



Government of **Western Australia**
North Metropolitan Health Service
Mental Health, Public Health and Dental Services



Western Australian Tuberculosis Control Program

Tuberculosis notifications in Western Australia 2022

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EXECUTIVE SUMMARY

In 2022 the number of tuberculosis (TB) cases notified and the TB incidence rate in Western Australia (WA) decreased by a third compared to the prior 9 years. This decline in TB incidence is likely to be due to closure of international borders due to the COVID-19 pandemic, which stopped immigration from countries with high TB prevalence, from where most TB cases come. The delay in the effect of closed borders that were first imposed in March 2020 is consistent with peak reactivation of latent TB in immigrants occurring between 2 -5 years after migration. Diagnosis of TB shortly after migration is unusual because of pre-migration screening and TB incidence in 2020-2021 was contributed to by onshore visa medical screening of visitors needing extend their visa because they could not leave Australia.

The decrease in TB notifications was seen in both overseas born cases, who are the main contribution to overall rates, and non-Aboriginal Australian born cases. However, Australian born Aboriginal TB incidence increased by 83%. The number of notifications was low (4), but represented an 87% increase, 44% of the Australian born notifications (4 of 9), and a rate that was 12 times that of non-Aboriginal Australian born Western Australians. Whole genome sequencing (WGS) of the TB isolates demonstrated that these 4 cases were genetically linked to 2 independent clusters in 2 separate regions of WA. WGS also demonstrated linkage to several historical cases dating back more than 20 years in both clusters and linkage to a larger outbreak in the APY Lands of South Australia. Since the recognition of these outbreaks, considerable additional resources have been directed by both the WA Tuberculosis Control Program and the WA Country Health Service (WACHS) toward TB control activities in Aboriginal communities.

Despite the changes noted above, more than 90% of TB notifications continue to be in overseas born immigrants from countries with high TB prevalence. People from India, the Philippines, and Vietnam contributed 50% of the total notifications. Although there were only 4 notifications in people from Bhutan, their TB incidence rate in WA was the highest of any country of birth, which has not been seen in other Australian jurisdictions. In 2022, of 4151 Bhutanese people migrating to Australia for study, 2575 (62%) came to WA (Australian Department of Education Student Numbers).

The majority of TB notifications continues to be in permanent residents, but nearly half of the cases were temporary residents in 2022, evenly distributed between students (36%), workers (33%) and visitors (21%). A significant proportion of these (38%, 15% of total notifications) were diagnosed through visa medical screening, which demonstrates the value of active surveillance in early detection of TB. TB was diagnosed in 6 students (43% of student notifications) on visa medical, showing the importance of the reversal of the Commonwealth Government's decision to temporarily not require students to undergo repeat onshore screening for visa extensions.

The characteristics of TB notifications were similar to previous years. Of note, a higher proportion of cases were in the largest age groups between 15 and 44 years, with few paediatric notifications and no cases under 14 years old. A majority of notifications were extra-pulmonary, which is a much higher proportion than is reported elsewhere in the world. This is probably because pulmonary TB is more commonly diagnosed through offshore visa screening and treated prior to migration, and the high resourced health system of WA is better at detecting extra-pulmonary TB. Though a higher proportion of notifications were proven by culture (76%), there continues to be significant minority of extra-pulmonary TB diagnoses made empirically, especially lymph node and ocular TB.

The proportion of pulmonary TB notifications with sputum that is positive for acid fast bacilli on microscopy (smear positive) remains high (50%) relative to reported standards but has improved compared to previous years. These cases are more advanced and more infectious and may relate to reported health system delay. One quarter of TB cases had a health system delay of more than 90 days and when pulmonary TB notifications are categorised according to whether there was significant individual or public health consequence, 52% were considered delayed. Thus, contrary to the higher diagnostic yield of extra-pulmonary TB in a well-resourced health system referred to above, a low diagnostic suspicion for TB is possibly allowing excessive delay to diagnosis and consequent risk of transmission.

The number of patients started on treatment for latent TB infection (LTBI) has remained stable for the 5 years it has been reported and is likely to represent the current capacity of the central TB clinic (Anita Clayton Centre, ACC). A trial introduction of LTBI treatment in a primary care practice, aiming to increase this preventive strategy, was not successful. A recently introduced new requirement for immigrants who are prospective health care workers to have a test for LTBI as part of their visa medical may increase referrals and treatment of LTBI in the future. The successful completion of LTBI treatment at the ACC remains high (87%).

In notifications that could be assessed, TB treatment in 2021 was successful in a high proportion of notifications (95%) but is reduced from previous years. This decline is due to a high case fatality rate (4%, 5 deaths due to TB) and 2 patients that defaulted from treatment before successfully completing. Patients that died of TB are reviewed formally by the WA TB Control Program and the patients that defaulted from treatment continue to be followed by the program, monitoring for relapse.

TB in WA: 2022 SNAPSHOT

	2022	Compared to 2021
Number of notifications	100	↓ 30.1%
Incidence rate	3.6/100,000	↓ 33.3% ¹
Rate in Australian-born population	0.5/100,000	↓ 28.6% ¹
Rate in Indigenous population	4.3/100,000	↑ 87.0% ¹
Rate in overseas-born population:	10/100,000	↓ 22.3% ¹
Geospatial distribution	27 LGA's	↓ 12.9%
Rate in metropolitan Perth area	3.8/100,000	↓ 38.7% ¹
Rate in regional areas	2.5/100,000	↑ 4.2% ¹
Health System Delay (Median)	43 (days)	↓ 37.7%
Percentage of Pulmonary TB with significant Delay	54%	↑ 63.6%
Culture confirmation	75% (n=76)	↑ 4.5%
Percentage of smear positive pulmonary TB	50%	↓ 21.9%
Resistance to any first line drug	18% (n=14)	↑ 38.5%
MDRTB	3% (n=2)	↓ 25.0%
Genotyping (WGS)	97% of positive culture	↓ 3.0%
Cluster rate	12% (n=9)	↑ 26.6%
TB in Health Care Workers	7% (n=13)	↓ 22.2%
Pulmonary TB smear positive	0 cases	↑ 5 in 2021
Treatment Outcome (2021)	95% success rate	↓ 4.0% (2020)
Case fatality rate	3% (n=5)	↑ 0% in 2020
Latent TB Treatment	87% (n=381) completion rate	↓ 2.8%
Contact investigation	1223 contacts identified	↓ 44.1%
No TB infection or disease	82%	↑ 1.0%
LTBI	15%	↑ 15.4%
Secondary TB	0.3% (n=2)	↓ 50.0%

¹ Population data is based on Australian Bureau of Statistics (ABS) census and intercensal estimates that are updated regularly. Therefore, rates may differ from those previously reported.

DATA SOURCES

TB notifications:

Tuberculosis (TB) notification data recorded on the Western Australia (WA) Notifiable Infectious Diseases Database (WANIDD), is used in this report. Under the Public Health Act 2016, medical practitioners, including laboratory pathologists are required to notify TB cases to the WA Department of Health Communicable Disease Control Directorate. Notification data includes information such as the type of TB, case demography, clinical details, laboratory results, risk factors and some case management details.

The total number of TB cases is based on persons who were residents in WA at the time of diagnosis. Persons diagnosed in other parts of Australia or abroad who moved into WA were excluded. Treatment outcomes are given for cases notified in the previous year (2021), because of the length of time taken for the treatment of TB to be completed.

Population data used to calculate disease rates in this report has been derived from the Australian Bureau of Statistics (ABS) Estimated Resident Population (ERP) which is based on the concept of usual residence and refers to all people, regardless of nationality, citizenship or legal status, who usually live in WA. Molecular typing data is provided by the WA Mycobacterium Reference Laboratory. Most TB culturing and all TB isolates identification and molecular typing in WA is undertaken by the reference laboratory.

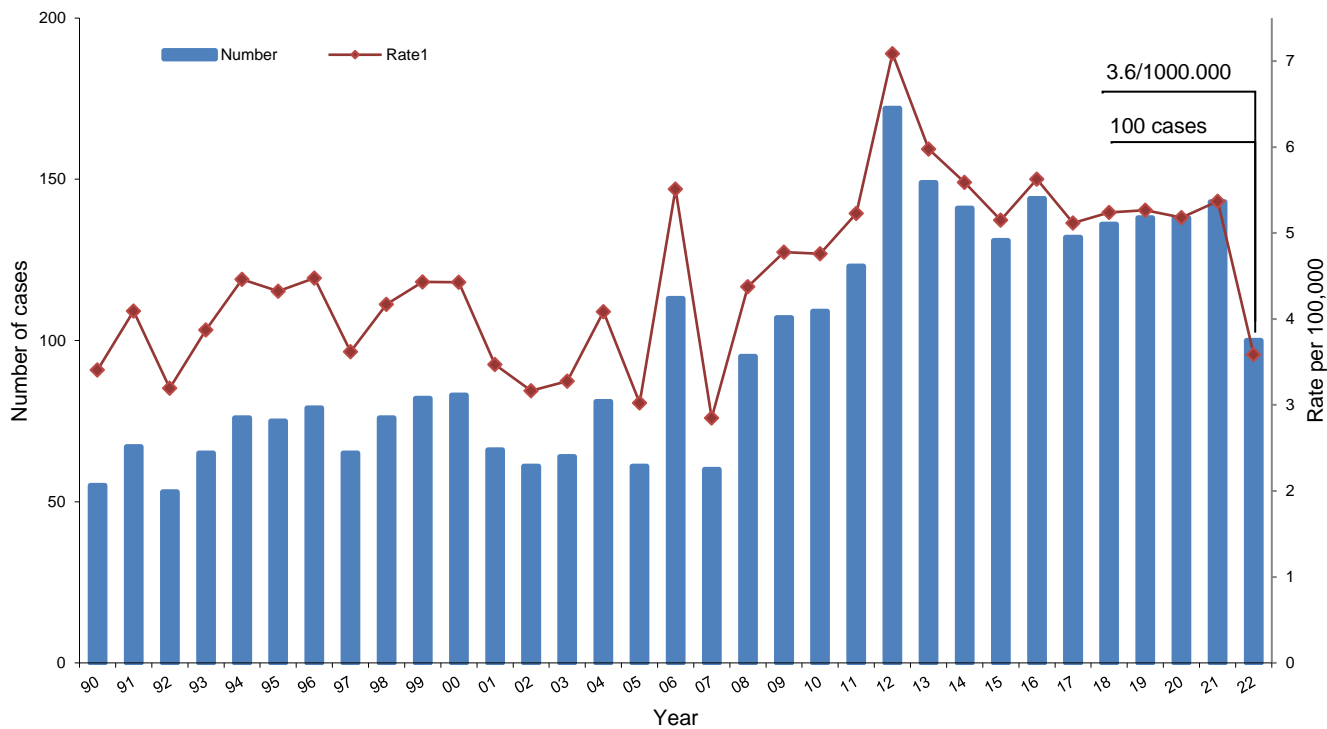
Latent TB and Contact Investigation:

Data presented in this report are collated and extracted from the WA TB Control Program (WATBCP) working databases. These are data collection tools setup primarily to assist with TB case managers' workload. Measures to ensure the uniformity and completeness of the data collection sheets were introduced to maintain and enhance data quality.

TB in WA

In 2022, there were 100 cases of active TB notified in Western Australia (WA), a decrease of 30% since 2021. The WA TB incidence rate was 3.6 per 100,000 population.

Figure 1: Tuberculosis notifications numbers and rates, WA, 1990-2022



1990-2000:

Overall increase: 51%
Average annual increase: 5.3%

2001-2011:

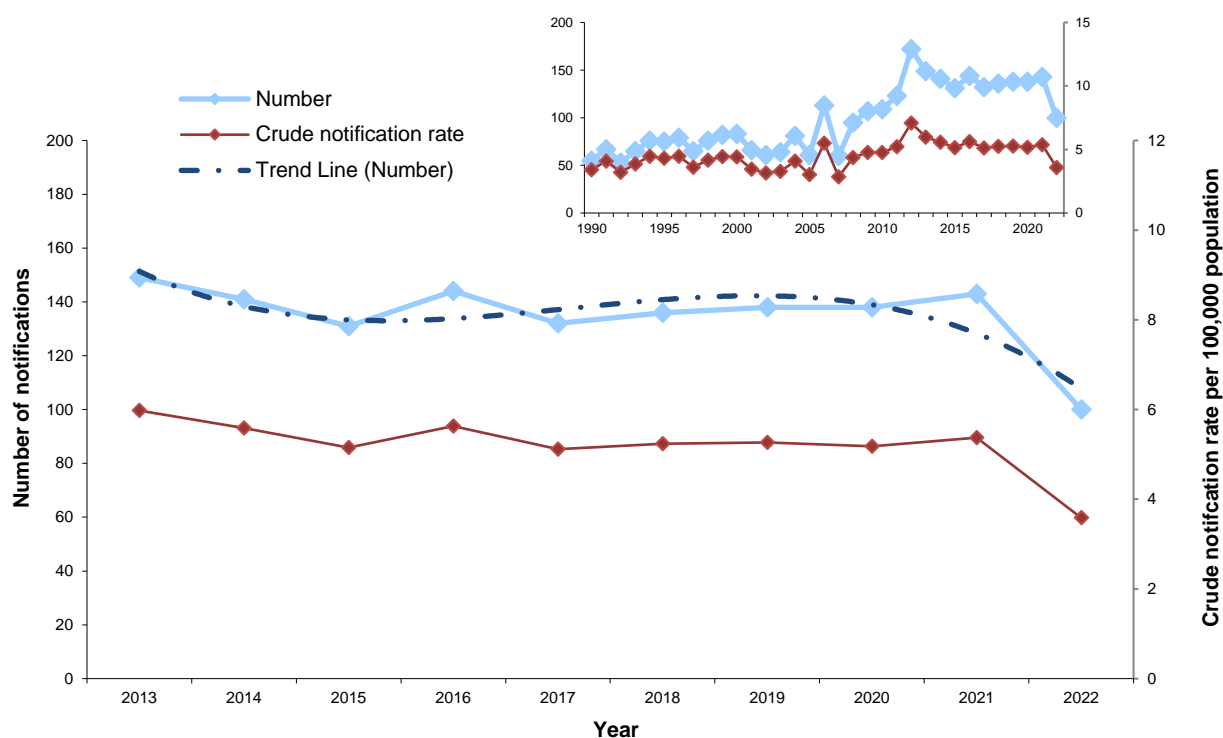
Overall increase: 86%
Average annual increase: 12.3%

2012-2022:

Overall decrease: 42%
Average annual decrease: 4.6%

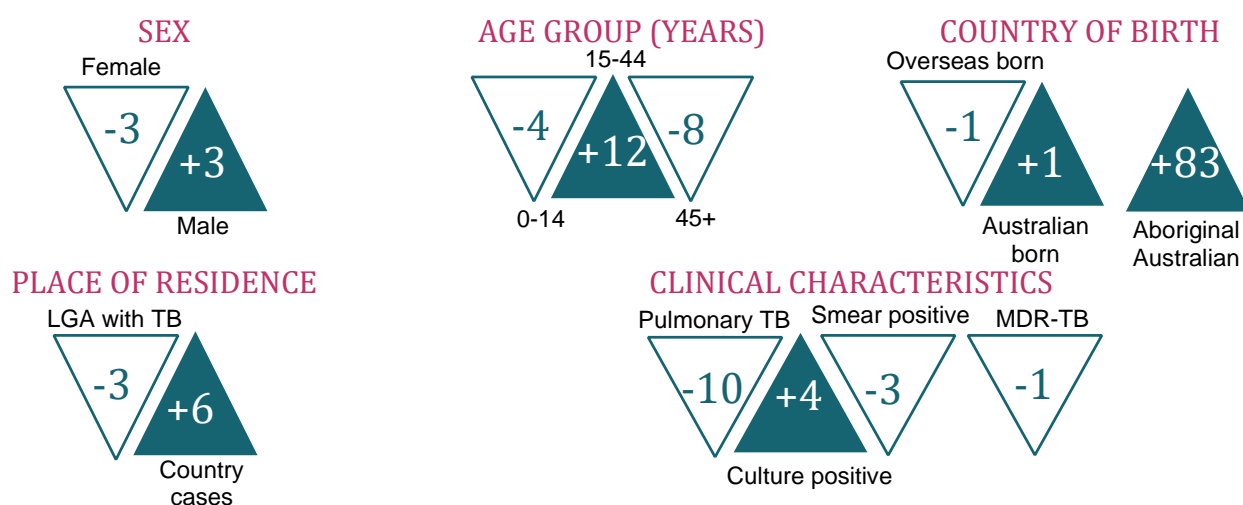
OVERALL NUMBERS AND RATES

Figure 2: Tuberculosis notifications numbers and rates, WA, 2013-2022



The number of notifications in 2022 decreased from the previous five-year high seen in 2021 to the lowest recorded number in a year since 2008. This decline in TB numbers may be a delayed result of Covid-19 pandemic border restrictions that was in place from early 2020 and is in line with our consistent data that shows a median time of 2-5 years in Australia prior to TB activation and diagnosis.

Figure 3: Percentage point change for selected TB case characteristics, WA 2021-2022



DEMOGRAPHIC CHARACTERISTICS

AGE AND SEX

Figure 4: Tuberculosis by Sex and age-group, WA 2022

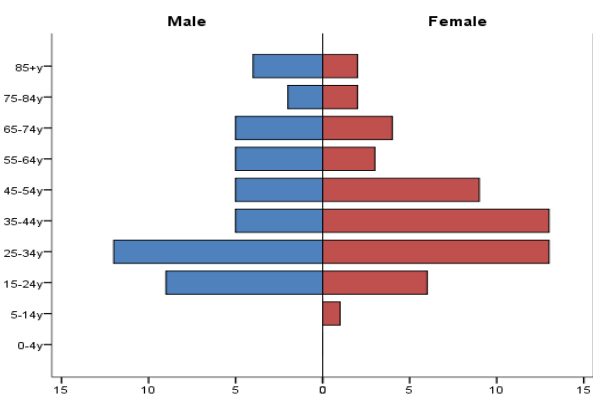
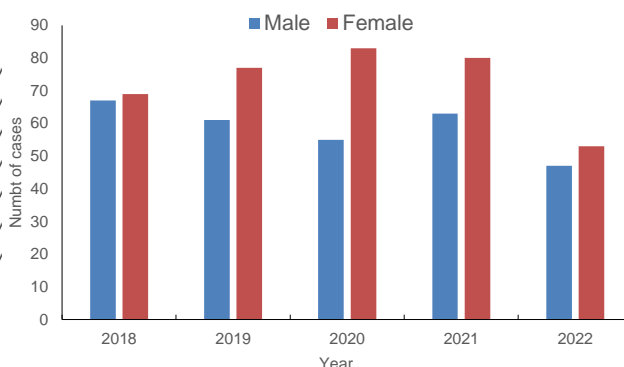


Figure 5: Tuberculosis by sex distribution, WA 2018-2022



In 2022, the female predominance noted in the past 5 years was again observed with females representing 53% (n=53) of notified TB cases and with male to female ratio of 1:1.13. Although this gender difference was not statistically significant, it was a reversal of the global and national trends that consistently show male predominance among TB patients.

Figure 6: Tuberculosis by age group, WA 2018-2022

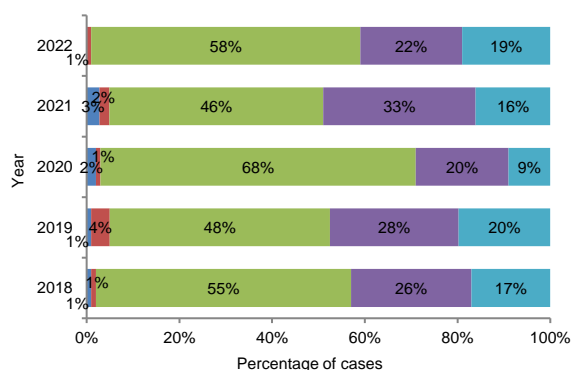
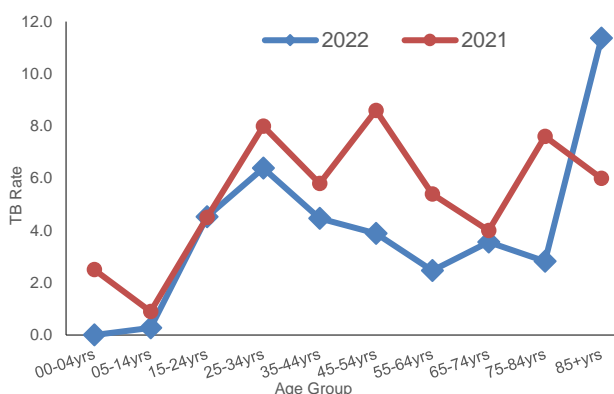


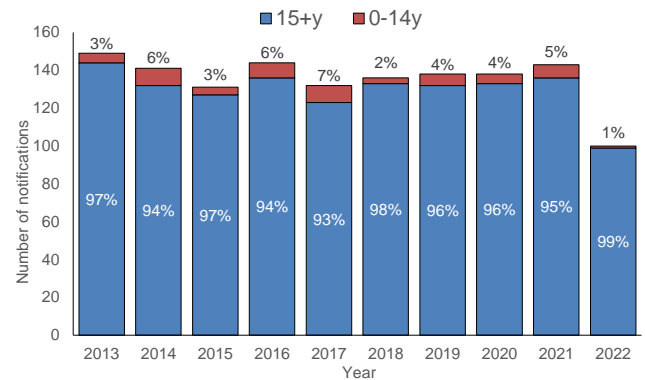
Figure 7: Tuberculosis rates by age-group, WA 2021-2022



The overall age distribution showed a slightly younger cohort in 2022 with a median age of 40.5 years (range 14-95 years) compared to 44 years in 2021. The notification rates by age group peaked in the 85+ year age group (n=6, rate=11.6/100,000) followed by the 25-34 age group (n=25, rate=6.4/100,000), 15-24 age group (n=15, rate=4.5/100,000) and 35-44 age group (n=18, rate=4.5/100,000). The median age among males was 39 years (range 18-95 years); while the median age among females was 41 years (range 14-91 years).

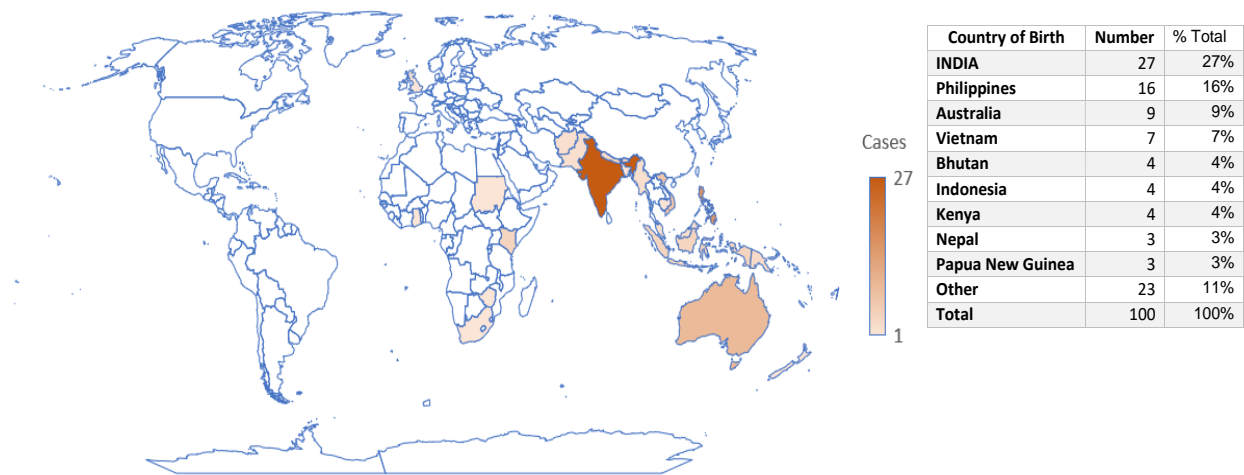
The number of TB cases among children less than 15 years of age decreased to 1%, (n=1) with a rate of 0.2 per 100,000 population compared to the national rate of 1.1/100,000 in this age group. The child diagnosed with TB was overseas born and was a new case with no source identified.

Figure 8: Percentage of total TB notifications that are children, WA 2013-2022



COUNTRY OF BIRTH

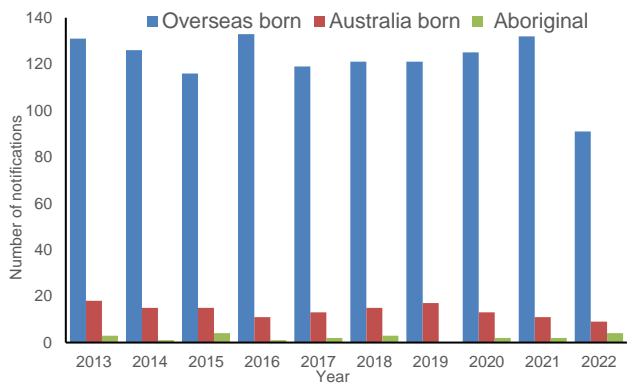
Figure 9: Tuberculosis cases by place of birth, WA, 2022



The 2022 TB cases had 26 countries of birth recorded with 91% (n=91) born overseas. The majority originated from TB high burden countries with the most recorded countries of birth being India (27%, n=27), Philippines (16%, n=16), Vietnam (7%, n=7) and Bhutan (4%, n=4).

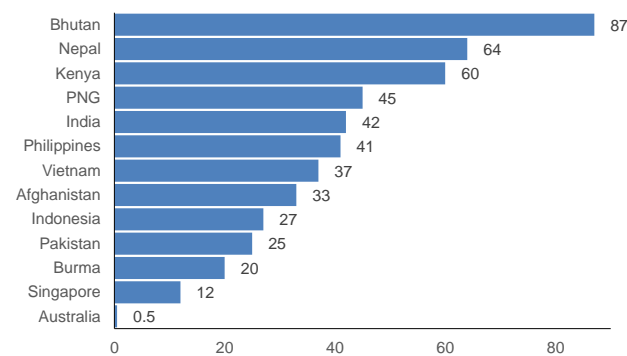
The proportion of TB in the Australian born population increased slightly to 9% (n=9) from 8% in 2021 with an incidence rate of 0.5 per 100,000. Of the 9 Australian born TB cases, 4 were Aboriginal with an incidence rate of 4.3 per 100,000, representing 4% of the total TB case load and 44% of those born in Australia.

Figure 10: Tuberculosis cases by place of birth, WA, 2013 – 2022



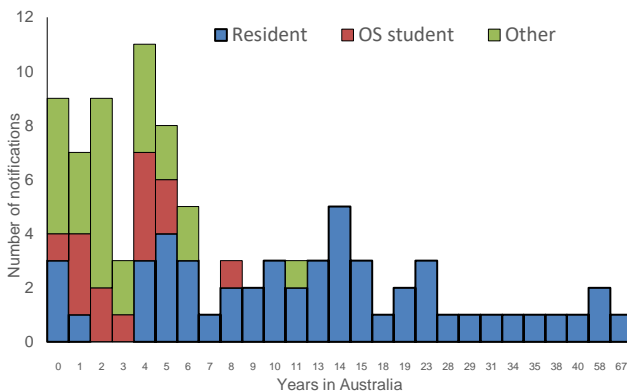
TB notification rates by country of birth varied from 0.5/100,000 for Australian born cases to 87/100,000 for Bhutanese born cases. The total notification rate for all overseas born cases was 10.1 per 100,000 population.

Figure 11: Tuberculosis rates by place of birth, WA 2022



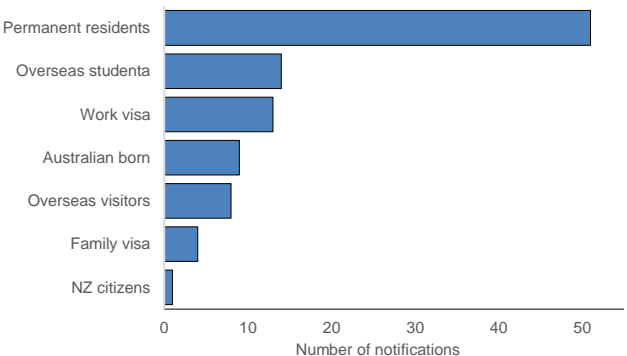
The interval between the date of arrival in Australia and TB notification date ranged from 0 to 67 years, with a median interval of 5 years. Twenty-seven percent (n=25) were diagnosed within two years and 52% (n=47) within five years of entering Australia.

Figure 12: Overseas born cases by time in Australia and immigration status



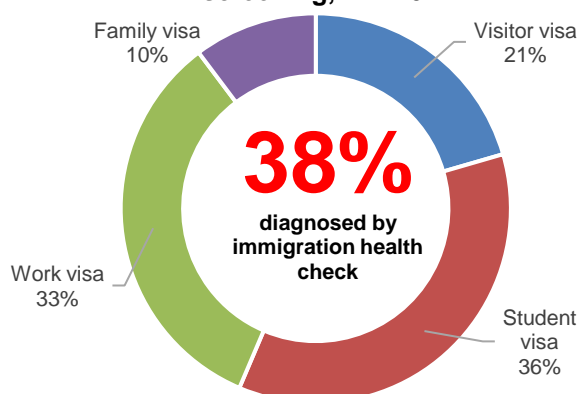
The majority of the overseas born cases identified as permanent residents (56%, n=51) decreasing from 71% in 2021. The numbers of TB cases among overseas students also decreased to 15% (n=14) from 17% (n=22) in 2021. On the other hand, the overseas visitors numbers increased to 9% (n=8) compared with 4% (n=5) in 2021).

Figure 13: Tuberculosis cases by immigration status, WA 2022



Of those with temporary Australian residence status (n=39), 38% (n=15) were diagnosed with TB as part of immigration health check (42% in 2021). These include 4 visitor visa and 6 student visa applicants representing 50% and 43% of cases in the respective visa categories.

Figure 14: Tuberculosis diagnosis by immigration screening, WA 2022



PLACE OF RESIDENCE

TB was notified in 27 Local Government Areas (LGA) in 2022, (31 in 2021) and the percentage of cases in country WA increased to 14% (n=14) from 8% in 2021 with an incidence rate of 2.5/100,000 (95% CI 1.2-3.8). Perth metropolitan area accounted for the remaining 86%, (n=86) of the cases with a rate of 3.8/100,000 population (95% CI 3.0-4.7).

Table 1: Tuberculosis notification numbers and rates, WA Regions 2022

Region	Number	Rate ¹ (95% CI) ²
Metropolitan Perth	86	3.8 (3.0 – 4.7)
South-West	4	2.1 (0.0 – 4.1)
Goldfields-Esperance	4	7.0 (0.1 – 13.9)
Midwest- Gascoyne	3	4.4 (-0.6 – 9.4)
Great Southern	2	3.1 (-1.2 – 7.4)
Pilbara	1	1.7 (-1.6 – 5.0)
Wheatbelt	0	-
Kimberley	0	-

¹ Crude notification rate per 100,000 population

² 95% Confidence interval

The East Metropolitan Health Service Area had the highest number of TB cases (40% n=40). Most of the cases were concentrated in the local government areas of City of Wanneroo, City of Stirling, City of Perth, City of Armadale and City of Bayswater which together accounted for 46% (n=46) of all WA TB burden in 2022.

Figure 15: Tuberculosis notifications by health service area, WA Regions 2022

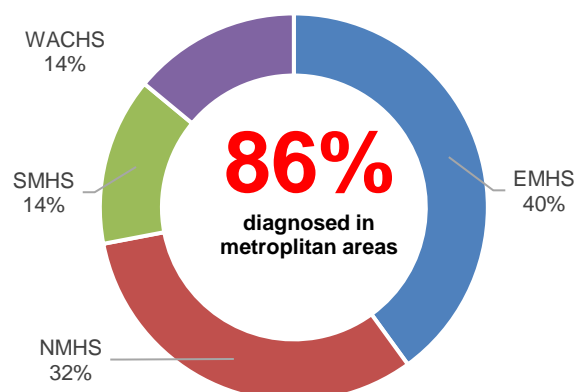
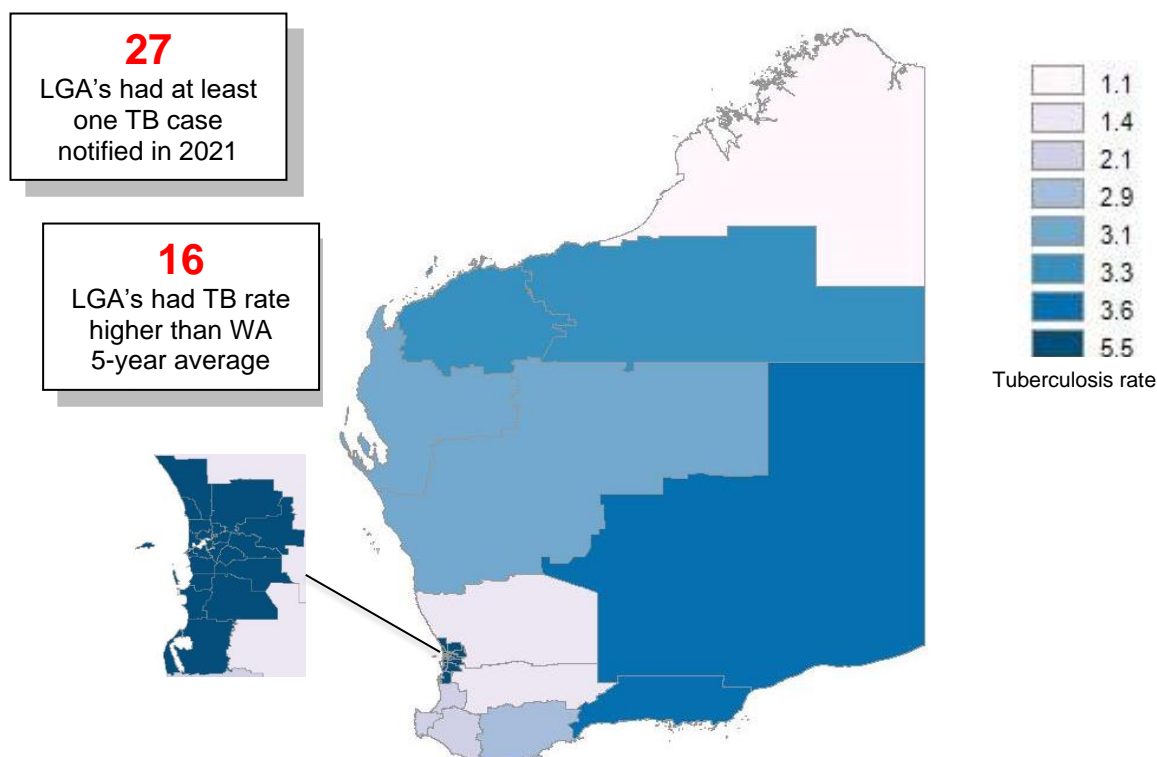


Figure 16: Five-year average tuberculosis incidence rates by WA Regions 2018-2022



The 5 years average rate of regional TB was highest in Perth metropolitan area with an average rate of 5.5/100,000 population, followed by the Goldfields-Esperance (3.6/100,000), the Pilbara (3.3/100,000), the Midwest-Gascoyne (3.1/100,000), the Great Southern (2.9/100,000), the South-West (2.1/100,000), the Wheatbelt (1.4/100,000) and the Kimberley (1.1/100,000).

Table 2: Regional comparison of tuberculosis notifications, WA 2022

		Metro	Country	P value
Age	Median (IQR)	40.5 (27-59)	41.0 (27-56)	>0.05
Sex	Male	42 (48.8%)	5 (35.7%)	>0.05
	Female	44 (51.2%)	9 (64.3%)	
Place of Birth	Australia	4 (4.7%)	5 (35.7%)	< 0.05
	Overseas	42 (95.3%)	9 (64.3%)	
TB Type	PTB	39 (45.3%)	10 (71.4%)	>0.05
	XPTB	47 (54.7%)	4 (28.6%)	
HIV Status	Positive	2 (2.3%)	0 (0.0%)	>0.05
	Negative	82 (95.3%)	12 (85.7%)	
	Not tested or refused	0 (0.0%)	1 (7.1%)	
	Unknown	2 (2.3%)	1 (7.1%)	
HS lag time	Median (IQR)	51 (13-101)	35 (9-61)	>0.05
HS Delay	Yes	40 (46.5%)	3 (21.4%)	<0.05
	No	46 (53.5%)	10 (71.4%)	

Compared to country cases, a significantly higher percentage of metropolitan case were born overseas. Also, metropolitan cases were significantly more likely to experience clinically important health system delay. On the other hand, there were no significant difference in age, sex, type of TB or HIV status between the 2 groups.

CLINICAL CHARACTERISTICS

In 2022, 49% (n=49) of the notified cases had pulmonary involvement with 38% of cases (n=38) having pulmonary disease only while extrapulmonary disease only was reported in 51% (n=51) of the cases.

Of the extrapulmonary sites reported, lymph node was the most common (51%), followed by pleural TB (12%), disseminate TB (11%), bone/joint TB (8%) and TB of the gastrointestinal tract (8%). Table 3 gives the numbers of extra-pulmonary sites reported among TB cases in 2022 (more than one extra-pulmonary site may be reported for each notified case).

Of the 100 cases notified in 2022, 95% (n=95) were new diagnoses of TB; while 2% (n=2) were classified as a TB recurrence following treatment overseas. TB recurrences may be due to either relapse or reinfection.

Figure 17: Tuberculosis notifications by site of disease, WA 2022

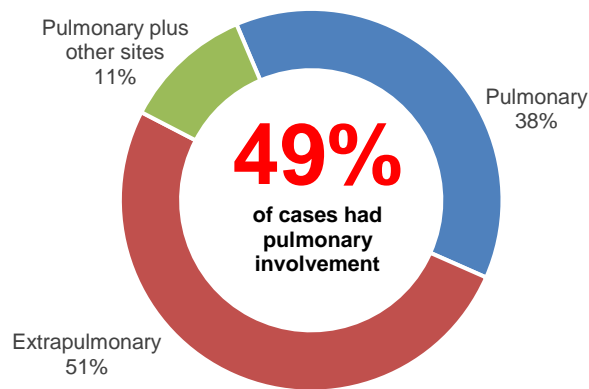
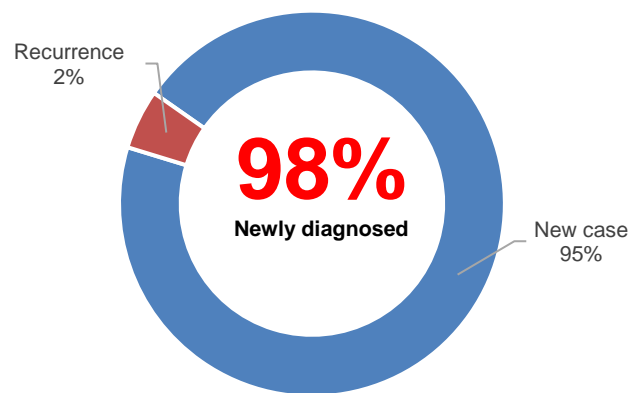


Table 3: Extra-pulmonary TB notifications by site of disease, WA 2022

Site of extra-pulmonary TB*	Number	% Total
Lymph Node	33	51%
Pleural	8	12%
Disseminated TB	7	11%
Bone/Joint	5	8%
Peritoneal (includes all GI sites)	4	6%
Genito/Urinary	4	6%
Ocular	3	5%
Meningeal	1	2%
Total	65	100%

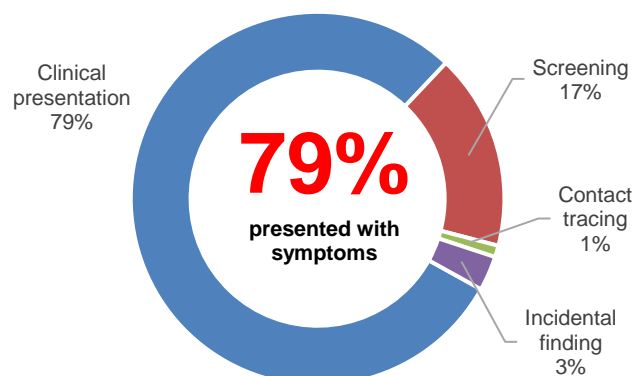
* More than one extra-pulmonary site may be reported for each notified case of TB

Figure 18: Tuberculosis case classification, WA 2022



Most cases notified in 2022, 79% (n=79), were diagnosed with TB as part of an investigation of clinical symptoms. An additional 17 cases (17%) were identified through screening including immigration health check, 3 cases (3%) were identified as a result of tests performed for reasons other than suspected TB disease, while only one cases (1%) was identified through contact investigation.

Figure 19: Tuberculosis case by detection method, WA 2022



MYCOBACTERIAL LABORATORY DATA

The percentage of culture confirmed TB cases increased slightly from 73% (n=104) in 2021 to 76% (n=76) in 2022. This was mainly due to increase in culture positive pulmonary and pulmonary plus other sites cases with 48 (98%) culture confirmed cases in 2022 compared with 86% culture confirmation in 2021. Also, culture confirmation of extra-pulmonary TB cases slightly increased with 55% culture positive cases (54% in 2021). A further 5 extra-pulmonary TB cases were confirmed with positive Nucleic Acid Amplification Test (NAAT). All the 76 cultured Mycobacterium isolates were identified by Whole Genome Sequencing (WGS) as Mycobacterium tuberculosis.

Figure 20: Tuberculosis Notifications by method of diagnosis, WA 2022

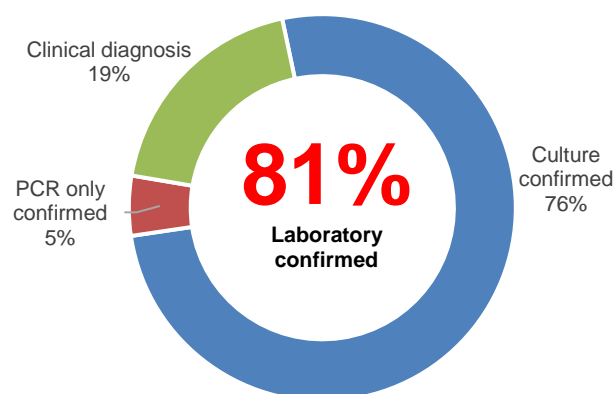


Table 4: Tuberculosis Notifications by culture and sputum smear result, WA 2022

Site	Culture Positive		Sputum Smear Positive	
	Number	% Site	Number	% Site*
All TB notifications	76	76%	26	26%
Pulmonary only	38	100%	19	50%
Pulmonary plus other sites	10	91%	7	64%
Extrapulmonary only	28	55%	0	0%

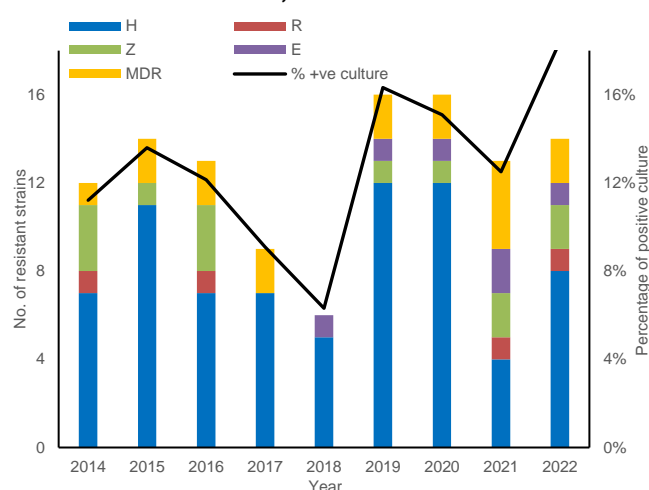
*Percentage of all cases including culture negative

The Proportion of culture positive pulmonary TB cases in 2022 that were sputum smear positive was 54% (26/48), representing 34% of total culture positive TB notifications. This is a decrease from the 67% pulmonary TB smear positive cases notified in 2021.

Drug susceptibility

Of 76 culture confirmed cases in 2022, 82% (n=62) were fully susceptible to all first line TB drugs and 18% (n=14) were resistant to at least one drug. These figures were higher than the 13% resistance noticed in 2021. On the other hand, the number of multi-drug resistant TB (MDR-TB) cases decreased from 4 cases in 2021 to 2 cases in 2022. One of the MDR-TB cases had a pre-extensively drug-resistant TB with additional resistance to fluoroquinolones (pre-XDR-TB). All patients with drug resistant TB were born overseas and only the case with pre-XDR-TB had a history of prior TB treatment overseas.

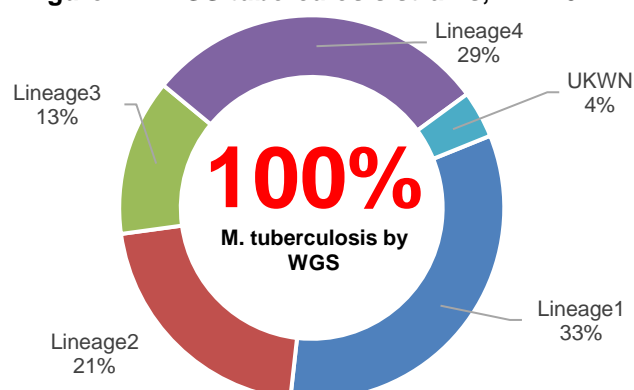
Figure 21: Tuberculosis cases with drug resistance, WA, 2014-2022



Genotyping and strain identification

From 2020, The TB reference laboratory started to use Whole Genome Sequencing (WGS) to characterise TB strains and assess transmission. Isolates that are within 10 single nucleotide polymorphisms (SNP) of another isolate are notified to the WATBCP for review and investigation of epidemiological links.

Figure 22: WGS tuberculosis strains, WA 2022



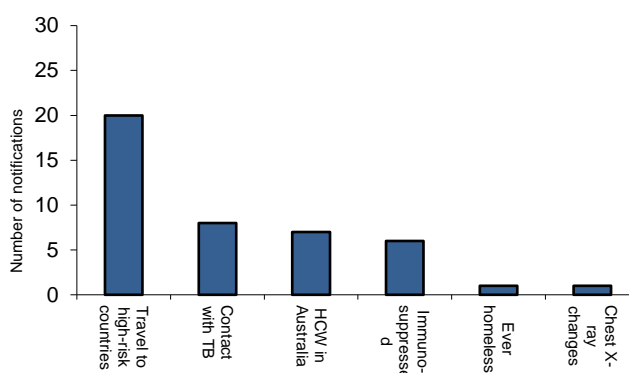
In 2022, Indo-Oceanic (Lineage 1) were the most common strains representing 33% of the isolates, followed by Euro-American (lineage 4) 29% , East-Asian (lineage 2) 21%, and East African-Indian (lineage 3) 13%.

Of the sequenced isolates, 12% (n=9) were found to be part of a cluster of at least 2 cases notified in 2022 or earlier. The remaining 67 culture positive cases (88%) were not linked to any other case at the time of analysis. Of the 9 clustered cases, 5 (56%) were males, the median age was 24 years (range 19-59 years) and 56% (n=5) lived in Perth metropolitan area. Cases with pulmonary involvement accounted for 67% (n=6), of which 67% (n=4) had positive smear for AFBs on a respiratory specimen. Five of the 9 clustered patients were Australian born including 3 Aboriginal patients. The remaining 4 were overseas born (2 from India, one from Bhutan and one from Vietnam). Epidemiological links were identified for 6 clusters involving household and close contact settings.

TB RISK FACTORS

No TB risk factors were identified for 60% (n=60) of 2022 TB cases. Of the identified risk factors, the most reported was past travel to, or residence in, a high-prevalence country (47%). Being a household or close contact of TB (19%) was the second highest reported TB risk factor followed by ever employed in Australian health (16%) and being immunosuppressed due to health condition or medication (14%).

Figure 23: Risk factors reported for tuberculosis notifications, WA 2022



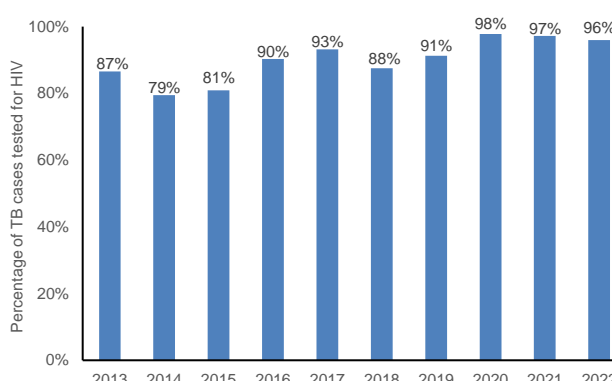
In both Australia born and overseas born cases, past travel to, or residence in, a high prevalence country was the most frequently reported risk factor. Similarly, having a household member or close contact with TB was the second most reported risk factor in both groups.

Table 5: Risk factors for tuberculosis by place of birth, WA 2022

Risk Factor	All cases	Australian born	Overseas born
Travel to a high prevalence country	20 (47%)	2(50%)	18 (46%)
Contact with TB	8 (19%)	1 (25%)	7 (18%)
Ever employed in Australian health	7 (16%)	0	7 (18%)
Immuno-suppressed	6 (14%)	0	6 (15%)
Chest X-ray changes	1 (2%)	0	1 (3%)
Ever homeless	1 (2%)	1 (25%)	0

The HIV status was known in 96% (n=96) of TB cases in 2022, which is stable compared with 2020 (97%). Two of the tested cases were HIV positive, both were overseas born females with previously diagnosed HIV.

Figure 24: HIV screening at time of TB diagnosis, WA 2013-2022



TB AMONG HEALTH CARE WORKERS

In 2022, of those with known occupation (n=64), 11% (n=7) reported working as health care workers. Only one of these patients had smear negative pulmonary TB. Contact investigation of the pulmonary TB case did not reveal any active TB cases. All 7 health care workers were overseas born from high TB prevalence countries.

HEALTH SYSTEM (HS) DELAY

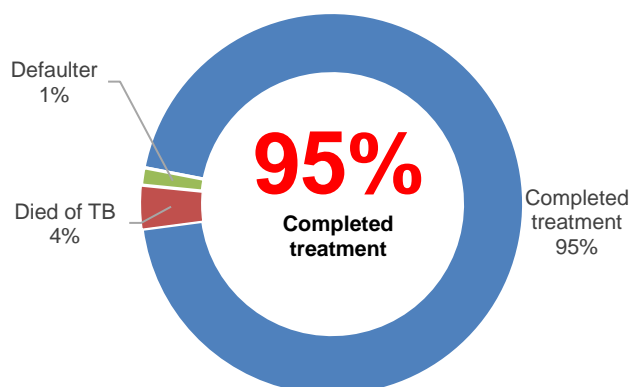
Of the 100 cases notified in 2022, 39% (n=39) were diagnosed within 30 days of first health contact, 24% (n=34) were diagnosed between 30 and 90 days and 26% (n=26) were diagnosed more than 90 days after their initial health contact. The median time from the first health contact to TB diagnosis decreased to 43 days (range 2-1106 days) from 69 days and 62 days in 2021 and 2020 respectively. Delay by TB type showed that pulmonary TB cases had a median delay of 40.5 days (range 2-803 days) (44.5 days in 2021) while extra-pulmonary cases had a median delay of 47 days (range=2-1106 days) (102 days in 2021).

Clinically important delay, as assessed by the delay matrix introduced in 2016, was observed in 43% of 2022 cases (n=43); this was less than the delay observed among 52% of 2021 cases. On the other hand, the matrix showed a difference in health system delay between pulmonary and extra-pulmonary TB cases with pulmonary TB cases significantly more likely to experience health system delay (54% vs 33%) with an odds ratio of 2.36 (95% CI=1.04-5.33). In 2021, pulmonary TB cases were 1.58 times more likely to be delayed compared to extra-pulmonary TB cases.

TREATMENT OUTCOMES, 2021

Treatment outcome was assessable for 95% (n=136) of the notified 143 cases in 2021 after excluding those transferred outside of Australia (3 cases) or died of other causes while on treatment (4 cases). There were no cases still on treatment.

Figure 25: Assessable tuberculosis treatment outcome, WA, 2021



The proportion of cases successfully treated (including cured and completing treatment) was 95% (n=129) of assessable cases, decreasing from the 99% reported in 2020.

Table 6: Tuberculosis treatment outcome, WA, 2021

Outcome	Number	% Total
Assessable outcomes		
Treatment success	129	95%
Cured (bacteriologically confirmed)	0	0%
Completed treatment	129	95%
Interrupted treatment	0	0%
Died of TB (died during treatment of TB, as a result of TB disease)	5	4%
Defaulter	2	1%
Failure	0	0%
Not followed up, outcome unknown	0	0%
Total assessable	136	100%
Non-assessable outcomes		
Transferred out of Australia	3	2%
Died of other cause (died during treatment of cause other than TB)	4	3%
Still under treatment	0	0%
Total	143	100%

There were 5 TB related deaths reported in 2021 with a case fatality rate of 3%. There were also 2 cases that defaulted before completing adequate treatment. of the 5 TB related deaths, 3

cases were over 90 year of age, with comorbidities and delayed diagnosis, one patient was 69 year old with TB meningitis and significant comorbidities and the last patient was 76 year old with no comorbidities or other reason to account for the patient sudden death.

LATENT TB

In 2022, the number of people treated for latent TB infection (LTBI) remained stable with 439 individuals starting treatment compared to 437 in 2021. Treatment completion rate was 87% (n=381), decreasing by 2.8% from 2020 completion rate.

Gender distribution among those starting LTBI treatment showed female predominance representing 58.5% (n=257) and female to male ratio of 1.4:1. The majority were less than 44 years of age (70.6%) with the age group 25-34 representing the biggest age group and accounting for 26.7% of those starting LTBI treatment.

Where place of birth was recorded, 90.6% of those starting LTBI treatment were among overseas born individuals and 82.9% were born in TB high-prevalence countries (countries with annual TB rate of $\geq 40/100,000$ population).

Figure 26: LTBI treatment outcomes, WA 2018 - 2022

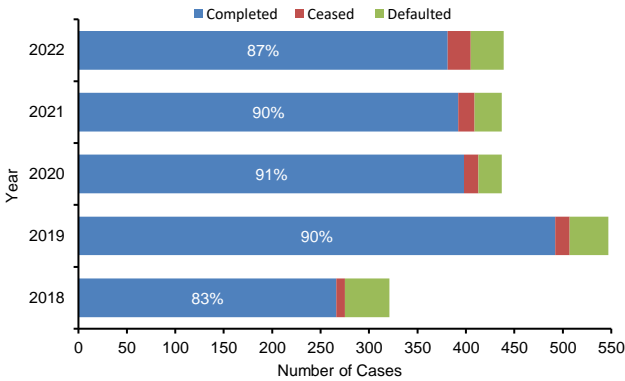


Figure 27: LTBI treatment by age group and sex, WA 2022

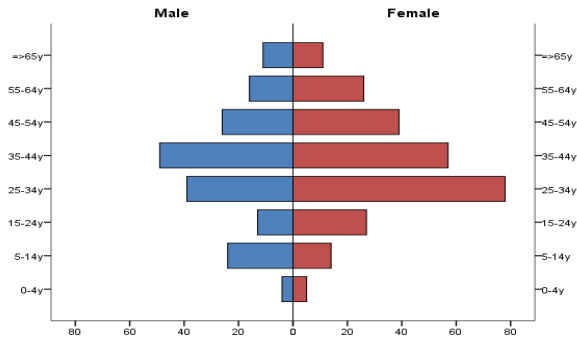
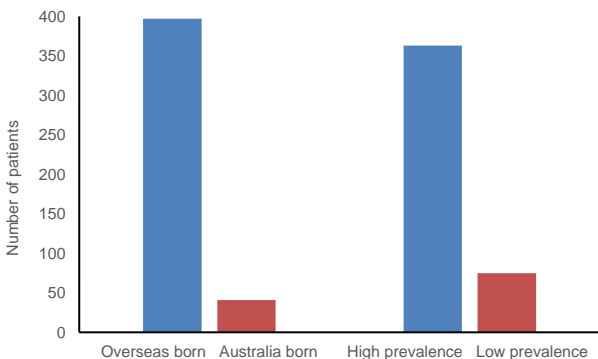


Figure 28: LTBI cases by place of birth, WA 2022



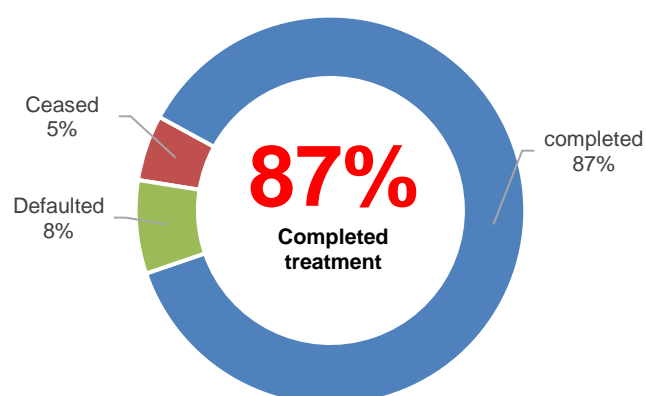
Of those that took LTBI treatment, the reasons for the LTBI test were recent migration (38.0%), health care worker screening (28.7%), TB contact tracing (15.3%), screening of newly arrived refugees (5.9%) or screening prior to immunosuppressive treatment (3.6%).

Table 7: Reason for LTBI test in cases treated, WA 2022

Country of Birth	Number	% Total
Recent migrant	167	38.0%
Healthcare worker screening	126	28.7%
TB Contacts	67	15.3%
Recently arrived refugee	26	5.9%
Immunosuppressed	16	3.6%
Other	37	8.4%

Of those failing to satisfactorily complete LTBI treatment in 2022, 5.5% (n=24) ceased medication due to adverse drug reactions, and 7.7% (n=34) failed to complete LTBI treatment for reasons that included non-adherence or non-attendance of clinic appointments, which can potentially be improved with additional targeted interventions.

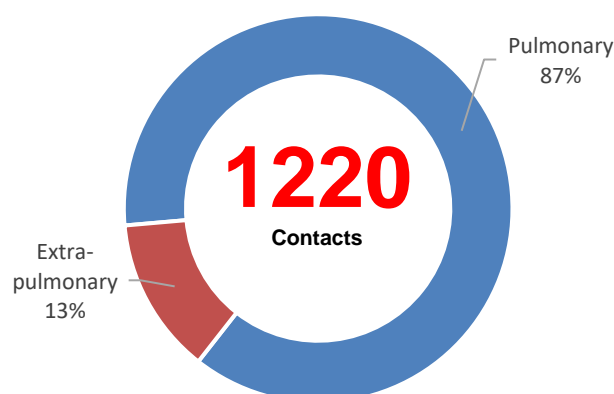
Figure 29: LTBI by treatment outcome, WA 2022



TB CONTACT INVESTIGATION

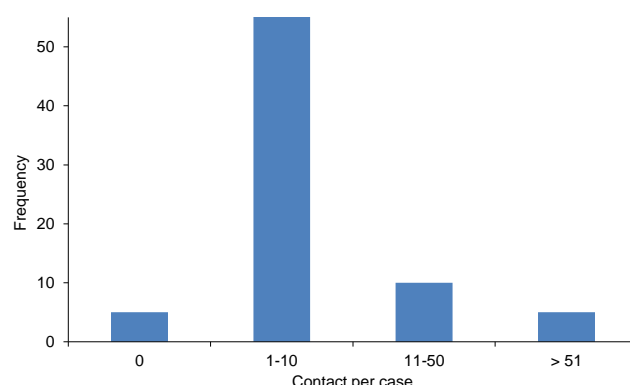
In 2022, a total of 1220 contacts of 95 notified TB cases (95% of all notifications). were identified. Of these, 87.0% (n=1061) were contacts of 49 pulmonary TB (PTB) cases and 13.0% (n=159) were contacts of 46 extra-pulmonary TB (XPTB) cases. No contacts were identified for 5 extra-pulmonary TB cases.

Figure 30: Number of TB contacts, WA 2022



The highest number of contacts associated with a single case was 199 contacts. This involved a smear positive pulmonary TB case with contact investigation in educational and congregate settings. The median number of contacts per case was 3 (interquartile range (IQR) 1-6.5 cases).

Figure 31: Number of contacts per respiratory case, WA 2022

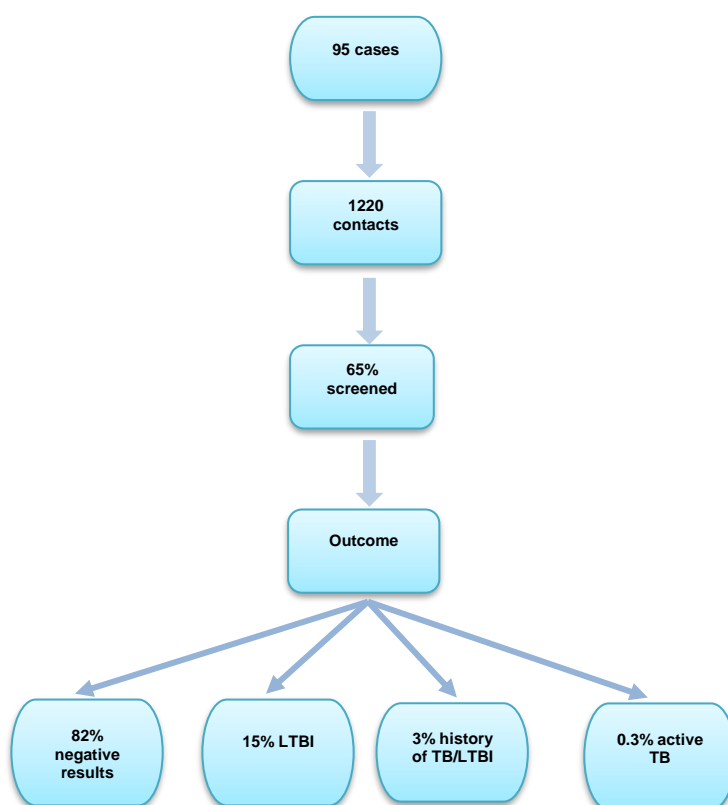


The median number of contacts of pulmonary TB cases was 6 contacts per case (IQR 2.25-17.5 contacts). Majority of pulmonary TB cases (72.3% n=34) had 10 or fewer contacts. Eight cases (17.0%) had 11 to 50 contacts while 5 cases (10.6%) had more than 50 contacts identified. There were 19 children less than 5 years of age identified as contacts, representing 1.8% of pulmonary TB contacts.

Contact investigation outcomes

In 2022, 34.3% of all contacts (n=418) did not attend for contact tracing tests, did not complete testing or there was no recorded outcome of their TB screening; this was an increase from the 32.1% contacts with no outcome recorded in 2021. Five contacts (0.4%) died before screening completion and 2 contacts (0.2%) were transferred out of WA to their jurisdiction of residence. Of those completing contact tracing assessment, 81.9% (n=795) had negative screening results, 14.7% (n=117) were diagnosed with LTBI, 3.1% (n=25) had a past history of TB or LTBI and 0.3% (n=2) were found to have secondary active TB cases identified by contact investigation. The secondary TB cases were 2 adults who were household contacts of a family member with smear positive pulmonary TB.

Figure 32: Contact investigation outcome, WA 2022



DATA QUALITY AND COMPLETENESS

Notification data

TB notification data is collected through core notification data similar to all other notifiable infectious diseases and an enhanced TB database that collects disease specific information not captured by the core notification data. A completion audit of primary notification data fields is presented. Fields that had their records extracted from other database fields were excluded.

Core notification data

All audited variables were complete with no missing values. Data cleaning undertaking as part of this report preparation continues to contribute to this data quality improvement.

Enhanced TB surveillance data

All audited enhanced surveillance variables were complete except for 'residence time in Australia' and 'Australia arrival date'. As noted in previous reports these were not actual missing values but were not recorded for Australian born cases and is primarily a reflection of the database design limitation that continues to identify Australian born cases in these variables with empty fields.

Latent TB and contact investigation data

There was no significant improvement in the quality of LTBI data in 2022. Most of the data gaps was noticed with the 'Risk Factor' variable and the 'year of Australia entry' variable which had more than 50% of missing values.

On the other hand, contact investigation data improved in 2022 with only 9% of identified contacts having no screening outcome recorded, in 2021 16% of the identified contacts had no screening outcome recorded.

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