UK Health Security Agency

Tuberculosis in Yorkshire and Humber

2021 report (presenting data to end of 2020)

Data from 2000 to 2020

Contents

The data presented in this report is correct as at 8 July 2022.

Acknowledgements

We are grateful to all those who contribute information on people with tuberculosis in Yorkshire and Humber, including nurses, physicians, microbiologists, scientists, outreach and social care and administrative staff. We also acknowledge colleagues at the UKHSA National Mycobacterium Reference Service for information on culture confirmation and drug susceptibility testing. Further thanks are due to the UKHSA National TB Unit for providing the cleaned matched data set, the Yorkshire and Humber Health Protection Team and the Field Service Yorkshire and Humber team for their work supporting Enhanced Tuberculosis Surveillance.

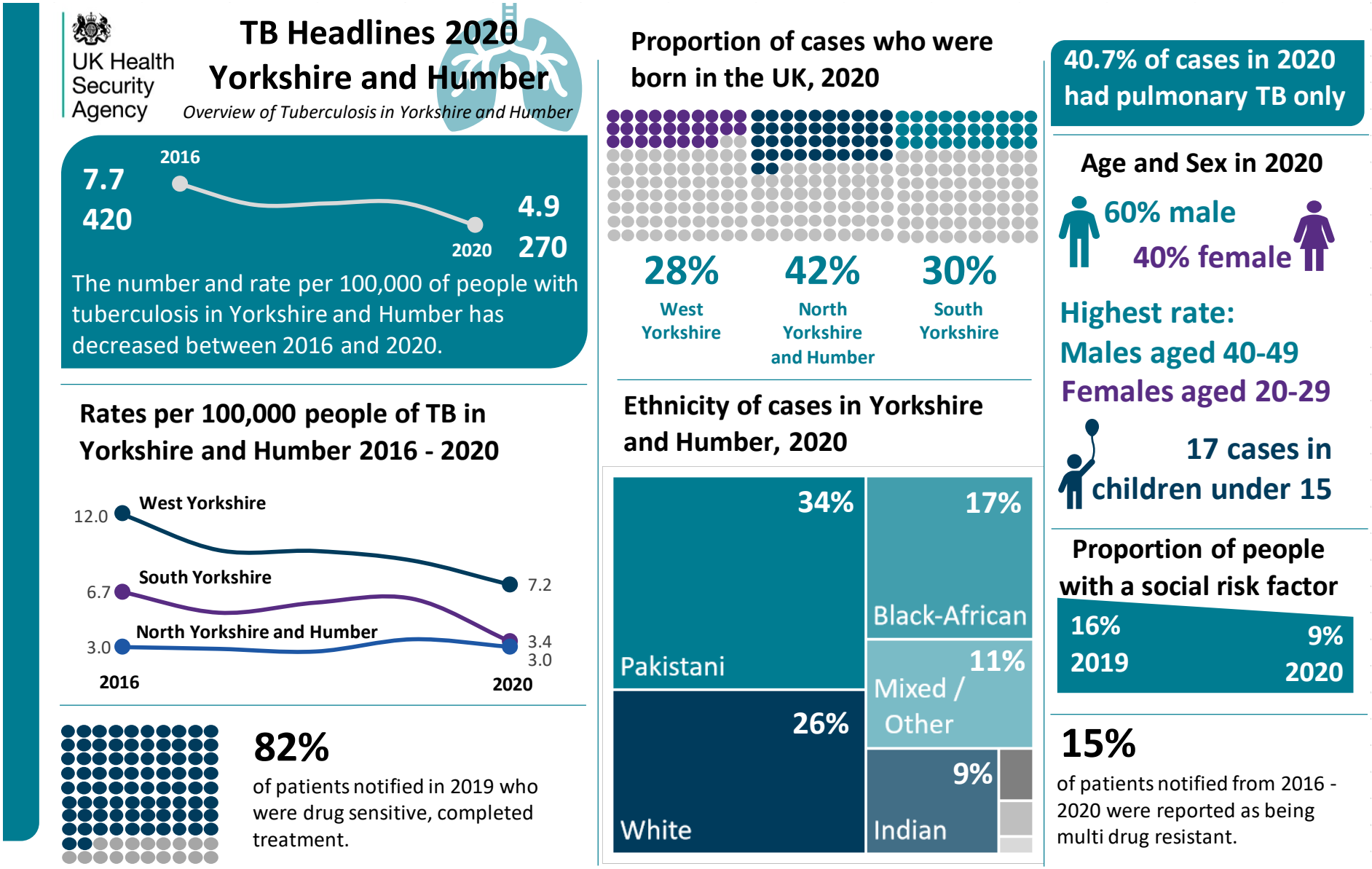
Authors

This report was prepared by Hannah Moore, Madeline Cox, Adrian Wensley and Aston Quinney of the Field Service (Yorkshire and Humber), Health Protection Operations, UKHSA

Suggested citation

UK Health Security Agency. (September 2022) Tuberculosis in Yorkshire and Humber: 2021 Report (presenting data to end of 2020), 2022. UK Health Security Agency: (Yorkshire and Humber)

Infographic summary: TB headlines 2020 Yorkshire and Humber (see next page for accessible text version)



Accessible text version of summary infographic 'TB headlines 2020 Yorkshire and Humber'

TB headlines for Yorkshire and Humber 2020

The number and rate per 100,000 of people with tuberculosis in Yorkshire and Humber has decreased between 2016 and 2020. In 2016 there were 420 cases and a rate of 7.7 per 100,000. In 2020 there were 270 cases with a rate of 4.9 per 100,000.

The rates per 100,000 people of TB in Yorkshire and Humber between 2016 and 2020 by clinical review area have decreased or remained the same. In West Yorkshire the rate fell from 12.0 in 2016 to 7.2 in 2020. In South Yorkshire the rate was 6.7 in 2016 and 3.4 in 2020. In North Yorkshire and Humber, the rate remained at 3.0 per 100,000.

Of drug-sensitive patients notified in 2019, 82% completed treatment.

The proportion of cases who were born in the UK in 2020 by each clinical review area – West Yorkshire, 28% of cases were born in the UK. In North Yorkshire and the Humber it was 42% and in South Yorkshire 30% of cases were born in the UK.

The ethnicity group break down for cases reported in 2020 are as follows: Pakistani 34%, followed by White with 26%, Black African with 17%, Mixed/Other with 11% and Indian with 9%.

A total of 40.7% of cases in 2020 had pulmonary TB only.

A total of 60% of cases were male, 40% were female.

The highest rates were seen in males aged 40 to 49 and females aged 20 to 29.

Seventeen cases were reported in children under 15.

The proportion of cases reporting a social risk factor decreased between 2019 and 2020. 16% of cases reported a social risk factor in 2019 compared to 9% in 2020.

Of patients notified between 2016 and 2020, 15% were reported as being multidrug-resistant.

Executive summary

There were 270 cases of TB reported in Yorkshire and Humber in 2020, an incidence rate of 4.9 cases per 100,000 population.

Yorkshire and Humber has lower rates of TB than the England average of 7.3 per 100,000 population.[1] The only local authority in Yorkshire and Humber with a rate higher than this average was Bradford (13.3 per 100,000). In Bradford, more than 65% of people with TB were born outside the UK which is similar to pre-pandemic levels. For Yorkshire and Humber, where country of birth was known, the most common countries people were born in were Pakistan and Eritrea.

The number of people with TB in Yorkshire and Humber who were born outside the UK has decreased in 2020, as has the number with TB born in the UK. As in previous years in Yorkshire and Humber, TB rates in the UK born population remains very low at 1.5 per 100,000 while the rate in the people with TB who were born outside the UK was 3.22 per 100,000.

Of people notified with TB in 2020, 62% had pulmonary disease. Pulmonary TB was more common among people born in the UK, than in those born abroad (68.7% versus 59). In 2020, 67% of those with pulmonary TB in Yorkshire and Humber were confirmed by culture, compared to 75% in England. Of all cases, both pulmonary and extra pulmonary, notified in Yorkshire and Humber, 57% were confirmed by culture.

Over 26% of people with pulmonary TB experience a delay of more than 4 months between symptom onset and the start of treatment. The delays were highest in males, those not born in the UK and of a White ethnic group.

Information on the offer of HIV testing was available for 91% of people reported with TB (excluding cases that were diagnosed post-mortem). Encouragingly, 97% of cases notified in 2020 were offered HIV testing (excluding cases diagnosed post-mortem and those where status was already known).

[1] Tuberculosis in England: annual report

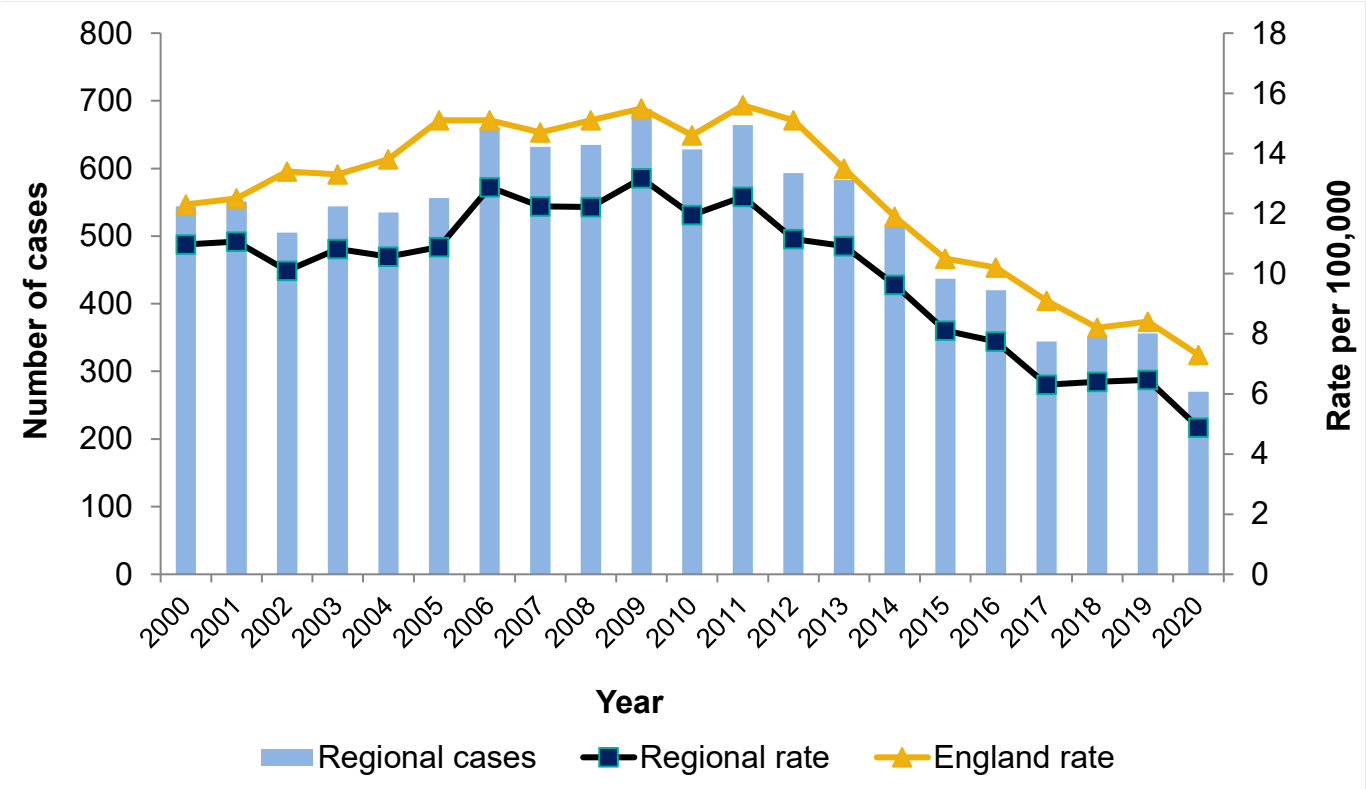
1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2020, 270 people resident in Yorkshire and Humber were diagnosed and treated for TB within the region. Compared to 2019, this is a significant decrease in both the number of cases and the rate (n=356, 6.5 per 100,000). However, this decrease may be partly explained by reporting and diagnostic delays in the region caused by the COVID-19 pandemic.

The rate of TB in Yorkshire and Humber in 2020 was 4.9 cases per 100,000 population (95% CI 4.3 to 5.5), which is lower than the rate observed in 2019 (6.5 per 100,000 population) and the 2020 England rate of 7.3 per 100,000 population. This follows a general trend in the region of a decrease in TB since 2009, where incidence peaked at 13.2 cases per 100,000 population (Figure 1). Yorkshire and the Humber has been consistently below the England average rate since reporting began, and below the World Health Organization (WHO) definition of a low incidence area (less than 10 cases per 100,000 population) since 2014.

Figure 1. TB case reports and rates, Yorkshire and Humber, 2000 to 2020

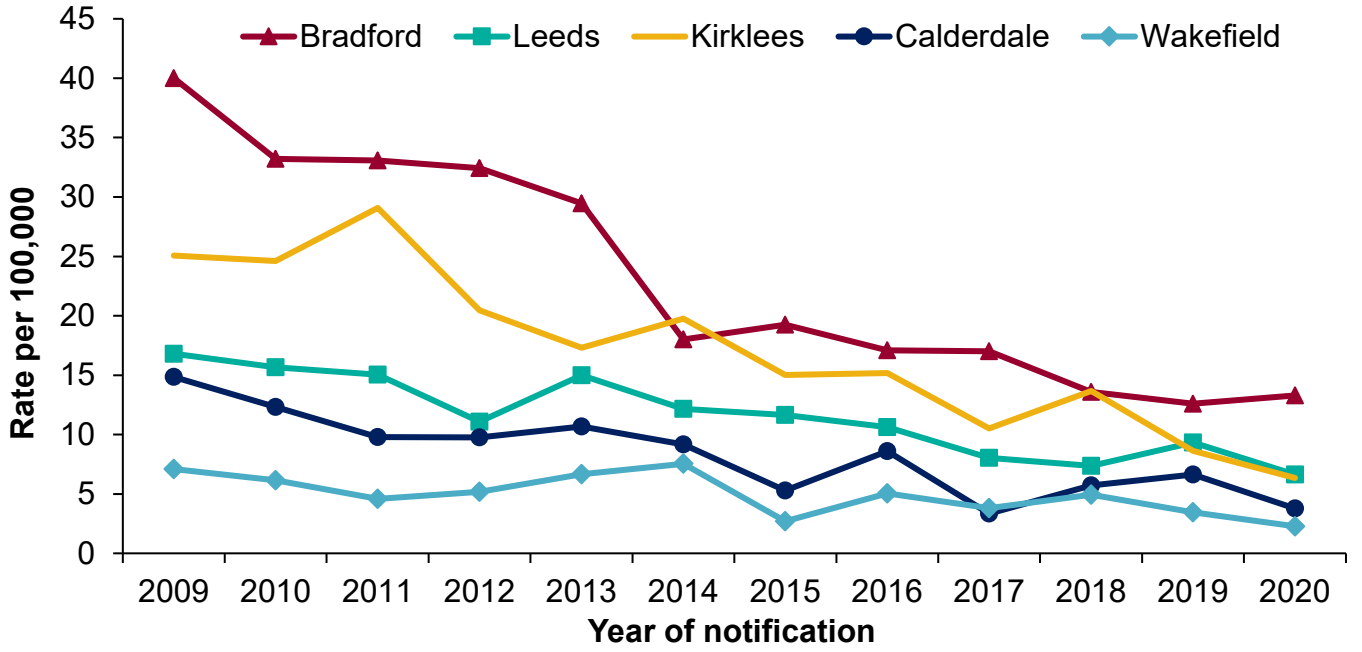


In 2020, Bradford was the only upper tier local authority in Yorkshire and Humber with a TB rate higher than the national rate (13.3 compared to 7.3 per 100,000 population) (Figure 2 and Figure 3). There were 5 local authorities with higher rates than the regional average of 4.9 per 100,000 population; Bradford (13.3 per 100,000; 72 cases), Kingston upon Hull (6.6 per 100,000; 17 cases), Leeds (6.6 per 100,000; 53 cases), Kirklees (6.3 per 100,000; 28) and York (5.7 per 100,000 population; 12 cases).

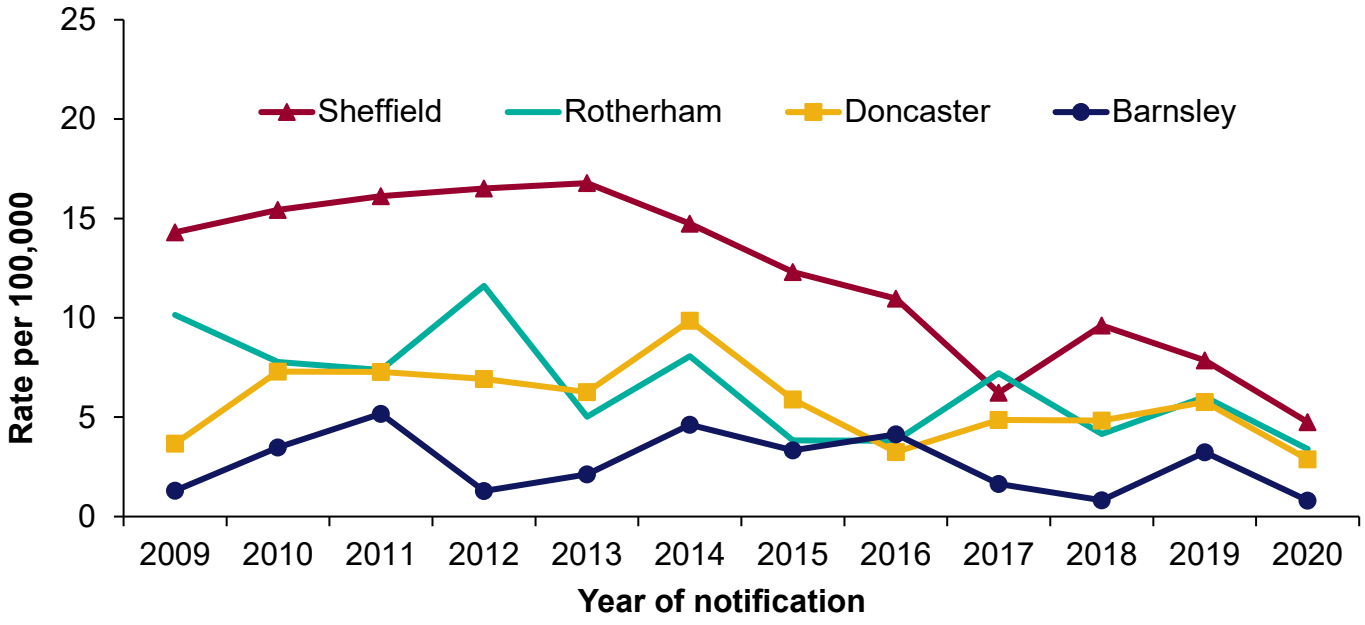
Local authority areas with recent increases in TB cases were York, Bradford and North Yorkshire. Increases for Bradford and North Yorkshire were small between 2019 and 2020 (Bradford; 13.3 cases per 100,000 compared to 12.6 in 2019 and North Yorkshire; 2.7 per 100,000 compared to 1.6 in 2019). However, the TB incidence rate for York increased significantly since 2018 (1.9 per 100,000 population compared to 5.7 per 100,000 population). Although there were a small number of cases (4 cases in 2018 and 12 cases in 2020) this increase should be closely monitored to ensure it does not represent an upward trend.

Figure 2. TB case rates, by upper tier local authority of residence, Yorkshire and Humber, 2009 to 2020

2.a) West Yorkshire



2.b) South Yorkshire



2.c) North Yorkshire and Humber

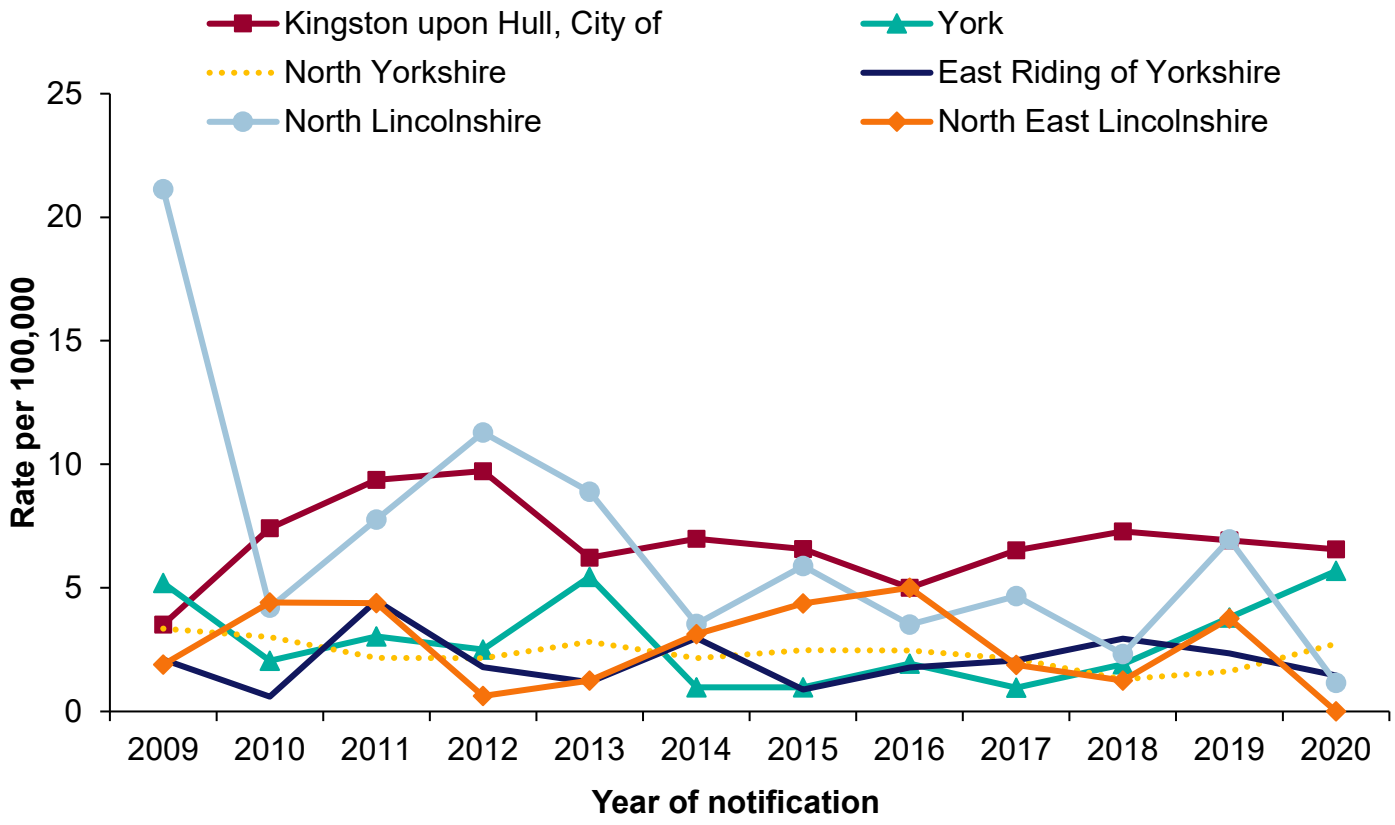
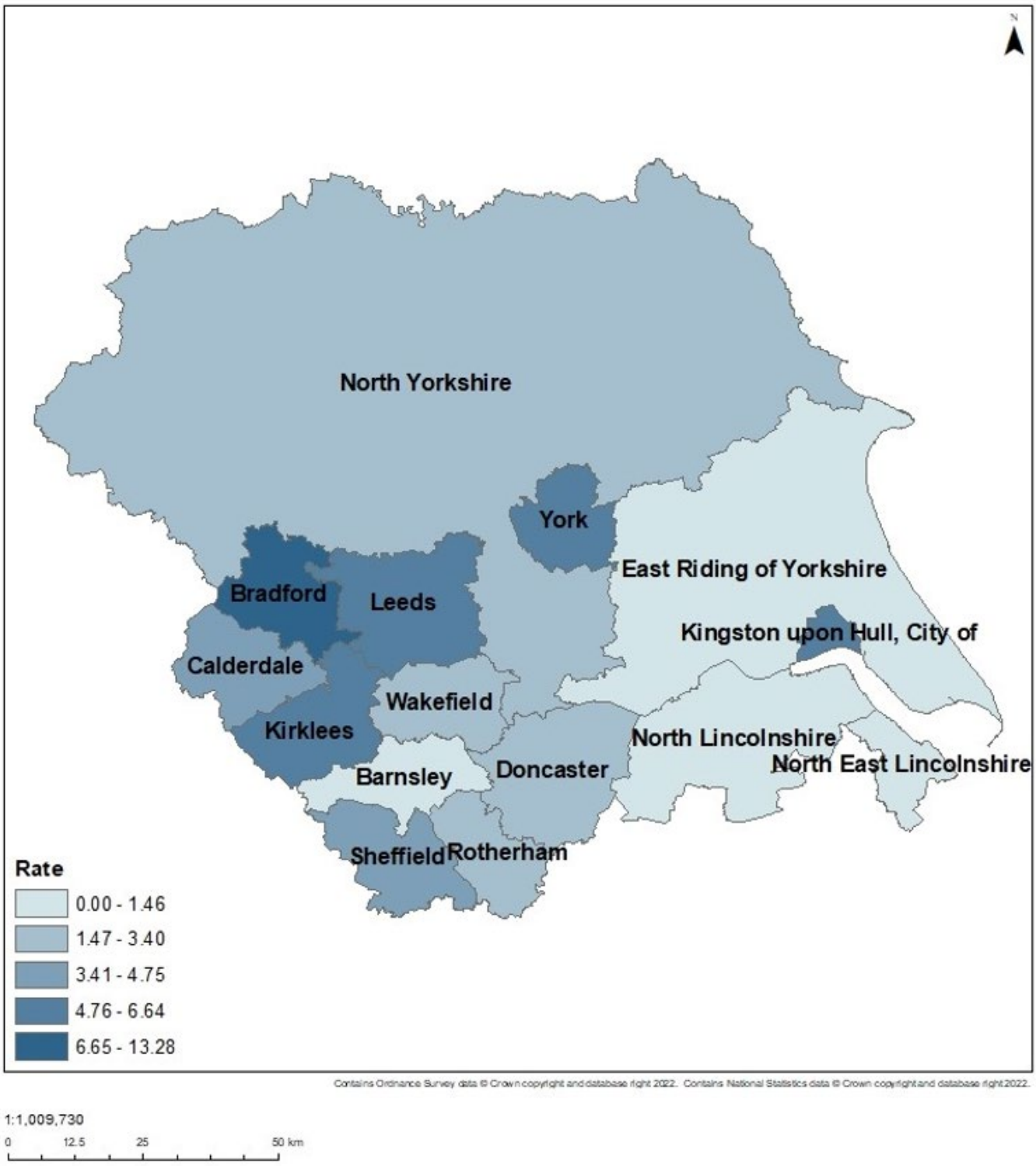


Figure 3. TB cases by rate per 100,000 by upper tier local authority of residence, Yorkshire and Humber, 2020



Demographic characteristics

In 2020, 60% of people diagnosed with TB in Yorkshire and the Humber were male (161 out of 270) and 57% of cases were aged 15 to 44 years old (153 out of 270). This age and sex distribution is broadly similar to England overall, where 59.1% of cases were male and 55.9%

were aged 15 to 44 years old. The highest rate in Yorkshire and Humber was seen in people aged 30 to 39 years old (12.2 per 100,000) and the lowest was seen in children aged under 9 (1.4 per 100,000). A similar pattern was seen in England, with those aged 30 to 34 years having the highest rate (12.8 per 100,000) and children having the lowest rate (under 15 years; 1.5 per 100,000).

There were 17 cases of TB notified in children less than 15 years old in Yorkshire and Humber in 2020 (1.7 per 100,000). This is slightly higher than the England rate for this age group (1.5 per 100,000 population). The rate for children under 15 also represents a slight increase in Yorkshire and Humber compared with 2019 (1.6 per 100,000) however the number of cases were very small (14 in 2017, 19 in 2018, 16 in 2019). Despite this, TB cases in children should be closely monitored to identify possible ongoing TB transmission.

Figure 4. TB case reports and rate by age and sex, Yorkshire and Humber, 2020

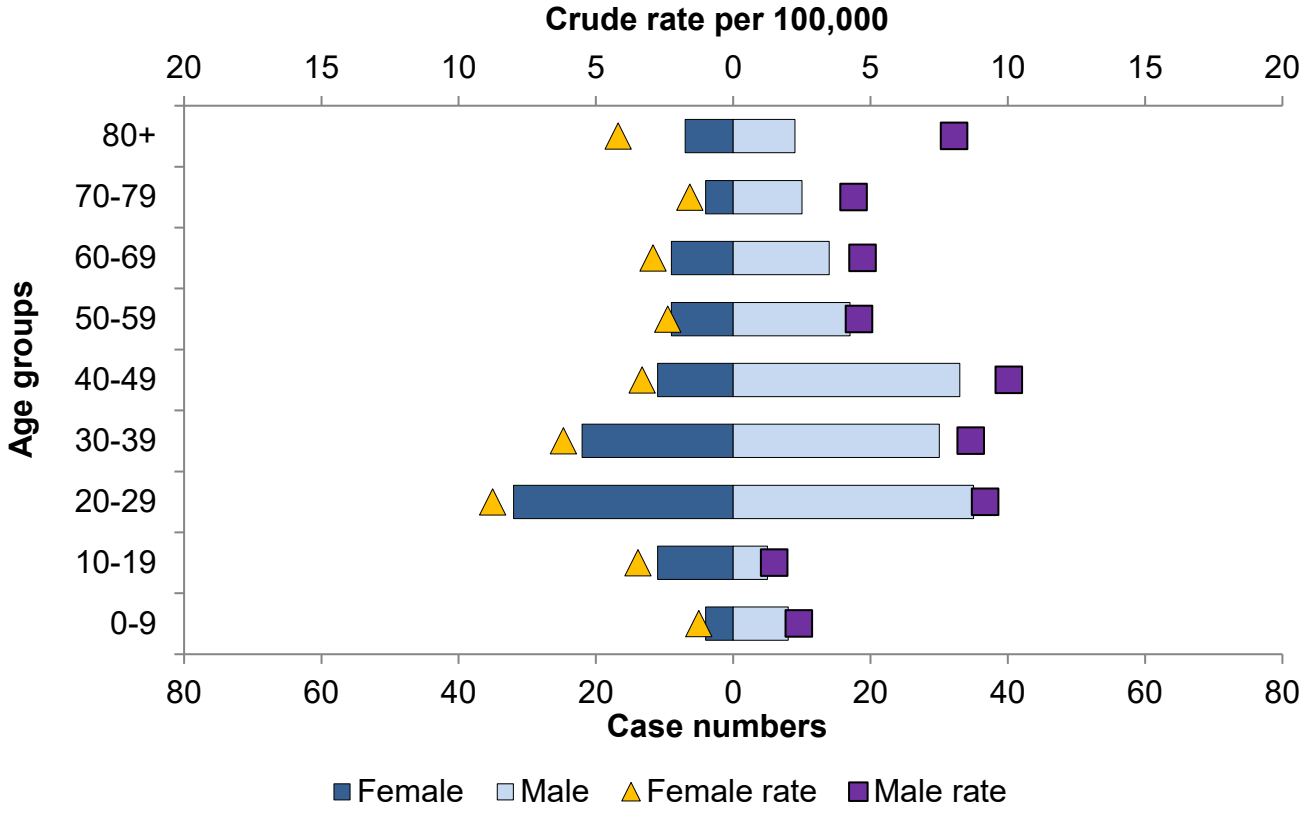
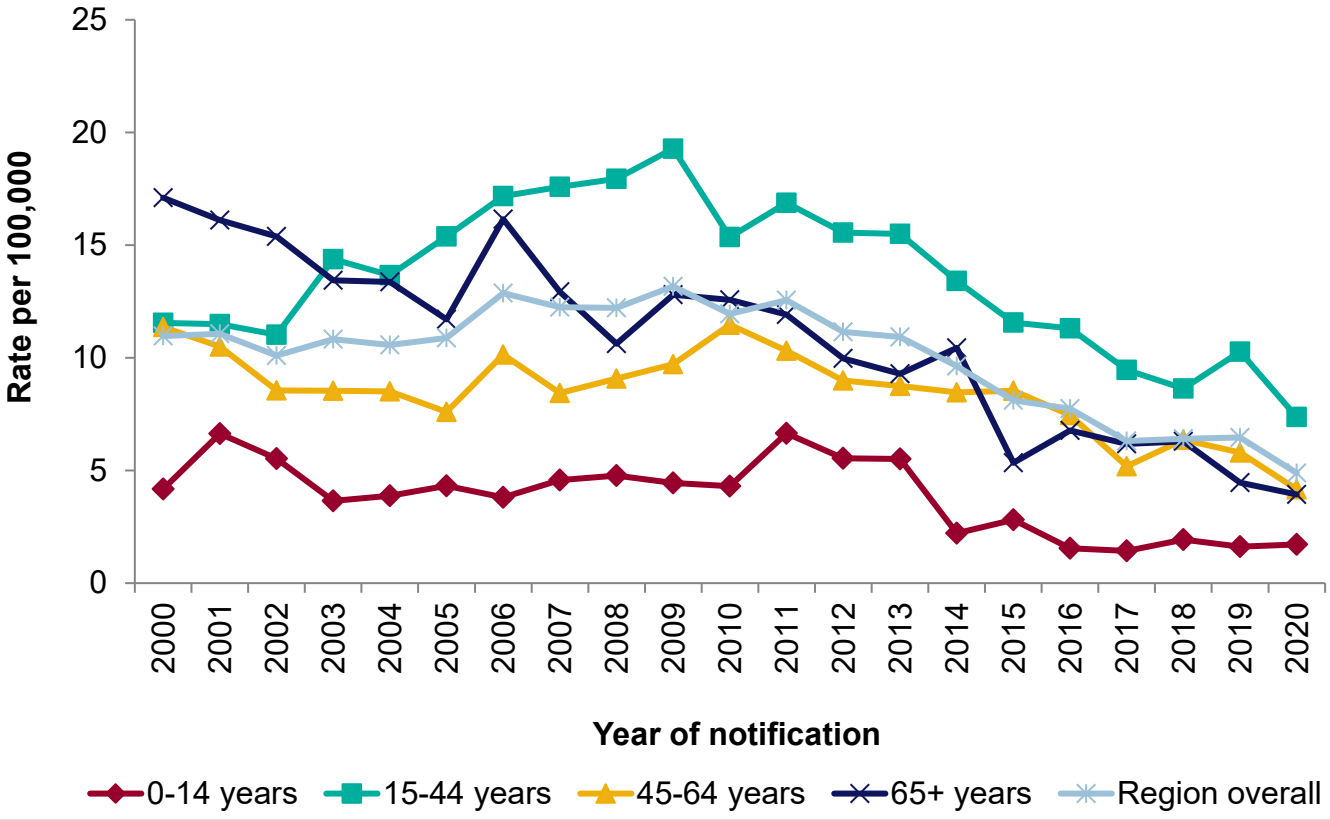


Figure 5. TB case rates by age group, Yorkshire and Humber, 2000 to 2020



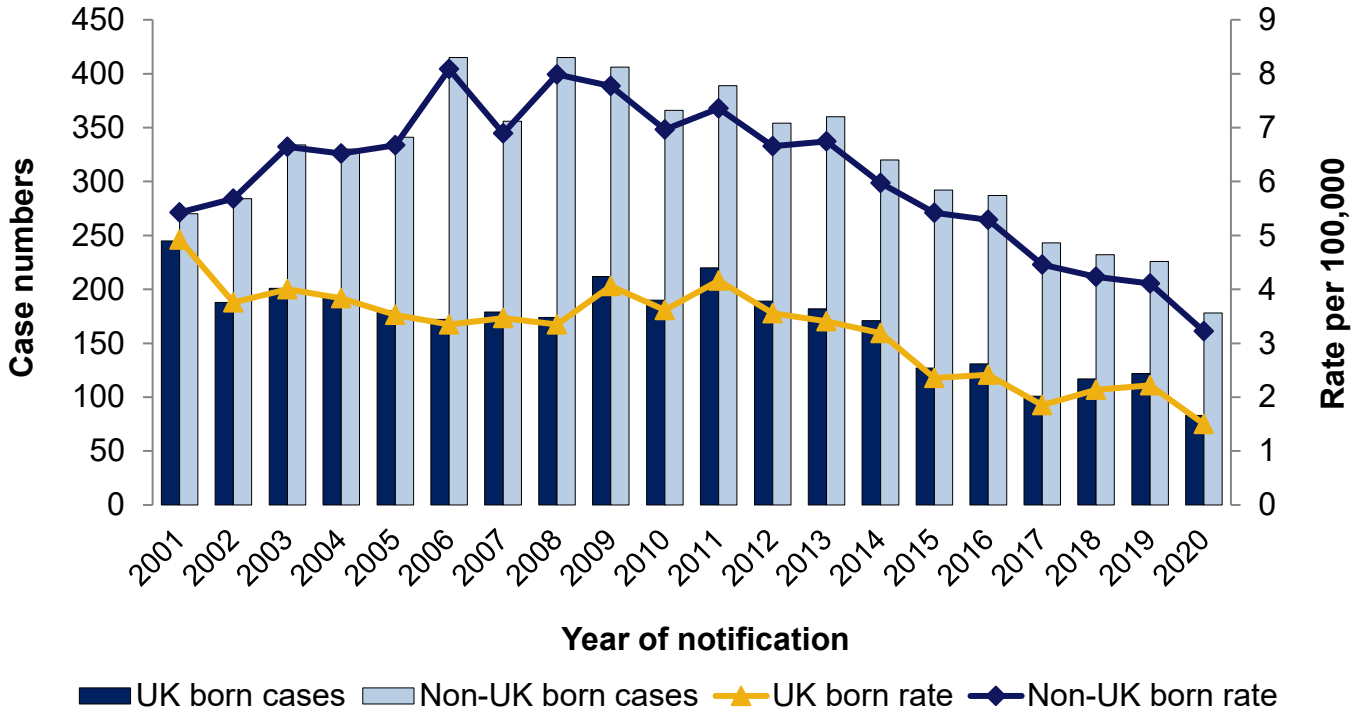
Place of birth and time since entry

The rates of TB in the non-UK born population should be interpreted in the context of changes to the pre-UK entry screening policies. In 2005, the UK piloted the pre-entry screening of long-term migrants to the UK for active pulmonary TB in 15 high TB incidence countries. In 2012, this pre-entry screening was extended to all countries with a high incidence of TB (more than 40 cases per 100,000 population).[2]

In 2020, country of birth was recorded for 97% notified cases in Yorkshire and Humber. Where this information was known, 68% of the cases were reported in the non-UK born population (178 out of 261). There has been a notable decrease in the number of UK born TB cases reported in Yorkshire and Humber since 2019 (2019:122, 2020:83) which followed a brief rise between 2017 and 2019. There could be a number of reasons for this decrease, such as the impact of the COVID-19 pandemic or natural variation in case numbers. However, this could represent a true downward trend in these cases.

[2] Public Health England (2016). UK pre-entry tuberculosis screening report 2015

Figure 6. TB case reports and rate by place of birth, Yorkshire and Humber, 2001 to 2020



Between 2019 and 2020, among non-UK born cases, there was a decrease in both the number of notifications (178 in 2020 compared to 226 in 2019) and the rate (2020, 3.2 cases per 100,000 population; 2019, 4.1 cases per 100,000) of TB cases among this population, representing a large percentage decrease in both indicators (-21% and -22% respectively). Of the cases born outside the UK[3], 22% were born in Pakistan (59 out of 261), a slight increase from 2019 (17%; 60 out of 348). While the greatest proportion of cases not born in the UK[4] come from Pakistan, the number of cases reported in individuals who were born in Pakistan has been slowly decreasing since 2013 (Figure 7).

In 2020, the year of entry to the UK was reported for 62% of TB patients born outside the UK (163 out of 261). The highest TB rate in this population in Yorkshire and Humber was among those aged between 15 to 44 years (39 cases per 100,000). For those with data available[5], 40% of non-UK born Yorkshire and Humber cases had been in the UK more than 11 years before their TB diagnosis (65 out of 163) (Figure 8). There was variation by country of birth in the median time between a person's first entry to the UK and developing TB (Table 1). The country with the biggest gap between median entry time and TB notification was Pakistan (16 years). Somalia (5 out of 163) and Cameroon (3 out of 163) had the shortest median time (less than one year). Further investigation into possible epidemiological links or common risk factors among these populations should be investigated in addition to promoting how and when to access healthcare.

[3] Where this information was recorded (261 out of 270, 97%).
[4] Public Health England (2016). UK pre-entry tuberculosis screening report 2015
[5] Where this information was recorded (261 out of 270, 97%).

Figure 7. Trend in TB case numbers in the 5 most common countries of birth, Yorkshire and Humber, 2000 to 2020

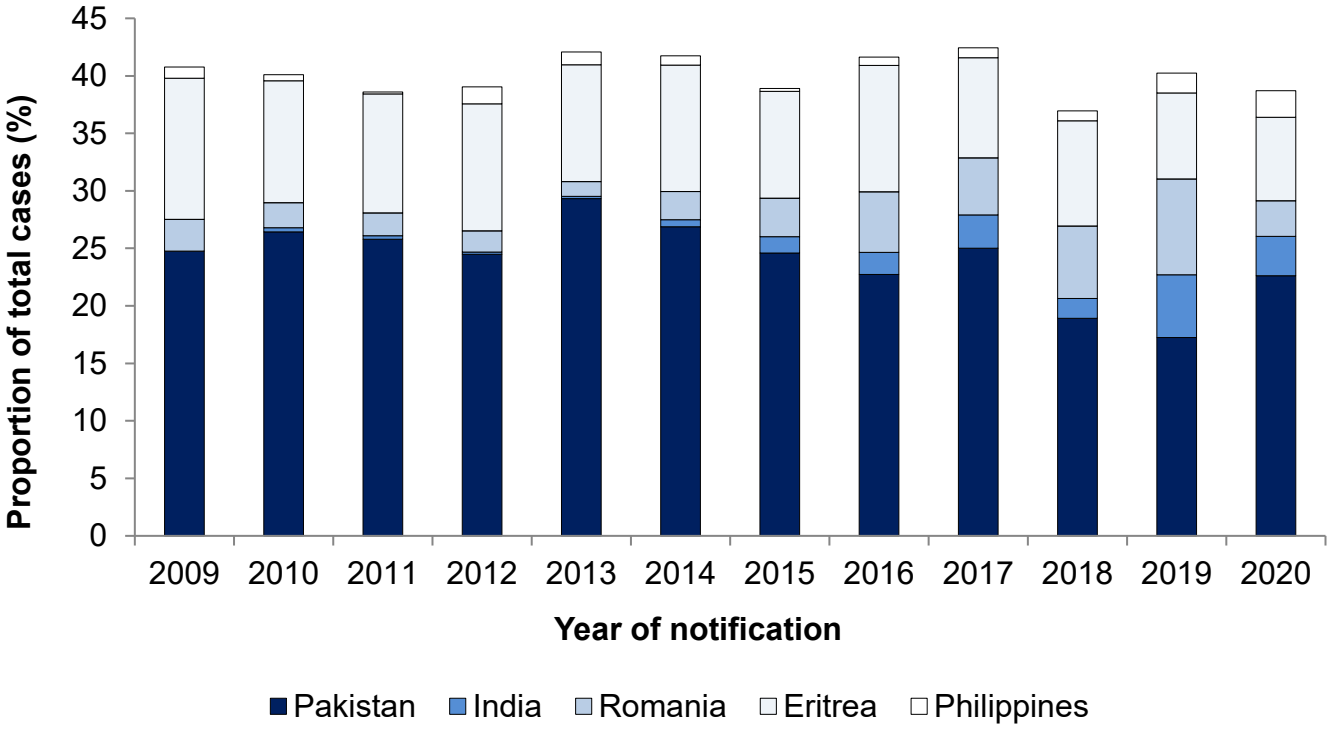


Figure 8. Time between entry to the UK and TB notification for non-UK born patients by year, Yorkshire and Humber, 2009 to 2020

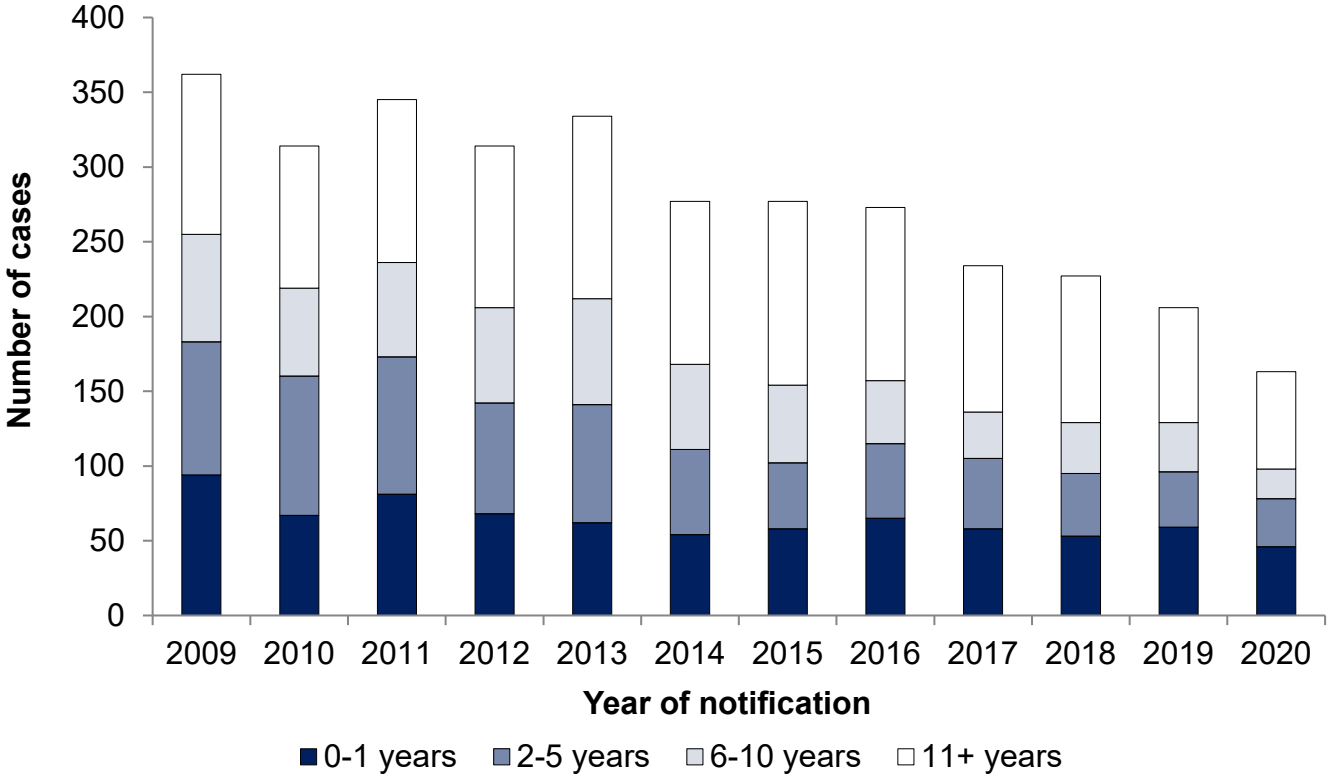


Table 1. Ten most common countries of birth for non-UK born TB patients, Yorkshire and Humber, 2020

Country of origin	Number of cases	Proportion of non-UK born (%)	Median time since entry (years)	Time since entry (interquartile range in years)	
Pakistan	59	35	16	8	29
India	19	11	2	0	16
Romania	9	5	3	1	4
Eritrea	8	5	2	1	5
Philippines	6	4	15	9	23
Sudan	6	4	2	1	6
Poland	5	3	9	6	11
Somalia	5	3	0	0	5
Afghanistan	4	2	9	5	14
Cameroon	3	2	0	0	5

Ethnicity

Ethnicity was recorded for 97% of cases (261 out of 270). The highest proportion of cases was seen in the Pakistani ethnic group (34%, 89 out of 261). However the highest rate of TB was found in the Black African population (66.6 per 100,000 population; Figure 9). The number of cases of TB has declined in all ethnic groups since 2019.

The majority (68%) of cases in the White ethnic group were among the UK-born population, whilst only 4% of cases in the Black African group and 4% of cases in the Indian ethnic group were among those born in the UK (Table 2).

Rates of TB analysed by ethnicity should be interpreted with caution as population estimates used as the denominators for the different ethnic groups were calculated using the Labour Force Survey, which is liable to sampling error for small population groups.[6]

[6] The Labour Force Survey (LFS) was used to calculate population estimates based on a random sample of surveyed individuals, weighted to represent others in the region. Small populations are often underrepresented in the LFS sample, which may inflate TB rates for ethnic groups such as Bangladeshi, Chinese and Black-Caribbean.

Figure 9. TB case number and rate by ethnic group, Yorkshire and Humber, 2020

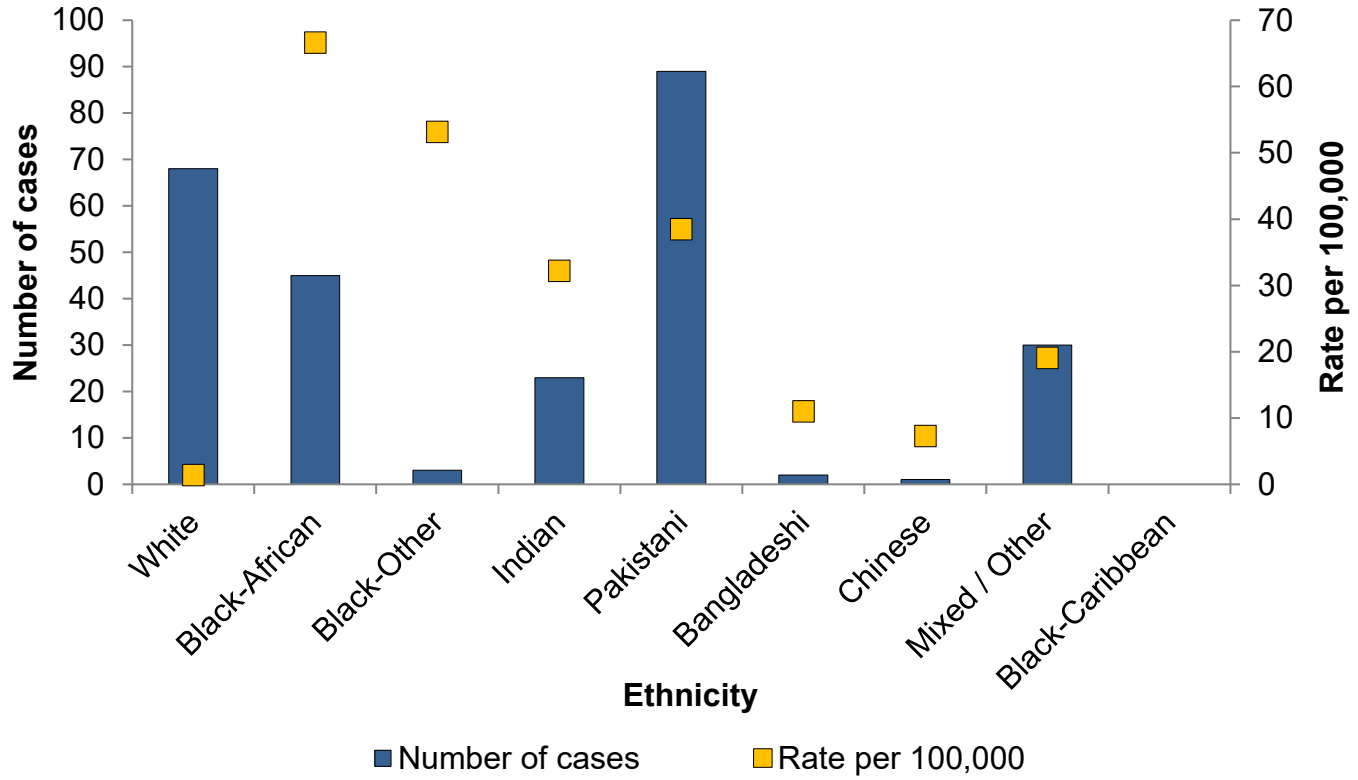


Figure 10. TB case number by ethnic group, Yorkshire and Humber, 2009 to 2020

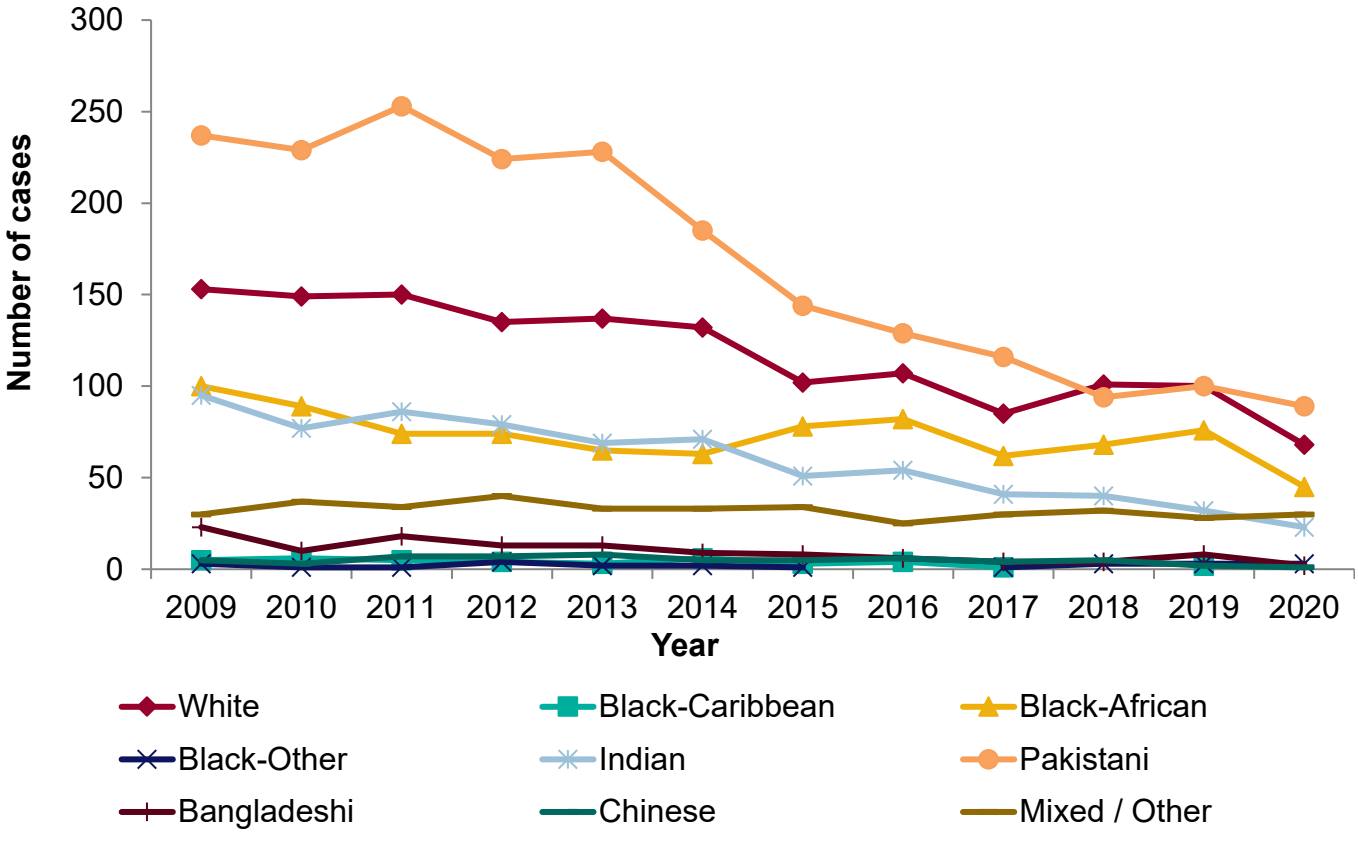


Table 2. Proportion of UK born TB patients by ethnic group, Yorkshire and Humber, 2020

Ethnic group	Proportion of UK born (%)
White	68
Black-African	4
Black-Other	33
Indian	4
Pakistani	29
Bangladeshi	50
Chinese	0
Mixed or Other	10

Occupation

In 2020, 28% of TB cases were not in education or employment, substantially less than England overall (42%). A further 15% of Yorkshire and Humber cases were retired. For others stating an occupation, 7.6% were full time students (19 out of 249), 5.6% were healthcare workers and 5.2% worked in IT or office work.

Table 3. Occupational category of TB patients aged 18 to 65 years, Yorkshire and Humber, 2020

Occupation[7]	Number of cases	Percent
Unemployed	37	14.9
Retired	36	14.5
Other	35	14.1
Housewife or husband	24	9.6
Full time student	19	7.6
Unknown	21	8.4
Health care worker	14	5.6

[7] Note: 21 cases (children) have been excluded from the table. Denominator = 249. Please note that non-standard occupational categories have been used to make the best use of available data for the region.

Occupation[7]	Number of cases	Percent
IT or office work	13	5.2
Driver (including taxis)	11	4.4
Retail or sales	11	4.4
Catering, chef or food outlet worker	10	4.0
Asylum seeker	9	3.6
Factory worker	9	3.6

Clinical characteristics

Site of disease

Of the people notified with TB in 2020, 40.7% had pulmonary TB only, and 21.5% had pulmonary and extra-pulmonary disease in at least one other anatomical site (Table 4). Where country of birth was known, a higher proportion of UK born cases had pulmonary disease (68.7%, 57 out of 83) compared with non-UK born cases (59.0%, 105 out of 178).

Previous diagnosis

In 2020, where recorded, 5.6% (15 out of 270) of TB cases in Yorkshire and Humber had received a previous diagnosis for TB more than 12 months before their current notification. This was slightly more than the proportion overall in England (6.2%). The mean time from previous diagnosis, where recorded, was 12.5 years with a median time of 7 years.

Table 4. Anatomical site of disease of TB patients, Yorkshire and Humber, 2020

Site of disease	Number of cases	Proportion (%)
Pulmonary +/-EP sites	168	62.2
Pulmonary ONLY	110	40.7
Pulmonary +EP sites	58	21.5
Bone or joint (spine)	9	3.3
Bone or joint (other)	5	1.9
CNS (meningitis)	6	2.2
CNS (other)	5	1.9

Site of disease	Number of cases	Proportion (%)
Cryptic	1	0.4
Gastrointestinal	16	5.9
Genitourinary	6	2.2
IT lymph nodes	28	10.4
Lymph nodes (extra-thoracic)	60	22.2
Laryngeal	2	0.7
Miliary	8	3.0
Pleural	27	10.0
Other (extra-pulmonary)	32	11.9
EP Unknown	82	30.4
Unknown	0	0.0

* Patients may have disease at more than one site, so the total % will not equal 100%.
CNS: Central nervous system.
EP: Extra pulmonary.

Hospital inpatient and directly observed therapy

Hospital inpatient status was recorded for 96.7% of all cases reported in Yorkshire and Humber in 2020 and just over one-quarter of these were recorded as being a hospital inpatient at time of TB diagnosis (26.8%, 70 out of 261). Males made up 54% (38 out of 70) of the inpatient cases and the age groups with the highest proportion of inpatient cases were reported for those aged 35 to 44 and 65+ (18.6%, 13 out of 70). Of those reported as inpatients at the time of diagnosis, 6 cases had at least one social risk factor.

The receiving of directly observed therapy (DOT) was recorded for 93% (252 out of 270) of cases.[8] Of those cases, 14% were reported as being on DOT (35 out of 252), which is the largest proportion recorded to date.

[8] Laboratory data on culture confirmed TB isolates from the National Mycobacterium Reference Service were matched to TB case notifications and the results were used to report culture confirmation. Results for microscopy, PCR and histology are also collected in ETS/NTBS.

2. Laboratory confirmation of TB

Culture confirmation and speciation

In 2020, 57.4% of people notified with TB in Yorkshire and Humber had their diagnosis confirmed by culture (155 out of 270).[9] Of those with disease site recorded, 67.3% with pulmonary TB were confirmed by culture (113 out of 168) compared with 41.2% of cases with extra-pulmonary TB (41 out of 102). This is less than the proportion confirmed by culture in 2018; 77.2% and 47% respectively. Of the culture confirmed cases in 2020, 97.4% (151 out of 155) had *Mycobacterium tuberculosis* identified in their sample and 2.6% (4 out of 155) *Mycobacterium africanum*. These proportions are similar to what has been reported in previous years.

Sputum smear

In 2020, 63.7% of people with pulmonary TB in Yorkshire and Humber had a sputum smear result recorded on the Enhanced Tuberculosis Surveillance system (ETS, now National Tuberculosis Surveillance System NTBS) (107 out of 168), and of those, 47.7% (51 out of 107) were positive. In comparison, data for England showed 65% of pulmonary cases had a sputum smear test recorded on ETS of which 56% had a positive result.

[9] Laboratory data on culture confirmed TB isolates from the National Mycobacterium Reference Service were matched to TB case notifications and the results were used to report culture confirmation. Results for microscopy, PCR and histology are also collected in ETS/NTBS.

3. TB Transmission

Whole Genome Sequencing (WGS) continues to be utilised routinely on all M. tuberculosis isolates to identify closely related strains of TB to inform possible transmission between patients. This information has been shared with Regional Health Protection Teams, and TB services during the pandemic and informs contact tracing and public health responses to cases. UKHSA is undertaking ongoing work to develop and improve reliable indicators of transmission to assist in efforts to reduce UK TB incidence in compliance with the Action Plan.

Rate of TB in UK born children

TB in UK born children is used as an indirect indicator for recent TB transmission within the UK, since TB in children is likely to be caused by recent exposure (as opposed to reactivation of latent TB infection acquired some time previously).

From 2016 to 2018, the rate of TB in UK born children (aged 0 to 14 years) in Yorkshire and Humber increased from 1.5 to 1.9 per 100,000 resident population. In 2019 the rate was 1.6 and this has increased slightly to a rate of 1.7 per 100,000 resident population in 2020. The rate reported for England in 2020 was 1 per 100,000 resident population.

Contact tracing

Screening of people exposed to a patient with active TB is an important part of preventing TB and reducing further transmission. Local TB nursing teams undertake this vital work for cases of TB in Yorkshire and Humber with support from the Health Protection Team in UKHSA when required. In 2020, information on the number of contacts was collected for 254 of 270 cases. This included 156 pulmonary cases and 98 extra pulmonary cases. Of the pulmonary cases, 77% had close contacts identified, 33% had ≥5. Of the extra-pulmonary cases 60% had close contacts identified, with 21% having ≥5. Of all the contacts of the pulmonary cases notified in 2020, 92% (583 out of 632) were seen for assessment and 135 were found to be positive for Latent Tuberculosis Infection (LTBI). For the extra-pulmonary cases, 83% (204 out of 246) were seen for assessment and 22 were found to be positive for LTBI.

4. Delay from onset of symptoms to start of treatment

Time from symptom onset to diagnosis

The time between symptom onset and diagnosis was recorded for 92% of the 270 cases notified in 2020. Pulmonary cases counted for 62% of infections with 154 cases compared to 95 extrapulmonary cases. The median number of days from symptom onset to diagnosis was 57 for those with a pulmonary infection and 102 for extrapulmonary. Although pulmonary infections made up a greater proportion of infections, they were diagnosed on average (median) 45 days sooner than extrapulmonary. This difference may be attributable to difficulty in diagnosing extrapulmonary TB compared with pulmonary TB.

Time from symptom onset to start of treatment

While delays in treatment can occur due to various reasons, being treated promptly following the onset of symptoms is better for the patient. Table 5 shows the number of pulmonary and extrapulmonary cases grouped by the length of time taken to receive treatment. Time taken has been categorised into 3 periods: less than 2 months, from 2 to 4 months and greater than 4 months.

Table 5. Time between symptom onset and treatment start*, Yorkshire and Humber, 2020

Time delay	Pulmonary		Extra-pulmonary only		Overall	
	n	%	n	%	n	%
Under 2 months	73	51.0	26	28.6	99	42.3
2 to 4 months	32	22.4	26	28.6	58	24.8
Over 4 months	38	26.6	39	42.9	77	32.9
Total	**143**		**91**		**234**	

* Excluding asymptomatic patients, and those with missing onset dates. Percentages may not sum due to rounding.

Time to treatment from symptom onset for 51% of those with pulmonary TB on treatment was less than 2 months. For extrapulmonary cases, 28% of those treated received therapy within 2 months of symptom onset. The percentage of cases waiting 2 to 4 months for treatment was 22% for pulmonary and 28% for extrapulmonary.

A wait of over 4 months was recorded for 26% of pulmonary and 43% of extrapulmonary cases.

Characteristics of pulmonary patients with treatment delay greater than 4 months from symptom onset

A total of 38 cases diagnosed with pulmonary TB waited over 4 months from symptom onset before commencing treatment. When split by sex, 55% were male.

The number of cases by age group shows; 53% were in the 15 to 44 year old age range, 29% were between 45 and 64 years old, and 18% were over 65.

More people waiting more than 4 months for treatment were non-UK born (22) than UK born (15). The percentage of non-UK cases with a treatment delay of over 4 months was 60%. For those born outside of the UK, 7 had entered the UK over 11 years ago, 2 between 6 and 10 years, 6 between 2 to 5 years and 6 less than 2 years.

The percentage of cases that were sputum smear positive was 24. Of those who answered the questions on social risk factors, 2 out of 27 noted having social risk factors. There were 0 cases that had been previously diagnosed with TB.

Drug-sensitivity was recorded for 37 cases and drug-resistant TB was recorded for one case.

5. TB outcomes in drug-sensitive cohort

Drug-sensitive cohort

For the purposes of TB outcome reporting, the drug sensitive cohort include all cases with sensitivity (without resistance) to rifampicin, regardless of other drug resistance. TB outcomes among patients with drug-resistant disease are considered in the next chapter (Chapter 6). Treatment outcomes for the drug sensitive cohort are reported separately for the following groups:

1. For patients with an expected duration of treatment less than 12 months, outcomes at 12 months are reported. This group excludes individuals with central nervous system (CNS) disease, who would be treated for 12 months. In addition, those with spinal, cryptic disseminated or miliary disease are excluded from this group, as CNS involvement cannot be reliably ruled out for the purposes of reporting.
2. For patients with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported.

Outcomes for TB patients with expected duration of treatment less than 12 months

Of the TB cases diagnosed in 2019 in Yorkshire and Humber, 88% (315 out of 356) were drug sensitive and had an expected treatment duration of less than 12 months. Records indicate 82% (257 out of 315) of those cases completed treatment (Table 6). This is a small decrease from 2018 (90%) and 2017 (92%), where treatment completion was the highest seen in Yorkshire and Humber over the past 10 years. This current decrease in completion rates of cases from 2019 should be monitored to determine whether it is the start of a trend.

The treatment completion rates are slightly higher for the non-UK born population (83%; 164 out of 197) completing treatment compared with the UK-born population (80%; 90 out of 113). Of the cases notified in 2019, 73% (11 out of 15) of children aged 0 to 14 years completed treatment. In the 65 years and over age category, this reduced to 65% (26 out of 40). In terms of clinical characteristics, treatment was completed by 77% of people with pulmonary TB (148 out of 191), 81% of people that were sputum smear positive (57 out of 70), and 81% of people who had a previous diagnosis of TB (26 out of 32).

The proportion of people with drug sensitive TB diagnosed in Yorkshire and Humber in 2019 who died was 5.4% (17 out of 315) (Table 7). This is a small decrease on the last reported Yorkshire and Humber figures in 2018, where 5.8% of cases died (19 out of 327). The proportion of cases who died in England was reported as 4.2%. All drug-sensitive cases who died after diagnosis in 2019 were over the age of 44 years, with the majority of those deaths being in the over 65 age group (59%, 10 out of 17).

Just one case diagnosed in 2019 of Yorkshire and Humber drug sensitive cases was reported as still being on treatment 12 months after diagnosis, which is one less than 2018. A further 1.5% of cases (5 out of 315) were lost to follow-up, which is a smaller proportion than in England (3.4%) and an improvement on the previous year (2.1%).

Table 6. Number and proportion completing treatment at 12 months, Yorkshire and Humber, 2000 to 2019*

Year	Drug-sensitive cases	Cases completed treatment at 12m	Proportion (%)
2009	606	468	77
2010	564	427	76
2011	591	431	73
2012	536	442	82
2013	529	458	87
2014	471	400	85
2015	382	324	85
2016	371	323	87
2017	304	278	91
2018	327	291	89
2019	315	257	82

* Excludes rifampicin-resistant TB, and patients with CNS, spinal, miliary or cryptic disseminated disease.

Table 7. TB outcome at 12 months in Drug Sensitive Cases, Yorkshire and Humber, patients diagnosed in 2019*

Outcome recorded at 12 months	Number	%
Treatment completed	257	82
Died	17	5
Lost to follow-up	5	2
Still on treatment	1	0
Treatment stopped	4	1
Not evaluated	31	10
Total	**315**	

* Excludes rifampicin-resistant TB, and patients with CNS, spinal, miliary or cryptic disseminated disease.

Outcomes for drug sensitive cohort of patients with CNS, spinal, miliary or cryptic disseminated TB

A total of 33 cases were notified in 2019 with CNS, spinal, miliary or cryptic disseminated TB. A total of 76% completed treatment, 5 patients died, 1 was reported as still being on treatment and 2 remained unevaluated.

No cases within this group were lost to follow up. Of the 5 patients who died, all were male aged between 45 and 72. The average age of patients in this group is 43. None were diagnosed at post mortem.

Table 8. TB outcome for patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, Yorkshire and Humber, patients diagnosed in 2019*

Outcome	Number of cases	Proportion (%)
Treatment completed	25	75.8
Died	5	15.2
Still on treatment	1	3.0
Not evaluated	2	6.1
Total	33	

* Excludes rifampicin-resistant TB

6. Drug-resistant TB (including outcomes in the drug-resistant cohort)

Drug resistance

Of the many antibiotics used to treat TB, resistance may occur to one or more of these antibiotics and may be in complex combinations. A distinction is made between first, second and third line TB antibiotics depending upon their clinical effectiveness. First line drugs include isoniazid, rifampicin, pyrazinamide and ethambutol. Second line drugs are injectable agents (for example, amikacin, capreomycin, kanamycin), fluoroquinolones (for example, moxifloxacin, ofloxacin, ciprofloxacin) and other oral bacteriostatic agents. MDR-TB cases are initially resistant to at least isoniazid and rifampicin. Extensively drug-resistant TB cases (XDR-TB) are initially MDR and resistant to at least one injectable agent (second line drugs) and at least one fluoroquinolone.[10]

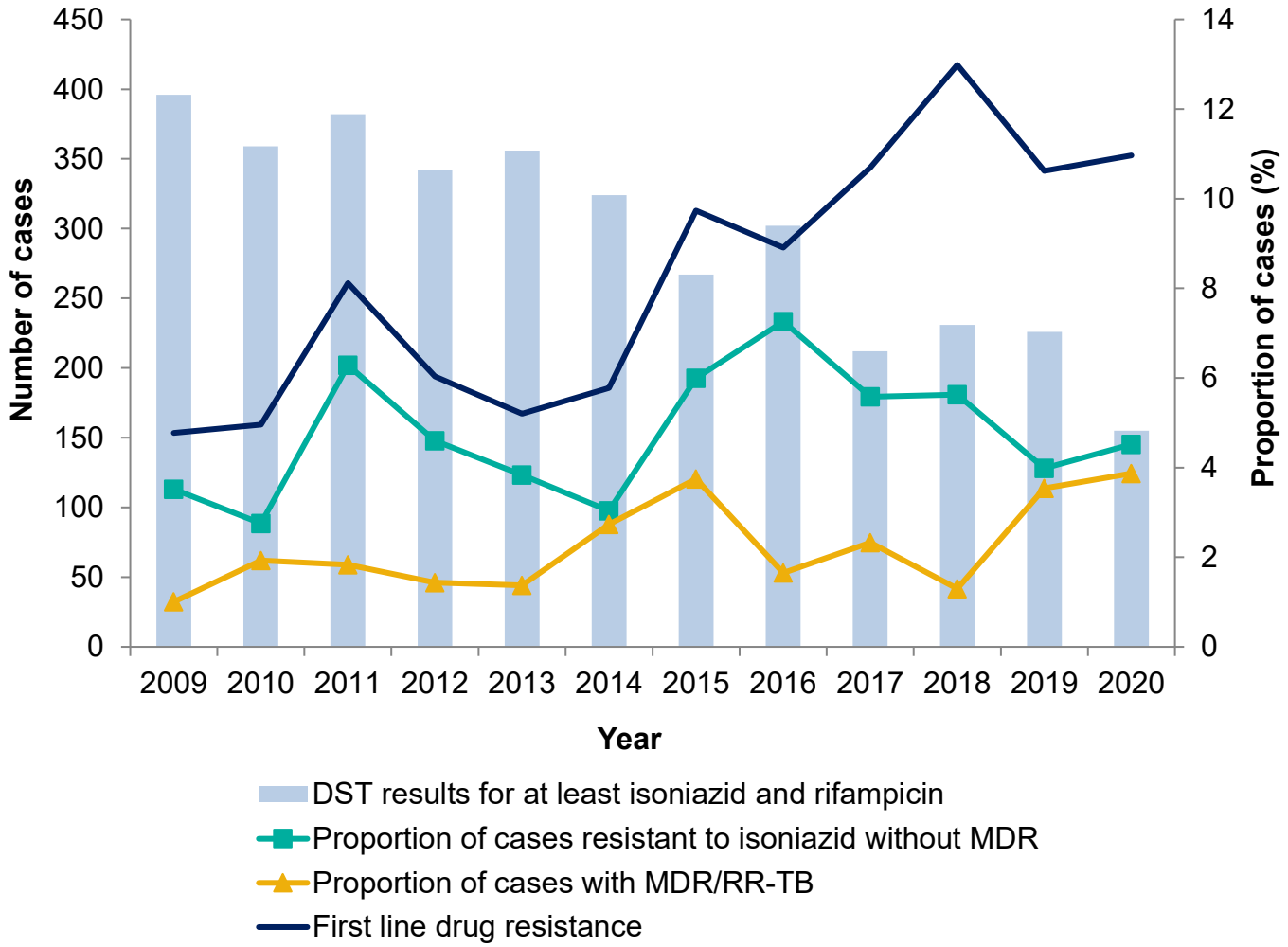
Overall initial drug resistance and geographical distribution

In 2020, Yorkshire and Humber reported 155 culture confirmed cases of TB with drug sensitivity testing (DST) for at least isoniazid and rifampicin. The proportion of TB cases with first line drug resistance was 5% (17 out of 155), the same proportion as 2019 (11%, 24 out of 226). The proportion of cases with initial resistance to isoniazid but not rifampicin (INH-R) has remained similar to the previous year at 5% (7 out of 155), below the national proportion of 6.4%. Six cases (4%) had MDR/rifampicin-resistant TB (RR-TB) (Figure 11). Two cases notified in 2020 were pre-XDR, and one case was XDR-TB.

A total of 53% of cases with drug-resistant disease were male (9 out of 17), and 65% were in the 15 to 44 year age group (11 out of 17). A higher proportion of people born outside the UK had drug-resistant disease (82%,14 out of 17 born outside the UK, versus 18%, 3 out of 17 born in the UK). Resistant isolates were identified most commonly in people of Pakistani (35%) ethnicity.

[10] World Health Organization (2010). ‘Guidelines for treatment of tuberculosis’

Figure 11. Proportion of TB cases with initial first line drug resistance, Yorkshire and Humber, 2009 to 2020



TB outcome at 24 months for patients with rifampicin-resistant disease

Three cases were identified as being drug resistant in 2018. All 3 cases have completed treatment at 24 months.

7. TB in under-served populations

Social risk factors

There were 253 TB cases in Yorkshire and Humber in 2020 who were 15 years or older, 75% (191) had completed risk factor information (Table 9). Of these, 9% (17 out of 191) of patients had at least one risk factor for TB acquisition, including being in prison (7 out of 17), homelessness (4 out of 17), alcohol misuse (6 out of 17) or drug use (6 out of 17). In 2020, among all cases with at least one risk factor, 94% were male (16 out of 17). A majority of those with known risk factors had pulmonary TB (76%, 13 out of 17) and were aged between 15 to 44 (76%, 13 out of 17). Fifty-three per cent of those with any risk factor were non-UK born (9 out of 17) and 53% (9 out of 17) were of White ethnicity.

The treatment completion rate for those with drug sensitive TB and any risk factor recorded between 2009 and 2019 in Yorkshire and Humber was 79.8% (310 out of 389). This is lower than treatment completion for cases with no risk factors (89.3%, 3,057 out of 3,424). Of the patients with known risk factors, 8.5% of patients died during 2009 to 2019 (33 out of 389), which is higher than the proportion seen in patients without known risk factors (4.4%, 151 out of 3,424). A further 8.7% of cases with risk factors were lost to follow-up (33 out of 389), more than twice as many compared with cases without risk factors (3.6%; 120 out of 2,979). When we look at treatment outcomes by those who received Directly Observed Therapy (DOT), however, the completion rates among cases with risk factors are much more similar to those without risk factors (80.7%, 88 out of 109 compared to 81.9%, 163 out of 174) suggesting that DOT does help improve completion rates.

Table 9. Social risk factors among TB patients aged under 14 years, Yorkshire and Humber, 2009 to 2020

Year	Total	Number with field completed	Number with any risk factor	%
2009	647	458	44	10
2010	588	460	41	9
2011	602	515	44	9
2012	541	455	39	9
2013	531	448	36	8
2014	495	420	47	11
2015	410	341	40	12
2016	405	341	35	10

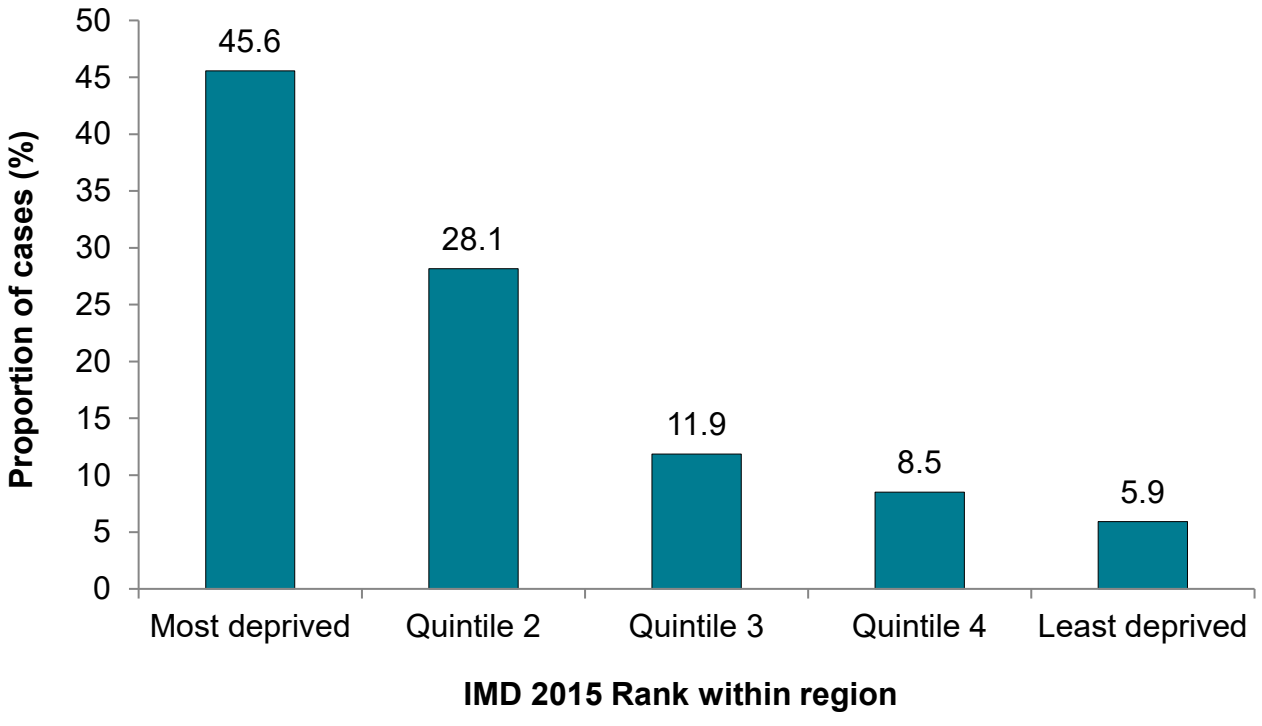
Year	Total	Number with field completed	Number with any risk factor	%
2017	330	282	36	13
2018	332	278	29	10
2019	340	293	47	16
2020	253	191	17	9

Deprivation

Of the Yorkshire and Humber TB cases notified in 2020, the highest proportion of cases came from the most deprived areas in the region, with 45.6% of cases coming from the most deprived quintile (123 out of 270) (Figure 12). This was greater than the total number of cases in the 3 least-deprived quintiles combined. There was a clear trend both locally and nationally of continued inequalities in TB rates, with an increased burden of disease seen in the most deprived communities.

Cases living in the most deprived areas were predominantly male (59%, 73 out of 123) and between 15 to 44 years old (65%, 80 out of 123). A total of 68% were non-UK born (84 out of 123). Thirty-nine per cent reported their ethnicity as Pakistani (48 out of 123), 20% (25 out of 123) reported White ethnicity, followed by 19% Black African (24 out of 123). Five per cent indicated having any social risk factor (7 out of 123).

Figure 12. TB case rate by deprivation, Yorkshire and Humber, 2020



8. Discussion

There were 270 cases of TB reported in Yorkshire and Humber in 2020, an incidence rate of 4.9 cases per 100,000 population. These were cases that were both resident and treated within the region. Compared to 2019, this was a significant decrease in both the number of cases and the rate (n=356, 6.5 per 100,000). However, there is evidence to suggest this decrease may be partly explained by reporting and diagnostic delays in the region caused by the COVID-19 pandemic. The next report (2021 data, due in 2022), should provide a clearer picture of the current trends in TB incidence in relation to the impacts of COVID-19 on TB diagnosis and rates.

TB continues to be distributed unequally across the region. Bradford, Leeds and Kirklees continued to have some of the highest rates in the region, however only Bradford was above the England rate of 7.3 per 100,000. Barnsley, North East Lincolnshire and North Yorkshire all have some of the lowest rates, ranging from 0.8 to 2.7 per 100,000. Whilst most local authorities show a general decrease in incidence or small fluctuations in rates, rates in York, Kingston Upon Hull and Bradford have shown small increases.

The highest age and sex specific rates of TB in Yorkshire and Humber were recorded among men aged 40 to 49 years (10.1 per 100,000) and women aged 20 to 29 years (8.8 per 100,000), with very few paediatric cases reported. TB rates showed a small increase for children under 15, but slightly decreased in the other age groups (15 to 44, 45 to 64 and 65+).

A general reduction in TB cases in Yorkshire and Humber has been seen in both the non-UK born and the UK born population over the past 5 years, with one of the largest year-on-year reductions in cases observed between 2019 and 2020. However, the rate of TB in the non-UK born population was more than double that of the UK born population in 2020. Around 40% of non-UK born TB cases diagnosed in 2020 had been resident in the UK for more than 10 years (where data was available). The 5 most common countries of birth for non-UK born TB cases diagnosed in 2020 were Pakistan, India, Romania, Eritrea and the Philippines. Most non-UK born cases were born in either Pakistan or India, but a general decrease in TB cases born in these countries since last year has been seen. There has been a slight increase in 2018 in cases born in Romania, Eritrea and the Philippines.

In 2020 almost one-third of people with TB aged 18 to 65 years were not recorded as being in employment or education. Where information was recorded, 14.5% of people were retired, 9.6% described themselves as housewives or husbands and 7.6% of people with TB were full time students.

As in previous years, over half (62%, 168 out of 270) of cases reported in 2020 in Yorkshire and Humber had pulmonary TB and around a quarter (27%) were hospital inpatients at the time of diagnosis. Eight per cent of cases were known to have had a previous TB diagnosis. Overall, 57.4% of cases diagnosed in 2020 were confirmed by culture; when we look at only pulmonary TB, 67.3% were culture confirmed, which is approaching the national target of 80%.

Among people with pulmonary TB in 2020 in Yorkshire and Humber, 42% started TB treatment within 2 months of symptom onset, a small increase from the previous year. It is of concern that around 27% of people with pulmonary TB started treatment more than 4 months after symptom onset, consistent with a prolonged period of infectiousness. For those with extra-pulmonary TB, 43% of cases experienced delays of 4 months or more.

Where information was available, treatment was completed within 12 months for 82% of people with rifampicin sensitive TB reported in 2019, whose expected treatment duration was less than 12 months. The most common outcome category for people who did not complete treatment was death (29%, 17 out of 58) and of cases who died, TB was listed as contributing to death for 35% of those cases, incidental to death for 35% and causing death for 6%. In 24% of deaths, it was unknown if TB was related. The proportion of people who were lost to follow up remained at 2% as in 2018.

TB antibiotic sensitivity was known for 92% of cases in 2020, of which 11% were resistant to at least one first line drug, and 4% had multidrug-resistant or rifampicin-resistant TB (MDR/RR-TB). One case of extensively drug-resistant TB (XDR-TB) was reported in 2020 in Yorkshire and Humber.

People with one or more social risk factors for TB, such as drug and alcohol misuse, homelessness and prison, were less frequent in 2020 (9%) compared to 2019 (16%). Individuals with risk factors recorded since 2009 were more likely to be male (82.6%), White (47.7%), been in the UK less than 2 years (35.4%) have pulmonary TB (79.1%) have had a previous diagnosis of TB (11.4%), and first line drug resistance (9.8%) than their counterparts without social risk factors. In 2020 nearly half of all TB cases in Yorkshire and Humber were resident in the most deprived areas (45.6%).

In conclusion, while the overall number of TB notifications is decreasing in Yorkshire and Humber, the changing epidemiology of the disease both in the region and nationally presents new challenges. Additionally, this decrease should be viewed with caution in light of the impact of the COVID-19 pandemic. Reducing transmission in migrant communities continues to be an area of concern, particularly in the most deprived areas of the region. Ensuring timely treatment and reducing delays as a way of limiting disease transmission (particularly among vulnerable communities) should be a focus for general public health and infection control work.

Providing high quality diagnostics and treatment for newly diagnosed cases should be an important part of our continuing efforts to delivery effective TB care. This includes culture confirmation of new cases, using Whole Genome Sequencing technologies, providing rapid screening in possible outbreak venues and implementing innovative treatment options like DOT and VOT. Much has been done to reduce the burden of TB in Yorkshire and Humber and a further extension of these good practices is an important step in our efforts to eradicate TB by 2035.

Conclusion and recommendations

This report provides the latest available epidemiology of TB in Yorkshire and Humber, describing those populations at increased risk of disease. This evidence can help services implement the basic elements of TB control, namely prompt identification of active cases of disease, supporting patients to successfully complete treatment, and preventing new cases of disease occurring, through effective case management and robust contact tracing. The information can also be useful to target resources effectively.

Rates of TB diagnosis are falling overall in Yorkshire and Humber and are still below the national average. However, inequalities persist within the region and certain populations remain disproportionally affected by TB; namely those living in more deprived areas and those born overseas. The impact of the COVID-19 pandemic is also likely to have affected diagnosis rates in the region, and it is possible that the region may see an increase in the next year.

The main recommendations derived from the data presented in this report include:

- ensuring that accurate and complete information is provided to the UKHSA National Tuberculosis Surveillance System (NTBS) in a timely manner
- offering and encouraging HIV testing for all those diagnosed with TB and ensuring, and ensuring tests are done in line with national guidance where possible
- increasing the proportion of pulmonary TB cases with a sputum smear result to better inform local infection control and prevention activity
- reporting treatment outcome for all patients and reviewing reasons why completion is low in some areas

In addition, this report can help inform the implementation of the National Tuberculosis Action Plan for 2021 to 2026. This includes strengthening early detection of TB in higher risk groups and, those with social risk factors as well as ensuring timely access to diagnosis and effective treatment.

References

1. Tuberculosis in England: annual report
2. Public Health England. UK pre-entry tuberculosis screening report 2015
3. World Health Organization. Guidelines for treatment of tuberculosis. 2010
4. National Tuberculosis Action Plan for 2021 to 2026

Appendix A. Notes on the report

About the Field Service

The Field Service (FS) supports UK Health Security Agency (UKHSA) Centres and partner organisations through the application of epidemiological methods to inform public health action. It does this in 2 main ways, firstly by providing a flexible expert resource, available, as and when needed, to undertake epidemiological investigations for key health protection work and secondly through the expert analysis, interpretation and dissemination of surveillance information to UKHSA Centres, local health partners, service providers and commissioners of services. Within the FS network, excellence and innovation is encouraged, we foster academic collaborations and take active part and lead in research, development and training.

Intended audience

This report is for use by healthcare professionals who diagnose and/or care for people with tuberculosis (TB), commissioners involved in planning and financing TB services, public health professionals working to improve TB control and the health of at-risk populations, researchers with an interest in TB, and government and non-governmental organisations working in the field of TB. In particular this report is for the use of the Yorkshire and Humber and North East TB Control Board and local health protection forums.

Aim of report

This report describes the recent epidemiology of TB in Yorkshire and Humber. It includes local trends, which areas and population groups have a high burden of disease, and detail on the care of patients.

Further TB information

The following resources are available online.

The national report of TB in England.

Additional data on TB notifications in the UK to the end of 2020 and breakdowns by country in 'Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: United Kingdom, 2000 to 2019'.

TB Strategy Monitoring Indicators (part of the Collaborative TB Strategy for England 2015 to 2020).

The Tuberculosis action plan for England 2021 to 2026. The priorities and actions outlined in the Action Plan will provide our stakeholders and partners with the tools to reduce TB incidence in all our communities, enabling the UK to meet its commitment to the World Health Organization (WHO) and eliminate TB in England by 2035. Multi-stakeholder collaboration will be essential to implementation of the Action Plan, including support for staff and a focus on inequalities.

The 'TB Action Plan for England 2021 to 2026' will improve prevention, detection and control of TB. The 5 priorities of the TB Action Plan are:

Priority 1 – Recovery from COVID-19
Priority 2 – Prevent TB
Priority 3 – Detect TB
Priority 4 – Control TB disease
Priority 5 – Workforce

TB indicators at upper tier local authority and clinical commissioning group level.

Appendix B. Description of data sources and definitions

Data sources

This report is based on TB case notifications made to the UKHSA Enhanced Tuberculosis Surveillance system (ETS) in England to the end of 2020. This information is updated annually to take into account denotifications (where the patient was found not to have TB), late notifications and other updates. The data presented in this report supersedes data in previous reports.

Diagnostic laboratories serving acute hospitals are the first place in which TB infection-related samples are received and processed within the pathway of clinical diagnosis and management of suspected TB cases. Results for microscopy, polymerase chain reaction (PCR), histology and culture are collected in ETS. Appropriate referral of clinical specimens to the Mycobacterium Reference Laboratories is an important part of the routine work of the diagnostic laboratories in the investigation and management of TB cases.

The National Mycobacterium Reference Service (NMRS) receives these diagnostic materials and undertake characterisation using culture and molecular diagnostic methods to define species of Mycobacterium, TB antibiotic (drug) susceptibility and organism relatedness. Historically, organism relatedness has been determined by Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR) typing, however this has been superseded in recent years by Whole Genome Sequencing (WGS).

Definitions

Term	Definition
BCG	Bacillus Calmette-Guérin vaccination
CI	Confidence interval
CCG	Clinical Commissioning Group
Cluster	Two or more patients notified within the time period of analysis with TB cause by strains with ≤12 SNP differences
CNS	Central nervous system
Cohort review	The systematic review of all TB patients notified by a TB service in a 3 to 4 month period, looking at standard outcomes in terms of patient care and number of contacts screened
Cryptic disseminated TB	Systemic illness without localising features
DOT	Directly observed treatment

Term	Definition
Drug	In the context of TB control a drug is an anti-TB antibiotic
Drug-resistant cohort	The drug-resistant cohort includes any patients with rifampicin-resistant TB (initial or acquired)
including MDR-TB (initial or acquired)	as well as those without culture confirmation treated with an MDR-TB regimen
Drug-sensitive cohort	The drug sensitive cohort excludes all TB patients with rifampicin-resistant TB (initial or acquired) including MDR-TB (initial or acquired), and non-culture confirmed patients treated with an MDR-TB regimen
DST	Drug sensitivity testing, based on UKHSAnotypic analysis of cultured TB isolates
ETS	Enhanced TB surveillance system
First-line drug resistance	First-line anti-TB antibiotic drug resistance is defined as resistance to at least one of the first line antibiotics (isoniazid, rifampicin, ethambutol, pyrazinamide)
HAART	Highly active antiretroviral therapy
IGRA	Interferon-gamma release assay – blood test for TB infection which does not differentiate between active disease and LTBI
IMD 2015	The Index of Multiple Deprivation 2010 rank for each LSOA, based on deprivation score assigned, relative to other LSOAs in the UKHSA East of England area
IQR	Interquartile range
LSOA	Lower super output area (geographic definition)
LTBI	Latent TB infection
MDR	Multidrug resistance: cases initially resistant to at least isoniazid and rifampicin
Miliary TB	TB infection spread via the bloodstream to all parts of the body
MIRU-VNTR	Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats
PCR	Polymerase chain reaction
Post-mortem diagnosis	A patient diagnosed at post-mortem is defined as where TB was not suspected before death, but a TB diagnosis was made at post-mortem, with pathological and/or microbiological findings consistent with active TB that would have warranted anti-TB treatment if discovered before death
Pulmonary tuberculosis	A pulmonary case is defined as a patient with TB involving the lungs and/or tracheobronchial tree, with or without extra-

Term	Definition
	pulmonary TB diagnosis. In this report, in line with the WHO's recommendation and international reporting definitions, miliary TB is classified as pulmonary TB due to the presence of lesions in the lungs
Second-line drugs	Second-line drugs include injectable agents (for example, amikacin, capreomycin, kanamycin), fluoroquinolones (for example, moxifloxacin, ofloxacin, ciprofloxacin) and other oral bacteriostatic agents.
SNP	Single nucleotide polymorphism – mutation of one base pair in the genome of an *M. tuberculosis* complex isolate
TB	Tuberculosis
UTLA	Upper tier local authority (geographic definition)
VOT	Video observed therapy
WGS	Whole genome sequencing
XDR	Extensive drug resistance: cases initially MDR and resistant to at least one injectable agent (amikacin, capreomycin or kanamycin) and at least one fluoroquinolone (moxifloxacin ofloxacin or ciprofloxacin)

Treatment outcome

Information on outcomes were reported for all patients reported in the previous year, excluding those with known rifampicin-resistant disease: outcomes for these were reported at 24 months. Definitions for outcome are based on World Health Organization (WHO) and European definitions, but adapted to the UK context. In this report, all data was obtained from the ETS matched data set provided in August 2021.

Proportions

All proportions in this report are calculated among patients with known information or a known result, except where otherwise stated.

Confidence intervals

A 95% confidence interval for incidence was obtained using the relevant procedure in Stata, assuming a Poisson distribution.

Population denominator

Tuberculosis rates by geographical area, age, sex and place of birth were calculated using ONS mid-year population estimates. Tuberculosis rates by ethnic group were calculated using population estimates from the Labour Force Survey (LFS).

The LFS is based on a population sample, so estimates are liable to sampling errors, particularly for small population subgroups, and should be interpreted with caution.

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

Prepared by: Field Service (Yorkshire and Humber)
For queries relating to this document, please contact: yhreu@UKHSA.gov.uk

Published: November 2022
Publishing reference: GOV-13495