TUBERCULOSIS NOTIFICATIONS IN AUSTRALIA, 1994

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Abstract

The fourth annual report of the National Mycobacterial Surveillance System (NMSS) is presented, containing notifications of new and reactivated cases of tuberculosis and cases of atypical mycobacterial infection reported in Australia in 1994. The overall rates of notification of tuberculosis have remained stable for some years and remain low by world standards. The situation is less clear for reactivated disease and atypical mycobacterial infection, both of which showed increased numbers of notifications in 1994. The data also show that some groups in the Australian community experience much higher than average rates of disease. These include Aboriginal and Torres Trait Islander people and persons born outside Australia. Surveillance through the NMSS has a major role to play in the control of these diseases. Efforts to further improve the quality of surveillance data in this database are recommended.

Introduction

Tuberculosis and other mycobacterial infections are a major public health concern in both developing and developed countries[1, 2]. The incidence of new infections has risen in recent years in several developed countries and high rates of new disease have been reported by countries in the Australian region. In Australia, as in other developed countries, increased risk is recognised in several identifiable sub-populations. These include members of indigenous populations and some migrant groups, HIV-positive persons, elderly men living alone, homeless persons and refugees[3-7]. Increased resistance of mycobacteria to anti-microbial therapy is a major concern in some countries, although it has not been observed in Australia[8, 9].

The National Mycobacterial Surveillance System was begun in 1991 under the auspices of the Communicable Diseases Network Australia New Zealand. Its aims were to enhance the previously existing mechanisms of national surveillance of tuberculosis and other mycobacterial disease and to provide more comprehensive data to facilitate prevention and control measures. This report is the fourth from the NMSS, for the calendar year 1994. Previous reports have been published for the years 1991, 1992 and 1993[10-12].

Methods

Data were collected by health authorities in each State and Territory under the provisions of the public health legislation in each jurisdiction. These data were provided to the NMSS in computerised format for collation and analysis. The dataset includes core fields in common with the National Notifiable Diseases Surveillance System including a unique identifier for each notification, disease code, postcode of residence, sex, dates of onset and report, Aboriginality, confirmation status of the report and the week of data transmission[13]. Supplementary data fields include date of birth, ethnicity, country of birth, length of residence in Australia for overseas-born persons, species of pathogen, principal site of disease, methods of diagnosis (culture techniques, microscopy, histology, tuberculin testing, radiography and clinical examination), antimicrobials used at the time of notification, BCG status, HIV status and reactivation status.

The case definitions were those used since 1986[14]:

1. Tuberculosis (new case)

- a case which has been confirmed by the identification of *Mycobacterium tuberculosis* (or *M. africanum* or *M. bovis*) by culture or by microscopy; 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.

2. Tuberculosis (relapse or reactivation)

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

3. Atypical mycobacterial infection

Clinical features consistent with one or more of the following:

- presence of a compatible disease process which is clinically, radiologically and / or pathologically not due to other causes,
- consistent repeated recovery of the same organism from the same site in moderate to abundant amounts,
- recovery of atypical mycobacteria from sites which are normally sterile.

Denominator population data and mortality data for tuberculosis and other mycobacterial diseases were obtained from the Australian Bureau of Statistics. Denominator data are estimates of relevant populations as at 30 June, 1994.

Table 1. Notifications of new and reactivated cases of tuberculosis and rates per 100,000 population, 1994, by State or Territory

State or Territory	New cases		Reactivations		Total	
	Notifications	Rate per 100,000	Notifications	Rate per 100,000	Notifications	Rate per 100,000
ACT	9	2.99	3	1.00	12	3.99
NSW	386	6.38	32	0.53	418	6.91
NT	31	18.11	0	0.00	31	18.11
Qld	107	3.35	5	0.16	112	3.50
SA	53	3.61	2	0.14	55	3.74
Tas	13	2.75	2	0.42	15	3.18
Vic	286	6.39	49	1.09	335	7.48
WA	75	4.41	4	0.24	79	4.64
TOTAL	960	5.38	97	0.54	1057	5.92

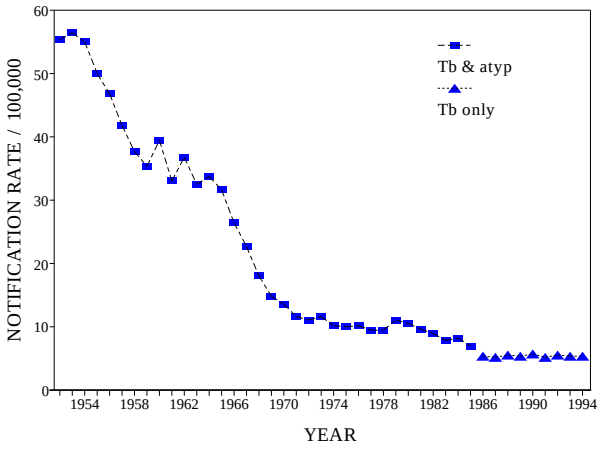
Results

Notifications

There were 960 notifications of new cases of tuberculosis in Australia for 1994. In addition, 97 cases of relapse or reactivation were notified (Table 1). The annual incidence rates of 5.38 per 100,000 population for new cases and 5.92 per 100,000 for total cases are similar to rates in recent years (Table 2). These rates have remained low in Australia since the early 1980s (Figure 1). However the rate for reactivations, 0.54 per 100,000 population, is higher than for any recent year. Rates of notification of both new and reactivated cases varied considerably between States and Territories (Table 1). The highest rates for notifications of new cases were reported by the Northern Territory (18.11 per 100,000), Victoria (6.39 per 100,000) and New South Wales (6.38 per 100,000).

Seven States and Territories also notified a total of 750 cases of atypical mycobacterial infection.

Figure 1. Notification rates of new cases of tuberculosis per 100,000 population, Australia, 1952 to 1994, by year[1]



1. Notifications from 1948 to 1985 include atypical disease.

Table 2. Notifications of new and reactivated cases of tuberculosis and rates per 100,000 population, 1986 to 1994, by year

Year	New cases		Reactivations		Total	
	Notifications	Rate per 100,000	Notifications	Rate per 100,000	Notifications	Rate per 100,000
1986	863	5.39	43	0.27	906	5.65
1987	868	5.34	39	0.24	907	5.58
1988	925	5.59	29	0.18	954	5.77
1989	902	5.36	50	0.30	952	5.66
1990	979	5.73	37	0.22	1016	5.95
1991	903	5.21	47	0.27	950	5.48
1992	983	5.62	28	0.16	1011	5.78
1993	944	5.35	47	0.27	991	5.61
1994	960	5.38	97	0.54	1057	5.92

Age and Sex

There were 512 notifications of new disease for males and 448 for females. The corresponding crude annual incidence rates were 5.74 and 5.00 per 100,000 population respectively (Table 3).

The highest numbers of reported new cases were in the 25-29 and 30-34 years age groups for both sexes (Table 3). Age-specific rates for both males and females were highest in the elderly, although there was a lesser peak in incidence for both sexes between 20 and 39 years of age (Figure 2).

Principal sites of disease

The principal site of disease was reported for 817 notifications of new disease (86%). Of these 817 cases, 494 (61%) were pulmonary and 146 (18%) were lymphatic (Table 4). Pulmonary and pleural disease were more commonly reported for males and lymphatic disease was more common in females.

Pathogen

The species of causative organism was reported for 652 notifications of new disease (68%, lower than the 74% reported for 1993). *M. tuberculosis* was reported for 642 cases, *M. bovis* for 3 cases and *M. africanum* for 7 cases.

Figure 2. Age group and sex specific notification rates of new cases of tuberculosis per 100,000 population, 1994

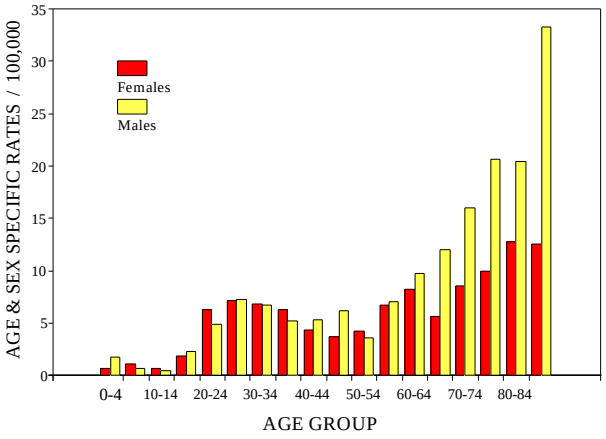


Table 3. Notifications of new cases of tuberculosis and rates per 100,000 population, 1994, by age group and sex

	Females		Males		Total	
Age group (years)	Notifications	Rate per 100,000	Notifications	Rate per 100,000	Notifications	Rate per 100,000
0-4	4	0.64	11	1.66	15	1.16
5-9	7	1.12	4	0.61	11	0.86
10-14	4	0.65	3	0.46	7	0.55
15-19	11	1.77	15	2.29	26	2.03
20-24	45	6.30	35	4.93	80	5.50
25-29	48	7.08	49	7.20	97	7.14
30-34	50	6.81	49	6.68	99	6.75
35-39	44	6.33	36	5.20	80	5.77
40-44	28	4.28	35	5.34	63	4.81
45-49	22	3.67	38	6.14	60	4.93
50-54	19	4.21	17	3.58	36	3.88
55-59	26	6.73	27	6.96	53	6.78
60-64	29	8.21	34	9.67	63	8.94
65-69	20	5.61	40	12.00	60	8.70
70-74	27	8.56	42	15.96	68	11.75
75-79	23	9.97	34	20.66	55	13.91
80-84	21	12.71	20	20.39	41	15.57
85+	16	12.51	18	33.25	34	18.68
Unknown	4		5			
TOTAL	448	5.00	512	5.74	960	5.38

Table 4. Notifications of new cases of tuberculosis, 1994, by reported principal site of disease and sex

Site	Females		Males		Total	
	Notifications	% of known	Notifications	% of known	Notifications	% of known
Pulmonary	202	53.2	292	66.8	494	60.5
Pleural	13	3.4	37	8.5	50	6.1
Lymphatic	101	26.6	45	10.4	146	17.9
Bone/Joint	10	2.6	9	2.1	19	2.3
Genito-urinary	18	4.7	14	3.2	32	3.9
Miliary	3	0.8	3	0.7	6	0.7
Meningeal	5	1.3	10	2.3	15	1.8
Peritoneal	6	1.6	5	1.2	11	1.4
Other sites	22	5.8	22	5.0	44	5.4
Site not reported	68		75		143	
TOTAL	448		512		960	

Methods of diagnosis

One or more of the diagnostic methods listed in Table 5 was reported to have been used for 888 (93%) of the 960 cases of new disease. In 804 (91%) of these 888 cases at least one of the methods was reported as testing positive to confirm the diagnosis of active tuberculosis.

For 72 cases none of the methods listed in Table 5 was reported as having been used. Other diagnostic methods were reported for some cases, including diagnosis at surgical operation or post-mortem in 11 cases.

Radiography was most frequently reported as a diagnostic method used, and was also most likely to confirm tuberculosis (in 78% of 743 cases). Histology was least used (32% of cases) and was also least likely to provide confirmatory evidence (30% of the 306 cases in which it was used). Culture was reported for 57% of cases in 1994, compared to 81% of cases in 1993. When used, culture was confirmatory in 76% of cases in 1994, similar to the 73% in 1993.

Use of Antimicrobials

The use of antimicrobial therapy at the notification date was reported for 664 cases of new disease (69%, Table 6). It was reported that 659 patients were treated with isoniazid, 655 with rifampicin, 587 with pyrazinamide and 492 with ethambutol. Streptomycin was reported as having been used for only six patients. Other drugs were reported as having been used in a small number of cases. Ethionamide, prothionamide, cycloserine and ciprofloxacin were used in one case each. Pyridoxine was used as adjuvant therapy in 46 cases. A small number of regimes encompassed virtually all of the therapeutic combinations reported (Table 6). In nearly all cases three or four drugs were used. For 17 cases a statement indicated or suggested that no antimicrobial treatment had been provided and explanations were usually offered, including terminal status and post-mortem diagnosis.

BCG status

BCG status was reported for only 143 notifications of new cases of tuberculosis (15%). Of these, 81 persons had previously received BCG vaccination and 62 had not. A further 212 persons were reported to have 'unknown' BCG status. In the remaining 510 cases no information was provided.

Table 5. Notifications of new cases of tuberculosis, 1994, by diagnostic method

Diagnostic method	Method reported used[1]		Test positive	
	Number	Per cent of total cases	Number	Per cent
Culture	543	56.6	410	75.5
Microscopy	532	55.4	202	38.0
Histology	306	31.9	92	30.1
Tuberculin testing	391	40.7	207	52.9
Radiography	743	77.4	576	77.5
Clinical examination	404	42.1	271	67.1

1. Multiple diagnostic methods were reported for most cases.

Table 6. Notifications of new cases of tuberculosis, 1994, by antimicrobials used at notification date

Drug combination	Notifications	% of known
Isoniazid + rifampicin + pyrazinamide + ethambutol	452	67.0
Isoniazid + rifampicin + pyrazinamide	122	18.1
Isoniazid + rifampicin + ethambutol	25	3.7
Isoniazid + rifampicin	40	5.9
Other combinations	25	3.7
Nil treatment / deceased at diagnosis	17	1.6
Not reported	285	-
TOTAL	960	

HIV status

HIV status was reported for only 75 notifications of new cases of tuberculosis (8%). Of these, 19 were reported to be HIV positive and 56 HIV negative. HIV-positive persons included 17 males aged 26 to 51 years (median 33 years). Seven males had pulmonary disease, three lymphatic disease and 2 pleural disease. The two females were a child with pulmonary disease and an adult with lymphatic disease.

Country of birth

Information on country of birth was included in 838 notifications (87%) (Table 7). There were 201 notifications for persons reported as born in Australia, the annual crude incidence rate being 1.46 per 100,000 population. This was considerably lower than the rates for the two previous years (1.80 and 1.62 per 100,000 population in 1993 and 1992 respectively).

Six hundred and thirty-seven cases of new disease were reported to have been born overseas. The annual crude incidence rate for non-Australian born persons was 15.68 per 100,000 overseas born population, slightly higher than the rates in 1993 and 1992 (14.63 and 15.10 per 100,000 respectively). The highest numbers of notifications were for persons born in Viet Nam (140), the Philippines (73), UK and Ireland (57) and China (45).

The highest notification rates were for persons born in Viet Nam, the Philippines and Indonesia, all greater than 75 per 100,000 Australian residents born in the country concerned. The notification rates for migrants from China, India and Papua New Guinea were all close to 50 per 100,000.

The length of time that overseas born persons had been resident in Australia was reported for 442 notifications (69%). Reported duration of residence ranged from less than one year (122 notifications) to 91 years (Figure 3). The median was four years. For 231 cases (52%) notification of new disease had been made less than five years since arrival. Median lengths of residence were less than 10 years for persons born in most areas of Oceania and Asia, whereas they were more than 10 years for persons born in most European countries.

Aboriginality

Aboriginality was reported for all but two of the 201 new cases of tuberculosis in Australian-born persons; 32 cases were reported in Aboriginal or Torres Strait Islander persons. This corresponds to an annual crude incidence rate of 10.6 per 100,000 population. This rate is approximately double the rate for Australia as a whole and about nine times the rate for non-indigenous Australian-born persons. Aboriginal and Torres Strait Islander persons included 11 females in the age range from 6 to 78 years (median 39 years) and 21 males in the age range 5 to 82 years (median 51 years). Pulmonary disease was reported for 8 females and 16 males. Several other primary sites of infection were reported, including miliary disease in a 13-year-old boy and a 43-year-old woman.

Reactivations

Ninety-seven relapsed or reactivated cases of tuberculosis were notified (Table 1). These comprised 9.4% of total notifications and represented a notification rate of 0.54 per 100,000 population. This was twice the rate reported for 1993 and was considerably higher than rates reported for previous years (Table 2).

Included were 51 females (aged 14 to 91 years; median 58 years) and 26 males (aged 21 to 87 years; median 60 years). Site of disease was reported for 93 of the 97 cases; 67 had pulmonary disease, 16 lymphatic disease

Figure 3. Notifications of new cases of tuberculosis in overseas born persons by duration of residence, 1994

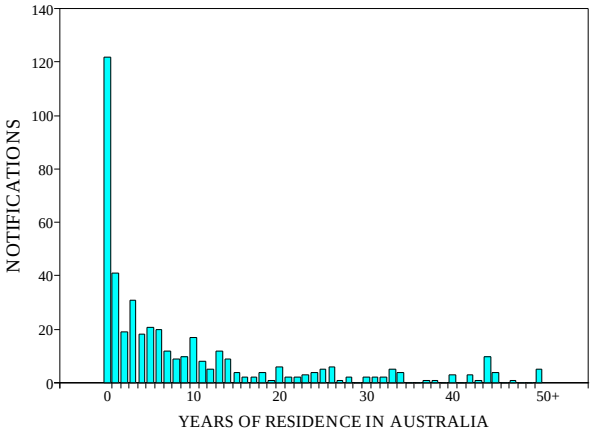


Table 7. Notifications of new cases of tuberculosis, 1994, estimated rates per 100,000 population and median age, by country of birth

Country	Cases	Rate[1] per 100,000 persons	Median age (years)	Median length of residence (years)
OCEANIA				
New Zealand	8	2.8	63	13
Papua New Guinea	12	50.6		0
Other Oceania	6	-	-	
ASIA				
China	45	49.5	57	7
Hong Kong	19	22.1	36	3
India	36	48.0	33	3
Indonesia	31	79.5	29	2
Philippines	73	82.9	34	2
Viet Nam	140	98.6	33	4
Turkey	9	27.3	31	3
Lebanon	3	3.7	37	2
Other Asia	81	-	-	
EUROPE				
UK and Ireland	57	4.6	72	34
Greece	13	9.0	65	32
Italy	17	6.5	61	33
Former Yugoslavia	15	8.5	49	6
Other Europe	37	-	-	
Central & South America	6	-	-	
Africa	18	-	-	
Country not specified	11	-	-	
TOTAL OUTSIDE AUSTRALIA	637	15.68		
AUSTRALIA	201	1.46	64	
Not reported	122	-	-	
TOTAL	960	5.38	43[2]	

1. Incidence rates are calculated only for separate countries, per 100,000 Australian residents born in that country.
2. Median for all females is 40 years; median for all males is 46 years.

and three each had bone, joint or genito-urinary disease. In four cases disease in other sites was reported. HIV status was reported for only one case and was negative.

Deaths

In 11 cases information was included which indicated that the person had died. The Australian Bureau of Statistics reported 83 deaths during 1994 in which the primary underlying cause of death was tuberculosis[15], an annual death rate of 0.465 per 100,000 population. Fifty deaths were in males including 17 cases of pulmonary disease, four meningeal and/or central nervous system disease, three miliary tuberculosis and 26 due to late effects of tuberculosis. Thirty-three deaths in females were reported including nine cases of pulmonary disease, three meningeal and/or central nervous system disease, one miliary, one disease of other organs and 19 due to late effects.

Atypical mycobacterial infection

Atypical mycobacterial infection notifications were received from seven States and Territories. There was a total of 750 reports. Four States each reported more cases of atypical disease than of tuberculosis (new and reactivated), these reports accounting for 728 of the total. HIV status was reported for 151 cases, of which 142 (94%) were HIV-positive.

Of the HIV-positive cases, there were 138 males, their ages ranging from 23 to 72 years (median 40 years). The four females were aged from 36 to 49 years. Sites of infection were poorly specified.

Organisms reported were *M. avium-intracellulare* (525 notifications), *M. fortuitum-chelonae* (92), *M. gordonae* (35), *M. scrofulaceum* (21), *M terrae* (16), *M. marinum* (9), *M. kansasii* (8), *M flavescens* (6), *M. xenopi* (5), *M. gastri* (4), *M. slowaty* (2), *M. smegmatis* (2), *M. abscessii* (1), *M*

szulgai (1), *M. haemophilum* (1), untyped (6) and unknown / not reported (49 cases).

Discussion

The results of this surveillance system for 1994 should be interpreted in conjunction with reports derived from other Australian data, in particular the Tuberculosis Laboratory Surveillance System[9].

Notification rates of new cases of tuberculosis have remained stable in Australia for several years and are low by world standards. However some groups in the community continue to be disproportionately affected. These include Aboriginal and Torres Strait Islander people and several immigrant groups. The high notification rate in the Northern Territory was only partially due to cases in Aboriginal persons, as 55% of notifications in that Territory were in non-Aboriginal persons.

The notification rates in persons from migrant groups from Viet Nam, the Philippines, Indonesia, China and India remain at high levels commensurate with the rates reported for the previous two years[11,12]. The short duration of residence in many cases in overseas borne persons, specifically those from Asian countries reflects the high prevalence of disease in their countries of origin.

The elderly have higher rates of tuberculosis than younger groups. There is a marked gender differential in those over 65 years with higher rates in males. These high rates in elderly males may be associated with factors such as homelessness, hostel residence and alcohol misuse, as in other countries[5] and warrant further investigation.

HIV-tuberculosis co-infection is recognised as a significant factor in the rising incidence of tuberculosis in many countries[6,7,16]. HIV status is poorly documented in this database. However, the lack of a gender difference in rates in younger age groups where most HIV infection occurs suggests that HIV does not currently play a major role in *M. tuberculosis* infection in this country.

The prevention of emergence of multidrug resistance is dependent on good surveillance, early diagnosis and effective treatment. Use of 4-drug treatment regimes are encouraged in this regard.

The number of cases of atypical mycobacterial infection reported for 1994 is much higher than that for 1993. The difference in numbers reported by States and Territories indicate that there is under-reporting of this category of mycobacterial infection from some jurisdictions.

There is a marked gender differential in notifications of atypical mycobacterial infections with a preponderance of males, particularly in HIV-positive persons. In view of the known association of both tuberculosis and atypical mycobacterial infection with HIV infection, efforts should be undertaken to improve this area of surveillance and to ascertain HIV status in relation to cases of both tuberculosis and atypical mycobacterial infection. In some countries the importance of establishing HIV status in cases of tuberculosis and offering testing for tuberculosis to persons seeking HIV tests has been demonstrated[17,18].

Information in the database was incomplete for several data fields, including methods of diagnosis, antimicrobials used, BCG status, HIV status, reactivation status, Aboriginality, country of birth and length of residence in Australia. The information recorded for some data items is completed in different ways in different jurisdictions. This is especially so for items in which some definitional latitude is allowed (for example onset date and report date). It is probably also true for the inclusion or otherwise of a case in the database, the assignation of 'confirmation status' and (in a few cases) the description and classification of the 'principal site of disease'. The extent to which information was provided on data fields such as HIV status, BCG vaccination status, use of diagnostic methods and use of antimicrobials varied considerably between datasets provided from different jurisdictions.

The lack of information in many cases about the use of culture methods to establish a diagnosis may reflect a diagnosis accepted as confirmed by other methods before the results of culture are known. Radiographic techniques are presumably heavily relied upon to establish a diagnosis, although bacterial culture and anti-microbial sensitivity testing are needed in the treatment phase. The increasing use of more sophisticated diagnostic methods, including DNA probes and PCR techniques, underlines a need for the National Mycobacterial Surveillance System to keep abreast of such developments.

The significance of the apparent increase in numbers of reactivated or relapsed cases is uncertain, because of the wide disparity in numbers reported by the separate States and Territories, and because the data has been coded in different ways in the separate databases supplied by them. Review of the definitions of relapse and reactivations, and of the methods of ascertainment and recording this information in individual cases, is recommended.

The notification rate for new cases of tuberculosis in Australia compares favourably with rates in other countries. However in view of the presence in this country of several vulnerable groups, some of whom have been shown to have much higher than average rates of disease, further efforts are warranted to improve surveillance of this important group of diseases.

The importance of adequate health screening procedures on incoming migrants and effective liaison with State / Territory health authorities is emphasised.

There are a number of deficiencies in current data collection procedures and these need to be rectified. The NMSS will be reviewed to address these issues and to consider the current review of tuberculosis control strategies being undertaken by the National Health and Medical Research Council Working Party on Tuberculosis.

Acknowledgments

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