

# Tuberculosis notifications in Australia, 1997

Nicole Gilroy<sup>1</sup> in collaboration with the National TB Advisory Group (Ral Antic, John Carnie, Amanda Christensen, Jag Gill, Anastasios Konstantinos, Vicki Krause, Mark Hurwitz, Avner Misrachi) for the Communicable Diseases Network Australia and New Zealand

## Abstract

Since the inception of the National Mycobacterial Surveillance System (NMSS) in 1991, annual crude notification rates for tuberculosis (TB) have remained stable at between 5 and 6 per 100,000 population. In 1997, there was a total of 1,001 TB notifications in Australia, of which 954 were new TB cases and 47 relapses. The corresponding annual crude notification rate for new and relapsed TB was 5.15 and 0.25 per 100,000 respectively. Seventy-nine per cent of notifications that had a country of birth reported were overseas born. In keeping with trends observed over recent reporting years, the populations for which notified TB rates were highest include the overseas born from high prevalence countries and indigenous Australians. The lowest rates of disease have continued to be reported in the non-indigenous, Australian born population. Surveillance reports over the last seven years indicate that the rate of disease in this population is gradually declining. *Commun Dis Intell* 1999;23:337-347.

## Introduction

The dominant global threat of tuberculosis (TB) to human health has been reaffirmed in a series of recent World Health Organization reports. One-third of the global population, and as many as 50% of the world's refugees, are estimated to be infected with *Mycobacterium tuberculosis* (*M. tuberculosis*).<sup>1</sup> In 1997, 2.9 million deaths world wide were attributable to TB,<sup>2</sup> and 3.3 million case notifications were reported by 173 countries to the WHO Global Surveillance Programme, of which

38% were sputum smear positive. These reported figures represent only 42% of the estimated 7.9 million cases of TB for the year.<sup>3</sup>

The HIV pandemic continues to fuel the TB epidemic in regions of the world, especially Asia and sub-Saharan Africa. Up to 40% of AIDS deaths in these regions are due to TB, and it is estimated that by the end of the century, HIV will account for 1.5 million new TB cases per year that would otherwise have not occurred.<sup>1</sup>

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1. Corresponding author: Dr Nicole Gilroy, National Centre for Disease Control, Department of Health and Aged Care, GPO Box 9848, Canberra, 2601

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The global burden of TB is maintained by poverty, natural disasters, conflict and political instability, which have served to thwart the development of health services in many countries, or have lead to a progressive erosion in existing health infrastructures. Human migration, that is so often the consequence of these events, has created a social context in which the delivery of effective drug treatment is further compromised. Poorly supervised and partially treated TB are the basis for the emergent problem of multi-drug resistant TB (MDR-TB) that has already taken root in 'hot zones' around the globe. From 35 countries surveyed in 1994-1997, the median prevalence of primary MDR-TB was 1.4% (range: 0-14.4%) and for acquired resistance, the median prevalence was 13% (range: 0-54%).<sup>4</sup> The existing and growing threat of MDR-TB is already raising concerns that the DOTS (Directly Observed Therapy Short course) advocated by the WHO's Global Tuberculosis Programme may need to be upgraded in some countries to a 'DOTS-plus' strategy to help identify resistant disease and offer individualised therapy.<sup>5</sup>

Although 64% of global TB case notifications in 1997 were from South-East Asia and the Western Pacific regions,<sup>3</sup> Australia has maintained stable TB rates in the face of this major regional disease threat.<sup>6</sup> The National Mycobacterial Surveillance System (NMSS) that has been in effect since 1991, has enabled trends in the rates of active TB to be monitored over the last seven years, and has helped describe the epidemiology of TB in Australia. These surveillance efforts have helped identify high-risk groups for targeted control. In time, enhancements to the existing surveillance system will be better able to inform policy makers, public health practitioners and clinicians on the outcomes achieved from TB control efforts.

## Methods

Notifications reported to State and Territory health authorities are collated on an annual basis and referred to the National Mycobacterial Surveillance System in computerised format, with all reports being de-identified beforehand. In all States and Territories, with the exception of New South Wales, \* a standardised data set is forwarded to Commonwealth for collation and analysis using Epi info version 6.04. A core data field is shared with the National Notifiable Disease Surveillance System (NNDSS). Variables reported in this core field include: a unique identifier for each notification; disease code, to differentiate *Mycobacterium tuberculosis* complex (MTBC) from atypical mycobacteria infections; postcode of residence; date of birth; sex; dates of disease onset and report; indigenous status; and confirmation status of the report. A supplementary data set is included with information pertaining to ethnicity, country of birth, length of residence in Australia for overseas born persons, species of the pathogen, principal site of disease, methods of diagnosis, antimicrobial therapy initiated at the time of notification, past BCG vaccination, HIV status and classification of tuberculosis as new or relapsed disease.

\* New South Wales forwards the complete data set for mycobacterial notifications. A number of additional fields are included in this data set which are not routinely used for national reporting.

The case definitions for mycobacterial disease are those which have been in place since 1986:

### Tuberculosis (new case)

- a case which has been confirmed by the identification of *Mycobacterium tuberculosis* (or *M. africanum* or *M. bovis*) by culture, or
- a case which has been diagnosed to be active clinically and which has been accepted as such by the State or Territory Director of Tuberculosis.

### Tuberculosis (relapse)

- a case of active tuberculosis diagnosed again (bacteriologically, radiologically or clinically) having been considered inactive or quiescent following previous full treatment (as deemed appropriate by the State or Territory Director of Tuberculosis).

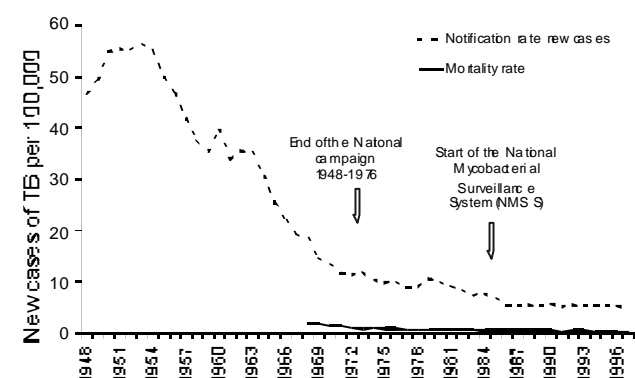
Mortality data for tuberculosis, and denominator population data for the calculation of rates, were obtained from the Australian Bureau of Statistics (ABS). Denominator data for age and sex are based on mid-year population estimates for 1997. Resident population by indigenous status and country of birth were based on estimates of the relevant population sizes as at 30 June, 1997. The classification and grouping of countries adhered to the ABS standard classification of countries for social statistics.<sup>7</sup>

## Results

### Notification rates - new and relapsed cases

In 1997, 1,001 cases of active tuberculosis were notified nationally: 954 (95%) were new cases and 47 were relapses. The corresponding crude annual notification rate was 5.15 per 100,000 for new cases, 0.25 per 100,000 for relapses and 5.40 per 100,000 for total notifications. These rates are slightly lower than what has been reported over the last decade (Table 1). Since 1986, the decline in notification rates for new disease has slowed compared to the decade after the end of the National TB Campaign (Figure 1).

**Figure 1. Notification rates for new tuberculosis (1948-1997) and tuberculosis crude mortality rates (1967-1997) per 100,000 population, Australia**



**Table 1. Notifications of new and relapsed cases of tuberculosis, and rates per 100,000 population, Australia, 1986-1997, by year**

Year	New cases		Relapsed cases		Total cases	
	Number	Rate	Number	Rate	Number	Rate
1986	863	5.39	43	0.27	906	5.66
1987	868	5.34	39	0.24	907	5.58
1988	925	5.60	29	0.18	954	5.77
1989	902	5.36	50	0.30	952	5.66
1990	979	5.74	37	0.22	1,016	5.95
1991	903	5.22	47	0.27	950	5.50
1992	983	5.62	28	0.16	1,011	5.78
1993	944	5.35	47	0.27	991	5.61
1994	996	5.58	61	0.34	1,057	5.93
1995	988	5.47	50	0.28	1,038	5.75
1996	983	5.37	54	0.29	1,037	5.66
1997	954	5.15	47	0.25	1,001	5.40

**Table 2. Notifications of new and relapsed cases of tuberculosis and rates per 100,000 population, Australia, 1997, by State and Territory**

State/Territory	New cases		Relapsed cases		Total cases	
	Number	Rate	Number	Rate	Number	Crude Rate
Australian Capital Territory	11	3.55	2	0.65	13	4.20
New South Wales	414	6.60	31	0.49	445	7.09
Northern Territory	33	17.63	2	1.07	35	18.70
Queensland	97	2.85	8	0.24	105	3.09
South Australia	46	3.11	0	0.00	46	3.11
Tasmania	13	2.75	1	0.21	14	2.96
Victoria	274	5.95	2	0.04	276	5.99
Western Australia	66	3.67	1	0.06	67	3.73
Total	954	5.15	47	0.25	1,001	5.40

Total notification rates varied widely between jurisdictions (Table 2). Since 1991, rates of TB have been less than 5 per 100,000 in Tasmania, Queensland, South Australia and Western Australia. In the Australian Capital Territory rates have been less than 5 per 100,000 for all years except 1992 and 1995. The two most populous States, Victoria and New South Wales, have reported intermediate rates of between 5 and 8 per 100,000 since 1991, and the Northern Territory has reported rates in excess of 15 per 100,000 over the same time period.

#### Age and sex

Sex was reported in 952 (99.8%) of 954 new TB cases. Of these, males accounted for 506 (53%) and females for 446 notifications. The corresponding rates for new disease in males and females was 5.49 and 4.79 per 100,000 respectively.

Age-specific rates for males were 1.3 to 2.7-fold higher than corresponding rates in females over the age of 65 years (Table 3). In the younger age groups, age-specific rates for males showed an increase above 7 per 100,000 in the 25-29 year age group, and females had similar rates

in the 30-34 year old age group. Male rates increased to over 8 per 100,000 in all age groups over the age of 60 years. By contrast female rates increased to over 7 per 100,000 in all age groups over the age of 70 years. Males accounted for 27(57%) cases of relapsed disease and females for 20. The highest age-specific rate for relapsed disease of 1.80 per 100,000 was reported in the 75-79 year old age group. Persons over the age of 65 years accounted for 25 (53%) of all notifications of relapsed disease.

Age standardised notification rates for new TB cases by State and Territory are shown in Table 4. When adjusted by age, the rates in Northern Territory remained 3 to 7-fold higher than other States/Territory.

#### Principal sites of disease

Of new TB cases, 574 were pulmonary and 171 lymphatic (Table 5). Details of site by age and country of birth are described below.

**Table 3. Notifications of new cases of tuberculosis and rates per 100,000 population, Australia, 1997, by age group and sex**

Age group (years)	Males <sup>1</sup>		Females <sup>2</sup>		Total	
	Number	Rate	Number	Rate	Number	Rate
0-4	11	1.66	7	1.11	18	1.39
5-9	5	0.74	1	0.16	6	0.46
10-14	8	1.19	4	0.62	12	0.91
15-19	17	2.56	14	2.22	31	2.39
20-24	24	3.44	47	6.96	71	5.17
25-29 <sup>3</sup>	70	9.61	48	6.62	118	8.12
30-34	46	6.47	51	7.14	97	6.81
35-39	46	6.24	50	6.75	96	6.49
40-44	31	4.50	38	5.49	69	5.00
45-49	36	5.54	25	3.91	61	4.73
50-54	22	3.95	25	4.66	47	4.30
55-59	28	6.47	22	5.24	50	5.87
60-64	30	8.34	24	6.62	54	7.47
65-69	36	10.72	16	4.55	52	7.57
70-74	40	14.25	27	8.23	67	11.01
75-79	20	10.53	20	7.83	40	8.98
80-84	21	19.30	15	8.39	36	12.52
85+	13	19.92	11	7.29	24	11.11
Unknown	2	-	1	-	3	-
Total	506	5.49	446	4.79	952	5.14

1. Two males no age known
2. One female no age known
3. Two in 25-29 year age group with no known sex

**Table 4. Age standardised rates for new tuberculosis cases by State and Territory<sup>1</sup>**

	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
Total notifications	11	414	33	97	46	13	271	66
Unadjusted	3.55	6.60	17.63	2.85	3.11	2.75	5.88	3.67
Indirect adjusted	3.74	6.55	19.92	2.90	3.03	2.77	5.82	3.76

1. Indirect age standardised rates calculated using 5 year age-specific TB rates for Australia (based on 1997 mid year population estimates) applied to each of the corresponding age group categories for States/Territories

**Table 5. Notifications of new and relapsed cases of tuberculosis in Australia, 1997, by site of disease**

Site	New cases	Relapsed cases	Total cases	%Total
Pulmonary	574	40	614	61.3
Pleural	35	0	35	3.5
Lymphatic	171	3	174	17.4
Bone/Joint	43	1	44	4.4
Gen/Urinary	28	0	28	2.8
Miliary	16	1	17	1.7
Meningeal	6	1	7	0.7
Peritoneal	18	0	18	1.8
Others	22	0	22	2.2
Unknown	41	1	42	4.2
Total	954	47	1,001	100

**Table 6. Method of diagnosis used in new and relapsed cases of tuberculosis, Australia, 1997**

Method of diagnosis	New	% all new cases	Relapsed	% all relapsed cases
Culture	558	58.5	16	34.0
Microscopy	215	22.5	6	12.8
Histology	178	18.7	2	4.3
Tuberculin test	148	15.5	2	4.3
Radiology	285	29.9	15	31.9
Clinical	227	23.8	7	14.9
Others	4	0.4	0	0.0

1. More than one diagnostic technique was reported in some cases

### BCG status

BCG status was positive in 156 (16%), negative in 386 (38%) and unknown for 459 (46%) of 1,001 TB notifications. Thirty (19%) of those who had received BCG vaccination in the past were Australian born (19 of these were indigenous Australians), 114 (73%) were overseas born and in 12 (8%) the country of birth was not reported.

Of the 156 cases of active TB that had been BCG vaccinated in the past, 97 (62%) were reported as having pulmonary TB as the principal site of disease, 55 (35%) had extra-pulmonary disease and one case was reported as having miliary disease. In 3 cases a principal disease site was not specified.

### Methods of diagnosis

The methods used to obtain a diagnosis of active TB are given for new and relapsed disease cases in Table 6. Of the 1,001 notifications of active TB in Australia for 1997, a positive culture was reported in only 574 (57%) and positive microscopy in 221 (22%). The range of culture positive notifications by State or Territory ranged from 38-86%. For all States and Territories (except New South Wales, for which this information was not readily available), culture was used in combination with microscopy or histology in 170 (50%) of 358 culture positive cases.

### Pathogen

Despite the low reporting of culture as a diagnostic method, a pathogen was reported in 862 (86%) of all notified cases of TB. Of these 853 (99%) were *M. tuberculosis*, 5 (0.6%) *M. bovis* and 4 (0.4%) *M. africanum*.

### Antimicrobial therapy

The choice of antibiotic regimen started at the time of notification was reported in 842 (84%) cases of TB (Table 7). The two most commonly prescribed combinations were isoniazid, rifampicin, pyrazinamide and ethambutol in 665 (79%) cases, and a three drug combination of isoniazid, rifampicin and pyrazinamide in 110 (13%) cases. In 809 (96%) cases, one of the prescribed regimens included a combination of isoniazid and rifampicin.

Of all the 842 drug regimens reported, a six drug regimen was started in 3 (0.5%), a five drug regimen in 3 (0.3%), a four drug regimen in 680 (81%), a three drug regimen in 139 (16%) and a two drug regimen in 17 (2%) cases. In

only 1 case of relapsed disease was a regimen of more than four drugs prescribed.

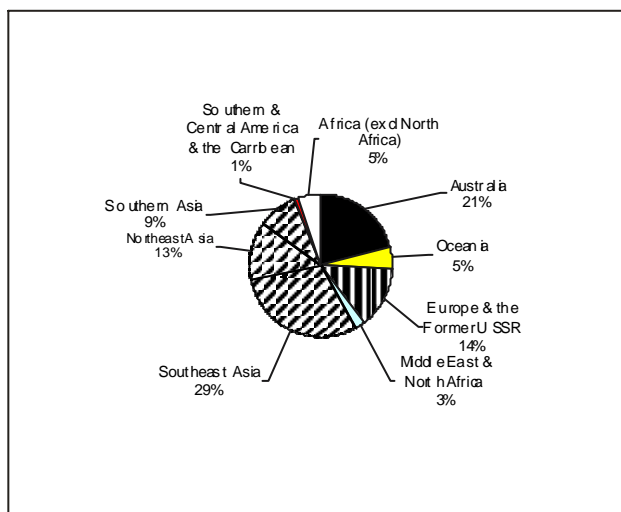
### HIV status

HIV status was unknown in 900 (90%) notified cases of TB. Of the 101 cases in which HIV status was reported, there were 10 positive and 91 negative. The TB/HIV co-infected cases consisted of 6 males and 4 females. Seven (70%) were aged between 20 and 45 years, 2 were aged over 75 years and only 1 case was reported in a child aged 1 year. None of the HIV reported TB cases were relapses. Seven of the 10 were overseas born. The principal sites of TB reported included pulmonary (8), lymphatic (1) and disseminated (1).

### Country of birth

The majority of notified cases of TB were people born overseas. The proportion of TB cases in the overseas born, by region of birth, are shown in Figure 2. The number of new TB cases reported in the Australian and overseas born populations was 176 and 673 respectively. The corresponding rate of new TB disease in the Australian and overseas born populations was 1.2 and 15.6 per 100,000 respectively. Rates of new TB in the Australian born population are lower than reported since 1991. Rates in the overseas born have been constant

**Figure 2. Proportion of tuberculosis cases where country of birth was reported, in Australian and overseas born, by region of birth, 1997<sup>1</sup>**



1. Country of birth was not reported in 11% of notifications

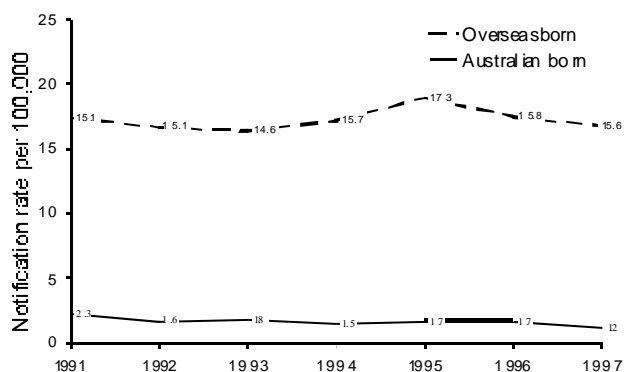
Table 7. Initial drug regimen at time of notification of tuberculosis, Australia, 1997

	New cases	Relapsed cases	Total
<b>6 drug regimen</b>			
H+R+Z+E+cyc+cipro	1	0	1
H+R+Z+E+clarithro+cipro	1	0	1
H+Z+E+ RFB+clo+cipro	1	0	1
<b>5 drug regimen</b>			
H+R+Z+E+str	1	1	2
H+Z+capreo+cyc+RFB	1	0	1
<b>4 drug regimen</b>			
H+R+Z+E	629	36	665
H+R+Z+eth	4	0	4
H+R+Z+str	0	1	1
H+R+E+str	2	0	2
H+R+E+clarithro	1	0	1
H+Z+E+ RFB	6	0	6
H+Z+E+str	1	0	1
<b>3 drug regimen</b>			
H+R+Z	108	2	110
H+R+E	22		22
H+Z+E	5	1	6
R+Z+E	1		1
<b>2 drug regimen</b>			
H+Z	13	1	14
H+E	1		1
R+E	0	1	1
H+RFB	1		1
Unknown	155	4	159
<b>Total</b>	<b>954</b>	<b>47</b>	<b>1,001</b>

H=isoniazid; E=ethambutol; Eth=ethionamide; RFB=rifabutin;  
R=rifampicin; Str=streptomycin; Cipro=ciprofloxacin; Clo=clofazamine;  
Z=pyrazinamide; c larithro=clarithromycin; Capreo=capreomycin; cyc=cycloserine.

since 1991 with no similar downward trend, as seen in the Australian born, being observed (Figure 3).

Figure 3. Tuberculosis notification rates, new disease, in the Australian and overseas born, 1991-1997

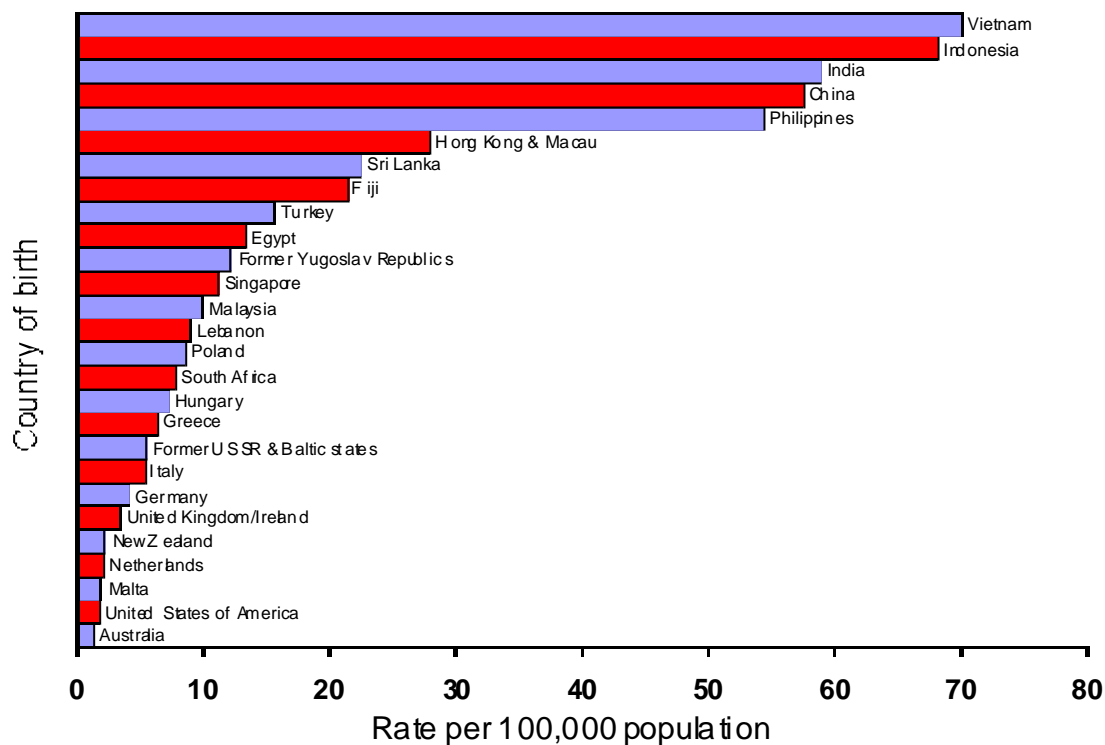


In cases of relapse, Australian born were most frequent. Ten (24%) were Australian born, of which 3 were indigenous Australians. The remaining 31 cases in the overseas born came from the following regions: Asia (21), Europe (6), Middle East (1), South America (1), Africa(1) and Oceania (1). Country of birth was unknown for 6 relapsed cases.

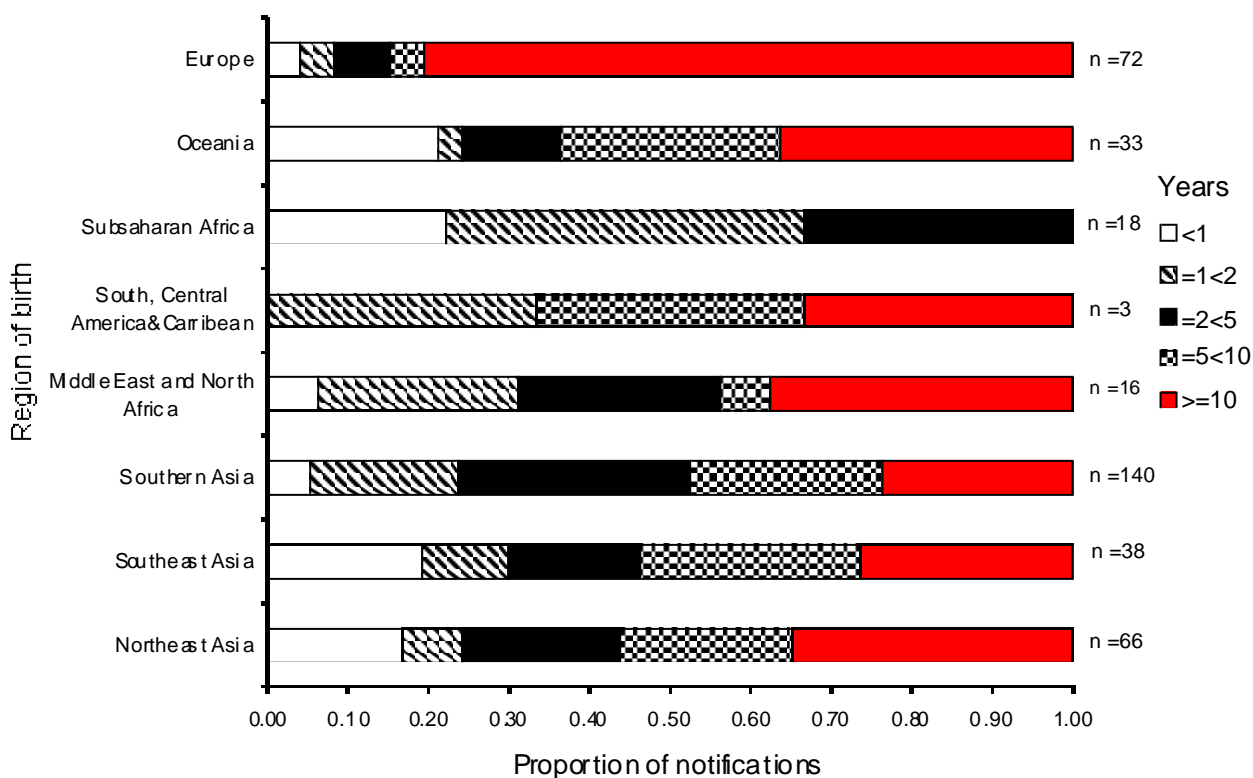
The relative rates of all TB notifications (new and relapsed) per 100,000 overseas born resident population in Australia, are shown in Figure 4. The countries with the highest rates of TB include Vietnam 116 cases (70.1 per 100,000); Indonesia 36 cases (68.2 per 100,000); India 53 cases (59.0 per 100,000); China 75 cases (57.6 per 100,000); and the Philippines 57 cases (54.4 per 100,000). Together these countries accounted for 337 (48%) notifications in the overseas born. The rates of TB in the overseas born per 100,000 resident population in Australia for 1997 are presented together with World Health Organization case notification rates for TB in the country of origin for the same year (Table 8). In some countries, such as Indonesia the estimated rates are considered to be higher than what is officially reported.

The length of time that overseas born persons had been resident in Australia was reported for 386 (55%)

**Figure 4. Tuberculosis notification rates, by country of birth, per 100,000 resident population in Australia, 1997**



**Figure 5. Years of Australian residency for tuberculosis notifications in the overseas born, by region of birth**



notifications. Of these 55(14%) had been resident for less than 1 year, 44 (11%) from 1 to less than 2 years, 66 (17%) from 2 to less than 5 years, 75 (19%) from 5 to less than 10 years and 146 (38%) for 10 years or more. The majority (80%) of persons from Europe developed active TB after 10 years of Australian residency, and 40- 50% of those from the Asian region developed TB within 5 years of Australian residency. The 18 TB notifications in sub-Saharan Africans, for which number of years of

Australian residency were reported, all occurred within 5 years of arrival in Australia (Figure 5).

The age and sex distribution of Australian and overseas born TB notifications is given in Figures 6 and 7. The overseas born show high age specific rates in both young adults and the elderly, whereas in the Australian born population, a gradual increase in age-specific rates with advancing age is more characteristic.

**Table 8. Total notifications of tuberculosis, Australia, 1997. Number and estimated rates per 100, 000 by reported country and region of birth\***

	Number	Estimated population by country of birth in Australia	Rate per 100,000 population in Australia, by country of birth	WHO notification rate (per 100,000) for country, 1997
<b>Australia</b>	186	14,209,600	1.3	6.3
<b>Oceania</b>				
Fiji	9	41,900	21.5	21.1
New Zealand	7	325,500	2.2	5.0
Other	26	55,600	48.6	
<b>Europe &amp; the former USSR</b>				
Germany	5	121,500	4.1	13.6
Greece	9	141,700	7.1	7.3
Hungary	2	27,500	7.3	42.4
Italy	14	256,700	5.5	8.5
Malta	1	54,500	1.8	3.0
Netherlands	2	94,700	2.1	9.5
Poland	6	70,000	8.6	36.2
United Kingdom/Ireland	42	1,214,100	3.5	10.1/12
Former Yugoslav Republics	24	197,600	12.1	39.3-71.2 <sup>1</sup>
Former USSR & Baltic States	3	54,700	5.5	30.7-119.3 <sup>2</sup>
Other	14	179,700	7.8	
<b>Middle East &amp; North Africa</b>				
Egypt	5	37,400	13.4	21.7
Lebanon	7	77,700	9.0	22.3
Turkey	5	32,000	15.6	33.1
Other	7	67,900	10.3	
<b>Southeast Asia</b>				
Indonesia	36	52,800	68.2	10.9
Malaysia	9	90,800	9.9	64.4
Philippines	57	104,700	54.4	294.5
Singapore	4	35,800	11.2	57.5
Vietnam	116	165,400	70.1	111.0
Other	44	68,500	64.2	
<b>Northeast Asia</b>				
China	75	130,300	57.6	33.7
Hong Kong & Macau	22	78,700	28.0	111.7
Other	19	85,500	22.2	
<b>Southern Asia</b>				
India	53	89,900	59.0	118.3
Sri Lanka	12	53,300	22.5	35.7
Other	14	25,000	56.0	
<b>Northern America</b>				
Canada	0	28,500	0.0	6.2 <sup>3</sup>
United States of America	1	56,600	1.8	6.4
Other	0	400	0.0	

**Table 8. Total notifications of tuberculosis, Australia, 1997. Number and estimated rates per 100, 000 by reported country and region of birth\*, (continued)**

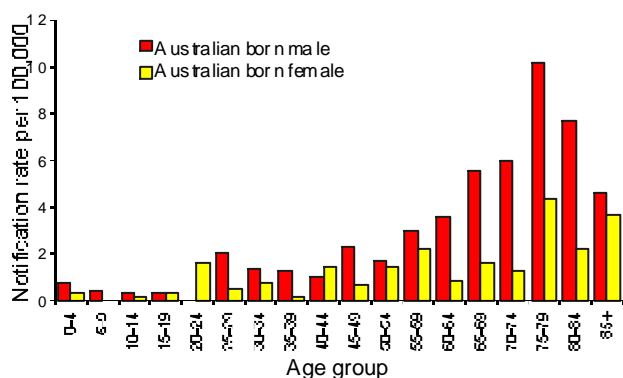
<b>Southern &amp; Central America, and the Caribbean</b>				
Chile	0	26,200	0.0	26.5
Other	6	57,400	10.5	
<b>Africa (excl North Africa)</b>				
South Africa	5	64,300	7.8	242.7
Other	43	57,900	74.3	
Unknown	111			
Totals	1,001	18,532,300		

1. Federal Republic of Yugoslavia = 39.3 per 100,000; Bosnia Herzegovina = 71.2 per 100,000
2. Tajikstan = 30.9 per 100,000; Kryrgyzstan = 119.3 per 100,000. Rates for the Russian federation are 82.3 per 100,000
3. As 1997 figures for Canada are not available, the 1996 figure is given

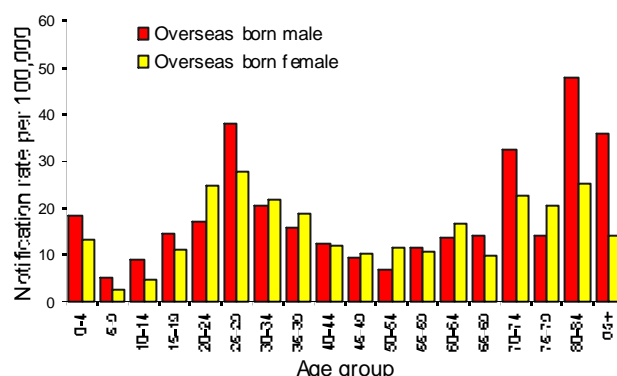
The relative distributions of pulmonary, lymphatic and 'other than lymphatic' extra-pulmonary TB by sex and 15 year age groups in the Australian and overseas born populations is shown in Figures 8, 9 and 10. Overseas born males accounted for the highest numbers of pulmonary TB notifications in those aged over 15 years. Overseas born females accounted for the highest number of notifications of lymphatic disease in all age groups. Of the 155 notifications of lymphatic disease for which country of birth and sex were reported, 107 (69%) were overseas born females. Of these, 67 (62%) were between the ages of 25 and 50 years. Overseas born females accounted for the majority of extra-pulmonary disease notifications, in age groups over 30 years. Overall, 42% of all disease in the overseas born and 28% in the Australian born was extra-pulmonary.

Of the 36 cases of TB notified in children less than 15 years of age, a country of birth and disease site was reported in 30. Of these, 19 were pulmonary, 4 lymphatic and 7 were an alternative disease site. Ten (53%) of the 19 pulmonary cases, none of the 4 cases of lymphatic disease and 3 of 7 extra-pulmonary (other than lymphatic) TB sites were in Australian born children.

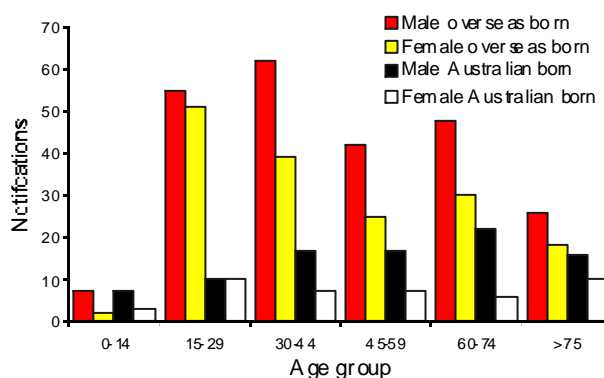
**Figure 6. Age-specific tuberculosis notification rates in the overseas born, per 100,000 overseas born population, 1997**



**Figure 7. Age-specific tuberculosis notification rates in the Australian born, per 100,000 Australian born resident population, 1997**



**Figure 8. Pulmonary tuberculosis as principal disease site. Notifications in Australian and overseas born, by age group and sex, 1997**



**Indigenous status**

Indigenous status was reported for 847 (85%) of all notifications. Indigenous Australians accounted for 40 TB cases in 1997, of which 3 were relapses and 37 new cases of TB. Twenty (50%) notifications of TB in indigenous Australians were reported from the Northern Territory. The annual crude incidence rate of new disease per 100,000 indigenous population was between 9.1 and 10.1 based on upper and lower indigenous population estimates for the year. Relapse rates were 0.73 and 0.76 per 100,000 based on the same estimates. The comparative TB rate of new disease in the Australian born, non-indigenous population was 1.0 per 100,000.

Twenty-two notifications were in males and 18 in females. Six (15%) of indigenous notifications were aged over 60 years, and 1 case was aged less than 14 years. The remaining 33 (82.5%) notifications were aged between 20 and 60 years.

**Mortality**

In 1997, the Australian Bureau of Statistics<sup>8</sup> reported 35 deaths for which TB was the underlying cause. The crude mortality rate was 0.19 per 100,000, which is the lowest rate reported for TB in 30 years. Of these, 25 (71%) were in males and 10 in females. Twenty-eight (80%) deaths occurred in persons over the age of 60 years, and no TB deaths were registered in persons under 25 years of age.

Sites of disease reported included pulmonary (27), other respiratory (1), meninges and central nervous system (2) and miliary (5).

**Discussion**

The NMSS has only ever reported on active TB disease. Symptomatic TB is often progressive and the majority of sufferers will seek medical attention during the course of their illness. Such cases are detected by passive surveillance. In other instances active TB cases will be picked up through active TB surveillance efforts. Contact tracing, post-migration screening and occasional screening of high risk populations such as health care workers, represent active surveillance strategies that will occasionally detect active TB cases. The relative number of active TB cases notified nationally detected through active, versus passive, surveillance is unknown.

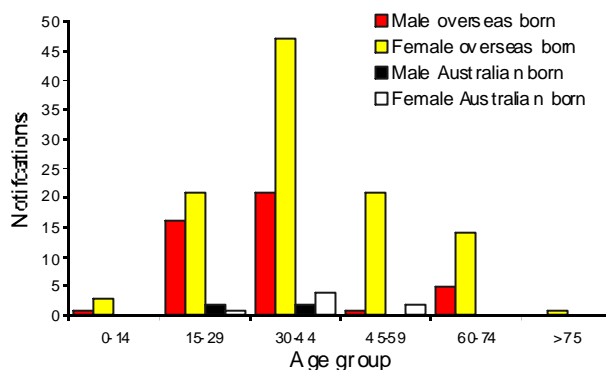
Australia continues to report one of the lowest TB rates in the world. Other developed countries that have reported rates of less than 6 per 100,000 in 1997 include Sweden, Iceland and Norway.<sup>3</sup> Since 1986 annual crude notification rates for TB in Australia have stabilised between 5 and 6 per 100,000.<sup>6,9</sup>

The lack of a progressive decline in national TB rates over the last decade is explained in part by the reservoir of individuals within the population who are infected, but have no evidence of disease. Most of these cases will not be picked up through active surveillance unless they are a contact of an active TB case, or belong to a high-risk group. This reservoir is being added to over time with the intake of migrants, especially those from high prevalence countries. Untreated, approximately 10% of infected individuals with normal immunity will develop active TB

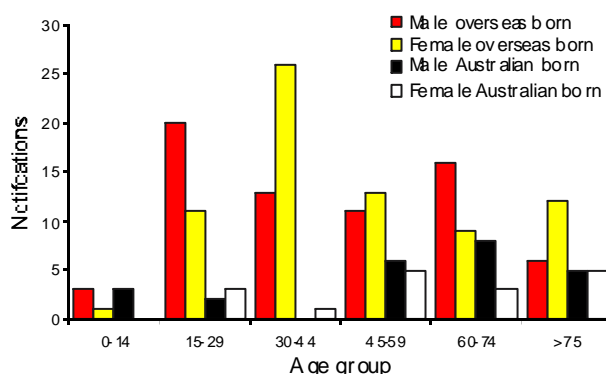
within their lifetime, and half of these will do so within the first 2 years of infection.<sup>10</sup>

In the Australian born population, the highest rates of active TB are reported in the aging population. Many of these cases represent infections that were acquired in the distant past when TB in Australia was prevalent. The years of highest TB prevalence in Australia were those that predated 1950, the year that all States agreed to participate in the National TB Campaign.<sup>11</sup> Compared to the elderly Australian born, the rate of active TB in Australian born children in age groups under 15 years reported in both 1996 and 1997 has been less than 1 per 100,000, which is an indirect indicator of low prevalence of infection within this group. Almost half of all TB notifications in the overseas born in 1997 were from India, Indonesia, China, The Philippines and Vietnam. The WHO has indicated that the first four countries in this list, together with Bangladesh and Pakistan, account for more

**Figure 9. Lymphatic tuberculosis as principal site of disease. Notifications in the Australian and overseas born, by age group and sex, 1997**



**Figure 10. Extra-pulmonary tuberculosis (other than lymphatic) as principal disease site. Notifications in the Australian and overseas born, by age group and sex, 1997**



than 50% of all new TB cases notified annually throughout the world.<sup>12</sup>

The proportion of overseas born cases represented in annual TB notifications has increased over the last decade. In 1986, 60% of all annual notifications were migrants, as compared to 70% in 1990, 75% in 1996 and 79% in 1997. However, rates of tuberculosis in the overseas born have not increased over the same time period. For all years, with the exception of 1995, rates in the overseas born have been between 15 and 16 per 100,000. The Australian born population have not only demonstrated a decline in the proportion of all TB notifications but have also demonstrated a progressive decline in notification rates, from 2.8 in 1986, to 2.3 per 100,000 in 1991,<sup>9,13</sup> to 1.2 per 100,000 in 1997.

Compared to 19 other industrialised countries surveyed by the WHO in 1997,<sup>3</sup> the proportion of TB occurring in non-nationals was highest for Australia (79%). Denmark reported 68%, Sweden 66%, France 51%, and the United States of America 39%. However, TB notification rates for the overseas born population was lowest in Australia compared to other industrialised countries. Reported notification rates in the foreign born populations of other industrialised countries, ranged between 29 and 109 per 100,000. These differences may be explained by different screening protocols for potential migrants, intake of 'higher risk' groups, such as refugees and asylum seekers, or a higher proportion of illegal immigrants who evade regulatory screening.

The progression to active TB within 12 months of arrival in Australia in approximately 14% of migrants may indicate the acquisition of TB close to the time of intended migration in these cases. Refugees, who have been interned in camps or prisons where malnutrition, poor sanitation and overcrowding increase their susceptibility to infection, may be at increased risk of progression to disease shortly after their arrival in Australia. Alternatively resettlement conditions for many migrants may be socio-economically stressful. Such factors in the early months after migration may hasten the progression to active disease. Alternatively, certain high-risk migrants, such as refugees and those on TB Undertakings (TBUs) are targeted for screening in the first few months post-migration. This may improve the ascertainment of disease in such cases in the first year of arrival in Australia. The current national surveillance system does not report on the residency status of those who are overseas born. There is therefore no way of gauging how much disease is potentially occurring in short-term visitors such as tourists, students or those on working visas, as compared to the overseas born population who have permanent residency. Similarly, the amount of active disease being detected in refugees and migrants on TBUs is unable to be ascertained from current national data. In Western Australia, an increasing trend towards notification of TB in non-resident migrants has been reported since 1991, and 15% of notifications over this time period have been in non-resident migrants.<sup>14</sup> The systematic reporting of such information at a national level would help to guide immigration and public health policy.

The pattern of tuberculosis, as described by site of disease, is different between the Australian and overseas born populations. A higher proportion of extra-pulmonary disease is described in the overseas born. Overseas born

females, especially young and middle aged adults, account for the highest proportion of lymphatic disease. Peripheral tuberculous lymphadenitis most frequently affects patients in their second and third decades, and the predominance of this entity in females is well recognised in a number of studies.<sup>15</sup>

Over the last 7 years, rates of TB have been 10 to 15-fold higher in indigenous Australians compared to the non-indigenous, Australian born population. Reporting accurately on trends in this group has been made difficult by the shifts in the census denominator estimates for this population,<sup>16,17</sup> and also because of the inconsistent reporting of indigenous status by some jurisdictions.<sup>18</sup> Among the risk factors for TB in indigenous Australians are poor socio-economic status, diabetes, renal disease, smoking, alcohol abuse and poor nutrition.<sup>19</sup>

The representativeness of data on HIV status, and on culture positivity for notified cases of TB is poor. HIV status continues to be under reported within the NMSS, with information missing in 90% of notifications. For all years dating back to 1992, the number of positive cultures reported to the NMSS has consistently under-estimated those reported by the National Mycobacterial Reference Laboratory Network (MRLN). In 1997, 574 notifications reported that the diagnostic method was culture, with 722 isolates forwarded to the MRLN.<sup>20</sup>

The existing surveillance system for TB reporting needs to be enhanced to include information on treatment outcomes, and to provide more complete data on the residency status of overseas born TB cases. Linkages between the NMSS and other surveillance systems, such as the national HIV/AIDS registry and the MRLN, would provide a more complete analysis of trends occurring over time with HIV/TB co-infection, and of MTBC drug resistance patterns in Australia.

There are no indications that the global TB threat is abating, which reinforces the need for all nations to remain vigilant. Having a surveillance system in place that can accurately report on trends, and important changes in the epidemiology of TB, alerts public health authorities and policy makers to emergent problems. The ongoing challenge of national surveillance is to better forewarn so that we, as a nation, are better forearmed to respond to potential public health threats.

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