

South Island tuberculosis infection

**An analysis of notifications (2001-2015)
Incidence 2016-2017 (Appendix)**



Canterbury
District Health Board
Te Pōari Hauora o Waitaha

Prepared by the Information Team
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Foreword

This report on tuberculosis has been produced to improve understanding of its local epidemiology in order to assist with its public health management.

Document availability

This document is available on the Community and Public Health website:
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Summary points

Main findings

- There were 428 confirmed new cases of tuberculosis (TB) in the South Island between 2001 and 2015. Analyses were limited to *confirmed* new cases because they comprised the largest proportion of new cases (86%) and because of their diagnostic certainty. There were only 50 new cases classified as probable and 35 confirmed relapse or reactivation notifications in the South Island in that time period.
- TB incidence and hospitalisation rates in the South Island were approximately half the New Zealand rates.
- No other species apart from *Mycobacterium tuberculosis* was identified from the South Island data. Less than two percent nationally were *M. bovis*.
- Forty percent of cases born overseas had only extra-pulmonary TB compared with 19 percent of cases born in New Zealand.
- Notification rates were highest among those in the 20-29 years and 30-39 years age groups. The rate of notifications among males was 1.4 times that of females.
- TB rates for 2011-2015 were highest for those of Indian ethnicity, with 34.2 cases per 100,000 population per year, compared with other (non-Chinese) Asian (7.7 cases) and Pacific peoples (4.5 cases).
- Seventy percent of cases were born outside New Zealand, of whom 86 percent were from a high incidence country (greater than 40 cases per 100,000 per year). Forty three percent of notifications were persons born in India, China or the Philippines. From 2011 to 2015 the mean annual rate of TB in the Indian ethnic group was 102.7 per 100,000 population compared with 2.2 for Māori and 0.7 for European.
- Incidence varied depending on migration trends. From 2001 to 2003 only four percent of cases born outside New Zealand were from India compared with 43 percent from 2013 to 2015.
- Of immigrants who developed TB disease after arrival in New Zealand, 46 percent had an onset within two years and 68 percent within five years. Tuberculosis among refugees and migrants is not considered to be an important source of TB for most New Zealand-born populations.
- Incidence was highest among those living in the most socioeconomically deprived neighbourhoods, and was four times the incidence in the least socioeconomically deprived areas. The rate in urban areas was three times that in rural areas.
- Fifty three percent of cases were in paid employment, with rates highest among Labourers and lowest among Managers.
- The greatest risk factor was being born outside New Zealand. Twenty percent of notifications had contact with a confirmed case.
- There were only four outbreaks in the South Island from 2001-2015. The largest occurred in Canterbury and involved 12 cases with transmission mostly occurring in household settings.

Comments

The major TB problem for the past 15 years in both South and North Islands, has been the development of clinical disease in a significant proportion of people arriving from high incidence countries. It has been estimated that between 25-50 percent of immigrants from countries with a TB rate greater than 15 per 100,000 population have latent TB infection (LTBI) (1, 2) that predisposes them to disease in the years after arrival.

This problem is not unique to New Zealand. In the United States, two thirds of all TB cases occur among foreign-born persons and after two decades of annual decline, the incidence in 2013-2015 plateaued (3). The United States (4), like the United Kingdom (5, 6), have programmes to address the problem, and in 2014 Canada made recommendations for targeted screening for LTBI among certain immigrants (7). So far New Zealand has yet to update its approach but with record immigration in 2016 (8) and the spectre of an increasing number of notifications coupled with the likelihood of resistant strains, the need to address the problem is now greater than ever.

Recommendations

An appropriate starting point would be a comprehensive national review of the current situation and an evaluation of the appropriateness of internationally recommended interventions in a New Zealand context. The authors of the 2010 New Zealand Tuberculosis Guidelines (9) foresaw the need for a properly developed programme involving enhanced screening for LTBI in immigrants with follow-up prophylaxis. They stated that "... any new programme needs to be adequately planned and resourced, to ensure adequate follow-up of medication side effects and adherence." Other authorities have referred to programmes also needing to include novel strategies, be culturally sensitive, be able to access all at-risk foreign-born groups, and possibly be integrated into primary care where a long-term trusting relationship can be established (1). The local public health response to notified cases needs to remain culturally appropriate and to take into account the particular needs of and challenges faced by recent immigrant people.

A successful programme would improve the quality of life of many people in the long term by reducing the likelihood of disease while allowing them to continue to contribute to society without the perceived stigma associated with clinical TB. A proactive approach involving a well thought out programme may not be easy or inexpensive but should in the long term reduce health system costs.

Introduction

The global situation

Tuberculosis (TB) is a multisystem disease principally spread by respiratory droplets and historically associated with poverty and overcrowding (10). It has various presentations and manifestations, and is a leading cause of death from communicable disease worldwide (10). Approximately one third of the world's population is infected with *Mycobacteria tuberculosis* although only approximately 10 percent of those infected will ever become sick with TB (11). In 2015 there were estimated to be 10.4 million new TB cases and 1.7 million deaths, including 0.4 million with HIV (11).

Globally in 2015 an estimated 480,000 people developed moderately drug-resistant TB (MDR-TB¹), an additional 100,000 developed rifampicin-resistant TB (RR-TB), and 250,000 died as a result of MDR/RR-TB (12). Extensively drug-resistant TB (XDR-TB²) was reported by 117 countries in 2015. On average, an estimated 9.5 percent of people with MDR-TB have XDR-TB (12). Fourteen countries including India and China have not only high rates of TB but also high rates of MDR-TB and HIV co-infection (13). This is a concern for New Zealand because of the relatively high number of immigrants from these countries (14).

The New Zealand situation

New Zealand has low rates of TB, MDR-TB, and HIV co-infection (15). However, TB remains a commonly notified disease in New Zealand, although the overall rate of active disease is low (6.3 per 100,000 in 2015) (16) compared with most other countries (17) (**Figure 1**). The large majority (approximately 96%) of TB notifications in New Zealand are new cases as opposed to relapsed cases or reactivations.

The two most common risk factors for TB in New Zealand, with each being reported for approximately 70 percent of notifications have been being born outside of New Zealand, and current or recent residence in a household with person(s) born outside New Zealand (18, 19). Approximately 68 percent of TB disease among immigrants occurs within the first five years of arriving in New Zealand (15) but few New Zealand-born cases result from them (18). There are comparatively few new TB cases associated with exposure in a healthcare setting or recent residence in an institution (19).

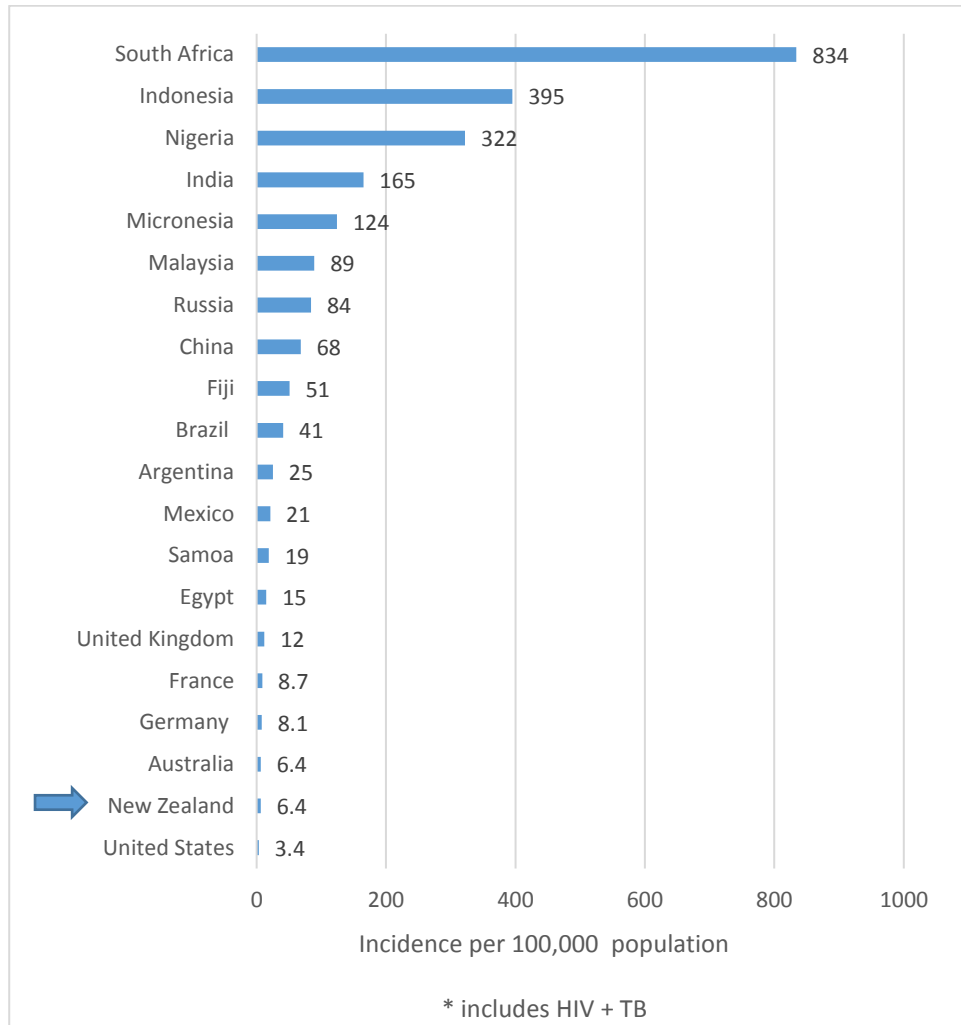
TB and HIV co-infection are uncommon in New Zealand, with no cases in 2013 and only two in 2014 (15). During the last 10 years there have been a total of 31 cases of MDR-TB, giving an average annual rate of 1.3 percent among culture-positive TB cases. Only one case of XDR-TB has been identified in New Zealand, in 2010 (15).

The annual number of TB notifications in the Canterbury District Health Board (DHB) region has doubled since 2011 (16). The demographic characteristics of these cases are similar to those seen nationally. These high rates result in pressures on resources for contact tracing, testing, and treatment, and the problems are exacerbated because many cases do not have English as a first language. This report on the epidemiology of TB in the South Island is intended to contribute to earlier identification and improvement in management of those with the disease, and those at risk.

¹ Moderately drug-resistant TB (MDR-TB): resistant to at least isoniazid and rifampicin.

² Extensively drug-resistant TB (XDR-TB): MDR-TB plus resistance to any fluoroquinolone and one of the other three injectable anti-TB drugs, amikacin, kanamycin, or capreomycin.

Figure 1. Comparison of the incidence of tuberculosis* in New Zealand with other countries, 2014 (15-17)



Methods

Data

National TB data were retrieved from EpiSurv³ for the 15 years from 1 January 2001 to 31 December 2015 inclusive. Analyses have been provided for the South Island and New Zealand.

Notification classifications

Throughout this report, unless otherwise stated, the analysis of the data is limited to *confirmed new* cases of TB because of their relatively large number and their diagnostic certainty. The other EpiSurv diagnostic classifications (relapse or reactivation, latent infection [LTBI], and on preventive treatment) were not analysed but their incidence is briefly reviewed in a later section, **Notification classifications**.

Incidence and rates

Population estimates at 30 June 2001 to 2015 from Statistics New Zealand were used to calculate incidence and hospitalisation rates over time. In the section summarising hospitalisations, notifications with unknown (n=8 for the South Island and n=31 for New Zealand) or missing (n=2 for the South Island and n=22 for New Zealand) hospitalisation information were excluded from the analysis.

Demographic characteristics

To calculate rates of TB notification among different demographic groups, population count data from the 2006 Census were used, as this was deemed to be a suitable estimate for the mid-point of the time period. Prioritised ethnicity (Māori, Pacific, Chinese, Indian, Other Asian, Other, and European) was used. Ethnicity data were analysed only for the time period 2011–2015 inclusive, and 2013 Census population count data were used to estimate rates, as DHB-level prioritised ethnicity data were only available for the 2013 Census.

Cases were categorised as residing in either urban or rural locations using the Urban/Rural Profile 2006 (20), where urban areas consisted of main urban areas, satellite urban communities and independent urban communities; and rural areas consisted of rural areas with high urban influence, rural areas with moderate urban influence, rural areas with low urban influence, and highly rural/remote areas. In addition, the neighbourhood deprivation (NZDep2006) of the area where cases lived was categorised into quintiles (21). NZDep2006 is a small-area-based relative deprivation index based on nine socioeconomic variables from the 2006 Census. NZDep2006 scores are usually categorised into tenths (deciles), numbered from 1 (least deprived) to 10 (most deprived). NZDep2006 describes the socioeconomic deprivation experienced by groups of people in small areas and describes the general deprivation of an area. It does not describe the socioeconomic deprivation of an individual.

The occupation of each case, where recorded, was coded according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO v1.2, Level 1)⁴. Children and young people less than 17

³ EpiSurv is the national notifiable disease surveillance database operated by the Institute of Environmental Science & Research Ltd (ESR) on behalf of the Ministry of Health.

⁴ For a description of the occupations included in each category, see: www.stats.govt.nz/tools_and_services/ClassificationCodeFinder/ClassificationCodeHierarchy.aspx?classification=3781

years of age and/or school students, and tourists were not included in the analyses. It is important to note that the level at which occupation data is collected and coded in this dataset may be inconsistent, and results should be interpreted with this in mind. Rates were calculated using population counts for each occupation category for people 15 years of age and older, from the 2006 Census.

Risk exposures

The specific risk exposures analysed were taken from the 2014 Annual Tuberculosis Report from the Institute of Environmental Science & Research Ltd (ESR) (15).

Outbreaks and clusters

The outbreaks analysed were reported in the ESR reports: Annual summary of outbreaks (2001-2014), Tuberculosis reports (2007-2014), and Annual surveillance summaries (2001-2014) (19, 22, 23).

Notification classifications

In this report, only the data of confirmed new cases have been analysed in detail because they comprised the large majority of the notifications and because of their diagnostic certainty. ESR do not report nationally on notifications classified as either 'Latent tuberculosis infection' (but see **Discussion**) or 'Tuberculosis infection – on preventive treatment'. This latter category with only 11 notifications appears to be an anomalous historic classification for LTBI.

Between 2001 and 2015 there were a total of 843 TB notifications in the South Island including those classified as under investigation or unknown (**Table 1**). This represented 7.1 percent of the New Zealand total. In the South Island, 85.8 percent of new case TB notifications were classified as confirmed and 10 percent were probable, which were similar to national percentages. A distinguishing feature of the group diagnosed as probable compared with confirmed new cases was that they were younger with 16 percent aged less than 10 years compared with 1.9 percent.

The case status of 95 percent of South Island notifications classified as LTBI and 89 percent of national notifications were either under investigation or unknown. ESR do not report these notifications and in EpiSurv their status defaults to Under investigation. In the South Island, the 277 LTBI notifications were similar to confirmed new cases for ethnicity, the percentage born outside New Zealand and sex, but as a group were significantly younger with 60 percent aged less than 20 years including 30 percent aged less than 10 years. The LTBI cases in the Community and Public Health area were all on prophylaxis. There were 35 notifications of confirmed 'Tuberculosis disease - relapse or reactivation'. As a group compared with new cases they were older (37.1% aged 70 years and above compared with 13.6%), had a greater male predominance (69% compared with 58%) and ethnically comprised fewer Asian people (43% compared with 61%).

Table 1. South Island and New Zealand tuberculosis notifications by classification (2001-2015)

		South Island		New Zealand	
		n	%	n	%
New case	Confirmed	428	86	3830	82
	Probable	50	10	746	16
	Under investigation	17	3	67	1
	Unknown	4	1	12	0
		499	100	4655	100
Latent	Confirmed	4	1	570	8
	Probable	11	4	132	2
	Under investigation	201	69	3399	49
	Unknown	76	26	2769	40
		292	100	6870	100
On preventive treatment	Confirmed	0	0	21	12
	Probable	1	9	43	25
	Under investigation	4	36	22	13
	Unknown	6	55	88	51
		11	100	174	100
Relapse or reactivation	Confirmed	35	85	188	87
	Probable	3	7	22	10
	Under investigation	3	7	6	3
	Unknown	0	0	1	0
		41	100	217	100
Total		843		11,916	

Incidence and rates

Notifications

From 2001 to 2015, there were 3,830 confirmed TB notifications (new cases) nationally, with 428 in the South Island. Although the South Island has had a lower TB notification rate than New Zealand as a whole over the last 15 years, the rate in the South Island remained relatively stable, while it decreased nationally (**Figure 2**). The annual rate in Canterbury fluctuated between 1.6 to 5.3 per 100,000 population. For Southern DHB, the notification rate also fluctuated, but was consistently lower than in the South Island generally.

There were between zero and two TB cases reported annually in the West Coast and South Canterbury DHBs each year. In Nelson Marlborough DHB, notifications varied from one in 2002 to 11 in 2012, but were fewer than five in most years. Due to the very small numbers of notifications in these three DHBs, it is difficult to identify a trend over time. Therefore, the rates are not presented in **Figure 2**.

Figure 2. Annual tuberculosis notification rates per 100,000 population for the South Island, New Zealand, Canterbury DHB, and Southern DHB, 2001-2015



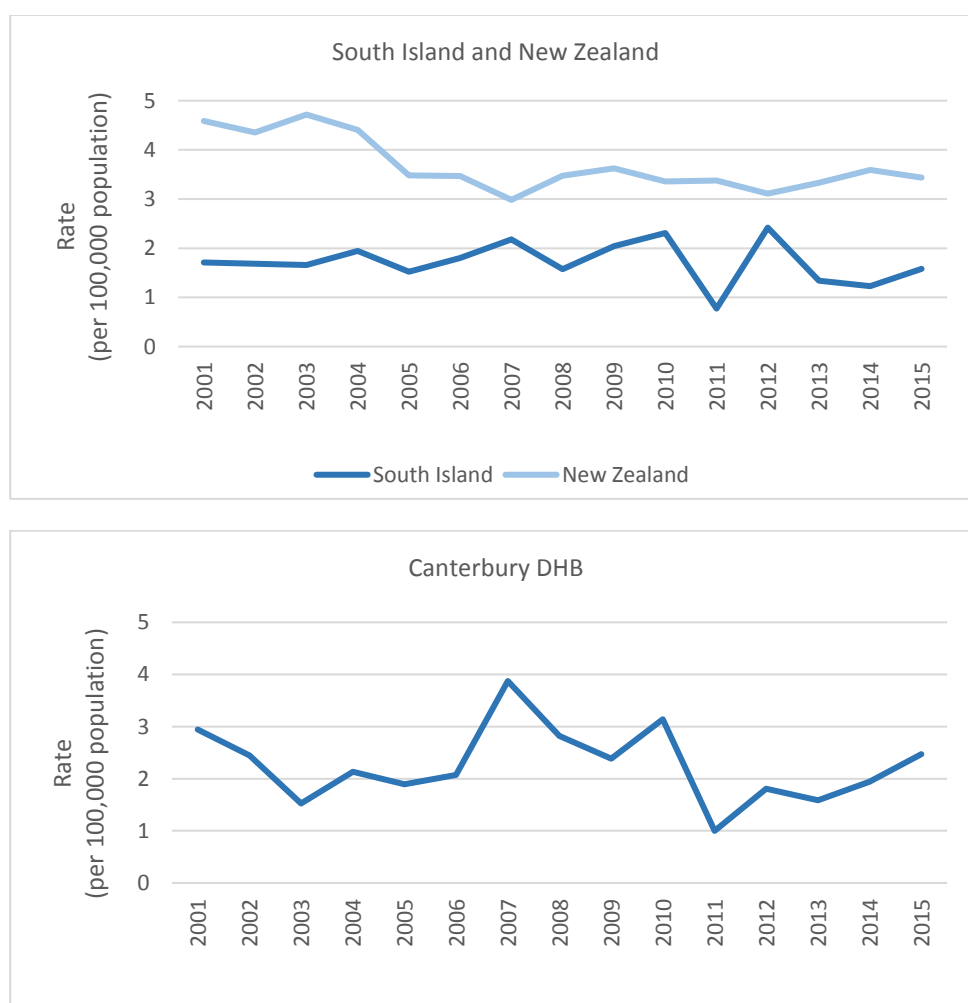
Hospitalisation

Overall, 62.2 percent of TB notifications in the South Island were hospitalised over the last 15 years. This proportion is very similar to the national level of 61.9 percent. Hospitalisation proportions were higher among patients younger than 15 years (72.7%, 8 out of 11) and 60 years and above (73.0%, 73 out of 100), and lower among those 15-39 years (56.3%, 125 out of 222) and 40-59 years (63.5%, 54 out of 85).

Between 2001 and 2015, the TB hospitalisation rate was lower in the South Island than in New Zealand as a whole (**Figure 3**), consistent with the TB notification rate. While the hospitalisation rate has decreased nationally, it has fluctuated in the South Island. The highest hospitalisation rate in the South Island occurred in 2012 (2.4 per 100,000 population), and the lowest in 2011 (0.8 per 100,000 population). The Canterbury DHB rate was greatest in 2007 (3.9 per 100,000 population), and lowest in 2011 (1.0 per 100,000 population).

Hospitalisations in the Nelson Marlborough DHB varied dramatically from none in 2002 to nine in 2012, but remained between 0-3 each year in the rest of the years. Hospitalisations in the West Coast DHB (0-2 per year, 8 in total), South Canterbury DHB (0-2 per year, 6 in total) and Southern DHB (1-6 per year, 49 in total) were also very low. Rates calculated on these numbers can be greatly influenced by just one or two cases and, as they do not show any stable pattern, they are not presented in **Figure 3**.

Figure 3. Annual TB hospitalisation rates per 100,000 population for the South Island, New Zealand, and Canterbury DHB, 2001-2015



Mortality

Reported deaths from TB varied from 0-5 each year in the South Island. In total, 24 new TB cases died during the last 15 years (2001–2015). One (4%) was in the 15-39 year age group, four (17%) in the 40-59 year age group, and the majority (79%) were 60 years and over. The mean annual mortality rate of 0.16 per 100,000 population was similar to the national rate of 0.17 (2005-2012) (15, 24). The Australian rate for 2015 (excluding HIV + TB) was 0.18 per 100,000 population (17).

Mycobacterium species

No other species apart from *Mycobacterium tuberculosis* were identified in the South Island. In the national TB reports from 2010 to 2014 (15, 25-28), at least 75 percent of TB cases notified were culture positive. The incidence of *M. bovis* ranged from 0-1.8 percent of cases per year.

Site of infection

There was a difference in the anatomical sites of disease (pulmonary or extra-pulmonary) between South Island cases born in New Zealand and those born outside New Zealand. For cases born in New Zealand, 19.3 percent developed only extra-pulmonary disease compared with 40 percent of cases born outside New Zealand (**Table 2**). These percentages were similar to the national data for 2012-2014 (15, 27, 28).

Table 2. Anatomical site of tuberculosis in cases born in New Zealand and born outside New Zealand, for the South Island (2001-2015) and New Zealand (2012-2014)

Place of birth	Anatomical site	South Island, 2001-2015 (%)	New Zealand, 2012-2014 (%)
New Zealand	Pulmonary*	80.7	73.0
	Extra-pulmonary only	19.3	28.0
Outside New Zealand	Pulmonary*	59.7	53.7
	Extra-pulmonary only	40.3	45.7

* Includes cases that also had extra-pulmonary disease.

Demographic characteristics

The demographic characteristics of new TB notifications are described in the following section for 2001-2015 (except for ethnicity, which is presented for 2011-2015).

Age

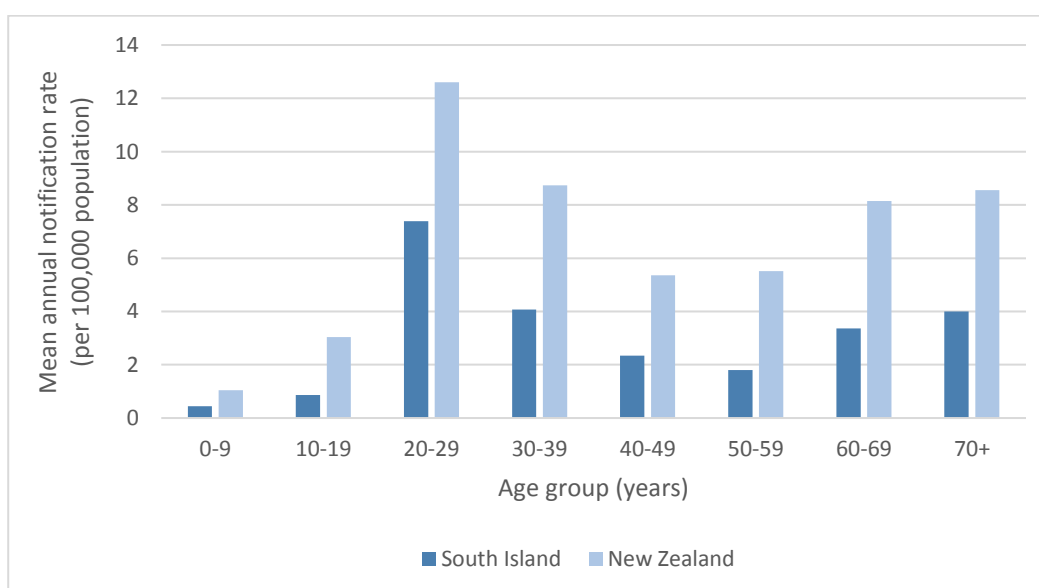
In the South Island, notification rates for new cases of TB were highest among those aged 20-29 years, followed by those aged 30-39 years and 70 years and over (**Table 3**). Rates were lowest among children and young people. These patterns were also apparent in New Zealand as a whole (**Figure 4**). Rates for all age groups were lower in the South Island than nationally.

Table 3. Tuberculosis notification rates in the South Island, by age group (2001-2015)

	0-9 years	10-19 years	20-29 years	30-39 years	40-49 years	50-59 years	60-69 years	70+ years	Total
Number of notifications	8	18	132	82	52	34	43	58	428
Mean annual number of notifications	0.5	1.2	8.8	5.5	3.5	2.3	2.9	3.9	28.5
Mean annual notification rate per 100,000 population	0.4	0.9	7.4	4.1	2.3	1.8	3.4	4.0	2.9
Percentage of notifications (%)	1.9	4.2	30.9	19.2	12.2	8.0	10.1	13.6	100.0

The age of one case was unknown.

Figure 4. Mean annual rate of tuberculosis notifications, by age group, in the South Island and New Zealand (2001-2015)



Sex

In the South Island, notification rates for new cases of TB were 1.4 times higher among males than females (**Table 4**). This sex ratio is similar to national (15) and international (29, 30) observations. Male and female rates nationally were approximately twice those in the South Island (**Figure 5**).

Table 4. Tuberculosis notification rates in the South Island, by sex (2001-2015)

	Male	Female
Number of notifications	246	182
Mean annual number of notifications	16.4	12.1
Mean annual notification rate per 100,000 population	3.5	2.5
Percentage of notifications (%)	57.5	42.5

Figure 5. Mean annual rate of tuberculosis notifications, by sex, in the South Island and New Zealand (2001-2015)

Ethnicity

In the South Island, for the 138 new cases of TB between 2011 and 2015, the mean annual notification rate among people of Indian ethnicity was dramatically higher at 102.7 per 100,000 population per year (**Table 5**). This was almost 150 times the rate among Europeans and almost twice the rate of the Indian ethnicity group nationally (**Figure 6**). It was the only demographic parameter for which the South Island rate was higher than that of New Zealand overall. One possible explanation is that since the 2013 Census, relatively more people of Indian ethnicity chose to settle in the South Island than previously. This would have resulted in more notifications along with an underestimate of the denominator population (the 2013 Census data was used to calculate the rates) - and hence an unexpectedly high rate. Supporting this possibility are immigration data which show that in 2014-15 there were 25,793 permanent or long term Indian arrivals to New Zealand compared with only 15,103 in 2011-12 (31) and there were 25 notifications in the South Island in 2014-15 compared with 13 in 2011-12. Unfortunately there are no data indicating where ethnic groups have settled since 2013. The “Other Asian” ethnicity group had the next highest TB rate in both the South Island and nationally.

Table 5. Tuberculosis notification rates in the South Island, by ethnicity (2011-2015)

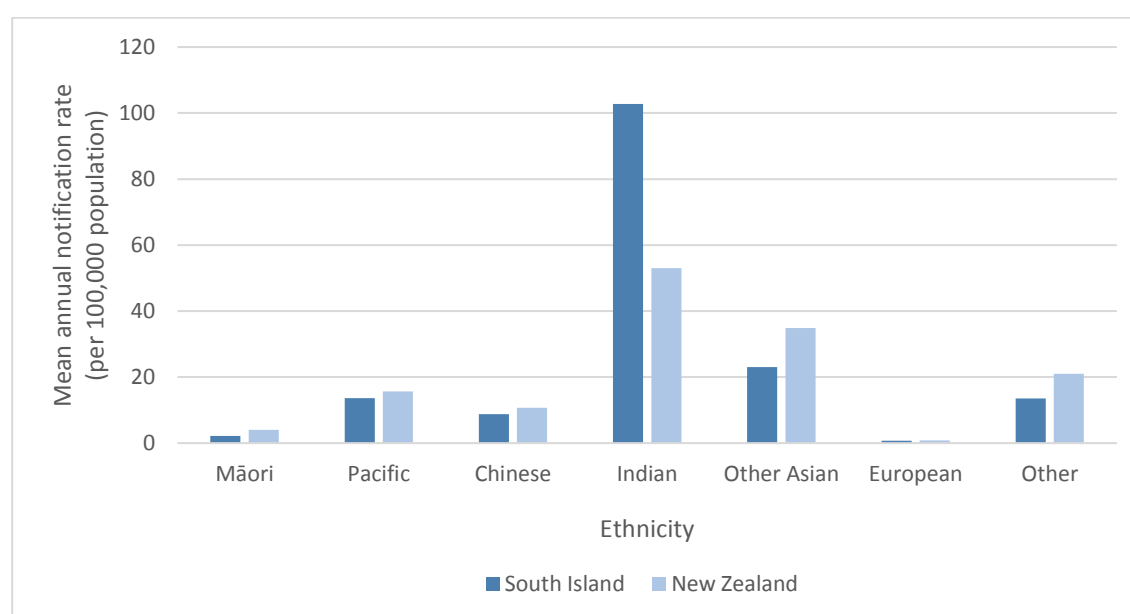
	Māori	Pacific	Chinese	Indian	Other Asian	Other	European
Number of notifications	9	12	8	47	28	5	28
Mean annual number of notifications	1.8	2.4	1.6	9.4	5.6	1.0	5.6
Mean annual notification rate per 100,000 population	2.2	13.6	8.8	102.7	23.0	13.6	0.7
Percentage of notifications (%)	6.6	8.8	5.8	34.3	20.4	3.6	20.4

Using prioritised ethnicity: Māori, Pacific, Chinese, Indian, Other Asian, Other, European.

Rates have been calculated using population counts from the 2013 Census.

The ethnicity of 1 case was unknown.

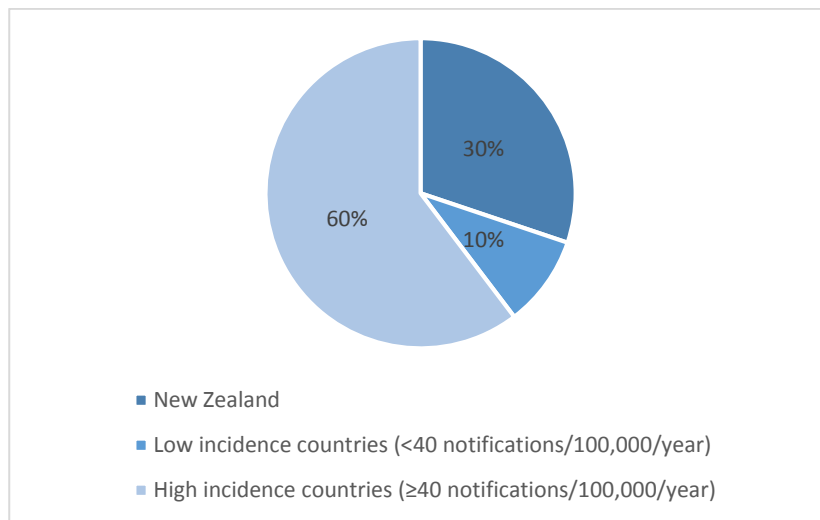
Figure 6. Mean annual rate of tuberculosis notifications, by ethnicity, in the South Island and New Zealand (2011-2015)



Country of birth

Of the 428 South Island notifications, 300 (70.1%) were born outside New Zealand (**Figure 7**) and 70.3 percent had current or recent residence with a person born outside New Zealand (**Table 9**). These findings are consistent with the national figures for 2012-2014 which showed that 77-80 percent of new cases were born outside New Zealand, and 69-76 percent had current or recent residence with a person born outside New Zealand (15, 27, 28). Of the 70 percent of notifications in the South Island who were born outside New Zealand, 259 (86%) were born in high incidence countries (i.e. countries with an annual rate of ≥ 40 notifications per 100,000 population).

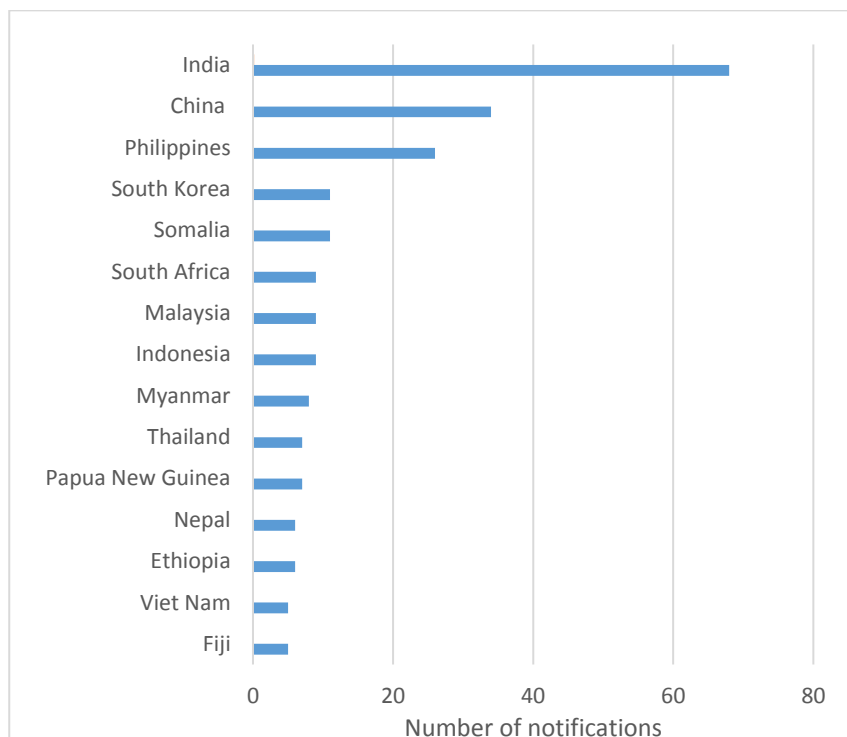
Figure 7. Percentages of South Island tuberculosis notifications born either in New Zealand or in high or low incidence countries, 2001-2015



The top 15 high incidence countries where immigrants who subsequently developed TB (new case) after arrival in New Zealand were born are shown in **Figure 8**. These countries accounted for 85 percent of all immigrants who developed TB. The top three countries, India, China and the Philippines accounted for 42.7 percent of cases. However, the incidence varied over time depending on migration trends. From 2001-2003 only four percent of notifications of persons born overseas were from India compared with 43 percent in 2013-2015.

There were 41 cases born outside New Zealand who came from low incidence countries, of whom six were from Samoa. Samoa had a TB incidence rate of 11 per 100,000 population in 2015 (17). No other low incidence country contributed more than three cases from 2001 to 2015.

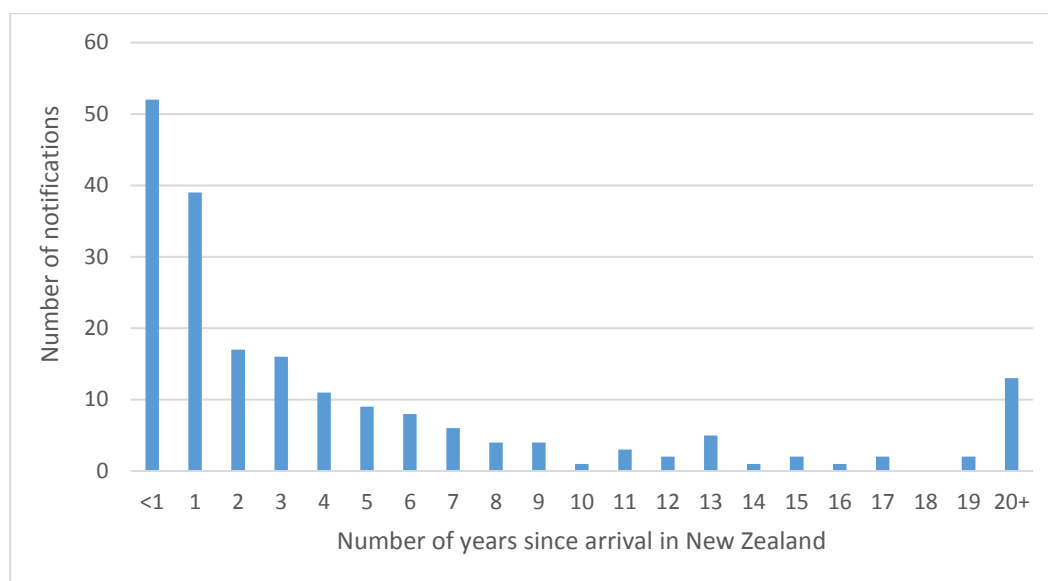
Figure 8. The top 15 countries of South Island notified tuberculosis cases born outside New Zealand, 2001-2015



Years since arrival in New Zealand

Cases born outside New Zealand tended to develop TB disease in the early years after arrival, with 46 percent presenting in the first 2 years and 68.2 percent within 5 years (**Figure 9**). The median time for development of disease from arrival to the date of notification was 2.5 years (mean 6.2 years). Nationally for 2010-2014 the times are similar with 4 years for the median and a range of 7.1-8.3 years for the mean (15). The authors of one article considered the higher rate of TB in the early years after migrating to be reactivation of LTBI acquired in the home country shortly before migrating, coupled with a complex interplay of host and environmental factors after arrival (2).

Figure 9. Years to onset of tuberculosis since arrival in New Zealand for South Island notifications, 2001-2015



Urban-rural location

In the South Island, the notification rate for new cases of TB was approximately three times higher among those living in urban areas compared to those living in rural areas (**Table 6**). The urban-rural difference nationally was even more marked because of a much higher urban rate (**Figure 10**). Both urban and rural rates were lower in the South Island compared with national rates.

Table 6. Tuberculosis notification rates in the South Island, by rural/urban location of residence (2001-2015)

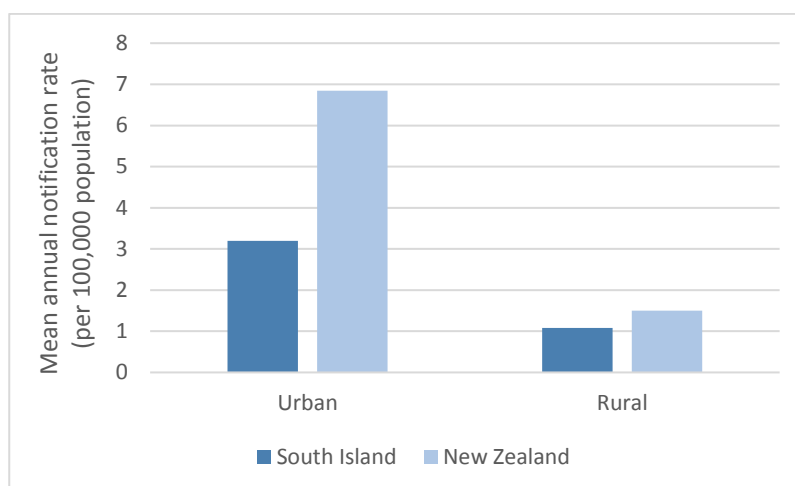
	Urban	Rural
Number of notifications	375	30
Mean annual number of notifications	25.0	2.0
Mean annual notification rate per 100,000 population	3.2	1.1
Percentage of notifications (%)	92.6	7.4

Cases were categorised using the Urban/Rural Profile 2006.

Rates have been calculated using population counts from the Urban/Rural 2006 categories.

The Urban/Rural profile of 23 cases was unknown.

Figure 10. Mean annual rate of tuberculosis notifications, by rural/urban location of residence, in the South Island and New Zealand (2001-2015)



Neighbourhood deprivation

In the South Island, TB notification rates increased with increasing neighbourhood deprivation (**Table 7**). This pattern was also apparent nationally (**Figure 11**). Rates were lower in the South Island for all deciles of neighbourhood deprivation.

Table 7. Tuberculosis notification rates in the South Island, by neighbourhood deprivation (2001-2015)

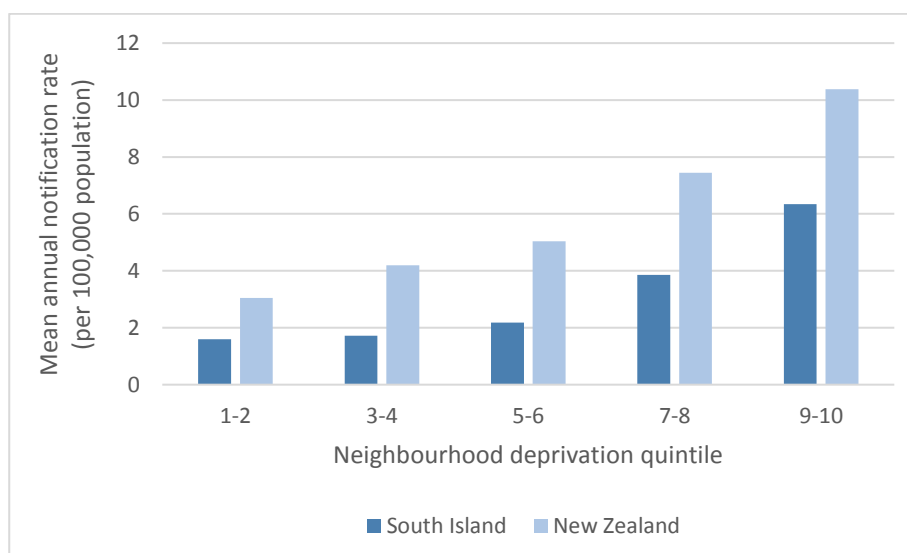
	Deciles 1-2	Deciles 3-4	Deciles 5-6	Deciles 7-8	Deciles 9-10
Number of notifications	55	58	68	109	110
Mean annual number of notifications	3.7	3.9	4.5	7.3	7.3
Mean annual notification rate per 100,000 population	1.6	1.7	2.2	3.9	6.3
Percentage of notifications (%)	13.8	14.5	17.0	27.3	27.5

Cases were categorised using NZDep2006 as a measure of neighbourhood deprivation.

Population counts use data from the NZDep2006 categories.

The NZDep2006 of 28 cases was unknown.

Figure 11. Mean annual rate of tuberculosis notifications, by neighbourhood deprivation, in the South Island and New Zealand (2001-2015)



Occupation

For those in paid employment, the notification rates were highest among people in the Labourer occupational group, followed by Technician and Trades Workers, and Community and Personal Care Workers. A similar pattern, although with higher rates in all occupational groups, was also observed nationally (Figure 12).

Table 8. Tuberculosis notification rates in the South Island, by occupation (2001-2015)

	Manager	Professional	Technician & Trades Worker	Community & Personal Service Worker	Clerical & Administrative Worker	Sales Worker	Machinery Operator & Driver	Labourer	Not in paid employment*
Number of notifications	16	27	30	18	9	12	10	51	129
Mean annual number of notifications	1.1	1.8	2.0	1.2	0.6	0.8	0.7	3.4	8.6
Mean annual notification rate per 100,000 population	1.3	2.2	3.1	2.8	1.1	1.7	2.1	4.8	NR
Percentage of notifications (%)	5.3	8.9	9.9	6.0	3.0	4.0	3.3	16.9	42.7

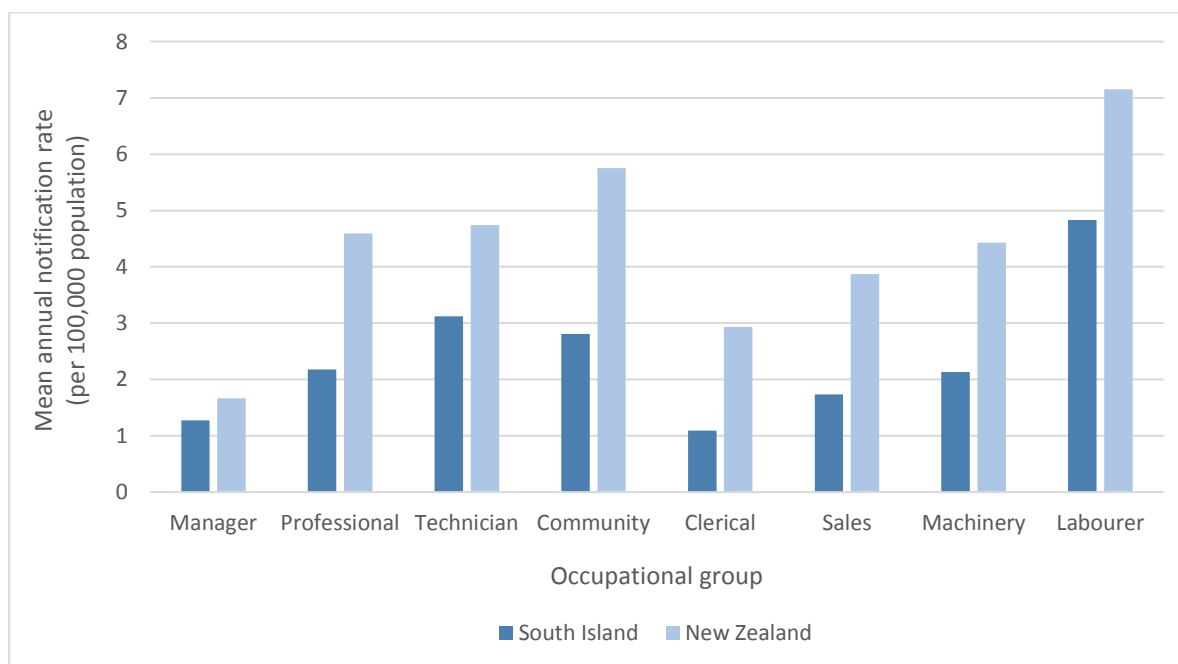
* Not in paid employment includes at-home parent, homemaker, retiree, unemployed, tertiary student and volunteer.

This table does not include: children and young people less than 17 years of age and/or school student, tourists, those who did not state an occupation, refugees, or those whose occupation could not be classified.

Rates have been calculated using population counts from the 2006 Census.

NR, this rate could not be calculated as a suitable denominator was not available.

Figure 12. Mean annual rate of tuberculosis notifications, by occupation, in the South Island and New Zealand (2001-2015)



Risk exposures

Seven major TB risk factors have been reported nationally since 2012 and are included here (**Table 9**). Analysis of the most common risk factor, ‘case was born outside of New Zealand’, is found earlier in this report (see **Country of birth** and **Years since arrival in New Zealand** sections). The second most common risk factor, ‘current or recent residence in household with person born outside of New Zealand’ in many cases appears to be more a reflection that immigrants live with whānau rather than being a risk factor per se since more than 95 percent of those with this so-called risk were also born outside New Zealand.

Sixty five notifications (16.5% of 394 for whom the information was known) were reported as having an immunosuppressive illness. The conditions reported were diabetes, renal failure, sarcoidosis, alcoholism and hepatitis C. HIV testing was undertaken for 39.5 percent of cases (information unknown for 25% of notifications), but no outcomes were reported. Nationally from 2007 to 2014 there were 26 cases notified who were also HIV positive; an average of 3.3 cases per year (19).

‘Exposure in a healthcare setting’, ‘taking immune-suppressive medication’, or ‘current or recent residence in an institution’ are relatively uncommon risk factors, identified among only 4.8-6.6 percent of notified cases. These findings are similar to the most recent national figures (15). Smoking is a known risk factor but is not specifically asked about on the case report form. It has been estimated that people who smoke have approximately twice the risk of both *M. tuberculosis* infection and active TB compared with those who have never smoked (32).

Table 9. Risk factors reported for South Island tuberculosis notifications (2001-2015)

Risk factor	Cases*	Total**	%
Current or recent residence in household with person(s) born outside of NZ	258	367	70.3
Case born outside of NZ	300	428	70.1
Contact with confirmed case of TB	72	347	20.7
Immunosuppressive illness	65	394	16.5
Exposure in healthcare setting	25	381	6.6
Immunosuppressive medication	21	389	5.4
Current or recent residence in an institution (e.g. prison)	19	398	4.8

* Number of cases with ‘yes’ recorded for the risk factor.

** Number of cases for which information was recorded for the risk factor.

Outbreaks

An outbreak of TB is defined as two or more cases known to be linked by epidemiological investigation or DNA fingerprinting. A cluster of cases all living in a single household however is not considered an outbreak (9). Approximately 10 percent of TB cases occur as part of recognised outbreaks. Large outbreaks, involving 12–61 cases have occurred in the North Island in a school, church group, and prison.

Nationally from 2001-2015 there were 49 outbreaks (450 cases) due to *M. tuberculosis* and one outbreak (two cases) due to *M. bovis* (15, 22). In the South Island there were only four outbreaks reported of which one was in Canterbury DHB, two in South Canterbury DHB and one in Southern DHB (**Table 10**). The four South Island outbreaks involved between 2-12 cases. The ages of cases ranged from 0-68 years and the average ages ranged from 17.5-38.2 years.

The index case of the largest South Island outbreak (12 cases) was an adult Asian male who had lived in New Zealand for seven years after immigrating. He had radiological evidence of active TB and was sputum positive. Transmission predominantly occurred in household settings and subsequent cases were persons of Asian, European and Māori ethnicity. Cases were notified from 2006 to 2009 and although not all were able to be linked epidemiologically, all had the same DNA typing.

Table 10. Outbreaks of tuberculosis listed in Canterbury and South Canterbury (2001-2015)

Year	DHB	Number of cases	Average age (years)	Age range (years)
2001	South Canterbury	4	17.5	3-32
2002	South Canterbury	2	43	41-45
2009	Canterbury	12	32.8	0-62
2012	Southern	6*	38.2	19-68

*One case was a confirmed new case and five were latent TB infection.

Discussion

The pattern of South Island TB notification data for the past 15 years was similar to the national data in many respects. Incidence rates including within neighbourhood deprivation quintiles, urban and rural areas, and by occupation were lower in the South Island.

The analysis of the 478 confirmed new cases in the South Island gives a picture of tuberculosis in the between the years 2001 to 2015. However, new cases are not the only indication of the public health significance of this disease, as there were also 277 cases of LTBI notified in that time. Although they were similar to new cases in terms of ethnicity and sex, approximately half were children under 15 years. The policy at Community & Public Health is to only enter latent infections if they have been commenced on prophylaxis but there is no information on the subsequent history of these cases as Community & Public Health does not follow them up and ESR does not report on them nationally. The WHO states that currently available treatments for LTBI have an efficacy ranging from 60-90 percent (33).

The major issue in New Zealand regarding TB, as in a number of other developed low incidence countries, is migration from countries that have a high burden of TB disease (34-36). Seventy percent of new South Island cases were born outside New Zealand, 46 percent of whom developed TB disease within two years of arrival, usually as a result of reactivation of LTBI (1, 2). This has resulted in a plateauing of the previously declining annual incidence of TB in the South Island (at approximately 3 cases per 100,000 population) and in New Zealand (at approximately 6 cases per 100,000 population) (18).

Between January 2010 and January 2016, the highest numbers of immigrant residents to New Zealand came from China (35,865) and India (31,594) (14), two countries that have a high burden not only of TB but also of MDR-TB and HIV-TB (13). The incidence of TB reported among immigrants between 2001-2015 (**Figure 8**) shows that India and China were the top two countries of birth for this population. The highest numbers of visiting students to New Zealand came from these countries and they were also in the top three for immigrant workers to this country (14). Analysis of disease by ethnicity identified a very high rate for the Indian ethnicity group, which was not able to be satisfactorily explained although it may be related to an increase in immigrants to the South Island since 2013.

It is a concern that there has only been a slight reduction in TB rates nationally since 1988 and a plateauing since 2007, when there is the possibility for improvement. In particular, the introduction of the IGRA test with its improved sensitivity and specificity (37) has in some settings allowed for more efficient screening, and cost-effective screening criteria have been identified (38).

Currently Immigration New Zealand requires screening for TB disease by way of a medical examination and chest x-ray of certain persons depending on their risk and the type of application for entry (9). The situation is different with regards to screening and management of LTBI. The New Zealand Ministry of Health TB 2010 guidelines (9) state *“Currently screening and treatment of latent TB in people from high incidence countries is limited to refugee children aged under 16 years.”* They go on to add, *“Adults who are recent immigrants from high-incidence countries should be screened and considered for latent TB treatment if they have:*

- *a known history of exposure to an infectious case within the preceding two years*
- *immune-suppression or a predisposing medical condition*
- *a fibrotic lesion on CXR, and disease requiring full multi-drug treatment has been excluded.”*

Given also that the WHO has published guidelines for the management of LTBI in low incidence countries and made the conditional recommendation that immigrants from high incidence countries be screened and treated (39), it would seem appropriate for New Zealand to comprehensively review its TB data on immigrants and the available resources to determine if a more proactive management of this population would be cost effective and likely to reduce the burden of TB disease in New Zealand.

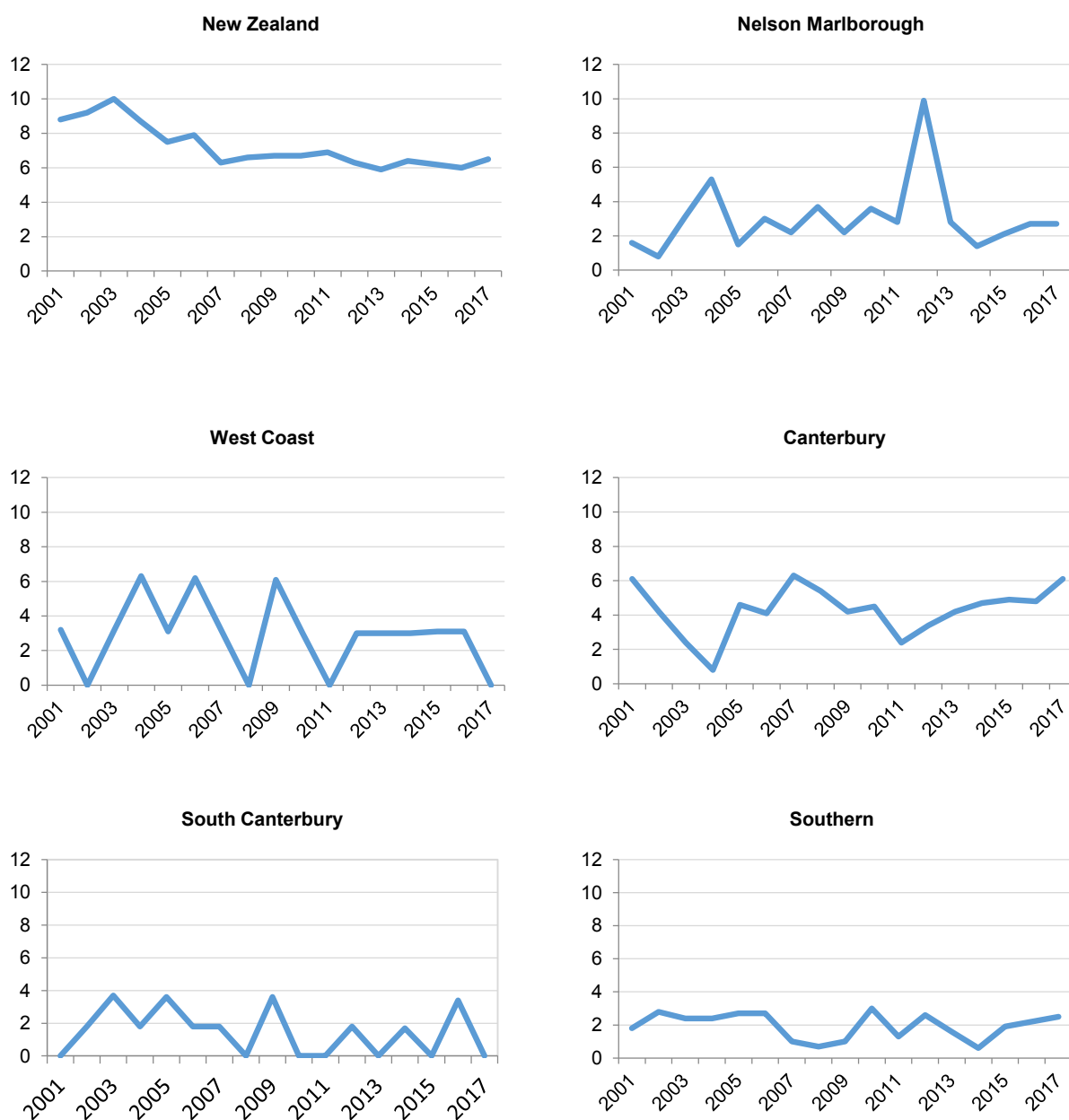
Appendix

Updated May 2018

Incidence 2016-2017

In the years 2016-2017 since this report was written there has been a continuation of an upward trend in tuberculosis notification rates* in the Canterbury DHB region apparent since 2012, although the rate in 2017 was no higher than in 2001. Rates in other DHBs have been consistent with those of previous years (Figure 13).

Figure 13. Annual tuberculosis notification rates per 100,000 population for New Zealand and the South Island DHBs (2001-2017)



* All notifications

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