

TUBERCULOSIS NOTIFICATIONS IN AUSTRALIA, 2011

Christina Bareja, Justin Waring, Richard Stapledon, Cindy Toms, Paul Douglas and the National Tuberculosis Advisory Committee, for the Communicable Diseases Network Australia

Abstract

The National Notifiable Diseases Surveillance System received 1,385 tuberculosis (TB) notifications in 2011, representing a rate of 6.2 cases per 100,000 population. While Australia has maintained a rate of 5 to 6 cases per 100,000 for TB since the mid-1980s, there has been a steady increase in incidence over the past decade. In 2011, Australia's overseas-born population continued to represent the majority of TB notifications (88%) with a notification rate of 20.2 per 100,000. The incidence of TB in the Australian-born Indigenous population has fluctuated over the last decade and showed no clear trend; however, in 2011 the notification rate was 4.9 per 100,000, which is a notable decrease from the 7.5 per 100,000 recorded in 2010. The incidence of TB in the Australian-born non-Indigenous population has continued to remain low at 0.9 per 100,000. Australia continued to record only a small number of multi-drug-resistant TB (MDR-TB) cases nationally ($n=25$), all of which were identified in the overseas-born population. To ensure that Australia can retain its low TB rate and work toward reducing rates further, it is essential that Australia maintains good centralised national TB reporting to monitor trends and identify at-risk populations, and continues to contribute to global TB control initiatives. *Commun Dis Intell* 2014;38(4):E356–E368.

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Introduction

Like many low-incidence countries, Australia's biggest challenge in maintaining good tuberculosis (TB) control is to manage TB rates in its migrant population. Throughout the 19th and 20th centuries, the majority of Australia's migrant population has originated from European countries. Over the last decade, the proportion of migrants coming from European countries has declined from 52% in 2001 to 40% in 2011, while the proportion of migrants coming from Asian countries increased from 24% in 2001 to 33% in 2011.¹ Given this change in migration patterns as well as Australia's close proximity to the South East Asia and Western Pacific regions where 60% of the world's TB cases are located,² Australia's ability to maintain good TB control domestically will rely on the ongoing success of the Stop TB Strategy to reduce the TB burden in these regions.

The National Tuberculosis Advisory Committee (NTAC), a subcommittee of the Communicable Diseases Network Australia (CDNA), oversees the surveillance of TB in Australia. NTAC also has the key role of providing strategic, expert advice to CDNA and the Australian Government, on a coordinated national approach to TB control. NTAC also has the role of developing and reviewing nationally agreed strategic plans and guiding their implementation for the prevention and control of TB in Australia.

This report describes the epidemiology of notified cases of TB in Australia in 2011 and should be considered in conjunction with the annual Australian Mycobacterium Reference Laboratory Network (MRLN) report on bacteriologically confirmed cases.³

Methods

TB is a nationally notifiable disease in Australia and is monitored using the National Notifiable Disease Surveillance System (NNDSS). Under state and territory public health legislation medical practitioners, public health laboratories and other health professionals are required to report to jurisdictional health authorities, cases of TB that fit the national case definition.⁴ 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), a working group of NTAC with representation from states and territories, the Commonwealth and the MRLN, ensures routine and timely reporting of trends and emerging issues in TB. The TBDQWG is responsible for maintaining national consistency in data standards and systems for national TB reporting.

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 2014. 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. The details on case definition, data collection, quality control and the categorisation of population sub-groups are available in the 2007 annual report.⁵

This report presents data analysed by date of diagnosis, a derived field within the NNDSS. The methodology for the date of diagnosis changed in January 2014 and was applied to notifications retrospectively, including for this 2011 report. Diagnosis date for TB is equivalent to the notification received date. This is the date the notification of the disease was received by the communicable disease section of the health authority. Crude rates for the overall population were calculated using the 2011 mid-year estimated resident population from the Australian Bureau of Statistics (ABS) *Australian Demographic Statistics*.⁶ Crude rates for the overseas-born population were calculated using the 2011 mid-year estimated resident population from the ABS *Migration, Australia, 2011–12 and 2012–13* tables.⁷

Results

Epidemiological situation in 2011

In 2011, there were 1,385 cases of TB reported to the NNDSS, representing a rate of 6.2 cases per 100,000 population (Figure 1, Table 1). This was an increase of 1% in the number of notified cases compared with 2010 (n=1,368). While a relatively low rate of TB has been maintained since the mid-1980s, there has been a steady and sustained increase in incidence over the decade leading up to 2011 (Figure 1).

A case classification was reported in almost all cases (n=1,381) reported in 2011. Of those with

a case classification, the majority of cases were classified as new (95%, n=1,314); that is a patient who has never been treated for TB or a patient treated previously for less than 1 month (Table 1). Relapse was reported in 67 cases, with 17 of those cases reported as relapsing following full treatment in Australia, 12 following partial treatment in Australia and 38 following full or partial treatment overseas.

Geographic distribution

As in previous years, New South Wales accounted for the largest number of cases notified by a state or territory (n=541, Table 1). In 2011, the lowest number of notifications and the lowest jurisdiction-specific rate was reported in Tasmania (n=17, Table 1) while the highest jurisdiction-specific rate was reported in the Northern Territory (15.1 per 100,000).

Figure 1: Notification rate for tuberculosis, Australia, 1960 to 2011

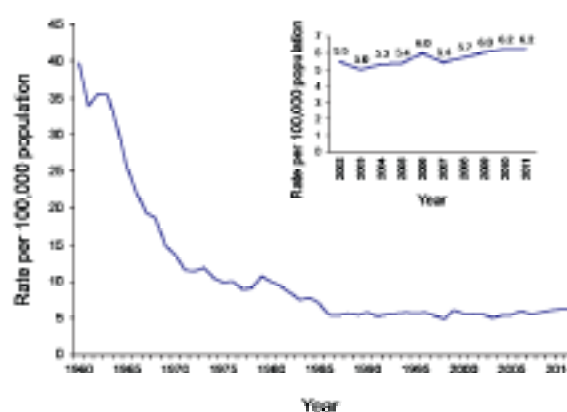


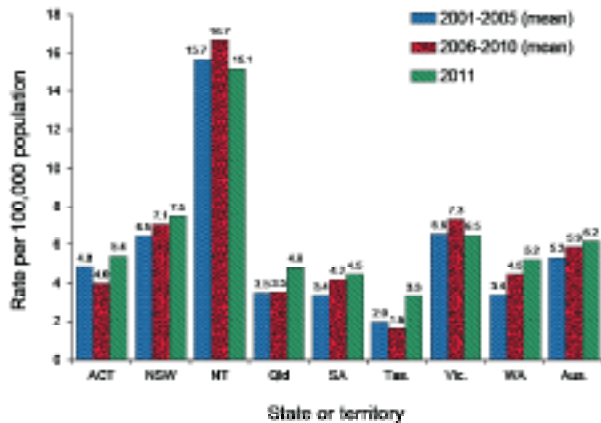
Table 1: Notified cases and rates for tuberculosis, Australia, 2011, by case classification and state or territory

State or territory	New cases		Relapse cases		Total*	
	Notifications	Rate	Notifications	Rate	Notifications	Rate
ACT	20	5.4	0	–	20	5.4
NSW	505	7.0	33	0.5	541	7.5
NT	32	13.8	2	0.9	35	15.1
Qld	204	4.6	12	0.3	216	4.8
SA	71	4.3	2	0.1	73	4.5
Tas.	16	3.1	1	0.2	17	3.3
Vic.	347	6.3	13	0.2	360	6.5
WA	119	5.1	4	0.2	123	5.2
Aust.	1,314	5.9	67	0.3	1,385	6.2

* Total includes 4 cases reported without a case classification (NSW: 3; NT: 1).

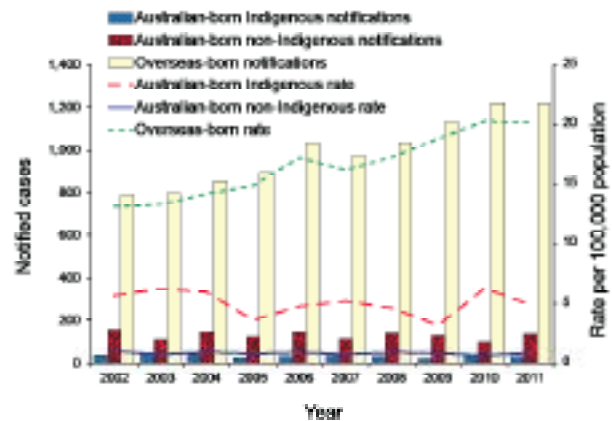
In 2011, all jurisdictions except for Victoria and the Northern Territory, recorded a jurisdiction-specific rate higher than the 5-year mean jurisdiction-specific rates of the 2 preceding 5-year intervals (Figure 2).

Figure 2: Notification rate for tuberculosis, Australia, 2001 to 2011, by state or territory



The rate of TB in Australian-born non-Indigenous people has remained relatively stable since 2002, while the rate in Australian-born Indigenous peoples has demonstrated no clear trend, ranging from 3.1 to 6.3 cases per 100,000 over this period (Figure 3).

Figure 3: Notified cases and rate for tuberculosis, Australia, 2002 to 2011, by population subgroup



Tuberculosis in the Australian-born population

The overall rate of TB in the Australia-born population in 2011 was 1.0 per 100,000 (Table 2). The rate in the Australian-born Indigenous population (4.9 per 100,000) was more than 5 times the rate reported in the Australian-born non-Indigenous population (0.9 per 100,000). The rate in the Australian-born population however, meets the pre-elimination target set by the World Health Organization (WHO) to be achieved by 2035, reflecting the need to concentrate additional control strategies on the Indigenous and migrant population.⁸

Tuberculosis in the overseas-born population

All but 1 case of TB diagnosed in 2011 were reported with country of birth information, with 88% (n=1,214) 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 46% (n=16) in the Northern Territory to 91% (n=112) in Western Australia.

Table 2: Notified cases and rates for tuberculosis, Australia, 2011, by population subgroup and state or territory

State/ territory	Indigenous		Non-Indigenous		Total		Overseas-born	
	Notifications	Rate	Notifications	Rate	Notifications	Rate	Notifications	Rate
ACT	0	—	3	1.1	3	1.1	17	17.7
NSW	7	3.4	56	1.1	63	1.2	478	23.4
NT	12	17.4	7	5.9	19	10.1	16	36.7
Qld	10	5.3	19	0.6	29	0.8	186	18.5
SA	2	5.3	5	0.4	7	0.6	66	17.0
Tas.	0	—	2	0.5	2	0.4	15	23.4
Vic.	0	—	36	0.9	36	0.9	324	20.4
WA	2	2.3	9	0.6	11	0.7	112	14.2
Aust.	33	4.9	137	0.9	170	1.0	1,214	20.2

In 2011, the rate of TB among overseas-born people was more than 19 times the rate in Australian-born and maintained the peak reported in this population group in the previous year. TB in overseas-born people has increased steadily since this subgroup was first reported in 2002 (Figure 3). This figure should be interpreted with caution, given that completeness of reporting the country of birth has improved over this time.

Among overseas-born cases notified in 2011, the most frequently reported country of birth was India (n=276), followed by Vietnam (n=99), the Philippines (n=99) and China (n=82) (Table 3). Among the most frequently reported countries of birth, the highest estimated rates were for those born in Nepal (284 per 100,000), Ethiopia (260 per 100,000) and Papua New Guinea (238 cases per 100,000). These estimated rates must be interpreted with caution as temporary residents are included

in Australia's TB notifications (the numerator) but may not be included in the ABS estimated resident population (the denominator).

Residency status was available for 97% (n=1,174) of TB cases reported as overseas born in 2011. 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=635) followed by overseas students (n=224) (Table 4). This was seen across all states and territories except South Australia, where overseas-born cases were most likely to be reported as overseas visitors (n=17).

There were 47 cases of TB notified among Papua New Guinea (PNG) nationals accessing health care in the Torres Strait Protected Zone (TSPZ) in 2011, a 42% increase on the 33 cases reported in 2010. Treating PNG nationals in the TSPZ

Table 3: Notified cases and rates for tuberculosis for frequently reported countries of birth, Australia, 2011, by case classification

Country of birth	New cases	Relapse cases	Total cases*	Estimated resident population†	Estimated rate (per 100,000 population)	WHO country rate (per 100,000 population) ‡
India	265	9	276	337,120	82	181
Vietnam	93	6	99	207,620	48	151
Philippines	98	1	99	193,030	51	270
China§	75	7	82	387,420	21	75
Nepal	77	2	79	27,810	284	163
Papua New Guinea	66	7	73	30,650	238	346
Indonesia	42	2	44	73,060	60	187
Sudan	25	1	26	22,000	118	117
Ethiopia	22	3	25	9,630	260	258
Thailand	23	1	24	52,990	45	124
Afghanistan	22	2	24	32,970	73	189
Bangladesh	18	5	23	31,620	73	225
Myanmar	21	1	22	24,430	90	381
Pakistan	21	1	22	34,150	64	231
Malaysia	21	0	21	134,140	16	81
Cambodia	17	0	18	32,510	55	424
Sri Lanka	15	1	16	99,740	16	66
Other overseas-born	231	9	241			
Total overseas-born	1,152	58	1,214			
Australian-born	161	9	170			
Total	1,314	67	1,385			

* Total includes cases reported without a case classification.

† The Australian Bureau of Statistics estimated resident population at 30 June 2011, Cat 3412.0.

‡ Rates from the World Health Organization TB Burden Estimates, 2011.

§ China excludes Special Administrative Regions and Taiwan.

|| Total includes cases reported without a country of birth.

Table 4: Notified cases of tuberculosis in overseas-born people, Australia, 2011 by residency status and state or territory

Residency status	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Aust.
Refugee/humanitarian	0	1	0	10	7	2	12	12	44
Permanent resident	10	287	8	57	8	5	196	64	635
Overseas visitor	2	25	1	19	17	3	10	14	91
Overseas student	5	101	2	32	8	2	63	11	224
Unauthorised person	0	7	2	0	0	1	1	4	15
Other	0	52	2	20	1	2	34	6	117
Illegal foreign fisher	0	0	1	0	0	0	0	0	1
Residents of the TSPZ accessing tuberculosis treatment in Queensland	N/A	N/A	N/A	47	N/A	N/A	N/A	N/A	47
Unknown or not reported	0	5	0	1	25	0	8	1	40
Total overseas-born cases	17	478	16	186	66	15	324	112	1,214

TSPZ Torres Strait Protected Zone.

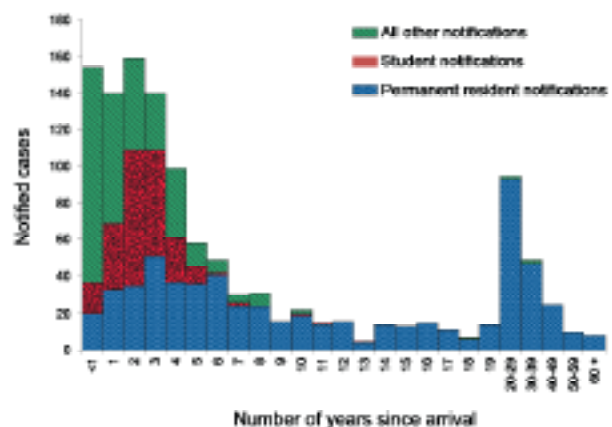
accounted for 22% of Queensland's total caseload in 2011. There was only 1 illegal foreign fisher reported with TB in 2011, the same as in 2010.

In 2011, data on the year of arrival were available for 98% (n=1195) of the cases reported as overseas born. Fifty per cent (593/1195) of these cases were diagnosed with active TB within 4 years of arrival in Australia and 31% (185/593) of those cases reported were in the overseas student population (Figure 4). This high figure primarily reflects reactivation of latent TB infection (LTBI) indicating the potential need to target this in control strategies.

Premigration health screening

The *Migration Regulations 1994*, enabled by the *Migration Act 1958*, stipulate that visa applicants must meet certain Public Interest Criteria; and these criteria include visa applicants must be "... free from TB" and/or not be a "... threat to public health in Australia or a danger to the Australian community".⁹ Therefore, permanent resident visa applicants, some temporary resident visa applicants, and children aged 11 years or over are required to undergo an offshore medical examination, including a chest x-ray, to screen for active TB. Children aged less than 11 years are required to undergo a physical examination.

In 2011, 287 cases of active TB were documented through the premigration health screening process offshore. This represents an estimated incidence rate in those undertaking premigration medical examinations of 80 per 100,000. Approximately 60% of these cases were identified in those applying for temporary resident visa categories; mostly student and short-term visitor visas. These cases include visa applicants who were

Figure 4: Notified cases of tuberculosis in the overseas-born population, Australia, 2011, by residency status and number of years since arrival in Australia

either newly diagnosed through the premigration health screening process or who were already on treatment at the time of screening. Similar to the onshore NNDSS data, a large proportion (63%) of active TB cases identified in the premigration health screening process were in visa applicants from the Philippines, India, Vietnam and China. Visa applicants who are identified as having active TB during premigration screening are required to undergo treatment for the disease prior to entry to Australia.

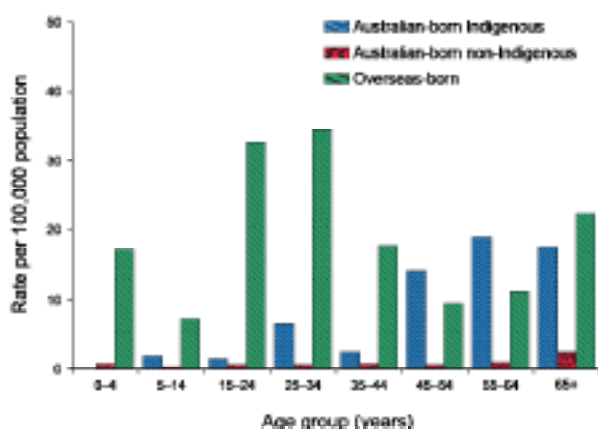
Further information on premigration health screening process and related statistics can be obtained from the Australian Government Department of Immigration and Border Protection, Global Health Branch.

Age and sex distribution

Age and sex were reported for all TB cases notified in 2011. Continuing the trend reported in previous years, there were more males than females notified with TB, with a male to female ratio of 1.2:1.

In 2011, TB was predominantly seen in young adults aged 25–34 years. This was driven by high rates in overseas-born cases in this age group (Figure 5). In cases reported as Australian-born Indigenous and Australian-born non-Indigenous, the burden of disease increased with age.

Figure 5: Notification rates for tuberculosis, Australia, 2011, by population subgroup and age group



One of the most important aspects of TB control is the monitoring of incidence in children aged less than 15 years because these cases represent recent TB infection. TB was notified in 51 children aged less than 15 years in 2011, 4% of the total notified cases. Of these, 15 were Australian-born non-Indigenous children including 8 cases reported as having one or more parents born in a high-risk country. An additional 3 cases were Australian-born Indigenous and 33 cases were children born overseas.

Selected risk factors for tuberculosis

Selected risk factor data were provided for 99% (n=1,370) of notified cases in 2011. Overall, the most frequently reported risk factor was past travel to or residence in a high-risk country (n=1,145, Table 5). The increase seen in the reporting of this risk factor, compared with previous reporting periods, is in part due to Victoria initiating reporting of this risk factor to the national dataset from 2011. 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.

Table 5: Notified cases of tuberculosis, Australia, 2011 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	16	35	120	171
Ever resided in a correctional facility†	2	0	7	9
Ever resided in an aged care facility†	1	2	6	9
Ever employed in an institution†‡	1	0	12	13
Currently or previously† employed in health industry in Australia or overseas	0	5	93	98
Ever homeless	0	1	3	4
Past travel to or residence in a high-risk country	2	35	1,107	1,145
Chest x-ray suggestive of old untreated TB	1	1	14	16
Currently receiving immunosuppressive therapy	1	7	13	21
Australian-born child with one or more parent born in a high-risk country	0	9	0	9
None of the above risk factors	9	52	65	126
Total cases assessed for risk factors	30	133	1,206	1,370

* 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.

Having a household member or close contact with TB was the most common risk factor reported by Australian-born Indigenous cases (n=16). Whereas, it was equally common as a risk factor reported for Australian-born non-Indigenous cases as past travel to or residence in a high-risk country (n=35) and the second most common risk factor reported by overseas-born cases (n=120).

A total of 98 cases of TB in 2011 were reported in people who were currently or had previously worked in a health care setting. Of these, 44 were working in a health care setting in Australia at the time of diagnosis or within 12 months of diagnosis. More than half (n=24) 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 2011. Nine per cent (n=126) of TB cases were reported as having no risk factors identified.

Tuberculosis and HIV status

The HIV testing history of notified cases of TB was reported in 98% of cases (n=1,351, Table 6). More than half of these cases (n=779) were reported with a known HIV status, of which 2.6% (n=20) were reported as HIV positive. Australian-born non-Indigenous cases were reported more frequently as HIV positive (5.0%) than Australian-born Indigenous (0%) and overseas-born cases (2.5%). One-fifth (n=280) of cases with an HIV testing history were reported as being tested for HIV but the result of that test was unknown. These cases were almost entirely reported by Victoria, where current policy prevents the HIV status of an individual being reported against their TB notification.

Anatomical site of disease

The anatomical site of TB disease was recorded in all notified cases in 2011 (Table 7). Pulmonary disease was the most frequently reported site of disease

(61%, n=848), with most of these cases reported as having pulmonary disease only. Cases presenting with disease focused in extrapulmonary sites accounted for 39% (n=537) of cases, with lymph nodes (n=291) and pleura (n=82) reported as the most frequent extrapulmonary sites. Of the more severe forms of TB, there were 6 cases classified as miliary and 6 cases classified as meningeal.

Bacteriologically-confirmed cases and drug resistance

Cases confirmed bacteriologically including the drug susceptibility profiles of culture isolates are reported in the annual MRLN report.³

The number of cases confirmed by culture of the *Mycobacterium tuberculosis complex* from clinical samples was 1,057 (76%). Of the 848 pulmonary cases, 682 (80.4%) were culture positive and of these 289 (42.3%) were smear positive. Specimens obtained by bronchoscopy established the diagnosis in 148 (21.7%) of the confirmed cases of which 37 (25.0%) were smear positive. Three cases had multi-drug-resistant TB (MDR-TB) isolated from bronchoscopy samples; 1 smear positive. Extrapulmonary disease was culture confirmed in 374 (53%) cases.

In vitro drug susceptibility testing of culture isolates demonstrated resistance to at least one of the standard first line anti-tuberculosis agents in 107 (10.0%) cases. Mono-resistance to isoniazid was reported in 45 cases and mono-resistance to rifampicin was reported in 1 case only. Resistance to at least isoniazid and rifampicin (MDR-TB) was confirmed in 25 (2.4%) cases with overseas-born persons accounting for 100% of these. Ten patients with MDR-TB accessed health services in the TSPZ. In 2011, 2.4% of all bacteriologically-confirmed cases were MDR-TB, but only 1.4% when the TSPZ cases were excluded.

Table 6: Notified cases of tuberculosis, Australia, 2011 by population subgroup and HIV status

HIV testing history	Australian-born Indigenous	Australian-born non-Indigenous	Overseas-born	Total
HIV positive	0	3	17	20
HIV negative	30	57	671	759
HIV tested, result unknown	0	24	256	280
Not tested	3	47	233	283
Refused testing	0	3	6	9
HIV testing history unknown	0	3	31	34
Total	33	137	1,214	1,385

Table 7: Notified cases of tuberculosis, Australia, 2011 by case classification and site of disease

Site of disease	New cases	Relapse cases	Total*	Per cent of cases
Total pulmonary disease	802	46	848	61.2
Pulmonary only	642	39	681	49.2
Pulmonary plus other sites	160	7	167	12.1
Total extrapulmonary only†	512	21	537	38.8
Pleural	82	0	82	5.9
Lymph nodes	275	15	291	21.0
Bone/joint	48	1	50	3.6
Genito/urinary	25	1	26	1.9
Miliary	6	0	6	0.4
Meningeal	6	0	6	0.4
Peritoneal	32	2	35	2.5
Other	126	4	131	9.5
Unknown extrapulmonary site	0	0	0	0.0

* Total includes four extrapulmonary cases reported without a case classification.

† More than one extrapulmonary site may be reported for each notified case of extrapulmonary tuberculosis.

Treatment outcomes of 2010 tuberculosis patient cohort

The treatment outcomes of an annual patient cohort are reported in the following year's annual report. This allows adequate time for all cases notified in a single year to begin treatment and for the treatment outcomes to be recorded in the NNDSS. Treatment outcomes for the 2011 patient cohort will be reported in the 2012 annual report.

In 2010, treatment success, which includes those cured (bacteriologically-confirmed) and those who completed treatment, was reported in 96% (1185/1233) of cases with assessable outcomes (Table 8). Treatment success ranged from 89.5% in Australian-born Indigenous cases to 96.8% Australian-born non-Indigenous cases. In 2010, there was 1 case of a treatment failure reported in an overseas-born case and a total of 10 (0.8%) cases were reported to have died due to TB.

National performance indicators

Performance criteria for incidence (less than 1 per 100,000) were met only for the incidence rates in Australian-born non-Indigenous cases (Table 9). Incidence rates in children exceeded the performance criteria (less than 0.1 case per 100,000) in all population groups. The reporting of HIV testing history has improved on the previous year and is close to reaching the target of 100%. Outcome reporting fell short of meeting the target of 100% for the 2010 patient cohorts, with 1% of cases with assessable outcomes reported with an unknown outcome. The performance indicator for cases that

reported treatment success was met in 2010 (Table 9). Additionally in 2010, this performance indicator was met for Australian-born non-Indigenous cases and overseas-born cases, but fell slightly short for Australian-born Indigenous cases (Table 8).

Discussion

The incidence of TB in Australia continues to be one of the lowest for any country in the world. The rate of 6.2 per 100,000 population is equivalent to rates in recent years,^{10,11} indicating that the 1% increase in notifications is as expected for migrant population growth. However, when this rate is compared with the mean of the 2 preceding intervals of 5 years there is a slight increase. This upward trend is particularly evident in New South Wales, Queensland, Western Australia and Tasmania, whereas the relatively higher rates in Victoria and Northern Territory seem to have stabilised.

The rate of TB in Australia reported in 2011 compares favourably with equivalent countries with well-developed and resourced health care systems e.g. New Zealand (7 per 100,000)¹² and the United Kingdom (14.4 per 100,000).¹³ However, as reported in 2010, Australia's upward trend is in contrast with the downward trend seen in the United States of America (USA). The USA has seen a steady decline in rates over the last 10 years and in 2011 recorded a rate of 3.4 per 100,000.¹⁴ It is possible that this contrasting trend is a result of the USA's differing approach to Australia in both premigration screening and LTBI screening policies. For example, since 2009 the USA's premigration screening policy has included insisting on a sputum culture as well as

Table 8: Notified cases of tuberculosis, Australia, 2010, 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
Assessable outcomes								
Treatment success	34	89.5	91	96.8	1,055	96.4	1,185	96.1
Cured (bacteriologically confirmed) †	6	15.8	5	5.3	58	5.3	69	5.6
Completed treatment	28	73.7	86	91.5	997	91.1	1,116	90.5
Interrupted treatment‡	0	0.0	0	0.0	4	0.4	5	0.4
Died of tuberculosis	0	0.0	1	1.1	9	0.8	10	0.8
Defaulted§	4	10.5	1	1.1	15	1.4	20	1.6
Failure	0	0.0	0	0.0	1	0.1	1	0.1
Not followed up, outcome unknown	0	0.0	1	1.1	10	0.9	12	1.0
Total assessable	38	100.0	94	100.0	1,094	100.0	1,233	100.0
Non-assessable outcomes								
Transferred out of Australia	0	0.0	3	3.0	87	7.1	90	6.6
Died of other causes	2	4.8	3	3.0	29	2.4	34	2.5
Still under treatment	2	4.8	0	0.0	9	0.7	11	0.8
Total	42	100.0	100	100.0	1,219	100.0	1,368	100.0

* Total includes 7 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 9: National tuberculosis performance indicators, performance criteria* and the current status of tuberculosis, Australia, 2010 and 2011

National tuberculosis performance indicator	Performance criteria	2010	2011
Annual incidence of TB (cases per 100,000 population)			
Australian-born Indigenous Australians	<1	6.3	4.9
Australian-born non-Indigenous Australians	<1	0.6	0.9
Overseas-born persons	*	20.3	20.2
Incidence in children <15 years, by risk group (per 100,000 population)			
Australian-born Indigenous Australians	<0.1	2.5	1.2
Australian-born non-Indigenous Australians	<0.1	0.5	0.4
Overseas-born persons	*	6.6	9.0
Collection of HIV status			
Collection of HIV status in all tuberculosis cases	100%	95%	98%
Treatment outcome measures (%)			
Cases evaluated for outcomes	100%	99	TBA
Cases that have treatment completed and are cured (treatment success)	>90%	96	TBA
Cases recorded as treatment failures	<2%	0.1	TBA

* Performance criteria currently under review.

TBA To be assessed; treatment outcomes for 2011 patient cohort to be reported in the 2012 annual report.

sputum microscopy to exclude TB in prospective migrants.¹⁵ Furthermore, since 2000 the USA has engaged in targeted tuberculin testing in high risk groups, including recent migrants from high-burden TB countries, to identify and treat LTBI.^{15,16} In addition, the USA has introduced LTBI premigration screening for all children under 15 years of age. Other contributing factors could include that previously in the USA, prospective migrants diagnosed with TB on screening were allowed entry and thus were counted in USA notification data, whereas more recently these migrants have been excluded from entry and are therefore no longer counted in USA's notification data. Also, the USA receives more migrants from medium burden TB regions, such as the Americas, than Australia does, thereby lowering the risk of TB reactivation after migration.¹⁷

TB notifications classified as relapsed remain unusual in Australia, though slightly more cases were reported in 2011 than in 2010 (4.8% and 3.8% of cases respectively). Of the 67 relapse cases reported in 2011, 29 (51%) had been treated in Australia. Current notification data does not clarify whether this is related to inadequate treatment, poor adherence to or supervision of the initial treatment or whether the relapsed TB is associated with drug resistance or whether re-infection is a consideration.

The incidence rate of TB in Australian-born people remains very low and stable; however, Aboriginal

and Torres Strait Islander people remain disproportionately more affected, with a 5 times higher incidence rate in 2011 than Australian-born non-Indigenous people. The 2011 rate in Aboriginal and Torres Strait Islander people is an improvement on that reported in 2010, which was 11 times higher. Over the last 10 years the rate of TB in Aboriginal and Torres Strait Islander people has neither improved nor deteriorated.

The incidence of TB in Australia continues to be largely determined by migration, with nearly 90% of notifications in 2011 being in overseas-born people. There has been a steady rise in the number of TB notifications in this group for the last 10 years. India continues to contribute the largest number of TB cases (20%), reflecting its status as the most common country of origin for new permanent residents in Australia as well as being a high TB burden country.¹⁸ Vietnam, the Philippines and China are also high TB burden countries and significantly contribute to new permanent residents in Australia, accounting for another 20% of TB notifications in Australia. Nepal was first recognised as a significant contributor to Australian TB notifications in 2010, particularly among students undertaking tertiary education in Australia. In 2011, Nepal again was in the top 5 countries that contributed to TB notifications in Australia with a high proportion of notifications reported as overseas students studying in Australia.

While residency status is self-reported and unverified, the reported data show 44% of TB notifications among overseas-born people are not permanent residents. In 2011, among temporary residents notified with TB, the largest group remains overseas students who contributed to 16% of all TB notifications, 18% of TB notifications in overseas-born people, and 31% of all overseas-born cases diagnosed within 4 years of arrival. This is a lower proportion of notifications than in 2010, though the change is likely to be more a function of the number of students than any change to their risk of TB. NTAC continues to work towards engaging relevant stakeholders in the tertiary education and immigration sectors to undertake active case finding and treatment of LTBI and increase awareness of TB in this population.

In 2011, TB notifications among PNG nationals accessing health care in the TSPZ increased by 42% compared with 2010. PNG nationals accessing health care in the TSPZ represented 22% of all TB notifications. The 2010 initiated collaboration between the TB Control Programs of the PNG, Queensland, and Australian Governments, initiated and funded by the Australian Government in 2010, continued to work toward improving the joint capacity to manage TB in the Western Province of PNG. While it is expected that this collaboration will reduce TB notifications in this group in Australia in future years, the outcome of the enhanced program in the Western Province will be monitored due to its importance.

The other group of migrants arriving by sea that contribute to TB in Australia are illegal maritime arrivals (IMAs), either those seeking asylum or the vessel's crew members. As reported in 2010, the current enhanced dataset does not specifically collect this information, so the exact number of IMA-related cases is not reported here. In 2011, the Department of Immigration and Citizenship (now the Department of Immigration and Border Protection) reported an increased number of boats arriving.¹⁹ Given that this group originated in countries with a high TB burden, it is also likely that the group has contributed to the number of TB notifications in 2011. Nearly all of the TB cases in this migrant group are detected in either Western Australia or the Northern Territory as this is where most IMAs arrive and are then first screened for TB. In a separate report, yet to be published, Western Australia and the Northern Territory together reported 14 cases in this group in 2011, at a rate of 296 per 100,000 people screened.

One of the most frequently reported risk factors for both Australian-born Indigenous (n=16) and Australian-born non-Indigenous cases (n=35) was a history of a household or other close contact with

TB. This is important as, in the absence of any other risk factor it is possibly an indicator that local transmission of TB is occurring. In the Australian-born Indigenous cases, 53% of notifications, with risk factor information available, reported a history of household or other close contact with TB. This proportion is less than 2010, but still significant enough to indicate that household transmission is likely continuing to be the main reason for persistently higher rates of TB among Indigenous Australians.

Another marker of transmission of TB within Australia is the incidence of TB in children aged under 15 years. Most cases in this age group were reported as being overseas-born (n=33, 65%) with the remaining 35% of TB cases in this age group being in Australian-born children (n=18). This proportion of Australian-born cases is 3 times higher than the Australian-born proportion of all TB notifications (12%). Fifty-three per cent of the Australian-born children with TB were reported to have at least 1 parent born in a high incidence country. With 'circulatory migration', that is residents returning frequently to their country of origin, this pattern of disease in children may be expected to rise. It may also reflect the absence of a thorough premigration screening process in this cohort. In 2011, there were 3 cases reported in Australian-born Indigenous children. Overcrowding and late presentation may contribute to this transmission in the Indigenous Australian setting and childhood cases are therefore not unexpected. It is important that thorough and timely contact tracing is carried out to identify childhood cases early and to offer observed curative treatment. Reporting on methods of diagnosis for TB in children overall and their risk factors for disease may be useful performance indicators for TB programs and TB control.

People who had previously or are currently working in the healthcare industry were again an important group being notified with TB, making up 7% of the total notifications. This contribution to TB notifications from this group has been increasing over recent years. Less than half of these healthcare workers had recently been working in the sector at the time of diagnosis and only 20% had pulmonary TB and would therefore have been potentially infectious. There were no reported cases of transmission of TB from a healthcare worker to patients. Virtually all healthcare workers (95%) with TB were born overseas and none were considered to have acquired TB from their work in Australia. These data, therefore, do not indicate a lack of infection control in healthcare facilities. However, healthcare workers remain an important risk group for active surveillance for TB.

According to Australia's *2011 National HIV Testing Policy version 1.3*, 'all people with HIV should be tested for tuberculosis, and all people with tuber-

culosis should be tested for HIV'.²⁰ In 2011, 98% of cases had a HIV test history* reported and of those cases 77% were tested for HIV. HIV co-infection with TB remains uncommon in Australia and at similar levels to previous years.

The outcome of TB treatment remains very good with consistently more than 95% of cases with assessable outcomes in recent years being successfully treated. Both the case fatality rate (0.8%) and the treatment default rate (1.6%) in 2010 were very low and slightly better than results from 2009. In 2010, the outcomes for treatment of TB in Australian-born Indigenous cases were poorer than for other groups, with an overall success of 90%.

This report demonstrates good and sustained TB control in Australia. The crude incidence rate in Australian-born non-Indigenous people is consistently better than the target of less than 1 per 100,000, and achieves the WHO's pre-elimination target of less than 10 notified TB cases per million population.²¹ Australia also reports very good outcomes for treatment of TB and in 2010 met targets in all subgroups. Conversely, this assessment against performance indicators does highlight potential challenges, and therefore the future targets for future work to improve TB control in Australia. Notifications and the rate of TB in overseas-born people continues to rise and be the main driver of overall TB incidence; the incidence in children in all subgroups did not meet the performance targets, possibly indicating low grade transmission of TB in Australia; and incidence and outcomes for Indigenous Australians continues to indicate a lower level of control. The key to sustaining the achievements in TB control in Australia that are reported here will be the maintenance of jurisdictional TB control programs at the current high standard, an increasing focus on both pre- and post-migration strategies including for children, and nationally agreed and coordinated strategic activity toward improving detection and outcomes in the at-risk subgroups identified by epidemiological reports such as this one.

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Tuberculosis Data Quality Working Group members (in alphabetical order): Ms Christina Bareja, Ms Michelle Bringham, Ms Leona Burke, Mr David Coleman, Ms Jo Fagan, Dr Vanessa Johnston, Mr Richard Lumb, Mr Byron Minas, Ms Wendy Mossman, Ms Nicola Stephens and Dr Ee Laine Tay with Ms Rachael Corvisy from the Secretariat.

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Author details

Christina Bareja¹
Justin Waring²
Richard Stapledon³
Cindy Toms¹
Paul Douglas⁴

1. Vaccine Preventable Diseases Surveillance Section, Health Protection Policy Branch, Office of Health Protection, Department of Health, Canberra, Australian Capital Territory
2. Western Australian Tuberculosis Control Program, Department of Health, Perth, Western Australia
3. South Australian Tuberculosis Services, Royal Adelaide Hospital, Adelaide, South Australia
4. Global Health Branch, Australian Government Department of Immigration and Border Protection, Sydney, New South Wales

Corresponding author: Ms Cindy Toms, Vaccine Preventable Diseases Surveillance Section, Health Protection Policy Branch, Office of Health Protection, Department of Health, Telephone: +61 2 6289 8692. Email: cindy.toms@health.gov.au

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* HIV test history means knowing whether or not the person was tested for HIV, not tested for HIV or refused testing for HIV testing.

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