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Tuberculosis in the East Midlands: Annual review (2015 data)

Data from 2000 to 2015

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The data presented in this report are correct as at August 2016.

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Notes on the report

Intended audience

This report is aimed at healthcare professionals involved in the diagnosis and/or treatment of TB patients, commissioners involved in planning and financing of TB services, public health professionals who are working in the control of TB or health of at-risk populations, researchers with an interest in TB, and government and non-governmental organisations working in the field of tuberculosis. In particular, we aim to update the East Midlands TB Control Board on the epidemiology of TB in the region.

Aim of report

This report describes the recent epidemiology of TB in East Midlands, providing an update on local trends, identifying areas of high burden of disease, at risk population groups, and opportunities for interventions and prevention of future cases.

Data sources

This report presents detailed data on TB case notifications made to the Enhanced Tuberculosis Surveillance system (ETS) in England to the end of 2015. Data from notifications made to ETS from 2000 are updated annually to take into account denotifications, late notifications and other updates. The data presented in the current year's report supersedes data in previous reports.

Other TB reporting

The national report presenting recent epidemiology of TB in England is available at <https://www.gov.uk/government/publications/tuberculosis-in-england-annual-report>. Additional high-level data on TB notifications in the UK to the end of 2015, and 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 2015'. These are available at <https://www.gov.uk/government/collections/tuberculosis-and-other-mycobacterial-diseases-diagnosis-screening-management-and-data>.

As part of the Collaborative TB Strategy for England, 2015 to 2020, a suite of TB Strategy Monitoring Indicators was developed (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403231/ Collaborative_TB_Strategy_for_England_2015_2020_.pdf).

Indicators used in this report

The following indicators are presented in this report:

- National TB Strategy Monitoring Indicator 1: Overall TB incidence per 100,000 population (England and PHEC)
- National TB Strategy Monitoring Indicator 2: TB incidence in UK born and non-UK born populations (England)
- National TB Strategy Monitoring Indicator 5: Incidence of TB in UK born children aged under fifteen years (England)
- National TB Strategy Monitoring Indicator 6: Proportion of pulmonary TB cases starting treatment within two months of symptom onset (England, PHEC and UTLA data shown on Fingertips)
- National TB Strategy Monitoring Indicator 7: Proportion of pulmonary TB cases starting treatment within four months of symptom onset (England, PHEC and UTLA data shown on Fingertips)
- National TB Strategy Monitoring Indicator 16: Proportion of TB cases offered an HIV test (England, PHEC, UTLA and CCG data shown on Fingertips)
- National TB Strategy Monitoring Indicator 17: Proportion of drug sensitive TB cases with at least one social risk factor who completed treatment within 12 months (England and PHEC)

Data for indicators which are presented at upper tier local authority and clinical commissioning group can be found at <http://fingertips.phe.org.uk/profile/tb-monitoring> and were updated with data for 2015 in October 2016.

Executive summary

In 2015, 354 tuberculosis (TB) cases were reported among East Midlands residents, an incidence rate of 7.6 per 100,000 population. This rate was a non-significant decrease of 12.2% compared to 2014 and the third consecutive annual decrease. The incidence rate in the East Midlands remains statistically significantly below the national incidence of 10.5 per 100,000.¹

There continues to be variation in incidence across the East Midlands with the highest incidence rates reported in the residents of the Leicester (36.2 per 100,000), Nottingham (16.6 per 100,000), Derby (13.4 per 100,000) upper tier local authorities and Boston (16.4 per 100,000) and Northampton (12.6 per 100,000) local authorities. Whereas the TB incidence rate in Leicester has continued to decrease, other areas such as Nottingham and Lincolnshire have increased compared to 2014, although these changes were not statistically significant.

The incidence rates of TB were nearly 20 times higher in those born outside the UK (50 cases per 100,000) compared to the UK born population (2.5 cases per 100,000). The number of cases and the incidence rate of TB in the non-UK born population have seen a year-on-year decline since 2012. Approximately 40% of TB cases diagnosed in 2015 entered the UK 10 or more years previously. The most common country of birth of non-UK born TB patients in 2015 was India (43.4%). There has been a slight decrease in the incidence of TB in the UK born population for the first year since 2007.

Consistent with previous years, the most common ethnicity for newly diagnosed TB patients in the East Midlands was Indian (38.3% of all cases). However, the incidence rate of TB was highest among residents of Bangladeshi ethnicity (127.1 cases per 100,000), which has increased from 2014. The next highest rates were among those of black other (non-African/non Caribbean) and Indian ethnicity, 87.2 and 85.0 cases per 100,000, respectively. Although the white ethnic group accounted for 28.9% of all TB cases in 2014, the incidence of TB in individuals of white ethnicity remains low (2.4 cases per 100,000).

In 2015, over half of TB cases had pulmonary disease (59.6%) of which 78.2% were confirmed by culture. Approximately one quarter (27.7%) of pulmonary cases experienced a delay of more than four months from onset of symptoms to starting treatment, a decrease from 36.1% in 2014.

The incidence rate of TB in UK born children under 15 years of age in East Midlands (1.1 cases per 100,000), an indirect indicator of recent transmission, has decreased for the first time since 2011.

Since 2010, 83.5% of all culture confirmed cases were strain typed with results for at least 23 out of 24 loci available. Between 2010 to 2015, 465 cases (34.6%) were clustered with at least one other case within the East Midlands with the majority of clusters consisting of only two people. The proportion of cases that are clustered with other cases has decreased from 34.8% (79) in 2010 to 29.1% (57) in 2015.

Out of the East Midlands cases diagnosed in 2014 with rifampicin-sensitive non-CNS, spinal, miliary or cryptic disseminated disease, 81.4% completed treatment within 12 months. This was a decrease from 2013. The most common reason for non-completion of treatment was death of the case (20 cases). Half of these deaths were diagnosed post-mortem (but are still included in these figures). Treatment completion rates were lower for those with CNS, spinal, miliary or cryptic disseminated disease at 61.4% although seven cases (12.3%) were still on treatment at their last reported outcome.

The proportion of cases with resistance to one or more first line drugs increased in 2015 (8.9%) although the proportion of cases with multiple drug resistance (MDR) has decreased to 0.4% in 2015 (one case). There were no cases of extensively drug-resistant (XDR) TB reported in 2015.

There is a clear association in the East Midlands between the incidence rate of TB and deprivation. Underserved populations are a priority area for TB control; social risk factors (histories of alcohol/drug misuse, homelessness, or imprisonment) were noted in 10.1% of TB cases over the age of 15 years (a decrease from 12.4% in 2014). These risk factors are more commonly reported in UK-born cases. Although those with social risk factors account for a small proportion of East Midlands cases, they were statistically more likely to have pulmonary disease and require directly observed therapy. Treatment completion at 12 months was lower in those with social risk factors compared to those with none (66.7% vs 86.5%).

In 2015, 93.1% of cases were offered an HIV test (285 cases) and the uptake of testing was high, with 97.5% of patients offered it (278) accepting the HIV test. TB notifications are matched annually with HIV surveillance data and for 2014 (most recent data available), it is estimated 2.6% of TB cases aged 15 years and over in the East Midlands are co-infected with HIV.

It is encouraging that overall numbers of TB cases in the East Midlands declined in 2015, demonstrating a positive start to the implementation of the national TB strategy. However, certain risk groups are still more likely to be affected than others. This underlines the need for services to work collaboratively across the range of health and social care issues that affect underserved populations in order to achieve a marked reduction in TB and in health inequalities associated with the disease.

Recommendations

Recommendations for local NHS and PHE can be found in full on page 36. They include:

- reduce the delay in TB diagnosis through improved awareness of TB in healthcare workers, allied professionals working with underserved populations and underserved populations themselves
- increase the proportion of cases that have a culture result to allow drug resistance detection and facilitate the identification of clusters
- commission and support highly-targeted case finding and prevention activities with a focus on underserved populations
- TB clinical teams to implement or continue cohort review as a tool to improve local TB control and as a measure of treatment outcomes and contact tracing activity
- healthcare staff should offer universal HIV testing for all those diagnosed with tuberculosis in line with national guidance
- ensure relevant information is completed accurately on the PHE ETS system
- ensure appropriate access to services and treatment for underserved populations and provide support to enable patients to complete treatment
- sustain the roll out of new migrant LTBI screening programme within the four high burden areas identified within East Midlands; Leicester City, Nene, Nottingham City and Southern Derbyshire clinical commissioning groups (CCGs)

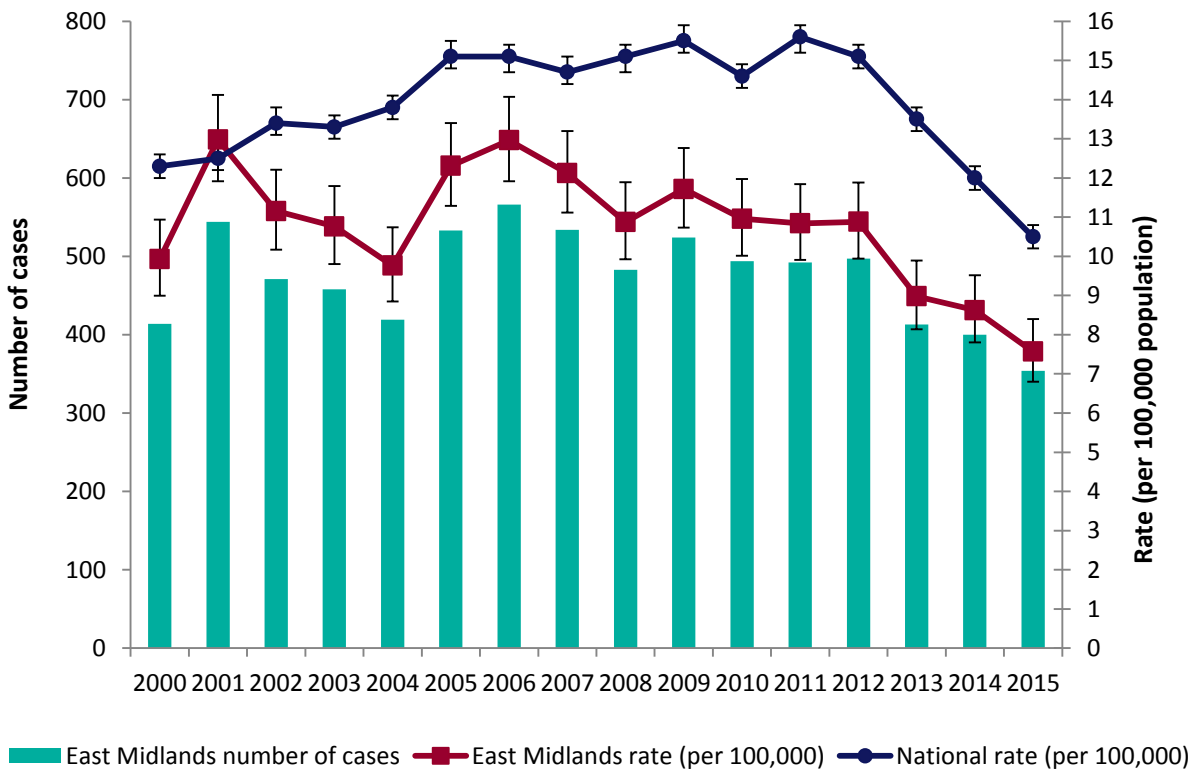
1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2015, 354 cases of tuberculosis were reported among East Midlands residents, an incidence of 7.6 per 100,000 population. This was a statistically non-significant decrease in the incidence rate of 12.2% compared to 2014 (400 cases) (Figure 1). This was the third consecutive year showing a decrease in East Midlands TB notification rate after remaining relatively stable between 2010 and 2012. This decrease follows the national trends in TB incidence, with England reporting an overall decrease of 32.7% since 2011. TB incidence in the East Midlands is lower than the England incidence rate of 10.5 per 100,000 population.¹ Cases reported in the East Midlands in 2015 accounted for 6.1% of the 5,758 cases reported in England.¹

National TB Strategy Monitoring Indicator 1: Overall TB incidence per 100,000 population (England and PHEC)

Figure 1: TB cases and incidence rates per 100,000 population, East Midlands, 2000 – 2015



Similar to previous years, the highest incidence rate of TB for East Midlands upper tier local authorities (UTLA) was in Leicester (36.2 cases per 100,000) although rates have been decreasing since 2009. The lowest incidence rate was in Nottinghamshire (2.2 cases per 100,000) (Figure 2) which was also a decrease from 2014. The authorities of

Derby and Derbyshire also had a decrease in the number and incidence of cases of TB reported compared with 2014, whereas Nottingham and Lincolnshire increased compared to 2014. The Leicestershire & Rutland and Northamptonshire figures remained similar to the previous year. The changes in incidence rates for all areas between 2014 and 2015 were not statistically significant.

Figure 2a: TB incidence rate per 100,000 population, by upper tier local authority of residence in the north east Midlands, 2000 – 2015

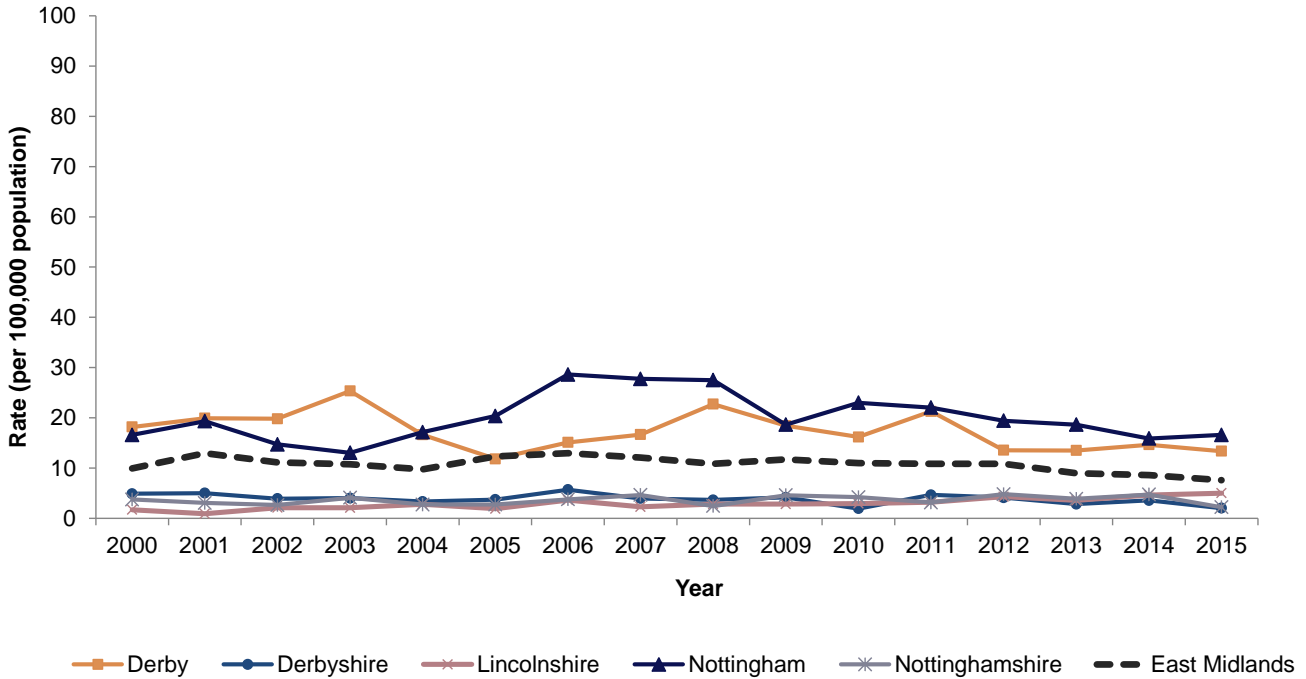
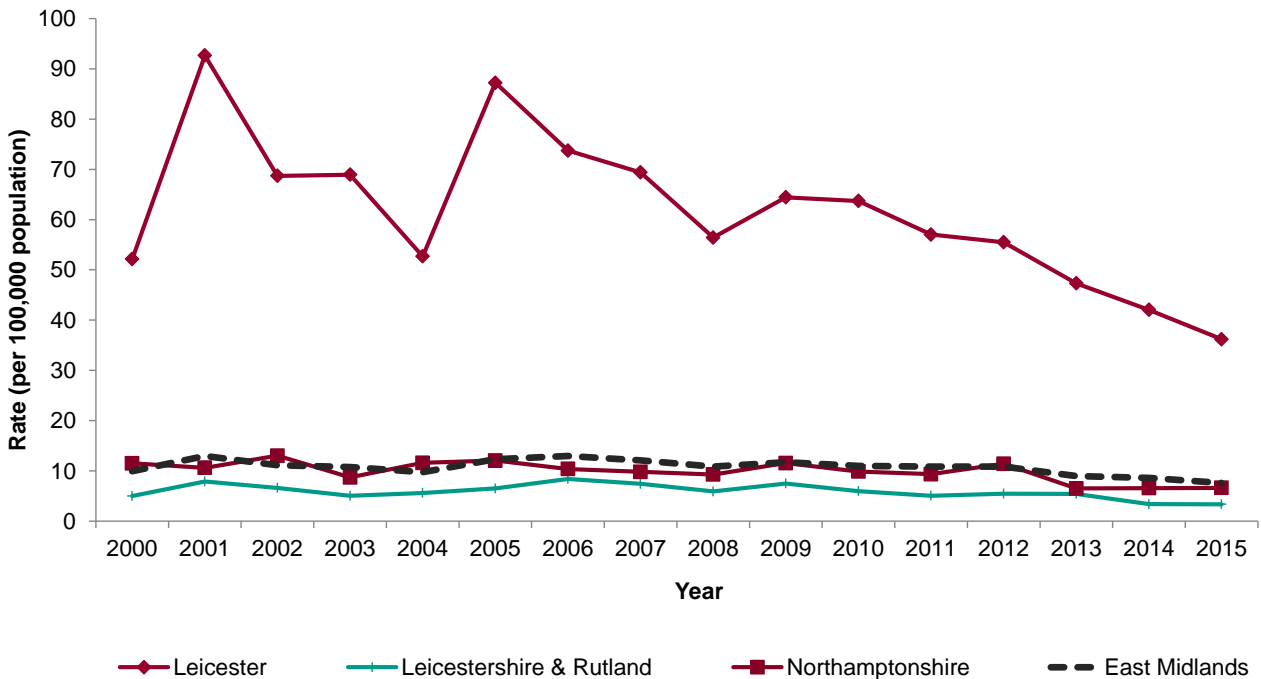


Figure 2b: TB incidence rate per 100,000 population, by upper tier local authority of residence in the south east Midlands, 2000 – 2015



Figures 3 and 4 demonstrate that the overall East Midlands incidence rate of TB masks areas with higher incidence. In particular, the highest incidence of TB occurred within Leicester City (36.2 per 100,000 population), Nottingham City (16.6 per 100,000 population) and Derby City (13.4 per 100,000 population) upper tier local authorities and Boston (16.4 per 100,000 population) and Northampton (12.6 per 100,000 population) local authorities in 2015.

Further data by local authority area can be found in Appendix B. The incidence rates by middle super output area (MSOA) show that 16 areas in the East Midlands had an average rate of over 40 cases per 100,000 population between 2013 and 2015. These MSOAs were within Leicester, Nottingham, Derby and Northampton.

Figure 3: TB rate per 100,000 population by local authority of residence, East Midlands, 2015

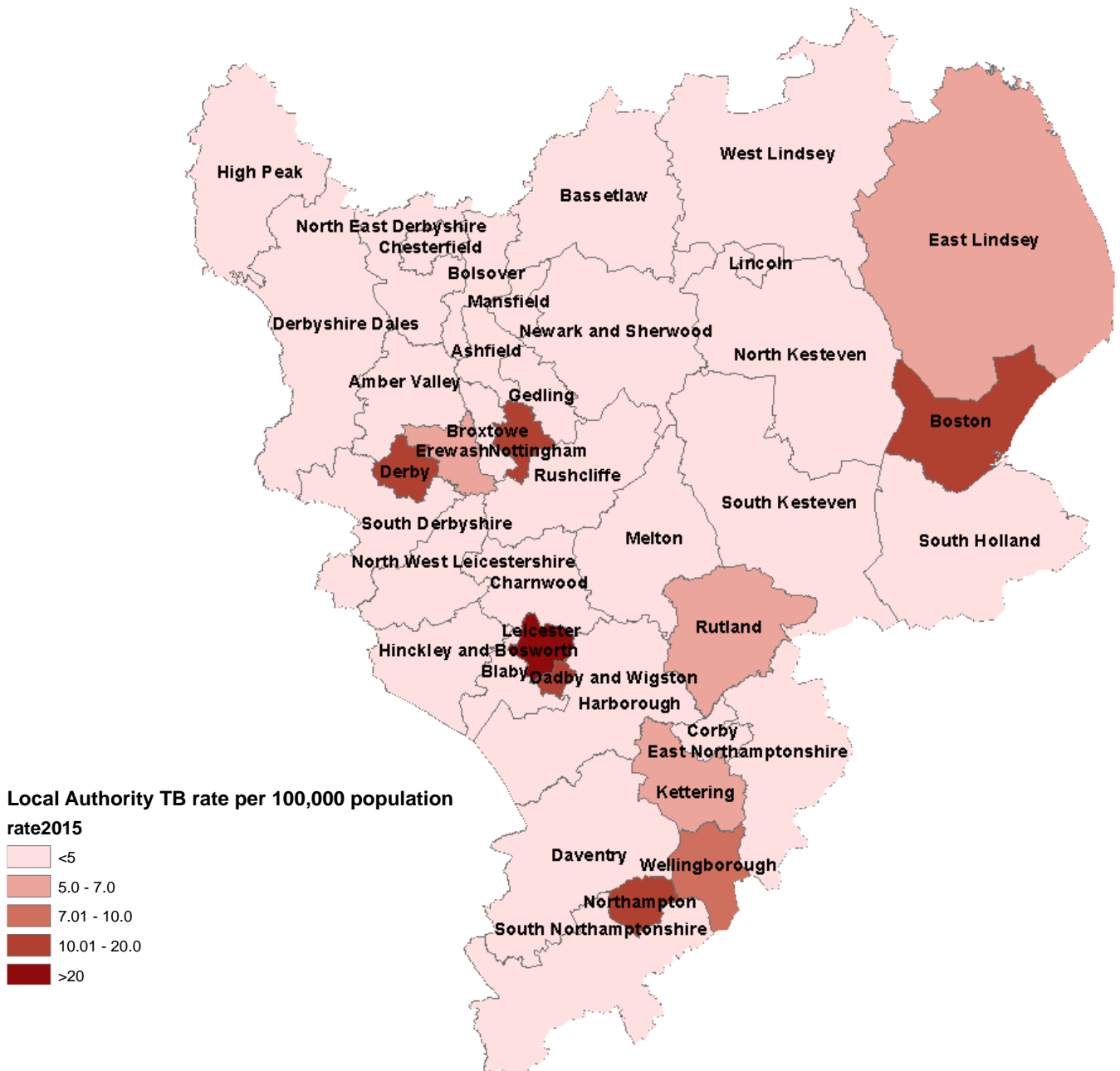
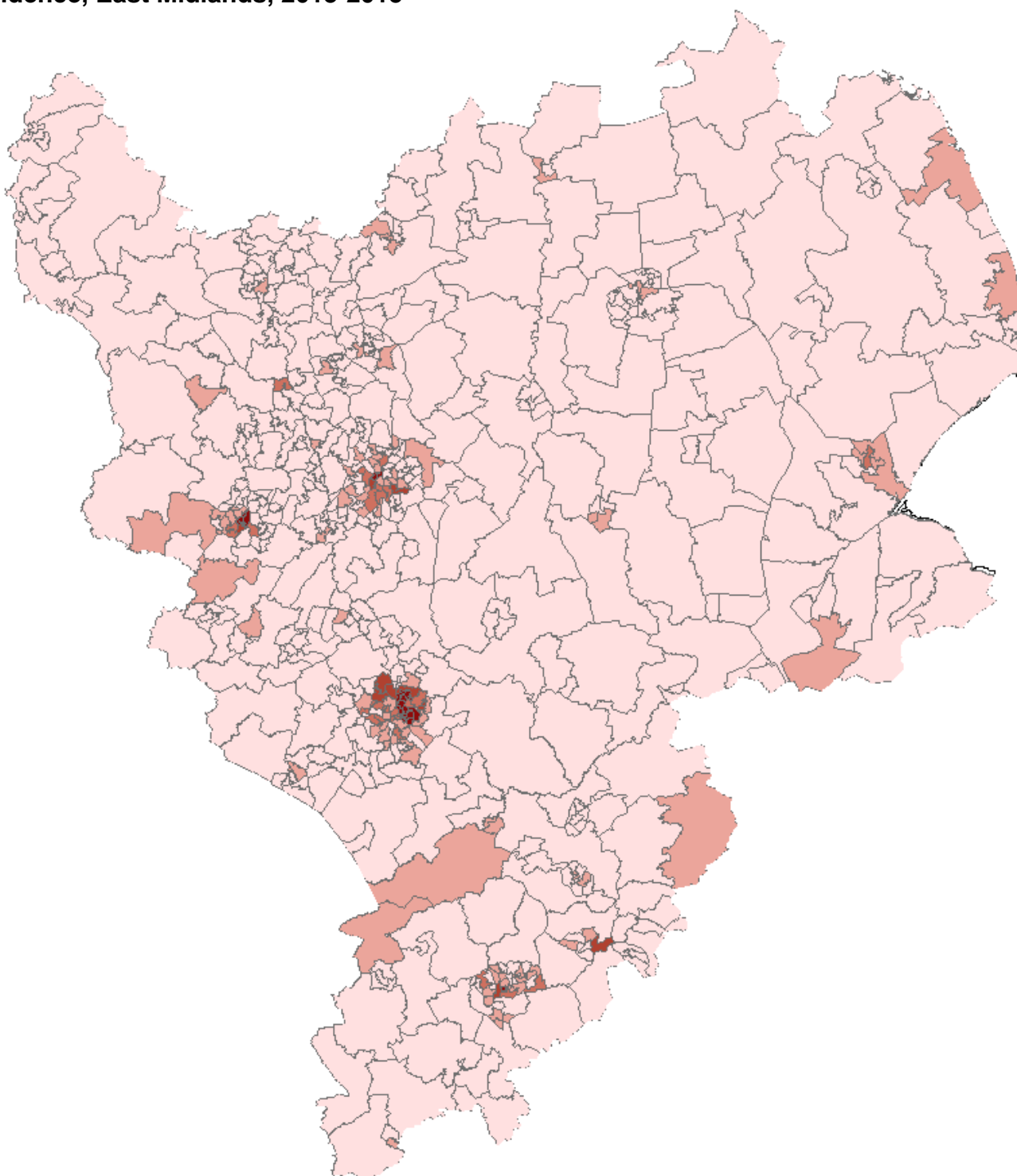
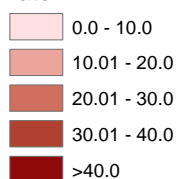


Figure 4: Average TB rate per 100,000 population by middle super output area of residence, East Midlands, 2013-2015



Middle Super Output Area TB rate for 100,000 population rate



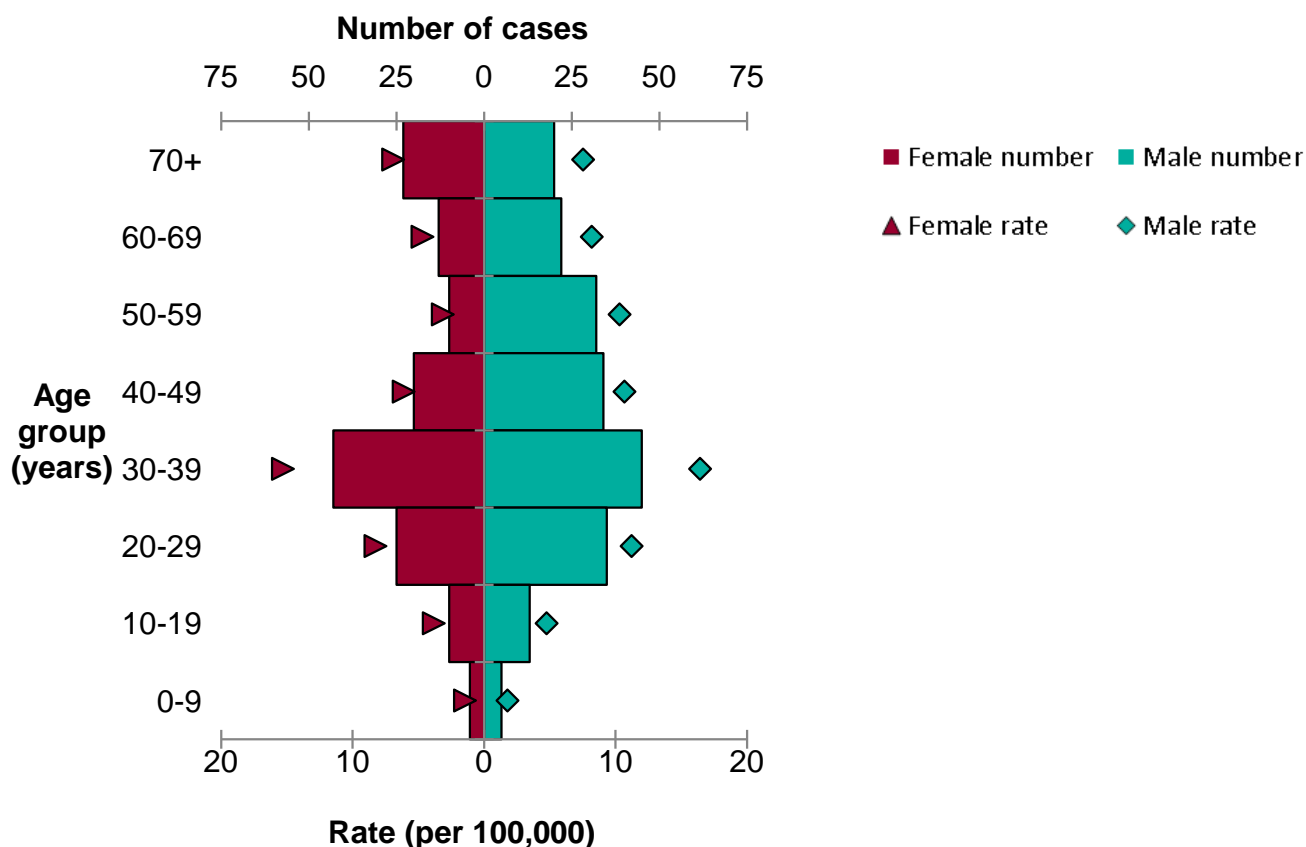
Demographic characteristics

Age and sex

As with previous years, the incidence rate of TB in 2015 for all cases was statistically significantly higher in males; 8.9 cases per 100,000 population (95% CI 7.7 – 10.2) compared to females (6.3 cases per 100,000 population, 95% CI 5.3 – 7.3). Males accounted for 58% (206 cases) of cases.

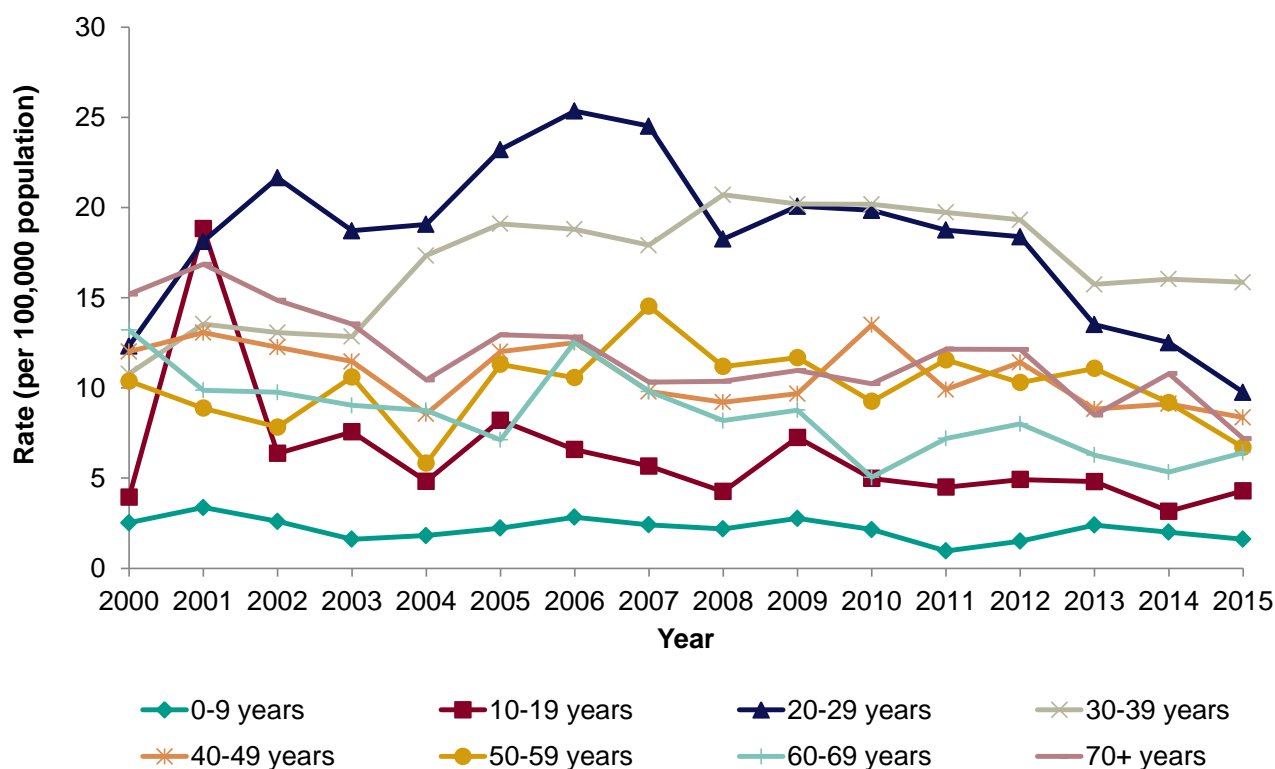
The majority of TB cases occurred in those aged 30–39 years. The number of cases in this age range was slightly higher among males than females, a trend that can be seen across all age groups (Figure 5). Further information can be found in Appendix B.

Figure 5: TB cases and rate per 100,000 by age and sex, East Midlands, 2015



The incidence rate of TB has remained highest in East Midlands residents aged 30–39 years (Figure 6). In 2015, there was a decrease in incidence for most age groups compared with 2014, with the exception of the 10–19 and 60–69 years age groups which increased. The majority of age groups show a long-term downward trend since 2009.

Figure 6: TB rate per 100,000 by age group (in years), East Midlands, 2000 – 2015



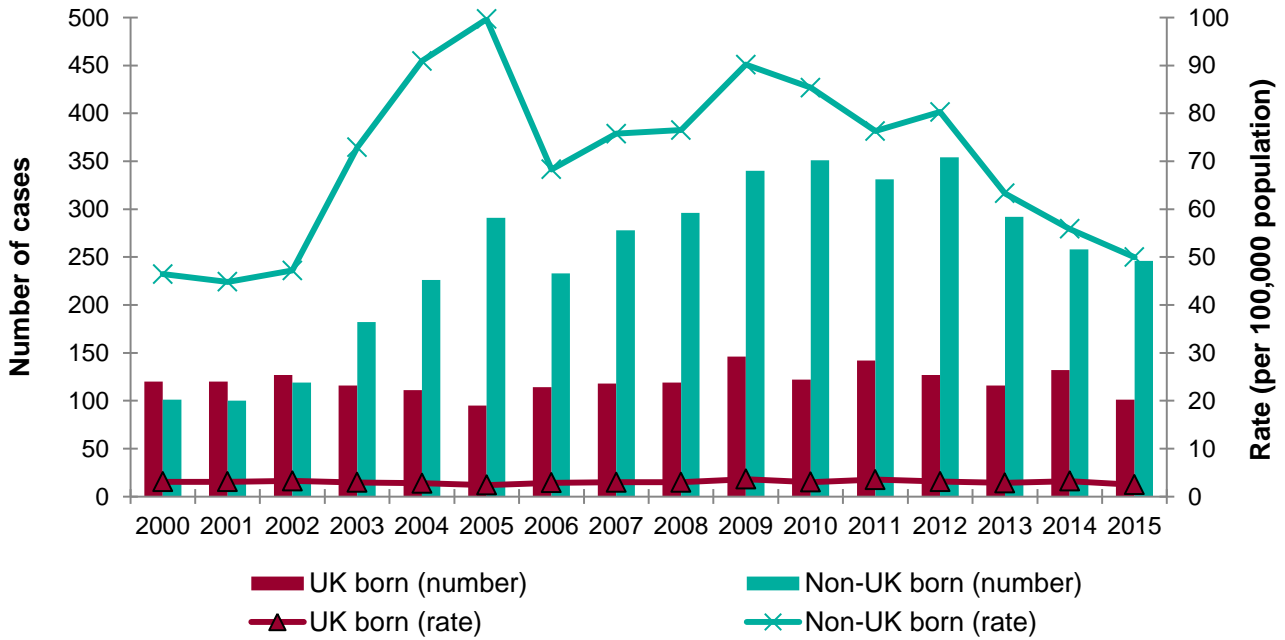
In 2015, the rate of TB in all children under 16 years of age within the East Midlands was 1.5 per 100,000 population (13 cases), of which 69.2% were UK born. This is a decrease from 1.8 cases per 100,000 population in 2014 (15 cases). Further information on TB in children for the UK born population can be found on page 21. In 2015, there were six cases of TB in children aged less than five years which was an increase from five cases in 2014. Among TB cases occurring in those aged under 5 years in 2015, 50% were UK born.

Place of birth and time since entry

In 2015, country of birth information was recorded for 347 cases (98.0%). Of these, 70.9% of all East Midlands TB cases were born outside the UK (246 cases), an incidence rate of 50.0 cases per 100,000 population. Although this rate is approximately 20 times higher than the incidence rate in those born in the UK (2.5 per 100,000 population), the rates within non-UK born population have been steadily decreasing since 2012. (Figure 7). The TB incidence within the UK born population has remained unchanged over previous years with a slight decrease from 3.2 per 100,000 population in 2014.

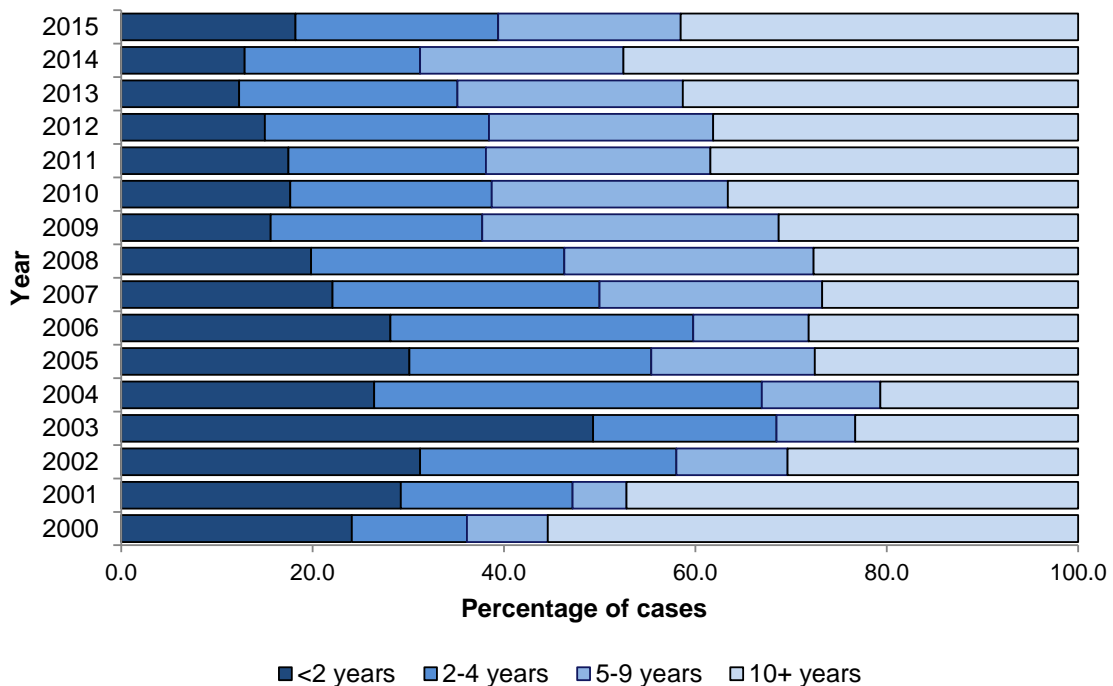
National TB Strategy Monitoring Indicator 2: TB incidence in UK born and non-UK born populations (England)

Figure 7: TB cases and incidence rate per 100,000 by place of birth, East Midlands, 2000-2015



In 2015, information on the time between entry to the UK and TB diagnosis was recorded for 95.9% of non-UK born cases (236 cases). Among those cases that were non-UK born, 58.5% (138 cases) arrived less than 10 years prior to diagnosis and 98 cases (41.5%) arrived in the UK 10 or more years prior to diagnosis and (Figure 8).

Figure 8: Time between entry to the UK and TB notification for non-UK born cases by year, East Midlands, 2000 – 2015



In 2015, the most commonly reported country of birth for non-UK born cases was India (43.4%), (Table 1) followed by Pakistan (6.6%), which was similar to 2014. Country of birth was unknown for two cases (0.8%).

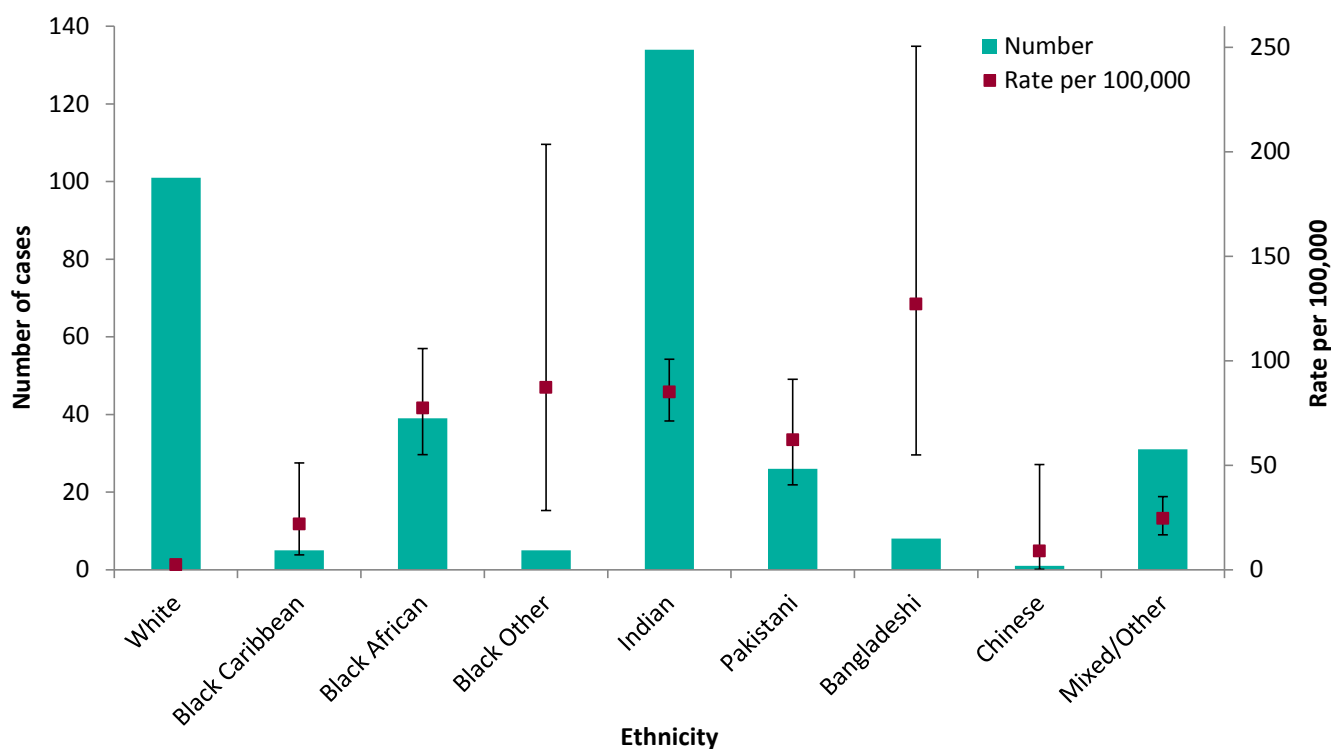
Table 1: The most common countries of birth of non-UK born TB cases, East Midlands, 2015

Country of birth	n	% of non-UK born patients
India	106	43.4
Pakistan	16	6.6
Lithuania	9	3.7
Eritrea	8	3.3
Nigeria	8	3.3
Bangladesh	7	2.9
Poland	7	2.9
Zimbabwe	6	2.5
Afghanistan	5	2.1
Romania	5	2.1
Uganda	5	2.1
Other (<5 cases)	62	25.4
Total	244	100

Ethnicity

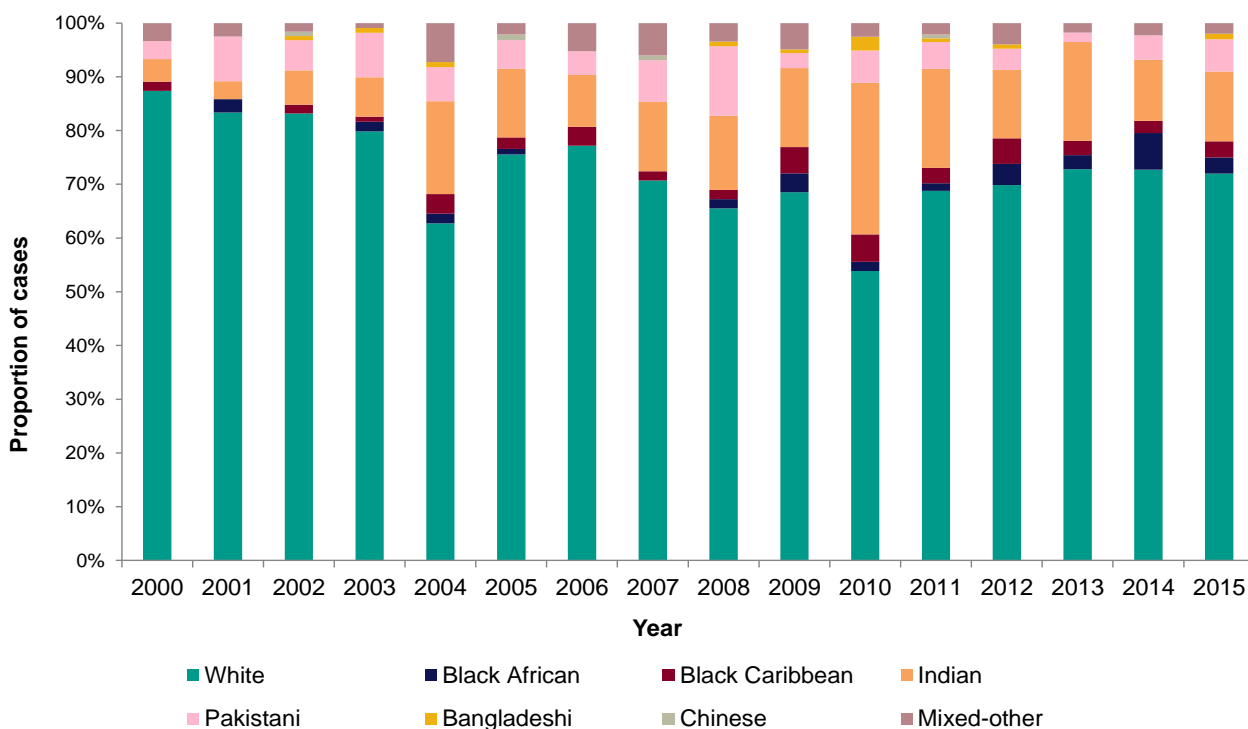
In 2015, ethnicity data was recorded for 99% (350) of cases. The most common ethnic grouping of TB cases in 2015 was Indian (38.3%). However, the incidence rate of TB cases was highest among residents of Bangladeshi ethnicity, 127.1 cases per 100,000 population (8 cases) (Figure 9). The next highest incidence rates were among those of Black other (non-African/non-Caribbean) and Indian ethnicity, 87.2 and 85.0 cases per 100,000 population, respectively. However, the numbers of cases of Black other and Bangladeshi ethnicity are small and rates are therefore subject to fluctuation. The white ethnic group accounts for 28.9% of all TB cases in 2015; the incidence of TB in individuals of white ethnicity remains low (2.4 cases per 100,000 population).

Figure 9: TB incidence rate per 100,000 population by ethnic group, East Midlands, 2015



In 2015, the most common ethnic group within the UK born case population was white (72%, 72 cases) which has remained the same as 2014 (Figure 10). The next most common ethnicity was Indian (13.0%, 13 cases), which increased from 2014. The proportion of UK born cases reporting Pakistani ethnicity has increased compared to 2014.

Figure 10: Proportion of UK born TB cases by ethnic group, East Midlands, 2000 – 2015



Clinical characteristics

Site of disease

In 2015, 59.6% of TB cases had pulmonary disease (211). The second most common site was extra thoracic lymph node TB accounting for 16.7% of cases (59) (Table 2).

Table 2: Site of disease of TB cases, East Midlands, 2015*

Site of disease	2015	
	n	%
Pulmonary	211	59.6
Lymph Node (extra thoracic)	59	16.7
Intra-thoracic lymph nodes	43	12.2
Pleural	38	10.7
Gastrointestinal/Peritoneal	18	5.1
CNS (Other - not meningitis)	17	4.8
Bone/Joint (spine)	15	4.2
Miliary	13	3.7
CNS (meningitis)	9	2.5
Genitourinary	9	2.5
Other [^]	18	5.1

*Patients may have disease at more than one site, so the total % will not equal 100%. [^] Other includes sites: Bone/Joint (other - not spine), Cryptic Disseminated, Laryngeal, Site unknown (extra pulmonary) and other.

The proportion of cases with pulmonary TB was statistically significantly higher among UK born cases (70.3%, 71/101) than those born abroad (54.5%, 134/246).

Previous history of tuberculosis

In 2015, information on previous diagnosis was recorded for 93.8% (332) of cases. Of these, 3.6% (12) of cases were previously diagnosed with TB more than 12 months before their current notification.

Directly observed therapy

In 2015, information on whether a case was started on directly observed therapy (DOT) was recorded for 94.1% of notified cases. Of these, 8.1% of cases (27) received DOT, a decrease from 12.7% (47) in 2014 which is thought to be due to decrease in numbers of cases requiring DOTs.

2. Laboratory confirmation of TB

Laboratory tests data collection

Data for all culture confirmed TB isolates from the Mycobacterial Reference Laboratories, including speciation, drug susceptibility testing and Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR) typing were matched to TB case notifications, and the results were used to report culture confirmation. Results for microscopy, PCR and histology were also collected in ETS.

Culture confirmation and speciation

In 2015, 66.9% (237) of cases were culture confirmed. This proportion was higher among those with pulmonary TB (78.2%, 165 cases) compared to patients with extra-pulmonary TB (50.3%, 72 cases).

Of those that were culture confirmed, the majority (97.5%, 231 cases) were speciated as *Mycobacterium tuberculosis*. The remaining cases were *M. africanum* (3), *M. bovis* (2) and in one case the organism was only identified to the level of *M. tuberculosis complex*.

Sputum smear

In 2015, only 77% (127) of cases with pulmonary TB had a sputum smear (microscopy) result reported. Of these, 52% were smear positive (66). The proportion smear positive was highest in those aged 45-65 years (58.8%, 20/34).

3. TB transmission

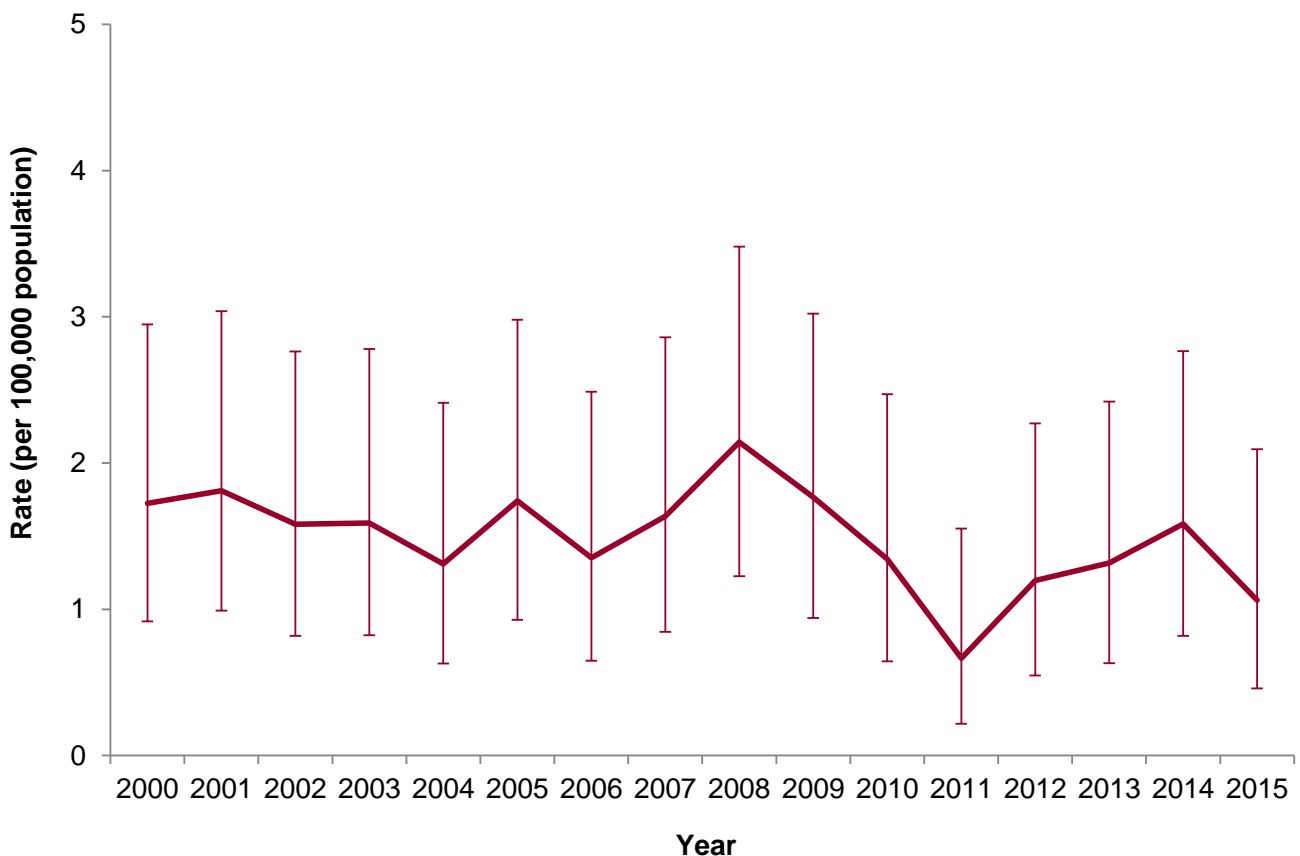
The incidence rate of TB in children is widely accepted to be a good indicator of TB transmission in a community. Molecular genotyping of the organisms causing TB in a population can also provide insight into putative transmission chains.

Rate of TB in UK born children

In 2015, the rate of TB in UK born children under 15 years of age in the East Midlands (an indirect indicator of recent transmission), was estimated at 1.1 cases per 100,000 population (8 cases). This was a decrease from 1.6 cases per 100,000 population in 2014 (12 cases) (Figure 11). However, this change was not statistically significant and the longer-term trend since the millennium remains static. Nonetheless the numbers are small and should be interpreted with caution.

National TB Strategy Monitoring Indicator 5: Incidence of TB in UK born children aged under fifteen years (England)

Figure 11: TB case incidence rate in UK born children aged under 15 years, East Midlands, 2000 – 2015



Strain typing and clustering

The PHE National Strain Typing Service was established in January 2010 and since that time all TB isolates have been typed using 24 loci Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR). Such strain typing identifies clusters of cases with indistinguishable strain types that may indicate that they are part of the same chain of transmission.² However, clustering could also reflect common endemic strains circulating within England or abroad and therefore the detection of a common strain type among cases does not confirm recent transmission. Additional epidemiological information is required to assess if a common strain type is likely to reflect recent transmission. MIRU-VNTR strain typing can be used to support or refute whether transmission has occurred between individuals.

Within the Field Epidemiology Service, there is a designated TB cluster investigator whose role is to review strain typing and identify clusters within and across PHE Centres. Cluster information is regularly provided to the East Midlands, including contextual information about strain types, which are routinely reviewed for epidemiological links.

It is hoped that the higher level of resolution provided by whole genome sequencing (WGS) will improve our understanding of TB transmission in England. WGS sequencing is due to be rolled out to the East Midlands at the end of 2016 and across England in 2017.

Proportion of cases clustered and geographical distribution

Between 2010 and 2015, there were 1611 culture confirmed cases, of which 1571 cases (97.5%) had an isolate that was strain typed and 1345 (83.5%) had at least 23 loci typed (Table 3). Of those which had at least 23 loci typed, 880 (65.4%) did not cluster with any other isolates within the East Midlands. The remaining 465 (34.6%) cases clustered with at least one other case in the East Midlands since 2010. This is less than the proportion of cases clustering in England (58.4%).¹ The proportion of cases clustering in the East Midlands decreased from 34.8% (79) in 2010 to 29.1% (57) in 2015. Between 2010 and 2015, 132 different strain type clusters were reported during 2010 to 2015 in the East Midlands and 2,539 were reported in England.¹

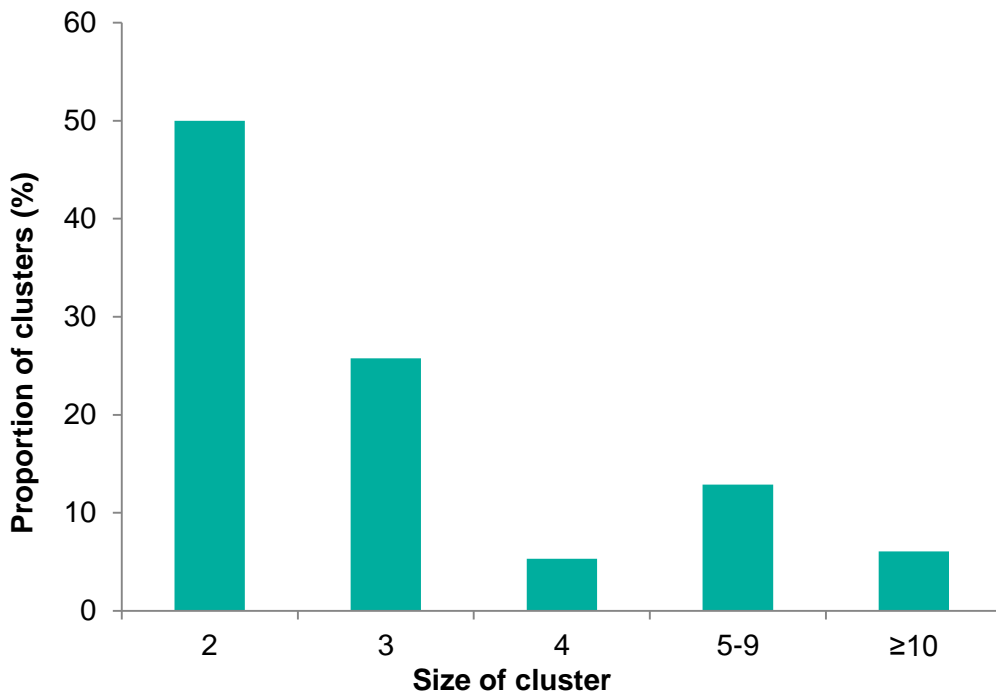
Table 3: Number and proportion of culture confirmed cases typed and number and proportion of cases in clusters, East Midlands, 2010 – 2015

Years	Culture confirmed cases	Strain typed cases		Strain typed cases \geq 23 loci		Cases clustered		Clusters
	n	n	%	n	%	n	%	n
2010 - 2015	1611	1571	97.5	1345	83.5	465	34.6	132

Size of clusters

Of the 132 clusters in the East Midlands identified from 2010 to 2015, the median cluster size was 2 cases (range 2–18). Half of the clusters (50.0%) consisted of two cases, while 12.9% consisted of 5 to 9 cases and 6.1% consisted of more than 10 cases (Figure 12).

Figure 12: Proportion of clusters by size, East Midlands, 2010 – 2015.



4. Delay from onset of symptoms to start of treatment

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

Information on the time from symptom onset to starting treatment was recorded for 92.4% (195 cases) of pulmonary TB cases in 2015 (Table 4). The median time between symptom onset to starting treatment for pulmonary TB cases was 77 days with an interquartile range (IQR) of 34 to 130 days. This was longer than the median delay to treatment commencement for England, but with overlapping interquartile ranges (72 days, IQR 36-132).¹ In the East Midlands, 41% of pulmonary cases started treatment within 0–2 months of symptom onset and 72.3% within four months. There has been a decrease in the proportion of pulmonary TB cases starting treatment more than four months after symptom onset from 36.1% in 2014 to 27.7% in 2015 although this was not statistically significant.

Table 4: Time between symptom onset and starting treatment for pulmonary TB cases*, East Midlands, 2011- 2015

Year	0-2 months		2-4 months		>4 months		Total
	n	%	n	%	n	%	n
2011	75	40.8	57	31.0	52	28.3	184
2012	69	35.0	63	32.0	65	33.0	197
2013	75	41.7	61	33.9	44	24.4	180
2014	74	36.1	57	27.8	74	36.1	205
2015	80	41.0	61	31.3	54	27.7	195

*excluding asymptomatic cases, and those with missing onset dates

National TB Strategy Monitoring Indicator 6: Proportion of pulmonary TB cases starting treatment within two months of symptom onset (England, PHEC and UTLA data shown on Fingertips)

National TB Strategy Monitoring Indicator 7: Proportion of pulmonary TB cases starting treatment within four months of symptom onset (England, PHEC and UTLA data shown on Fingertips)

Characteristics of pulmonary TB cases with a delay from onset of symptoms to treatment of more than two months

There were a higher proportion of pulmonary TB cases in females with a delay in starting treatment of more than two months (62.3%, 48/77) than males (56.8%, 67/118). The proportion of cases with a delay increased with age, from 14.3% (1/7) of children under the age of 15 years to 66.7% (20/30) of cases in the 65 years and over age group. There was a higher proportion of pulmonary cases with a delay who were UK born (65.2%, 43/66) compared to the non-UK born (56.0%, 70/125) group.

5. TB outcome in the drug sensitive cohort

Drug sensitive cohort

For the purposes of TB outcome reporting the drug sensitive cohort excludes all TB cases with rifampicin resistant TB (initial or amplified) including MDR-TB (initial or amplified), and non-culture confirmed cases treated as MDR-TB.³ Under this definition, cases with resistance to isoniazid, ethambutol and/or pyrazinamide but *without* resistance to rifampicin are included in the drug sensitive cohort. For TB outcomes in the drug resistant cohort, see Chapter 6.

Treatment outcomes for the drug sensitive cohort are reported separately for the following groups:

1. For cases with an expected duration of treatment less than 12 months, TB outcomes at 12 months are reported. This group excludes cases with CNS disease, who have an expected duration of treatment of 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.
2. For cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported. However, for cases notified in 2014, information on the final outcome was collected in 2015 which may only be one year after treatment start for many patients and treatment may therefore still be ongoing.

Due to the length of time of treatment, the most current treatment outcome data is reported for cases notified in 2014. In line with national reporting, outcomes are reported for those that started treatment and those who did not (eg diagnosed post-mortem, died without starting treatment, lost to follow up without starting treatment). In 2014, 400 TB cases were notified, of which 396 (99%) were sensitive to rifampicin and included in the drug sensitive cohort.

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

Of those with rifampicin-sensitive TB notified in 2014, 85.6% (339) had non-CNS, spinal, miliary or cryptic disseminated disease. Of these, 81.4% (276) completed treatment within 12 months, a non-statistically significant decrease from 88.1% in 2013 (Table 5). This is slightly lower than the proportion of cases in England completing treatment at 12 months (84%).¹

Table 5: Number and proportion completing treatment at 12 months, East Midlands, 2002 – 2014*

Year	TB patients		Total
	n	%	
2002	144	32.4	444
2003	128	29.6	433
2004	140	36.2	387
2005	138	28.0	492
2006	389	74.8	520
2007	382	80.6	474
2008	332	77.4	429
2009	390	80.7	483
2010	369	84.8	435
2011	359	81.8	439
2012	351	80.1	438
2013	317	88.1	360
2014	276	81.4	339

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

Of those that completed treatment, information on the length of treatment was recorded for 274 (99.3%). The majority of cases (67.9%, 186) completed treatment at between 6 and 8 months after commencement (Table 6).

Table 6: Number and proportion of cases completing treatment at 12 months by length of treatment, East Midlands, 2014*

Time from treatment start to treatment completion	n	%
<6 months	28	10.2
6-8 months	186	67.9
8-10 months	36	13.1
10-12 months	24	8.8
Total	274	100

At 12 months, 20 patients (5.9%) died before treatment completion, making death the most common reason for not completing treatment (Table 7). Ten of these deaths were diagnosed as having TB at post mortem but are still included in these overall figures. The next most common reasons for not completing treatment were that the case was still on treatment or lost to follow up – 19 cases (5.6%) and 18 cases (5.3%), respectively. Where the reason for loss of follow up was known, seven of these cases had left the UK. There were three cases (0.9%) where treatment had been stopped and three cases (0.9%) which had not been evaluated for treatment outcome at 12 months.

Table 7: TB outcome at 12 months, East Midlands, cases diagnosed in 2014*

Outcome at 12 months	n	%
Completed	276	81.4
Died	20	5.9
Lost to follow up	18	5.3
Still on treatment	19	5.6
Treatment stopped	3	0.9
Not evaluated	3	0.9
Total	339	100

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

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

Of the 57 patients with CNS, spinal, miliary or cryptic disease notified in 2014, 50.9% (29) completed treatment within 12 months and 61.4% (35) had completed at the last recorded outcome (Table 8). For those with recorded information on treatment length (33), the median treatment time was 276 days (IQR 271 – 365) (approximately 9 months).

There were seven cases (12.3%) still on treatment at the last recorded outcome, seven cases had died (12.3%) and six (10.5%) were lost to follow up.

Table 8: Last recorded TB outcome for cases with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, East Midlands, cases notified in 2014*

Outcome	n	%
Completed	35	61.4
Died	7	12.3
Lost to follow up	6	10.5
Still on treatment	7	12.3
Treatment stopped	1	1.8
Not evaluated	1	1.8
Total	57	100

*excludes rifampicin resistant TB

Deaths and lost to follow up in the drug sensitive cohort

Overall, 7.1% (28) of rifampicin sensitive cases notified in 2014 had died at the last recorded outcome. Of these, TB contributed to two (9.5%) of these deaths, was incidental to two (9.5%) and the relationship was not recorded for 17 (81%). Fourteen cases were diagnosed at post-mortem but it is unknown whether TB was an active cause of death or an incidental finding.

The proportion of rifampicin sensitive cases notified in 2014 and lost to follow up at the last recorded outcome was 6.1% (24 cases). The reason for lost to follow up was recorded for 15 of these cases, eight (53.3%) had left the UK and the remaining seven were recorded as 'other reason'. Where this was specified further, the cases had mainly not returned for treatment and could not be contacted.

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

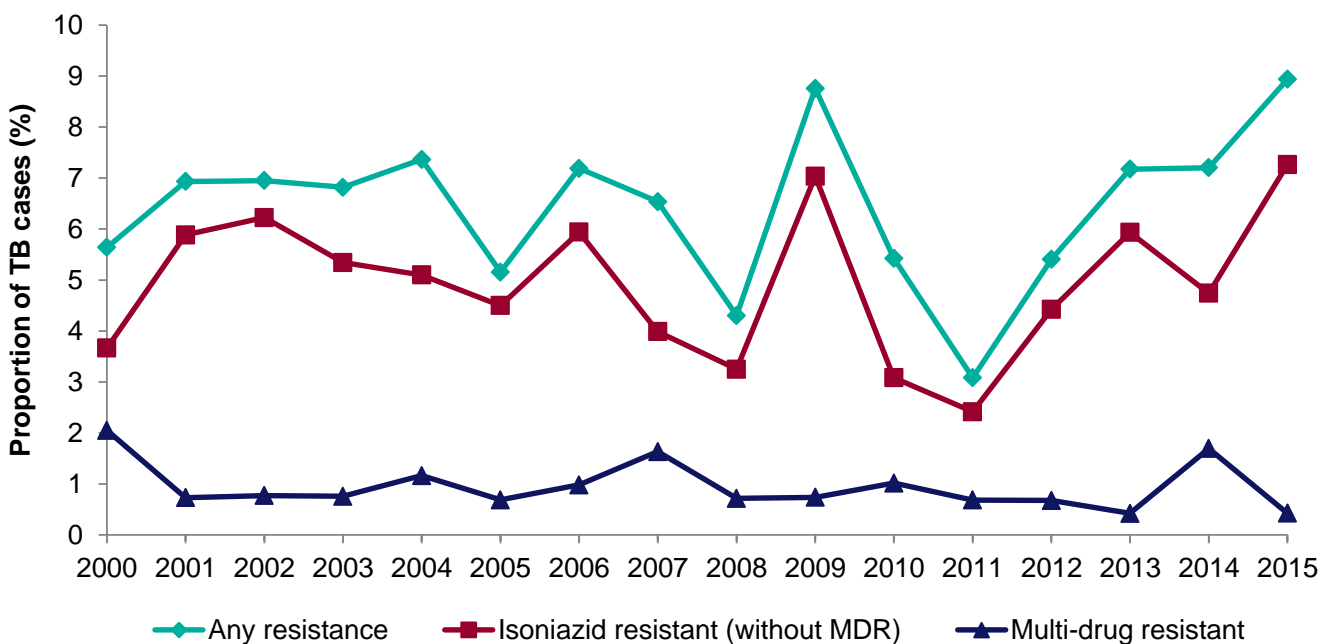
Drug resistance

Overall initial drug resistance

In 2015, resistance profiles were recorded for 96.2% (228) of culture confirmed cases and drug susceptibility test (DST) results were recorded for at least isoniazid and rifampicin for 99.2% (235) of culture confirmed cases. Of these, the proportion of TB cases resistant to one or more first line drugs was 8.9% (21 cases resistant of the 235 with DST results), which was an increase from 2014 (7.2%, 17 resistant of the 236 culture confirmed). The proportion of cases with isoniazid resistance without multi-drug resistance (MDR) increased from 4.8% (11 cases) in 2014 to 7.3% (17 cases) (Figure 13). The proportion of MDR TB cases decreased from 1.7% (4 cases) in 2014 to 0.4% (1 case), which is lower than the proportion of MDR TB cases in England (1.3%).¹

The numbers within the East Midlands are small and any year-on-year changes should be interpreted with caution. Further information can be found in Appendix B.

Figure 13: Proportion of TB cases with first line drug resistance, East Midlands, 2000 – 2015



In 2015, there was a higher proportion of resistance to one or more first line drugs in males (9.8% 14/143) compared to females (7.6%, 7/92) and the highest proportion was within the 15–44 years age range (9.9%, 14/142). Resistance was higher among cases

of pulmonary TB, 9.7% (16/165) compared to extra pulmonary TB, 7.1% (5/70). There was also a higher proportion of resistance among those born outside of the UK (10.4%, 18/173) than UK born (5.3%, 3/57). Resistance was also higher among those that had a previous diagnosis of TB (11.1%, 1/9) compared with those that did not (8.9%, 19/213).

TB outcome at 24 months for patients with rifampicin resistant disease

Due to the length of time of treatment for cases with rifampicin resistant TB, the most current treatment outcome data is reported for cases notified in 2013. In 2013, there were two cases of rifampicin resistant TB. Both cases had completed treatment (100%) at 24 months. The average treatment time in this group was 611 days (approximately 20 months).

7. TB in under-served populations

Social risk factors

In 2015, information on social risk factors was completed for 268 (78.4%) cases aged 15 years and above and 10.1% of cases had at least one social risk factor (Table 9). A social risk factor for the acquisition of TB is defined as current/history of homelessness, current/history of drug use, current/history of imprisonment or current alcohol misuse. Homelessness was the most common social risk factor (5.3%) followed by imprisonment (3.7%), drug misuse (2.6%) and alcohol misuse (2.2%) (Table 10). These risk factors are not mutually exclusive as 2.9% of cases (10) had multiple risk factors recorded.

Table 9: Social risk factors among TB cases, East Midlands, 2010 – 2015 *

Year	Any risk factor		Total
	n	%	
2010	25	6.5	384
2011	29	8.0	363
2012	24	6.6	362
2013	29	9.5	305
2014	34	12.4	275
2015	27	10.1	268

* For cases 15 years and over. Total number of cases for the year with risk factor data recorded

Table 10: Social risk factors among TB cases, East Midlands, 2015 *

Social risk factor	n	%	Total
Homelessness	16	5.3	303
Imprisonment	10	3.7	269
Drug misuse	8	2.6	313
Alcohol misuse	7	2.2	312

* For cases 15 years and over. Total number of cases for the year with risk factor data recorded

There was a statistically significantly higher proportion of TB cases with recognised social risk factors in males (15.0%, 23/153) as compared to females (3.5%, 4/115) $p=0.002$. There was also a higher proportion of TB cases with recognised social risk factors in the UK born cases (15% 12/80) than the non-UK born population (7.5%, 14/187) but the difference was non-significant.

Individuals with social risk factors were statistically significantly more likely to have pulmonary TB cases (88.9%, 24/27) than those without recognised social risk factors (56%, 135/241), $p=0.001$. They also had a higher proportion of sputum smear positive cases (58.8%, 10/17 vs 45.4%, 39/86) but this difference was not statistically significant.

There was a higher proportion of cases with drug resistance among those with at least one social risk factor (11.8%, 2/17 cases) compared to those with no risk factors (8.6%, 14/163) but this difference was not significant. Patients with social risk factors accounted for 12.5% of resistant cases in 2014.

There was a statistically significantly higher proportion of cases receiving DOT within those that reported having one or more social risk factors (47.8%, 11/23) compared to those without any social risk factors recorded (3.9%, 9/234).

Treatment completion at 12 months for rifampicin-sensitive TB cases notified in 2014 with at least one social risk factor was lower than for cases with no social risk factors (66.7% vs 86.5%) (Table 11). Treatment completion in those cases with at least one social risk factor in the East Midlands was also lower than for England as a whole (75.6%).¹ There was a higher proportion of cases that had died, were lost to follow up and still on treatment at 12 months in those with at least one social risk factor compared with those with no social risk factors (Table 11).

Table 11: TB outcome at 12 months, East Midlands, drug sensitive cases diagnosed in 2014 with at least one social risk factor*

Outcome at 12 months	At least one social risk factor		No social risk factor		Total
	n	%	n	%	n
Completed	20	66.7	180	86.5	200
Died	2	6.7	8	3.9	10
Lost to follow up	2	6.7	6	2.9	8
Still on treatment	5	16.7	11	5.3	16
Treatment stopped	0	0.0	1	0.5	1
Not evaluated	1	3.3	2	1.0	3
Total	30	100	208	100	238

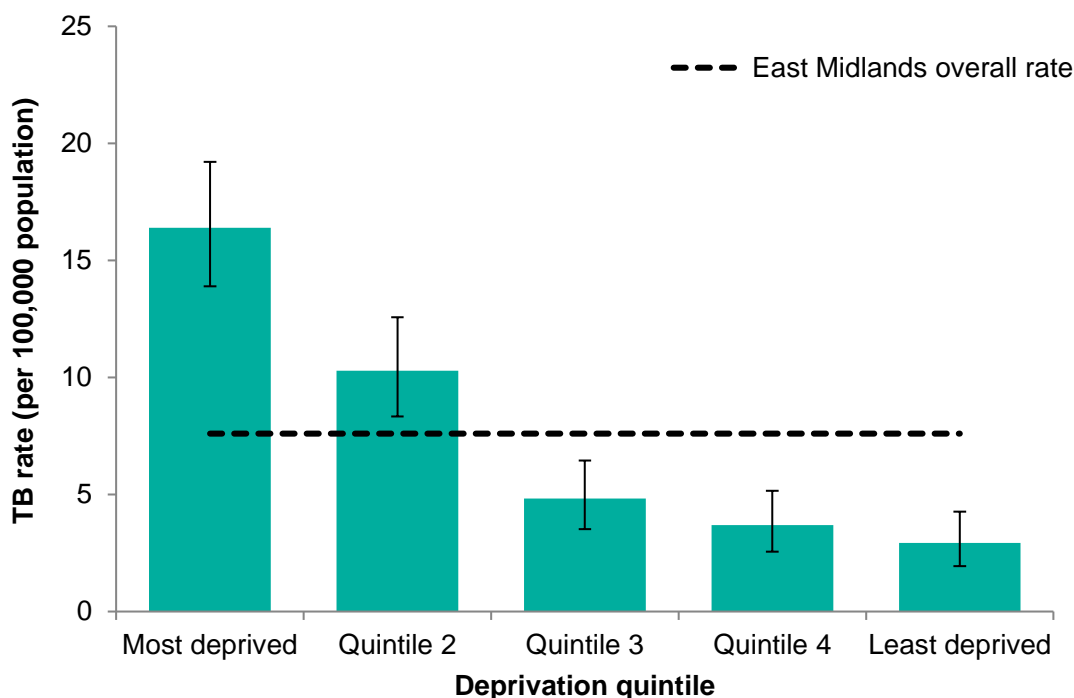
* For cases 15 years and over. Excludes rifampicin resistant TB

National TB Strategy Monitoring Indicator 17: Proportion of drug sensitive TB cases with at least one social risk factor who completed treatment within 12 months (England and PHEC)

Deprivation

In 2015, the incidence rate of TB was highest in those living in the areas that constituted the most deprived in the East Midlands; 16.4 cases per 100,000 population, which accounted for 43% of all cases (Figure 14). This compared to a rate of 2.9 per 100,000 population living in the least deprived areas, equivalent to 8% of cases.

Figure 14: TB rate per 100,000 population by deprivation quintile with East Midlands overall rate, East Midlands, 2015



8. TB-HIV co-infection and HIV testing among TB cases

HIV testing

In 2015, data on HIV testing was recorded for 91.3% of patients with previously unknown HIV status (excluding those diagnosed at post-mortem). Of these 93.1% were offered an HIV test (285 cases). Among those offered, uptake of testing was high, with 97.5% of patients (278) accepting the HIV test. Data on test results are not collected in ETS.

The proportion that were not offered testing was highest in children under 15 (58.3%, 7/12) and higher in UK born cases compared with non-UK born cases (12.1%, 11/91 vs 6.5%, 14/215).

National TB Strategy Monitoring Indicator 16: Proportion of TB cases offered an HIV test (England, PHEC, UTLA and CCG data shown on Fingertips)

HIV co-infection

To estimate co-infection, TB notifications are matched annually for cases aged 15 years and older with PHE HIV surveillance data.¹ The most recent year for which TB-HIV co-infection data are available is 2014. In 2014, 2.6% of TB cases aged 15 years and over in the East Midlands were estimated to be co-infected with HIV. This was an increase from 1.5% in 2013. However, the numbers are small and should be interpreted with care.

9. Latent TB infection testing and treatment

The Collaborative TB Strategy for England published in January 2015 outlined plans to systematically implement new entrant latent TB (LTBI) screening.⁴ This programme was based on NICE recommendations and aims to target persons aged 16 to 35 years, who entered the UK from a high incidence country ($\geq 150/100,000$ population or sub-Saharan Africa) within the last five years and had been previously living in that high incidence country for six months or longer.⁵ Those eligible for screening are identified by GP practices when registering as a new patient.

The national rollout of this programme began in April 2015 by prioritising 59 out of 209 clinical commissioning groups (CCGs) with the highest burden of TB in England. Within the East Midlands this included four CCGs; Leicester City, Nene, Nottingham City and Southern Derbyshire.

All four CCGs in the East Midlands have successfully submitted implementation plans which were approved and funded by NHS England. Three CCGs are now in the process of implementing the LTBI programme and have now started screening for LTBI.

Further information on initial results received from CCGs with operational LTBI programmes can be found in the Tuberculosis in England 2016 report.

10. Outbreaks and incidents

The East Midlands Health Protection Team (HPT) investigated 30 TB incidents or outbreaks during 2015 (Table 12). The most common incidents reported involved cases of TB in workplace settings (50%, 15/30). Lincolnshire reported the highest number of TB incidents in the East Midlands in 2015.

Table 12: Number of TB incidents reported to East Midlands HPT by setting and UTLA, East Midlands, 2015*

UTLA	Incident setting									Total
	Household	Care Home	College	Food outlet	Hospital HCW	Hospital patient	University	Visitor attraction	Workplace	
Derby City		1				1			1	3
Derbyshire			1						1	2
Leicester City			1		1	1	1		1	5
Leicestershire County and Rutland									1	1
Lincolnshire		1			1	3			10	15
Northamptonshire								1	1	2
Nottingham City	1			1						2
Nottinghamshire										0
Total	1	2	2	1	2	5	1	1	15	30

* Data source: HPZone

Discussion

In January 2015, PHE and NHS England published the Collaborative Tuberculosis Strategy for England, 2015 to 2020, which set out the actions required to achieve a year-on-year reduction in TB incidence and a reduction in the health inequalities associated with the disease.⁴ In line with the TB strategy, the East Midlands TB Control Board was established to strengthen the co-ordination and oversight of all aspects of TB control. The board includes representation from relevant local stakeholders including local government, CCGs, NHS England, acute trusts, PHE, academia and the voluntary sector. Its aim is to lead local networks to deliver the key changes outlined in the strategy. TB control boards are accountable to PHE and NHS England and aim to deliver sustained improvements in TB control, monitored through the key indicators in the strategy.

This report of TB in the East Midlands including data up until end of 2015 provides the latest epidemiological picture of TB in the area since the strategy was launched. The incidence of TB in the East Midlands has decreased in 2015, continuing a decreasing trend observed since 2012. This decrease in incidence has also been seen nationally; the East Midlands figures remain below the TB rate for England as a whole.¹

The decrease in the East Midlands was primarily seen among the non-UK born population. Nationally, the reduction in incidence rates for the non-UK born population is thought, in part, to reflect the decrease in the number of new migrants from high TB burden countries in recent years,⁶ combined with the impact of pre-entry screening^{1,7} although it is difficult to know if this is true for the East Midlands population. Approximately 40% of cases in the East Midlands are diagnosed 10 years or more after entry into the UK, which probably represents reactivation of latent TB infection.

Despite this decrease in non-UK born cases, the TB rate in the non-UK born population in the East Midlands is nearly 20 times higher than the UK born population; with India being the most common country of birth. The numbers and incidence rates of TB in the UK born population have remained relatively unchanged since 2007 but have shown a slight decrease in 2015 for the first time.

Variation in TB incidence rates continues to be seen across the East Midlands with the highest rates generally concentrated in the large urban areas of Leicester City, Nottingham City, Derby City and Northampton town. These areas have been targeted for latent TB screening of new entrants as part of the TB strategy.⁴ However, Boston local authority also had one of the highest incidence rates in the East Midlands in 2015 with Lincolnshire overall showing an increasing trend in the TB rate.

In 2015, the incidence rate of TB in UK born children under 15 years of age has decreased for the first time since 2011 and the proportion of strain typed cases found to

cluster with other cases in the East Midlands also decreased. This may suggest a decrease in recent transmission, however, it is too early to conclude if this trend will be sustained.

The time between symptom onset and starting treatment for pulmonary TB cases is of concern. Although the proportion of pulmonary TB cases starting treatment more than four months after onset has decreased, in 2015 this still accounted for just over one quarter of cases. This delay in treatment increases the opportunity for TB transmission to others. However, it is unclear whether these delays are due to the case presenting late to healthcare services, late diagnosis by clinicians or problems in the post diagnosis to treatment pathways; the delays therefore require further investigation.

The proportion of cases notified in 2014 with rifampicin sensitive and non-CNS, spinal, miliary or cryptic disseminated disease completing treatment within the East Midlands has decreased compared to 2013. This may be in part due to an increase in the number deaths reported in the East Midlands, preventing treatment completion. The proportion completing treatment at their last recorded outcome was lower among those with CNS, spinal, miliary or cryptic disseminated disease, although several patients were still on treatment.

Although there was a decrease in the number of MDR cases in the East Midlands, the proportion of cases with any drug resistance or isoniazid resistance has increased. The associated workload of drug resistant cases should not be underestimated, with drug resistant cases in the East Midlands from 2013 taking an average of 20 months to treat. Culture confirmation of cases, particularly pulmonary cases, is important to ensure drug resistant cases can be identified and effective treatment regimens put in place.

Reducing TB in the underserved population is one of the priority areas outlined in the TB strategy. In the East Midlands there is a clear trend between the acquisition and development of TB and deprivation. Although those with social risk factors account for a small proportion of East Midlands cases, they were statistically more likely to have pulmonary disease and require DOTs. In addition, treatment completion rates at 12 months were lower in those with at least one social risk factor compared to those without, probably reflecting the complex clinical and social needs of these cases. This underlines the need for good management of such patients, as described in the NICE guidance for vulnerable patients⁸ and a need to tackle ongoing social and economic factors.

Although the offer of HIV testing and uptake was high, this information was missing on 9% of patients and the offering of tests was not universal across all groups. UK guidance states all TB patients should be offered a test, regardless of age or ethnicity.⁹ Data quality and the percentage completeness of key data fields within ETS have improved for the East Midlands.¹ However, there remain variables where the recording of information could be further improved to increase understanding of TB within the East Midlands.

Conclusions and recommendations

It is encouraging that overall numbers of TB cases in the East Midlands have declined in 2015 demonstrating a positive start to the implementation of the TB strategy. However, certain risk groups are still more likely to be affected than others. This underlines the need for services to work collaboratively across the range of health and social care issues that affect underserved populations in order to achieve a marked reduction in TB and in health inequalities associated with the disease.

The East Midlands TB Control Board (TBCB) has been working closely with the seven TB Networks across the East Midlands. During 2016, a gap analysis tool assessed local TB services against both the TB strategy and the National TB service specification developed in November 2015. In addition, each TB Network in the East Midlands has fed back to the TBCB on a set of progress measures created nationally to monitor improvements since the introduction of the TB strategy. In line with national requirements, a TB workforce audit has also been completed with each TB service providing current staffing levels alongside the number of TB cases. This detailed information is being used to create a localised action plan that the TBCB will review and agree to secure improvements.

Recommendations for the NHS and PHE derived from the data presented in this report are included below in line with the strategy action areas:

1) Improve access to services and ensure early diagnosis (AfA1):

Reduce the delay in TB diagnosis through improved awareness of TB in healthcare workers.

2) Provide universal access to high quality diagnostics (AfA2)

Increase the proportion of cases that have a diagnostic laboratory result, particularly culture results to promptly identify drug resistance and allow WGS to identify clusters.

3) Improve treatment and care services (AfA3)

Commission and support highly-targeted case finding and prevention activities with a focus on underserved populations.

TB clinical teams to implement or continue cohort review as a tool to improve local TB control and as a measure of treatment outcomes and contact tracing activity.

Healthcare staff should offer universal HIV testing for all those diagnosed with tuberculosis and ensure where possible, tests are carried out in line with national guidance.¹¹

Ensure relevant information is completed accurately on the PHE ETS system, particularly with respect to dates of onset of symptoms and presentation to healthcare services and evaluation of treatment completion.

4) To tackle TB in under-served populations (AfA7)

Raise TB awareness in health care workers, allied professionals working with underserved populations and underserved populations themselves.

Ensure appropriate access to services and treatment and support to enable patients to complete treatment.

5) To implement new entrant latent TB screening (AfA8)

Sustain the roll out of new migrant LTBI screening programme within the four high-burden CCGs identified within East Midlands.

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Appendix A: Description of data sources and definitions

Data sources

Data on TB cases in East Midlands comes from the national Enhanced TB surveillance (ETS) system. Data collected includes notification details, and demographic, clinical and microbiological information, including drug resistance and strain type, provided by the Reference Laboratory.

Definitions

Social risk factors and directly observed therapy (DOT) have been defined in the RCN TB case management guidance.

Treatment outcome

Information on outcomes was reported for all cases notified in the previous year, excluding those with known rifampicin resistant disease: outcomes for these cases 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 August 2016.

Proportions

All proportions in this report are calculated among cases 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

TB rates by geographical area (Centre, local authority and MSOA), age and sex were calculated using ONS mid-year population estimates for the most recently available year. TB rates by place of birth and ethnicity were calculated using the Quarterly Labour Force Survey. <https://discover.ukdataservice.ac.uk/series/?sn=2000026>.

Cluster definitions

Strain typing was performed at the TB reference laboratories using 24 locus MIRU-VNTR profiling. Analysis was undertaken on strain type clusters defined as two or more people with TB caused by indistinguishable strains, with at least 23 complete VNTR loci. Analysis of clustering in East Midlands was carried out on cases that clustered in the East Midlands and were notified between 2010 and 2015.

Appendix B: TB among residents in the East Midlands

Table Bi: TB cases numbers by upper tier local authority and local authority of residence, East Midlands, 2000 – 2015

Upper tier local authority* and local authority district	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Derby	42	46	46	59	39	28	36	40	55	45	40	53	34	34	37	34
Amber Valley	8	6	3	2	3	5	7	2	6	5	1	6	5	4	6	3
Bolsover	1	2	2	3	0	3	3	0	2	1	1	2	5	0	4	0
Chesterfield	7	8	8	6	10	10	11	10	4	5	2	8	5	7	6	3
Derbyshire Dales	2	2	3	3	1	2	3	1	2	4	1	1	5	1	1	0
Erewash	6	6	5	7	4	0	3	4	3	4	2	7	5	2	4	6
High Peak	3	8	3	1	2	1	9	4	3	3	2	7	3	2	2	2
North East Derbyshire	2	2	2	4	3	4	3	6	3	2	1	2	1	1	2	0
South Derbyshire	7	3	3	4	2	3	4	3	5	8	5	3	3	5	3	2
Derbyshire	36	37	29	30	25	28	43	30	28	32	15	36	32	22	28	16
Leicester	148	262	196	199	155	263	226	216	178	206	207	188	184	158	142	124
Rutland	0	0	1	2	1	1	1	0	0	2	1	3	3	2	1	2
Blaby	7	4	7	7	6	10	11	7	9	6	10	4	4	8	3	3
Charnwood	11	18	14	9	19	17	19	20	13	21	18	17	7	10	4	6
Harborough	2	3	3	2	3	3	3	3	6	2	2	1	3	6	5	2
Hinckley and Bosworth	1	8	6	4	3	5	3	5	3	6	0	1	6	7	2	0
Melton	1	2	1	0	1	1	2	2	3	2	0	1	2	0	0	0
North West Leicestershire	1	4	2	4	1	1	6	3	3	1	4	1	3	2	4	4
Oadby and Wigston	9	12	9	5	3	5	11	10	3	11	6	7	10	3	5	7
Leicestershire & Rutland	32	51	43	33	37	43	56	50	40	51	41	35	38	38	24	24
Nottingham	45	52	40	36	48	58	82	80	80	55	69	67	60	58	50	53
Ashfield	2	0	2	7	4	2	5	3	1	5	3	3	7	3	9	2
Bassetlaw	3	2	2	2	3	4	1	5	2	5	4	1	4	4	3	2
Broxtowe	4	6	7	7	3	2	6	5	4	8	7	5	7	8	5	5
Gedling	6	3	5	4	1	6	7	7	4	4	8	5	8	6	6	3
Mansfield	9	5	3	3	8	4	4	5	2	5	4	5	3	4	8	2
Newark and Sherwood	1	0	1	6	1	2	3	1	1	5	1	2	3	2	4	1
Rushcliffe	3	7	0	2	1	1	3	10	5	4	6	4	6	4	3	3
Nottinghamshire	28	23	20	31	21	21	29	36	19	36	33	25	38	31	38	18
Boston	1	1	2	8	6	1	4	2	5	2	4	2	5	7	6	11
East Lindsey	0	2	1	1	2	0	2	5	0	4	4	3	1	3	6	8
Lincoln	1	1	2	0	2	5	3	3	5	2	2	4	6	5	3	4
North Kesteven	3	0	2	1	1	2	0	0	2	1	3	3	2	1	1	3
South Holland	3	1	4	3	1	3	9	1	3	4	3	1	4	1	3	3
South Kesteven	1	1	3	1	4	2	3	4	4	4	3	6	13	5	11	6
West Lindsey	2	0	0	0	3	0	4	1	1	3	2	4	0	4	4	2
Lincolnshire	11	6	14	14	19	13	25	16	20	20	21	23	31	26	34	37
Corby	6	5	6	3	1	9	4	7	5	13	9	6	5	4	5	1
Daventry	8	4	6	1	2	0	3	0	3	6	2	3	4	4	3	1
East Northamptonshire	5	2	3	1	2	3	1	0	3	3	5	2	3	2	3	3
Kettering	13	6	15	4	9	9	8	3	10	6	5	11	6	3	3	6
Northampton	21	39	47	35	53	50	41	49	29	42	35	32	47	26	27	28
South Northamptonshire	5	2	2	5	3	2	2	0	4	1	2	2	7	1	1	2
Wellingborough	14	9	4	7	5	6	10	7	9	8	10	9	8	6	5	7
Northamptonshire	72	67	83	56	75	79	69	66	63	79	68	65	80	46	47	48
East Midlands	414	544	471	458	419	533	566	534	483	524	494	492	497	413	400	354

* Upper tier local authorities are marked in bold

Table Bii: TB rate* per 100,000 population by upper tier local authority and local authority district of residence, East Midlands, 2000 – 2015**

Upper tier local authority* and local authority district	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Derby	18.2	19.9	19.8	25.3	16.6	11.8	15.1	16.7	22.7	18.4	16.2	21.3	13.6	13.5	14.7	13.4
Amber Valley	6.9	5.1	2.6	1.7	2.5	4.2	5.8	1.7	5.0	4.1	0.8	4.9	4.1	3.2	4.8	2.4
Bolsover	1.4	2.8	2.8	4.1	0.0	4.1	4.0	0.0	2.7	1.3	1.3	2.6	6.5	0.0	5.2	0.0
Chesterfield	7.1	8.1	8.1	6.0	9.9	9.9	10.8	9.8	3.9	4.9	1.9	7.7	4.8	6.7	5.8	2.9
Derbyshire Dales	2.9	2.9	4.3	4.3	1.4	2.9	4.3	1.4	2.8	5.7	1.4	1.4	7.0	1.4	1.4	0.0
Erewash	5.5	5.4	4.5	6.4	3.6	0.0	2.7	3.6	2.7	3.6	1.8	6.2	4.4	1.8	3.5	5.2
High Peak	3.4	8.9	3.4	1.1	2.2	1.1	10.0	4.4	3.3	3.3	2.2	7.7	3.3	2.2	2.2	2.2
North East Derbyshire	2.1	2.1	2.1	4.1	3.1	4.1	3.1	6.1	3.1	2.0	1.0	2.0	1.0	1.0	2.0	0.0
South Derbyshire	8.7	3.7	3.6	4.7	2.3	3.4	4.5	3.3	5.4	8.6	5.3	3.2	3.1	5.2	3.0	2.0
Derbyshire	4.9	5.0	3.9	4.0	3.4	3.7	5.7	4.0	3.7	4.2	2.0	4.7	4.1	2.8	3.6	2.0
Leicester	52.2	92.7	68.7	68.9	52.7	87.2	73.7	69.4	56.4	64.4	63.7	57.0	55.5	47.3	42.1	36.2
Rutland	0.0	0.0	2.8	5.6	2.8	2.8	2.7	0.0	0.0	5.3	2.7	8.0	8.1	5.3	2.6	5.3
Blaby	7.8	4.4	7.7	7.6	6.5	10.9	11.9	7.5	9.6	6.4	10.6	4.2	4.2	8.4	3.1	3.1
Charnwood	7.2	11.7	9.1	5.9	12.3	10.9	12.1	12.6	8.1	12.9	11.0	10.2	4.1	5.9	2.3	3.4
Harborough	2.7	3.9	3.8	2.5	3.8	3.7	3.7	3.6	7.2	2.4	2.4	1.2	3.5	6.9	5.7	2.2
Hinckley and Bosworth	1.0	8.0	6.0	4.0	2.9	4.9	2.9	4.8	2.9	5.7	0.0	0.9	5.7	6.6	1.9	0.0
Melton	2.1	4.2	2.1	0.0	2.1	2.1	4.1	4.1	6.1	4.0	0.0	2.0	3.9	0.0	0.0	0.0
North West Leicestershire	1.2	4.7	2.3	4.6	1.1	1.1	6.6	3.3	3.3	1.1	4.3	1.1	3.2	2.1	4.2	4.1
Oadby and Wigston	16.2	21.5	16.1	8.9	5.3	8.9	19.5	17.7	5.3	19.8	10.9	12.5	17.8	5.3	8.9	12.5
Leicestershire & Rutland	5.0	7.9	6.6	5.0	5.6	6.5	8.4	7.4	5.9	7.5	6.0	5.1	5.5	5.4	3.4	3.4
Nottingham	16.6	19.3	14.7	13.1	17.2	20.4	28.6	27.8	27.5	18.7	23.0	22.0	19.4	18.7	15.9	16.6
Ashfield	1.8	0.0	1.8	6.2	3.5	1.7	4.3	2.6	0.9	4.2	2.5	2.5	5.8	2.5	7.3	1.6
Bassetlaw	2.8	1.9	1.8	1.8	2.7	3.6	0.9	4.5	1.8	4.4	3.5	0.9	3.5	3.5	0.0	1.7
Broxtowe	3.7	5.6	6.5	6.5	2.8	1.8	5.5	4.6	3.7	7.3	6.4	4.6	6.3	7.2	4.5	4.5
Gedling	5.4	2.7	4.5	3.6	0.9	5.4	6.3	6.3	3.6	3.5	7.1	4.4	7.0	5.2	5.2	2.6
Mansfield	9.1	5.1	3.0	3.0	8.0	4.0	3.9	4.9	1.9	4.8	3.8	4.8	2.9	3.8	7.6	1.9
Newark and Sherwood	0.9	0.0	0.9	5.5	0.9	1.8	2.7	0.9	0.9	4.4	0.9	1.7	2.6	1.7	3.4	0.8
Rushcliffe	2.9	6.6	0.0	1.9	0.9	0.9	2.8	9.2	4.6	3.6	5.4	3.6	5.4	3.5	2.6	2.6
Nottinghamshire	3.8	3.1	2.7	4.1	2.8	2.7	3.8	4.7	2.4	4.6	4.2	3.2	4.8	3.9	4.7	2.2
Boston	1.8	1.8	3.5	14.0	10.3	1.7	6.7	3.3	8.0	3.2	6.2	3.1	7.7	10.6	9.0	16.4
East Lindsey	0.0	1.5	0.8	0.8	1.5	0.0	1.5	3.7	0.0	2.9	2.9	2.2	0.7	2.2	4.4	5.8
Lincoln	1.2	1.2	2.3	0.0	2.3	5.6	3.4	3.3	5.5	2.2	2.2	4.3	6.3	5.2	3.1	4.1
North Kesteven	3.3	0.0	2.1	1.0	1.0	2.0	0.0	0.0	1.9	0.9	2.8	2.8	1.8	0.9	0.9	2.7
South Holland	4.0	1.3	5.1	3.8	1.2	3.7	10.8	1.2	3.5	4.6	3.4	1.1	4.5	1.1	3.3	3.3
South Kesteven	0.8	0.8	2.4	0.8	3.1	1.6	2.3	3.1	3.0	3.0	2.3	4.5	9.6	3.7	8.0	4.3
West Lindsey	2.5	0.0	0.0	0.0	3.6	0.0	4.7	1.1	1.1	3.4	2.2	4.5	0.0	4.4	4.4	2.2
Lincolnshire	1.7	0.9	2.1	2.1	2.8	1.9	3.6	2.3	2.9	2.8	3.0	3.2	4.3	3.6	4.6	5.0
Corby	11.3	9.4	11.2	5.6	1.9	16.5	7.2	12.3	8.6	22.0	15.0	9.7	7.9	6.2	7.6	1.5
Daventry	11.4	5.6	8.2	1.3	2.7	0.0	3.9	0.0	3.9	7.7	2.6	3.8	5.1	5.1	3.8	1.2
East Northamptonshire	6.6	2.6	3.8	1.3	2.5	3.7	1.2	0.0	3.5	3.5	5.8	2.3	3.4	2.3	3.4	3.3
Kettering	15.9	7.3	18.0	4.7	10.5	10.4	9.1	3.3	11.0	6.5	5.4	11.7	6.3	3.1	3.1	6.1
Northampton	10.8	20.1	24.2	18.0	27.2	25.4	20.5	24.1	14.1	20.2	16.7	15.1	21.9	12.0	12.3	12.6
South Northamptonshire	6.4	2.5	2.5	6.1	3.6	2.4	2.3	0.0	4.7	1.2	2.3	2.3	8.1	1.1	1.1	2.2
Wellingborough	19.5	12.4	5.5	9.6	6.8	8.1	13.4	9.4	12.0	10.7	13.3	11.9	10.5	7.9	6.5	9.1
Northamptonshire	11.5	10.6	13.0	8.7	11.6	12.1	10.4	9.8	9.3	11.6	9.9	9.4	11.4	6.5	6.6	6.6
East Midlands	9.9	13.0	11.2	10.8	9.8	12.3	13.0	12.1	10.9	11.7	11.0	10.8	10.9	9.0	8.6	7.6

*rates calculated using ONS mid-year population estimates. ** Upper tier local authorities are marked in bold

Table Biii: TB case numbers and rate per 100,000 population by age and sex, East Midlands, 2015

Age group (years)	Female		Male		Total	
	n	rate	n	rate	n	rate
0-9	4	1.5	5	1.8	9	1.6
10-19	10	3.8	13	4.7	23	4.3
20-29	25	8.3	35	11.2	60	9.8
30-39	43	15.3	45	16.4	88	15.9
40-49	20	6.1	34	10.7	54	8.4
50-59	10	3.2	32	10.3	42	6.7
60-69	13	4.7	22	8.2	35	6.4
70+	23	6.9	20	7.5	43	7.2
Total	148	6.3	206	8.9	354	7.6

Table Biv: Drug resistance among TB patients with culture confirmed disease*, East Midlands, 2000 – 2015

Year	Any resistance		Isoniazid resistant (without MDR)		Multi-drug resistant	
	n	%	n	%	n	%
2000	11	5.6	7	3.7	4	2.1
2001	19	6.9	16	5.9	2	0.7
2002	18	6.9	16	6.2	2	0.8
2003	18	6.8	14	5.3	2	0.8
2004	19	7.4	13	5.1	3	1.2
2005	15	5.2	13	4.5	2	0.7
2006	22	7.2	18	5.9	3	1.0
2007	20	6.5	12	4.0	5	1.6
2008	12	4.3	9	3.2	2	0.7
2009	24	8.8	19	7.0	2	0.7
2010	16	5.4	9	3.1	3	1.0
2011	9	3.1	7	2.4	2	0.7
2012	16	5.4	13	4.4	2	0.7
2013	17	7.2	14	5.9	1	0.4
2014	17	7.2	11	4.7	4	1.7
2015	21	8.9	17	7.3	1	0.4

*culture confirmed cases with drug susceptibility testing results for at least isoniazid and rifampicin

Appendix C: Local authority TB epidemiological summaries

Local authority TB epidemiological summaries will provide further information about TB cases among residents of East Midlands upper tier local authorities with an average of at least 50 TB cases per year over the previous three years. These will be published shortly by your local FES team.