia. It remains a challenge to ensure they are adequately integrated into the health care system. For those unauthorised entrants seeking asylum in Australia an additional challenge has been to ensure communication between detention centres and TB programs and ensuring continuity of care once they are released into the community. One of the future priorities for NTAC is to work with the Department of Immigration and Citizenship to improve communication between TB services and/or refugee health services and the detention centres from which such subjects are released to community detention to ensure these people are adequately integrated into supportive health services.

PNG nationals from selected villages in the South Fly District of the Western Province, who access health care in the Torres Strait Treaty Zone, have been highlighted in previous reports.<sup>4</sup> A provision of the Torres Strait Treaty allows free movement between Australia and Papua New Guinea for traditional activities in the Protected Zone and nearby areas.<sup>7</sup> Some of these visitors from PNG access Australian health care centres while visiting the outer Torres Strait Islands. In 2008 and 2009, there were 40 cases of TB among such PNG patients reported to the NNDSS. Multi-drug resistance is a particular concern in this population.<sup>3</sup> It is important that these patients are effectively managed to minimise the further development of drug resistance and prevent transmission to the local Australian population. NTAC supports the view that the best long-term solution is to assist PNG in establishing effective TB treatment and control services so that residents can get the health care they

need at home. TB clinicians from both sides of the border are working together towards a staged, safe and ethical approach in handing over both sensitive and multi-drug resistant TB patients to PNG. NTAC advises that there be some provision for TB care of PNG nationals presenting to Australian clinics in the Torres Strait until such time that PNG can ensure adequate management of all cases, and that the transitional arrangement be closely monitored to ensure successful treatment outcomes.

A final target population is health care workers. Figure 7 shows that the number of TB cases in health care workers has been increasing and the majority is overseas born. These data must be interpreted with caution as changes in surveillance practices may contribute to different risk factor reporting over time. Surveillance suggests that many of these cases reactivate remote infection that has been acquired overseas, not from within Australian health care settings. The low incidence of TB in Australia has resulted in relaxation of health care worker screening for TB in many low risk settings throughout Australia. However, the increasing reliance in overseas-born health care workers at high risk for TB highlights the importance for health care settings to remain vigilant in screening their work force.

The data here are reported against key performance indicators established in the *National Strategic Plan For TB Control Beyond 2000*,<sup>8</sup> and at the end of the period addressed by this plan. The criteria for the crude incidence rates in the Australian-born population, by international standards, are very low. Yet the Australian-born non-Indigenous rate has continued to fall, and is now consistently below the indicator. The Australian-born Indigenous rate is also low and has fallen, such that it is approaching the non-Indigenous rate. However, it remains above the indicator and has not reached equivalency with non-Indigenous Australians. By contrast, the rate in overseas-born subjects continues to climb, and this is both indicative of the main source of TB, and the on-going challenge in TB control in Australia.

The indicator for crude incidence rates in children (< 15 years of age) is that of elimination, which would in turn indicate that recent infection is not occurring in Australia. While rates are stable and very low, especially in Australian-born children, this indicator has not been achieved. There are low proportions of cases in children under 15 years (2008 4.5%; 2009 4.2%) particularly those less than 5 years (2008 1.9%; 2009 1.37%). Although the rates observed in overseas-born children are higher (Table 4), the absolute numbers of cases are low. In Australian-born children the rates are less than 1 per 100,000 population and approaching elimination. In addition, the number of meningeal cases in chil-

dren less than 5 years is another key marker of TB control and such cases are rare averaging 1 case only per year since 2002.

Completeness of reporting both of HIV status and outcomes has improved considerably, and both are now close to the 100% benchmark.

In terms of treatment outcomes, high rates of treatment success in reportable cases have consistently exceeded the performance indicator. Relapse and treatment failure rates are important indicators of the quality of treatment programs. Relapse rates in people previously treated in Australia remain low (< 5%) and no treatment failure cases were reported.

In summary, by the performance indicators set in the strategic plan, Australia maintains excellent TB control. At the time of writing this report NTAC is awaiting final endorsement of a new strategic plan (2011–2015). This will include considerably widened strategic goals. With respect to reporting of notification data this will include achieving real time national reporting of combined clinical and laboratory data. Development of epidemiological performance indicators beyond those reported here will include measures of diagnostic delay, incidence of relapsed TB that was treated in Australia within 5 years, occurrence of TB in specific high risk sub-groups (in addition to crude rates) and a number of laboratory performance criteria (e.g. proportion of cases confirmed by culture, proportion of laboratories meeting recommended turn-around-time of results, and time to identification of drug resistant TB etc). Given the rise in the TB incidence rate in Australia that is identified in this report, and especially in the face of increasing immigration from countries with high burdens of TB, the implementation of this strategic plan will be important in the future control of TB in Australia.

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