

Tuberculosis in Queensland

2011-2012

Tuberculosis in Queensland, 2011-2012

Published by the State of Queensland (Queensland Health), August 2015



This document is licensed under a Creative Commons Attribution 3.0 Australia licence. To view a copy of this licence, visit creativecommons.org/licenses/by/3.0/au

© State of Queensland (Queensland Health) **2015**

You are free to copy, communicate and adapt the work, as long as you attribute the State of Queensland (Queensland Health).

For more information contact:

Communicable Diseases Unit, Department of Health, GPO Box 48, Brisbane QLD 4001, email epi@health.qld.gov.au, phone 07 3328 9728.

An electronic version of this document is available at <https://www.health.qld.gov.au/chrsp/tuberculosis/reports.asp>

Disclaimer:

The content presented in this publication is distributed by the Queensland Government as an information source only. The State of Queensland makes no statements, representations or warranties about the accuracy, completeness or reliability of any information contained in this publication. The State of Queensland disclaims all responsibility and liability (including without limitation for liability in negligence) for all expenses, losses, damages and costs you might incur as a result of the information being inaccurate or incomplete in any way, and for any reason reliance was placed on such information.

Contents

Figures.....	iv
Summary	v
Acknowledgements.....	v
1. Introduction	1
2. Notifications of TB.....	2
Epidemiology of TB in Queensland	2
Distribution of cases by TB Control Units.....	3
Distribution of cases by Hospital and Health Service of residence.....	3
3. Demographic characteristics	5
Age and sex.....	5
Aboriginal and Torres Strait Islander peoples	6
Country of birth	7
4. Risk Factors.....	8
Visa status	9
Arrival Date/Period of residence prior to diagnosis.....	10
Human immunodeficiency virus co-infection.....	10
TB in health care workers.....	11
5. Diagnosis and clinical details.....	12
Site of disease	12
6. Laboratory testing	14
Pulmonary cases	14
Extra pulmonary cases	14
Drug susceptibility testing.....	14
7. Treatment outcomes.....	17
Outcomes for MDR-TB cases.....	17
Deaths in TB cases.....	17
8. Discussion.....	19
Appendices.....	21
Appendix 1 – Queensland TB Control Unit Catchment Zones	21
Appendix 2 - TB Outcomes	22
Abbreviations.....	23
References	24

Figures

Figure 1: Number and notification rate of TB notifications in Queensland, 1904 – 2012*# ...	2
Figure 2: Number of cases and notification rate of TB by HHS of residence, Queensland, 2011	4
Figure 3: Number of cases and notification rate of TB by HHS of residence, Queensland, 2012.....	4
Figure 4: Number of TB cases by sex and age group at onset of disease, Queensland, 2011-2012.....	5
Figure 5: Notification rate of TB cases by age group at onset of disease, Queensland, 2011-2012.....	5
Figure 6: Number and proportion of TB cases notified by WHO region of birth*, 2011-2012	7

Tables

Table 1: TB cases by TB control unit, Queensland, 2008-2012	3
Table 2: TB notifications by Aboriginal and/or Torres Strait Islander origin, Queensland, 2008-2012.....	6
Table 3: TB cases and notification rates for Aboriginal and Torres Strait Islander and non-Indigenous Queenslanders, Queensland, 2008-2012	6
Table 4: Risk factors* reported by TB cases, 2011-2012	8
Table 5: Visa status of TB cases in Queensland, 2008-2012.....	9
Table 6: Period in Australia prior to TB diagnosis, 2011-2012	10
Table 7: HIV testing amongst TB cases, Queensland, 2008-2012.....	10
Table 8: Non-pulmonary sites of TB in cases reported with extra-pulmonary sites of disease, Queensland, 2011-2012	13
Table 9: Drug susceptibility testing of culture positive TB cases by site of disease, 2011-2012.....	15
Table 10: Antibiotic resistance profiles of MDR-TB cases by country of birth, 2011-2012 ..	16
Table 11: Treatment outcome for notified TB cases, 2011.....	17
Table 12: Treatment outcomes for MDR-TB cases, 2011	17

Summary

There were 392 notified cases of active tuberculosis (TB) in Queensland in 2011-2012, with 221 TB cases notified in 2011 and 171 TB cases notified in 2012. Cases in Queensland comprised 16 per cent and 13 per cent of the total cases of active TB in Australia in 2011 and 2012 respectively. The notification rate for active TB was 4.94 cases per 100,000 population in 2011 and 3.75 cases per 100,000 population in 2012; a decrease of 24 per cent in 2012 compared to the previous year. The overall rate of TB in Queensland remains low by global standards.

The majority of TB cases notified in Queensland were born in a high risk country for TB. Although rates of TB in Aboriginal and Torres Strait Islander Queenslanders are low on a global scale they are still significantly higher than other Queenslanders. In 2011-2012, 80 per cent of TB cases were tested for Human Immunodeficiency Virus (HIV) at or around the time of diagnosis. Two per cent of cases were found to have HIV-TB co-infection. There was one case of TB in a healthcare worker (HCW) that was likely to have been acquired in a Queensland healthcare facility in 2012.

Eighty-nine per cent of Queensland TB cases were laboratory confirmed, with 98 per cent of these confirmed by culture. All cases of culture-confirmed TB have drug susceptibility testing (DST) performed, with DST results for all but one case in the two year period. Seventy-nine per cent of all cases had fully sensitive *M. tuberculosis complex* identified with seven per cent (23 cases) identified as multi-drug resistant tuberculosis (MDR-TB). All MDR-TB cases were born overseas; 15 from Papua New Guinea (PNG).

Of the 221 notified cases in 2011, 152 cases (69 per cent) completed treatment, 48 cases (22 per cent) were transferred out of Australia and 11 cases (5 per cent) died prior to the completion of treatment. Outcomes for cases notified in 2012 will be reported in the 2013 report in line with the National Notifiable Diseases Surveillance System reporting.

Acknowledgements

During 2011-2012, special funding was granted through the Queensland Health, Health Technology Assessment process to the Queensland Mycobacterium Reference Laboratory (QMRL) for new technologies and interventions; specifically the implementation of molecular detection by GeneXpert.

This report was prepared by the Communicable Diseases Unit with assistance from Dr Hiranthi Walpola (Metro South Clinical Tuberculosis Service), with review from the members of the Queensland Tuberculosis Expert Advisory Committee. We gratefully acknowledge all the clinicians and administration staff who collected and reported surveillance data across the state.

1. Introduction

Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis complex*. TB transmission usually occurs through the inhalation of infectious droplets when a person with TB disease of the lungs coughs, speaks, sings, laughs or sneezes. The bacteria predominantly infect the lungs, but can also cause disease in other parts of the body (extra-pulmonary disease). Only a small proportion of people infected with *M. tuberculosis* develop active disease [1-3].

Tuberculosis (TB) is a notifiable condition under the Queensland *Public Health Act 2005*. It has been notifiable in Queensland since 1904 for pulmonary TB and 1937 for all forms of disease. Notification of TB can be based on the isolation of *Mycobacterium tuberculosis complex* (*M. tuberculosis*, *M. bovis* or *M. africanum*, excluding *M. bovis* variant Bacillus Calmette–Guérin [BCG] strain) by culture; or detection of *M. tuberculosis complex* by nucleic acid testing except where this is likely to be due to previously treated or inactive disease. As not all TB cases are able to be definitively diagnosed using laboratory techniques, cases can also be diagnosed by a clinician experienced in tuberculosis making a clinical diagnosis of tuberculosis. Whilst the diagnosis and management of latent TB (LTB) is an important part of TB management, only active TB is considered notifiable. This report is focused on diagnoses of active TB in Queensland.

The TB Control Program in Queensland during 2011-2012 was managed by the Queensland Tuberculosis Control Centre based at the Princess Alexandra Hospital (now known as Metro South Clinical Tuberculosis Service) with regional TB control units (TBCUs) in Cairns, Rockhampton, Toowoomba and Townsville (Appendix 1). PNG residents diagnosed with TB on the Australian islands of the Torres Strait Protection Zone are counted in the number of TB cases in Queensland and are included in the report data unless specified.

Data for this report were extracted from the Queensland Notifiable Conditions System (NOCS) on 23 July 2014. Surveillance data are subject to ongoing change as a result of ongoing data quality processes.

2. Notifications of TB

Epidemiology of TB in Queensland

There were 221 notifications of TB in 2011 and 171 notifications of TB in 2012 in Queensland (Figure 1). These notifications comprised 16 per cent and 13 per cent of the total notifications in Australia in 2011 (1,384 notifications) and 2012 (1,320 notifications) respectively [4]. The notification rate of TB in Queensland in 2012 was 3.75 cases per 100,000 population following the recent peak of notifications in 2011 (4.94 cases per 100,000 population).

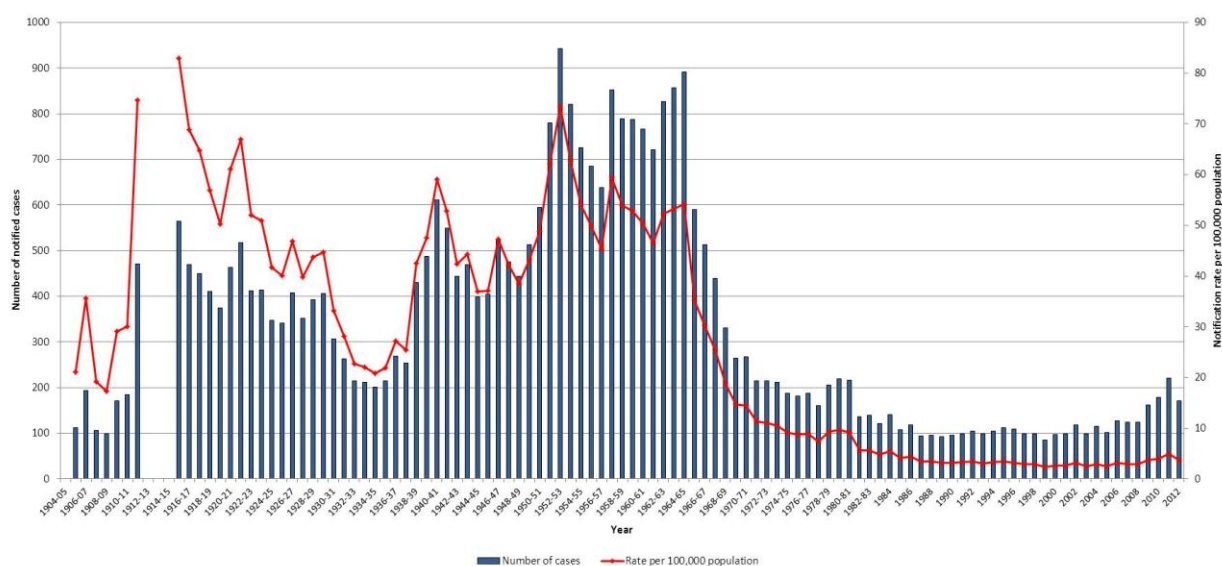


Figure 1: Number and notification rate of TB notifications in Queensland, 1904 – 2012*#

*Data unavailable for the years July 1913-June 1916

#Data adjusted to report by calendar year (compared to financial year) from 1983. Cases notified from Jan-Jun 1983 appear in both the 1982-1983 column and the 1983 column

Distribution of cases by TB Control Units

In 2011 and 2012, the majority of TB cases in Queensland were managed by Metro South Clinical TB Services (MSCTBS) (63 per cent) and Cairns TBCU (24 per cent) (Table 1).

Table 1: TB cases by TB control unit, Queensland, 2008-2012

TB Control Unit	2008	2009	2010	2011	2012	2008-2012 Average
Cairns	34 26%	46 27%	58 31%	58 26%	36 21%	46.4 26%
MSCTBS	86 65%	98 58%	108 58%	137 62%	109 64%	107.6 61%
Rockhampton	2 2%	7 4%	6 3%	9 4%	13 8%	7.4 4%
Toowoomba	3 2%	6 4%	5 3%	6 3%	3 2%	4.6 3%
Townsville	7 5%	11 7%	9 5%	11 5%	10 6%	9.6 5%
Qld Total	132 100%	168 100%	186 100%	221 100%	171 100%	175.6 100%

Distribution of cases by Hospital and Health Service of residence

In 2011-2012, 120 cases (31 per cent) were notified with a residential address in Metro South Hospital and Health Service (HHS) and 65 cases (17 per cent) in Metro North HHS. Sixty-nine cases (18 per cent) diagnosed in Queensland had a residential address in Papua New Guinea. Taking into account population size, the highest rate of notification was in Torres Strait-Northern Peninsula HHS in both 2011 and 2012, however in total there were six cases notified in the HHS over both years (Figure 2 and 3).

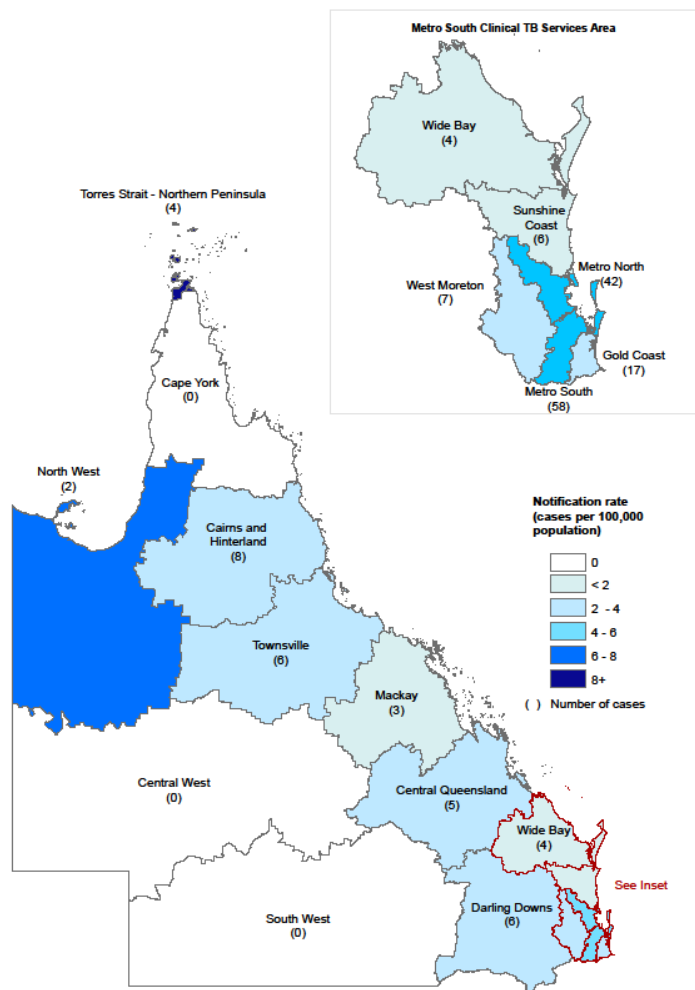


Figure 2: Number of cases and notification rate of TB by HHS of residence, Queensland, 2011

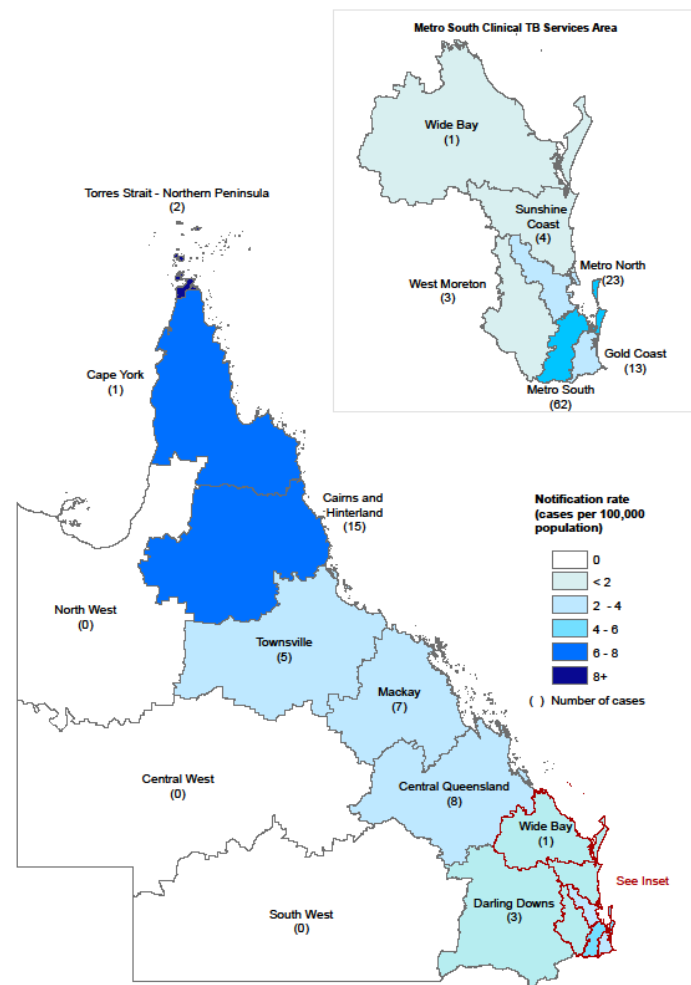


Figure 3: Number of cases and notification rate of TB by HHS of residence, Queensland, 2012

3. Demographic characteristics

Age and sex

In 2011-2012, the age of cases at onset of disease ranged from 2 weeks to 88 years, with the largest proportion of cases aged 25-29 years (20 per cent) (Figure 4: Number of TB cases by sex and age group at onset of disease, Queensland, 2011-2012). The median age at onset was 31 years. In 2011-2012, 51 per cent of TB cases were male.

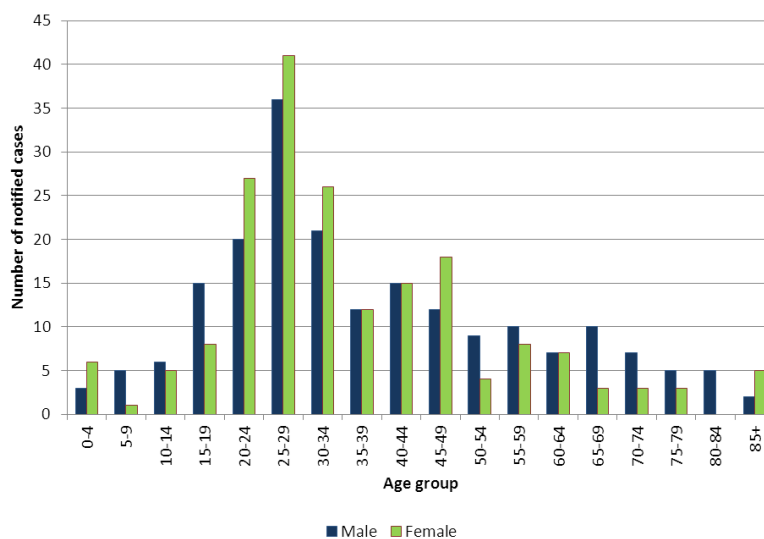


Figure 4: Number of TB cases by sex and age group at onset of disease, Queensland, 2011-2012

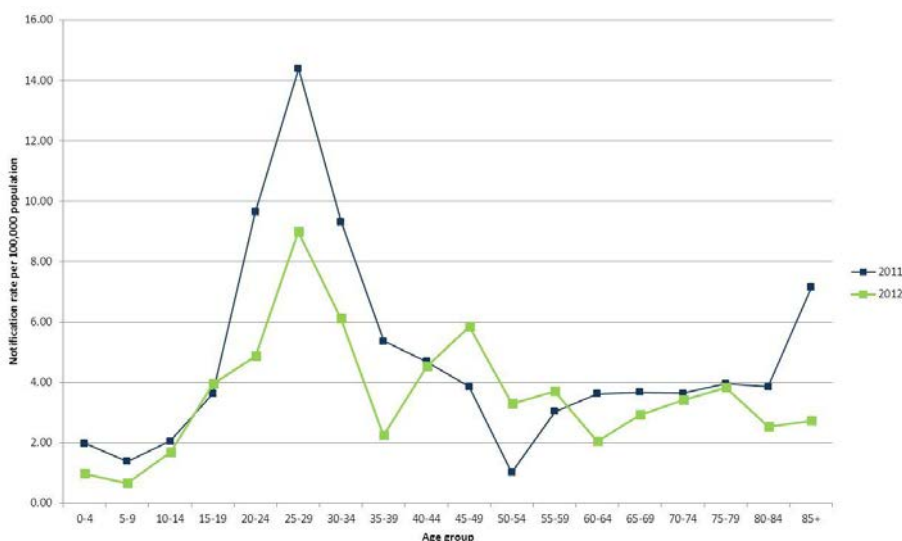


Figure 5: Notification rate of TB cases by age group at onset of disease, Queensland, 2011-2012

The sharp jump in notification rate in the 85 years and above age group in 2011-2012 (Figure 5) was represented by seven cases with an age range of 85 to 88 years of age. One case was a relapse following partial treatment in Australia and the other six were new cases. Six of the seven cases were overseas born, permanent residents of

Australia, with five cases having arrived in Australia more than 20 years prior (arrival date unknown for one case); one case was Australian born.

Aboriginal and Torres Strait Islander peoples

There were 21 notifications of TB in Aboriginal and Torres Strait Islander people in 2011-2012. Aboriginal and Torres Strait Islander people accounted for four per cent of Queensland's notifications of TB in 2011 and seven per cent of TB notifications in 2012 (Table 3: TB cases and notification rates for Aboriginal and Torres Strait Islander and non-Indigenous Queenslanders, Queensland, 2008-2012).

Table 2: TB notifications by Aboriginal and/or Torres Strait Islander origin, Queensland, 2008-2012

Indigenous status	2008	2009	2010	2011	2012	2008-2012 Average
Aboriginal but not Torres Strait Islander origin	5	8	6	7	8	6.8
Torres Strait Islander but not Aboriginal origin	2	2	1	3	3	2.2
Both Aboriginal and Torres Strait Islander origin	2	0	1	0	0	0.6
Neither Aboriginal nor Torres Strait Islander origin	121	157	175	207	154	162.8
Not Stated / Unknown	0	1	3	3	3	2
Qld Total	132	168	186	221	171	175.6
	100%	100%	100%	100%	100%	100%

The notification rate of TB in Queensland's Aboriginal and Torres Strait Islander population ranged from 5.0 to 6.7 cases per 100,000 population in 2008-2012 (Table 3)*. In 2011-2012, notification rates in Indigenous Queenslanders were 1.2 and 1.8 times the notification rate for non-Indigenous Queensland residents[#] respectively.

Table 3: TB cases and notification rates for Aboriginal and Torres Strait Islander and non-Indigenous Queenslanders, Queensland, 2008-2012

Indigenous status	2008	2009	2010	2011	2012
Aboriginal and Torres Strait Islander Queenslanders	9	10	8	10	11
<i>Rate (per 100,000 population)*</i>	5.9	6.4	5.0	6.1	6.7 [^]
Non-Indigenous Queenslanders	121	158	178	210	157
<i>Rate (per 100,000 population)[#]</i>	2.9	3.7	4.1	4.9	3.6 [^]
Rate ratio	2.0	1.7	1.2	1.2	1.8

* Notification rates for Aboriginal and Torres Strait Islander people were calculated using the Indigenous Experimental Estimated Resident Population (ERP), Queensland (2008-2011)

[^] Rates for 2012 calculated using the 2011 ERP for both Indigenous Experimental ERP (Queensland) and Queensland ERP

[#] Non-Indigenous rates calculated by subtracting Indigenous Experimental ERP from Queensland ERP for 2008-2011. The non-Indigenous Queensland category may include Indigenous people that did not identify as Indigenous or where Indigenous status was unknown.

Country of birth

In 2011-2012 the majority of cases were born overseas, with 61 cases (16 per cent) born in Australia and 331 cases (84 per cent) born overseas. Overseas-born cases notified in Queensland were predominantly from the WHO Western Pacific Region (187 cases, 48 per cent, excludes Australian-born TB cases) (Figure 6).

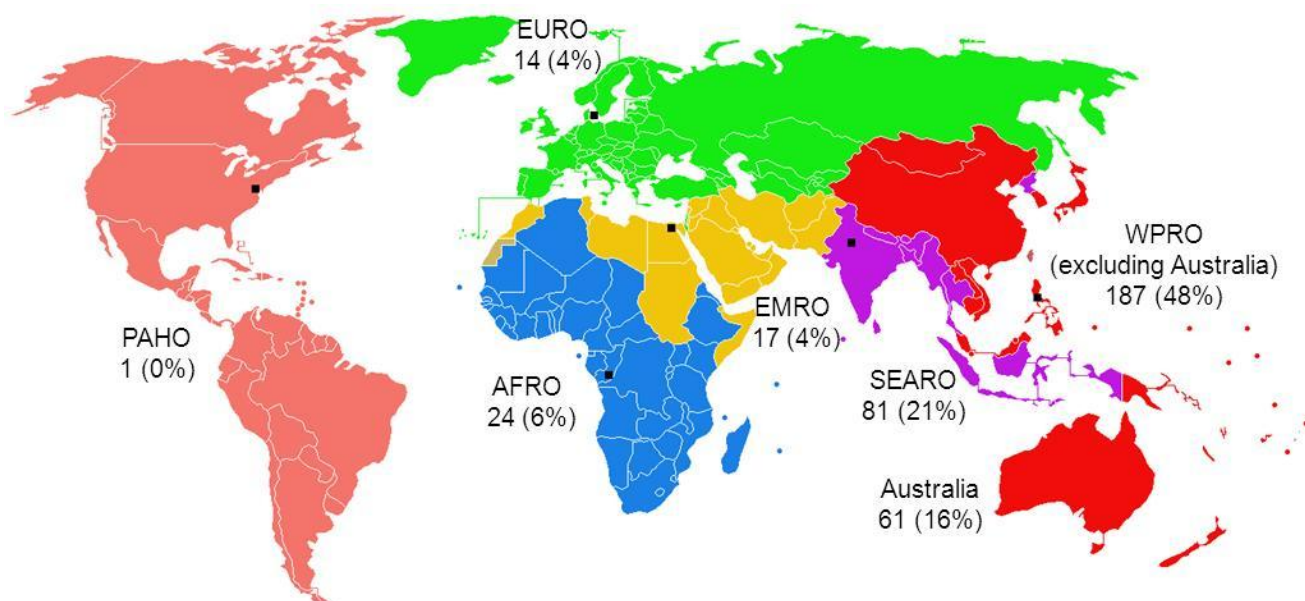


Figure 6: Number and proportion of TB cases notified by WHO region of birth*, 2011-2012

* Excludes 5 cases with unknown country of birth

Of the 392 cases in 2011-2012, the most common country of birth was PNG (n=101, 26 per cent). Other overseas countries where the highest number of cases were born included India (n=57, 15 per cent), Philippines (n=29, 7 per cent), China (n=15, 4 per cent), Vietnam (n=12, 3 per cent) and Nepal (n=11, 3 per cent). Of the 331 cases born overseas, 305 (92 per cent) were born in countries considered to have high prevalence of TB (prevalence rates > 40 cases per 100,000 population)[5].

The demographics of Australian-born TB cases and overseas born TB differ in both age distribution and gender in 2011-2012. Australian-born TB cases had a median age of 46 years (age range 7 – 85 years), whilst overseas-born TB cases had a median age of 30 years (age range 2 weeks – 88 years). Sixty-two per cent of Australian-born TB cases were male compared with 49 per cent of overseas-born cases.

4. Risk Factors

Overwhelmingly, migrating from a high risk country and/or being a visitor to a high risk country or countries were the most commonly reported risk factors in 2011-2012 (Table 4). Only 12 cases (3 per cent) over the two years were reported as being a household or close contact with TB. Risk factors were unknown for 32 cases (8 per cent) in 2011-2012.

Table 4: Risk factors* reported for TB cases, 2011-2012

Risk factors*	2011	2012
Migrant from a high risk country [#]	174 78%	113 66%
Visitor to a high risk country/countries [#]	85 38%	79 46%
Currently or previously employed in the health industry	30 14%	20 12%
Diabetic	10 5%	14 8%
Refugee	14 6%	8 5%
Steroids/immunosuppressive therapy	6 3%	7 4%
Household member or close contact with TB	6 3%	6 4%
Renal failure	6 3%	6 4%
Major abdominal surgery	2 1%	6 4%
HIV positive	3 1%	5 3%
Immunosuppression due to Cancer (excluding skin cancer)	2 1%	1 1%
Institutional living	1 0%	0 0%
Pneumoconiosis	1 0%	0 0%
Intravenous drug abuse	0 0%	1 1%
Other risk factor	9 4%	0 0%
No specified risk factors	1 0%	0 0%

* Multiple risk factors may be recorded for each case

[#] High risk country defined as those with TB incidence of 40/100,000 or more in 2011, as per estimates in WHO Global Tuberculosis Report 2012 [5]

Visa status

Fifteen per cent of TB cases notified in 2011 and 2012 in Queensland were born in Australia. The largest proportion of cases diagnosed with TB was in Australian permanent residents (27 per cent in 2011 and 33 per cent in 2012). Of particular note was the large decrease in the number of cases diagnosed in the Australian Torres Strait islands in the Torres Strait Protection Zone (Table 5).

Table 5: Visa status of TB cases in Queensland, 2008-2012

Visa status	2008	2009	2010	2011	2012	2008-2012 Average
Australian born	22 17%	30 18%	18 10%	30 14%	29 17%	25.8 15%
Permanent Resident	54 41%	60 36%	58 31%	60 27%	57 33%	57.8 33%
Treaty Visitation Rights (PNG national in Torres Strait Protection Zone)	21 16%	31 18%	42 23%	47 21%	16 9%	31.4 18%
Refugee/Humanitarian	1 1%	2 1%	6 3%	10 5%	6 4%	5 3%
Overseas Visitor	14 6%	17 7%	34 6%	33 9%	14 10%	13.4 8%
Overseas Student	14 11%	17 10%	34 18%	33 15%	14 8%	22.4 13%
Unauthorised Person	2 2%	0 0%	2 1%	0 0%	0 0%	0.8 0%
Other	9 7%	17 10%	11 6%	21 10%	18 11%	15.2 9%
Unknown	1 1%	0 0%	3 2%	1 0%	14 8%	3.8 2%
Qld Total	132 100%	168 100%	186 100%	221 100%	171 100%	175.6 100%

Arrival Date/Period of residence prior to diagnosis

Of the foreign-born TB cases notified in 2011-2012, 44 per cent and 21 per cent respectively were diagnosed within one year of arrival to Australia (Table 6). Seventy-seven cases (24 per cent) over the two year period were diagnosed following at least five years since their arrival into Australia.

Table 6: Period in Australia prior to TB diagnosis, 2011-2012

Time from arrival to TB diagnosis	2011	2012
New arrivals - diagnosed less than a year since arrival	83 44%	40 29%
Diagnosed within 1-2 years since arrival	34 18%	16 12%
Diagnosed within 3-5 years since arrival	26 14%	22 16%
Diagnosed more than 5 years since arrival	37 20%	40 29%
Unknown arrival date	9 5%	19 14%
Qld Total	189 100%	137 100%

Human immunodeficiency virus co-infection

The proportion of TB cases tested for HIV was 82 per cent and 78 per cent in 2011 and 2012, respectively (Table 7). There were eight cases (2 per cent) found to be co-infected with HIV at diagnosis in 2011-2012. Over the five year period from 2008-2012, 16 per cent of cases were not tested for HIV at diagnosis.

Table 7: HIV testing amongst TB cases, Queensland, 2008-2012

HIV Testing	2008	2009	2010	2011	2012	2008-2012 Average
Tested	81 61%	143 85%	145 78%	181 82%	132 78%	136.4 78%
Not tested	29 22%	16 10%	20 11%	39 18%	36 21%	27.8 16%
Unknown testing history	22 17%	9 5%	21 11%	1 0%	3 2%	11.2 6%
Qld Total	132 100%	168 100%	186 100%	221 100%	171 100%	175.6 100%

TB in health care workers

Fifty-four cases (14 per cent) of TB cases in 2011-2012 reported having worked in a health care facility. Of these, 50 cases (93 per cent) were health care workers, with only 4 cases (7 per cent) working as non-health care workers.

There was one case of TB in a HCW that was likely to have been acquired in a Queensland healthcare facility in 2012.

5. Diagnosis and clinical details

In 2011, 209 cases (95 per cent) diagnosed with TB were new cases and 12 cases were relapse cases following a past diagnosis of TB. Of these 12 cases, 5 relapsed following full or partial treatment overseas, 4 relapsed following partial treatment in Australia and 3 relapsed following full treatment in Australia. In 2012, 169 cases (99 per cent) diagnosed were new cases; one case relapsed following full treatment in Australia and one relapsed following full or partial treatment overseas. Twenty-nine cases (seven per cent) over 2011-2012 had previous history of TB treatment. In addition to the 14 relapse cases described over the two year period, 15 other cases reported previous treatment for TB.

In 2011-2012, diagnosis primarily followed consultation with a general practitioner (265 cases, 68 per cent). Eighty-five cases (22 per cent) were found through TB screening. Of those cases found through TB screening, the most common reasons screening was indicated were immigration and/or health undertakings (54 cases, 64 per cent), contact tracing (10 cases, 12 per cent) and refugee screening (6 cases, 7 per cent). Twenty-seven cases (7 per cent) had an incidental diagnosis of TB.

Site of disease

Pulmonary and extra pulmonary disease

In 2011-2012, 212 cases (54 per cent) had pulmonary disease only, 78 cases (20 per cent) had pulmonary disease plus other sites and 102 cases (26 per cent) had extra pulmonary disease only.

Extra pulmonary disease

There were 180 cases (46 per cent) reported to have TB disease elsewhere than the lungs (including 78 cases with concurrent pulmonary TB). The most common extra pulmonary sites recorded were lymph nodes (48 per cent of cases reporting extra pulmonary sites of disease), pleural (27 per cent) and bone and/or joints (11 per cent) (Table 8).

Table 8: Non-pulmonary sites of TB in cases reported with extra-pulmonary disease, Queensland, 2011-2012

Site	Number	Proportion of cases reporting extra-pulmonary disease
Lymph Node	86	48%
Pleural	48	27%
Bone/joint	20	11%
Miliary (with millet seed appearance on CXR)	10	6%
Disseminated (systemic symptoms)	9	5%
Genitourinary	6	3%
Peritoneal	6	3%
Abdominal	5	3%
Soft tissue abscesses	5	3%
Central nervous system	4	2%
Gastro-intestinal tract	4	2%
Meningeal	3	2%
Skin	3	2%
Pericardial	2	1%
Other	8	4%
Unknown	1	1%

*Multiple sites of disease may be reported for one case

6. Laboratory testing

Of the 392 TB cases notified in 2011 and 2012, 348 (89 per cent) were laboratory confirmed (by isolation of *Mycobacterium tuberculosis* complex [*M. tuberculosis*, *M. bovis* or *M. africanum*, excluding *M. bovis* var BCG] by culture or detection of *M. tuberculosis* complex by nucleic acid testing except where this is likely to be due to previously treated or inactive disease [6]). Of these, 342 cases were confirmed by culture and six cases were confirmed by nucleic acid testing only. There were two cases where *M. bovis* were isolated (excluding BCG variant) and one case where *M. africanum* was isolated. Forty-four clinical cases (11 per cent) were unable to be laboratory confirmed.

Pulmonary cases

Of the 272 laboratory confirmed pulmonary cases (including those with pulmonary TB plus other sites of disease) in 2011-2012, 233 cases (86 per cent) were sputum culture positive with 35 of these cases also having another positive culture for a different site. An additional 36 cases (13 per cent) had a positive culture result from a specimen other than sputum. Three pulmonary cases (one per cent) were confirmed by nucleic acid testing only.

Of the laboratory confirmed pulmonary cases, 124 cases (46 per cent) were sputum smear positive (acid fast bacilli [AFB] detected by microscopy). Eleven of these cases also had AFBs detected in other specimens. Ten cases had AFBs detected only on specimens other than sputum. None of the 19 pulmonary cases without laboratory confirmation had positive microscopy for AFBs. Four of these clinical cases had histology suggestive of TB.

Extra pulmonary cases

Of the 76 laboratory confirmed extra pulmonary cases in 2011-2012, 73 (96 per cent) were culture positive. Three extra pulmonary cases (4 per cent) were confirmed by nucleic acid testing only.

Of the laboratory confirmed extra pulmonary cases, 16 cases (21 per cent) had AFBs detected by microscopy. None of the 25 clinical extra pulmonary cases without laboratory confirmation had positive microscopy for AFBs. Seven of these clinical cases had histology suggestive of TB.

Drug susceptibility testing

All but one of the 342 culture confirmed TB cases in 2011-2012 had drug susceptibility testing (DST) performed. DST was not performed in one case where *M. tuberculosis* and *M. intracellulare* were cultured. Sensitivities could not be reported due to the mixed culture.

All DST are performed by reference laboratories with the Queensland Mycobacterial Reference Laboratory (QMRL) routinely testing all TB cultures for resistance to isoniazid (H), rifampicin (R), ethambutol (E), pyrazinamide (Z) and streptomycin (S)

using the BACTEC™ MGIT™ 960 proportion method. For specimens showing resistance, further antibiotic susceptibility testing for up to 13 different antibiotics was conducted dependent on sensitivity patterns seen. In 2011-2012, 79 per cent of all cases had fully sensitive *M. tuberculosis complex* identified (Table 9). Twenty-eight cases (eight per cent) were resistant to isoniazid only and 19 cases (six per cent) were identified to have other resistance patterns but were not resistant to isoniazid or rifampicin. There were no cases where rifampicin mono-resistance or rifampicin resistance with any other resistance pattern where the specimen was sensitive to isoniazid.

Table 9: Drug susceptibility testing of culture positive TB cases by site of disease, 2011-2012

Drug susceptibility testing	Pulmonary (including those with other sites)	Extra pulmonary disease only	Total
Fully sensitive	209 78%	62 85%	271 79%
Isoniazid (H) resistance only	24 9%	4 5%	28 8%
Other resistance (but sensitive to isoniazid [H] and rifampicin [R])	13 5%	6 8%	19 6%
Multi-drug resistance (resistant to isoniazid [H] and rifampicin [R])	22 8%	1 1%	23 7%
Qld Total	268 100%	73 100%	341 100%

Multi-drug resistant TB (MDR-TB) is defined as resistance to isoniazid and rifampicin, with or without resistance to other first-line drugs [7]. Twenty-three cases (seven per cent) were considered to be multi-drug resistant TB (MDR-TB), of which all but one case had pulmonary disease. There were seven different resistance profiles seen in the MDR-TB cases (Table 10).

The resistance profiles of the 15 MDR-TB cases born in PNG only showed slight differences. Fourteen of the 15 PNG-born cases were classified with a visa status of Treaty Visitation Rights and the remaining case was diagnosed in the Torres Strait with an unknown visa status. One case born in China had a similar resistance profile to that seen in the majority of PNG cases.

There were no cases of extensive drug resistance (XDR-TB) in 2011-2012; however two of the MDR-TB would be considered pre-XDR, one from Nepal and one from Laos. Pre-XDR TB was defined as TB with resistance to isoniazid and rifampicin and either one of the fluoroquinolones or second-line injectable agent but not both. One case was resistant to ofloxacin but sensitive to the second line injectable drugs, whilst the other was sensitive to the fluoroquinolones tested but resistant to all second-line injectable drugs tested (amikacin, capreomycin and kanamycin).

Of the 51 Australian-born TB cases with DST results, 45 cases (88 per cent) were fully sensitive, three cases (6 per cent) were resistant to isoniazid but not rifampicin, and three cases (6 per cent) were resistant to other drugs but not to isoniazid or rifampicin.

Table 10: Antibiotic resistance profiles of MDR-TB cases by country of birth, 2011-2012

Antibiotic susceptibility profiles*													Country of birth					
AK	CAP	CYC	E	ETD	H.1	H.4	KAN	OFL	PAS	Z	R	S	China	India	Laos	Nepal	PNG	Total
S [#]	S	S	S	S	R [#]	R	S	S	S	S	R	R	1	1	-	-	-	2
S	S	S	S	R	R	S	S	S	S	S	R	R	-	-	-	-	4	4
S	S	S	S	R	R	R	S	S	R	S	R	R	-	-	-	-	1	1
S	S	S	S	R	R	R	S	S	S	S	R	R	1	-	-	-	9	10
S	S	S	S	R	R	R	S	S	S	R	R	R	-	-	-	-	1	1
S	S	S	R	R	R	R	S	S	S	R	R	R	-	-	-	-	4	4
S	S	R	R	R	R	R	S	R	S	S	R	S	-	-	-	1	-	1
R	R	S	R	R	R	R	R	S	S	S	R	R	-	-	1	-	-	1
Total MDR Resistant cases													2	1	1	1	15	23

*Antibiotic abbreviations shown in Abbreviations table (page 22)

[#]S = sensitive, **R** = resistant

7. Treatment outcomes

The treatment outcomes of an annual patient cohort are reported in the following year's report. This allows adequate time for all cases notified in a single year to begin treatment and for the treatment outcomes to be recorded. Treatment outcomes for 2012 will be reported in the 2013 Annual Report. Treatment outcomes are defined by the National Notifiable Diseases Surveillance System dataset (Appendix 2).

Of the 221 notified cases in 2011, 152 cases (69 per cent) completed treatment, 48 cases (22 per cent) were transferred out of Australia and 11 cases (5 per cent) died prior to the completion of treatment (Table 11).

Table 11: Treatment outcome for notified TB cases, 2011

Treatment outcome	Number of cases	Proportion
Cured (bacteriologically confirmed)	15	7%
Completed treatment	136	62%
Completed treatment (with interruption > 2months)	1	0%
Defaulted from treatment	3	1%
Died of TB	9	4%
Died of other cause	2	1%
Transferred out of Australia	48	22%
Not followed up, outcome unknown	7	3%
Qld Total	221	100%

Outcomes for MDR-TB cases

Treatment outcomes for the 13 cases of MDR-TB notified in 2011 are shown in Table 12. Eight of the nine cases transferred out of Australia were in the Torres Strait Protection Zone and returned to PNG to complete treatment. Of the two cases that died of TB, one died prior to commencing treatment and the other within three weeks of commencing treatment. Both cases were from PNG diagnosed in the Torres Strait Protection Zone.

Table 12: Treatment outcomes for MDR-TB cases, 2011

Treatment outcome for MDR-TB cases	Number of cases	Proportion
Completed treatment	2	15%
Died of TB	2	15%
Transferred out of Australia	9	69%
Qld Total	13	100%

Deaths in TB cases

Eleven TB cases notified in 2011 died before completion of a course of TB treatment, of which nine were considered to have died from TB and two were considered to have died of other causes. Of the nine cases considered to have died of TB, eight cases had

pulmonary disease (with or without other sites of disease) and one case had TB meningitis. Three cases were diagnosed post mortem, one case before commencing treatment, three cases within two weeks of commencing treatment, and the remaining two cases within seven weeks of commencing treatment. Five cases that died of TB were PNG born seeking treatment in the Torres Strait Protection Zone (including the two MDR-TB cases reported in Table 12), one was Australian born and three were permanent residents of Australian born elsewhere. One case was a relapse case following full or partial TB treatment overseas.

8. Discussion

The overall rate of TB in Queensland remains low by global standards. The number of TB cases decreased by 20 per cent (222 to 175) from 2011 to 2012, with a notification rate of 3.75 cases per 100,000 population in 2012. A significant contributor to this reduction was a change to management of cross-border TB cases in the TSPZ in 2011 where PNG residents diagnosed with TB would return to Daru Hospital (PNG) for management and treatment. Between October 2011 and June 2012, 92 patients were transferred from the management of TB Control Units and Torres Strait health services to Daru Hospital. The provision of effective TB control services in the Australian Torres Strait Islands remains a major focus of Queensland's TB control program, particularly with the threat of MDR and XDR-TB.

The majority of TB cases notified in Queensland were born in a high risk country for TB. Other sub-populations at higher risk of developing active TB include HCW's and refugees. Although rates of TB in Aboriginal and Torres Strait Islander Queenslanders are low on a global scale they are still significantly higher than other Queenslanders. This continuing disparity has been attributed to poorer living conditions and nutrition experienced by Aboriginal and Torres Strait Islander people and the prevalence of chronic chest conditions [8]. The number of cases where household or close contact with a TB case was reported was low (3 per cent). It is possible that this risk factor has been underreported.

Globally, TB is the most important opportunistic infection complicating HIV infection and is the leading cause of AIDS-related deaths. Eighty per cent of TB cases in Queensland were tested for HIV at or around the time of diagnosis. There were eight cases (2 per cent) of HIV-TB co-infection identified in 2011-2012. Queensland and international guidelines recommend all TB cases should be tested for HIV [9, 10]. HIV testing in people diagnosed with TB is important as there is evidence that active TB infection in TB HIV co-infected cases is associated with increased immunodeficiency and mortality [11]. Treatment of TB and HIV co-infection is also complicated by drug adherence challenges, overlapping drug side effects and drug interactions [12]. HIV testing is also indicated in people living with HIV as they are more likely to progress from LTB to active disease, as well as have rapid progression of clinical disease [13]. Progression from LTB to active TB has been reported to be as high as 5-10 per cent per year in those with HIV compared to 5-10 per cent over a lifetime in those without HIV infection [14, 15].

Some HCWs have a higher risk of acquiring TB disease and then potentially transmitting to vulnerable populations than the general population [16]. The likely transmission of TB resulting in active infection in a HCW worker in a Qld healthcare facility was a timely prompt of the importance of focused TB-related education as well as rigorous adherence to infection control practices within clinical settings.

Queensland maintained a high level of laboratory confirmation (89 per cent) of TB cases, with 98 per cent of these confirmed by culture. All cases of culture confirmed TB have DST performed with results for all but one case in the two year period. In 2011, the molecular detection of *Mycobacterium tuberculosis complex* by GeneXpert was introduced in Queensland. The benefits of early detection of TB in the context of a high

proportion of AFB positive results being subsequently found to be non-tuberculous *Mycobacteria* allows for early implementation of appropriate treatment which leads to a reduction in the transmission of TB. GeneXpert also provided an early warning for MDR-TB by the detection of rifampicin resistance so appropriate treatment decisions can be made in a timely manner. In 2011-2012, six cases of TB were confirmed by nucleic acid testing which were unable to be subsequently cultured. Isolation of *M. tuberculosis complex* by culture remains the gold standard in TB diagnosis [17].

In 2011-2012, 79 per cent of all cases had fully sensitive *M. tuberculosis complex* identified with seven per cent (23 cases) identified as MDR-TB. All MDR-TB cases were born overseas, 15 from PNG, reinforcing the need for strong cooperation with PNG in the Torres Strait Protection Zone.

The continued provision of safe, timely laboratory diagnosis of TB and the minimisation of the development of drug resistance within Australia are considered national priorities [18]. Within Queensland, expansion to microbial stewardship programs, as well as reiteration of the importance of taking all TB medications as prescribed, may assist in reducing these resistance figures or at least ensuring currently sensitive TB patients do not go on to develop antibiotic resistance. This is important to TB patients as treatment time for MDR-TB is significantly increased (typically 18-24 months instead of 6-9 months) and poorer outcomes documented. Treatment costs also escalate. For a non-MDR-TB patient the cost of medications is approximately \$5,600, compared to treatment of MDR-TB being approximately \$80,000-250,000, with XDR-TB treatment costs exceeding \$500,000, before taking into account hospitalisation costs [19].

Treatment outcomes were known for 75 per cent of TB cases notified in 2011. Completeness of outcome data for the 48 cases transferred out of Australia is poor as it is difficult to collect the information after they leave the country following initial diagnosis. Outcomes for the 39 cases transferred out to PNG in 2011 are not yet known, including the five MDR-TB cases. There were only seven cases (excluding transfers out) where an outcome was not known. Eleven TB cases notified in 2011 died before completion of a course of TB treatment, of which nine were considered to have died from TB and two were considered to have died of other causes, with three cases diagnosed post mortem and the others all died within seven weeks of diagnosis.

Whilst rates of TB in Queensland decreased in 2012 and remain low in a global comparison, TB remains a disease of public health importance due the disease burden and the prevalence of MDR-TB and XDR-TB in the Western Pacific Region. The provision of effective TB control services remains a major focus of Queensland's TB control program, particularly with the threat of MDR and XDR-TB.

Appendices

Appendix 1 – Queensland TB Control Unit Catchment Zones

Hospital and Health Services
by Queensland Health Facilities

Queensland TB Control Unit
Catchment Zones



Prepared by: Statistical Output, Health Statistics Centre, 28 June 2012
Hospital and Health Services by Facilities as at 1 July 2012

Appendix 2 - TB Outcomes

NNDSS Field: TB_Outcomes

Patient outcomes after anti-tuberculosis treatment [20]

Outcome	Description
Cured (bacteriologically confirmed)	A pulmonary sputum smear positive and culture positive patient who was culture negative in the last month of treatment and on at least one previous occasion and completed treatment
Completed treatment	Patient who has successfully completed treatment but who does not meet the criteria to be classified as a cure or a failure
Interrupted treatment	Patient whose treatment was interrupted for two months or more but completed treatment
Died of TB	Patient died during the course of treatment as a result of TB disease
Died of other cause	Patient died during the course of treatment of cause other than TB disease
Defaulter	Patient defaults from treatment
Treatment failure	A patient who is sputum culture positive at 5 months or later during treatment.
Transferred out	Patient who has been transferred overseas and treatment outcome is unknown
Still under treatment	Patient currently under treatment in Australia
Not followed up, outcome unknown	Patient should have completed treatment in Australia but outcome is unknown.

Abbreviations

Antibiotic abbreviations used:

AK	Amikacin
CAP	Capreomycin
CYC	Cycloserine
E	Ethambutol
ETD	Ethionamide
H.1	Isoniazid 0.1
H.4	Isoniazid 0.4
KAN	Kanamycin
OFL	Ofloxacin
PAS	Para Amino Salicylate
Z	Pyrazinamide
R	Rifampicin
S	Streptomycin

Other abbreviations used:

AFB	Acid-fast bacilli
AFRO	Regional Office for Africa (World Health Organization)
EMRO	Regional Office for the Eastern Mediterranean (World Health Organization)
ERP	Estimated resident population
EURO	European Regional Office (World Health Organization)
HCW	Healthcare worker
HIV	Human immunodeficiency virus
HHS	Hospital and Health Service
LTBI	Latent tuberculosis infection
MDR-TB	Multi drug resistant tuberculosis
MSCTBS	Metro South Clinical TB Services
PAHO	Pan American Health Organization
PNG	Papua New Guinea
QMRL	Queensland Mycobacterial Reference Laboratory
QTBCC	Queensland Tuberculosis Control Centre
SEARO	South-East Asia Regional Office (World Health Organization)
TB	Tuberculosis
WHO	World Health Organization
WPRO	Western Pacific Regional Office (World Health Organization)
XDR-TB	Extensively resistant tuberculosis

References

- [1] Heymann DL, ed. Control of Communicable Diseases Manual. 19th ed. Washington: American Public Health Association 2008.
- [2] Australian Government Department of Health. CDNA National Guidelines for Public Health Units - Management of TB. 2013.
- [3] Centers for Disease Control (CDC). Tuberculosis (TB): Basic TB Facts. 2012 13 March 2012 [cited 10 September 2014]; Available from: <http://www.cdc.gov/tb/topic/basics/default.htm>
- [4] Australian Government Department of Health. Number of notifications of Tuberculosis, received from State and Territory health authorities in the period of 1991 to 2013 and year-to-date notifications for 2014. 2014 [cited 1 September 2014]; Available from: http://www9.health.gov.au/cda/source/rpt_4.cfm
- [5] Queensland Government Department of Health. Tuberculosis High Risk Countries. High-risk countries (those with TB incidence of 40/100,000 or more in 2011, as per estimates in WHO Global Tuberculosis Report 2012) 2013. 4 April 2013 [cited 1 September 2014]; Available from: http://www.health.qld.gov.au/chrisp/tuberculosis/high_risk_index.asp
- [6] Australian Government Department of Health. Tuberculosis. [cited 23 July 2014]; Available from: [http://www.health.gov.au/internet/main/publishing.nsf/650f3eec0dfb990fca25692100069854/98e2a62e5728132bca257bf00018ccde/\\$FILE/tb-casedef.pdf](http://www.health.gov.au/internet/main/publishing.nsf/650f3eec0dfb990fca25692100069854/98e2a62e5728132bca257bf00018ccde/$FILE/tb-casedef.pdf)
- [7] World Health Organization. Definitions and reporting framework for tuberculosis - 2013 revision; 2013.
- [8] Australian Indigenous Health/InfoNet. Summary of tuberculosis among Indigenous people. 2008 [cited 24 December 2013]; Available from: <http://www.healthinonet.ecu.edu.au/infectious-conditions/tuberculosis/reviews/our-review>
- [9] Queensland Government Department of Health. Health Service Directive – Tuberculosis Management: Protocol for the Treatment of Tuberculosis. 2013.
- [10] World Health Organization. Tuberculosis care with TB-HIV co-management: Integrated management of adolescent and adult illness (IMAI). Geneva; 2007.
- [11] Toossi Z, Mayanja-Kizza H, Hirsch CS, Edmonds KL, Spahlinger T, Hom DL, et al. Impact of tuberculosis (TB) on HIV-1 activity in dually infected patients. Clin Exp Immunol. 2001;123(2):233–8.
- [12] McIlleron H, Meintjes G, Burman WJ, Maartens G. Complications of Antiretroviral Therapy in Patients with Tuberculosis: Drug Interactions, Toxicity, and Immune Reconstitution Inflammatory Syndrome. 2007:S63-S75.
- [13] Centers for Disease Control and Prevention (CDC). TB and HIV Coinfection. Tuberculosis (TB) 2012 17 July 2012 [cited 10 September 2014]; Available from: <http://www.cdc.gov/tb/topic/TBHIVcoinfection/default.htm>
- [14] Australian Government Department of Health and Ageing. CDNA National Guidelines for Public Health Units - Management of TB. 2013.
- [15] Kwan CK, Ernst JD. HIV and Tuberculosis: a Deadly Human Syndemic. Clinical Microbiology Reviews. 24(2):351-76.

- [16] Baussano I, Nunn P, Williams B, Pivetta E, Bugiani M, Scano F. Tuberculosis among health care workers. *Emerg Infect Dis.* 2011 17(3):488-94.
- [17] Centers for Disease Control and Prevention (CDC). Updated Guidelines for the Use of Nucleic Acid Amplification Tests in the Diagnosis of Tuberculosis. *MMWR.* 2009 January 16 2009 58(1):7-10.
- [18] Australian Government Department of Health and Ageing. The strategic plan for control of tuberculosis in Australia: 2011-2015. *Communicable Diseases Intelligence.* 2012;36(3).
- [19] Queensland Tuberculosis Control Centre. Personal communication to Leona Burke. Brisbane 2012.
- [20] Australian Government Department of Health and Ageing. NNDSS Dataset - Enhanced Tuberculosis Surveillance. 2008.

Department of Health

Tuberculosis in Queensland, 2011-2012

www.health.qld.gov.au

Tuberculosis in Queensland – 2011-2012