

# TUBERCULOSIS NOTIFICATIONS IN AUSTRALIA, 2010

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## Abstract

The National Notifiable Diseases Surveillance System received 1,353 tuberculosis (TB) notifications in 2010, representing a rate of 6.1 cases per 100,000 population. While rates of 5 to 6 cases per 100,000 population for TB have been maintained in Australia, since first achieved in the mid-1980s, there has been a steady increase in incidence over the past decade. The incidence in the Australian-born Indigenous population was 7.5 per 100,000 population, which is 11 times the incidence reported in the Australian-born non-Indigenous population of 0.7 per 100,000 population. Overseas-born people accounted for 90% of all cases notified in 2010 and represented a rate of 24 per 100,000 population. International students have been recognised as an increasingly important group, representing 25% of all overseas-born cases notified in 2010, and are a focus of this report. 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. Outcome data for the 2009 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 national reporting of TB to identify populations at risk and monitor trends in TB. *Commun Dis Intell* 2014;38(1):E36–E48.

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## Introduction

There were 8.8 million incident cases of tuberculosis (TB) globally in 2010, with almost 60% of these cases occurring in Australia's neighbouring countries in South East Asia and the Western Pacific.<sup>1</sup> For the first time, the World Health Organization (WHO) reported in 2010 that both the absolute number of TB cases and TB incidence rates had been falling at a global level. The on-going success of the Stop TB Strategy in our region and globally is important to a low-incidence country like Australia where the TB burden is largely a function of migration.

A crucial component of effective TB control in Australia is the collection of accurate, comprehensive and timely surveillance data. 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 expert strategic 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 describes the epidemiology of notified cases of TB in Australia in 2010. This report should be considered in conjunction with the Australian Mycobacterium Reference Laboratory Network (MRLN) report on bacteriologically confirmed cases.<sup>2</sup>

## Methods

TB is a nationally notifiable disease in Australia and is monitored using the National Notifiable Disease Surveillance System (NNDSS). Medical practitioners, public health laboratories and other health professionals are required under state and territory public health legislation to report cases of TB to jurisdictional health authorities. The *National Health Security Act 2007* provides the legislative basis for the national notification of communicable diseases and authorises the exchange of health information between the Commonwealth and states and territories. State and territory health departments transfer these notifications regularly to the NNDSS. The primary responsibility for public health action resulting from notification resides with state and territory health departments.

The Tuberculosis Data Quality Working Group (TBDQWG) is a working group of NTAC. It has representation from states and territories, the Commonwealth and the MRLN. It ensures routine and timely reporting of trends and emerging issues in TB. The TBDQWG is also responsible for maintaining national consistency and currency in data standards and systems for TB surveillance, relied upon to produce this report.

Data presented in this report represent a point in time analysis of notified cases of TB. This report presents data extracted from NNDSS during

February 2012, with revised data from Tasmania finalised in July 2012 and from New South Wales finalised in November 2012. 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 state or territory level. Detailed notes on case definition, data collection, quality control and the categorisation of population subgroups are available in the 2007 annual report.<sup>3</sup>

This report presents data analysed by date of diagnosis. This is a derived field within the NNDSS that is the earliest of the reported fields of notification date and notification received date. Crude rates were calculated using the mid-year estimated resident population from the Australian Bureau of Statistics (ABS).<sup>5</sup> Rates specific to population subgroups were based on ABS estimated resident populations as at 30 June 2006, however rates of specific countries of birth were based on the estimated resident population as at 30 June 2010.<sup>5,6</sup>

## Results

### Epidemiological situation in 2010

In 2010, 1,353 cases of TB were reported to the NNDSS, representing a rate of 6.1 cases per 100,000 population (Figure 1 and Table 1). This is an increase of 3% in the number of notified cases compared with 2009 (n=1,313). While the low rate of TB first achieved in the mid-1980s has been maintained, there has been a steady increase in incidence over the decade leading up to 2010.

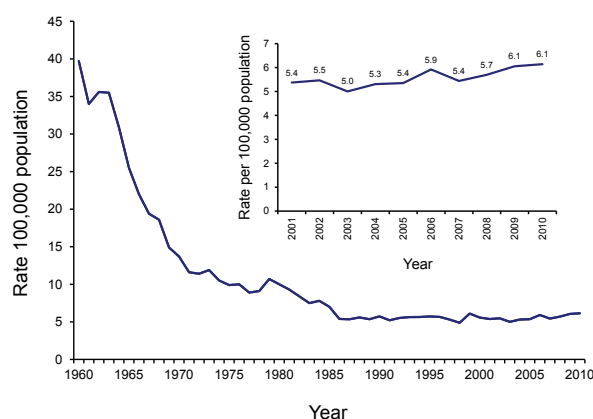
A case classification was reported in almost all cases (n=1,350) reported in 2010. Of those with a case classification, the majority of cases were clas-

sified as new (96%, n=1,298), that is, a patient who has never been treated for TB or a patient that was treated previously for less than 1 month (Table 1). Relapse was reported in 51 cases, with 12 of those cases reported as relapsing following full treatment in Australia, six following partial treatment in Australia and 33 following full or partial treatment overseas. One case reported by South Australia was reported as treatment after failure, which is a patient who has been treated after remaining culture positive 5 months or more following previous treatment. A report on the treatment after failure case is provided in the Box.

### Geographic distribution

As in previous years, New South Wales accounted for the largest number of cases notified by a state or territory (n=518; Table 1). The Australian Capital Territory and Tasmania reported the smallest number of cases in 2010 (n=10, per jurisdiction). The highest jurisdiction-specific rate in 2010 was

**Figure 1: Notification rates of tuberculosis, Australia, 1960 to 2010**



**Table 1: Notified cases and rates of tuberculosis, Australia, 2010, by case classification and state or territory**

State or territory	New cases		Relapse cases		Total*	
	Notifications	Rate	Notifications	Rate	Notifications	Rate
ACT	9	2.5	0	–	10	2.8
NSW	492	6.9	24	0.3	518	7.3
NT	28	12.2	0	–	28	12.2
Qld	171	3.9	8	0.2	179	4.1
SA	68	4.2	4	0.2	73	4.5
Tas.	10	2.0	0	–	10	2.0
Vic.	420	7.7	9	0.2	429	7.9
WA	100	4.4	6	0.3	106	4.6
Aust.	1,298	5.9	51	0.2	1,353	6.1

\* Total includes 1 case of treatment after failure reported by South Australia, and 3 cases reported without a case classification (1 reported by the Australian Capital Territory and 2 by New South Wales).

**Box. Case report: Treatment after failure**

A case of ‘treatment after failure’ was the first to have occurred in South Australia in at least the past 2 decades. This arose in an insulin dependent diabetic with pulmonary smear positive disease and initial high level isoniazid resistance. Treatment was supervised throughout by directly observed therapy (DOT). Sputum cultures were negative at the completion of the 2 month intensive phase, but again positive at the completion of nine months of treatment with rifampicin, ethambutol and pyrazinamide (REZ). Drug susceptibility testing confirmed acquired rifampicin resistance, making this a multi-drug-resistant TB (MDR-TB) case. The initial isolate in 2009 was susceptible to rifampicin at 0.25, 0.5, 1.0 and 2.0 mg/L (with the recommended Mycobacterium Growth Indicator Tube, breakpoint for susceptibility being 1.0 mg/L) and contained no rpoB mutation. The later isolate in 2010 was resistant to rifampicin at all 4 concentrations and contained an rpoB mutation known to confer resistance. The 2 isolates had the same 12-loci mycobacterial interspersed repetitive units profile. The patient was changed to an appropriate 2nd line regimen and subsequently also had a left upper lobectomy at 2 months to ‘debulk’ localised disease.

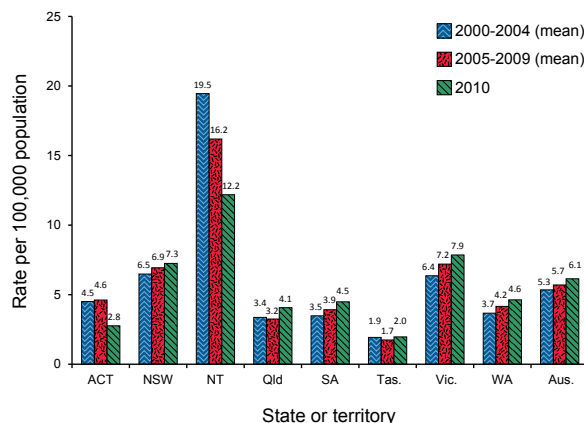
reported by the Northern Territory (12 per 100,000 population), followed by Victoria (7.9 per 100,000 population) and New South Wales (7.3 per 100,000 population).

Compared with the preceding 10 years, the Australian Capital Territory reported its lowest annual rate in 2010 (2.8 per 100,000 population, Figure 2), while Queensland (4.1 per 100,000 population) and Victoria both reported their highest jurisdiction-specific rate. Despite reporting the highest jurisdiction-specific rate in 2010, the rate of TB in the Northern Territory has continuously declined over the past 10 years, with the exception of 2007.

**Tuberculosis in the Australian-born population**

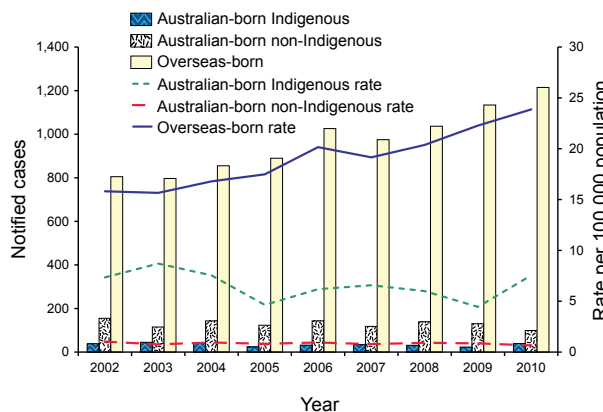
Indigenous status was reported for each of the 138 Australian-born cases reported in 2010 (Table 2). The overall rate of TB in the Australia-born population in 2010 was 0.9 per 100,000 population. The rate in the Australian-born Indigenous population (7.5 per 100,000 population) was 11 times the rate reported in the Australian-born non-Indigenous population (0.7 per 100,000 population).

**Figure 2: Notification rates of tuberculosis, Australia, 2000 to 2010, by state or territory**



The rate of TB in Australian-born non-Indigenous people has remained relatively stable since 2002 (Figure 3), while the rate in Australian-born Indigenous peoples has demonstrated no clear trend, ranging from 4.4 to 8.7 cases per 100,000 population over this period.

**Figure 3: Notified cases and rate of tuberculosis, Australia, 2002 to 2010, by population subgroup**



**Tuberculosis in the overseas-born population**

All cases of TB diagnosed in 2010 were reported with a country of birth, with 90% (n=1,215) of cases reported as overseas-born (Table 2). The proportion of cases that were reported as overseas-born varied across states and territories, ranging from 39% (n=11) in the Northern Territory to 95% (n=409) in Victoria and 100% (n=10) in the Australian Capital Territory.

**Table 2: Notified cases and rates of tuberculosis, Australia, 2010, by population subgroup and state or territory**

State or territory	Indigenous		Australian-born Non-Indigenous		Total		Overseas-born	
	Notifications	Rate	Notifications	Rate	Notifications	Rate	Notifications	Rate
ACT	0	–	0	–	0	–	10	12.7
NSW	11	7.2	53	1.1	64	1.3	454	25.1
NT	15	23.4	2	1.8	17	9.6	11	33.5
Qld	8	5.5	9	0.3	17	0.5	162	20.1
SA	1	3.6	7	0.6	8	0.7	65	18.9
Tas.	1	5.4	1	0.2	2	0.5	8	14.2
Vic.	1	3.0	19	0.5	20	0.5	409	30.3
WA	2	2.8	8	0.6	10	0.7	96	15.6
Aust.	39	7.5	99	0.7	138	0.9	1,215	23.9

The rate of TB amongst overseas-born people in 2010 was 27 times the rate in Australian-born. The rate of TB in overseas-born people in 2010 was the highest reported in this population group since 2002, with the group experiencing a consistent, steadily increasing trend over this period (Figure 3). This figure should be interpreted with caution, given that completeness of reporting country of birth has improved over this time.

Amongst overseas-born cases notified in 2010, the most frequently reported country of birth was India (n=302, Table 3), followed by Vietnam (n=114), the Philippines (n=91) and Nepal (89). Amongst the most frequently reported countries of birth, the highest estimated rates were amongst those cases born in Somalia (297 per 100,000 population), Nepal (289 per 100,000 population) and Papua New Guinea (PNG) (202 cases per 100,000 population). These estimates of rates must be interpreted with caution as they are biased by temporary visitors being included amongst notified cases but are not necessarily enumerated within the estimated resident population.

Residency status was available for 95% (n=1,152) of TB cases reported as overseas-born in 2010. Residency status is self-reported at the time of diagnosis and is not verified against migration records. The majority of overseas-born cases reported with a residency status were reported as permanent residents (n=603), followed by overseas students (n=282). Of the high-burden overseas-born populations identified in Table 3, the proportion of cases reported as overseas students ranged from 0% of cases born in the Republic of the Union of Myanmar, Somalia, Sudan and Afghanistan to 69% of cases born in Nepal.

There were 36 cases of TB notified amongst PNG nationals accessing health care in the Torres Strait Treaty Zone in 2010. This was a 50% increase on the 24 cases reported in 2009. Treating PNG nationals in the Torres Strait Treaty Zone accounted for 20% of Queensland's caseload in 2010. There was only 1 illegal foreign fisher reported with TB in 2010, similar to the low number of cases in this group in 2009.

Data on the year of arrival were available for 82% (n=996) of the cases reported as overseas-born in 2010. Of these cases, 29% (n=284) presented and were diagnosed within 2 years of arrival in Australia (Figure 4). In 2010 this was the first year where international students contributed to a peak of disease after 2 years of arrival in Australia. Half of all TB cases in the overseas-born occurred within 3 years of arrival in Australia (inter-quartile range, IQR: 1–12 years).

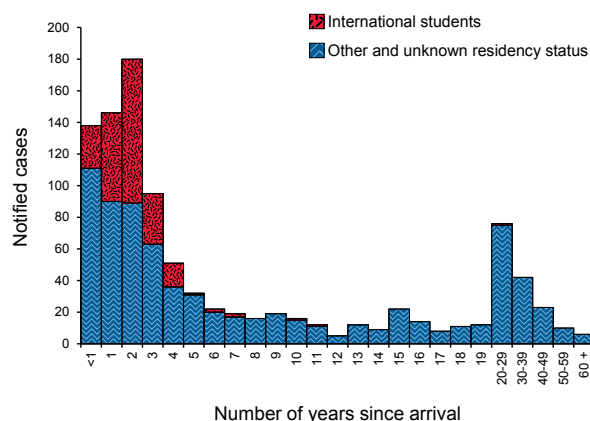
**Figure 4: Notified cases of tuberculosis in the overseas-born population, Australia, 2010, by number of years since arrival in Australia**

Table 3: Notified cases and rates of tuberculosis for frequently reported countries of birth, Australia, 2010, by residency status

Country of birth	International students*		Residency status		Total	Estimated resident population†	Estimated rate (per 100,000 population)	WHO rate (per 100,000 population)§
	n	%	Other and unknown residency status†	Total				
India	91	30	211	302	343,150	88	185	
Vietnam	24	21	90	114	210,090	54	199	
Philippines	3	3	88	91	178,570	51	275	
Nepal	61	69	28	89	30,840	289	163	
China	23	28	59	82	376,980	22	78	
Papua New Guinea	5	8	56	61	30,210	202	303	
Indonesia	17	33	35	52	68,960	75	189	
Bangladesh	9	28	23	32	28,770	111	225	
Thailand	8	32	17	25	53,070	47	137	
Republic of the Union of Myanmar	0	0	20	20	22,480	89	384	
Somalia	0	0	19	19	6,400	297	286	
Sudan	0	0	18	18	25,940	69	119	
Republic of South Korea	5	29	12	17	89,210	19	97	
Pakistan	7	41	10	17	31,890	53	231	
Cambodia	1	6	15	16	31,220	51	437	
Malaysia	2	13	14	16	129,980	12	82	
Afghanistan	0	0	16	16	27,140	59	189	
Other overseas-born	26	11	202	228				
Total overseas-born	282	23	933	1,215				
Australian-born	-	-	-	138				
Total				1,353				

\* Students presented as a per cent of total cases, by country of birth.

† An unknown residency status was reported in 5% of overseas-born cases.

‡ The Australian Bureau of Statistics estimated resident population at 30 June 2010, using ABS catalogue 3412.0.6.

§ Rates from the World Health Organization 2011 Global Tuberculosis Report.1

|| China excludes Special Administrative Regions and Taiwan.

## Age and sex distribution

Age was reported for all TB cases notified in 2010, while sex was available for close to 100% of cases (n=1,349). Continuing the trend reported in previous years, there were more males than females notified, with a male to female ratio of 1.2:1.

In 2010, TB was predominantly seen in young adults aged 25–34 years, and this was driven by high rates in overseas-born cases in this age group (Figure 5). The burden of disease increased with age in Australian-born cases regardless of Indigenous status.

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 49 children aged less than 15 years in 2010, which equated to 4% of the total number of notified cases. Of these, 18 were Australian-born non-Indigenous people including 5 cases reported as having one or more parents born in a high-risk country. An additional 5 cases were Australian-born Indigenous and 26 cases were children born overseas.

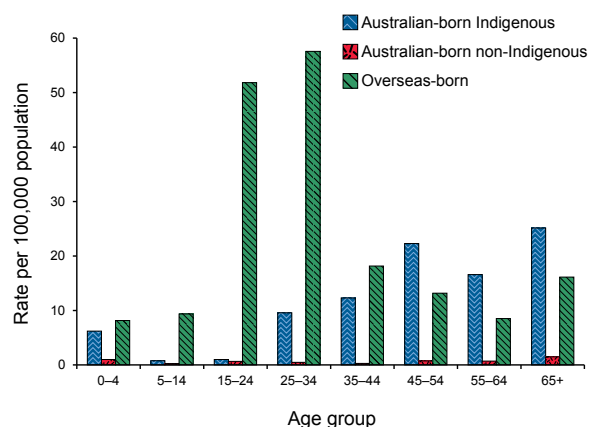
## Selected risk factors for tuberculosis

Selected risk factor data were provided for 73% (n=985) of notified cases in 2010. Overall, the most frequently reported risk factor was past travel to or residence in a high-risk country that was not their

country of birth (n=631, Table 4). Interpretation of this risk factor in overseas-born cases is problematic. At the time these data were collected there were inconsistent practices across states and territories as to the inclusion of a case's country of birth in the assessment of this risk factor. NTAC has agreed that this risk factor is to identify travel-related TB and as such is intended to be exclusive of a case's country of birth. Reporting of this risk factor from 2013 should be clearer.

Having a household member or close contact with TB was the 2nd most common risk factor

**Figure 5: Notification rates of tuberculosis, Australia, 2010, by population subgroup and age group**



**Table 4: Notified cases of tuberculosis, Australia, 2010, by population subgroup and selected risk factors\***

Risk factor*	Australian-born Indigenous	Australian-born non-Indigenous	Overseas-born	Total
Household or other close contact with TB	20	22	156	198
Ever resided in a correctional facility†	1	0	5	6
Ever resided in an aged care facility†	0	0	0	0
Ever employed in an institution†‡	0	2	8	10
Currently or previously† employed in health industry in Australia or overseas	1	4	52	57
Ever homeless	1	0	2	3
Past travel to or residence in a high-risk country	2	23	606	631
Chest X-ray suggestive of old untreated TB	1	3	4	8
Currently receiving immunosuppressive therapy	0	1	9	10
Australian-born child with one or more parent born in a high-risk country	0	4	–	4
None of the above risk factors	4	27	105	136
Total cases assessed for risk factors	29	79	877	985

\* More than 1 risk factor may be reported for each notified case of tuberculosis.

† Within the preceding 5 years.

‡ Institution is defined as a correctional facility, aged care facility or homeless shelter.

reported by Australian-born non-Indigenous and overseas-born cases (n=22 and 156, respectively), and it was the most common risk factor reported by Australian-born Indigenous cases (n=20).

A total of 57 cases of TB in 2010 were reported in people who were currently or had previously worked in a health care setting. Of these, 13 were working in a health care setting in Australia at the time of diagnosis or within 12 months of diagnosis. Almost half (n=6) of these cases presented with extrapulmonary disease only, which is generally not communicable. None of these notified 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 2010.

There were a number of cases of TB reported as not having any risk factors identified (n=136).

### Tuberculosis and HIV status

The HIV testing history of notified cases of TB was reported in 90% of cases (n=1,215, Table 5). More than half of these cases (n=654) were reported with a known HIV status, of which 3.4% (n=22) were reported as HIV positive. Of the cases with a known HIV status, Australian-born non-Indigenous cases were reported more frequently as HIV positive (4.9%) than Australian-born Indigenous (0%) and overseas-born cases (3.4%). Approximately one-third (n=368) of cases with an HIV testing history were reported as being tested with an unknown result. These cases were almost entirely reported by Victoria, where the HIV status of an individual cannot be reported against their TB notification.

### Anatomical site of disease

The anatomical site of TB disease was recorded for all notified cases in 2010 (Table 6). Pulmonary disease was the most frequently reported site of disease (n=830), with most of these cases reported as having pulmonary disease only.

Cases presenting with disease focused in extrapulmonary sites only accounted for 39% (n=523) of cases, with lymph nodes (n=178) and pleura (n=59) reported as the most frequent extrapulmonary sites. Of the more severe forms of TB, there were four classified as miliary and six as meningeal cases. While the treatment outcomes of these severe forms of TB were not finalised at the time of the data being finalised for this report, preliminary data suggested that of the cases with assessable outcomes (n=4), 75% were reported as having completed treatment. Of the remaining cases with non-assessable outcomes (n=6), two-thirds were still under treatment and one-third was transferred overseas and therefore their treatment outcome is unknown.

All extrapulmonary only cases reported with an unknown site were reported by Victoria.

### Bacteriologically confirmed cases and drug resistance

The number of cases confirmed bacteriologically by culture of the *Mycobacterium tuberculosis complex* was 1,051 (78%). Of the 830 pulmonary TB cases, 77% (n=642) were culture positive, of which 47% (n=304) were smear positive. Bronchoscopy was used to establish the diagnosis in 137 (21.3%) of the culture proven cases of which 27% (n=37) were smear positive. Five (3.6%) of these bronchoscopy cases were MDR-TB. Of the 523 extra-pulmonary only cases, 64% (n=333) were confirmed by bacteriological means. In children under 15 years, 49 were notified but only 12 (25%) were confirmed by the laboratory. The proportion of culture isolates with available *in vitro* drug susceptibility testing, demonstrating resistance to at least one of the standard first line anti-tuberculous agents was 12% (n=126). Resistance to isoniazid (no rifampicin resistance) was shown in 4.7% (n=49) of isolates. Resistance to at least isoniazid and rifampicin (MDR-TB by definition) was reported in 3.5% (n=37) of cases but 16 of these were from the PNG-Torres Strait Islands cross border region. Overseas-born persons accounted for all of the

**Table 5: Notified cases of tuberculosis, Australia, 2010, by population subgroup and HIV status**

HIV testing history	Australian-born Indigenous	Australian-born non-Indigenous	Overseas-born	Total
HIV positive	0	3	19	22
HIV negative	29	48	555	632
HIV tested, result unknown*	0	10	358	368
Not tested	4	23	163	190
Refused testing	0	0	3	3
HIV testing history unknown	6	15	117	138
Total	39	99	1,215	1,353

**Table 6: Notified cases of tuberculosis, Australia, 2010, by case classification and site of disease**

Site of disease	New cases	Relapse cases	Total*	Per cent of cases
Total pulmonary disease	789	38	830	61.3
Pulmonary only	622	34	659	48.7
Pulmonary plus other sites	167	4	171	12.6
Total extrapulmonary only†	509	13	523	38.7
Pleural	59	0	59	4.4
Lymph nodes	155	6	178	11.9
Bone/joint	33	0	35	2.4
Genito/urinary	26	0	27	1.9
Miliary	3	1	7	0.3
Meningeal	5	1	6	0.4
Peritoneal	6	1	14	0.5
Other	62	1	79	4.7
Unknown extrapulmonary site	174	3	174	12.9

\* Total includes 3 pulmonary cases (1 reported as treatment after failure and 2 reported without a case classification) and 1 extrapulmonary case reported without a case classification.

† More than 1 extrapulmonary site may be reported for each notified case of TB.

remaining cases including the Philippines (4), India (3), China (2) and Vietnam (3). Extensively drug resistant TB (MDR-TB plus resistance to an injectable agent and a quinolone) was reported in 1 overseas born case and a further case had MDR and quinolone resistance.

A more detailed analysis of bacteriologically confirmed cases, including the drug resistance profiles of isolates, is reported in the Australian Mycobacterium Reference Laboratory Network (MRLN) report.<sup>3</sup>

### Treatment outcomes of 2009 tuberculosis patient cohort

Treatment success, including those with bacteriologically confirmed cure and those who completed treatment was reported in 96% (n=1,136) of cases reported with assessable outcomes in 2009 (Table 7). Treatment success by population subgroup ranged from 90% (n=18) in Australian-born Indigenous cases to 96% (n=981) in overseas-born cases. There were 2 cases of a treatment failure reported in cases notified in 2009 and a total of 15 cases reported to have died due to TB.

### National performance indicators

The performance criterion for incidence (less than 1 per 100,000 population) developed by NTAC, was met only for the crude incidence rates in non-Indigenous cases (Table 8). Incidence rates in children exceeded the performance criteria (less than 0.1 case per 100,000 population) in all

population groups. While the reporting of HIV testing history has declined compared with the previous year, it has improved in recent years and is close to reaching the target of 100%. Outcome reporting came close to meeting the target of 100% for the 2009 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 2009. Additionally, this performance indicator was met in each of the population subgroups, including Australian-born Indigenous cases (Table 7).

### Discussion

The TB incidence rate in Australia of 6.1 per 100,000 population is low when compared with other countries, including comparable countries with well-developed and resourced health systems. In 2010, TB incidence in the United States of America (USA) was 4 per 100,000 population, the United Kingdom was 15 per 100,000 population and New Zealand was 8 per 100,000 population.<sup>1</sup> This report records a slight increase in the number of notifications and incidence rate compared with 2008 and 2009. This continues the overall trend toward an increase in incidence, as illustrated when the rate is compared with the mean for the 2 preceding intervals of 5 years (Figure 2). This upward trend is particularly noted in New South Wales, Queensland, South Australia, Victoria and Western Australia. It is also in stark contrast with the USA, where there has been a steady decline over the last 10 years.<sup>7</sup>



Table 7: Notified cases of tuberculosis, Australia, 2009, by population subgroup and treatment outcome

Treatment outcome	Australian-born Indigenous		Australian-born non-Indigenous		Overseas-born		Total cases*	
	Notifications	% assessable	Notifications	% assessable	Notifications	% assessable	Notifications	% assessable
<b>Assessable outcomes</b>								
Treatment success	18	90.0	115	95.0	981	95.8	1,136	95.5
Cured (bacteriologically confirmed)†	3	15.0	5	4.1	37	3.6	50	4.2
Completed treatment	15	75.0	110	90.9	944	92.2	1,086	91.3
Interrupted treatment‡	0	–	0	–	2	0.2	2	0.2
Died of tuberculosis	0	–	2	1.7	12	1.2	15	1.3
Defaulted§	2	10.0	1	0.8	23	2.2	27	2.3
Failure	0	–	1	0.8	1	0.1	2	0.2
Not followed up, outcome unknown	0	–	2	1.7	5	0.5	7	0.6
<b>Total assessable</b>	20	100.0	121	100.0	1,024	100.0	1,189	100.0
<b>Non-assessable outcomes</b>								
Transferred out of Australia	0	0.0	0	–	65	5.7	65	
Died of other causes	1	4.3	9	6.9	37	3.3	47	
Still under treatment	2	8.7	0	–	8	0.7	12	
<b>Total</b>	23	100.0	130	100.0	1,134	100.0	1,313	

\* Total includes 26 cases reported with an unknown population subgroup.

† 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 is defined as treatment interrupted for 2 months or more but completed.

§ Defaulted is defined as failed to complete treatment.

|| Failure is defined as sputum culture positive at 5 months or later.

**Table 8: National tuberculosis performance indicators, performance criteria\* and the current status of tuberculosis, Australia, 2009 and 2010**

National tuberculosis performance indicator	Performance criterion	2009	2010
<b>Annual incidence of TB (cases per 100,000 population)</b>			
Australian-born Indigenous Australians	< 1	4.4	7.5
Australian-born non-Indigenous Australians	< 1	0.9	0.7
Overseas-born persons	*	22.3	23.9
<b>Incidence in children &lt;15 years, by risk group (per 100,000 population)</b>			
Australian-born Indigenous Australians	< 0.1	1.5	2.6
Australian-born non-Indigenous Australians	< 0.1	0.6	0.5
Overseas-born persons	*	10.6	9.2
Collection of HIV status in tuberculosis cases	100%	95%	90%
<b>Treatment outcome measures (%)</b>			
Cases evaluated for outcomes	100%	91%	TBA
Cases that have treatment completed and are cured	>90%	96%	TBA
Cases recorded as treatment failures	<2%	0.2%	TBA

\* Performance criteria currently under review.

TBA To be assessed; treatment outcomes for 2010 patient cohort to be reported in the 2011 annual report.

TB cases in Australia are nearly all new cases, meaning there is no history of prior TB treatment. Only 4% of TB notifications in 2010 were relapsed TB, of which 35% (18 of 51) had previously been treated in Australia. From the data available, it is not clear whether these cases are genuine relapse or reinfection, and the details of the original treatment that may explain relapse, particularly amongst the 12 cases that were considered to have been fully treated in Australia, is also not available. Whether these cases of relapse were associated with acquired drug resistance is also not reported, but NTAC is investigating separately the incidence and characteristics of acquired drug resistance in Australia. Persistence of positive sputum culture despite at least 5 months of treatment, i.e. treatment failure, is extremely rare in Australia. However in 2010 there was a single case in which sputum cultures remained positive after 5 months treatment.

The TB rate in Australian-born people as a whole remains very low, but remains unacceptably high in Australian-born Aboriginal and Torres Strait Islander people. In 2010 the rate in Australian-born Indigenous persons was 11 times the non-Indigenous Australian-born rate and was higher than the previous 5 years (Figure 3). This is contrary to a prior trend downwards, though interpreting trends in this group is difficult, because of the low numbers. Encouragingly, the rate in the Northern Territory, where more than half of cases are Aboriginal, has fallen, which suggests improved control in that population.

The main contributor to TB incidence in Australia and the trend toward increasing TB notifications is increasing levels of migration from high incidence countries. Ninety per cent of TB notifications in 2010 were in overseas-born people, and this proportion and the rate in overseas-born people have steadily increased over the last 10 years. Overseas-born people with TB mainly come from high TB incidence countries from which Australia receives a large number of immigrants, specifically India, Vietnam and the Philippines. Notably, there has been an increasing number of TB cases amongst Nepalese immigrants, who are largely students undertaking tertiary education in Australia. TB notifications in people born in Nepal, together with Somalia, PNG, Bangladesh and Myanmar have the highest rates as a function of the low estimated population of these people resident in Australia. People originating from countries with high rates, such as these, are a target population for screening and an increased vigilance for TB amongst clinicians.

There are a number of other characteristics associated with TB notification in addition to country of birth, which can assist with identifying target groups for future TB control activities. In particular, although TB can occur many years after migration, in TB annual reports over many years it has been consistently noted that half of the TB cases in overseas-born people are young adults diagnosed within 3–4 years of migration including overseas students. These are specifically identified in this report (Table 3 and Figure 4) and represent 25% of

all overseas-born TB notifications. Through jurisdictional TB control programs, NTAC is working towards increased active surveillance for TB in students, and improvement of TB awareness and engagement in this population.

There are three important groups of maritime arrivals impacting TB control in Australia. In 2010 the number of notifications in PNG nationals in Australia nearly doubled compared with 2009 ( $n=36$ , 2010  $n=55$ ), and more than half of these were people crossing the Torres Strait Islands Treaty Zone between the Western Province of PNG and Far North Queensland. This group was a significant burden on the Queensland TB Control Program, as it represented one-fifth of Queensland TB notifications and 44% were MDR-TB. This group also represented 43% of all MDR-TB in Australia.<sup>3</sup> In 2010 a collaborative effort was initiated between the TB control programs in PNG, Queensland, and the Australian Government Department of Health, with funding from the then AusAid. The collaboration aims to develop the capacity for managing TB in the Western Province and transfer responsibility for clinical management of TB cases to the TB control program there. Until high level local control of TB is achieved in PNG, the potential for cases to present in Australia from the Western Province remains.

The second group of TB cases arriving by sea is asylum seekers. The number of irregular maritime arrivals (IMAs) increased in 2010. This group is recognised to be at higher risk for TB, because of both the high incidence of TB in the countries from which they originate and transit through, and the circumstances from which they are fleeing.<sup>8</sup> This group is not specifically reported here, because the current TB enhanced surveillance dataset does not clearly distinguish this group because case status as immigration detainees, temporary protection visa holders and permanently settled refugees is often not clearly recorded in notifications, and data on residency status is generally not reliable, because it is not verified. However, the two jurisdictions that receive all IMAs when they first arrive, Western Australia and the Northern Territory, are currently analysing this group and will report their number and characteristics separately.

The third potential group was Indonesians detained for fishing illegally in Australian waters. These represented a significant proportion of Australian TB notifications prior to 2008, but, as in 2009, were not represented significantly in 2010.<sup>9</sup>

Amongst other recorded risk factors for TB, predictably, a history of close contact with TB is commonly reported. This is most important in Australian-born TB cases, as it is marker of possible transmission of TB within Australia. Reported

close contact in Australian-born non-Indigenous TB notifications is relatively low (28% of cases assessed for risk factors), whereas 69% of Aboriginal and Torres Strait Islander peoples notified with TB have a history of contact, indicating that transmission to close contacts remains an important cause of higher TB rates in this group. Children diagnosed with TB, by definition, must have acquired their infection recently, so are the best indicator of recent transmission. Amongst Australian-born children, 4 (24% of cases assessed for risk factors) had at least 1 parent born in a high incidence country and 8 (47%) had reported close contact with a case. As a function of all notifications, these data suggest that while transmission within Australia is likely to be uncommon, it does occur. The high proportion of children and Indigenous cases that reported close contact with TB demonstrates the potential for loss of TB control through on-going transmission within Australia and should be monitored closely.

Prior TB annual reports have identified an increasing number of Health Care Workers (HCW) diagnosed with TB. In 2010 this was again seen, with a slight increase compared with 2008 and 2009. These HCWs were nearly all born overseas (91%) and none were considered to have acquired TB from a patient contact in Australia. They therefore do not represent a failure of infection control in Australian health care facilities, but do represent an important risk group for TB that has arisen from an increasing migration of HCWs from high incidence countries to work in Australia. Recognition of the risk posed by this group has led jurisdictional TB control programs to review TB risk management policies for HCWs, and NTAC is currently writing a national guideline for management of TB risk in HCWs.

HIV testing in TB notifications is now well reported (90%), though a result is only available in 54% of notifications. HIV and TB co-infection remains rare in Australia (3.4% of those in which a result was available) and a relatively minor contributor to annual TB incidence, unlike many other parts of the world.

Surveillance benchmarks for areas embarking on a TB elimination strategy are distinct from those for high incidence countries that aim to achieve disease control. Obtaining bacteriological confirmation for at least 80% of all cases is considered a reasonable benchmark for a low prevalence setting.<sup>10</sup> A lower proportion than this might suggest over-diagnosis as a potential issue. The proportion of notifications confirmed by culture in 2012 remained within the range of 70%–80%, which has been the trend of the past decade.<sup>2</sup> The higher rate of bacteriological confirmation noted in pulmonary cases (77%) is expected. However,

the lower culture yields reported in extra-pulmonary (64%) and childhood cases (25%) is likely to reflect the more pauci-bacillary nature of disease and the difficulty in obtaining adequate samples. Additionally, in children, cases strongly suspected on clinical and radiological grounds and related to recent household exposure (where the source case's bacteriologic information is already known) are invariably started on treatment for presumptive infection. Of concern is the number of culture confirmed cases detected by bronchoscopy that were also smear positive (n=37). It is likely that most of these smear positive cases would have been detected if good attempts to collect sputum or induced sputum samples had been undertaken, thereby avoiding bronchoscopy, which in this situation places staff involved in the procedure at unnecessary risk.

In conclusion, Australia maintained effective TB control in 2010 as measured against performance indicators set in the National Strategic Plan.<sup>11</sup> At the time of writing, a new strategic plan for 2011–2015 has been endorsed.<sup>12</sup> This document does not set specific numerical notification targets, as these have been recognised to be largely dependent on factors external to Australian TB control efforts; specifically, migration. However, this strategic plan offers much wider strategic goals, with a goal and objective based work plan. In particular, the plan recommends specific activity toward targeted screening for TB in high risk groups, including latent TB infection treatment. Finally, NTAC acknowledges the continued difficulty in publishing timely notification reports and combination of these reports with Mycobacterial Reference Laboratory reports. Achieving early combined reports is also a key goal in the current strategic plan.

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