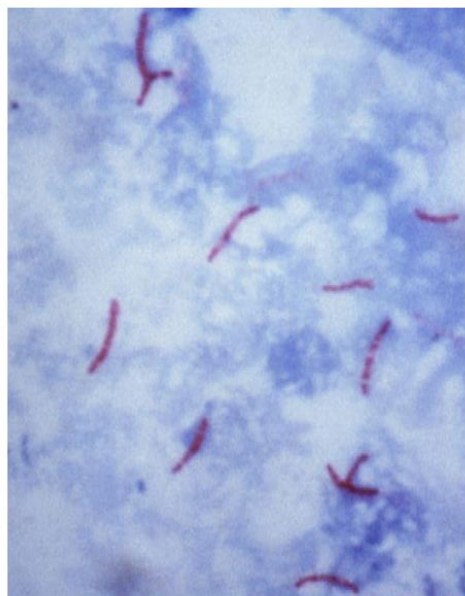
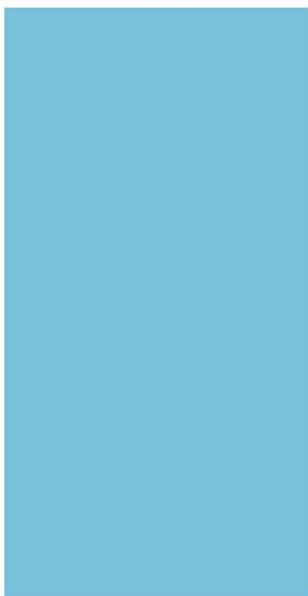
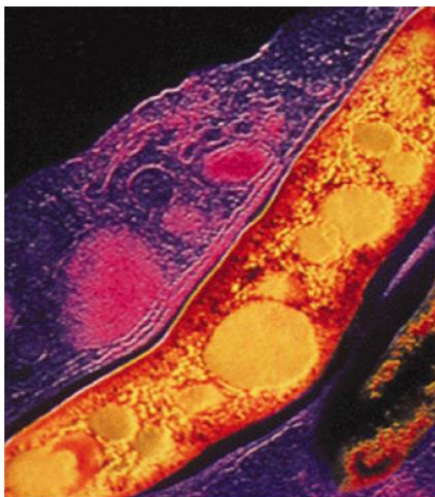


# Epidemiology of Tuberculosis In Northern Ireland

Annual Surveillance Report 2023  
(data up to end of 2022)



## Acknowledgements

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The Public Health Agency Northern Ireland gratefully acknowledges all those who contributed to this report, including; physicians, nurses, microbiologists, laboratory staff, and administrative staff who provide or contribute information on the surveillance of tuberculosis.

Date correct as of 31<sup>st</sup> April 2024.

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## Key Points

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- There were 68 cases of tuberculosis (TB) notified in Northern Ireland in 2022 giving a rate of 3.6 cases per 100,000 population.
- The average rate of TB was 3.1 cases per 100,000 population in 2020-2022.
- The average rates of TB were highest in the Belfast Health and Social Care Trust at 8.0 cases per 100,000 population in 2020-2022.

### Demographic characteristic

- The highest average rate of TB were observed in those aged 15-44 years at 4.2 cases per 100,000 population in 2020-2022.
- The proportion of TB cases born outside the UK was 65.7% in 2022. The average rate was highest in this population at 27.2 cases per 100,000 population in 2020-2022.

### Clinical characteristics

- The average rate of pulmonary TB in Northern Ireland was 2.2 cases per 100,000 population in 2020-2022.
- The average rate of extra-pulmonary TB in Northern Ireland was 1.0 cases per 100,000 population in 2020-2022.

### Microbiology

- 76% of TB cases were culture confirmed in 2022. Of the 52 isolates culture confirmed, 50 were confirmed as *M. tuberculosis* and two as *M. bovis*.

### Drug resistance

- In 2022, there were <5 TB cases that were resistant to first line drug treatment and <5 cases that were multi-drug resistant/rifampicin resistant (MDR/RR).

### Treatment outcome

- In 2021, 79.1% of people notified with non-MDR/RR TB completed treatment within 12 months.

## Introduction

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This report presents the epidemiological data for tuberculosis (TB) cases reported in Northern Ireland from 1 January 2022 to 31 December 2022. This report also presents data from previous years for comparative purposes and to give indications of trends in TB epidemiology.

The outcome of TB treatments are collected annually and reported in retrospect. The treatment outcomes reported in this report are for those individuals notified to the Public Health Agency (PHA) in 2021 as that is the latest year of notifications for whom treatment completion is expected within the 2022 data.

During the COVID-19 pandemic, major impacts on healthcare, migration, and social interactions will have affected TB notifications in complex ways. It is important to note that the data and findings from 2020 and 2021 are unlikely to represent the true burden of disease. As such their use in monitoring progress against both elimination goals and planning service provision will require careful consideration and further analysis. Data in this report uses a combination of historic (up to 2020) and recent epidemiological data (2020 onwards) from the Electronic Tuberculosis System (ETS) and the National Tuberculosis Surveillance system (NTBS).

There may be differences in numbers of TB cases quoted in the UK National TB report compared with this regional report, principally due to differences in time of data extraction and analysis between the two reports. This regional report takes account of late notifications that may have been reported after the national data extraction process has taken place.

## Definitions

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**Notified case:** Refers to clinically active disease caused, or thought to be caused, by infection with organisms of the *Mycobacterium tuberculosis* complex (*Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*).

**Culture confirmed cases:** Where the diagnosis has been confirmed by culture as *M. tuberculosis*, *M. bovis* or *M. africanum*.

**Other than culture confirmed cases:** In the absence of culture confirmation, a case with a clinician's judgement that the patient's clinical and/or radiological signs and/or symptoms are compatible with TB *and* a clinician's decision to treat the patient with a full course of anti-tuberculosis treatment.

**Pulmonary tuberculosis:** A disease involving the lung parenchyma and/or tracheobronchial tree, with or without extra-pulmonary tuberculosis diagnosis.

**Sputum smear result:** Sputum smear positive TB is defined as a positive microscopy result on spontaneously produced or induced sputum.

**Multi-drug resistant/rifampicin resistant TB (MDR/RR):** Resistant to Rifampicin and Isoniazid (MDR-TB) or Rifampicin resistant (RR-TB).

**Extensively-drug resistant TB (XDR-TB):** MDR/RR that are resistant to at least one of the previous second-line injectable drugs (amikacin, kanamycin, capreomycin) and any fluoroquinolone.

**Pre-extensively drug-resistant TB (Pre-XDR):** MDR/RR that are resistant to either one of the previous second-line injectable drugs (amikacin, kanamycin, capreomycin) or a fluoroquinolone.

**Health and Social Care Trusts (HSCTs) in Northern Ireland:** There are five HSCTs in Northern Ireland; Belfast (BHSCT), South Eastern (SEHSCT), Northern (NHSCT), Southern (SHSCT) and Western (WHSCT).

## Methodology

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### Data collection

Completed TB notification forms are forwarded to PHA in Northern Ireland where the information is entered onto the National Tuberculosis Surveillance system (NTBS). Treatment outcome forms are generated and forwarded, approximately 12 months after initial notification, to the patient's clinician, who then returns them to the PHA. This information is then appended to the initial notification details.

Information on *M. tuberculosis* complex isolates is obtained from local hospital diagnostic laboratories and the mycobacterial reference laboratory. Collected data include species (*M. tuberculosis*, *M. bovis* and *M. africanum*), specimen type, strain type and drug susceptibility.

Datasets are validated (using laboratory reports and anti-microbial susceptibility information), updated and analysed.

### Data analysis

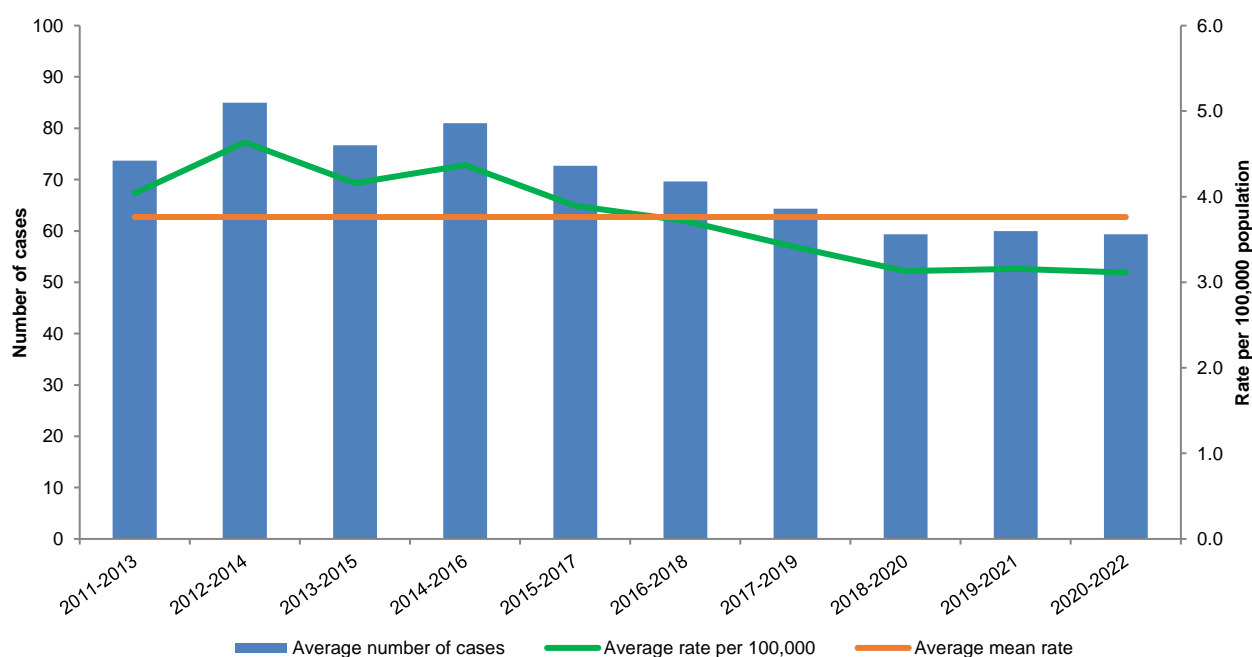
TB rates per 100,000 population, stratified by age, sex and HSCT in Northern Ireland, are calculated using the mid-year estimates of the Northern Ireland population from the Northern Ireland Statistics and Research Agency (NISRA). Revised 2011-2021 mid-year population estimates for Northern Ireland and the 11 Local Government Districts in line with the most recent Census 2021 population estimates were made available by NISRA on 29th June 2023. However, not all lower level populations have been released to date and will be reflected in the respective results, e.g. Trust level populations are currently not available for 2021 and beyond. Therefore, the mid-year population estimates are carried forward from 2020 for each Trust.

Three-year moving averages are calculated, where possible, as relatively small differences in the number of cases each year can give rise to substantial percentage changes due to small numbers and considerable year to year variation. Summary information on cases is reported only if the numbers do not risk data confidentiality.

## Results

### Overall number of cases and rates of infection

In 2022, a total of 68 cases were reported in Northern Ireland giving a rate of 3.6 cases per 100,000 population. This is an increase from 2021 (55 cases; 2.9 cases per 100,000 population). The three-year moving averages between 2011 and 2022 are shown in Figure 1. The average rate in 2020-2022 remained stable to 2019-2021, 3.1 compared to 3.2 cases per 100,000 population, respectively. The average number of cases was also similar, 59 compared to 60 cases, respectively.

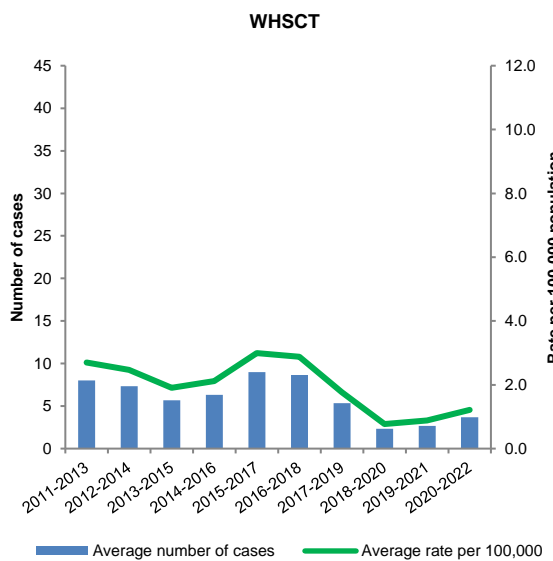
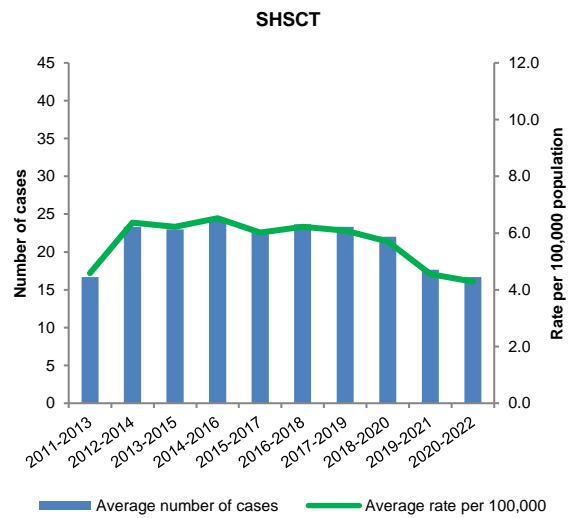
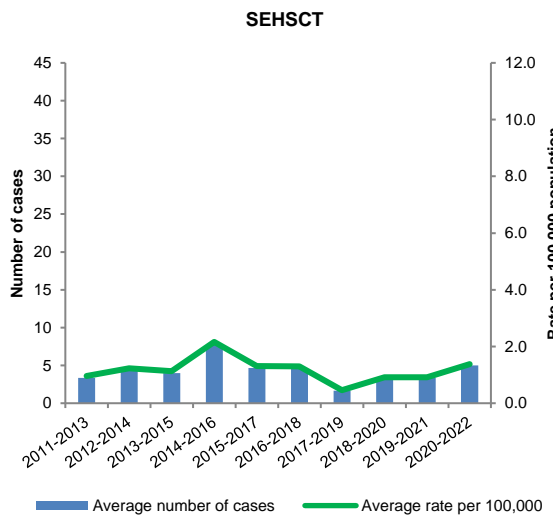
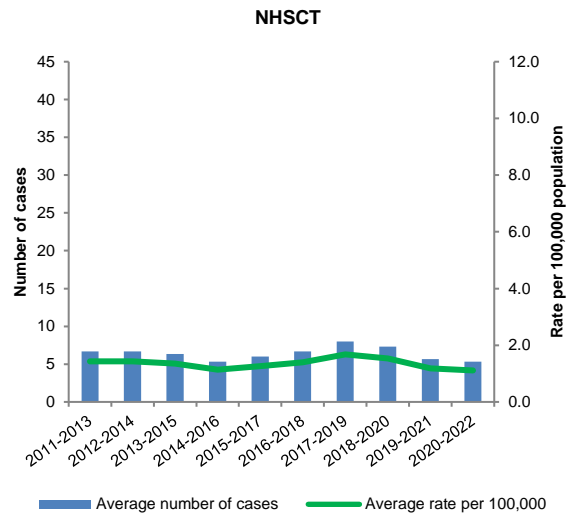
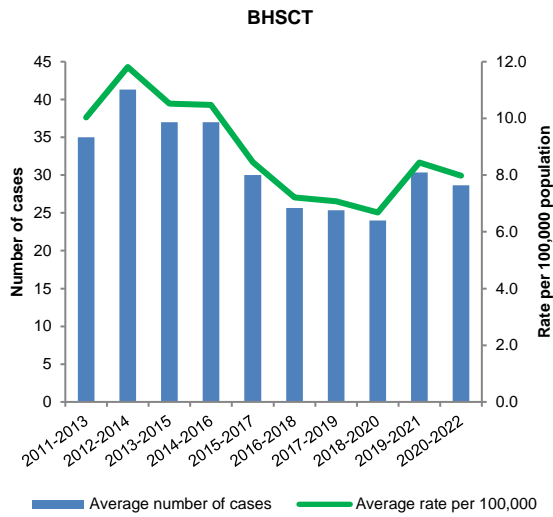


**Figure 1: Three-year moving average numbers and rates of TB cases, Northern Ireland, 2011-2022**

In 2020-2022, the average number of cases and rates increased in both the SEHSCT and WHSCT, but increases were negligible mainly due to small numbers. All other Trusts saw small decreases. The average number of cases and rate remained highest in BHSCT at 29 cases; 8.0 cases per 100,000 population. This was a small decrease to 2019-2021 (Figures 2 and 3).



# Epidemiology of Tuberculosis in Northern Ireland, Annual Surveillance Report 2023



**Figure 2: Three-year moving average numbers and rates of TB cases by HSCT, Northern Ireland, 2011-2022\***

\* mid-year population estimates are carried forward from 2020 for each Trust

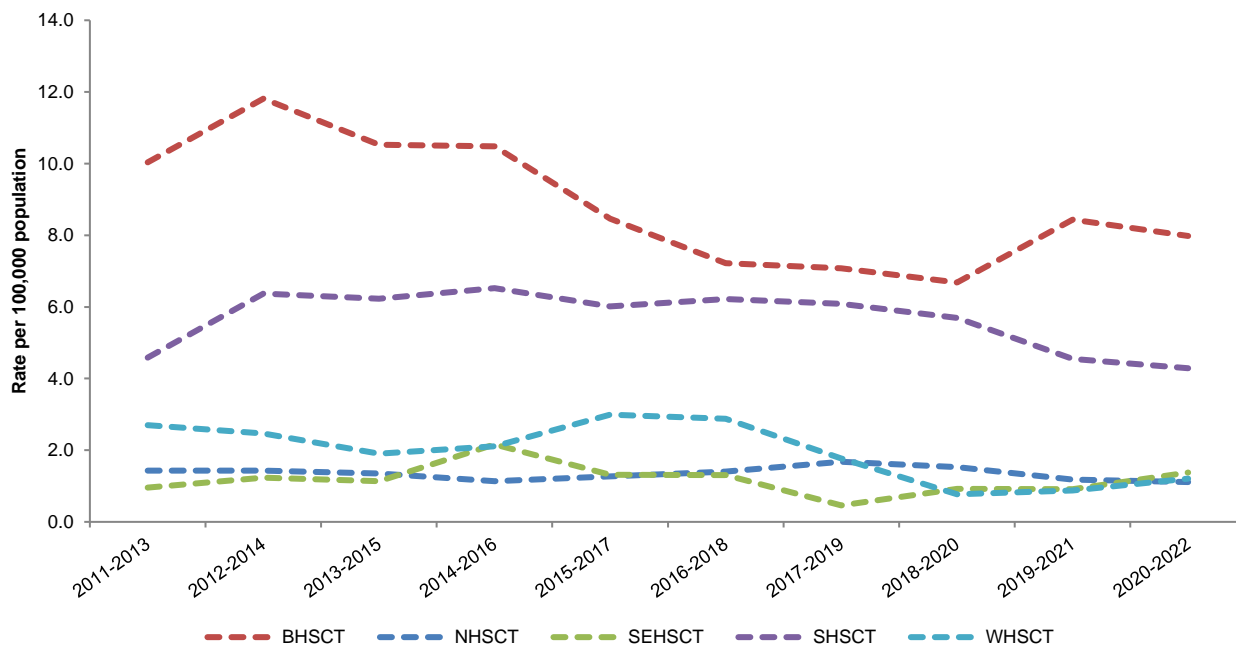


Figure 3: Three-year moving average rates of TB cases by HSCT, Northern Ireland, 2011-2022

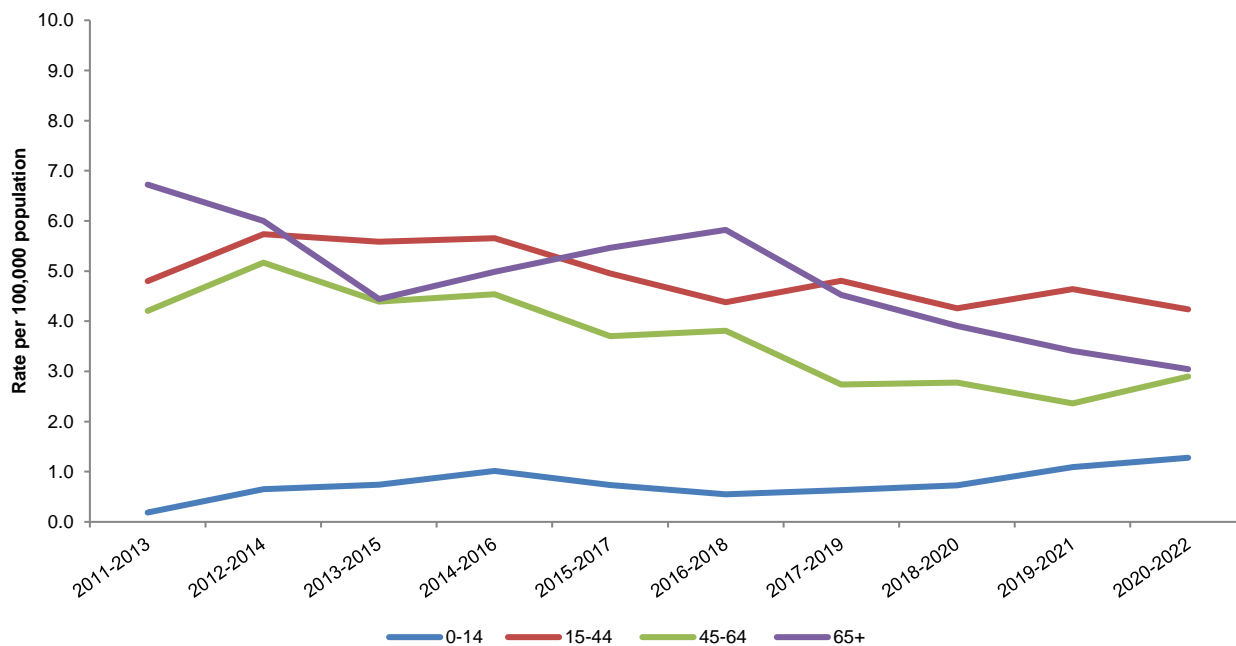
## Demographic characteristics

### Age and gender

Of the 68 notified cases in 2022, 73.5% (n=50) were male and 26.5% (n=18) were female. The ages ranged from 4 years to 90 years, with a median age of 36 years and a mean age of 39 years.

Patients aged 15-44 years accounted for the majority of cases reported in 2022, 54.4% (n=37), a decrease from 2021 when this group accounted for 56.4% (n=31) of cases.

The average rate was highest in those aged 15-44 years at 4.2 cases per 100,000 population in 2020-2022, which was a decrease from 2018-2020 (4.6 cases per 100,000 population). Average rates of TB increased in those aged 45-64 years in 2020-2022 compared to 2019-2021 (2.9 vs 2.4 per 100,000 population) and a slight increase was also observed in those aged 0-14 years (1.3 vs. 1.1 per 100,000 population) while the rate decreased in those aged 65 years and older (3.4 vs. 3.0 per 100,000 population) (Figure 4).



**Figure 4: Three-year moving average age-specific disease rates of TB cases, Northern Ireland, 2011-2022**

### Place of birth

In 2022, 65.7% (n=44) of cases were born outside the UK, an increase compared to 2021 when the proportion was 51.9% (n=28). The highest average rate of TB remains in those born outside the UK at 27.2 cases per 100,000 population in 2020-2022, compared with 28.8 cases per 100,000 population in 2019-2021. The average rate in the UK-born population remained stable at 1.4 cases per 100,000 in 2020-2022 compared with 1.5 per 100,000 population in 2019-2021 (Figure 5).

In 2022, the highest proportion of UK-born cases occurred in those aged 15-44 years (39%, n=9). The highest proportion of non-UK born cases were also in those aged 15-44 years (64%, n=28).

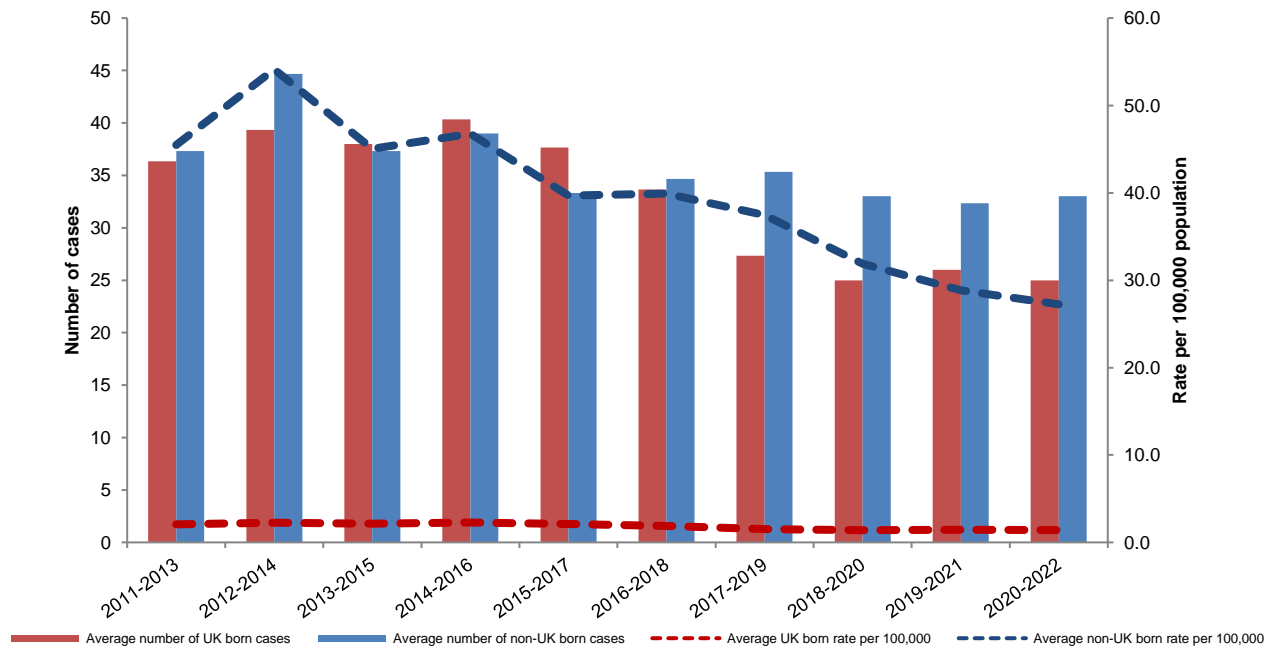


Figure 5: Three-year moving average numbers and rate of UK-born and non-UK born TB cases, Northern Ireland, 2011-2022

### Time from entry to UK to diagnosis

Time from entry into Northern Ireland until diagnosis in 2022 was known for 82% (n=36) of non-UK born cases. Of these, the majority were diagnosed between 3-9 years of entry (36%, n=13), with 33% (n=12) diagnosed 10+ years after entry.

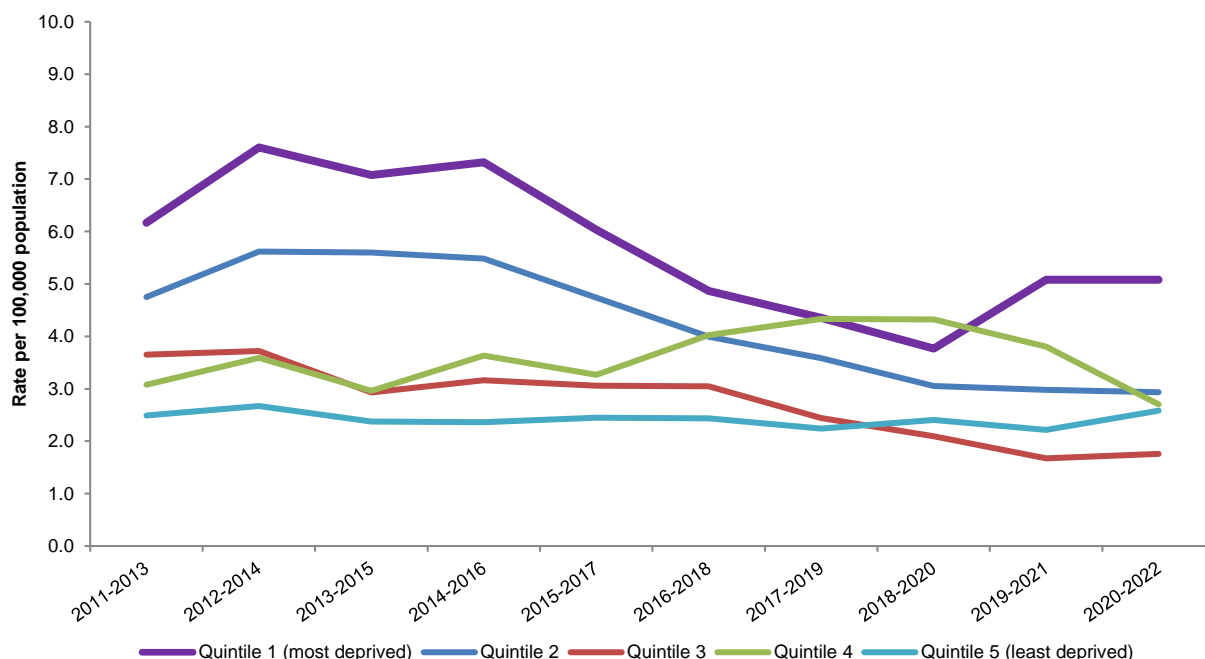
### Social risk factors

In 2022, 32.4% (n=22) of cases were reported as having at least one social risk factor. The social risk factors includes alcohol and/or drug misuse, homelessness, prison, asylum seeker, and/or mental health issues. However, non-reporting of risk factors may not be indicative of there being no risk factors existing; therefore, it is difficult to ascertain the true incidence.

### Deprivation

TB rates on average remain higher among those living in the most deprived areas than those living in the least deprived areas. In 2022, there was 19 cases reported in the most deprived area compared to 10 in the least deprived area. The rate in the most deprived area was 5.4 cases per 100,000 population compared to 2.8 cases per 100,000 population in the least deprived area. The three-year moving average rate in 2020-2022 was 5.1 cases

per 100,000 population in the most deprived area compared to 2.6 cases per 100,000 population in the least deprived area (Figure 6).



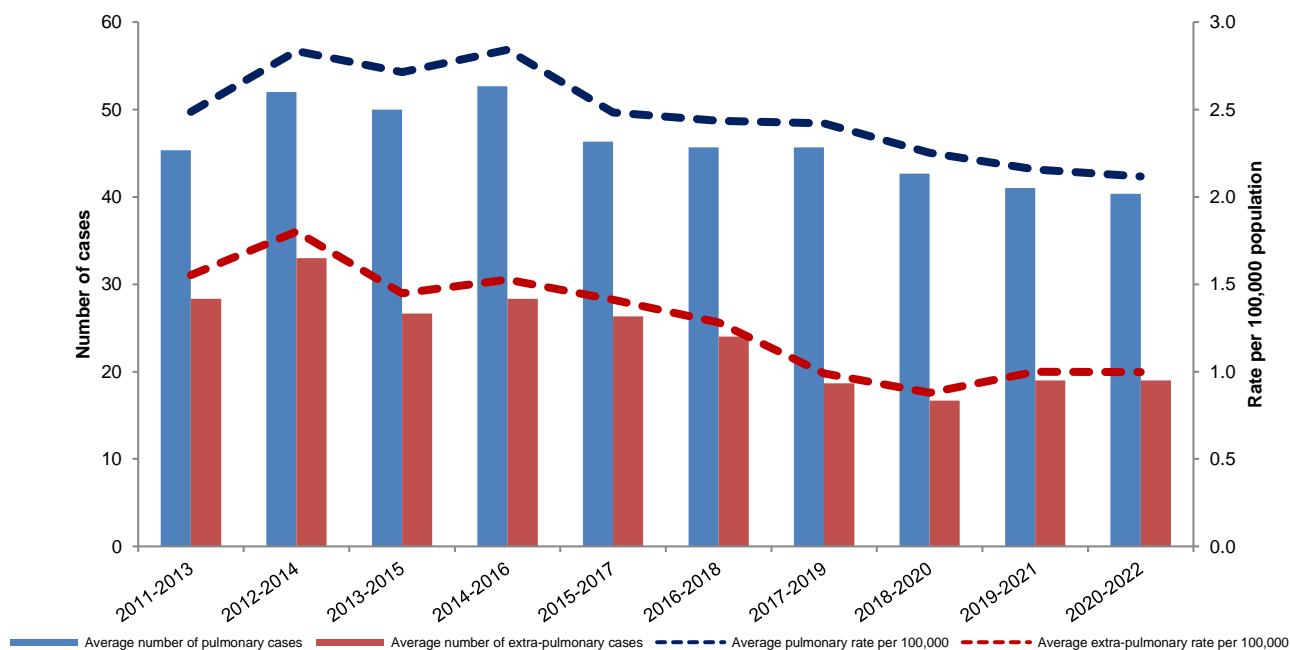
**Figure 6: Three-year moving average rate of TB cases by deprivation, Northern Ireland 2011-2022\***

\* mid-year population estimates are carried forward from 2020 for each quintile

The Northern Ireland Multiple Deprivation Measure (NIMDM) 2017 is an overall measure of multiple deprivation experienced by people living in an area and is measured at Super Output Area (SOA) level. Commissioned output is based on Small Area Population Estimates for 890 Super Output Areas in Northern Ireland. NISRA – Deprivation Statistics branch.

## Clinical characteristics

The average rate of pulmonary and extra-pulmonary cases remained stable between 2020-2022 and 2019-2021 (2.1 vs. 2.2 cases and 1.0 vs. 1.0 cases per 100,000 population, respectively) (Figure 7). The average number of pulmonary cases remains twice that of extra-pulmonary cases (40 pulmonary vs. 19 extra-pulmonary cases in 2020-2020).



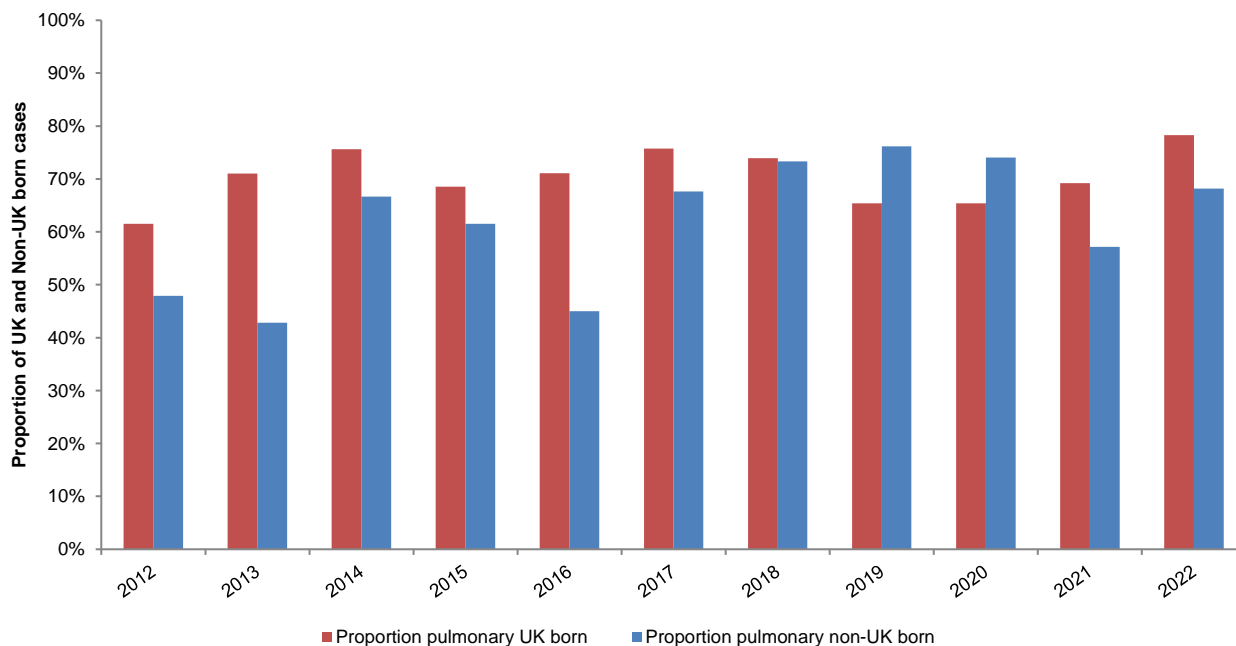
**Figure 7: Three-year moving average numbers and rates of pulmonary and extra-pulmonary TB cases, Northern Ireland, 2011-2022**

### Site of disease

Pulmonary involvement was reported as a site of disease in 70.6% (n=48) of cases in 2022. Other reported sites of disease included intra- and extra-thoracic lymph nodes (29.4%, n=20); other extra-pulmonary (10.3%, N=7); spine (8.8%, n=6); meningitis and other CNS (9%, n=5); military, pleural, gastrointestinal/peritoneal, other bone/joint, ocular and genitourinary (n=<5 each). Infection can occur at more than one site.

### Site of disease – pulmonary involvement

In 2022, 78.3% (n=18) of UK-born cases had pulmonary TB, which is higher compared to the proportion of cases in 2021 (69.2%; n=18). The proportion of pulmonary TB in non-UK born cases increased, from 57.1% (n=16) in 2021 to 68.2% (n=30) in 2022 (Figure 8).



**Figure 8: Proportion of UK and non-UK born pulmonary TB cases, Northern Ireland 2012-2022.**  
Denominator: Total UK or non-UK born TB cases.

Average pulmonary TB rates remained relatively stable in those aged 0-14 and 45-64 years in 2020-2022 compared to 2019-2021 (0.8 to 0.9 and 1.8 to 1.9 cases per 100,000 population, respectively). Average rates decreased slightly in those aged 15-44 and 65 years and older in the same timeframe (3.1 to 3.0 and 2.2 to 1.9 cases per 100,000 population, respectively).

Average pulmonary TB rates were lower in all age groups in females compared to males in 2020-2022. The highest average rate of pulmonary TB in males and females occurred in those aged 15-44 years; 4.1 and 1.8 cases per 100,000 population, respectively (Figures 9, 10 and 11).

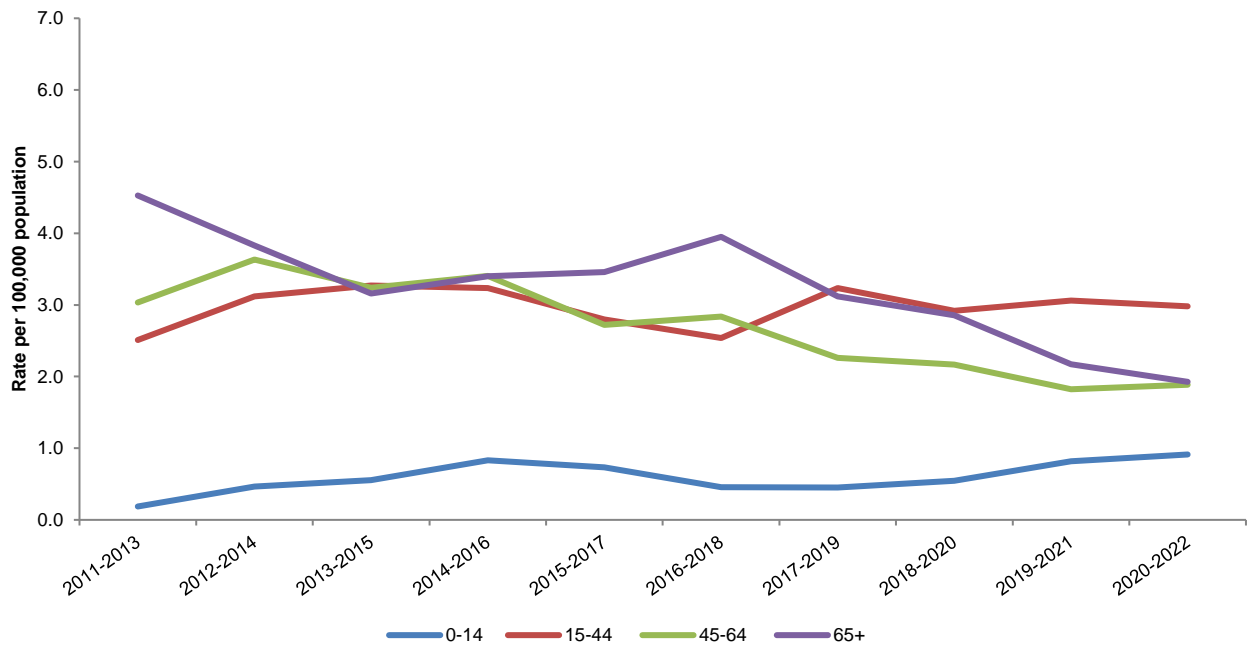


Figure 9: Three-year moving average age-specific disease rates of pulmonary TB cases, Northern Ireland, 2011-2022

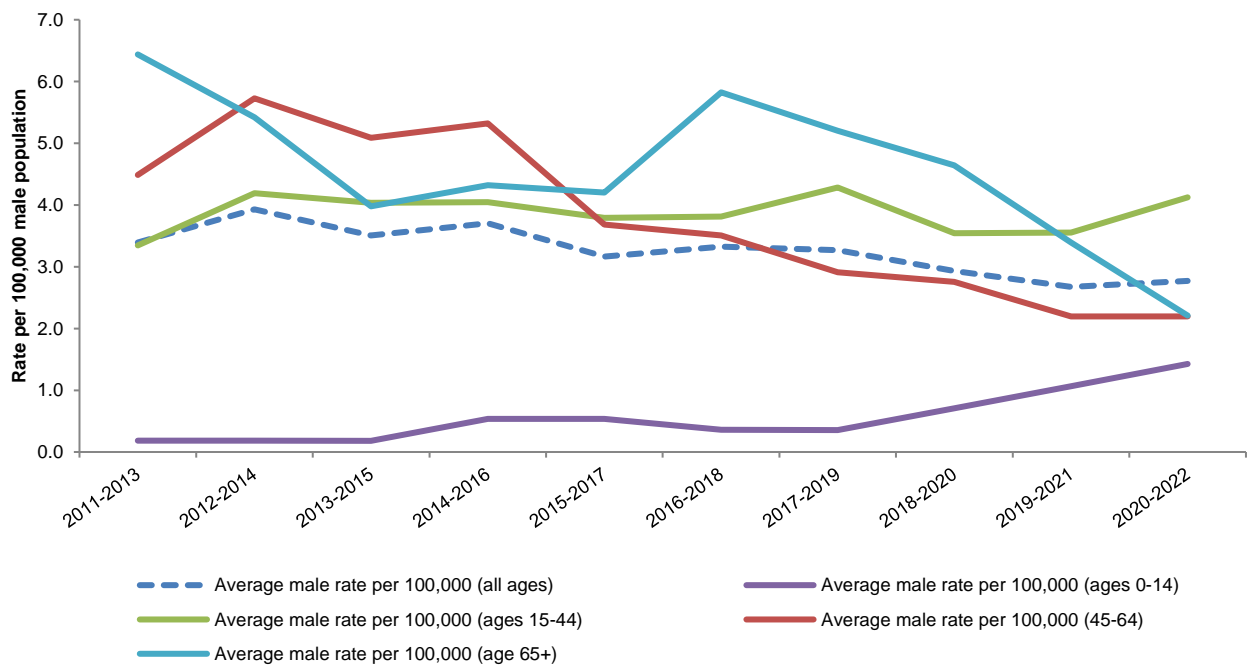
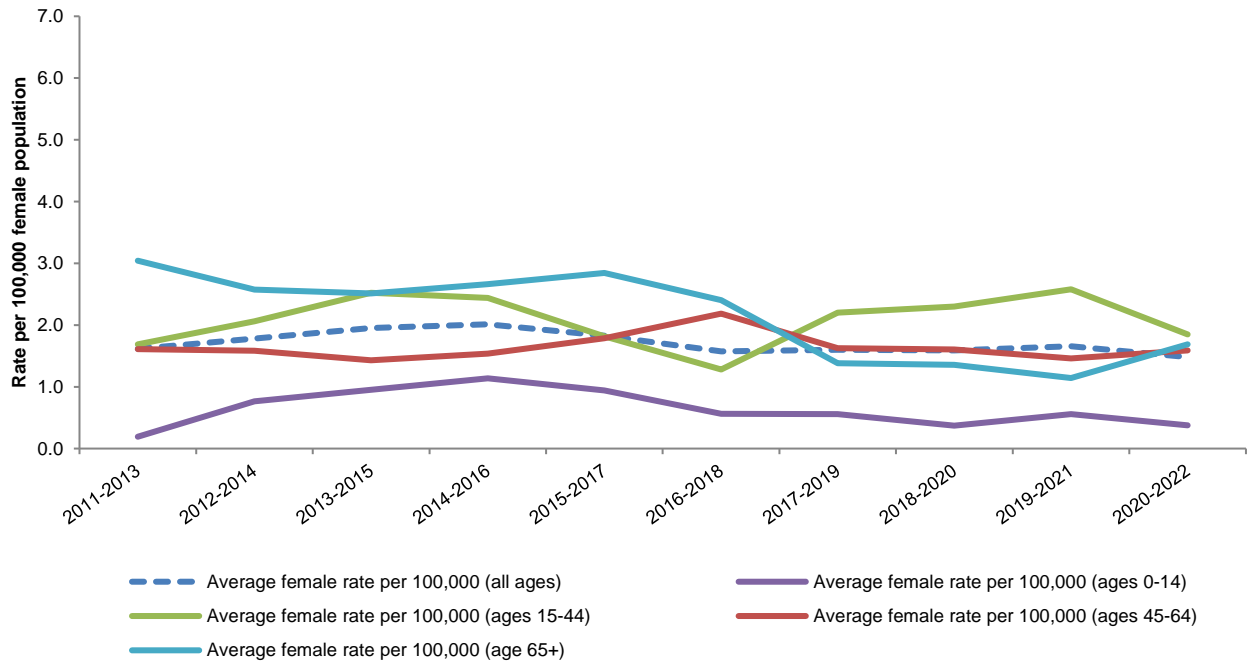


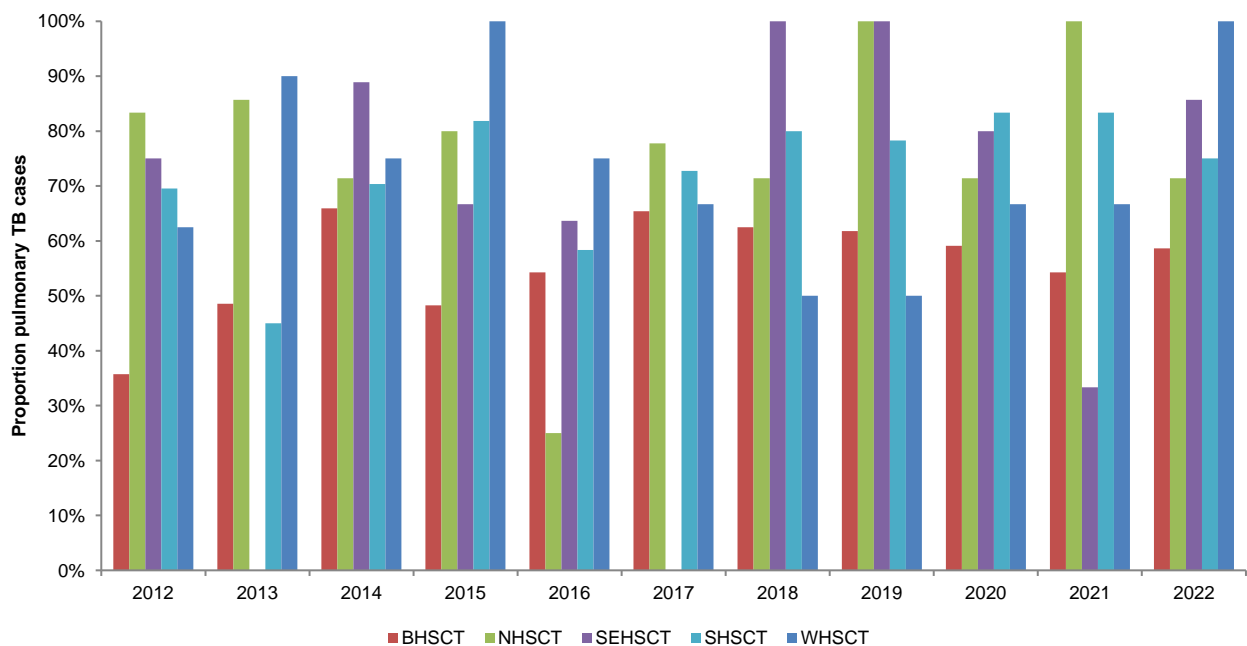
Figure 10: Three-year moving average age-specific disease rates of pulmonary TB cases in males, Northern Ireland, 2011-2022





**Figure 11: Three-year moving average age-specific disease rates of pulmonary TB cases in females, Northern Ireland, 2011-2022**

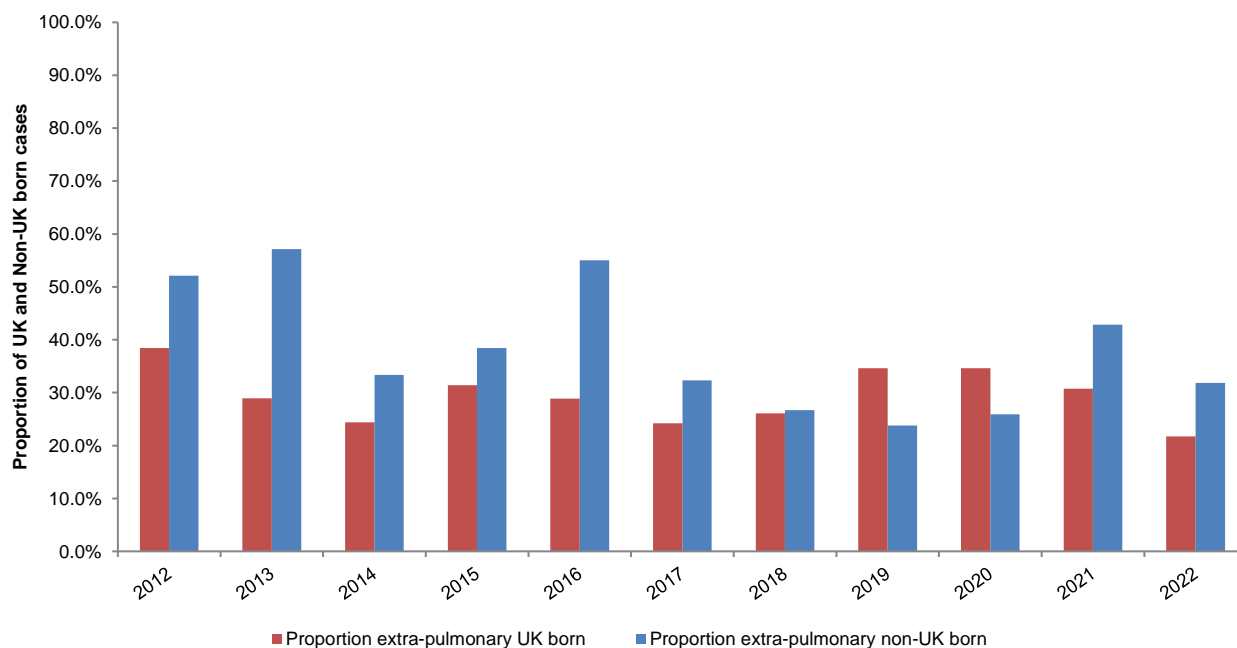
BHSCT reported the highest proportion of all pulmonary TB cases (35.4%) reported in 2022 (n=48). This accounted for 58.6% of all TB cases reported in BHSCT in 2022 (n=29) (Figure 12). BHSCT had a pulmonary TB rate of 4.7 cases per 100,000 population in 2022, followed by SHSCT (3.9 cases per 100,000 population).



**Figure 12: Proportion of TB cases in HSCTs with pulmonary infection, Northern Ireland, 2012-2022**  
Denominator: Total TB cases for each HSCT.

### Site of disease - extra-pulmonary involvement

In 2022, 21.7% (n=5) of UK-born cases had extra-pulmonary TB, which is lower compared to the proportion of cases in 2021 (30.8%; n=8). The proportion of extra-pulmonary TB in non-UK born cases also decreased, from 42.9% (n=12) in 2021 to 31.8% (n=14) in 2022 (Figure 13).



**Figure 13: Proportion of UK and non-UK extra-pulmonary TB cases, Northern Ireland, 2012-2022**  
Denominator: Total UK or non-UK born TB cases.

Average extra-pulmonary TB rates increased slightly in those aged 0-14 and 45-64 years in 2020-2022 compared to 2019-2021 (0.3 to 0.4 and 0.5 to 1.0 cases per 100,000 population, respectively). Average rates decreased slightly in those aged 15-44 and 65 years and older in the same timeframe (1.6 to 1.3 and 1.2 to 1.1 cases per 100,000 population, respectively)

Average extra-pulmonary TB rates were lower in all age groups, except 45-64 years in females compared to males in 2020-2022. The highest average rate of extra-pulmonary TB in males occurred in those aged 65 years and older (2.0 cases per 100,000 population), and in those aged 45-64 years in females (1.3 cases per 100,000 population) (Figures 14, 15 and 16).

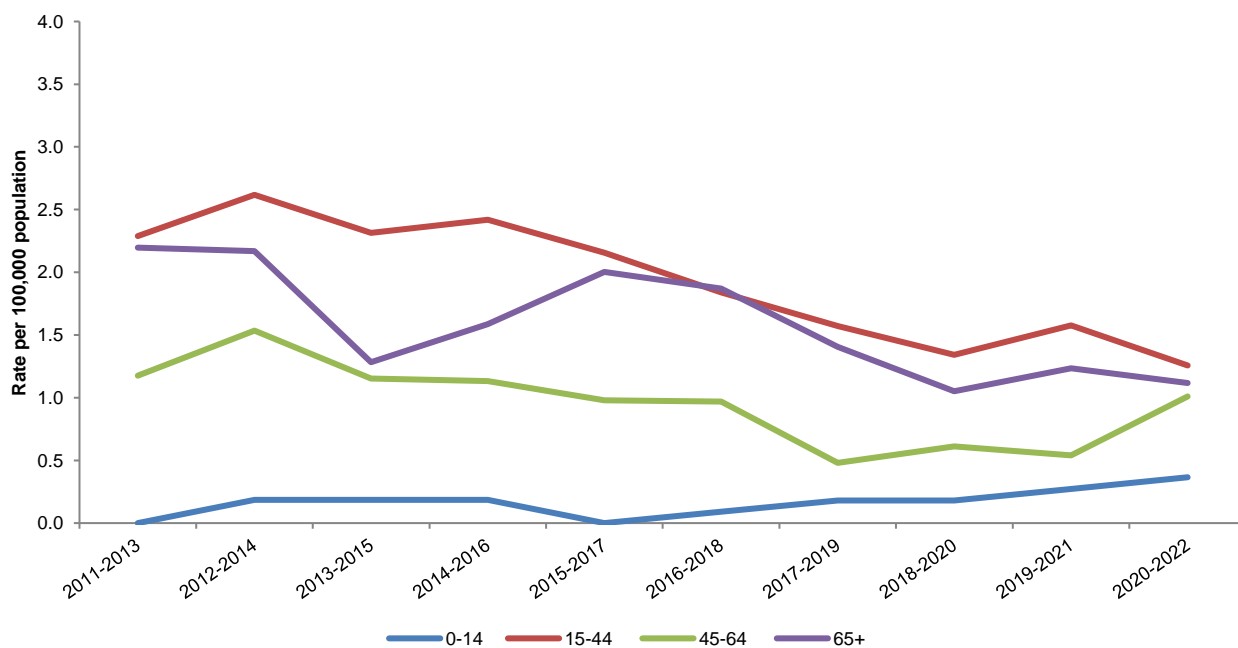


Figure 14: Three-year moving average age-specific disease rates of extra-pulmonary TB cases, Northern Ireland, 2011-2022

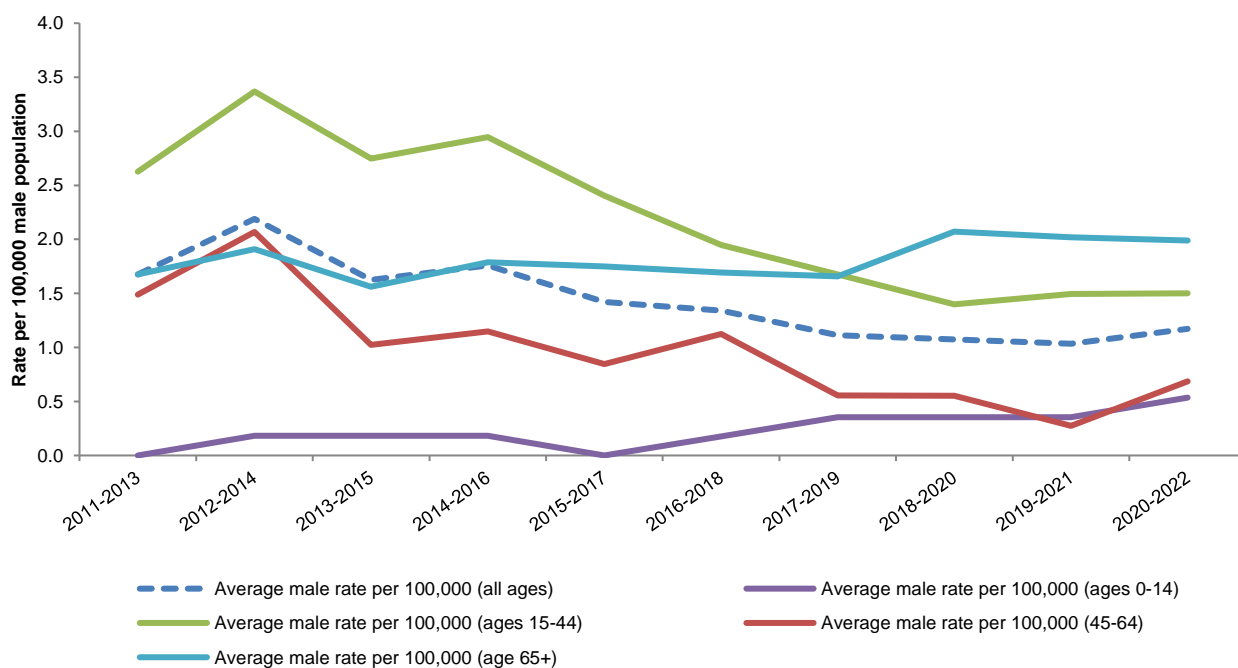


Figure 15: Three-year moving average age-specific disease rates of extra-pulmonary TB in males, Northern Ireland, 2011-2022

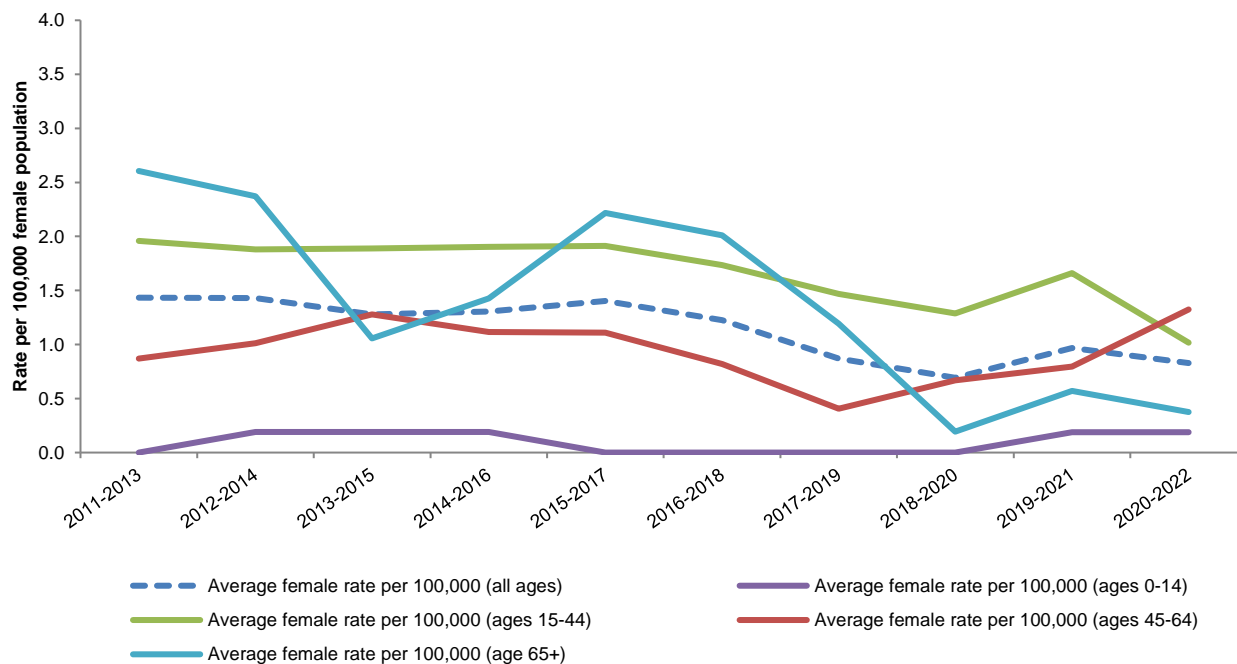


Figure 16: Three-year moving average age-specific disease rates of extra-pulmonary TB in females, Northern Ireland, 2011-2022

BHSCT reported the highest proportion of all extra-pulmonary TB cases (60.0%) reported in 2022 (n=20). This accounted for 41.4% of all TB cases reported in BHSCT in 2022 (n=29) (Figure 17). BHSCT had an extra-pulmonary TB rate of 3.3 cases per 100,000 population in 2022, followed by SHSCT (1.3 cases per 100,000 population).

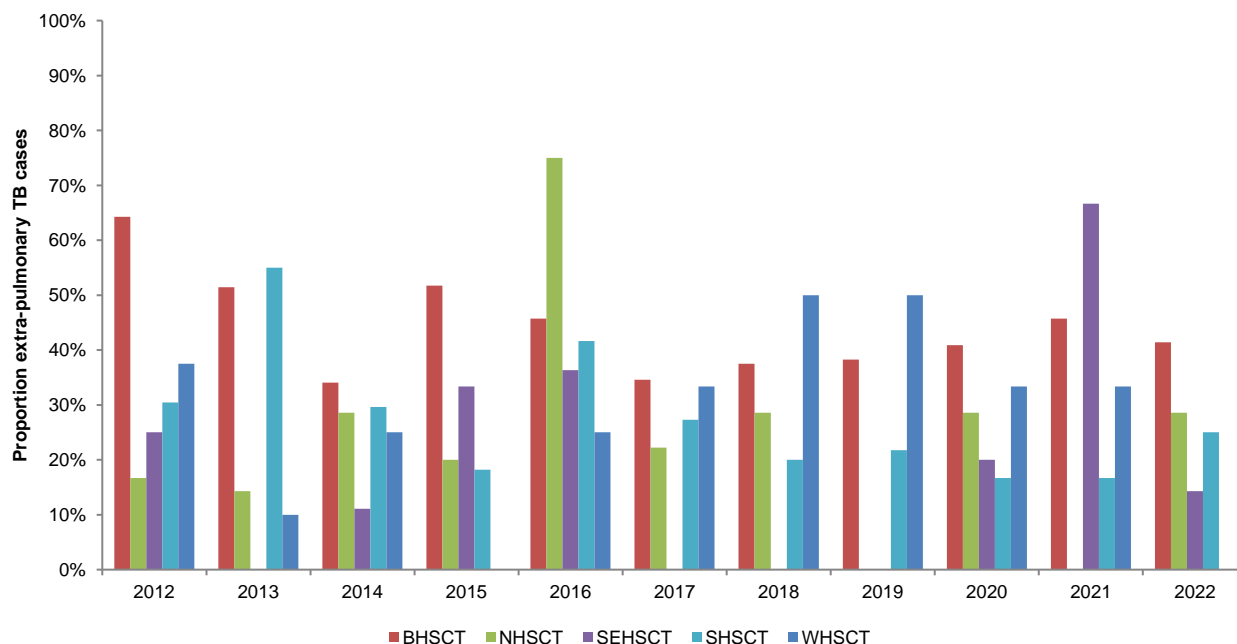


Figure 17: Proportion of TB cases in HSCTs with extra-pulmonary infection, Northern Ireland, 2012-2022. Denominator: Total TB cases for each HSCT.

## Time symptomatic

The time between onset of symptoms and starting treatment was known for 68% (n=46) of cases in 2022. Of the 46 cases: 28% (n=13) were treated within two months of onset of symptoms with a median time frame of 17 days (IQR 12-30); an additional 15% (n=7) of cases were treated within two to four months of onset with a median time period of 65 days (IQR 62-77); and the remaining 57% (n=26) of cases reported a treatment period from onset of symptoms greater than four months with a median time period of 197 days (IQR 162-353).

The time between onset of symptoms and starting treatment was known for 69% (n=33) of pulmonary cases in 2022. The overall median time period from onset of symptoms to treatment was 121 days (IQR 43-220). This period was lower than for extra-pulmonary cases (time known for 65%, n=13) where the median time period from onset to treatment was 155 days (IQR 62-246) (Table 2).

**Table 2: Time between onset of symptoms and start of treatment (days)**

All TB cases	Number	Median	IQR
0-2 months	13	17	12-30
2-4 months	7	65	62-77
>4 months	26	197	162-353
All	46	127	43-220
<b>Pulmonary cases</b>			
All pulmonary	33	121	43-220
<b>Extra-pulmonary cases</b>			
All extra-pulmonary	13	155	62-246

## Microbiology

In 2022, 76% (n=52) of all TB cases were culture confirmed, which is higher than 2021 (51%, n=28). Of the 52 isolates culture confirmed, 50 were confirmed as *M. tuberculosis* and two as *M. bovis*.

Of the 48 pulmonary cases in 2022, 87.5% (n=42) were culture confirmed. Smear results were known for 75% (n=36) of pulmonary infection cases. 41.7% (n=20) of pulmonary cases were culture and smear positive. 33.3% (n=16) of pulmonary infection cases were smear negative of which 13 were later confirmed by culture (all *M. tuberculosis*) (Table 3).

Of the 20 extra-pulmonary cases in 2022, 50% (n=10) were culture positive (Table 4).

**Table 3: Culture positive and smear positive pulmonary TB cases, Northern Ireland, 2012-2022**

Year	Pulmonary Cases	Culture Positive (%)	Culture and Smear Positive (%)
2012	47	77%	36%
2013	42	69%	43%
2014	67	70%	46%
2015	41	83%	46%
2016	50	78%	38%
2017	48	71%	46%
2018	39	69%	44%
2019	50	88%	38%
2020	39	74%	33%
2021	34	59%	38%
2022	48	88%	42%

**Table 4: Culture positive extra-pulmonary TB cases, Northern Ireland, 2012-2022**

Year	Extra-pulmonary Cases	Culture Positive (%)
2012	40	43%
2013	31	52%
2014	28	61%
2015	21	29%
2016	36	47%
2017	22	59%
2018	14	57%
2019	20	55%
2020	16	56%
2021	21	38%
2022	20	50%

## Drug resistance

Isoniazid, rifampicin, ethambutol and pyrazinamide are first-line drugs for treatment of TB in the UK. Drug susceptibility test results were available for all 52 culture confirmed cases of TB in Northern Ireland in 2022.

In 2022, there were <5 cases that were resistant to first line drug treatment and <5 cases that were multi-drug resistant/rifampicin resistant (MDR/RR). This is higher to what was reported in 2021 when no cases were resistant to first line drug treatment or MDR/RR.

## Treatment outcomes

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For the purpose of reporting outcomes for people with TB, the non-MDR/RR cohort is defined as all people notified with TB, excluding those in the MDR/RR cohort. Under this definition, people with TB resistant to isoniazid, ethambutol and/or pyrazinamide but without resistance to rifampicin are included in the non-MDR/RR cohort. Outcomes are reported according to the year of notification for people with non-MDR/RR TB up to, and including, 2021.

TB outcomes for the non-MDR/RR cohort are reported separately for the following groups:

- **Group 1:** For people with TB that have an expected treatment duration of less than 12 months. This group excludes people with culture confirmed MDR or RR-TB at diagnosis or during treatment and people treated with an MDR-TB regimen in the absence of culture confirmation and those with CNS, spinal, miliary or cryptic disseminated TB.
- **Group 2:** Last recorded TB treatment outcome for people with TB. Note that this group includes those with severe disease categories that are not expected to complete treatment within 12 months and were not included in Group 1. This group excludes people with culture confirmed MDR or RR-TB at diagnosis or during treatment and people treated with an MDR-TB regimen in the absence of culture confirmation.

In 2021, 79.1% (n=34) of people notified with non-MDR/RR TB completed treatment within 12 months (Table 5), which was higher than in 2020 (68.0%; n=34).

**Table 5: Outcome at 12 months for people with non-MDR/RR TB with an expected treatment duration less than 12 months, Northern Ireland, 2021\***

Outcome	Group 1	%
Completed	34	79.1
Died	<5	-
Lost to follow-up	<5	-
Still on treatment	<5	-
Treatment stopped	<5	-
Not evaluated**	7	16.3
<b>Total</b>	<b>43</b>	<b>100</b>

\* Excludes people with culture confirmed MDR or RR-TB at diagnosis or during treatment and people treated with an MDR-TB regimen in the absence of culture confirmation and those with CNS, spinal, miliary or cryptic disseminated TB.

\*\* Not evaluated includes those still on treatment.

Of those who completed treatment, 100% (n=34) completed treatment within 12 months. The majority of people (79.4%; n=27) completed treatment in 6 to 11 months. However, 20.6% (n=7) completed treatment in less than 6 months, which is shorter than the full duration of a short-course treatment.

Of those who completed treatment within 12 months, 55.9% (n=19) were male and 44.1% (n=15) were female. The majority of cases were aged 15-44 years (47.1%, n=16). Almost half of all cases were UK-born (47.1%, n=16). The majority of cases were pulmonary TB (55.9%, n=19), with seven of these (36.9%) being culture confirmed as *M. tuberculosis*.

At the last recorded outcome, 80.0% (n=44) of people notified in Group 2 in 2021 had completed treatment (Table 6). For the same group in 2020, 72.7% (n=40) had completed treatment at the last recorded outcome.

**Table 6: Last recorded TB outcome for the non-MDR/RR cohort, Northern Ireland, 2021\***

Outcome	Group 2	%
Completed	44	80.0
Died	<5	-
Lost to follow-up	<5	-
Still on treatment	<5	-
Treatment stopped	<5	-
Not evaluated**	<5	-
<b>Total</b>	<b>55</b>	<b>100</b>

\* Excludes people with culture confirmed MDR or RR-TB at diagnosis or during treatment and people treated with an MDR-TB regimen in the absence of culture confirmation.

\*\* Not evaluated includes those still on treatment.



## Discussion

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TB is caused by bacteria of the *Mycobacterium tuberculosis* complex. It is spread predominantly by the respiratory route, where bacteria are aerosolised by people with pulmonary disease and are then inhaled by susceptible individuals.

In 2014 the World Health Organization (WHO) adopted the Global [End TB Strategy](#), which aims to eliminate TB. In September 2023 the UK reconfirmed its commitment to the fight against TB at the [United Nations high-level meeting on TB](#) by meeting the WHO elimination targets for Hepatitis C, Hepatitis B and TB ahead of 2030. To monitor TB infection rates, treatment and transmission, NHS England and UKHSA developed a [TB Action Plan for England, 2021-2026](#) to support a year-on-year reduction in TB incidence and in-UK TB transmission to enable the UK to meet its commitment to the [WHO elimination targets by 2035](#).

TB remains a significant public health concern worldwide, including in Northern Ireland. Although Northern Ireland is a low incidence region for TB with 3.6 cases per 100,000 population reporting in 2022, it still faces challenges due to multiple factors including; more complex cases, late presentation and delayed treatment, a changing demography impacted by migration flows, and an increasing risk of treatment drug resistance. TB in Northern Ireland, similar to elsewhere in the UK continues to disproportionately affect the most deprived populations in our society, as evidenced in this report. More targeted interventions may be required to support those most at risk of getting the disease.

To support and enable reduction of TB in Northern Ireland necessitates consideration for expansion of the current TB surveillance programme to include latent TB surveillance, cluster identification and enhanced contact tracing, in populations most at risk. Earlier identification and treatment of individuals with latent TB infection would enhance early interventions and help prevent potential progression to active TB. Better surveillance mechanisms such as whole genome sequencing clustering and enhanced contact screening would better direct public health services thus supporting prevention of onward transmission of the disease.

The COVID-19 pandemic has had a complex impact on healthcare access and delivery, migration, and social behaviours, all of which may have influenced TB transmission,

diagnoses and notifications during the reporting period of this annual report. Readers should be mindful of the effect when interpreting the information in this report.

While data completeness has improved, missing data for some variables, especially those for social risk factors may result in biased estimates of the proportion of people with TB with these characteristics. Efforts to improve these are ongoing.