

# Tuberculosis in Queensland

1 January 2013 – 31 December 2014

## **Tuberculosis in Queensland, 2013-2014**

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# 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 Queenslanders.....	6
Country of birth.....	7
4. Risk Factors .....	8
Visa status.....	9
Period of residence prior to diagnosis.....	9
Human immunodeficiency virus co-infection.....	10
TB in health care workers .....	10
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 .....	18
Deaths in TB cases .....	18
8. Discussion .....	19
Appendices.....	21
Appendix 1 - Queensland TB Control Unit Catchment Zones .....	21
Appendix 2 - TB Outcomes.....	22
Abbreviations.....	23
References .....	25

## Figures

Figure 1: Number and notification rate <sup>^</sup> of TB notifications in Queensland, 1904-2014*# .....	2
Figure 2: Number of cases and annual notification rate of TB by HHS of residence, Queensland, 2013.....	4
Figure 3: Number of cases and annual notification rate of TB by HHS of residence, Queensland, 2014.....	4
Figure 4: Number of TB cases and notification rate by sex and age group at onset of disease, Queensland, 2013 .....	5
Figure 5: Number of TB cases and notification rate by sex and age group at onset of disease, Queensland, 2014 .....	5
Figure 6: Number and proportion of TB cases notified by WHO region of birth*, 2013-14.....	7

## Tables

Table 1: TB cases by TB control unit, Queensland, 2010-14 .....	3
Table 2: TB notifications by Aboriginal and/or Torres Strait Islander origin, Queensland, 2010-14 .....	6
Table 3: TB cases and annual notification rates for Aboriginal and Torres Strait Islander and non-Indigenous Queenslanders <sup>#</sup> , Queensland, 2010-14.....	6
Table 4: Risk factors* <sup>^</sup> reported for TB cases, 2013-14 .....	8
Table 5: Visa status of TB cases in Queensland, 2010-14 .....	9
Table 6: Period in Australia prior to TB diagnosis, 2010-14.....	10
Table 7: HIV testing amongst TB cases, Queensland, 2010-14 .....	10
Table 8: Sites of TB disease in cases reported with extra-pulmonary disease, Queensland, 2013-14 .....	13
Table 9: Drug susceptibility testing of culture positive TB cases by site of disease, 2013-14....	15
Table 10: Antibiotic resistance profiles of MDR-TB cases by country of birth, 2013-14 .....	16
Table 11: Treatment outcome for notified TB cases, 2012-13.....	17
Table 12: Treatment outcomes for MDR-TB cases, 2012-13 .....	18

## Summary

There were 320 notified cases of active tuberculosis (TB) in Queensland during 2013-14, with 153 TB cases notified in 2013 and 167 TB cases notified in 2014. Cases in Queensland comprised 12 per cent of the total cases of active TB notified in Australia in 2013 and 2014. The annual notification rate for active TB has fallen since 2011, with 3.3 cases per 100,000 population in 2013 and 3.6 cases per 100,000 population in 2014; a 27 per cent decrease from the recent peak of 4.9 cases per 100,000 population in 2011. 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 significantly higher than rates among other Queenslanders. In 2013-14, 76 per cent of TB cases were tested for Human Immunodeficiency Virus (HIV) at or around the time of diagnosis. Five cases (2 per cent) were found to have HIV-TB co-infection.

During 2013-14, 88 per cent of Queensland TB cases were laboratory confirmed, with 94 per cent of these confirmed by culture. Drug susceptibility testing (DST) was performed for all culture confirmed cases. Eighty-six per cent of culture confirmed cases had fully sensitive *M. tuberculosis* complex identified with three per cent (7 cases) identified as multi-drug resistant tuberculosis (MDR-TB).

Of the 324 notified cases in 2012 and 2013, 256 cases (79 per cent) completed treatment (with or without interruption and bacteriological evidence of cure). Forty-one cases (13 per cent) were transferred out of Australia, two thirds of these in 2012, many due to the handover of care of TB cases in the Torres Strait to Papua New Guinea.

Thirteen cases (4 per cent) died prior to the completion of treatment, seven were considered to have died from TB and six were considered to have died of other causes. Treatment outcomes for cases notified in 2014 will be reported in the 2015 report in line with the National Notifiable Diseases Surveillance System reporting.

## Acknowledgements

This report was prepared by the Communicable Diseases Branch, with review from the members of the Queensland Tuberculosis Expert Advisory Group and the Tuberculosis Consultative Group. We gratefully acknowledge all the clinicians and administrative staff who manage TB cases in Queensland and collect and report surveillance data alongside the Queensland Mycobacterial Reference Laboratory and referring laboratories for the continued provision of laboratory services for TB in Queensland.

# 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* complex develop active disease, with a lifetime risk of reactivation of TB disease in a person with documented latent TB (LTB) is estimated at 5-10 per cent (1-3).

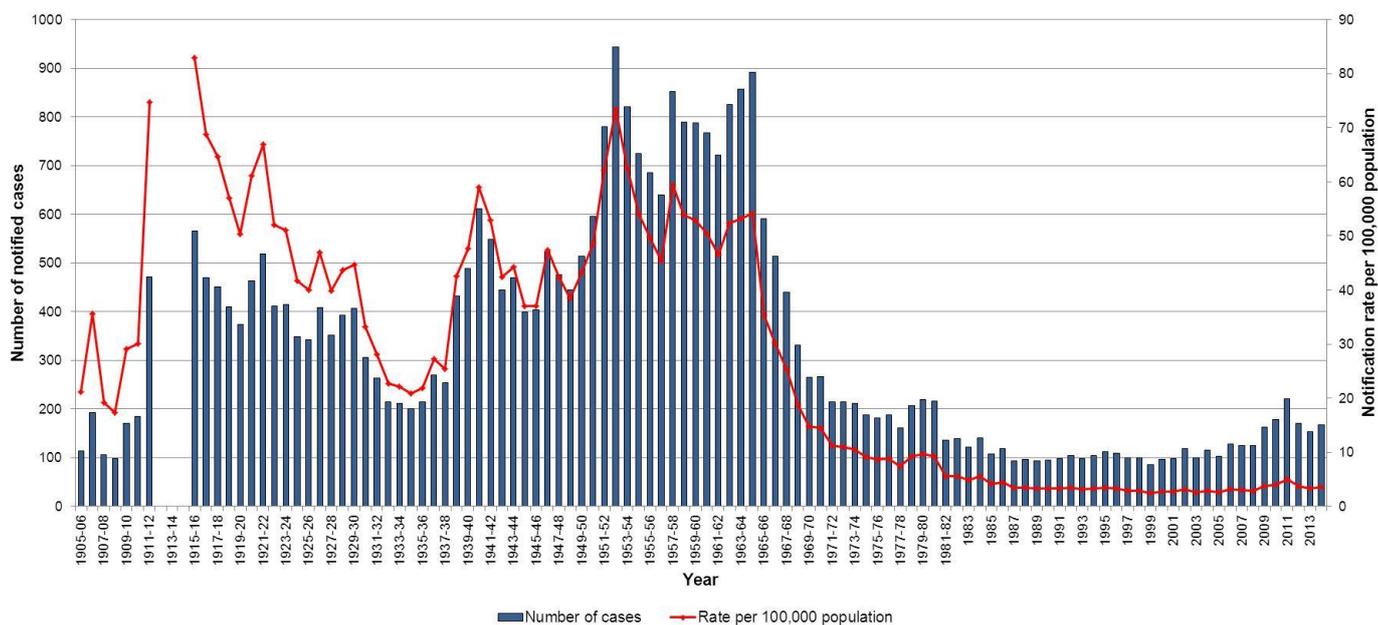
TB is a notifiable condition under the Queensland *Public Health Act 2005*. It has been notifiable in Queensland since 1904 for pulmonary TB and 1937 for all forms of disease. Notification of TB can be based on the isolation of *Mycobacterium tuberculosis* complex (*M. tuberculosis*, *M. bovis*, or *M. 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 (4). 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. Diagnosis and management of LTB is an important part of TB management, with the efficacy of currently available preventative treatments ranging from 60-90 per cent (5), though only active TB is notifiable. This report focuses on diagnoses of active TB in Queensland. Papua New Guinea (PNG) residents diagnosed with TB on the Australian islands of the Torres Strait Protected Zone are counted in the number of TB cases in Queensland and are included in the report data unless otherwise stated. It is important to note that the surveillance of notifiable conditions is a passive process which relies on laboratories and diagnosing clinicians to identify and appropriately notify under the *Public Health Act* and its associated *Regulations*.

Data for this report were extracted from the Queensland Notifiable Conditions System (NoCS) on 1 June 2015. 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 153 notified cases of TB in 2013 and 167 notified cases of TB in 2014 in Queensland (Figure 1). These cases comprised 12 per cent of the total notified cases in Australia in 2013 (1265 cases) and 2014 (1343 cases) (6). The annual notification rate of TB in Queensland was 3.3 cases per 100,000 population and 3.6 cases per 100,000 population in 2013 and 2014, respectively. This follows the recent peak of notifications in 2011 (4.9 cases per 100,000 population).



**Figure 1: Number and notification rate<sup>^</sup> of TB notifications in Queensland, 1904-2014<sup>#</sup>**

<sup>^</sup>Rates for 2006 onwards calculated using the Queensland Estimate Resident Population - data source for rates pre-2006 is unknown

\*Data unavailable for the years July 1913-June 1916

<sup>#</sup>Data adjusted to report by calendar year (compared to financial year) from 1983. Cases notified from Jan-Jun 1983 appear in both the 1982-83 column and the 1983 column

## Distribution of cases by TB Control Units

TB cases in Queensland are managed by regional TB Control Units (TBCU) (Appendix 1). The majority of TB cases in Queensland continue to be managed by Metro South Clinical TB Services (MSCTBS) (60 per cent in 2014) and Cairns TBCU (25 per cent in 2014) (Table 1).

**Table 1: TB cases by TB control unit, Queensland, 2010-14**

TB Control Unit	2010	2011	2012	2013	2014	2010-14 Average
Cairns	58 (31%)	58 (26%)	35 (20%)	20 (13%)	42 (25%)	42.6 (24%)
MSCTBS	108 (58%)	137 (62%)	109 (64%)	103 (67%)	101 (60%)	111.6 (62%)
Rockhampton	6 (3%)	9 (4%)	14 (8%)	6 (2%)	3 (2%)	7.6 (4%)
Toowoomba	5 (3%)	6 (3%)	3 (2%)	5 (4%)	6 (4%)	5.0 (3%)
Townsville/Mackay	9 (5%)	11 (3%)	10 (6%)	19 (12%)	15 (9%)	12.8 (7%)
<b>Total</b>	<b>186 (100%)</b>	<b>221 (100%)</b>	<b>171 (100%)</b>	<b>153 (100%)</b>	<b>167 (100%)</b>	<b>179.6 (100%)</b>

## Distribution of cases by Hospital and Health Service of residence

In 2013-14, 94 cases (29 per cent) were notified with a residential address in Metro South Hospital and Health Service (HHS) and 58 cases (18 per cent) in Metro North HHS. A small number of cases diagnosed in Queensland (16 cases, 5 per cent) had an overseas residential address. The majority of these (15 cases, 94 per cent) had a residential address in PNG at the time of diagnosis. Taking into account population size, the highest annual notification rate in 2013 was in the North West HHS (9.2 cases per 100,000 population) and in the Torres and Cape HHS in 2014 (35.5 cases per 100,000 population), however in terms of case numbers there were 3 cases in the North West HHS in 2013 and 9 cases in the Torres and Cape HHS in 2014 (Figure 2 and 3).

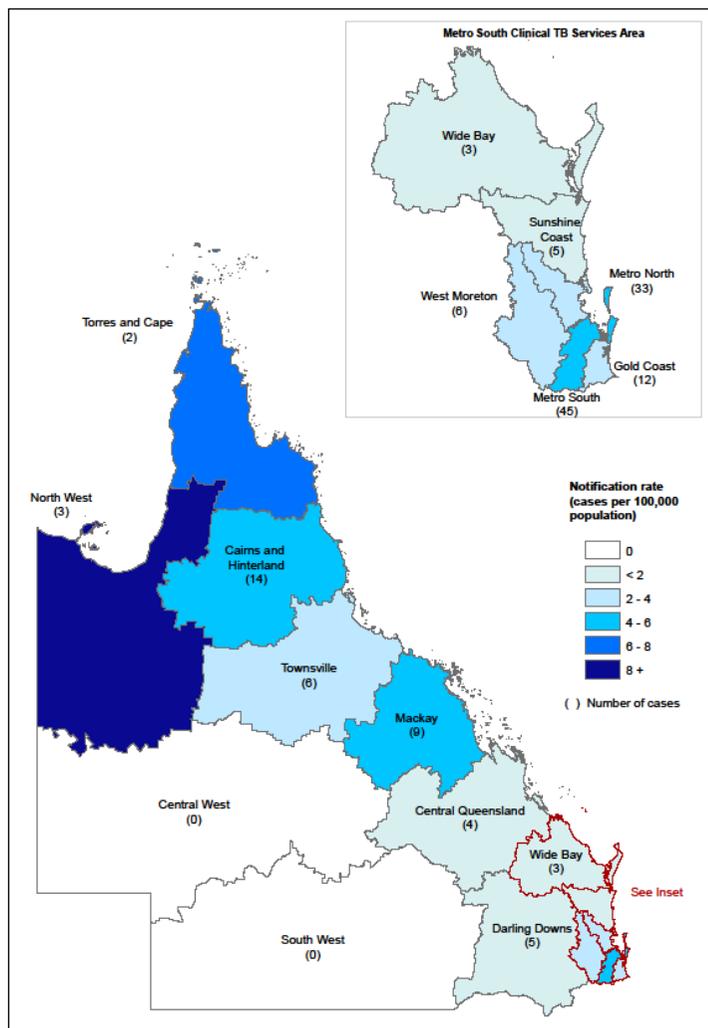


Figure 2: Number of cases and annual notification rate of TB by HHS of residence, Queensland, 2013

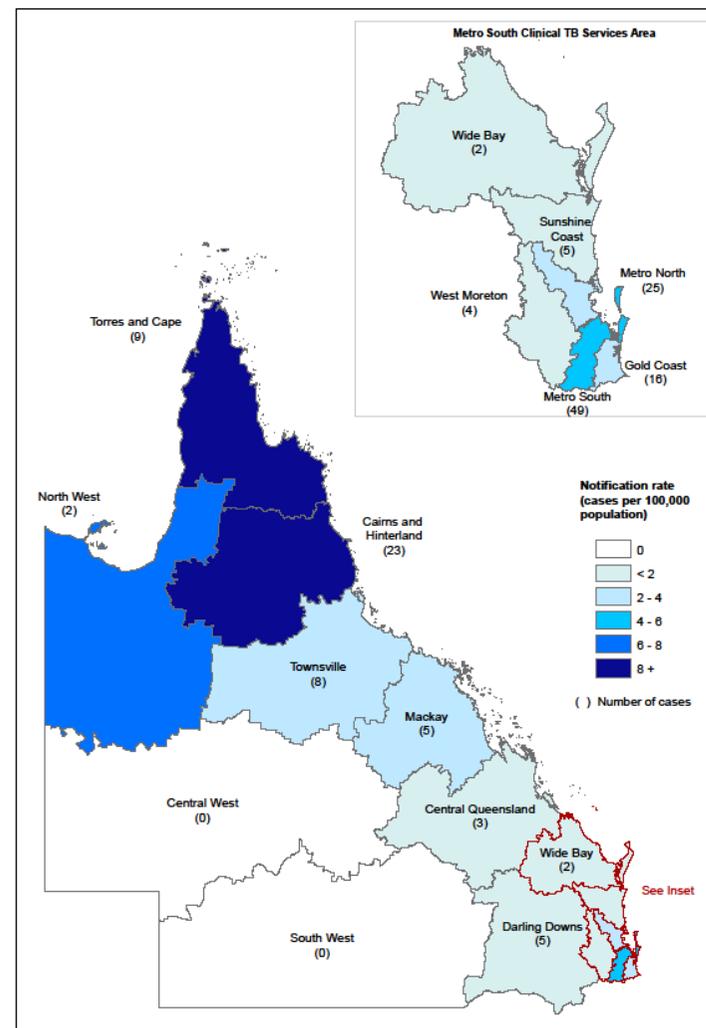
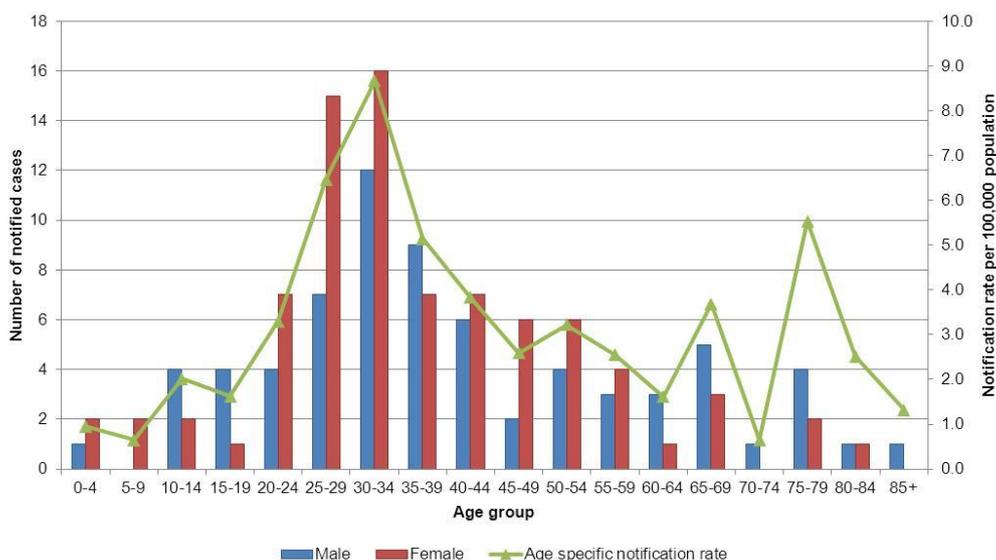


Figure 3: Number of cases and annual notification rate of TB by HHS of residence, Queensland, 2014

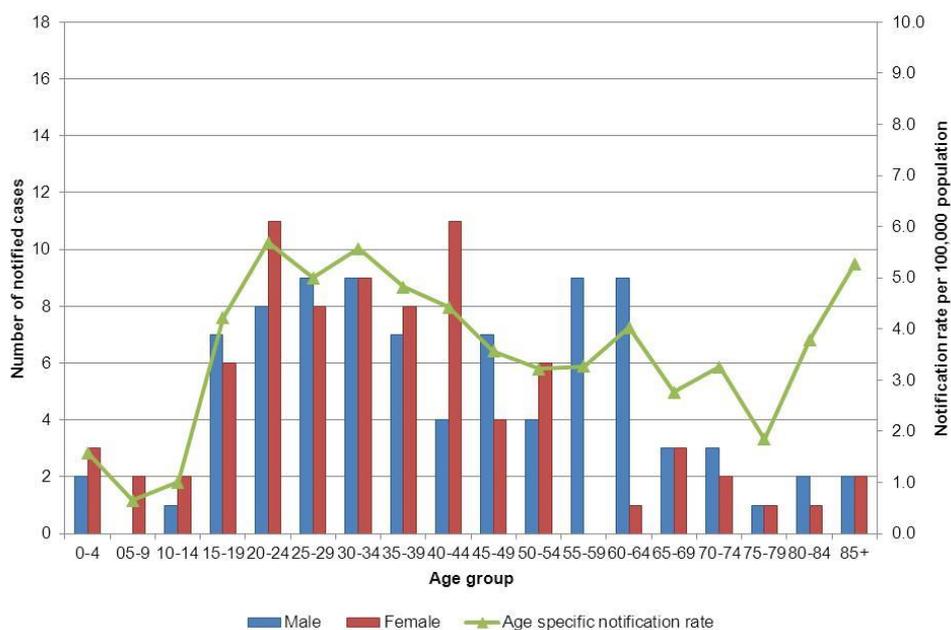
### 3. Demographic characteristics

#### Age and sex

In 2013-14, the age of cases at onset of disease ranged from three weeks to 91 years, with a median age of 36 years. In 2013-14, 51 per cent of TB cases were female. In 2013, cases occurred most frequently in the 30-34 year age group (Figure 4), whilst in 2014 the modal age group was the 20-24 year age group, closely followed by the 30-34 year age group (Figure 5).



**Figure 4: Number of TB cases and notification rate by sex and age group at onset of disease, Queensland, 2013**



**Figure 5: Number of TB cases and notification rate by sex and age group at onset of disease, Queensland, 2014**

## Aboriginal and Torres Strait Islander Queenslanders

There were 28 notifications of TB in Aboriginal and Torres Strait Islander people in 2013-14. Aboriginal and Torres Strait Islander people accounted for six per cent of Queensland's TB cases in 2013 and 18 per cent of TB cases in 2014 (Table 2). The increase in TB cases that identified as Torres Strait Islander in 2014 was likely the result of extensive contact tracing activities undertaken related to the identification of a cluster of cases in the Torres Strait.

**Table 2: TB notifications by Aboriginal and/or Torres Strait Islander origin, Queensland, 2010-14**

Indigenous status	2010	2011	2012	2013	2014	2010-14 Average
Aboriginal but not Torres Strait Islander origin	6 (3%)	8 (4%)	11 (6%)	5 (3%)	4 (2%)	6.8 (4%)
Torres Strait Islander but not Aboriginal origin	2 (1%)	3 (1%)	4 (2%)	5 (3%)	14 (8%)	5.6 (3%)
Both Aboriginal and Torres Strait Islander origin	1 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.2 (0%)
Neither Aboriginal nor Torres Strait Islander origin	175 (94%)	208 (94%)	155 (91%)	143 (93%)	149 (89%)	166.0 (92%)
Not Stated / Unknown	2 (1%)	2 (1%)	1 (1%)	0 (0%)	0 (0%)	1.0 (1%)
<b>Total</b>	<b>186 (100%)</b>	<b>221 (100%)</b>	<b>171 (100%)</b>	<b>153 (100%)</b>	<b>167 (100%)</b>	<b>179.6 (100%)</b>

The annual notification rate of TB in Queensland's Aboriginal and Torres Strait Islander population ranged from 4.9 to 9.1 cases per 100,000 population in 2010-14 (Table 3)\*. Notification rates in Indigenous Queenslanders in 2013 and 2014 were 1.6 and 2.7 times the annual notification rate for non-Indigenous Queensland residents respectively.

**Table 3: TB cases and annual notification rates for Aboriginal and Torres Strait Islander and non-Indigenous Queenslanders<sup>#</sup>, Queensland, 2010-14**

Indigenous status	2010	2011	2012	2013	2014 <sup>^</sup>
Aboriginal and Torres Strait Islander Queenslanders	9	11	15	10	18
<i>Rate (per 100,000 population)*</i>	4.9	5.8	7.8	5.0	9.1
Non-Indigenous Queenslanders	175	208	155	143	149
<i>Rate (per 100,000 population)<sup>#</sup></i>	4.1	4.9	3.5	3.2	3.3
<b>Rate ratio</b>	<b>1.2</b>	<b>1.2</b>	<b>2.2</b>	<b>1.6</b>	<b>2.7</b>

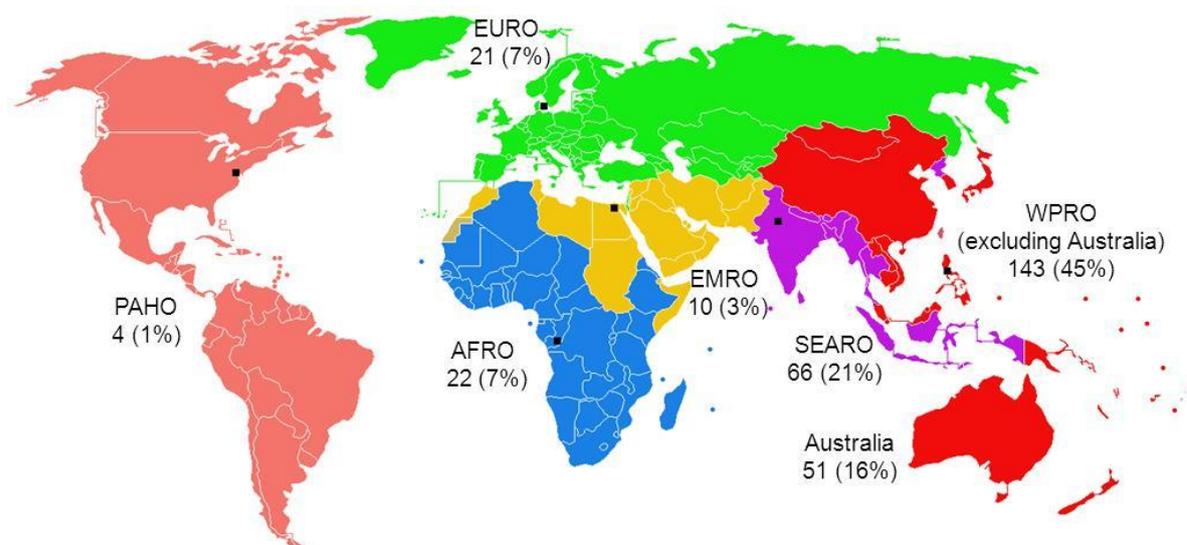
\* Notification rates for Aboriginal and Torres Strait Islander people were calculated using the Indigenous and Non-Indigenous Experimental Estimated Resident Population (ERP), Queensland (2010-2013)

<sup>^</sup> Rates for 2014 calculated using the 2013 Indigenous and Non-Indigenous Experimental ERP (Queensland)

<sup>#</sup> Cases where Aboriginal and/or Torres Strait Islander origin were unknown have been excluded.

## Country of birth

In 2013-14 the majority of cases were born overseas, with 51 cases (16 per cent) born in Australia and 267 cases (83 per cent) born overseas (country of birth was unknown for two cases). Overseas-born cases notified in Queensland were predominantly from the World Health Organization (WHO) Western Pacific Region (143 cases, 45 per cent, excludes Australian-born TB cases) (Figure 6).



**Figure 6: Number and proportion of TB cases notified by WHO region of birth\*, 2013-14**

\* Excludes 3 cases with unknown country of birth

Of the 320 cases in 2013-14, the most common country of birth was PNG (52 cases, 16 per cent). Other overseas countries where the highest number of cases were born included India (33 cases, 10 per cent), Philippines (33 cases, 10 per cent), China (12 cases, 4 per cent), Myanmar/Burma (11 cases, 3 per cent), Indonesia (10 cases, 3 per cent), and Vietnam (10 cases, 3 per cent). Of the 267 cases born overseas, 227 (85 per cent) were born in countries considered to have high prevalence of TB (estimated incidence rates of 60 cases per 100,000 population or higher) (7).

Australian born TB cases had a median age of 47 years (age range 3 weeks - 83 years), whilst overseas born TB cases had a median age of 34 years (age range 2 - 91 years).

## 4. Risk Factors

Overwhelmingly, migrating from a country considered high risk and/or visiting high risk countries were the most commonly reported risk factors in 2013-14 (Table 4). The proportion of cases reported as being a household or close contact with TB was higher in 2014 than 2013, however as noted in the 2011-12 report it is possible that this has been underreported in previous years (8).

**Table 4: Risk factors\*^ reported for TB cases, 2013-14**

Risk Factors*	2013	2014
Migrant from a high risk country <sup>#</sup>	113 (74%)	89 (53%)
Past travel to or residence > 3 months in a high risk country/countries <sup>#</sup>	46 (30%)	80 (48%)
Household member or close contact with TB	12 (8%)	33 (20%)
Diabetic	12 (8%)	10 (6%)
Currently or previously employed in the health industry	18 (12%)	22 (13%)
Current residence in a high risk country <sup>#</sup>	3 (2%)	9 (5%)
Alcohol or non-intravenous Drug abuse	4 (3%)	5 (3%)
Refugee	5 (3%)	5 (4%)
Steroids/immunosuppressive therapy	2 (1%)	6 (4%)
Major abdominal surgery	2 (1%)	5 (3%)
Australian-born child with 1 or more parents born in High Risk country	3 (2%)	1 (1%)
HIV positive	5 (3%)	0 (0%)
Immunosuppression due to Cancer (excluding skin cancer)	3 (2%)	2 (1%)
Renal failure	3 (2%)	2 (1%)
Ever homeless	0 (0%)	1 (1%)
Institutional living	0 (0%)	1 (1%)
Intravenous drug abuse	0 (0%)	1 (1%)
Pneumoconiosis	0 (0%)	1(1%)
Other risk factor	4 (3%)	3 (2%)
No known risk factors	3 (2%)	5 (3%)
Unknown risk factors or risk factors not assessed	7 (5%)	4 (2%)

\* Multiple risk factors may be recorded for each case

^ Risk factors other than country of residence have not routinely been collected on PNG residents diagnosed in the Torres Strait Protected Zone during 2013 or 2014

# High risk country defined as those with an annual TB incidence of 40/100,000 or more in 2011, as per estimates in WHO Global Tuberculosis Report 2012 at the time the data were collected (9).

## Visa status

Twenty cases (13 per cent) and 32 cases (19 per cent) notified in Queensland in 2013 and 2014 respectively, were born in Australia. The largest proportion of cases diagnosed with TB was in Australian permanent residents (51 per cent in 2013 and 43 per cent in 2014). Of particular note was the continued decrease post 2011 of the number of cases of PNG residents diagnosed in the Australian Torres Strait islands in the Torres Strait Protected Zone (Table 5). The number and proportion of overseas visitors and students, refugees and people on other visas remained similar to the five-year average.

**Table 5: Visa status of TB cases in Queensland, 2010-14**

Visa status	2010	2011	2012	2013	2014	2010-14 Average
Australian born	18 (10%)	30 (14%)	33 (19%)	20 (13%)	32 (19%)	26.6 (15%)
Overseas born, Australian citizens and permanent residents	58 (31%)	60 (27%)	56 (33%)	78 (51%)	71 (43%)	64.6 (36%)
Treaty Visitation Rights (PNG national in Torres Strait Protected Zone)	44 (24%)	47 (21%)	21 (12%)	3 (2%)	9 (5%)	24.8 (14%)
Refugee/Humanitarian	6 (3%)	10 (5%)	6 (4%)	5 (3%)	6 (4%)	6.6 (4%)
Overseas Visitor	12 (6%)	19 (9%)	17 (10%)	9 (6%)	14 (8%)	14.2 (8%)
Overseas Student	34 (18%)	33 (15%)	14 (8%)	13 (8%)	20 (12%)	22.8 (13%)
Unauthorised Person	2 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.4 (0%)
Other	11 (6%)	21 (10%)	18 (11%)	15 (10%)	14 (8%)	15.8 (9%)
Unknown	1 (1%)	1 (0%)	6 (4%)	10 (7%)	1 (1%)	3.8 (2%)
<b>Total</b>	<b>186 (100%)</b>	<b>221 (100%)</b>	<b>171 (100%)</b>	<b>153 (100%)</b>	<b>167 (100%)</b>	<b>179.6 (200%)</b>

## Period of residence prior to diagnosis

Of the overseas born TB cases notified in 2013-14, 19 per cent and 20 per cent respectively were diagnosed within one year of arrival to Australia (Table 6). A total of 102 cases were diagnosed at least five years after their arrival in Australia in with 55 (41 per cent) of these during 2013 and 57 (43 per cent) during 2014.

**Table 6: Period in Australia prior to TB diagnosis, 2010-14**

Visa status	2010	2011	2012	2013	2014	2010-14 Average
New arrivals - diagnosed within one year from arrival	57 (38%)	83 (44%)	40 (29%)	25 (19%)	26 (20%)	46.2 (31%)
Diagnosed within 1-2 years from arrival	22 (14%)	14 (7%)	12 (9%)	8 (6%)	11 (8%)	13.4 (9%)
Diagnosed within 2-5 years from arrival	29 (19%)	46 (24%)	26 (19%)	28 (21%)	19 (14%)	29.6 (20%)
Diagnosed more than 5 years from arrival	27 (18%)	37 (19%)	40 (29%)	55 (41%)	57 (43%)	43.2 (29%)
Unknown arrival date	17 (11%)	10 (5%)	19 (14%)	18 (13%)	19 (14%)	16.6 (11%)
<b>Total*</b>	<b>152 (100%)</b>	<b>190 (100%)</b>	<b>137 (100%)</b>	<b>134 (100%)</b>	<b>132 (100%)</b>	<b>149.0 (100%)</b>

\*Excludes Australian born TB cases and those with an unknown country of birth

Over the period 2010 to 2014, there has been a decrease in the number of TB cases that are new arrivals (diagnosed within one year of arrival in Australia) and an increase in the number of cases diagnosed more than five years after arriving in Australia.

## Human immunodeficiency virus co-infection

The proportion of TB cases tested for HIV was 76 per cent and 75 per cent in 2013 and 2014, respectively (Table 7). There were five cases (3 per cent) found to be co-infected with HIV at diagnosis in 2013 and no cases in 2014.

**Table 7: HIV testing amongst TB cases, Queensland, 2010-14**

HIV testing history	2010	2011	2012	2013	2014	2010-14 Average
Tested	145 (78%)	181 (82%)	132 (77%)	116 (76%)	126 (75%)	140.0 (78%)
Not tested	20 (11%)	39 (18%)	36 (21%)	32 (21%)	23 (14%)	30.0 (17%)
Unknown testing history	21 (11%)	1 (0%)	3 (2%)	5 (3%)	18 (11%)	9.6 (5%)
<b>Total</b>	<b>186 (100%)</b>	<b>221 (100%)</b>	<b>171 (100%)</b>	<b>153 (100%)</b>	<b>167 (100%)</b>	<b>179.6 (100%)</b>

## TB in health care workers

Thirty-nine cases (12 per cent) of TB cases in 2013-2014 reported having worked in a health care facility prior to their diagnosis with TB. Of these, 35 cases (90 per cent) were healthcare workers (HCW), with 4 cases (10 per cent) working as non-healthcare workers. Four cases in health care workers were born in Australia (11 per cent) and 31 cases were born overseas (89 per cent); with 23 of the 31 overseas born cases born in a country with a an annual estimated TB incidence of at least 60 cases per 100,000 population.

Twenty cases were identified as working as HCWs in Australian healthcare facilities at or within the 12 months prior to diagnosis, of which four cases were deemed likely to have been infectious. Contact tracing was undertaken by TB Control Units in healthcare settings where a HCW or patient was considered infectious (or where

vulnerable populations were involved); no cases of active TB were identified where transmission from a HCW within a healthcare setting was suspected.

No cases in HCW were identified as likely to have acquired tuberculosis in a Queensland healthcare facility in 2013 or 2014.

## 5. Diagnosis and clinical details

In 2013, 147 cases (96 per cent) diagnosed with TB were new cases and five cases were relapse cases following past treatment of TB. This information was unknown for one case. Of the 5 cases, 3 relapsed following full or partial treatment overseas, 1 relapsed following partial treatment in Australia and 1 relapsed following full treatment in Australia. In 2014, 158 cases (95 per cent) diagnosed were new cases; seven cases relapsed following full or partial treatment overseas. There were no relapse cases that had previously been treated in Australia. This information was unknown for two cases. Previous history of TB treatment was reported for four additional cases in 2013-14 who were not classified as relapse cases (may have included treatment for latent TB).

In 2013-14, diagnosis primarily followed consultation with a general practitioner or specialist as a result of clinical symptoms (163 cases, 51 per cent). Fifty-nine cases (18 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 (25 cases) and contact screening of household and other close contacts (15 cases). Fifty-five cases (17 per cent) had an incidental diagnosis of TB, and reason for diagnosis was unknown for 43 cases (13 per cent).

### Site of disease

#### **Pulmonary and extra-pulmonary disease**

In 2013-14, 173 cases (54 per cent) had pulmonary disease only, 34 cases (11 per cent) had pulmonary disease plus other sites, and 113 cases (35 per cent) had extra-pulmonary disease only.

#### **Extra-pulmonary disease**

There were 147 cases (46 per cent) reported to have TB disease elsewhere than the lungs (including 34 cases with concurrent pulmonary TB). The most common extra-pulmonary sites recorded were lymph nodes (44 per cent of cases reporting extra-pulmonary sites of disease) and pleural (18 per cent) (Table 8).

**Table 8: Sites of TB disease in cases reported with extra-pulmonary disease, Queensland, 2013-14**

Site of disease	Number and proportion of cases reporting extra-pulmonary disease*
Lymph node	64 (44%)
Pleural	27 (18%)
Bone/joint	7 (5%)
Miliary (with millet seed appearance on CXR)	6 (4%)
Gastro-intestinal tract	5 (3%)
Soft tissue abscesses	5 (3%)
Peritoneal	4 (3%)
Abdominal	4 (3%)
Disseminated (systemic symptoms)	3 (2%)
Genitourinary	3 (2%)
Meningeal	3 (2%)
Central nervous system	2 (1%)
Skin	2 (1%)
Other	22 (15%)

\*Multiple sites of disease may be reported for one case

## 6. Laboratory testing

Of the 320 TB cases notified in 2013 and 2014, 282 (88 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 (4)). Of these, 269 cases were confirmed by culture and 13 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. Thirty-eight clinically diagnosed cases (12 per cent) were unable to be laboratory confirmed.

### Pulmonary cases

Of the 192 laboratory confirmed pulmonary cases (including those with pulmonary TB plus other sites of disease) in 2013-2014, 164 cases (85 per cent) were sputum culture positive. An additional 27 cases (14 per cent) had a positive culture result from a specimen other than sputum (but were not positive on sputum culture); 21 cases from bronchoscopy, 1 case from a gastric aspirate, and 5 cases only from other non-pulmonary sites. One pulmonary case (one per cent) was confirmed by nucleic acid testing only.

Of the laboratory confirmed pulmonary cases, 92 cases (48 per cent) were sputum smear positive (acid fast bacilli [AFB] detected by microscopy). An additional 22 cases (11 per cent) had AFBs detected by microscopy from a specimen other than sputum (but were not positive for AFBs on sputum); 13 cases from bronchoscopy, 1 case from a gastric aspirate, and 8 cases from other non-pulmonary sites. One of the 15 pulmonary cases without laboratory confirmation was positive for AFBs on microscopy. One of the clinical cases without laboratory confirmation or smear positivity had histology suggestive of TB.

### Extra-pulmonary cases

Of the 90 laboratory confirmed extra-pulmonary cases in 2013-14, 78 (88 per cent) were culture positive. Twelve extra-pulmonary cases (13 per cent) were confirmed by nucleic acid testing only.

Of the laboratory confirmed extra-pulmonary cases, 22 cases (24 per cent) had AFBs detected by microscopy. Two of the 23 clinical extra-pulmonary cases without laboratory confirmation were positive for AFBs on microscopy. Eight of the clinical cases had histology suggestive of TB.

### Drug susceptibility testing

All 269 culture confirmed TB cases in 2013-14 had drug susceptibility testing (DST) results available. 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 2013-14, 229 cases (86 per cent) had fully sensitive *M. tuberculosis* complex identified (Table 9). Nineteen (seven per cent) were resistant to isoniazid but not rifampicin, four cases were resistant to rifampicin but not isoniazid and 10 cases (four per cent) were identified to have other resistance patterns but were not resistant to isoniazid or rifampicin.

**Table 9: Drug susceptibility testing of culture positive TB cases by site of disease, 2013-14**

Drug susceptibility testing	Pulmonary (including those with other sites)	Extra-pulmonary disease only	Total
Fully sensitive	158 (83%)	71 (91%)	<b>229 (86%)</b>
Isoniazid (H) resistance (but sensitive to rifampicin [R])	15 (8%)	4 (5%)	<b>19 (7%)</b>
Rifampicin (R) resistance (but sensitive to isoniazid [H])	3 (2%)	1 (1%)	<b>4 (1%)</b>
Other resistance (but sensitive to isoniazid [H] and rifampicin [R])	8 (4%)	2 (3%)	<b>10 (4%)</b>
Multi-drug resistance (resistant to isoniazid [H] and rifampicin [R])	7 (4%)	0 (0%)	<b>7 (3%)</b>
<b>Total</b>	<b>191 (100%)</b>	<b>78 (100%)</b>	<b>269 (100%)</b>

Multi-drug resistant TB (MDR-TB) is defined as resistance to isoniazid and rifampicin, with or without resistance to other first-line drugs (10). Seven cases (3 per cent) were considered to be multi-drug resistant TB (MDR-TB); all of which had had pulmonary disease. There were three different resistance profiles seen in the seven MDR-TB cases (Table 10). There were no cases of extensively drug resistant TB (XDR-TB) or pre-XDR TB in 2013-2014.

Six of the seven MDR-TB cases were born overseas, five in PNG, and one in Vietnam. One case was Australian born. Three of the five cases born in PNG were PNG residents diagnosed with TB in the Torres Strait Protected Zone. The remaining two were permanent residents of Australia at TB diagnosis. Four of the PNG born cases and the Australian born MDR-TB case were identical in the 26 loci VNTR-MIRU typing, with the other PNG born MDR-TB case having a closely related genotype differing at one loci. The Vietnam born MDR-TB case had distinctive VNTR-MIRU typing compared to the other MDR-TB cases.

Of the 41 Australian born TB cases with DST results available, 36 cases (88 per cent) were fully sensitive, one case (2 per cent) was resistant to isoniazid but not rifampicin, three cases (7 per cent) were resistant to other drugs but not to isoniazid or rifampicin, and one case was MDR-TB.

**Table 10: Antibiotic resistance profiles of MDR-TB cases by country of birth, 2013-14**

Antibiotic susceptibility profiles*													Country of birth			
AK	CAP	CYC	E	ETD	H.1	H.4	KAN	OFL	PAS	Z	R	S	Australia	PNG	Vietnam	Total
S <sup>#</sup>	S	S	S	R	R	R	S	S	S	S	R	R	1	-	-	1
S	S	S	S	R	R	R	S	S	S	R	R	R	-	3	1	4
S	S	S	R	R	R	R	S	S	S	R	R	R	-	2	-	2
<b>Total MDR-TB cases</b>													<b>1</b>	<b>5</b>	<b>1</b>	<b>7</b>

\*Antibiotic abbreviations shown in Abbreviations table (page 22)

<sup>#</sup>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 to begin treatment and for the opportunity for a treatment outcome to be recorded for the majority of cases. This report will cover outcomes from TB cases notified in 2012-13. Treatment outcomes for 2014 will be reported in subsequent years. Treatment outcomes are defined by the National Notifiable Diseases Surveillance System dataset (Appendix 2).

Of the 324 notified cases in 2012-2013, 254 (78 per cent) completed treatment (including demonstrating cure), 41 cases (13 per cent) were transferred out of Australia, 13 cases (4 per cent) died prior to the completion of treatment, and 11 cases (3 per cent) defaulted from treatment (Table 11).

**Table 11: Treatment outcome for notified TB cases, 2012-13**

Treatment outcome	2012	2013	Total
Cured (bacteriologically confirmed)	10 (6%)	11 (7%)	21 (6%)
Completed treatment	116 (68%)	118 (77%)	234 (72%)
Completed treatment (with interruption > 2months)	0 (0%)	1 (1%)	1 (0%)
Defaulted from treatment	7 (4%)	4 (3%)	11 (3%)
Treatment failure	1 (1%)	0 (0%)	1 (0%)
Died of TB	4 (2%)	3 (2%)	7 (2%)
Died of other cause	4 (2%)	2 (1%)	6 (2%)
Transferred out of Australia	28 (16%)	13 (8%)	41 (13%)
Not followed up, outcome unknown	1 (1%)	1 (1%)	2 (1%)
<b>Total</b>	<b>171 (100%)</b>	<b>153 (100%)</b>	<b>324 (100%)</b>

One case in 2012 was classified as treatment failure. This case was partially treated in Australia for fully sensitive TB. During their treatment they were re-infected with MDR-TB (re-infection rather than relapse with the acquired antibiotic resistance - as demonstrated by VNTR-MIRU genotyping).

## Outcomes for MDR-TB cases

Treatment outcomes for the 12 cases of MDR-TB notified in 2012-13 are shown in Table 12. Two cases completed treatment for MDR-TB. All seven cases transferred out of Australia were in the Torres Strait Protected Zone and transferred back to PNG to complete treatment. The case that defaulted from treatment returned to PNG however was not formally transferred out. Both cases that died of TB died prior to their diagnosis of MDR-TB.

**Table 12: Treatment outcomes for MDR-TB cases, 2012-13**

Treatment outcome for MDR-TB cases	2012	2013	Total
Completed treatment	2 (20%)	0 (0%)	2 (17%)
Defaulted from treatment	1 (10%)	0 (0%)	1 (8%)
Died of TB	1 (10%)	1 (50%)	2 (17%)
Transferred out of Australia	6 (60%)	1 (50%)	7 (58%)
<b>Total</b>	<b>10 (100%)</b>	<b>2 (100%)</b>	<b>12 (100%)</b>

## Deaths in TB cases

Thirteen TB cases notified in 2012-13 died before completion of a course of TB treatment, of which seven were considered to have died from TB and six died of other causes. Of the seven cases considered to have died of TB, all had pulmonary disease (with or without other sites of disease). Four cases were diagnosed post mortem, with the remaining cases having between three weeks and three months of TB treatment. Two cases were Australian born, three cases were permanent residents of Australia (arrived at least eight years prior to diagnosis), and one case was a PNG resident diagnosed in the Torres Strait Protected Zone (visa status was unknown for one case).

## 8. Discussion

The overall rate of TB in Queensland remains low by global standards. The number of TB cases decreased by 18 per cent from 2011-12 (392 cases) to 2013-14 (320 cases), with a notification rate of 3.6 cases per 100,000 population in 2014. The majority of TB cases notified in Queensland were born in a high risk country for TB, though this was a slightly lower proportion of the overseas born cases than reported in the 2011-12 report. However, for this report, an estimated annual incidence cut off of 60 cases per 100,000 population has been used compared to the 40 cases per 100,000 population cut off used in 2011-12. This change in reporting has been made to improve consistency between national and Queensland reporting, in line with the National Notifiable Disease System Dataset for Tuberculosis. For comparison to 2011-12, 87 per cent of overseas born cases were born in countries with a TB incidence of 40 cases per 100,000 population in 2013-14 compared to 92 per cent of overseas born cases in 2011-12.

Although rates of TB in Aboriginal and Torres Strait Islander Queenslanders are low on a global scale they continue to be 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 (11). In 2014 the disparity was more pronounced than the previous five years with the notification rate in Indigenous Queenslanders being 2.7 times the notification rate for non-Indigenous Queensland residents. This was likely the result of TB cases identified through contact tracing activities undertaken as the result of the identification of a cluster of cases in the Torres Strait. Some cases were diagnosed on clinical evidence only with no laboratory confirmation which may not have been identified without the extensive contact tracing investigation undertaken.

The decrease in the number of cases of PNG residents diagnosed in the Australian Torres Strait islands in the Torres Strait Protected Zone continued in 2013-14, likely the result in the changes to the management of cross-border TB cases, as reported in the 2011-12 report (8). This decrease is also likely a key factor in the number and proportion of TB cases amongst new arrivals (cases diagnosed within one year of arrival in Australia) over the period 2010 to 2014, as PNG residents diagnosed in the Torres Strait Protected Zone are classified as new arrivals as they are on three week visas under the *Torres Strait Treaty Act*. This reduction has resulted in an increase in the proportion of cases diagnosed more than five years after arriving in Australia, and an increase in the proportion of cases who are permanent residents of Australia at diagnosis. The scale up of offshore pre-migration screening may also have contributed to the reduction of TB cases in new arrivals as more migrants may have been diagnosed and treated prior to arriving in Australia (12).

The number of cases where there was a household or close contact with a TB case was higher in 2013-14 (9 per cent and 20 per cent respectively), compared to 3 per cent during 2011-12. This is likely due to increased accuracy of reporting than an actual increase in the proportion who are infected due to close contact with a TB case given Australia's low incidence of TB.

Co-infection with TB and HIV remains low with five cases (2 per cent) diagnosed over 2013-14. Queensland and international guidelines recommend all TB cases should be tested for HIV (13-14). 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 (15). Seventy-six per cent of TB cases in Queensland were tested for HIV at or around the time of diagnosis in 2013-14, a slight decrease from the 80 per cent tested in 2011-12.

Queensland maintained a high level of laboratory confirmation (88 per cent) of TB cases, with 98 per cent of these confirmed by culture. Isolation of *M. tuberculosis* complex by culture remains the gold standard in TB diagnosis (16). DST was performed for all cases where *M. tuberculosis* complex was isolated. 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 (17). In 2013-14, three per cent of cases were identified as MDR-TB. All MDR-TB cases were pulmonary (with or without other sites) and all had rifampicin resistance identified early prior to culture as a result of GeneXpert testing. No pre-XDR or XDR-TB was identified in 2013-14. Increased use of VNTR-MIRU genotyping and whole genome sequencing will provide further evidence and knowledge on TB transmission in Queensland.

Treatment outcomes were known for 83 per cent and 91 per cent of cases in 2012 and 2013 respectively. This was an increase on the 75 per cent of TB cases with known outcomes notified in 2011 that was reported in the 2011-12 report (8). This is likely due to the decrease in cases transferred out of Australia. Where an outcome was known, 91 per cent of cases over the two year period completed treatment (without interruption, and with or without bacteriological evidence of cure).

The rate of TB in Queensland remains low compared to other states of Australia and against a global comparison. A high proportion of cases during 2013-14 had a laboratory diagnosis and drug susceptibility testing results, with the use of molecular techniques to provide early identification and guidance for treatment of MDR-TB cases during 2013-14 increasing. Treatment completion and outcomes in most cases diagnosed are very good, particularly given the extended period of chemotherapy required in comparison to other communicable diseases. Ongoing surveillance and quality TB control activities remains of significant public health importance given Australia's geographical position and population demographics, particularly in regards to the threat of MDR-TB and XDR-TB in the Western Pacific Region.



## Appendix 2 - TB Outcomes

### NNDSS Field: TB\_Outcomes

#### Patient outcomes after anti-tuberculosis treatment (18)

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)
BCG	Bacillus Calmette-Guérin
DST	Drug susceptibility testing
EMRO	Regional Office for the Eastern Mediterranean (World Health Organization)
ERP	Estimated resident population
EURO	European Regional Office (World Health Organization)
HIV	Human Immunodeficiency Virus
HCW	Healthcare worker
HHS	Hospital and Health Service
LTB	Latent tuberculosis infection
MDR-TB	Multi drug resistant tuberculosis
MSCTBS	Metro South Clinical TB Services
NoCS	Notifiable Conditions System
PAHO	Pan American Health Organization
PNG	Papua New Guinea
SEARO	South-East Asia Regional Office (World Health Organization)
TB	Tuberculosis
TBCU	TB Control Unit
WHO	World Health Organization
WPRO	Western Pacific Regional Office (World Health Organization)
XDR-TB	Extensively drug resistant tuberculosis

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Tuberculosis in Queensland – 1 January 2013 – 31 December 2014

- 27 -