Tuberculosis in Yorkshire and Humber

Annual review (2018 data)

Data from 2000 to 2018
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Prepared by: Field Service Yorkshire and Humber
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The data presented in this report are correct as at October 2019.
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Authors

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Suggested citation

Executive summary

There were 352 cases of TB reported in Yorkshire and Humber in 2018, an incidence rate of 6.4 per 100,000 population. This a slight increase on the 2017 total number of cases and the rate (n=345, 6.3 per 100,000) but is not significantly higher. TB continues to be distributed unequally across the region, with a persistent gap between the local authorities with the highest burden and those with historically low incidence rates. Barnsley, North East Lincolnshire and North Yorkshire continue to have the lowest rates of TB in Yorkshire and Humber, with rates between 0.8–1.5 per 100,000 population. Bradford, Kirklees and Sheffield have the highest rates in the region. Despite having one of the highest rates in 2018, the overall rate in Bradford has steadily decreased since peaking in 2009. There has been an increase in the 2018 rate of TB in both Kirklees and Sheffield compared with 2017. This follows a generally reducing trend in the rate of TB notifications in Kirklees and Sheffield, and therefore further investigation may be warranted.

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. However, the rate of TB in the non-UK born population was nearly 20 times higher in 2018 compared to the UK born population, with two thirds of 2018 TB cases being non-UK born. Most non-UK born cases were born in either Pakistan or India, but there has been a decrease in TB cases born in these countries in 2018 compared to 2017. Conversely, there has been a slight increase in 2018 in cases born in Eritrea, Zimbabwe or Slovakia. Whereas the rate of TB in UK-born children in England has fallen in the last 2 years, the rate in Yorkshire and Humber has remained stable. Consequently, the England rate for TB in UK-born children is now the same as the Yorkshire and Humber rate.

Most TB cases reported in Yorkshire and Humber in 2018 were diagnosed with pulmonary TB, and one-quarter of those cases were hospital inpatients at the time of their diagnosis. There is some evidence of a persistent treatment delay, particularly for those with extra-pulmonary TB, where 40% of cases experience delays of 4 months or more. Once patients are on treatment, however, a large majority of them do complete their treatment within 12 months. Of those with rifampicin sensitive TB treated in 2017, 88.6% completed treatment. There was limited multidrug resistance reported in Yorkshire and Humber in 2018.

Cases of TB with one or more social risk factors, including drug and alcohol misuse, homelessness and prison were less frequent in 2018 (29% of cases) compared to 2017 (36% of cases). However, there continues to be inequalities in the distribution of disease, with the majority of TB cases diagnosed in 2018 in Yorkshire and Humber resident in the most deprived areas (43.2% of cases).

The changing epidemiology of the TB both in the region and nationally presents new challenges. Reducing transmission in migrant communities continues to be a priority.
Reducing treatment delays as a way of limiting disease transmission – particularly among vulnerable communities – should be a focus for public health and infection control.

**TB monitoring indicators**

As part of the Collaborative TB Strategy for England 2015 to 2020, a suite of TB Strategy Monitoring Indicators has been developed. Where data for these indicators is presented in this report, the indicator name is shown (in red boxes), and a summary table of national-level indicators is presented in Appendix V. Data for indicators presented by upper-tier local authority and CCGs can be found at http://fingertips.phe.org.uk/profile/tb-monitoring and was updated with data for 2018 in August 2019. Hyperlinks (in red boxes) for specific indicators are also shown throughout the report where data is presented.
1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2018, 352 people were diagnosed with TB in Yorkshire and Humber. This is a slight increase compared with 2017 where 345 cases were notified. The rate of TB in Yorkshire and Humber in 2018 was 6.4 per 100,000 population (95% CI 5.8–7.1). As is expected given the similar number of cases, this rate is close to that observed in 2017 (6.3, 95% CI 5.7–7.0) and lower than the 2018 England rate of 8.3 per 100,000 population. Despite the absence of a further decline in case numbers in 2018, there has been a substantial decrease in the rate of TB in Yorkshire and Humber of 51.2% since 2009, when the rate in the region peaked at 13.2 per 100,000 population. Since 2014, the TB rate in Yorkshire and Humber has been below the WHO definition of a low incidence area of less than 10 per 100,000 population. A similar decrease in TB cases has also been seen nationally (Figure 1).

TB Monitoring Indicator 1: Overall TB incidence per 100,000 population

Figure 1: TB cases and rates, Yorkshire and Humber, 2009 to 2018
In 2018, 3 upper tier local authorities in Yorkshire and Humber had a TB rate higher than the national rate of 8.3 per 100,000 population (Figures 2–4): Bradford (13.6 per 100,000; 73 cases), Kirklees (14.1 per 100,000; 62 cases) and Sheffield (9.6 per 100,000; 56 cases).

In Bradford, the 2018 figures represent the lowest rate and the lowest overall number of cases for the local authority since 2000. There has been a decrease of 20% in both the rate and number of cases in Bradford since 2017, when the rate was 17.0 per 100,000 and 91 cases were reported (Figure 3). The highest rate in Bradford was in 2009 at 40 per 100,000 population, with 205 cases were reported. The 2018 figure represents a 70% decrease in the TB rate for the local authority since 2009, and 64% decrease in the overall number of cases.

Both Kirklees and Sheffield have seen an increase in the TB rate and the number of cases reported since 2017. In 2018, Kirklees reported a 34% increase in both the number of cases and the rate per 100,000 population compared with 2017 (10.5 per 100,000; 46 cases). Sheffield saw a 56% increase in the number of cases in 2018 compared with 2017, from 36 to 56 cases, with the rate per 100,000 going up by 54% (6.2–9.6 per 100,000). Prior to 2018, both Kirklees and Sheffield had seen an overall decreasing trend in the rate and the number of cases reported each year. These increases should be closely monitored to ensure they don’t represent an upward trend in TB in these local authorities.

Figure 2: TB case rates by upper tier local authority of residence, South Yorkshire, 2009 to 2018
Figure 3: TB case rates by upper tier local authority of residence, West Yorkshire, 2009 to 2018

Figure 4: TB case rates by upper tier local authority of residence, York, East Riding and Humber 2009 to 2018
In 2018, 54.3% of people diagnosed with TB in Yorkshire and Humber were male (191/352) and 51% of cases were aged 15-44 years old (180/352). This age and sex distribution is similar to England overall, where 58.4% of cases were male and 54.7% were between 15-44 years old. The highest rate in Yorkshire and Humber was seen in people aged 30–39 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 is seen in England, with those aged 30–39 years also having the highest rate (14.4 per 100,000) and children having the lowest rate (<15 years; 1.5 per 100,000).

There were 19 cases of TB notified in children less than 15 years old in Yorkshire and Humber in 2018 (1.9 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 2017 (1.4 per 100,000). Although this represents a small number of cases (14 in 2017, 19 in 2018), TB cases in children should be closely monitored to identify possible ongoing TB transmission.
Place of birth and time since entry

In 2018, where place of birth was known, 65.9% of the notified cases in Yorkshire and Humber were reported in the non-UK born population (228/346). There has been a slight increase in the number of UK born TB cases in Yorkshire and Humber since 2017 (2017, 101; 2018, 118). This could be due to natural disease variation but should be closely monitored ¹.

Between 2017 and 2018, among non-UK born cases, there was a decrease in both the number of notifications (-6.5%) and the rate (-7.7%) of TB cases among this population. Of the cases born outside the UK, 29% were born in Pakistan (65/228), with a rate of 18.5 per 100,000 population. While this represents the highest rate and the greatest proportion of cases among those known to have not been born in the UK, the rate per 100,000 and the number of cases reported in individuals who were born in Pakistan has been decreasing since 2013.

In 2018, the year of entry to the UK was reported for 92.5% of TB patients born outside the UK (211/228). For those with data available, 43% of non-UK born Yorkshire and Humber cases had been in the UK more than 11 years before their TB diagnosis (90/211). The highest TB rate in this population in Yorkshire and Humber was among those aged over 65 years (64 per 100,000). There was variation by country of birth in the median time between a person’s first entry to the UK and their TB notification (where data was available) (Table 1). The country with the biggest gap between median entry time and TB notification was Pakistan (18 years). Eritrea (22/167) and Romania (6/167) had the shortest median time (2 years). Further investigation into possible epidemiological links or common risk factors among these populations should be investigated.

**TB Monitoring Indicator 2: TB incidence in UK born and non-UK born populations**

**Figure 7: TB cases and rate by place of birth, Yorkshire and Humber 2009 to 2018**
Figure 8: Time between entry to the UK and TB notification for non-UK born patients by year, Yorkshire and Humber, 2009 to 2018

Table 1: Ten most common countries of birth of non-UK born TB patients, Yorkshire and Humber, 2018

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Number of cases</th>
<th>Percentage non-UK born</th>
<th>Median time since entry (years)</th>
<th>Time since entry (interquartile range in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>65</td>
<td>28.5</td>
<td>18</td>
<td>7 42</td>
</tr>
<tr>
<td>India</td>
<td>32</td>
<td>14.0</td>
<td>16</td>
<td>1 38</td>
</tr>
<tr>
<td>Eritrea</td>
<td>22</td>
<td>9.6</td>
<td>2</td>
<td>0 3</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>10</td>
<td>4.4</td>
<td>13.5</td>
<td>7 16</td>
</tr>
<tr>
<td>Slovakia</td>
<td>9</td>
<td>3.9</td>
<td>3.5</td>
<td>2.5 12</td>
</tr>
<tr>
<td>Sudan</td>
<td>8</td>
<td>3.5</td>
<td>3</td>
<td>1 4</td>
</tr>
<tr>
<td>Poland</td>
<td>6</td>
<td>2.6</td>
<td>2.5</td>
<td>1 16</td>
</tr>
<tr>
<td>Romania</td>
<td>6</td>
<td>2.6</td>
<td>2</td>
<td>1 3</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>5</td>
<td>2.2</td>
<td>4</td>
<td>1 6</td>
</tr>
<tr>
<td>China</td>
<td>4</td>
<td>1.8</td>
<td>12</td>
<td>3.5 17.5</td>
</tr>
</tbody>
</table>
Ethnicity

Ninety-eight per cent of the cases notified had an ethnicity recorded (345/352). The highest proportion of cases is seen in the white ethnic group (30%, 102/345), however the highest rate is seen in the Black African population (139 per 100,000 population). For the first time since 2000, the number of cases seen in the Pakistani population has fallen below the white population, with all other ethnic groups remaining at similar numbers. This could be due to the increasing migration of the Eastern European population.²

² These rates should be interpreted with caution as population estimates used as the denominators for the different ethnic groups were calculated using the Labour Force Survey (LFS). This is liable to sampling error for small population groups. The 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 and this may inflate TB rates for ethnic groups.
Figure 10: TB cases and rate by ethnic group, Yorkshire and Humber, 2018

Figure 11: TB case number by ethnic group, Yorkshire and Humber, 2009 to 2018
Table 2: Proportion of Non-UK born TB patients by ethnic group, Yorkshire and Humber, 2018

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>Number of cases</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-African</td>
<td>64</td>
<td>28.1</td>
</tr>
<tr>
<td>Pakistani</td>
<td>63</td>
<td>27.6</td>
</tr>
<tr>
<td>Indian</td>
<td>35</td>
<td>15.4</td>
</tr>
<tr>
<td>White</td>
<td>26</td>
<td>11.4</td>
</tr>
<tr>
<td>Mixed / Other</td>
<td>26</td>
<td>11.4</td>
</tr>
<tr>
<td>Chinese</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Black-Other</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>225</strong></td>
<td><strong>98.7</strong></td>
</tr>
</tbody>
</table>

Occupation

In 2018, 34.4% of TB cases between the ages of 18 to 65 were not in employment or education (90/262)\(^3\), similar to the England figure of 32.4%. For those reporting an occupation, 8.4% were studying or working in education (22/262), 5% were healthcare workers (13/262) and 42.4% were classed as working in other occupations (111/262). Information was missing for approximately 8% of cases (20/262), and the remaining cases reported employment in the agricultural, laboratory/pathology or social services occupations.

Table 3: Occupational category of TB patients aged 18–65 years, 2018

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>111</td>
<td>42.4</td>
</tr>
<tr>
<td>None</td>
<td>90</td>
<td>34.4</td>
</tr>
<tr>
<td>Education</td>
<td>22</td>
<td>8.4</td>
</tr>
<tr>
<td>Information missing</td>
<td>20</td>
<td>7.6</td>
</tr>
<tr>
<td>Healthcare worker</td>
<td>13</td>
<td>5.0</td>
</tr>
<tr>
<td>Laboratory/pathology</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Social service/prison worker</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Agricultural/animal care worker</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>262</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

---

\(^3\) Those reported as being retired, unemployed, a prisoner, an immigration detainee, an asylum seeker or housewife/husband are classified as having no occupation. Cases were classified as being in education if reported to be a full-time student, lecturer or teacher.
Clinical characteristics

Site of disease

Table 3: Site of disease of TB patients, Yorkshire and Humber, 2018

<table>
<thead>
<tr>
<th>Site of disease</th>
<th>Number of cases</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary +/- Extra-pulmonary sites</td>
<td>215</td>
<td>61.1</td>
</tr>
<tr>
<td>Pulmonary ONLY</td>
<td>139</td>
<td>39.5</td>
</tr>
<tr>
<td>Extra-pulmonary Unknown</td>
<td>83</td>
<td>23.6</td>
</tr>
<tr>
<td>Lymph nodes (extra-thoracic)</td>
<td>81</td>
<td>23.0</td>
</tr>
<tr>
<td>Pulmonary + Extra-pulmonary sites</td>
<td>76</td>
<td>21.6</td>
</tr>
<tr>
<td>IT lymph nodes</td>
<td>47</td>
<td>13.4</td>
</tr>
<tr>
<td>Other (extra-pulmonary)</td>
<td>34</td>
<td>9.7</td>
</tr>
<tr>
<td>Pleural</td>
<td>28</td>
<td>8.0</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>27</td>
<td>7.7</td>
</tr>
<tr>
<td>Other</td>
<td>35</td>
<td>9.9</td>
</tr>
</tbody>
</table>

*patients may have disease at more than one site, so the total % will not equal 100%.

Of the people notified with TB in 2018, 39% had pulmonary TB only, and 22% had pulmonary and extra-pulmonary disease in at least one other site. Where country of birth was known, a higher proportion of UK born cases had pulmonary disease (74.6%, 88/118) compared with non-UK born cases (53.9%, 123/228).

Hospital inpatient and directly observed therapy

Hospital inpatient status was recorded for 93.2% of all cases reported in Yorkshire and Humber in 2018 (328/352) and nearly one-quarter were recorded as being a hospital inpatient at time of TB diagnosis (25.3%, 83/328). Males were 61% (51/83) and the age group with the highest proportion of inpatient cases was reported for those under 15 (47.1%, 8/17). However, the age group with the highest total number of inpatient cases reported was the 15 to 44-year-old age group (21%, 35/167). The 45 to 64-year-old age group had around one-quarter of their cases recorded as inpatients (23.3%, 21/90), while for those aged over 65 years old, 35.2% of cases were hospital inpatients at the time of being diagnosed with TB (19/54). Of those with at least one social risk factor, 40.7% were hospital inpatients when diagnosed (11/27).

Nine per cent of all cases notified were reported as being on directly observed therapy (DOT) (30/352), which is the same percentage as the previous 2 years.
2. Laboratory confirmation of TB

Culture confirmation and speciation

In 2018, 66% of people notified with TB in Yorkshire and Humber had their diagnosis confirmed by culture (231/352)\(^4\). Of those with disease site recorded, 77.2% with pulmonary TB were confirmed by culture (166/215) compared with 47% of cases with extra-pulmonary TB (65/137). Of the culture confirmed cases, 98.7% (228/231) had \textit{Mycobacterium tuberculosis} identified in their sample, 0.9% (2/231) \textit{Mycobacterium bovis} and 0.4% (1/231) \textit{Mycobacterium africanum}.

<table>
<thead>
<tr>
<th>TB Monitoring Indicator 8: Proportion of pulmonary TB cases that were culture confirmed</th>
</tr>
</thead>
</table>

Sputum smear

In 2018, 69% of people with pulmonary TB in Yorkshire and Humber had a sputum smear result recorded on ETS (149/215), and of those, 64% (96/149) 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.

\(^4\) 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.
3. TB transmission

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).

Since 2016, the rate of TB in UK born children in Yorkshire and Humber has remained at 1.2 per 100,000 resident population. The peak for Yorkshire and Humber was in 2001, where a rate of 5 per 100,000 was recorded. The rate has generally declined since then, but there has been no reduction in the rate since 2016. In contrast, England has seen a small decrease over the same period. Consequently, the England rate for TB in UK-born children is now the same as the Yorkshire and Humber rate.

Figure 12: Rate of TB in children (<15 years) born in the UK, Yorkshire and Humber and England, 2000 to 2018
Strain typing and clustering

In December 2016, Whole Genome Sequencing (WGS) was rolled out by NMRS-North and Central, covering the Midlands and North of England, at which time MIRU-VNTR typing (the previous method of strain typing) was discontinued.

WGS of *Mycobacterium tuberculosis complex* isolates provides information on Single Nucleotide Polymorphism (SNP) differences between isolates and describes how isolates are related to each other. WGS provides an indication of whether isolates are likely to be part of the same transmission chain and may also help determine the timing and direction of transmission [1-4].

Epidemiologically linked patients involved in transmission are unlikely to be identified at SNP distances of more than 12 [3], therefore WGS clusters of TB are defined as patients with one or more “near neighbour” patients whose TB sequences differ by 12 SNPs or fewer. Additional epidemiological information is required to assess whether recent transmission may have occurred, and whether any additional public health action should be taken.

Proportion of patients in clusters and geographical distribution

In 2018, of the people notified with culture confirmed TB in Yorkshire and Humber, 95.2% (220/231) had a WGS result that could be used to report relatedness, compared with 94.5% (2,693/2,850) in England. A quarter of Yorkshire and Humber cases with high quality WGS (25%; 55/220) clustered with at least one other person within a 12 SNPs cut-off.

Cluster Lineage

Half the clusters seen in Yorkshire and Humber in 2018 were European American lineage (109/220) and 34% were Delhi Central Asian lineage (75/220). The remaining clusters with known lineage were divided between the East African Indian lineage (7.7%; 17/220), Beijing lineage (7.3%; 16/220) and *M. bovis* (1.4%; 3/220).

Contact tracing

Screening of people exposed to a patient with active TB is an important strategy to find and treat active and latent TB and to prevent further transmission. The outcomes of

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5 Clusters of TB are defined as patients with one or more “near neighbour” patients whose whole genome sequences differ by 12 SNPs or fewer.
contact tracing activities are discussed by cohort reviews undertaken across Yorkshire and Humber [5].

For cohort review, Yorkshire and Humber as a region has been divided into 4 areas: South Yorkshire (Barnsley, Doncaster, Rotherham and Sheffield); CKW (Calderdale, Kirklees and Wakefield); LBA (Leeds, Bradford and Airedale) and NYH (North Yorkshire, North East Lincolnshire, North Lincolnshire and East Riding & Humber). Each area holds cohort review meetings from 2 to 4 times per year depending on case numbers. A cohort of cases is selected for each meeting, based on notification date to allow each case to have completed at least 6 months of treatment. Some cases might not be discussed at a cohort because they have transferred out after notification.

In 2017, 328 patients were discussed at a cohort review meeting. This included 192 pulmonary cases and 136 extra pulmonary cases. Of the pulmonary cases, 93% had close contacts identified, 59% had ≥5. Of the extra-pulmonary cases 78% had close contacts identified, with 26% having ≥5.

Of all the contacts of the pulmonary cases notified in 2017, 94% (1372/1463) were seen for assessment and for the extra-pulmonary cases, 95% (391/409) were seen for assessment.
4. Delay from onset of symptoms to start of treatment

Time from symptom onset to treatment start for patients with pulmonary TB

The delay between symptom onset and start of treatment was available for 87% (307/352) of cases. Of these, 39% of cases started treatment within 2 months. This is similar to the 41% reported in 2017. In 2018, 27% of cases started treatment between 2 and 4 months and 34% experienced a delay of more than 4 months. This is a slight increase from 2017 where 31% of cases commenced treatment 4 months after onset of symptoms. The percentage of cases across England experiencing a delay of 4 months or more is 29.2%.

There appears to be some difference between symptom onset and treatment start between Yorkshire and Humber cases with pulmonary TB compared with cases with extra-pulmonary TB. Almost 40% of extra-pulmonary TB patients started treatment more than 4 months after symptoms began (48/121), compared with 30% of pulmonary TB patients (56/186). These differences could be attributed to difficulty in diagnosing extra-pulmonary TB in patients compared with pulmonary TB.

Table 4: Time between symptom onset to treatment start, Yorkshire and Humber, 2018

<table>
<thead>
<tr>
<th>Time delay</th>
<th>Pulmonary</th>
<th>Extra-pulmonary only</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>&lt;2 months</td>
<td>75</td>
<td>40.3</td>
<td>44</td>
</tr>
<tr>
<td>2-4 months</td>
<td>55</td>
<td>29.6</td>
<td>29</td>
</tr>
<tr>
<td>Over 4 months</td>
<td>56</td>
<td>30.1</td>
<td>48</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>186</td>
<td></td>
<td>121</td>
</tr>
</tbody>
</table>

*excluding asymptomatic patients, and those with missing onset dates

**TB Monitoring Indicator 6:** Proportion of pulmonary TB patients starting treatment within 2 months of symptom onset

**TB Monitoring Indicator 7:** Proportion of pulmonary TB patients starting treatment within 4 months of symptom onset
Characteristics of pulmonary TB patients with a delay from onset of symptoms to treatment of more than 4 months

In 2018, 62% of pulmonary TB patients in Yorkshire and Humber with a treatment delay of more than 4 months were male (35/56) and 46.4% were between 15 to 44 years old (26/56). Half of the pulmonary TB cases were sputum smear positive (28/56) and 14.3% reported a previous TB diagnosis (8/56). A small majority of cases were non-UK born (54%, 30/56) and of those cases with UK entry recorded, 33% (10/28) entered the UK 11 or more years ago.

**Table 5: Characteristics of pulmonary cases with treatment delay >4 months, Yorkshire and Humber, 2018**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pulmonary cases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>21</td>
<td>37.5</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>62.5</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-14</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>15-44</td>
<td>26</td>
<td>46.4</td>
</tr>
<tr>
<td>45-64</td>
<td>20</td>
<td>35.7</td>
</tr>
<tr>
<td>65+</td>
<td>9</td>
<td>16.1</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-UK born</td>
<td>30</td>
<td>53.6</td>
</tr>
<tr>
<td>UK born</td>
<td>26</td>
<td>46.4</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>22</td>
<td>39.3</td>
</tr>
<tr>
<td>Black African</td>
<td>10</td>
<td>17.9</td>
</tr>
<tr>
<td>Indian</td>
<td>3</td>
<td>5.4</td>
</tr>
<tr>
<td>Pakistani</td>
<td>15</td>
<td>26.8</td>
</tr>
<tr>
<td>Chinese</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>Mixed / Other</td>
<td>5</td>
<td>8.9</td>
</tr>
</tbody>
</table>
5. TB outcomes in drug sensitive cohort

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

Of the TB cases diagnosed in 2017 in Yorkshire and Humber, 87% (306/345) were drug sensitive and had an expected treatment duration of less than 12 months. Records indicate 89% (271/306) of those cases completed treatment. This is a slight improvement on 2016 (86%) and continues the general upward trend of treatment completion seen in Yorkshire and Humber over the past 10 years. The 2017 completion rate in Yorkshire and Humber was also higher than the rate seen in England for the same year (85%). Of the cases notified in 2017, 100% (13/13) of children aged 0–14 years completed treatment. In the 65 years and over age category, this falls to 69% (38/55).

The treatment completion rates are slightly higher for the non-UK born population with 90% (194/215) completing treatment compared with the UK-born population with 86% (77/91). In terms of clinical characteristics, treatment was completed by 85% of people with pulmonary TB (158/186), 76% of people that were sputum smear positive (51/67), and 89% of people who had a previous diagnosis of TB (17/19).

The proportion of people with drug sensitive TB diagnosed in Yorkshire and Humber in 2017 who died was 4% (13/306). This is lower than the proportion who died in England (5.3%) and a decrease on the Yorkshire and Humber 2016 figures (5.4%). All cases who died after diagnosis in 2017 were over the age of 45 years, with the majority in the over 65 age group (69.2%, 9/13). This was also the age group with the highest overall proportion of deaths in cases with drug sensitive TB, with 16.4% of cases aged over 65 dying (9/53) compared to 1.7% (4/233) in those aged under 65.

Around 3% (9/306) of Yorkshire and Humber drug sensitive cases were reported as still being on treatment 12 months after diagnosis in 2017, the same as 2016. A further 2% of cases (6/306) were lost to follow-up, which is a smaller proportion than in England (4.2%) and an improvement on the previous year (3.5%).

| TB Monitoring Indicator 10: Proportion of drug sensitive TB patients who had completed a full course of treatment by 12 months | 25 |
Figure 13: Number and proportion completing treatment at 12 months, Yorkshire and Humber and England, 2009 to 2017

*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

Of the cases notified in 2017, there were 35 patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, compared 42 from the year before. Eighty-6 per cent of cases completed treatment (30/35) compared with 71% from the previous year.
6. Drug resistant TB (including outcomes in the drug resistant cohort)

Overall initial drug resistance and geographical distribution

In 2018, Yorkshire and Humber reported 231 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 13% (30/231), higher than 2017 (9%, 20/212) and the highest level of resistance reported in the region since 2000. Cases with initial resistance to isoniazid but not rifampicin (INH-R) has remained the same as the previous year at 6% (13/231), below the national proportion of 6.6%. Three cases (1.3%) had MDR/rifampicin resistant TB (RR-TB). No cases notified in 2018 were pre-XDR, and 1 case was XDR-TB.

TB Monitoring Indicator 9: Proportion of culture confirmed TB cases with drug susceptibility testing reported for the 4 first line agents

TB Monitoring Indicator 18: Proportion of culture confirmed TB cases with any first line drug resistance

Figure 14: Proportion of TB cases with initial first line drug resistance, Yorkshire and Humber, 2009 to 2018

Of those with DST, 30 cases in Yorkshire and Humber had any first line resistance in 2018 (13%). All cases were under the age of 65 years, with 70% (21/30) aged between
15 to 44. Eighty-six per cent were non-UK born (24/30). Seventy per cent had pulmonary TB (21/30), and just one case reported a previous diagnosis of TB.

<table>
<thead>
<tr>
<th>TB Monitoring Indicator 19: Proportion of culture confirmed TB cases with multi-drug resistant TB</th>
</tr>
</thead>
</table>

**Acquired drug resistance**

Acquired drug resistance is defined as a newly emerged resistance to one or more anti-TB antibiotics identified on repeat culture 3 or more months after the first specimen date. In addition, cases with a change from a sensitive to resistant result following commencement of anti-TB antibiotic treatment are reclassified as acquired resistance (even if this is within the 3-month period).  

There were 7 reported cases of acquired drug resistance in Yorkshire and Humber between 2000 and 2018. The median time to development of drug resistance was 77 days after the earliest specimen date (IQR: 32–278 days).

| TB Monitoring Indicator 13: Proportion of drug resistant TB cases who had completed treatment at 24 months |

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

In 2016, 6 cases of MDR/RR-TB were reported in Yorkshire and Humber. All patients had completed treatment at 24 months after treatment was started.

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6 Patients who acquire resistance are recorded in the year they were notified, not the year they acquired resistance. Therefore, the numbers for recent years may still increase for those on treatment.
7. TB in under-served populations

Social risk factors

There were 333/352 TB cases in Yorkshire and Humber in 2018 who were 15 years or older. Of those, 82% (272) had completed risk factor information, with 29 (11%) patients indicating any risk factor, including being in prison, homelessness, alcohol misuse or drug use. Regular recording of social risk factors for TB cases started in 2009, and among all cases reported in 2018 with at least one risk factor, 83% were male (324/391). A majority of those with known risk factors had pulmonary TB (80%, 311/391) and were aged between 15 to 44 (63%, 248/391). Fifty-one per cent of those with any risk factor were born in the UK (179/366) and 48.1% (188/383) were of white ethnicity.

The treatment completion rate for those with drug sensitive TB and any risk factor recorded between 2009 and 2018 in Yorkshire and Humber was 79% (256/324). This is lower than treatment completion for cases with no risk factors (89.3%, 2659/2979). Of the patients with known risk factors, 8.6% of patients died over the time period (28/324), which is higher than the proportion seen in patients without known risk factors (4.4%, 132/2979). A further 10% of cases with risk factors were lost to follow-up (32/324) compared with 4% of cases without risk factors (120/2979). When we look at treatment outcomes by those who received DOT, however, the cases with known risk factors were more likely to complete treatment than those who did not have any known risk factors (85%, 72/85 compared to 79%, 126/160).

Table 6: Social risk factors among TB patients, Yorkshire and Humber 2009 to 2018

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Number with field completed</th>
<th>Number with any risk factor</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>333</td>
<td>272</td>
<td>29</td>
<td>11</td>
</tr>
<tr>
<td>2017</td>
<td>331</td>
<td>283</td>
<td>36</td>
<td>13</td>
</tr>
<tr>
<td>2016</td>
<td>406</td>
<td>342</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>2015</td>
<td>410</td>
<td>341</td>
<td>40</td>
<td>12</td>
</tr>
<tr>
<td>2014</td>
<td>495</td>
<td>420</td>
<td>47</td>
<td>11</td>
</tr>
<tr>
<td>2013</td>
<td>531</td>
<td>448</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>2012</td>
<td>541</td>
<td>455</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>2011</td>
<td>602</td>
<td>515</td>
<td>44</td>
<td>9</td>
</tr>
<tr>
<td>2010</td>
<td>588</td>
<td>460</td>
<td>41</td>
<td>9</td>
</tr>
<tr>
<td>2009</td>
<td>647</td>
<td>458</td>
<td>44</td>
<td>10</td>
</tr>
</tbody>
</table>
### Table 7: Social risk factors among TB patients, Yorkshire and Humber 2018, 2009 to 2018

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>n</th>
<th>2017-2018 (%)</th>
<th>2009-2018 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prison</td>
<td>9</td>
<td>31.0</td>
<td>39.6</td>
</tr>
<tr>
<td>Homelessness</td>
<td>8</td>
<td>27.6</td>
<td>33.8</td>
</tr>
<tr>
<td>Alcohol misuse</td>
<td>11</td>
<td>37.9</td>
<td>34.5</td>
</tr>
<tr>
<td>Drug use</td>
<td>8</td>
<td>27.6</td>
<td>32.7</td>
</tr>
</tbody>
</table>

### TB Monitoring Indicator 17: Proportion of patients with drug sensitive TB with at least one social risk factor who completed treatment within 12 months

### Deprivation

Of the Yorkshire and Humber TB cases notified in 2018, the highest proportion of cases came from the most deprived areas, with 43.2% of cases coming from the most deprived quintile (152/352). This is greater than the total number of cases in the 3 least deprived quintiles combined. There is 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 (57%, 86/152) and between 15 to 44 years old (58%, 88/152). Seventy-seven per cent were non-UK born (116/152). Around a quarter of cases reported their ethnicity as Pakistani (38/152) or Black African (44/152), with around a further 20% reporting white ethnicity (35/152). Eleven per cent indicated having any social risk factor (14/152).

### Figure 15: TB case rate by deprivation on regional scale, Yorkshire and Humber, 2018
8. TB-HIV co-infection and HIV testing of TB patients

HIV testing

TB complicating HIV infection is a well-recognised and particularly lethal clinical state, but is successfully treated with a combination of highly active antiretroviral therapy (HAART) and appropriate TB antibiotic treatment [6]. For this reason, it is essential all patients with TB should undergo HIV testing to ensure those diagnosed as having TB-HIV co-infection have the opportunity to start curative TB treatment and HAART as soon as possible, thereby preserving their life expectancy and reducing the risk of TB and HIV transmission to others.

**TB Monitoring Indicator 16: Proportion of TB patients offered an HIV test**

**Table 8: Number and proportion of cases offered and not offered a HIV test by Local Authority, Yorkshire and Humber 2018 Geographical distribution, 2018**

<table>
<thead>
<tr>
<th>Upper tier local authority</th>
<th>Number not offered</th>
<th>Number offered</th>
<th>Total</th>
<th>Proportion (%) offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnsley</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Bradford</td>
<td>2</td>
<td>56</td>
<td>58</td>
<td>96.6</td>
</tr>
<tr>
<td>Calderdale</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Doncaster</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td>East Riding of Yorkshire</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Kingston upon Hull, City of</td>
<td>0</td>
<td>14</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Kirklees</td>
<td>2</td>
<td>59</td>
<td>61</td>
<td>96.7</td>
</tr>
<tr>
<td>Leeds</td>
<td>4</td>
<td>46</td>
<td>50</td>
<td>92</td>
</tr>
<tr>
<td>North East Lincolnshire</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>North Lincolnshire</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>North Yorkshire</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>85.7</td>
</tr>
<tr>
<td>Rotherham</td>
<td>1</td>
<td>8</td>
<td>9</td>
<td>88.9</td>
</tr>
<tr>
<td>Sheffield</td>
<td>5</td>
<td>48</td>
<td>53</td>
<td>90.6</td>
</tr>
<tr>
<td>Wakefield</td>
<td>1</td>
<td>14</td>
<td>15</td>
<td>93.3</td>
</tr>
<tr>
<td>York</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>
Of the cases reported in 2018 in Yorkshire and Humber, 94.6% (295/302) were offered a HIV test. This is similar to the England proportion of 94.8%\(^7\). There were 16 cases where HIV status was known and 20 cases where no information was recorded. Three TB cases were offered an HIV test but refused (1%), and 2 cases (0.6%) were offered a test but no test was done. Apart from Leeds and Sheffield, most local authorities in Yorkshire and Humber offered a large proportion of TB patients an HIV test and/or had low numbers of TB cases overall. Even in the case of Leeds and Sheffield, the numbers were relatively small. However, as TB-HIV co-infection is recognised as an important medical condition, all clinicians need to ensure HIV testing is offered to all TB patients.

Of the TB cases not offered a HIV test, 76% (13/17) were female, and 47% were children under 15 (8/17). There is no clear difference between UK-born and non-UK born TB cases being offered a HIV test (53% vs 47%), though a higher proportion of those reporting white ethnicity (47%, 8/17) were not offered a test when compared with other ethnicities.

Within the cohort review programme in Yorkshire and Humber, it is standard to work towards 100% of cases being offered a HIV test, excluding those diagnosed post-mortem or those under the age of 6 years. Further exploration as to whether this accounts for the high proportion of children under 15 years not being offered a test should be done.

**TB-HIV co-infection rates**

HIV status is not collected in ETS, but TB-HIV co-infection is estimated nationally by anonymously linking reports in ETS with the SOPHID and HANDD HIV datasets\(^8\) for patients aged 15 years and older [7]\(^9\).

HIV-TB co-infection rates peaked in Yorkshire and Humber in 2006, when 6.7% of TB cases had a known concurrent HIV infection. Rates have steadily decreased and in 2018, 2.4% of people in Yorkshire and Humber with TB were co-infected with HIV. This is a slight increase from 2017 (1.8%). The past 2 years have seen the lowest proportion of co-infection since data became available in 2001. This mirrors the pattern in England, with an overall steady decline in co-infection rates after a peak in the mid-2000s. This likely reflects the lowering incidence of both HIV and TB infections overall in the country.

In England, the median age of people with TB-HIV co-infection has increased from 34 years (IQR: 30–41) in 2001 to 46 years (IQR: 38–51) in 2018. The general epidemiology of HIV infection likely contributes to this pattern. Because fewer people are being infected

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\(7\) The denominator for this percentage excludes cases diagnosed at post-mortem and cases where the HIV status is already known.

\(8\) SOPHID: Survey of Prevalent HIV Infections Diagnosed. HANDD: HIV and AIDS New Diagnoses Database

\(9\) See Tuberculosis in England: 2019 for methods
with HIV, people in younger age groups are not entering the cohort to keep the median age at the previous level. Therefore, the cohort itself ages as the existing infected individuals age. More effective treatment options and general awareness of the need for treatment also means those with HIV-TB co-infection also appear to be living longer. In England in 2018, the majority (82%) of people with TB-HIV co-infection were born outside the UK, 73% of whom were born in sub-Saharan African countries.

**Figure 16: Proportion\(^a\) of people (notified and un-notified) with TB-HIV co-infection\(^b\), Yorkshire and Humber and England, 2006 to 2018**

![Graph showing the proportion of people with TB-HIV co-infection from 2006 to 2018 in Yorkshire and Humber and England.](image)

\(^a\) Proportion is calculated using the number of TB notifications with HIV co-infection plus the number who are un-notified with an MTBC isolate which matched to a person with HIV as the numerator, and the number of all TB notifications (with or without HIV co-infection) plus the number of un-notified TB isolates which matched to a person with HIV as the denominator.

\(^b\) Includes people with TB and HIV co-infection aged 15 years and older.
9. BCG vaccination

BCG vaccine coverage

The BCG immunisation programme is a risk-based programme. The vaccine is recommended for individuals at higher risk of exposure to TB, particularly to protect against serious forms of disease in infants [7]. All infants (<12 months old) living in an area where TB incidence is ≥40 per 100,000 population should be offered the BCG vaccine. From April 2015, neonatal BCG has been included as part of the Cover Of Vaccination Evaluated Rapidly (COVER) programme. This provides an opportunity for BCG vaccine coverage to be estimated to local authorities where a universal neonatal vaccination programme is in place.

BCG vaccination status of TB patients

In 2018, information regarding BCG vaccination status was recorded for 185 cases in Yorkshire and Humber. UK born patients accounted for 68 of those of whom, 67.6% were BCG vaccinated. Sixty-eight per cent of the non-UK born population were vaccinated.

There were 16 patients aged 0–14 years. Ten were UK-born and 40% of those were vaccinated. Of the remaining 6 who were non-UK born, 66.7% of those were vaccinated.
10. Latent TB infection testing and treatment

This report, derived from the ETS surveillance system, which is a national case register and management system for cases of active TB, does not include data for latent TB infection (LTBI). A national programme for the screening and treatment of LTBI for new migrants living in high incidence CCGs was introduced by the Department of Health and PHE in 2015. Information for this programme is currently collected separately to that held in ETS [5].

Individuals are eligible for the national LTBI testing programme if they are aged 16–35 years and entered the UK from a high incidence country (≥150 cases per 100,000 or sub-Saharan Africa) within the last 5 years and had stayed in that high incidence country for 6 months or longer. Eligible individuals can be identified prospectively by GP practices during the new patient registration process, however all areas primarily use community or secondary care TB services who search retrospectively through GP new patient registration data.

Important messages

Poor data submissions continue to impact on the programme’s monitoring capabilities despite the improved quality and frequency of data submissions between 2017 and 2018.

In 2018, 15,883 LTBI tests were received, a slight increase of 3.5% from 2017.

All TBCBs saw a reduction or levelling off for LTBI testing activity apart from London and Yorkshire and Humber and the North East, which saw increased testing activity.

A higher proportion of men tested positive for LTBI than women in all age groups between 2016 to 2018.

The LTBI test positivity rate has declined to 15.8% (2,509/15,835) in 2018 from 17% (2,569/15,115) in 2017 and 18.1% (1,566/8,663) in 2016.

People born in India and Pakistan were the 2 most commonly tested groups between 2016 and 2018.

The proportion of people with a positive LTBI test who accessed LTBI treatment has declined annually from 78.3% (632/807) in 2016, to 65.7% (912/1409) in 2017 to 58.3% (671/1151) in 2018.

Overall LTBI treatment completion has increased annually from 65.1% (358/550) in 2016, to 65.3% (503/770) in 2017 to 76.5% (349/456) in 2018.
Number of tests

In 2018, 15,883 LTBI tests meeting the eligibility criteria for the programme were reported on by PHE. This was a small increase of 3.5% from 15,343 tests received in 2017, compared to an increase of 73.6% from 8,837 to 15,343 between 2016 and 2017 respectively. Between 2017 and 2018, all TCBs saw a levelling off or a decline in the number of people tested apart from London and Yorkshire and Humber and the North East, which increased LTBI testing activity (Figure 10.2).

Figure 17: Number of LTBI tests performed by TB Control Board in England, 2016 to 2018
Discussion

There were 352 cases of TB reported in Yorkshire and Humber in 2018, an incidence rate of 6.4 per 100,000 population. This a slight increase on the 2017 total number of cases (345) and rate (6.3 per 100,000). The rates in 2017 and 2018 are the lowest seen in Yorkshire and Humber in over 15 years.

TB continues to be distributed unequally across the region, with a persistent gap between the local authorities with the highest burden and those with historically low incidence rates. Bradford, Kirklees and Sheffield continued to have the highest rates in the region and are all above the England rate of 8.3 per 100,000. Barnsley, North East Lincolnshire and North Yorkshire all have the lowest rates, ranging from 0.8–1.5 per 100,000. There has been a slight increase in the 2018 rate of TB in both Kirklees and Sheffield compared with 2017. However, a consistent reduction in the rate of TB has been seen in Bradford since peaking in 2009.

The highest age and sex specific rates of TB in Yorkshire and Humber were recorded among men aged over 80 years (12.3 per 100,000) and women aged 30–39 years (12.9 per 100,000), with very few paediatric cases reported. TB rates declined for children under 15 and in the 15 to 44 age group, but slightly increased in those aged 45 to 64. Rates have remained relatively stable for those over 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. However, the rate of TB in the non-UK born population was nearly 20 times higher in 2018 compared to the UK born population. Around 40% of non-UK born TB cases diagnosed in 2018 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 2018 were Pakistan, India, Eritrea, Zimbabwe and Slovakia. 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 Eritrea, Zimbabwe or Slovakia.

In 2018 one-third of people with TB aged 18-65 years were not recorded as being in employment or education. Where occupation was recorded, 8% of people with TB were in the education sector as either staff or students, and 5% were healthcare workers.

As in previous years, over half (61%, 215/352) of cases reported in 2018 in Yorkshire and Humber had pulmonary TB and 25% were hospital inpatients at the time of diagnosis. Eight per cent of cases were known to have had a previous TB diagnosis. Overall, 66% of cases diagnosed in 2018 were confirmed by culture; when we look at only pulmonary TB, 77.2% were culture confirmed, which is approaching the national target of 80%.
Among people with pulmonary TB in 2018 in Yorkshire and Humber, 40% started TB treatment within 2 months of symptom onset. It is of concern that around 30% 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, 40% of cases experienced delays of 4 months or more.

Treatment was completed within 12 months for 88.6% of people with rifampicin sensitive TB reported in 2017 whose expected treatment duration was less than 12 months. The most common outcome category for people who did not complete treatment was death (4.2%) and of cases who died, TB was listed as contributing to death for 38% of those cases. The proportion of people who were lost to follow up declined compared to those reported in 2015.

TB antibiotic sensitivity was known for 66% of cases in 2018, of which 13% were resistant to at least 1 first line drug, and 1% had multidrug-resistant or rifampicin resistant TB (MDR/RR-TB). One case of extensively drug-resistant TB (XDR-TB) were reported in 2018.

People with 1 or more social risk factors for TB, including drug and alcohol misuse, homelessness and prison were less frequent in 2018 (11%) compared to 2017 (13%). Individuals with risk factors were more likely to be male (82.9%), UK born (51.1%), white (48.1%), have pulmonary TB (79.5%) have had a previous diagnosis of TB (10.5%), and first line drug resistance (9.7%). In 2018 a majority of TB cases in Yorkshire and Humber were resident in the most deprived areas (43.2%).

HIV tests were not offered to 5.0% of people with TB in 2018 who were eligible to be tested. There was little variation in HIV tests being offered by local authority, with only North Yorkshire and Rotherham offering tests to less than 90% of TB cases eligible to receive a test. However, for most local authorities, these are very small numbers. A low proportion of people had TB-HIV co-infection in Yorkshire and Humber in 201 (2.4%), reflecting a declining trend since peak rates in 2005 (7.2%).

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. Reducing transmission in migrant communities continues to be an area of concern. Reducing treatment 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

Although rates of TB diagnosis continue to fall in Yorkshire and Humber, it is important to focus on further reducing rates in certain populations. Many parts of England are seeing a steady increase in cases of TB from those born in Central and Eastern Europe. Rates in these communities in Yorkshire and Humber should be monitored to ensure a similar rise does not occur here.

Recommendations

Local commissioners should consider outreach (including prison ‘inreach’) linked to diagnostic and treatment services for underserved populations to reduce the burden of disease in these communities. The treatment completion rate for those with drug sensitive TB in underserved populations is 79%, which is 10% lower than the treatment completion rate for the general population. Efforts should be made to increase the completion rate for underserved populations to match the completion rate of the general population. This could be done as part of a wider initiative to address health inequalities. TB Monitoring Indicator 17.

While primary prevention is important, TB services should ensure early diagnosis and treatment for those with pulmonary TB to ensure onwards transmission does not occur. This will help reduce infectiousness while improving outcomes for those diagnosed. TB Monitoring Indicators 6 and 7.

Once cases are in treatment, TB services should ensure those in treatment for TB complete their treatment course. This is particularly important for those with social risk factors, so ways to achieve high compliance rates in these populations should be explored. TB Monitoring Indicator 10.

TB services and laboratories should ensure all specimens are submitted for TB culture to meet the national aim to have 80% of all diagnostic specimens for TB culture confirmed. TB Monitoring Indicator 8.

The changing demographics of TB incidence in non-UK born populations needs to be monitored. Those born on the Indian subcontinent continue to account for the highest proportion of TB in non-UK born cases, but the total numbers have been decreasing. In 2018, a high proportion of cases were reported from Eritrean migrants as well as from Central and Eastern Europe. Local commissioners should develop programmes to link with local services to ensure timely diagnosis and referral to treatment for these new migrants. TB Monitoring Indicator 2.
All stakeholders should continue to support the use of whole genome sequencing for TB diagnosis and cluster investigation. Implications for the use of WGS for cluster investigations, and the effect this can have on resources, needs to be considered. The Yorkshire and Humber TB Control Board should consider developing a plan on how best to holistically support cluster investigation. TB Monitoring Indicator 2.
References


Appendix A: Notes on the report

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 other organisations working in the field of TB. In particular this report is for the use of the Yorkshire and Humber 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 national report of TB in England is available at:

Additional data on TB notifications in the UK to the end of 2018, including breakdowns by country, can be found in the Official Statistic for TB, ‘Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: United Kingdom, 2000 to 2018’. This is available at:

As part of the Collaborative TB Strategy for England 2015-2020, TB Strategy Monitoring Indicators are available at:

A number of TB indicators at Upper Tier Local Authority and Clinical Commissioning Group level can be found at http://fingertips.phe.org.uk/profile/tb-monitoring and was updated with data for 2018 in August 2019. [Note: data presented for TB monitoring indicators at regional level DO NOT need to suppress small numbers due to the large
size of the underlying population and because these are not accompanied by any identifiable information.]

**Drug sensitive cohort**

For the purposes of TB outcome reporting, drug sensitive cases exclude all patients with rifampicin resistant TB (initial or amplified) including multidrug-resistant TB (MDR-TB, initial or amplified), and non-culture confirmed patients treated for MDR-TB. [Reference: World Health Organisation. Definitions and reporting framework for tuberculosis - 2013 revision. 2013; available from: http://apps.who.int/iris/bitstream/10665/79199/1/9789241505345_eng.pdf.]. Under this definition cases with resistance to isoniazid, ethambutol and/or pyrazinamide but without resistance to rifampicin are included in the drug sensitive cohort. TB outcomes among patients with drug resistant disease are considered in the next chapter.

Treatment outcomes for the drug sensitive cohort are reported separately:

- 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.
- for patients with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported.
Appendix B: Data sources and definitions

Data sources

This report is based on TB case notifications made to the PHE Enhanced Tuberculosis Surveillance system (ETS) in England to the end of 2018. 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). Laboratory data on culture confirmed TB isolates from the National Mycobacterium Reference Service are matched to TB case notifications and the results are used to report culture confirmation. Results for microscopy, PCR and histology are also collected in ETS.

Screening of people exposed to a patient with active TB is an important strategy to find and treat active and latent TB and prevent further transmission. The outcomes of contact tracing activities are discussed by cohort reviews undertaken in all areas of Yorkshire and Humber. (reference TB Collaborative Strategy: www.gov.uk/government/publications/collaborative-tuberculosis-strategy-for-england).
Definitions

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 3-4-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
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 phenotypic 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 PHE 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
Tuberculosis in Yorkshire and Humber (2018)

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-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 (e.g. amikacin, capreomycin, kanamycin), fluoroquinolones (e.g. 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 dataset provided in June 2018.

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 (Centre, local authority, MSOA and LSOA), 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) [www.esds.ac.uk/findingData/qlfs.asp]. 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.

Cluster definitions

Strain typing was performed by the National Mycobacterial Reference Service using Whole Genome Sequencing. Analysis was undertaken on strain type clusters as defined above.

Drug resistance

Anti-TB antibiotic drugs are a large family and 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 antibiotic drugs depending upon their clinical effectiveness. First line drugs include isoniazid, rifampicin, pyrazinamide and ethambutol. Second line drugs are injectable agents (e.g. amikacin, capreomycin, kanamycin), fluoroquinolones (e.g. 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 and at least one fluoroquinolone (Reference: World Health Organisation, Guidelines for treatment of tuberculosis. 2010.).

Acquired drug resistance

Acquired drug resistance is defined as a newly emerged resistance to one or more anti-TB antibiotics identified on repeat culture 3 or more months after the first specimen date. In addition, cases with a change from sensitive to resistant result following commencement of anti-TB antibiotic treatment are reclassified as acquired resistance (even if this is within the 3-month period). It should be noted patients who acquire resistance are recorded in the year they were notified, not the year they acquired resistance, therefore the numbers for recent years may still increase for those still on treatment.
There have been 7 reported cases of acquired drug resistance in Yorkshire and Humber between 2000 and 2018. The median time to development of drug resistance was 77 days after the earliest specimen date (IQR 32-278 days).