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 2023

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EXECUTIVE SUMMARY

In 2023 tuberculosis (TB) notifications in Western Australia (WA) substantially increased to 161. After a steady-state of approximately 130 – 145 notifications annually for the 9 years to 2021, the number fell to 100 in 2022, representing a delayed effect of the closure of the international border due to the COVID pandemic. In 2023 there was a 61% increase in notifications, at an incidence rate of 5.6 per 100 000, which is considered principally due to the large backlog of immigration that occurred from mid-2022, especially of tertiary students and skilled workers. Consistent with this increase being related to migration is that the notifications were:

- Young: 51% aged 25 – 44 years,
- Foreign-born and recently arrived: 91% born outside Australia and 41% immigrated less than 2 years prior to diagnosis,
- Urban residence: 92% live in Perth,
- Tertiary students: 20% of all notifications, up from 15% in 2022, and the largest sub-group of temporary visa holders.

Health care workers (HCW) were an important subgroup of immigrant workers. In 2023 there were 11 HCW (10% of those with a recorded occupation) notified with TB, which was a 43% increase from 2022. All HCW with TB were born in countries with high TB prevalence, and none were considered to have acquired TB in Australia. This has occurred despite a newly introduced program of screening of HCW for latent TB infection on visa medical with a view to early, post-migration preventive therapy. However, a positive effect of this program can be expected to be delayed by many years.

Two separate outbreaks of TB were identified in 2022 amongst Aboriginal Australians centred in the Midwest and the Goldfields. In 2023 Aboriginal people continue to suffer TB at an incidence rate that was approximately five times greater than non-Aboriginal Australian born people (4.3 per 100,000). However, the absolute number of notifications remains small and is not the cause of the overall increase in notifications. Two TB notifications occurred in Aboriginal people in 2023, both linked to one of the outbreaks. The proportion of notifications outside of Perth (8%, n = 13) has also fallen compared with 2022.

The clinical characteristics of notified TB were not significantly different from previous years. The proportion of pulmonary TB and the distribution of extra-pulmonary sites was similar, though, notably, there were 7 disseminated and 3 meningeal TB notifications. The increase in total notifications is not explained by more empiric treatment of TB, with a higher proportion of notifications with positive microbiology (84% culture positive). In 2023 a higher proportion of cases were found by clinical presentation (84%), as opposed to active surveillance, and were sputum smear positive (65%). This may indicate later presentation of TB, giving advanced and more infectious TB, which in turn is a threat to TB control and adds to the workload for the TB program. More advanced TB could be a consequence of health system delay, but this did not deteriorate in 2023. The median delay from presentation to diagnosis improved to 39 days (43 days in 2022), though 32% of cases took longer than 90 days and 44% were categorised as delayed causing significant clinical or public health consequences. More advanced TB may also be due to patient delay in presentation, in turn due to recent migration and poor access to healthcare, though this is not formally examined.

The outcome of treatment of TB notifications is reported for 2022, and the proportion of notifications successfully treatment remained very high (98%). There was one death from TB

recorded (case fatality rate = 1%) and one patient that defaulted from treatment before completion, who remains under surveillance.

This report again describes genotype data with whole genome sequencing (WGS), identifying the lineage strains of TB notified and 16 notifications (12%) that were part of a cluster of at least 2 cases. The most significant cluster was of 7 notifications in 2023 involving predominantly young male migrants from East African countries. Their common TB organism has proved to be both highly infectious and virulent, and establishing the epidemiological links between the members of this outbreak to extend targeted contact tracing has required substantial additional work by the TB Control Program.

The TB Control Program diagnosed and treated 767 patients with latent TB infection (LTBI), a 75% increase from previous years, and 88% completed preventive therapy. The largest subgroup was HCW screened for visa or work purposes (256, 33%), which substantially increased after the newly introduced pre-visa screening requirement for immigrant HCW. More LTBI was also seen in other recent migrants (227, 30%) and contacts (132, 17%). Increased TB notifications were associated with increased contact tracing – amongst 1836 contacts identified, 14% were diagnosed with LTBI and there were 8 cases of secondary TB, including 4 pre-school aged children. Nine TB notifications required tracing of greater than 50 contacts.

In 2023 increased TB notifications, and the associated increase in contact tracing, latent TB infection diagnosis and treatment, management of complex patients and increased directly observed therapy, has substantially increased the workload of the WA Tuberculosis Control Program. A large increase in immigrants from countries with high TB incidence has also contributed to increased workload directly through active surveillance requirements. This increased activity has placed a strain on the limited resources of the TB Control Program, especially personnel, and required prioritization and curtailment of some activity to work within the resource limitations.

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TB in WA: 2023 SNAPSHOT

	2023	Compared to 2022
Number of notifications	161	↑ 61.0%
Incidence rate	5.6/100,000	↑ 55.9%[1]
Rate in Australian-born population	0.8/100,000	↑ 60.0%[1]
Rate in Indigenous population	4.3/100,000	No change[1]
Rate in overseas-born population:	13/100,000	↑ 30.0%[1]
Geospatial distribution Rate in metropolitan Perth area Rate in regional areas	35 LGA's 6.4/100,000 2.5/100,000	↑ 29.6% ↑ 68.1%[1] No change[1]
Health System Delay (Median)	38.5 (days)	↓ 10.5%
Culture confirmation Resistance to any first line drug MDRTB	84% (n=135) 11% (n=15) 2% (n=3)	↑ 10.3% ↓ 39.7% ↓ 15.6%
Genotyping (WGS) Cluster rate	99% of positive culture 12% (n=16)	↑ 2.0% No change
TB in Health Care Workers Pulmonary TB smear positive	10% (n=11) 2 cases	↑ 42.9% ↑ (0 in 2022)
Treatment Outcome (2022) Case fatality rate	98% success rate 1%	↑ 3.0% ↓ (3% in 2021)
Latent TB Treatment	88% (n=673) completion rate	↑1.0%
Contact investigation No TB infection or disease LTBI Secondary TB	1836 contacts identified 82% 14% 0.7%	↑ 50.1% No change ↓ 1.0% ↑ 133.3%

[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 demographics, clinical details, laboratory results, risk factors and some case management details.

The total number of TB cases is based on persons who were 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 (2022), 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. In WA most TB culture and all TB isolate identification and molecular typing is undertaken by the reference laboratory.

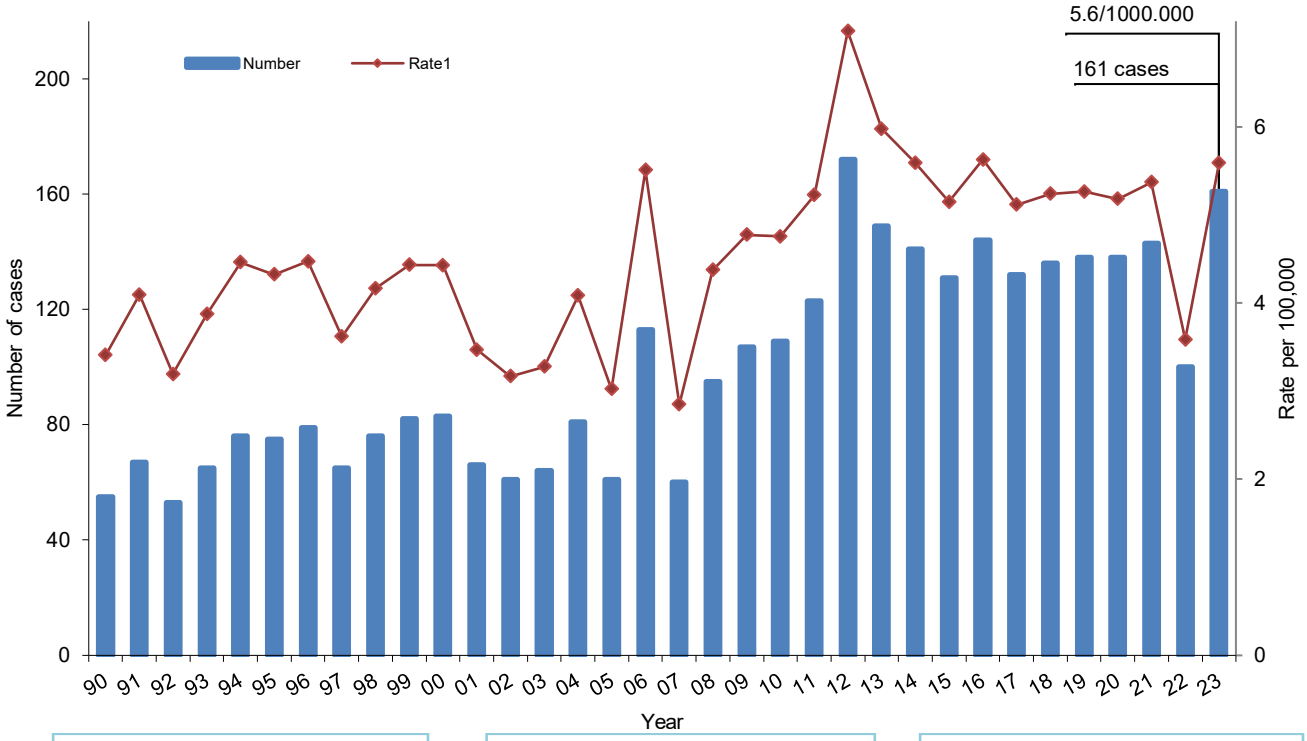
Latent TB and Contact Investigation:

Data presented in this report is 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 tools were introduced to maintain and enhance data quality.

TB in WA

In 2023, Western Australia (WA) reported 161 active tuberculosis (TB) cases, marking a 61% increase from the previous year. The incidence rate of TB in WA was 5.6 per 100,000 people.

Figure 1: Tuberculosis notifications numbers and rates, WA, 1990-2023



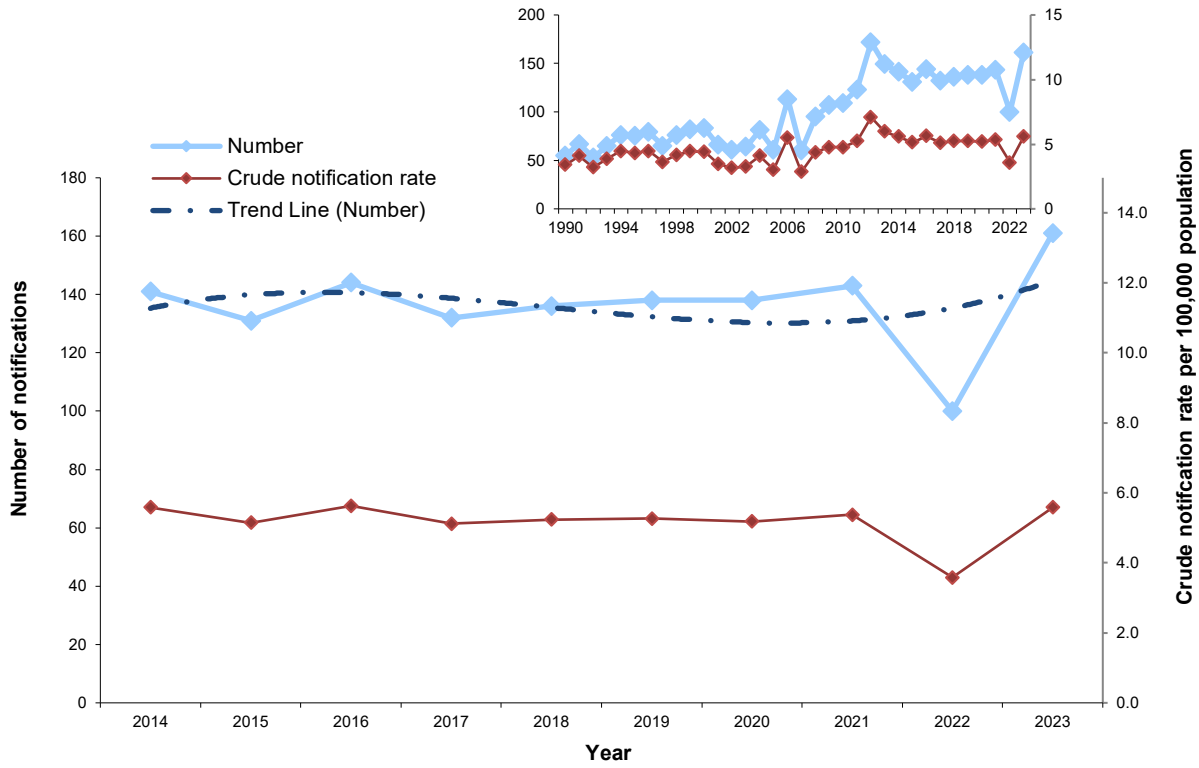
1990-2000:
Overall increase: 51%
Average annual increase: 5.3%

2001-2011:
Overall increase: 86%
Average annual increase: 12.3%

2012-2023:
Overall decrease: 6%
Average annual decrease: 1.5%

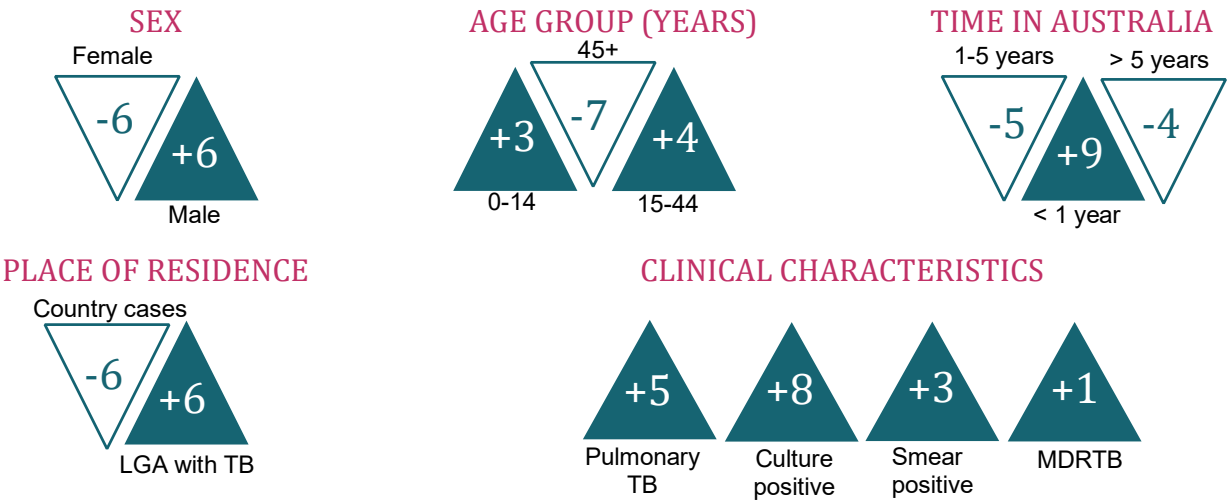
OVERALL NUMBERS AND RATES

Figure 2: Tuberculosis notifications numbers and rates, WA, 2014-2023



TB notifications increased substantially from the 100 cases recorded in 2022 and represents the highest annual figure since 2012. The increase in TB cases may be partially attributed to a correction of the previous year's unusual decline, as well as the increase in overseas arrivals following the lifting of COVID-19-related border restrictions.

Figure 3: Percentage point change for selected TB case characteristics, WA 2022-2023



DEMOGRAPHIC CHARACTERISTICS

AGE AND SEX

Figure 4: Tuberculosis by Sex and age-group, WA 2023

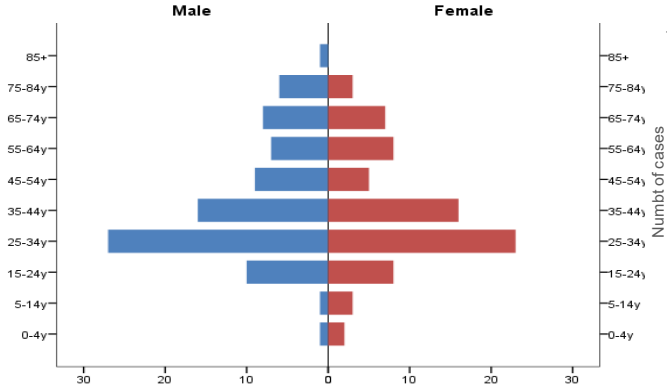
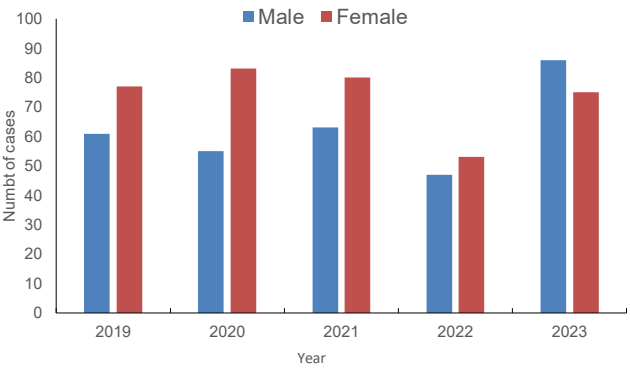


Figure 5: Tuberculosis by sex distribution, WA 2019-2023



In 2023, the number of males diagnosed with TB slightly surpassed that of females, reversing the trend of female predominance observed over the previous six years. Males accounted for 53% (n=86) of reported TB cases, resulting in a male-to-female ratio of 1.13:1. While this gender difference was not statistically significant, it aligns with global and national trends that consistently indicate a higher prevalence of TB among males.

Figure 6: Tuberculosis by age group, WA 2019-2023

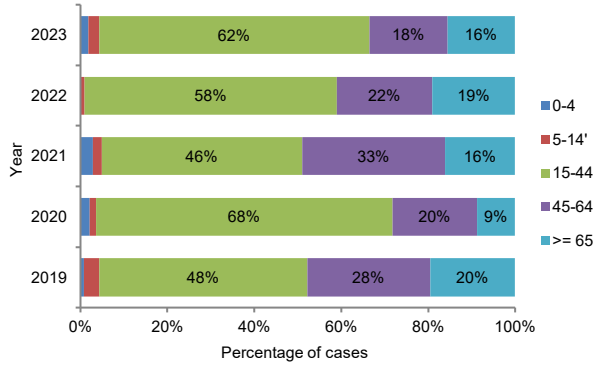
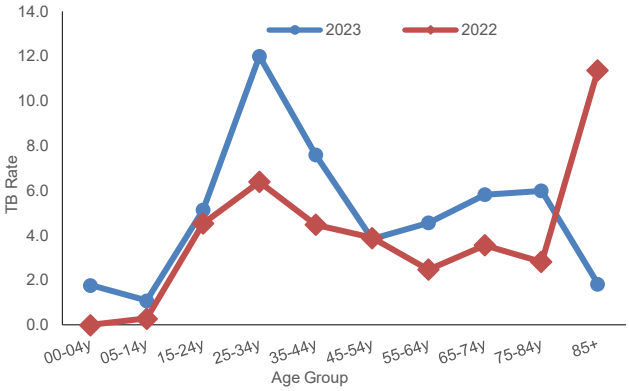


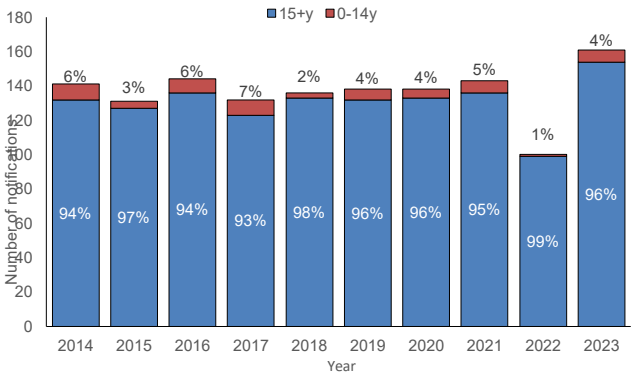
Figure 7: Tuberculosis rates by age-group, WA 2022-2023



In 2023, the age distribution reflected a younger demographic, with a median age of 35 years (ranging from 1 to 82 years) compared to 41 years in 2022. Notification rates peaked in the 25-34 age group (n=50, rate=12.0 per 100,000), followed by the 35-44 age group (n=32, rate=7.6 per 100,000). For older cohorts, the 75-84 age group reported 9 cases (rate=6.0 per 100,000), and the 65-74 age group recorded 15 cases (rate=5.8 per 100,000). The median age for males was 35.5 years, with ages spanning from 1 to 88 years, whereas for females, the median age was 35 years, with ages ranging from 1 to 82 years.

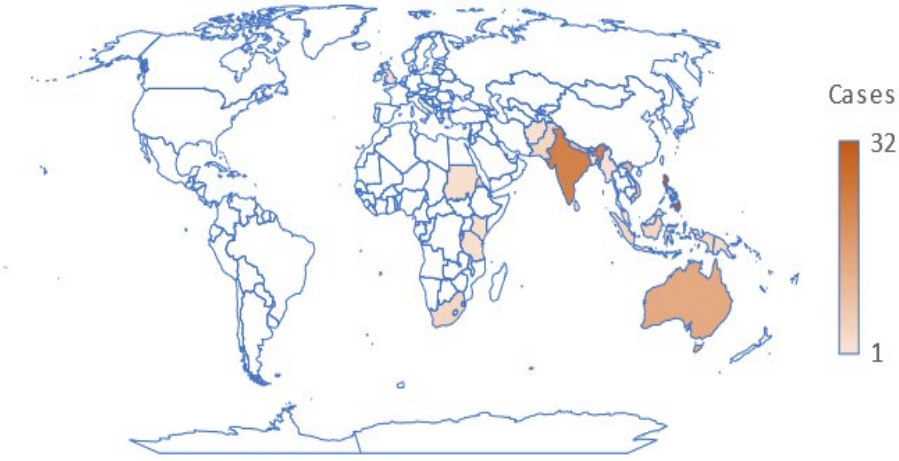
The proportion of TB in children under 15 years of age rose from 1% in 2022 to 4% (n=7). The rate of TB in this demographic was 1.3 per 100,000 population, compared to a national average of 1.1 per 100,000 for the same age group. Among the seven diagnosed cases, five were Australian-born children; four of these had recent household contact with a confirmed TB case. Three remaining notifications had no identified sources in Australia. Two were born overseas, and the third born in Australia, but had visited Kenya and stayed 18 moths there during COVID lockdown.

Figure 8: Percentage of total TB notifications that are children, WA 2014-2023



COUNTRY OF BIRTH

Figure 9: Tuberculosis cases by place of birth, WA, 2023

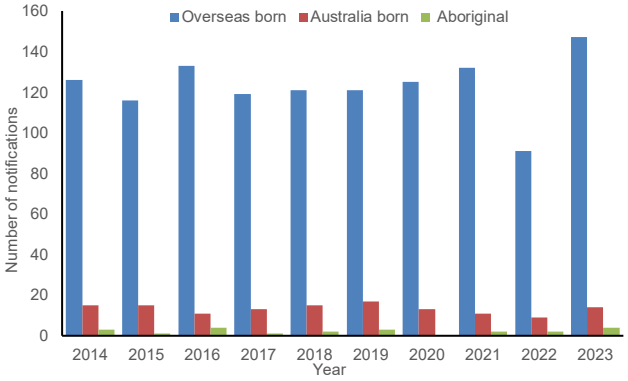


Country of Birth	Number	% Total
Philippines	32	20%
India	23	14%
Bhutan	19	12%
Australia	14	9%
Vietnam	10	6%
Nepal	8	5%
Indonesia	5	3%
Eritrea	4	2%
China	4	2%
South Africa	4	2%

In 2023, TB cases were reported from individuals born in 34 different countries, with 91% (n=147) of cases originating from abroad. The majority of these individuals came from countries with a high burden of TB, including the Philippines (20%, n=32), India (14%, n=23), Bhutan (12%, n=19), and Vietnam (6%, n=10).

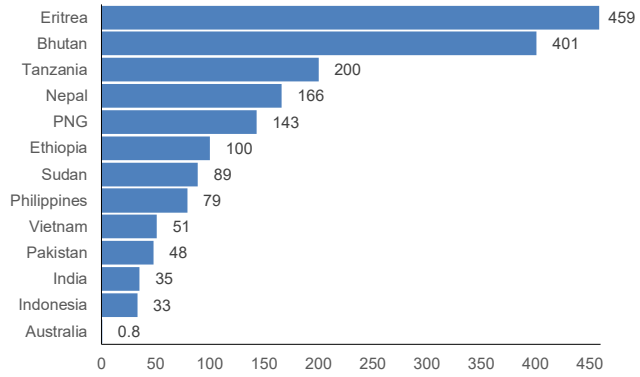
The proportion of TB cases among individuals born in Australia remained stable at 9% (n=14), corresponding to an incidence rate of 0.8 cases per 100,000 population. Among the 14 Australian-born TB cases, 2 were identified as Aboriginal, leading to an incidence rate of 4.2 cases per 100,000. This group represents 1% of the total TB cases reported and 14% of cases among individuals born in Australia.

Figure 10: Tuberculosis cases by place of birth, WA, 2014 – 2023



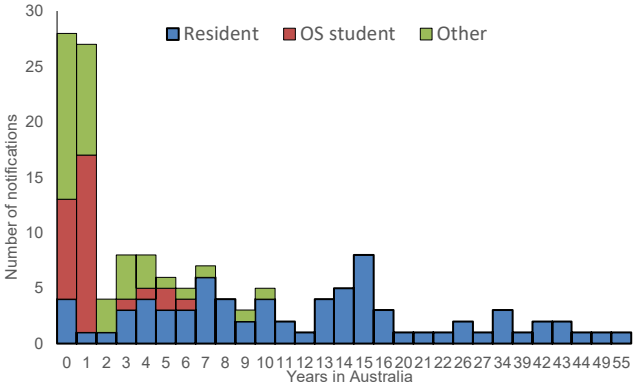
TB notification rates based on country of birth demonstrated significant variability. For Australian-born cases, the notification rate was 0.8 per 100,000 population. In contrast, individuals born in Eritrea and Bhutan had much higher rates of 459 and 401 per 100,000, respectively. Overall, the notification rate for all overseas-born cases was 13 per 100,000, reflecting an increase from the previous rate of 10 per 100,000 observed in 2022.

Figure 11: Tuberculosis rates by place of birth, WA 2023



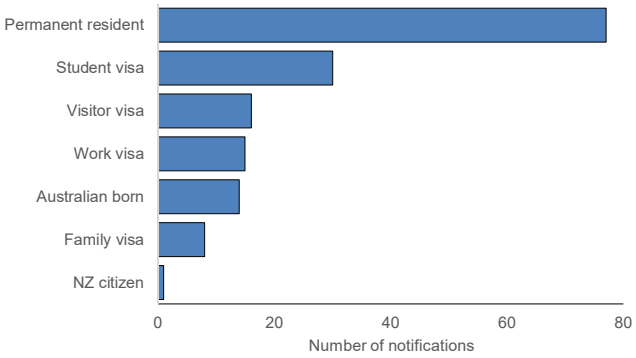
The interval between the date of arrival in Australia and the date of TB notification varied significantly, ranging from 0 to 55 years, with a median interval of 4 years. Notably, 41% of cases (n=59) were diagnosed within two years of arrival, an increase from 27% in 2022. Additionally, 52% of cases (n=81) were diagnosed within five years of their arrival, consistent with the 52% rate observed in 2022.

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



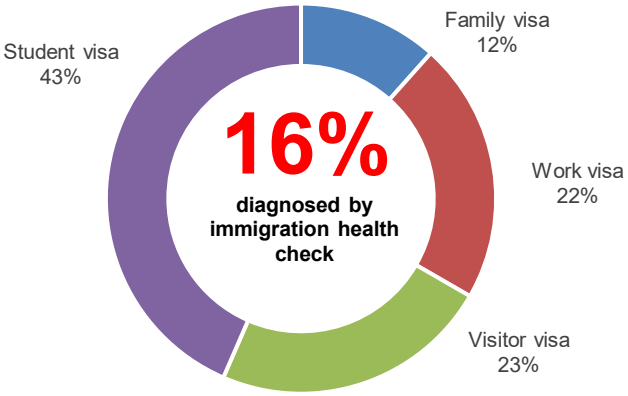
The majority of TB cases among overseas-born individuals were permanent residents who accounted for 52% (n=77) of cases, a slight decline from 56% in 2022. In contrast, the proportion of TB cases among overseas students rose to 20% (n=30), up from 15% in 2022. Additionally, the incidence of TB among overseas visitors also increased, representing 11% (n=16) of cases, compared to 9% in the previous year.

Figure 13: Tuberculosis cases by immigration status, WA 2023



Among individuals with temporary Australian residency status (n=69), 16% (n=11) were diagnosed with TB during immigration health assessments, a decrease from 38% in 2022. This group included 3 applicants for family visas and 5 applicants for student visas, representing 38% and 17% of TB cases within their respective visa categories.

Figure 14: Tuberculosis diagnosis by immigration screening, WA 2023



PLACE OF RESIDENCE

In 2023, TB cases were reported in 35 Local Government Areas (LGAs), up from 27 in 2022. The proportion of cases identified in regional Western Australia decreased to 8% (n=13), down from 14% in the previous year, resulting in an incidence rate of 2.5 cases per 100,000 population (95% CI: 1.1-3.8). In contrast, the Perth metropolitan area accounted for the majority of cases, with 92% (n=148) and an incidence rate of 6.4 cases per 100,000 population (95% CI: 5.4-7.4).

Table 1: Tuberculosis notification numbers and rates, WA Regions 2023

Region	Number	Rate[1] (95% CI)[2]
Metropolitan Perth	148	6.4 (5.4 – 7.4)
South-West	4	2.0 (0.0 – 4.0)
Midwest- Gascoyne	3	4.4 (-0.6 – 9.3)
Wheatbelt	3	4.0 (-0.5 – 8.4)
Goldfields-Esperance	1	1.7 (-1.7 – 5.2)
Pilbara	1	1.7 (-1.6 – 4.9)
Great Southern	1	1.5 (-1.5 – 4.5)
Kimberley	0	-

[1] Crude notification rate per 100,000 population
[2] 95% Confidence interval

In 2023, the East Metropolitan Health Service Area reported the highest proportion of TB cases, accounting for 42% (n=68) of the total cases. The majority of these cases were concentrated in the following Local Government Areas: City of Canning, City of Gosnells, City of Swan, City of Bayswater. and City of Armadale. Together, these areas represented 40% (n=64) of the total TB burden in WA for the year.

Figure 15: Tuberculosis notifications by health service area, WA Regions 2023

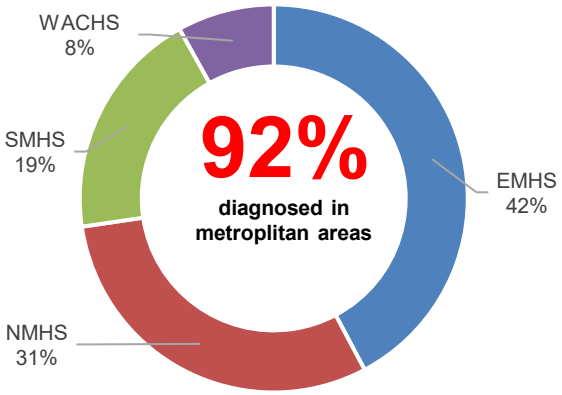
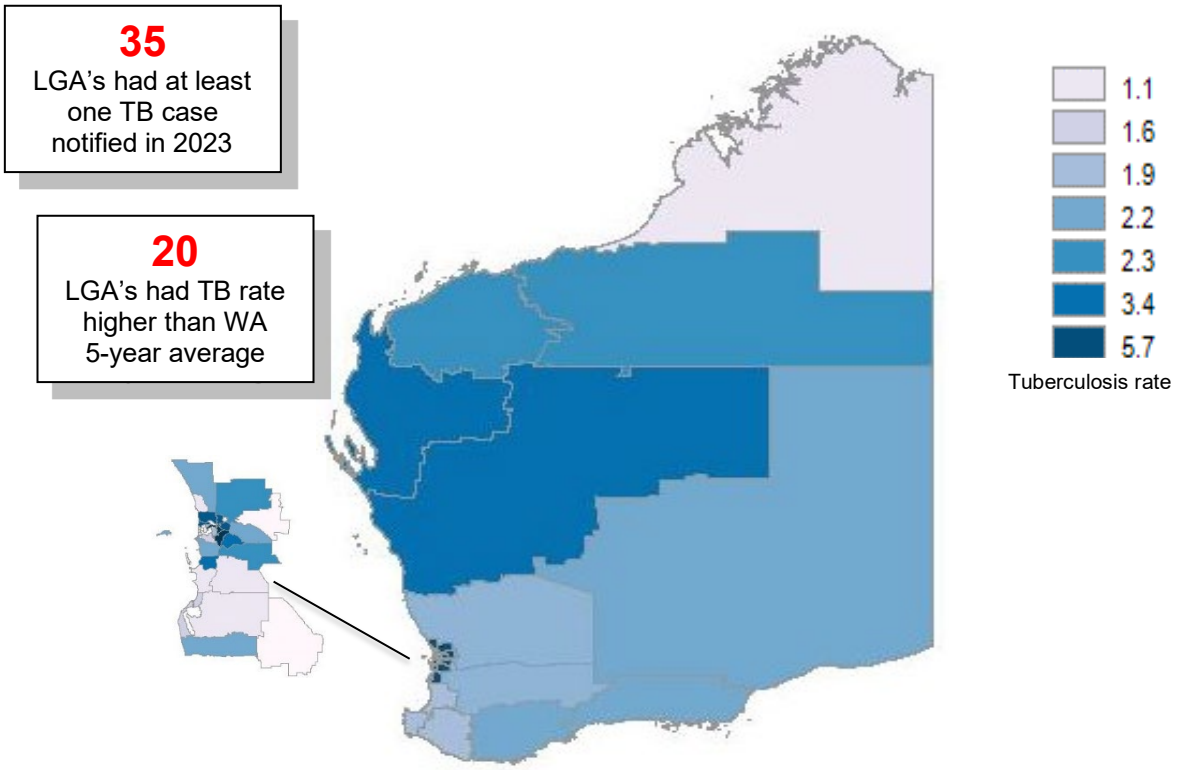


Figure 16: Five-year average tuberculosis incidence rates by WA Regions 2019-2023



The five-year average incidence of TB was highest in the Perth metropolitan area, with a rate of 5.7 cases per 100,000 population. This was followed by the Midwest-Gascoyne region, which had an average rate of 3.4 cases per 100,000. Other regions exhibited lower average rates: the Pilbara (2.3 cases per 100,000), Goldfields-Esperance (2.2 cases per 100,000), and Great Southern (2.2 cases per 100,000). The South-West region reported an average rate of 1.9 cases per 100,000, while the Wheatbelt showed 1.6 cases per 100,000, and the Kimberley reported the lowest average rate of 1.1 cases per 100,000.

Table 2: Regional comparison of tuberculosis notifications, WA 2023

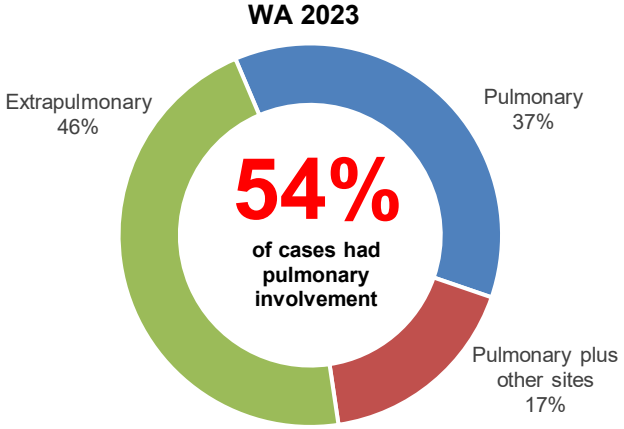
		Metro	Country	P value
Age	Median (IQR)	35 (27-55)	36 (24-50)	>0.05
Sex	Male	79 (53.4%)	7 (53.8%)	>0.05
	Female	69 (46.6%)	6 (46.2%)	
Place of Birth	Australia	10 (6.8%)	4 (30.8%)	< 0.05
	Overseas	138 (93.2%)	9 (69.2%)	
TB Type	PTB	78 (52.7%)	9 (69.2%)	>0.05
	XPTB	70 (47.3%)	4 (30.8%)	
HIV Status	Positive	4 (2.7%)	2 (15.4%)	>0.05
	Negative	136 (91.9%)	10 (76.9%)	
	Not tested or refused	8 (5.4%)	1 (7.7%)	
	Unknown	2 (2.3%)	1 (7.1%)	
HS lag time	Median (IQR)	39 (11-128)	32 (11-89)	>0.05
HS Delay	Yes	65 (44.5%)	6 (50.0%)	>0.05
	No	81 (55.5%)	6 (50.0%)	

A comparative analysis of demographic and clinical parameters between metropolitan and country patients revealed a significant difference in the place of birth with metropolitan patients more likely to have been born overseas compared to their country counterparts. Conversely, no significant differences were observed in age, sex, type of TB, HIV status, or health system delay.

CLINICAL CHARACTERISTICS

In 2023, pulmonary involvement was observed in 54% (n=87) of the notified TB cases. Among these, 37% (n=59) presented with pulmonary disease exclusively. Conversely, 46% of 2023 TB cases (n=74) exhibited only extrapulmonary disease.

Figure 17: Tuberculosis notifications by site of disease, WA 2023



Among the reported extrapulmonary sites of TB in 2023, lymph node involvement was the most prevalent, accounting for 37% of cases. This was followed by pleural TB at 23%, gastrointestinal tract involvement at 9%, and genitourinary TB at 11%. Additionally, bone and joint TB constituted 8% of the cases. Table 3 presents the detailed numbers of extrapulmonary sites reported among notified TB cases, noting that multiple extrapulmonary sites may be documented for each case.

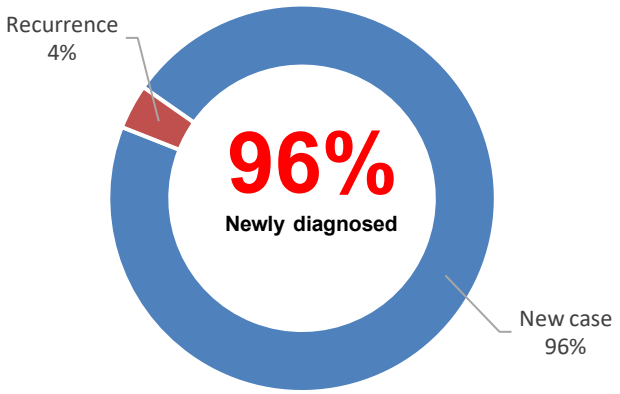
Table 3: Extra-pulmonary TB notifications by site of disease, WA 2023

Site of extra-pulmonary TB*	Number	% Total
Lymph Node	43	37%
Pleural	27	23%
Peritoneal (includes all GI sites)	11	9%
Genito/Urinary	9	8%
Bone/Joint	8	7%
Disseminated TB	7	6%
Ocular	7	6%
Meningeal	3	3%
Cutaneous	2	2%
Total	117	100%

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

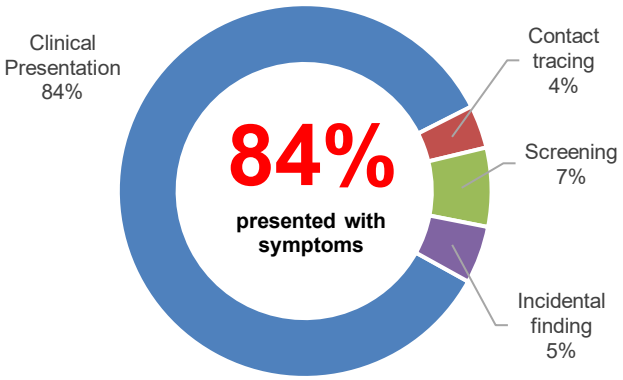
Among the 161 notified cases in 2023, 96% (n=155) represented new diagnoses of TB, while 4% (n=6) were classified as recurrences following treatment administered abroad. These TB recurrences could be attributed to either relapse of the original disease or reinfection with a new strain.

Figure 18: Tuberculosis case classification, WA 2023



In 2023, the majority of notified TB cases (84%, n=136) were diagnosed during investigations prompted by clinical symptoms. Additionally, 11 cases (7%) were identified through screening initiatives, such as immigration health checks. Eight cases (5%) were detected as a result of diagnostic testing conducted for purposes unrelated to suspected TB disease, while 6 cases (4%) were identified through contact investigations.

Figure 19: Tuberculosis case by detection method, WA 2023



MYCOBACTERIAL LABORATORY DATA

The proportion of culture-confirmed TB cases rose from 76% (n=76) in 2022 to 84% (n=136) in 2023. This increase was primarily attributed to a rise in culture-positive extra-pulmonary TB cases, which saw a confirmation rate of 74% in 2023, compared to 55% in 2022. Conversely, the culture confirmation rate for pulmonary and pulmonary-plus-other-site cases experienced a slight decline, from 98% in 2022 to 92% in 2023. Additionally, three cases—two pulmonary and one extra-pulmonary—were confirmed via positive Nucleic Acid Amplification Test (NAAT). Whole Genome Sequencing (WGS) analysis revealed that 98% of the cultured Mycobacterium isolates were identified as Mycobacterium tuberculosis; one isolate was identified as Mycobacterium orygis, while two isolates did not undergo WGS due to challenges in obtaining a sufficiently purified mycobacterial culture.

Figure 20: Tuberculosis Notifications by method of diagnosis, WA 2023

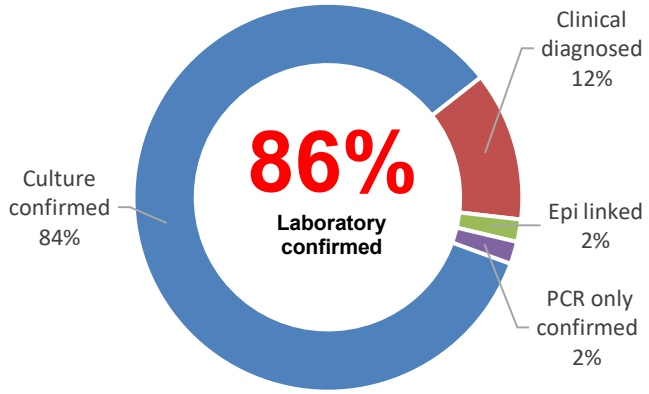


Table 4: Tuberculosis Notifications by culture and sputum smear result, WA 2023

Site	Culture Positive		Sputum Smear Positive	
	Number	% Site	Number	% Site*
All TB notifications	135	84%	53	65%
Pulmonary only	54	92%	36	65%
Pulmonary plus other sites	26	93%	17	65%
Extrapulmonary only	55	74%	0	0%

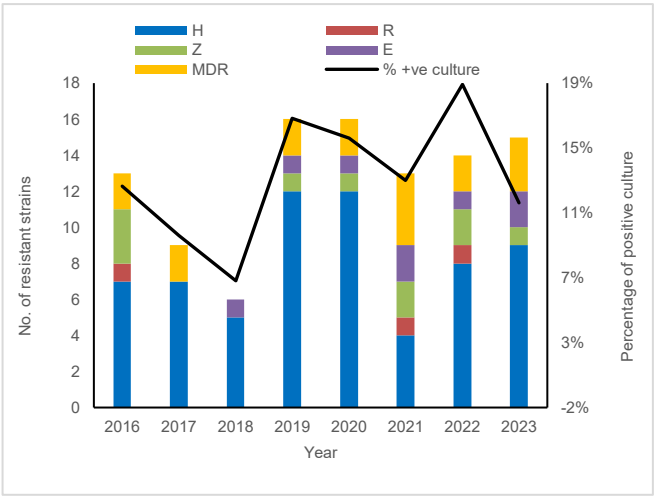
*Percentage of all cases including culture negative

The Proportion of culture positive pulmonary TB cases in 2023 that were sputum smear positive was 65%. This is an increase from the 54% pulmonary TB smear positive cases notified in 2022.

Drug susceptibility

In 2023, of the 135 culture-confirmed TB cases, 91% (n=123) exhibited full susceptibility to all first-line TB drugs, whereas 9% (n=12) exhibited resistance to at least one drug. This represents a decrease from the 18% resistance rate noted in 2022. Conversely, the incidence of multi-drug resistant TB (MDR-TB) rose from 2 in 2022 to 3 cases in 2023. Of the MDR-TB cases, one exhibited resistance to all first-line TB medications. Among the patients with drug-resistant TB, one was born in Australia and presented with mono-resistant TB. The other 11 patients were born overseas, including one case with isoniazid resistant TB who had a history of previous TB treatment outside of Australia.

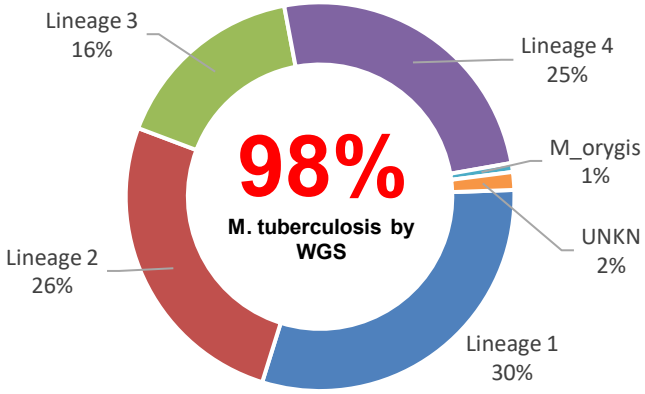
Figure 21: Tuberculosis cases with drug resistance, WA, 2016-2023



Genotyping and strain identification

Since 2020, the TB reference laboratory has implemented Whole Genome Sequencing (WGS) to characterize Mycobacterium tuberculosis strains and evaluate patterns of transmission. Isolates that exhibit fewer than 10 single nucleotide polymorphisms (SNPs) difference in comparison to another isolate are reported to the Western Australian Tuberculosis Control Program (WATBCP) for further review and investigation of potential epidemiological connections.

Figure 22: WGS tuberculosis strains, WA 2023



In 2023, Indo-Oceanic strains (Lineage 1) were the most prevalent, accounting for 30% of the isolated Mycobacterium tuberculosis strains. This was followed by East-Asian strains (Lineage 2) at 26%, Euro-American strains (Lineage 4) at 25%, and East African-Indian strains (Lineage 3) at 16%.

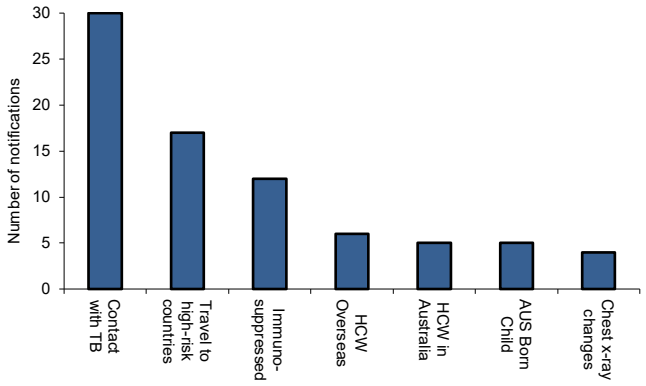
Of the sequenced Mycobacterium tuberculosis isolates, 12% (n=16) were identified as part of a cluster comprising at least two cases reported in 2023 or earlier. The remaining 119 culture-positive cases (88%) were not genomically linked to other cases at the time of analysis. Among the 16 clustered cases, 12 (75%) were males, with a median age of 28.5 years (range: 3-63 years). All clustered cases resided in the Perth metropolitan area.

Pulmonary involvement was observed in 69% (n=11) of the clustered cases, with 73% (n=8) of these exhibiting positive acid-fast bacillus (AFB) smears from respiratory specimens. Of the 16 clustered patients, two were born in Australia, including a 3-year-old child. The remaining 14 cases were overseas-born, originating from various countries: including Bhutan, Ethiopia, Tanzania, and Sri Lanka. Epidemiological links were identified for three clusters involving six cases in household and close contact settings.

TB RISK FACTORS

In 2023, 57% of the identified TB cases (n=91) had no recognized risk factors. Among the remaining 70 cases with documented risk factors, the most common was being a household or close contact of a TB patient, which accounted for 43%. The second most prevalent risk factor was past travel to or residence in a high-prevalence country (24%). Additionally, 17% of cases involved individuals who were immunosuppressed due to underlying health conditions or medications. Lastly, 9% of cases reported a history of employment in overseas health services.

Figure 23: Risk factors reported for tuberculosis notifications, WA 2023



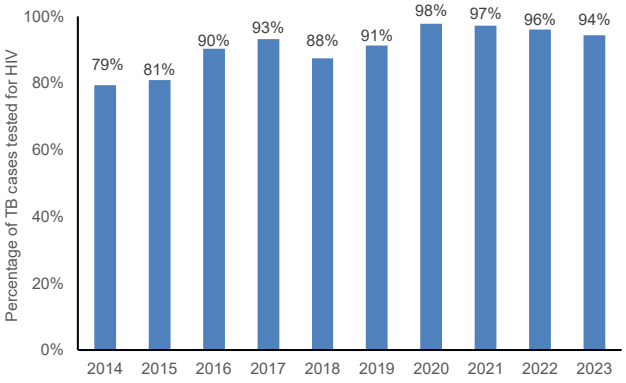
In both Australian-born and overseas-born individuals, the most commonly reported risk factor for TB was having a household member or close contact with a TB patient. The second most frequently identified risk factor for both groups was prior travel to or residence in a high-prevalence country.

Table 5: Risk factors for tuberculosis by place of birth, WA 2023

Risk Factor	All cases	Australian born	Overseas born
Contact with TB	30 (38%)	6 (43%)	24 (37%)
Travel to a high prevalence country	17 (22%)	3 (21%)	14 (22%)
Immuno-suppressed	12 (15%)	0	12 (18%)
Ever employed in Overseas health	6 (8%)	0	6 (9%)
Ever employed in Australian health	5 (6%)	0	5 (8%)
Australian born child	5 (6%)	5 (36%)	-
Chest X-ray changes	4 (5%)	0	4 (6%)

In 2023, the HIV status was reported in 94% of TB cases (n=152), representing a slight decrease from the 96% testing rate reported in 2022. Among the individuals tested, six were found to be HIV-positive. Notably, all six were foreign-born and were newly diagnosed with HIV coinfection at the time of the TB diagnosis.

Figure 24: HIV screening at time of TB diagnosis, WA 2014-2023



TB AMONG HEALTH CARE WORKERS

In 2023, among the 114 individuals with documented occupations, 10% (n=11) identified as healthcare workers. Of these, four patients were diagnosed with pulmonary TB, two of whom tested positive for AFBs via smear microscopy. A contact investigation related to the pulmonary TB cases did not uncover any additional active TB cases. Notably, all 11 healthcare workers were foreign-born and originated from countries with a high prevalence of TB.

HEALTH SYSTEM (HS) DELAY

In 2023, of the reported 161 TB cases, 45% (n=72) received a diagnosis within 30 days of their initial healthcare contact, while 22% (n=35) were diagnosed between 30 and 90 days, and 32% (n=51) were diagnosed more than 90 days after their first interaction with healthcare provider. The median interval from initial healthcare contact to TB diagnosis was reduced to 39 days (Longest delay =2856 days), an improvement compared to 43 days in 2022 and 69 days in 2021.

Stratifying the data by TB type revealed that pulmonary TB cases exhibited a median diagnostic delay of 30 days (range: 1-2865 days), a decrease from 41 days in 2022. Extra-pulmonary TB

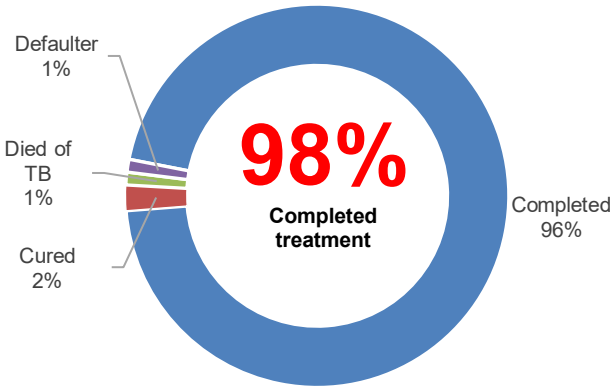
cases demonstrated a median delay of 44 days (range: 2-1106 days), also slightly improved from 47 days in the previous year.

Significant delay, as evaluated by clinical or public health adverse consequence using the delay matrix introduced in 2016, was identified in 44% of reported TB cases (n=71), which is consistent with the 43% delay observed in 2022. Notably, a disparity in health system delays was evident between pulmonary and extra-pulmonary TB cases. Specifically, patients with pulmonary TB were significantly more likely to be categorised as having had health system delays based on adverse consequences, with 54% affected compared to 34% of those with extra-pulmonary TB. This yields an odds ratio of 2.26 (95% CI: 1.18–4.31). In 2022, the data indicated that pulmonary TB cases were 2.36 times more likely to experience diagnostic delays compared to their extra-pulmonary counterparts.

TREATMENT OUTCOMES, 2022

In 2022, treatment outcomes were assessable for 93% of the reported 100 TB cases (n=93). This assessment excluded one case that was transferred outside of Australia, five cases that died from causes unrelated to TB while receiving treatment, and one case that did not initiate treatment. Notably, there were no cases reported as still undergoing treatment at the time of reporting.

Figure 25: Assessable tuberculosis treatment outcome, WA, 2022



The success rate for treating TB cases, defined as the proportion of patients who completed their treatment or were declared cured, reached 98% (n=91) among assessable cases. This figure reflects a notable increase from the 95% success rate reported in 2021.

Table 6: Tuberculosis treatment outcome, WA, 2022

Outcome	Number	% Total
Assessable outcomes		
Treatment success	91	98%
Cured (bacteriologically confirmed)	2	2%
Completed treatment	89	96%
Interrupted treatment	0	0%
Died of TB (died during treatment of TB, as a result of TB disease)	1	1%
Defaulter	1	1%
Failure	0	0%
Not followed up, outcome unknown	0	0%
Total assessable	93	100%

Non-assessable outcomes		
Transferred out of Australia	1	1%
Died of other cause (died during treatment of cause other than TB)	5	5%
Did not start treatment	1	1%
Total	100	100%

In 2022, there was one reported death attributable to TB, resulting in a case fatality rate of 1%, a decrease from the 3% observed in 2020, the deceased was a 19-year-old Australian Aboriginal woman who was diagnosed with tuberculosis (TB) post-mortem. TB bacilli were isolated from multiple tissues during the examination. Additionally, there was one incident of treatment default prior to the completion of the prescribed regimen. In contrast, 2 cases of treatment default were documented in 2020.

LATENT TB

In 2023, there was a notable increase in the number of individuals treated for latent tuberculosis infection (LTBI), with 767 patients initiating a preventive treatment regimen. This figure represents a 75% increase compared to the 439 individuals who commenced treatment in 2022. The treatment completion rate was reported at 88% (n=673), reflecting stability relative to the 87% completion rate observed in 2022.

The gender distribution among individuals initiating treatment for LTBI demonstrated a predominance of females, constituting 58% (n=446) of the cohort, and resulting in a male-to-female ratio of 1:1.4. Furthermore, a substantial proportion of the participants were under the age of 44 years, representing 78% of the total population treated with a median age of 34 years. Notably, the age group of 25 to 34 years accounted for the largest segment, comprising 33% of those commencing LTBI treatment.

Among individuals initiating treatment for LTBI, where place of birth was documented, 91% were born abroad, with 85% originating from countries classified as having a high prevalence of TB (defined as those with an annual incidence rate of ≥ 40 cases per 100,000 population).

Figure 26: LTBI treatment outcomes, WA 2019 - 2023

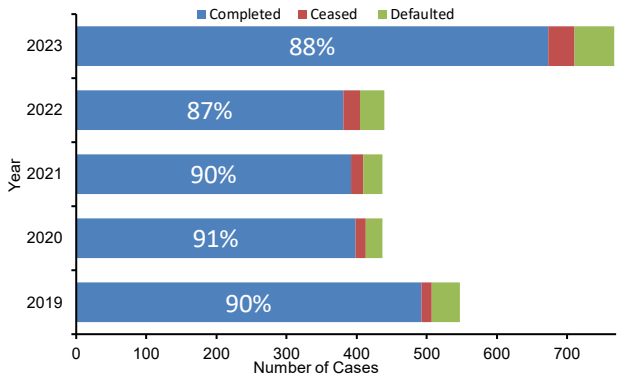


Figure 27: LTBI treatment by age group and sex, WA 2023

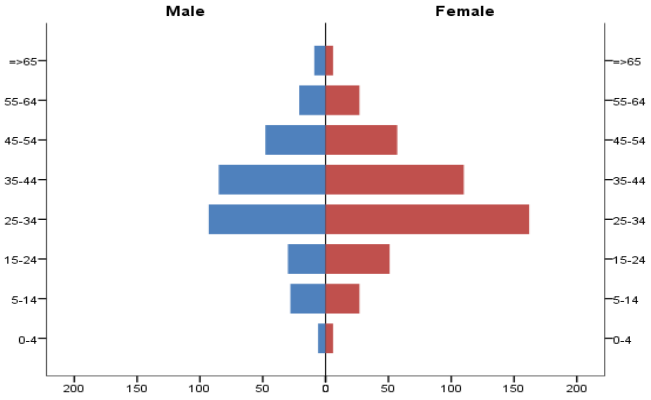
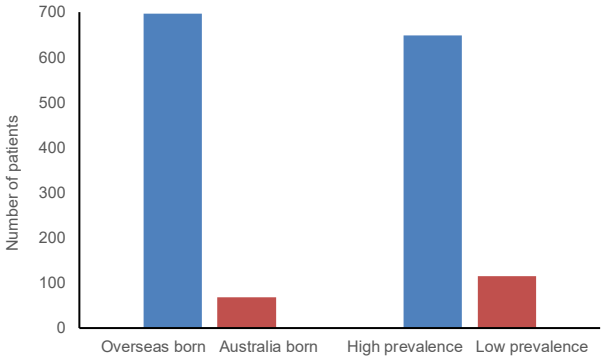


Figure 28: LTBI cases by place of birth, WA 2023



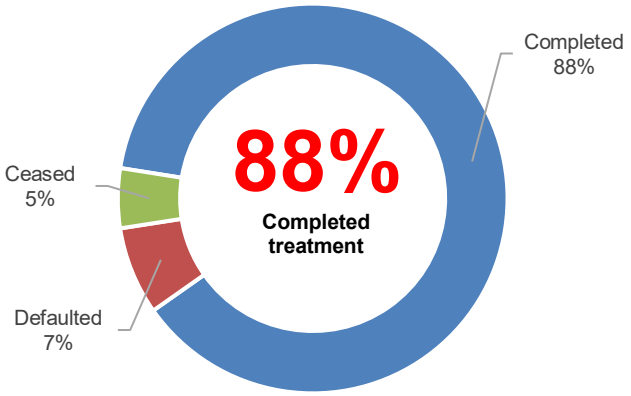
The primary reasons for undergoing LTBI screening included: health care worker screening (33%), recent migration (30%), contact tracing associated with TB exposure (17%), screening of newly arrived refugees (9%), and pre-emptive screening prior to immunosuppressive therapy (1%).

Table 7: Reason for LTBI test in cases treated, WA 2023

Country of Birth	Number	% Total
Healthcare worker screening	256	33.4%
Recent migrant	227	29.6%
TB Contacts	132	17.2%
Recently arrived refugee	72	9.4%
Immunosuppressed	11	1.4%
Other	69	9.0%

Among patients who did not successfully complete their latent LTBI treatment in 2023, 5% (n=34) discontinued therapy due to adverse drug reactions. Additionally, 7% (n=56) did not complete their treatment regimen, citing reasons such as non-adherence and missed clinic appointments. These patterns suggest that implementation of targeted interventions could enhance treatment adherence and completion rates.

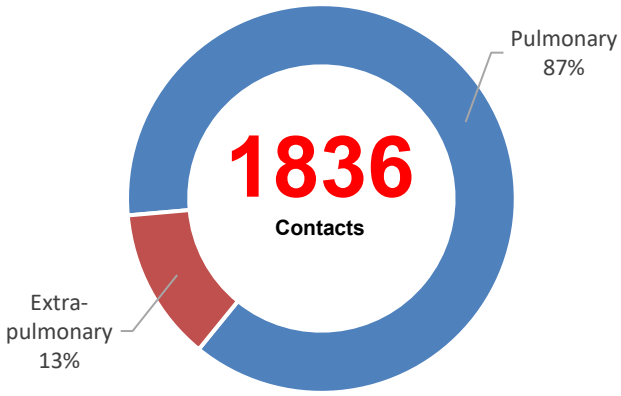
Figure 29: LTBI by treatment outcome, WA 2023



TB CONTACT INVESTIGATION

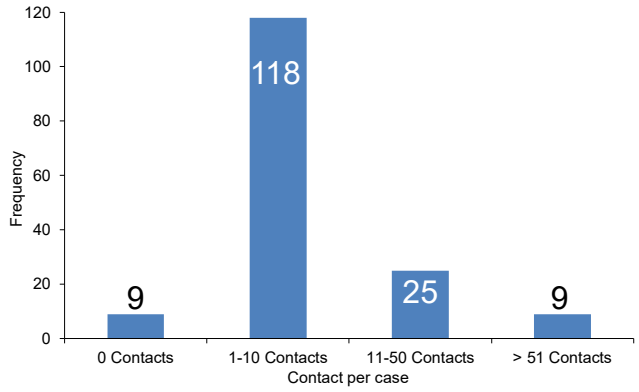
In 2023, a total of 1,838 contacts were identified from 152 notified TB cases, representing 94% of all notifications. Among these contacts, 87% (n=1,602) were associated with 83 cases of pulmonary TB, while 13% (n=234) were linked to 70 cases of extrapulmonary TB. Notably, no contacts were identified for 5 cases of pulmonary TB and 4 cases of extrapulmonary TB.

Figure 30: Number of TB contacts, WA 2023



The maximum number of contacts identified for a single case was 191, which was linked to a smear-positive pulmonary TB case that underwent contact investigation within educational and congregate settings. The median number of contacts per TB case was 4, with an interquartile range (IQR) of 3 to 9 contacts.

Figure 31: Number of contacts per respiratory case, WA 2023



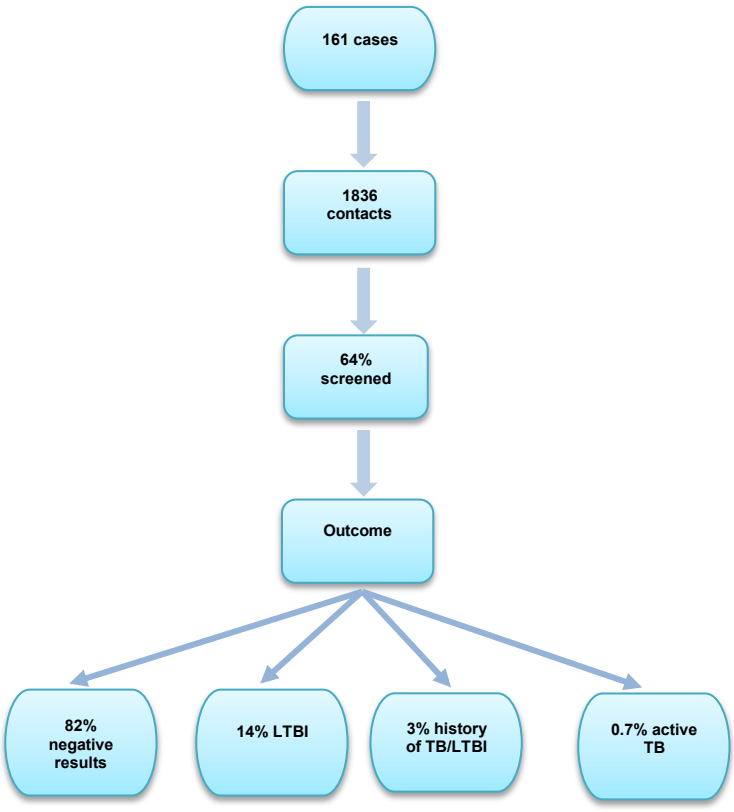
The median number of contacts associated with pulmonary TB cases was 8 contacts per case, with an interquartile range of 4 to 29 contacts. The majority of pulmonary TB cases (59%, n=48) had 10 or fewer identified contacts. Additionally, 30% of cases (n=25) had between 11 and 50 contacts, while 11% of cases (n=9) reported more than 50 contacts. Notably, among the identified contacts, there were 82 children under the age of 5, accounting for 5% of the total pulmonary TB contacts.

Contact investigation outcomes

In 2023, a total of 36% of identified contacts (n=669) did not attend scheduled contact tracing tests, failed to complete their assessments, or had no documented outcome regarding their screening; this reflects an increase from 34% reported in 2022. Among these, 12 contacts (1%) passed away prior to the completion of screening, and 6 contacts (0.3%) were transferred out of WA to their jurisdiction of residence.

Among those who underwent contact tracing assessment, 82% (n=955) had negative screening results, 14% (n=165) were diagnosed with latent TB infection (LTBI), 3% (n=39) had a documented past history of either TB or LTBI, and 0.7% (n=8) were identified as secondary active TB cases through the contact

Figure 32: Contact investigation outcome, WA 2023



investigation process. The secondary active TB cases comprised four children aged 1 to 7 years and four adults aged 23 to 30 years, all of whom were household contacts.

DATA QUALITY AND COMPLETENESS

Notification data

TB notification data is systematically collected using a core notification framework, similar to that employed for other notifiable infectious diseases. Additionally, an enhanced TB database is utilised to gather disease-specific information not encompassed by the core notification data. A completion audit of the primary notification data fields is conducted, wherein fields populated by data extracted from other database fields are excluded from analysis.

Core notification data

All audited variables were found to be complete, with no missing values observed. The data cleaning processes implemented during the preparation of this report continue to enhance the overall quality of the dataset.

Enhanced TB surveillance data

All audited enhanced surveillance variables were complete, with the exception of ‘residence time in Australia’ and ‘Australia arrival date’. As previously indicated in prior reports, the absence of data for these variables does not represent actual missing values; but is attributed to the database design. This limitation should be taken into consideration when interpreting the dataset.

Latent TB and contact investigation data

In 2023, there was a notable enhancement in the quality of latent tuberculosis infection (LTBI) data, with all essential database fields being fully populated. However, two fields, namely 'Year of Australia Entry' and 'Risk Factor,' contained incomplete data.

In the 2023 contact investigation data, 12% of identified contacts had no documented screening outcomes, representing a notable increase from the 9% of identified contacts lacking recorded outcomes in 2022. This trend highlights a growing issue in data completeness that requires further analysis and intervention efforts.

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