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Protecting and improving the nation's health

Tuberculosis in England
2017 report
(presenting data to end of 2016)

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Published October 2017
PHE publications
gateway number: 2017486

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Key points

- in 2016, there were 5,664 TB cases notified in England, down from 5,727 in 2015
- following a sustained annual decline of at least 10% in the number of TB cases since 2012, the decline slowed to 1% in 2016
- the incidence rate of TB was 10.2 per 100,000 in 2016, compared with 10.5 per 100,000 in 2015, the lowest rate since 2000
- the rate of TB in the UK born population in 2016 remained low at 3.2 per 100,000, compared with 3.3 per 100,000 in 2015
- between 2015 and 2016 there was no decline in the number of cases among the non-UK born population (4,096 in both years), in contrast to the approximately 10% annual decline in the previous three years
- the rate of TB in the non-UK born population in 2016 was 49.4 per 100,000, compared with 51.3 per 100,000 in 2015, and remained 15 times higher than in the UK born population, with 74% of TB cases born abroad
- the number of TB cases confirmed or treated as MDR/RR-TB (the drug resistant cohort) remained fairly stable in the last three years, with 68 cases in 2016; however the number (59) and proportion (1.7%) of TB cases with initial MDR/RR-TB has increased slightly compared with 2015 (53, 1.5%)
- the proportion of TB cases co-infected with HIV in 2015 was 3.8%, compared with 3.3% in 2014. The majority of TB-HIV co-infected cases were born in countries with high HIV prevalence
- in 2016, long delays between symptom onset and treatment start continued, with 31% of pulmonary TB cases experiencing a delay of more than four months, compared with 28% in 2015
- following a year-on-year improvement between 2006 and 2013, there was a second consecutive year of a small reduction in the proportion of drug sensitive TB cases completing treatment within 12 months, from 85.6% in 2013 to 83.4% in 2015
- the proportion of all drug sensitive cases reported to have died at the last recorded outcome increased from 4.7% in 2013 to 6.1% in 2015; most of these deaths occurred in those aged 65 and older

- in 2016, 11.1% of TB cases had at least one social risk factor; only a small decrease since 2015 (11.7%). TB cases with at least one social risk factor are more likely to have drug resistant TB, have worse TB outcomes and are approximately twice as likely to have been lost to follow-up or died

- BCG vaccination coverage was lower in 2016/17, compared with coverage in 2015/16 in each local authority with TB incidence ≥40 per 100,000 and a universal policy
    - in local authorities with TB incidence <40 per 100,000 and universal coverage of BCG, coverage varied from 5% to 92% in 2016/2017

- the recent steep decline in notifications of TB in England slowed to 1% in 2016. The reasons for this are as yet unclear and likely to be multifactorial. We continue to monitor the situation

- to continue the achievement of year-on-year reductions in TB incidence, and return to the steep declines seen in previous years, it is important to maintain the effort to deliver all 10 key areas for action in the *Collaborative TB Strategy for England 2015-2020* and strengthen TB control. Recommendations to achieve this are outlined at the end of this report. Specifically, it will be important to focus on:
    - reducing active TB in recent new migrants through the UK TB pre-entry screening programme
    - preventing reactivation of TB among migrants through LTBI testing and treatment
    - continuing efforts to reduce diagnostic delay through awareness raising in communities affected by TB and among health professionals
    - maintaining the quality of TB diagnostic, treatment and care services to ensure high rates of culture confirmation and treatment completion
    - maintain focus on the social factors associated with TB and ensure an integrated approach to the specific needs of under-served populations

Contents

Acknowledgements

This report was prepared by the Tuberculosis Section, Centre for Infectious Disease Surveillance and Control, National Infection Service, PHE. The report was made possible through collaboration with the Field Epidemiology Services, PHE, and Microbiology Services, PHE. We gratefully acknowledge all those who contributed information on TB cases in England, including physicians, nurses, microbiologists, scientists and administrative staff. Special thanks are extended to those who co-ordinate and oversee TB surveillance at sub-national level for their essential collaboration in the ongoing improvements to TB surveillance.

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Suggested citation

Public Health England. (2017) Tuberculosis in England: 2017. Public Health England, London.

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 TB services, public health professionals 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 TB.

Aim of report

This report describes the recent epidemiology of TB in England, providing an update on trends and burden of TB at a national and sub-national level. It also presents data on the implementation of the UK pre-entry TB screening programme, the national roll-out of systematic latent TB infection (LTBI) testing and treatment, and BCG vaccination coverage estimates. The data presented is used to inform recommendations on the ongoing implementation of the *Collaborative TB Strategy for England 2015-2020* [1].

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 2016. Data from notifications made to ETS from 2000 is updated annually to take into account denotifications, late notifications and other updates. The data presented in this year's report supersedes data in previous reports.

Experimental BCG coverage data for areas with universal BCG vaccination is presented using the Cover of Vaccination Evaluated Rapidly (COVER) programme data from April 2015 to March 2017.

Public Health England (PHE) receives three different types of LTBI testing and treatment data:

- LTBI testing data: data collected by GPs using clinical templates. This is available for three GP systems (EMISWeb, SystmOne and VISION). Clinical and demographic information on tested patients is available through these systems
- LTBI treatment data: This data is collected from secondary care (TB nursing services) using an Microsoft Excel worksheet template providing details of treatment provided to LTBI positive patients with the exception of a few CCGs, where treatment is provided in either primary or community care. Information

includes prescribing data, treatment outcomes and test results for routine follow-up tests
- Laboratory data: This data is collected by laboratories carrying out the LTBI testing and include basic demographic information and IGRA test results.

Data from the LTBI testing and treatment database (England) between July 2014 to June 2017 is presented.

Data from the pre-entry screening database (UK) is presented to the end of 2016.

Other data displays

High-level data on TB notifications in the UK to the end of 2016, and breakdowns by country, can be found in the Official Statistics for TB, *Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: UK, 2000 to 2016*. This is 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 2015-2020*, a suite of TB Strategy Monitoring Indicators has been developed (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403231/Collaborative_TB_Strategy_for_England_2015_2020_.pdf). 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 that are presented by upper tier local authority and clinical commissioning group can be found at http://fingertips.phe.org.uk/profile/tb-monitoring and will be updated with data for 2016 on 7 November 2017. Hyperlinks (in red boxes) for specific indicators are also shown throughout the report where data is presented.

Background

In January 2015, Public Health England and NHS England jointly launched the *Collaborative Tuberculosis Strategy for England 2015-2020* [1]. The strategy aims to achieve a year-on-year decrease in TB incidence, a reduction in health inequalities, and ultimately the elimination of TB as a public health problem in England.

To achieve these aims and deliver significant improvements in TB control the strategy sets out 10 key areas for action:

1. Improve access and earlier diagnosis
2. Provide universal high-quality diagnostics
3. Improve treatment and care services
4. Ensure comprehensive contact tracing
5. Improve BCG vaccination uptake
6. Reduce drug resistant TB
7. Tackle TB in under-served populations
8. Implement new entrant latent TB (LTBI) testing and treatment
9. Strengthen surveillance and monitoring
10. Ensure an appropriate workforce to deliver TB control

Since the launch of the Strategy, significant steps have been taken to deliver on the 10 ‘areas for action’, in the past year the following have been achieved:

- local implementation of the Strategy by the seven multiagency TB Control Boards
- preparation of a national TB service specification with linked TB clinical policy for commissioners and service providers
- TB awareness raising material updated in collaboration with TB Alert
- a national laboratory audit to assess TB diagnostic capability
- support to the British Thoracic Society to enhance and update the BTS MDR-TB Clinical Advice Service
- a national ‘needs assessment’ of the facilities for MDR-TB cases
- a comprehensive resource launched to tackle TB in under-served populations with local workshops and work streams to support housing the homeless with TB
- work to embed the new migrant LTBI testing and treatment programmes, funded by NHS England, in the priority CCGs
- support to TB nurses through strengthening local TB nurse networks and a second national TB nurse conference
- a review of the wider TB workforce and a conference for TB support workers

This year’s annual TB report describes the epidemiology of TB in England, provides data on the implementation of the UK pre-entry TB screening programme, the national roll-out of systematic LTBI testing and treatment and BCG vaccination coverage estimates. On the basis of data presented, recommendations are made on the further work required to deliver the aims of the Collaborative TB Strategy, and ultimately lead to improved TB control in England.

1. TB notifications and incidence

Key messages

- a total of 5,664 TB cases were notified in England in 2016, the lowest number of cases since 2000
- in 2016, there was a 1% decline in the number of cases in England from 5,727 in 2015, in contrast to the 10% year-on-year decline seen between 2012 and 2015
- the rate of TB was stable between 2015 (10.5 per 100,000, 95% CI 10.2-10.7) and 2016 (10.2 per 100,000, 95% CI 10.0-10.5)
- there was no decline in the number (4,096) of non-UK born TB cases between 2015 and 2016, following a year-on-year reduction of more than 10% between 2012 and 2015
- the rate of TB in the non-UK born population remained 15 times higher than the UK born population, and 74% of cases were non-UK born
- in 2016, the majority (63%) of non-UK born cases occurred among those who have lived in the UK for more than six years, having increased year-on-year since 2010 (49%)
- between 2015 and 2016, there was a 4% reduction in the number of cases in the UK born population, mainly among South Asian and Black-African ethnic groups although this reduction was smaller than the previous year (2014 to 2015: -13%)

Overall numbers, rates and geographical distribution

In 2016, 5,664 TB cases were notified in England, a rate of 10.2 per 100,000 population (95% confidence interval (CI) 10.0-10.5) (Figure 1.1, Appendix I Table Ai.1.1). Between 2015 and 2016, there was a small reduction in the number of cases (2015: 5,727, -1.1%), while the rate of TB was stable (2015: 10.5 per 100,000, 95% CI 10.2-10.7). This is in contrast to the large annual decline (>10%) in the number of cases and the rate of TB between 2012 and 2015 (Table Ai.1.1).

As in previous years, the main burden of disease was concentrated in large urban areas with London PHE Centre (PHEC) accounting for the highest proportion of cases in England (39.0%, 2,210/5,664), with a rate of 25.1 cases per 100,000 (95% CI 24.1-26.2). Following a year-on-year decline in the number of cases across all PHECs since 2012, in 2016, the number of cases continued to decline or remain stable in each PHEC, with the exception of the West Midlands (2015: 700 versus 2016: 721), North West (2015: 568 versus 2016: 600) and East of England (2015: 389 versus 2016: 436) (Figure 1.2, Table Ai.1.2).

Figure 1.1: TB case notifications and rates, England, 2000-2016

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

The proportion of local authority districts with a three-year average rate of less than 5.0 per 100,000 increased from 44.2% (144/326) in the period of 2011 to 2014, to 53.7% (175/326) in the period of 2014 to 2016 (Figure 1.3, Appendix II Table Aii.1.1).

Between 2014 and 2016, 39.6% (82/207) of clinical commissioning groups[1] had an average rate of less than 5.0 per 100,000 (Figure 1.4, Table Aii.1. 2).

There are seven TB control boards that have been functioning since September 2015; the number and rate of TB in each of these TB control board areas in 2016 are shown in Figure 1.5.

[1] Clinical commissioning group boundaries as at April 2017

Figure 1.2: TB case notifications and rates by PHE Centre, 2000-2016

Please note: the axes on the London figure are different to that of other PHECs due to the higher number of cases and rate of TB in London.

Figure 1.2: TB case notifications and rates by PHE Centre, 2000-2016 continued

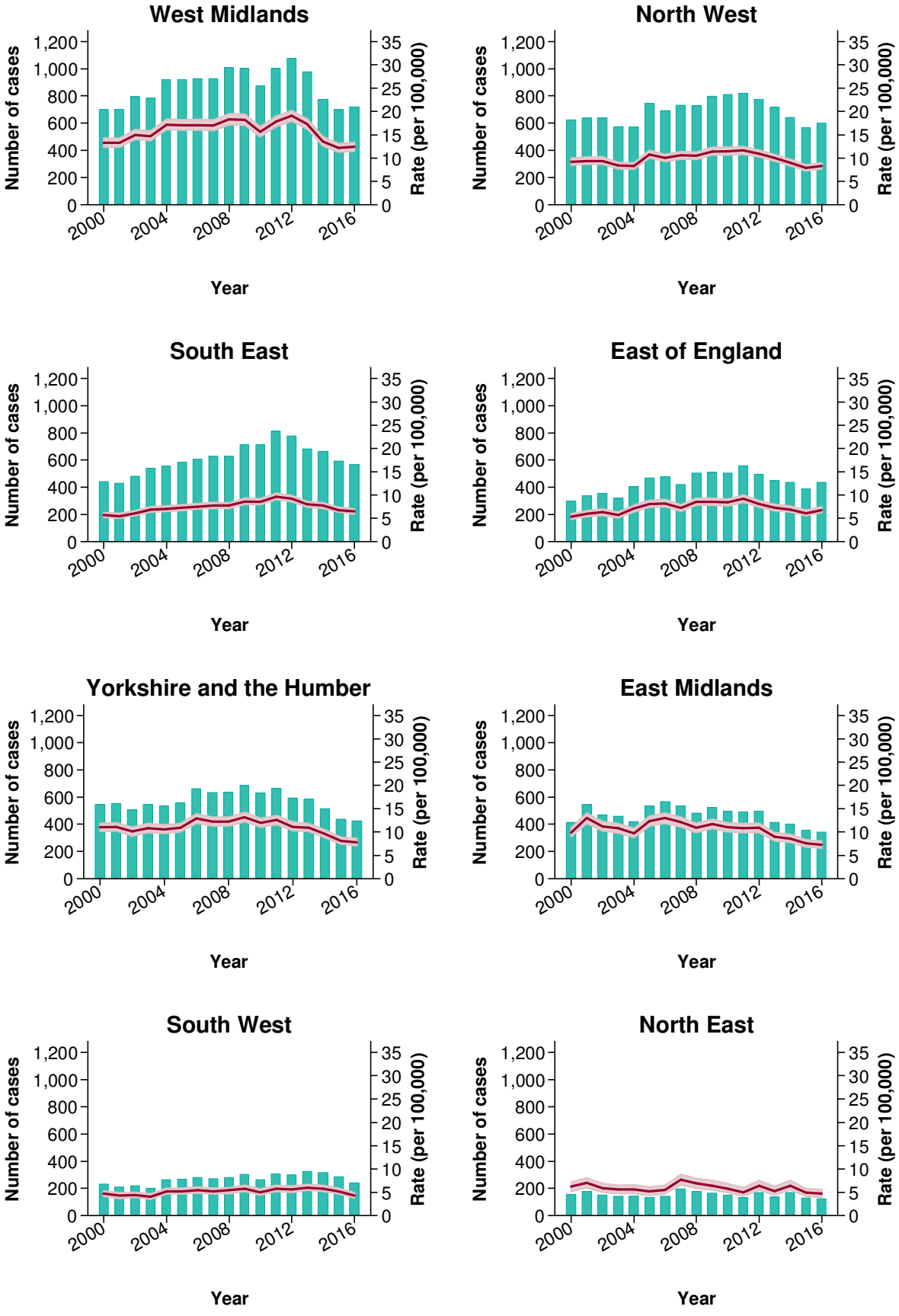


Figure 1.3: Three-year average TB rates by local authority district, England, 2014-2016 (box shows enlarged map of London area)

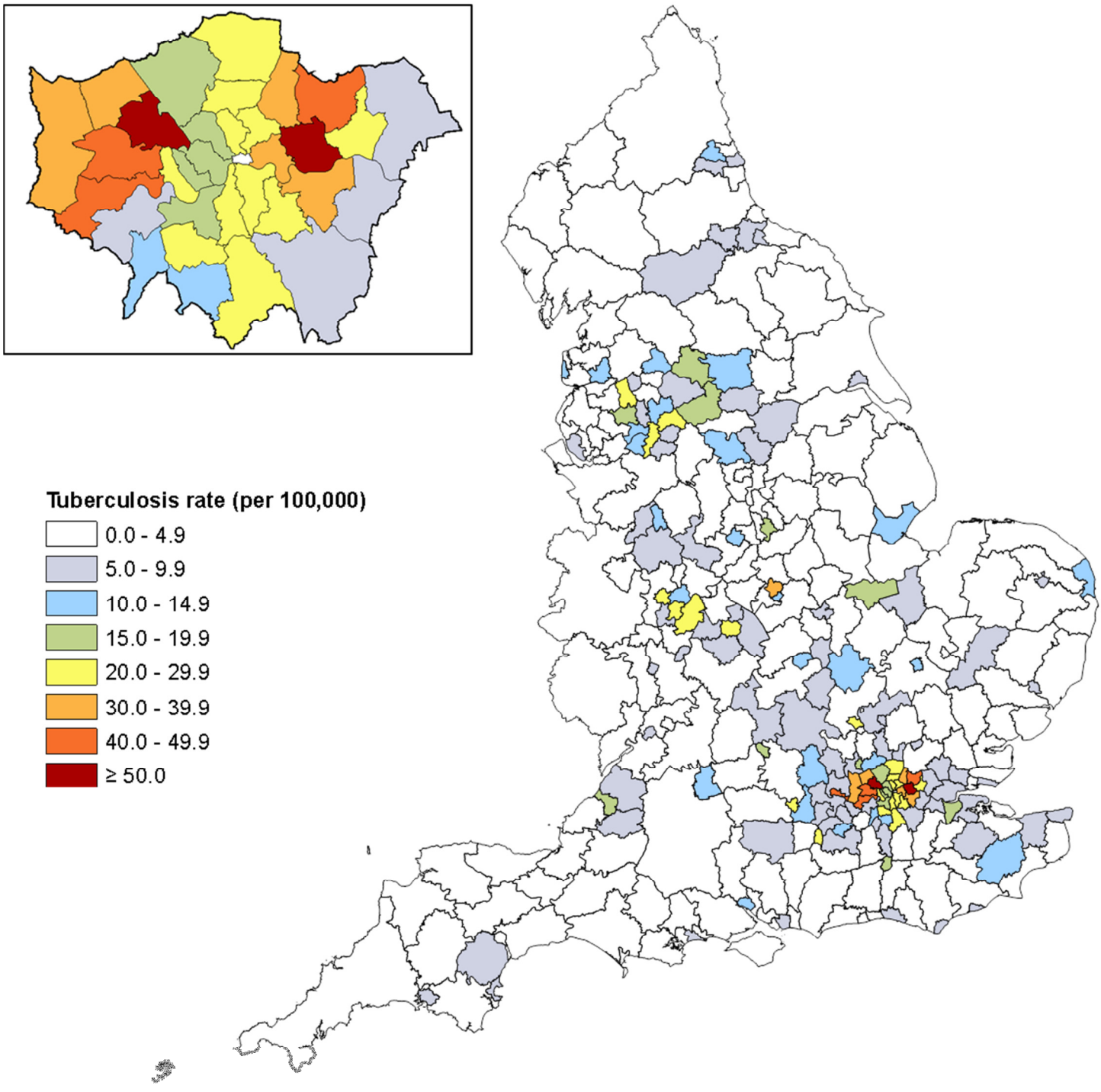
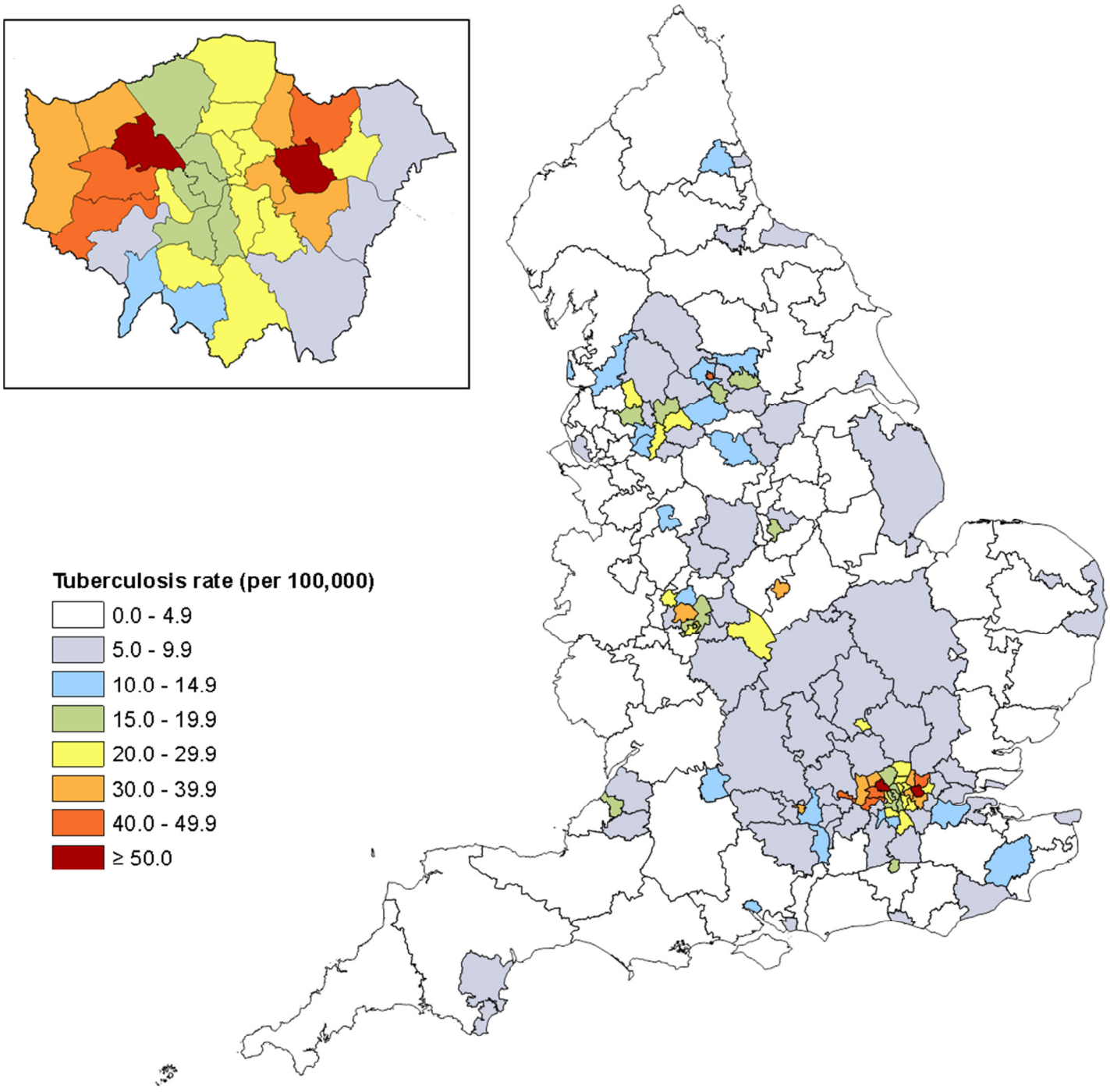
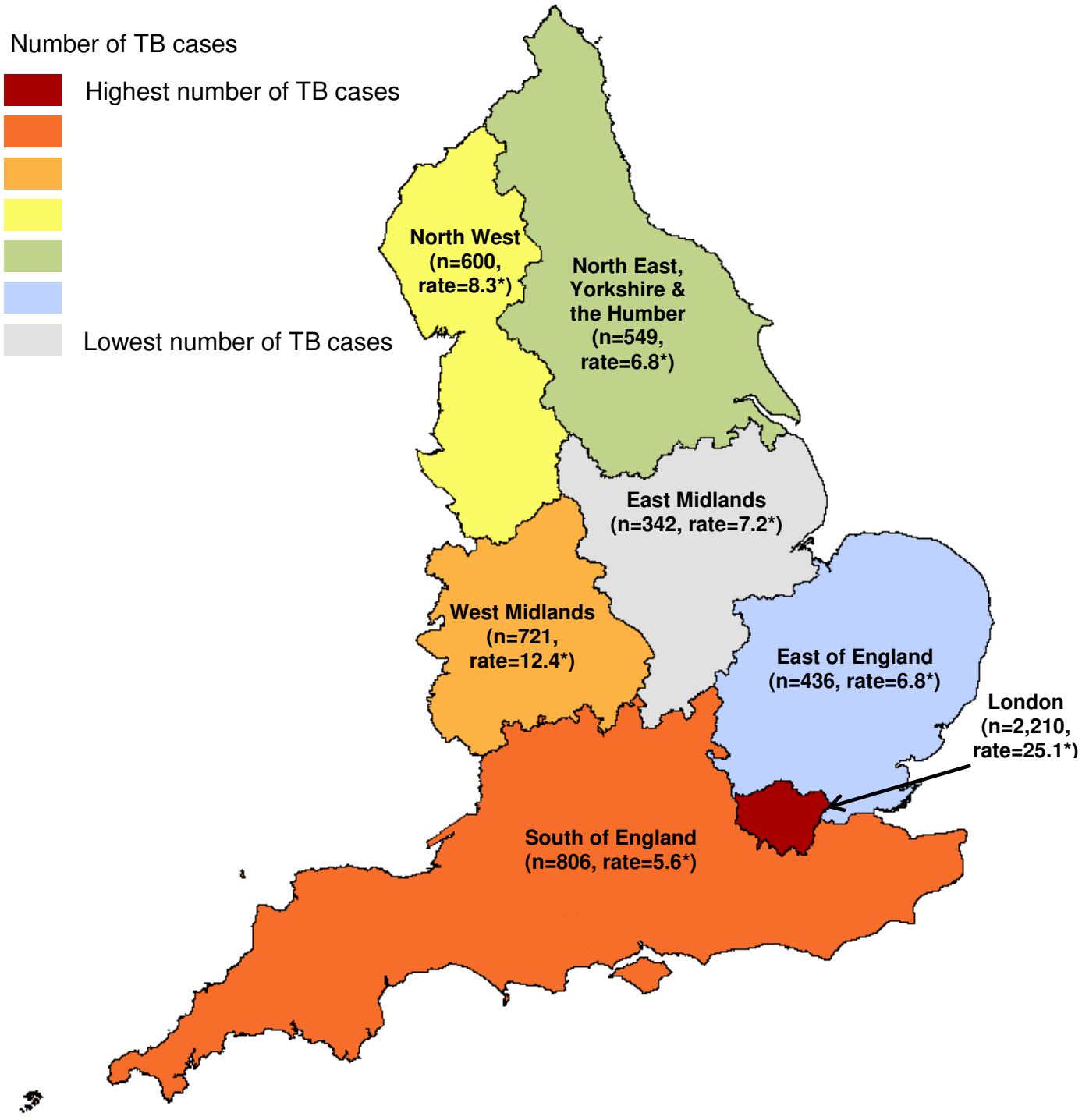


Figure 1.4: Three-year average TB rates by clinical commissioning group[2] (CCG), England, 2014-2016 (box shows enlarged map of London area)



[2] Clinical commissioning group boundaries as at April 2017

Figure 1.5: TB case notifications and rates by TB control board[3], England, 2016



* per 100,000

[3] The TB Control Boards (TBCBs) are aligned with PHEC boundaries other than North East and the Yorkshire and the Humber PHECs, which together form the North East, Yorkshire and Humber TBCB, and the South East and South West PHECs, which together form the South of England TBCB

Demographic characteristics

Age and sex

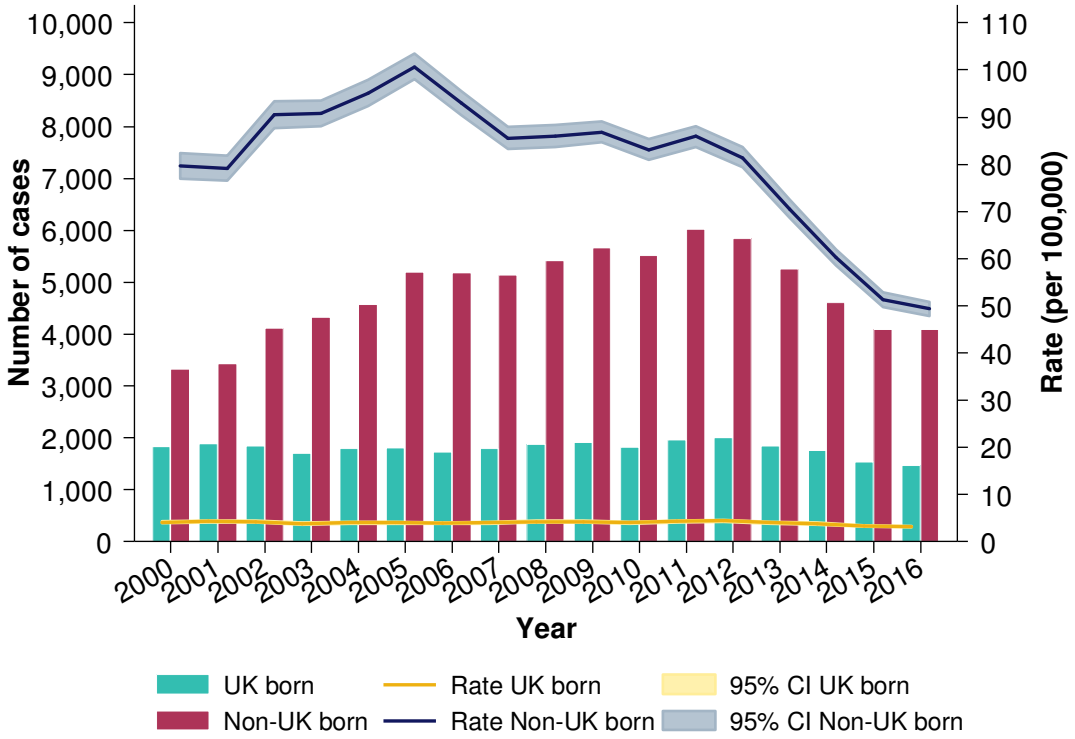
In 2016, 59.1% (3,345/5,664) of TB cases were male and 55.8% (3,159/5,664) of cases were aged 15 to 44 years old. The rate of TB was highest in those aged 25 to 29 years (18.5 per 100,000), followed closely by those aged 35 to 39 years (17.6 per 100,000), and was lowest in children aged 5 to 9 years (1.2 per 100,000). A total of 207 cases were notified in children aged less than 15 years in 2016 (Table Ai.1.3). For the rate of TB in UK born children over time, a proxy of TB transmission in England, see Chapter 3.

Non-UK born TB cases

In 2016, 73.6% (4,096/5,565) of TB cases with a known place of birth were born outside the UK. Between 2015 and 2016, there was no decrease in the number of non-UK born cases, and the rate of TB in the non-UK born population remained similar (2016: 49.4 per 100,000 versus 2015: 51.3 per 100,000), following a year-on-year decline in the non-UK born population from 2011 (6,021, 85.9 per 100,000). However, in 2016, the rate of TB in the non-UK born population was at its lowest since 2000 (Figure 1.6, Table Ai.1.4).

Similar to previous years, in 2016 the rate of TB in the non-UK born population was 15 times higher than the rate in the UK born population. In 2016, the highest rate of TB in the non-UK born population was in the older age groups (80 years and older: 69.3 per 100,000, 75 to 79 years: 62.9 per 100,000), followed by those aged 25 to 29 years (61.6 per 100,000) (Figure 1.7, Table Ai.1.3).

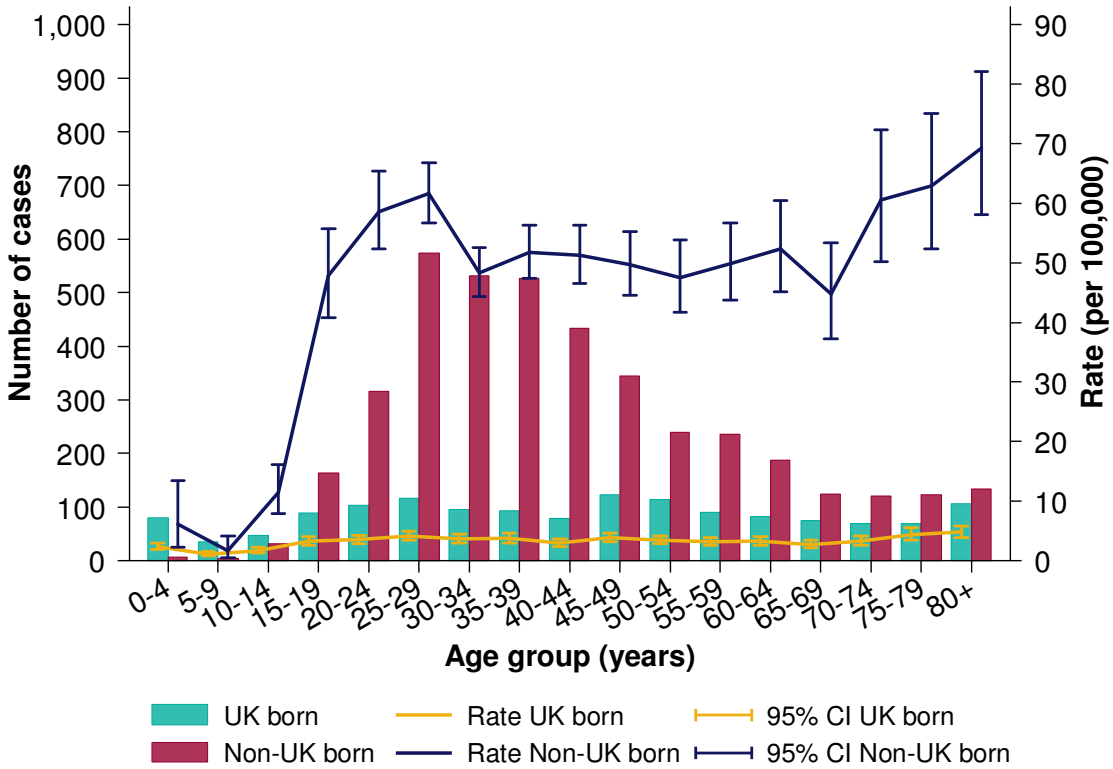
Figure 1.6: TB case notifications and rates by place of birth, England, 2000-2016



Please note: confidence intervals around the UK born population are small therefore not visible.

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

Figure 1.7: TB case notifications and rates by age group and place of birth, England, 2016



In 2016, the highest rates of TB in the non-UK born population were in the West Midlands PHEC (68.3 per 100,000), North West PHEC (55.7 per 100,000) and Yorkshire and the Humber PHEC (53.3 per 100,000) (Table Ai.1.5).

Between 2015 and 2016, the change (increase/decrease) in the number of non-UK born cases by PHEC mirrored the change in the number of cases by PHEC overall (Figure 1.8, Table Ai.1.5).

Figure 1.8: TB case notifications and rates by PHE Centre and place of birth, 2000-2016

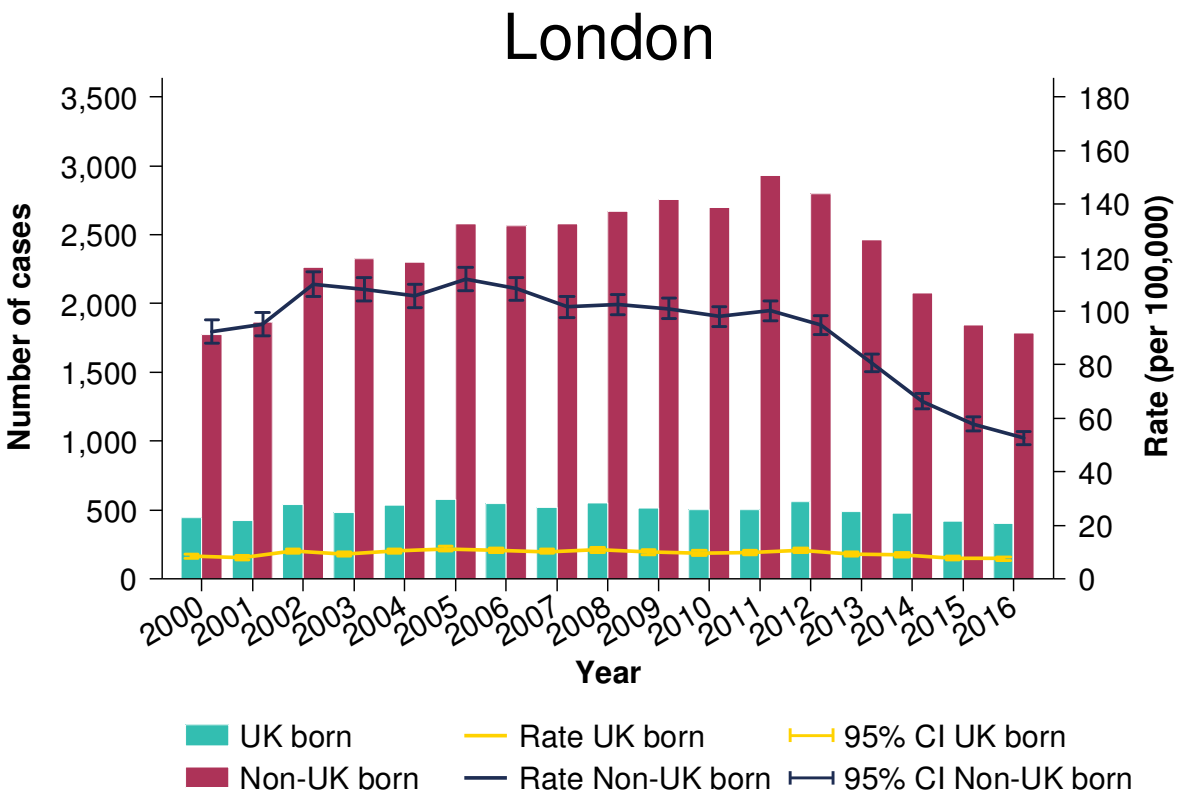
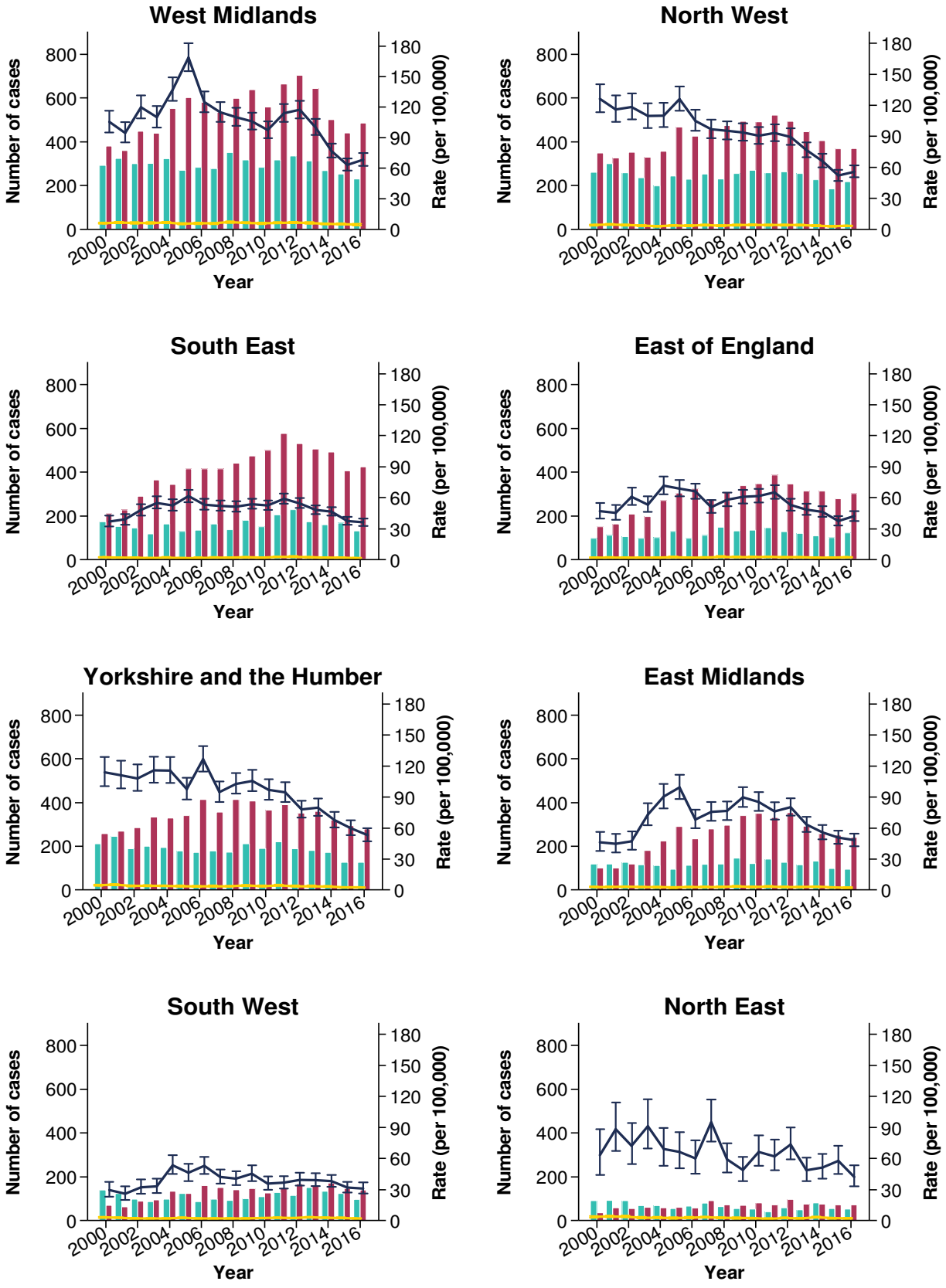
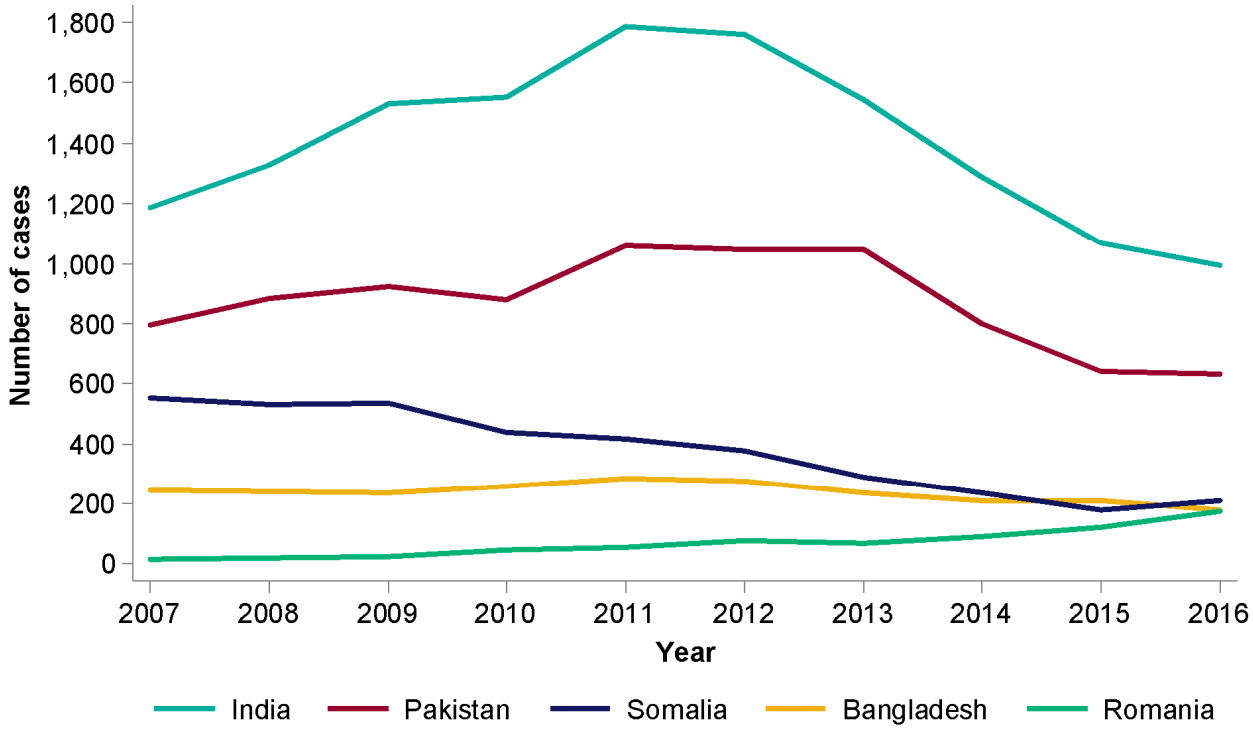


Figure 1.8: TB case notifications and rates by PHE Centre and place of birth, 2000-2016 continued



In 2016, the most frequent countries of birth for non-UK born cases were India, Pakistan, Somalia, Bangladesh and Romania (Table 1.1, Table Ai.1.6). Between 2015 and 2016, the number of cases born in India and Pakistan declined (-6.9% and -1.3% respectively), although the decline in both countries of birth was smaller than previous years (Figure 1.9, Table Ai.1.6). In contrast, the number of cases born in Somalia increased by 18.0% between 2015 (178) and 2016 (210), following a year-on-year decline since 2009 (535), and the number of cases born in Romania increased more than two-fold since 2012 (2012: 77 versus 2016: 175). The number of cases born in Eritrea also increased year-on-year since 2013 (2013: 58 versus 2016: 102), although the number was relatively low (Table Ai.1.6).

Figure 1.9: Trend in TB case notifications for the top five countries of birth* of non-UK born cases, England, 2007-2016



* Five most frequent countries of birth in 2016

There is large variation in the median time between entry to the UK and TB notification by country of birth (Table 1.1). For the most frequent countries of birth (India, Pakistan, Somalia and Bangladesh), the median time between entry to the UK and TB notification has increased since 2012. In contrast, the median time between entry to the UK and TB notification is low (two years) and has decreased or remained stable since 2012 for cases born in Romania and Eritrea. In 2016, 16.6 (634/3,817) of non-UK born cases[4] were notified within two years of entering the UK and 36.8% (1,406/3,817) within six years of entering the UK (Figure 1.10, Table Ai.1.7). Similar to previous years, the proportion of cases notified more than 11 years since entry increased, from 29.0%

[4] Where time between entry to the UK and notification is known

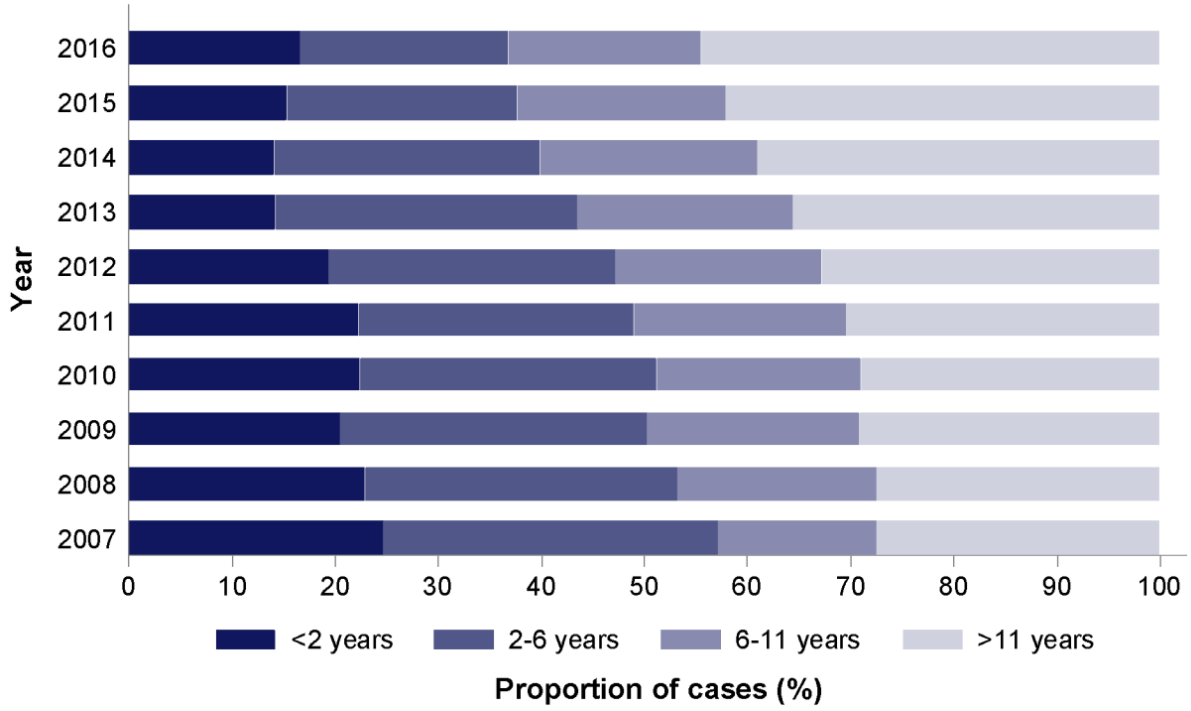
(1,382/4,759) in 2010 to 44.5% (1,697/3,817) in 2016. Between 2014 and 2016, there was a small increase in the proportion of cases notified within two years of entering the UK (2014: 14.1%, 603/4,271 versus 2016: 16.6%, 634/3,817) (Figure 1.10, Table Ai.1.7). This increase mainly occurred in cases entering between one and two years prior to notification (2014: 5.9%, 251/4,271 versus 2016: 7.8%, 298/3,817), compared with those entering within one year of notification (2014: 8.2%, 352/4,271 versus 2016: 8.8%, 336/3,817).

Table 1.1: Most frequent countries of birth for TB cases and time between entry to the UK and TB notification, England, 2016

Country of birth	Number of cases	Proportion of cases (%)*	Median time since entry to UK (IQR)**
United Kingdom	1,469	26.8	-
India	994	18.1	9 (3-19)
Pakistan	632	11.5	13 (5-32)
Somalia	210	3.8	11 (6-16)
Bangladesh	176	3.2	13 (6-26)
Romania	175	3.2	2 (0-4)
Nepal	109	2.0	5 (3-8)
Philippines	106	1.9	10 (5-13)
Eritrea	102	1.9	2 (0-6)
Nigeria	100	1.8	10 (5-18)
Zimbabwe	84	1.5	13 (9-15)
Sri Lanka	82	1.5	14 (8-18)
Poland	69	1.3	8 (4-10)
Kenya	59	1.1	15 (9-36)
Afghanistan	53	1.0	6 (0-13)
Other (<1%)	1,065	19.4	8 (2-17)
Total*	**5,485**	**100.0**	**9 (3-16)**

* Where country of birth was known
** Years, IQR refers to interquartile range

Figure 1.10: Time between entry to the UK and TB notification for non-UK born cases, England, 2007-2016



UK born TB cases

In 2016, there were 1,469 TB cases among the UK born population, a rate of 3.2 per 100,000 (95% CI 3.0-3.3) (Figure 1.6, Table Ai.1.4). There was a small decline in the number of cases (2015: 1,529, -3.9%), while the rate of TB has remained similar (2015: 3.3 per 100,000, 95% CI 3.2-3.5), following a larger overall decline between 2012 and 2015 in number of cases (-23.7%) and rate of TB (-25.0%).

The age distribution of UK born cases differs substantially to that of non-UK born cases, with a fairly even distribution of cases and rates across all the adult age groups; the highest rate being in the population aged 80 years and older (4.8 per 100,000, 95% CI 3.9-5.8) (Figure 1.7, Table Ai.1.3).

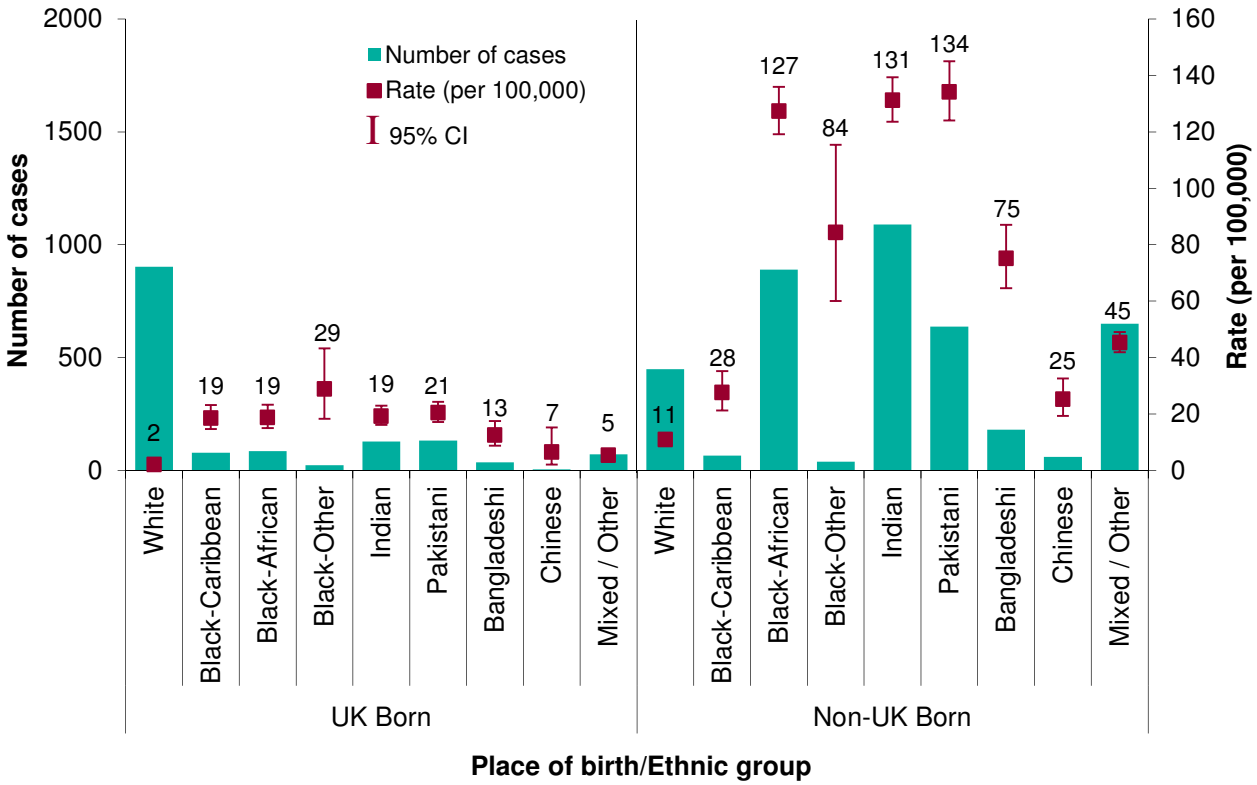
In 2016, the number of cases in the UK born population continued to decline or remain stable in all PHECs, with the exception of the East of England PHEC (2015: 102 versus 2016: 122) and the North West PHEC (2015: 185 versus 2016: 217) (Figure 1.8, Table Ai.1.5).

Of the UK born TB cases notified in 2016 where ethnic group was known, the majority (61.7%, 902/1,461) were from the White ethnic group, 20.3% (296/1,461) from South Asian[5] ethnic groups and 12.8% (187/1,461) from Black[6] ethnic groups. Rates were

[5] Indian, Pakistani and Bangladeshi ethnic groups
[6] Black-Caribbean, Black-African and Black-Other ethnic groups

highest in the non-White ethnic groups, with rates between three and fourteen times higher than in the White ethnic group (Figure 1.11, Table Ai.1.8).

Figure 1.11: TB case notifications and rates by place of birth and ethnic group, England, 2016

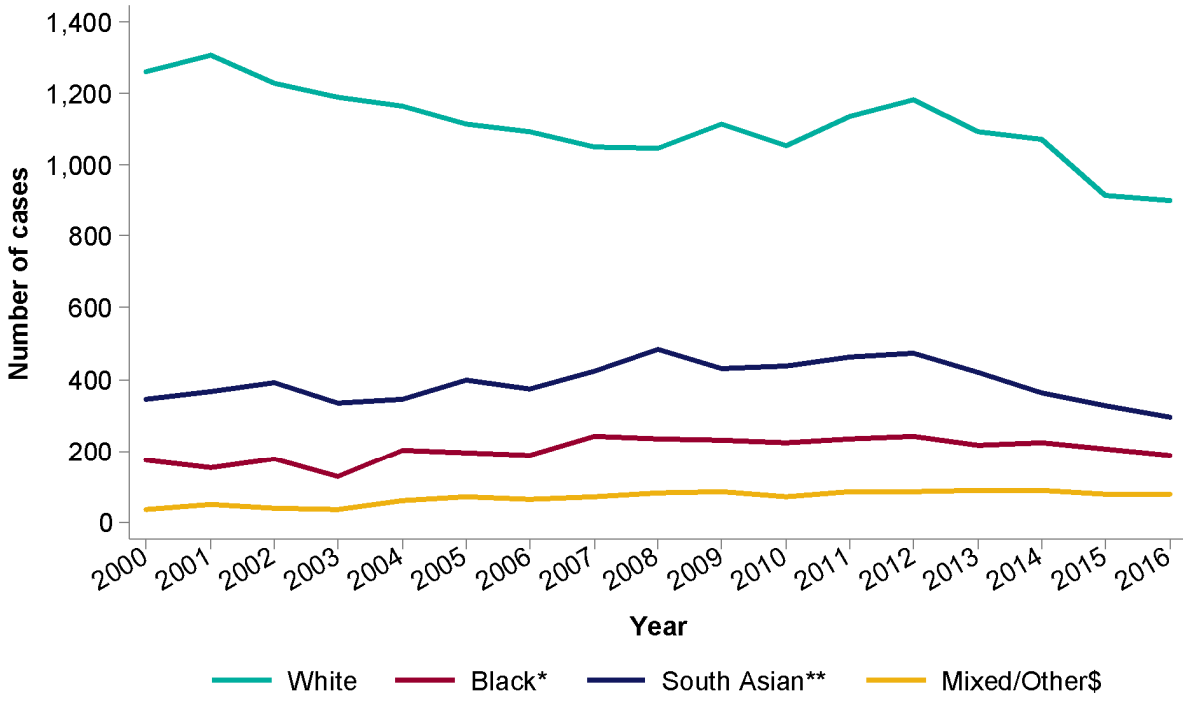


Please note: rates by ethnic group are displayed as labels.

The decline in the number of cases in the UK born population between 2015 and 2016 occurred among all ethnic groups, with the largest decline among South Asian[7] (-9.8%) and Black[8] (-8.8%) ethnic groups, and a smaller decline in the White ethnic group (-1.6%) (Figure 1.12, Table Ai.1.9).

[7] Indian, Pakistani and Bangladeshi ethnic groups
[8] Black-Caribbean, Black-African and Black-Other ethnic groups

Figure 1.12: Number of UK born TB cases over time by ethnic group, England, 2000-2016



* Cases with Black-Caribbean, Black-African and Black-Other ethnic groups were grouped as 'Black'
** Cases with Indian, Pakistani and Bangladeshi ethnic groups were grouped as 'South Asian'
$ Cases with Mixed/Other and Chinese ethnic groups were grouped as 'Mixed/other'

Occupation

Among cases notified in 2016 aged between 16 and 64 years with a known occupation, 35.2% (1,491/4,240) were not in education or employment (for further information see Chapter 7); 10.2% (432) were either studying or working in education, 7.1% (304) were healthcare workers, and the remaining cases (47.5%, 2,013) were classed as working in other occupations.

Clinical characteristics

Site of disease

Over half of cases[9] notified in 2016, had pulmonary disease (53.9%, 3,041/5,642) (Table 1.2) and one-quarter (25.0%, 761/3,041) of these also had extra-pulmonary disease in at least one other site. A much higher proportion of non-UK born cases had extra-pulmonary disease only (51.4%, 2,103/4,089), compared with UK born cases (31.9%, 467/1,465) (Table Ai.1.10).

[9] Where site of disease was known

Table 1.2: TB case notifications by site of disease, England, 2016

Site of disease*	Number of cases	Proportion (%)**
Pulmonary	3,041	53.9
Miliary	161	2.9
Laryngeal	17	0.3
Extra-pulmonary	3,362	59.6
Extra-thoracic lymph nodes	1,335	23.7
Intra-thoracic lymph nodes	740	13.1
Unknown extra-pulmonary	653	11.6
Pleural	453	8.0
Other extra-pulmonary	386	6.8
Gastrointestinal	335	5.9
Bone – spine	211	3.7
Bone – not spine	125	2.2
CNS – meningitis	117	2.1
CNS – other	117	2.1
Genitourinary	89	1.6
Cryptic disseminated	55	1.0

* With or without disease at another site
** Proportion of cases with known sites of disease (5,642), total exceeds 100% due to disease at more than one site
CNS - Central Nervous System

Directly observed therapy (DOT)

Information on whether a case received DOT[10] was known for 94.2% of cases (5,333/5,664) notified in 2016. Of these, 14.3% (761) were reported to have received DOT (for further information see Chapter 7). In 2016, 30.3% (59/195) of cases aged less than 15 years received DOT (Table Ai.1.11).

Previous history of TB

For cases[11] notified in 2016, 6.5% (351/5,402) had a previous diagnosis of TB more than 12 months before their current notification. Among those with a previous diagnosis of TB, 92.6% (262/283) were known to have previously been treated for TB and 38.3% (127/332) received DOT during their current notification. Time since previous diagnosis was known for 88.3% (310/351) of these cases, with a median time since previous diagnosis of 9 years (IQR 3-22 years).

[10] In the Enhanced TB Surveillance system (ETS), the relevant variable is “Patient to begin a course of treatment under direct observation”; in the London TB Register (LTBR) the relevant variable is “Patient was taking Directly Observed Therapy at any time during the episode of care”.
[11] With known previous history of TB

Co-morbidities

Data completeness[12] of each co-morbidity status including diabetes, hepatitis B, hepatitis C, chronic renal disease, chronic liver disease and immunosuppression of all causes varied in 2016, with the lowest proportion of completion for hepatitis C status (76.6%, 2,646/3,454) and the highest proportion of completion for diabetes status (87.3%, 3,017/3,454).

Eleven percent (10.5%, 317/3,017) of cases had diabetes, 1.7% (44/2,654) had hepatitis B, 1.5% (41/2,646) had hepatitis C, 2.7% (81/2,953) had chronic renal disease, 1.2% (34/2,919) had chronic liver disease and 4.3% (125/2,909) were immunosuppressed (Table 1.3). Of those who were immunosuppressed[13], 17.6% (22) were known to have had cancer, 15.2% (19) were on biological therapy (including anti-TNFα treatment) and 12.0% (15) had had a transplant (Table 1.3).

Table 1.3: TB case notifications by co-morbidity status, England*, 2016

Co-morbidity	n	%	Total**
Diabetes	317	10.5	3,017
Hepatitis B	44	1.7	2,654
Hepatitis C	41	1.5	2,646
Chronic renal disease	81	2.7	2,953
Chronic liver disease	34	1.2	2,919
Immunosuppression	125	4.3	2,909
Cancer	22	17.6	125
Biological therapy	19	15.2	125
Transplantation	15	12.0	125
Steroids	9	7.2	125
Auto-immune disease	5	4.0	125
Other	27	21.6	125
Unknown	10	8.0	125

*Excludes cases from London
** Where information on co-morbidity status was known

[12] Excludes London cases, as these data fields were not available in LTBR in 2016
[13] Data relating to immunosuppression are collected in ETS, however data on HIV status (including whether immunosuppression is due to HIV) is not collected. For data on TB-HIV co-infection, see chapter 8.

Travel and visitor risk factors

Information on history of travel to, and visitors received, from a country[14] outside the UK in the two years prior to TB diagnosis was known for 77.6% (2,679/3,454) and 71.0% (2,453/3,454) of TB cases[15] in 2016, respectively. Seventeen percent (17.2%,462) of TB cases had travelled outside the UK and 7.3% (178) had received a visitor from outside the UK (Table 1.4). In 2016, 23.3% (420/1,800) of non-UK born cases had travelled to a country outside the UK, compared with only 4.7% (41/867) of UK born cases (Table 1.4).

Table 1.4: Number and proportion of TB case notifications with history of travel to and visitors received from a country* outside the UK in the last two year prior to diagnosis, England, 2016**

	Travel to a country outside the UK			Visitor received from outside the UK		
Place of birth[$]	**n**	**%**	**Total**	**n**	**%**	**Total**
UK born	41	4.7	867	26	3.2	821
Non-UK born	420	23.3	1,800	151	9.3	1,621
Total[#]	462	17.2	2,679	178	7.3	2,453

* Excludes countries in Western Europe, US, Canada, New Zealand and Australia
** Excludes London cases
[$] Where place of birth was known
[#] Total includes those with unknown place of birth

For non-UK born cases where the country of travel or origin of visitor was known, 87.8% (347/395) of cases had travelled to their country of birth, and 77.5% (117/151) of cases had received a visitor from their country of birth.

In 2016, a high proportion of cases from India (26.8%, 122/455), Pakistan (22.1%, 80/362), Romania (24.7%, 19/77), Nepal (31.0%, 18/58) and the Philippines (41.5%, 22/53) had travelled outside the UK in the two years prior to diagnosis, the majority of whom had travelled to their country of birth.

[14] Excludes countries in Western Europe, US, Canada, New Zealand and Australia
[15] Excludes London cases, as these data fields were not available in LTBR in 2016

2. Laboratory confirmation of TB

Key messages

- in 2016, 63% of TB cases were culture confirmed; an increase of 2% from 2015
- as in previous years, a higher proportion of pulmonary TB cases were culture confirmed compared with extra-pulmonary TB cases (76% versus 48%)
- culture confirmation was lowest (26%) among cases less than 15 years of age, similar to previous years
- only 63% of pulmonary TB cases had a sputum smear result reported, and 56% of these were positive
- 29% of cases were not confirmed by any laboratory method (culture, microscopy, histology or PCR)
- the number and proportion of isolates in 2015 which could not be matched to a notification within the same, previous or subsequent year (60, 1.7%) was the lowest since 2007

Laboratory tests data collection

Data for all culture confirmed TB isolates from the National Mycobacterium 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 (see Appendix III: Methods), and the results were used to report culture confirmation. Results for microscopy, PCR and histology were collected in ETS (see Appendix III: Methods).

Culture confirmation

Of TB cases notified in 2016, 63.0% (3,570/5,664) were culture confirmed, an increase of 2.0% from 2015 (61.0%, 3,492/5,727) (Table Ai.2.1). Among pulmonary TB cases, in 2016 76.0% were culture confirmed (2,310/3,041), compared with 74.1% in 2015 (2,244/3,027) (Table Ai.2.2). In 2016, as in previous years, a higher proportion of pulmonary cases were culture confirmed compared with extra-pulmonary cases (76.0%, 2,310/3,041 versus 48.1%, 1,251/2,601).

Culture confirmation varied by PHEC, with the highest proportion of culture confirmed cases in Yorkshire and the Humber (71.8%, 305/425) and the lowest in the West Midlands (57.1%, 412/721) (Table Ai.2.1). Between 2015 and 2016, the proportion of culture confirmed cases decreased in the East Midlands (67.4% in 2015 versus 61.4% in 2016) and North West (63.2% in 2015 versus 62.8% in 2016) while all other PHECs remained stable or had a slight increase in the proportion of culture confirmed cases.

In 2016, as in previous years, the proportion of culture confirmation was lower among TB cases aged less than 15 years (26.1%, 54/207) compared with those aged 15 to 44 years (67.4%, 2,130/3,159), 45 to 64 years (59.2%, 856/1,445) and 65 years and older (62.1%, 530/853). Among TB cases aged less then 15 years, the proportion of culture confirmation for pulmonary cases was 28.6% (40/140) compared with 22.2% (14/63) for extra-pulmonary cases.

Among culture confirmed TB cases notified in 2016 (3,570), 96.2% (3,434) were identified as *Mycobacterium tuberculosis*, 1.0% (34) *Mycobacterium bovis,* 1.4% (51) *Mycobacterium africanum*, 0.1% (3) *Mycobacterium microti* and 1.3% (48) *Mycobacterium tuberculosis* complex, which were not further differentiated (Table Ai.2.3).

Sputum smear test results

Of all pulmonary TB cases notified in 2016, 63.1% (1,920/3,041) had a sputum smear (microscopy) result reported, of which 56.1% (1,077/1,920) were positive. While the proportion of pulmonary cases with a reported sputum smear result has increased each year since 2009 (56.3%), the proportion reported is still too low to allow further robust analysis. Ninety-four percent (94.2%, 1,015/1,077) of those with a positive sputum smear were also culture confirmed, compared with only 68.3% (576/843) of sputum smear negative cases. Thirteen percent (13.2%, 402/3,041) of pulmonary TB cases had no sputum smear result or culture confirmation.

Other laboratory test results

In 2016, 21.2% (443/2,094) of TB cases that were not culture confirmed had an alternative positive laboratory test (microscopy, histology or PCR) result indicative of TB, with the highest proportion (13.1%, 275/2,094) positive on histology (Table 2.1). However, a high proportion (78.8%, 1,651/2,094) of cases that were not culture confirmed did not have any other known positive lab result reported. Overall, 29.1% (1,651/5,664) of all cases were not confirmed by any laboratory method (culture, microscopy, histology or PCR), a slight improvement since 2015 (31.6%, 1,810/5,727).

Table 2.1: Number and proportion of non-culture confirmed TB cases by method of laboratory confirmation, England, 2016

Laboratory test results*	Pulmonary		Extra-pulmonary		All cases**	
	n (731)#	%	n (1,350)#	%	n (2,094)#	%
Sputum smear positive	62	8.5	0	N/A	62	3.0
Smear positive (not sputum)	21	2.9	43	3.2	65	3.1
Histology positive	59	8.1	216	16.0	275	13.1
PCR positive	14	1.9	50	3.7	64	3.1
No known positive lab result	584	79.9	1,055	78.1	1,651	78.8

* Some cases may have more than one test result therefore the total percentage may exceed 100%
** Total cases including those with an unknown site of disease
# Total number of non-culture confirmed TB cases, used as the denominator in proportion of laboratory test results shown

TB isolates not matched to notified cases

Unmatched isolates[16] may be due to TB cases that were not notified, and can therefore provide an estimate of under-reporting. However, some isolates may also have failed to match to a notified case if personal identifiers were incomplete or inaccurate, and a small number may represent contaminants which were not identified as such in surveillance reporting.

The number and proportion of isolates received from National Mycobacterium Reference Laboratories that could not be matched to a notified case in the previous, same or subsequent year, decreased from 419 isolates (8.6%) in 2007 to 60 isolates (1.7%) in 2015 (Table 2.2). In 2016, isolates from 213 (6.0%) individuals could not be matched to a case notified in the previous or same year (Table 2.2). As in previous years, the proportion of unmatched isolates for 2016 is likely to decrease further once matched to 2017 notifications.

[16] Isolates are deduplicated to only count one isolate per case per notification period, see Appendix III: Methods for further information.

Table 2.2: Unmatched isolates by specimen year, England, 2007-2016

Specimen year	Unmatched to a case within the previous or same year		Unmatched to a case within the previous, same or subsequent year		All isolates*
	n	%	n	%	n
2007	607	12.4	419	8.6	4,890
2008	668	13.3	427	8.5	5,015
2009	590	11.7	360	7.1	5,038
2010	505	10.3	266	5.4	4,889
2011	497	9.3	209	3.9	5,327
2012	425	8.5	162	3.2	5,022
2013	367	8.1	159	3.5	4,505
2014	271	6.9	109	2.8	3,952
2015	250	7.0	60	1.7	3,557
2016	213	6.0	-	-	3,575

* Deduplicated based on patient identifiers to represent one isolate per case per notification period

3. TB transmission

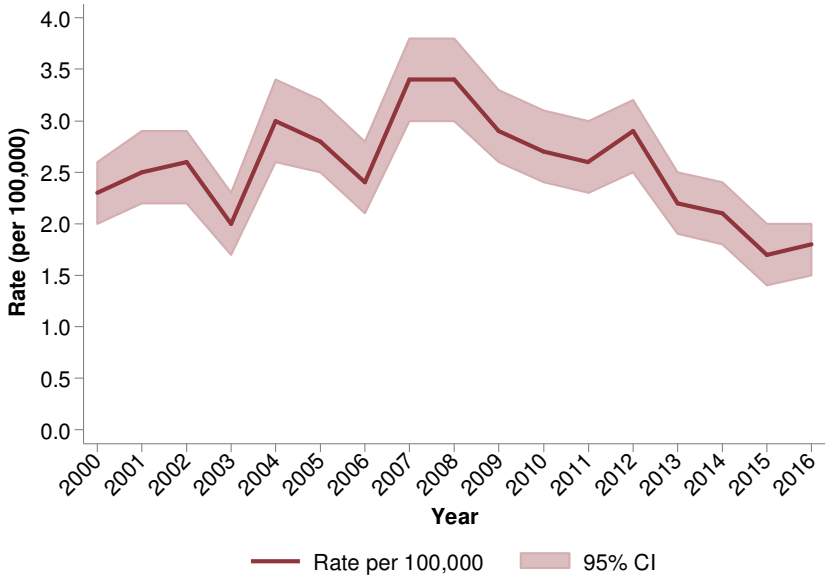
Key messages

- in 2016, the rate of TB in UK born children, a proxy for recent transmission in England, was 1.8 per 100,000; a 47% reduction from the peak of 3.4 per 100,000 in 2008
- the proportion of MIRU-VNTR strain typed TB cases that clustered decreased from 62% in 2012 to 58% in 2016
- the number of new clusters detected each year decreased between 2012 and 2015, but increased slightly in 2016
- the majority of strain type clusters between 2010 and 2016 were small, with almost half (45%) containing only two cases
- whole genome sequencing was rolled out in Central and North England at the end of 2016, and will be fully rolled out across England by the end of 2017 at which time MIRU-VNTR typing will be terminated

Rate of TB in UK born children

In 2016, the rate of TB in UK born children less than 15 years of age, a proxy for recent transmission within England, was 1.8 per 100,000 (95% CI 1.5-2.0), similar to 2015 (1.7 per 100,000, 95% CI 1.4-2.0). There has been a 47.1% overall reduction in this rate since the peak of 3.4 per 100,000 (95% CI 3.0-3.8) in 2007 and 2008 to the rate in 2016. (Figure 3.1, Table Ai.3.1).

Figure 3.1: Rate of TB in UK born children*, England, 2000-2016



* Aged less than 15 years

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

Strain typing and clustering

The National TB Strain Typing Service in England was established in 2010 to prospectively type TB isolates using 24 loci MIRU-VNTR. In December 2016, the service was terminated in North and Central England and replaced by whole genome sequencing (WGS). The service will be fully terminated throughout England by the end of 2017 (see WGS section below for further details).

Clustered cases (with indistinguishable MIRU-VNTR strain types) may reflect cases that are part of the same chain of transmission, but could also reflect common endemic strains circulating either within England or abroad. MIRU-VNTR strain typing can be used to refute transmission between individuals who have distinguishable strain types, but an indistinguishable strain type does not confirm transmission; additional epidemiological information is required to assess whether cases with indistinguishable strain types are likely to reflect recent transmission.

In 2016, 63.0% (3,570/5,664) of notified TB cases were culture confirmed, and of those, 78.8% (2,814/3,570) had an isolate with at least 23 loci typed (Table 3.1). This is lower than previous years due to the transition from the use of strain typing to WGS in North and Central England. Overall, for culture confirmed cases notified between 2010 and 2016, 82.5% (24,691/29,916) had strain typing completed for at least 23 loci, and 59.7% (14,733/24,691) of these cases clustered in 2,878 molecular clusters (Table 3.1, Table Ai.3.2). The proportion of clustered cases varied by PHEC; the areas with the largest number of cases generally had the highest proportion of clustered cases (Table Ai.3.2).

Table 3.1: Number and proportion of clustered cases and new clusters by place of birth and year, England, 2010-2016

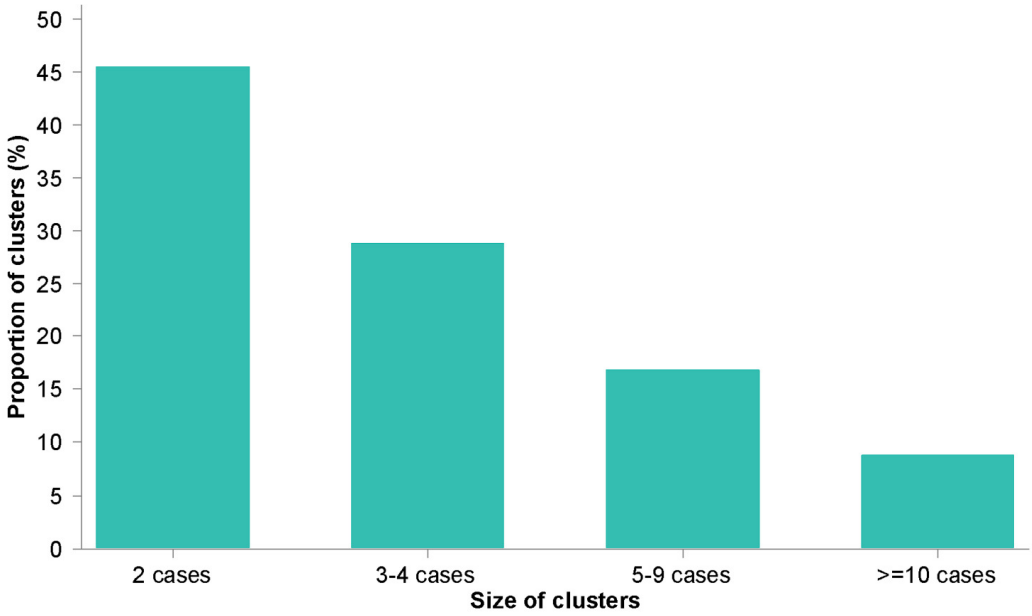
Year	Culture confirmed cases	≥23 loci typed cases*		Clustered cases**		Non-UK born clustered cases		UK born clustered cases		New clusters (per year)#
	n	n	%	n	%	n	%	n	%	n
2010	4,609	3,230	70.1	1,924	59.6	1,339	56.6	500	69.1	368
2011	5,032	4,269	84.8	2,543	59.6	1,749	55.9	718	72.4	541
2012	4,896	4,304	87.9	2,667	62.0	1,844	58.4	747	73.9	539
2013	4,393	3,663	83.4	2,240	61.2	1,550	57.4	649	72.5	410
2014	3,924	3,347	85.3	1,953	58.4	1,339	54.8	580	68.3	419
2015	3,492	3,064	87.7	1,762	57.5	1,198	54.0	541	68.3	283
2016	3,570	2,814	78.8	1,644	58.4	1,147	54.5	465	71.9	318
Total	**29,916**	**24,691**	**82.5**	**14,733**	**59.7**	**10,166**	**56.1**	**4,200**	**71.1**	**2,878**

* % ≥23 loci is the proportion of culture confirmed cases which have had at least 23 loci typed
** Clustered in time period (2010-2016), clustered cases notified in year
# A new cluster forms at the point when a second case is notified with indistinguishable MIRU-VNTR strain type as an existing case

The proportion of cases that clustered with at least one other case within the seven-year period from 2010 to 2016 peaked at 62.0% in 2012, declined to the lowest level in 2015 (57.5%), and increased slightly in 2016 (58.4%) (Table 3.1). Similarly, the number of new clusters detected[17] increased from 283 (the lowest) in 2015 to 318 in 2016. Between 2010 and 2016 a higher proportion of UK born TB cases clustered with at least one other case (71.1%, 4,200/5,910), compared with non-UK born TB cases (56.1%, 10,166/18,121).

Of the 2,878 clusters in England between 2010 and 2016, the median cluster size was three cases (range 2-244). The majority of clusters (74.4%; 2,141/2,878) were small in size (<5 cases), with 45.5% (1,310) having only two cases in the cluster. 8.8% of clusters (254) had ten or more cases (Figure 3.2, Table Ai.3.2).

Figure 3.2: Proportion of clusters by size, England, 2010-2016



Between 2010 and 2015, there was a reduction in the rate of TB among UK born children, a decrease in the proportion of clustered cases and a reduction in the number of new clusters each year, suggesting that there had been a decrease in TB transmission within England during this time period. In 2016, however, there was a small increase in the rate of TB among UK born children, a small increase in the proportion of clustered TB cases and an increase in the number of new clusters, suggesting a possible increase in recent transmission although these small increases are in a single year's data.

[17] A new cluster forms at the point when a second case is notified with an MIRU-VNTR strain type indistinguishable from an existing case

Whole genome sequencing

Whole genome sequencing (WGS) of *Mycobacterium tuberculosis* complex isolates provides information on Single Nucleotide Polymorphism (SNP) differences between isolates and provides more information than MIRU-VNTR strain typing on how isolates are related to each other. WGS will provide greater understanding of whether isolates are likely to be part of the same transmission chain, and may also help determine the timing and direction of transmission [2, 3, 4]. WGS has been carried out retrospectively on some isolates from TB cases epidemiologically and molecularly linked by MIRU-VNTR to support cluster investigation and to inform public health action going forward. Routine prospective sequencing has been in place in areas served by the National Mycobacterium Reference Service (NMRS) - Central and North since December 2016 and will be deployed in NMRS - South by the end of 2017. Relatedness results from sequenced isolates matched to 2017 notifications will be presented in next year's annual report.

4. Delay from symptom onset to treatment start

Key messages

- in 2016, the median time between symptom onset and treatment start for pulmonary cases was 77 days
- nearly one-third (31%) of pulmonary cases experienced a delay of more than four months between symptom onset and treatment start
- a higher proportion of UK born cases (34%) experienced a delay of more than four months compared with non-UK born cases (29%)
- the proportion of non-UK born cases with a delay of more than four months increased from 23% in 2011 to 29% in 2016
- a low proportion (11%) of children less than 15 years of age experienced a delay of more than four months; in contrast, 40% of those aged 65 years and older experienced a delay of more than four months

Time from symptom onset to treatment start for pulmonary TB cases

Information on time from symptom onset to treatment start was available for 91.7% (2,739/2,986) of pulmonary cases notified in 2016. Data on the time from symptom onset to treatment start has been available for more than two-thirds of cases since 2011 and data completion has improved during this period. Current data completeness on date of first presentation to health services is low and does not enable us to distinguish late presentation to health services from delays occurring within the health service.

In 2016, the median time between symptom onset and treatment start was 77 days (interquartile range (IQR) 38-141). Thirty nine percent (39.4%, 1,079/2,739) of pulmonary cases started treatment within two months, and 29.9% (819/2,739) between two and four months from symptom onset. In 2016, 30.7% (841/2,739 of pulmonary cases had a delay from symptom onset to treatment start of more than four months; the greatest proportion with this delay since 2011 (Table 4.1).

As in previous years, the proportion of cases in 2016 that experienced a delay of more than four months increased with age group (less than 15 years: 10.9%, 15-44 years: 27.6%, 45-64 years: 34.9%, 65 years and older: 40.2%) (Table 4.2). Between 2015 and 2016, the proportion of cases that experienced this delay increased in all age groups but in particular in those aged 65 years and older (40.2% in 2016 versus 34.9% in 2015).

Table 4.1: Number and proportion of pulmonary TB cases by time from symptom onset to treatment start, England, 2011-2016

Year	Time from symptom onset to treatment start						
	0-2 months		2-4 months		>4 months		Total*
	n	%	n	%	n	%	n
2011	1,318	45.0	855	29.2	754	25.8	**2,927**
2012	1,371	44.1	923	29.7	815	26.2	**3,109**
2013	1,224	41.2	900	30.3	847	28.5	**2,971**
2014	1,158	39.5	888	30.3	887	30.2	**2,933**
2015	1,184	42.4	831	29.8	777	27.8	**2,792**
2016	1,079	39.4	819	29.9	841	30.7	**2,739**

* The number of pulmonary cases with time between symptom onset to start of TB treatment available, excluding those diagnosed post-mortem and those who did not start treatment

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

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

Table 4.2: Number and proportion of pulmonary TB cases by time from symptom onset to treatment start by age group, England, 2016

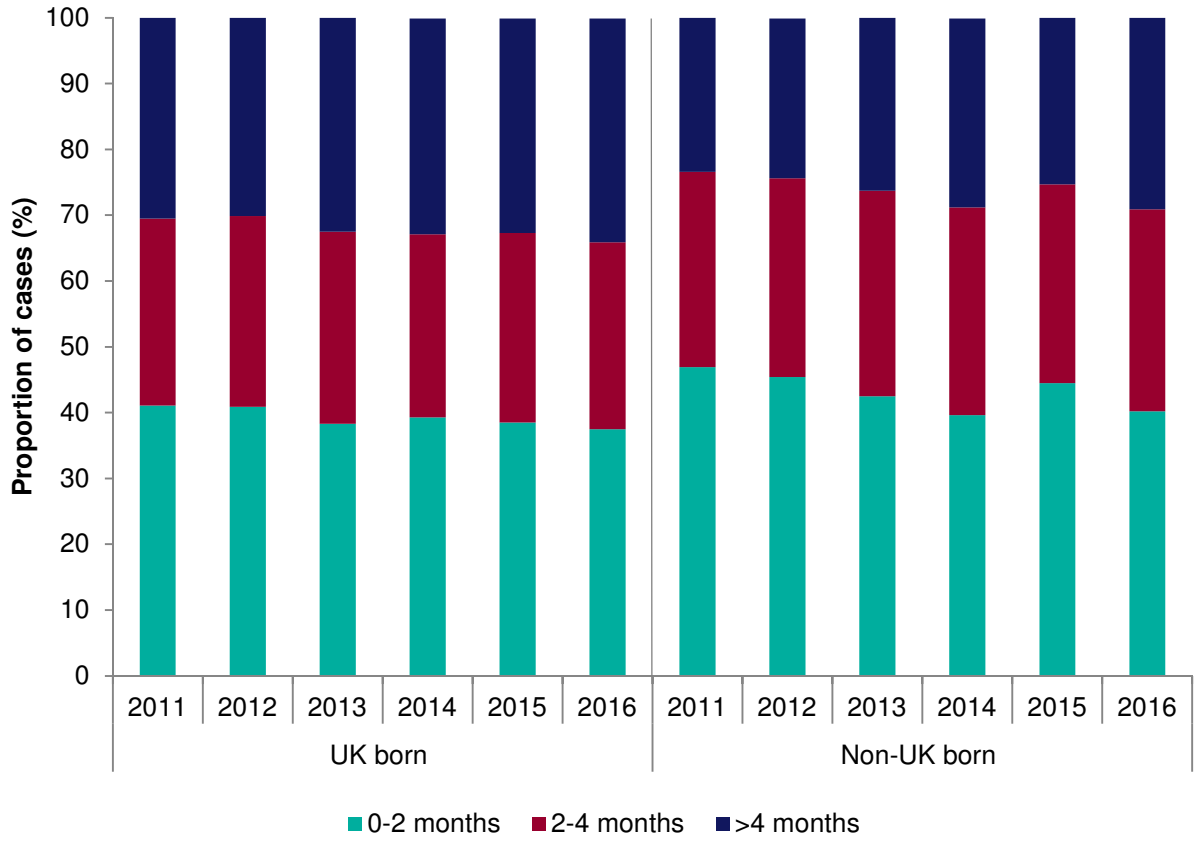
Time from symptom onset to treatment start	Age group (years)									
	0-14		15-44		45-64		65+		Total*	
	n	%	n	%	n	%	n	%	n	%
0-2 months	82	74.6	634	41.7	229	33.8	134	30.8	1,079	39.4
2-4 months	16	14.5	465	30.7	212	31.3	126	29.0	819	29.9
>4 months	12	10.9	418	27.6	236	34.9	175	40.2	841	30.7
Total	**110**	**100.0**	**1,517**	**100.0**	**677**	**100.0**	**435**	**100.0**	**2,739**	**100.0**

* The number of pulmonary cases with time between symptom onset to start of TB treatment available, excluding those diagnosed post-mortem and those who did not start treatment

The proportion of pulmonary cases with a delay of more than four months varied by PHEC, with the highest proportion in the South West (38.0%, 52/137) and the lowest proportion in the North East (26.6%, 17/64) (Table Ai.4.1).

UK born cases have consistently experienced a longer delay from symptom onset to treatment start than non-UK born cases (Figure 4.1 and Table Ai.4.2). Among non-UK born cases there has been an increase in the proportion of cases with a delay of more than four months from 2011 (23.4%, 441/1,887) to 2016 (29.1%, 535/1,836).

Figure 4.1: Proportion of pulmonary TB cases with a delay from symptom onset to treatment start by place of birth, England, 2011-2016



5. TB outcomes in the drug sensitive cohort

Key messages

- following a year-on-year improvement between 2006 to 2013, there has been a reduction in the proportion of TB cases (with an expected treatment duration of less than 12 months) completing treatment by 12 months, from a peak of 85.6% in 2013 to 83.4% in 2015
- the number and proportion of all drug sensitive cases who had died at the last recorded outcome has increased in the last two years, from 4.7% in 2013 to 6.1% in 2015
- the proportion of all drug sensitive cases who were lost to follow-up at the last recorded outcome has remained stable at 4.2%

Drug sensitive cohort, 2006-2015

For the purposes of TB outcome reporting, the drug sensitive cohort is defined as excluding all cases in the drug resistant cohort (for the full definition of the drug resistant cohort see Chapter 6). 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.

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

- 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 for the purposes of reporting.
- for cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded TB outcome is reported.

Detailed data on deaths and cases lost to follow-up at last recorded outcome are presented for the entire drug sensitive cohort.

TB outcomes for the drug sensitive cohort with expected duration of treatment less than 12 months

Treatment completion

Table 5.1: TB outcome at 12 months for drug sensitive cases with expected treatment duration <12 months*, England, 2015

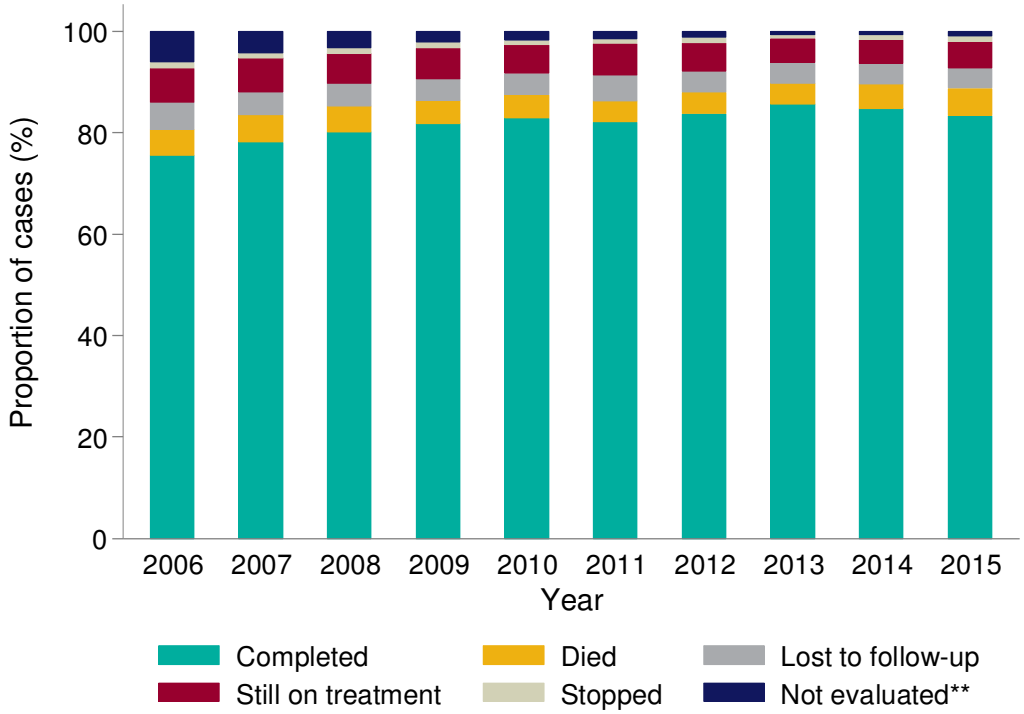
TB outcome	n	%
Completed	4,168	83.4
Died	263	5.3
Lost to follow-up	200	4.0
Still on treatment	267	5.3
Stopped	56	1.1
Not evaluated**	45	0.9
Total	**4,999**	**100.0**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

Of cases notified in 2015, 83.4% (4,168/4,999) completed treatment within 12 months (Table 5.1, Table Ai.5.1). There was a year-on-year improvement in the proportion of cases completing treatment within 12 months from 2006 (75.5%) to 2013 (85.6%), followed by a reduction in 2014 (84.8%) and 2015 (83.4%) (Figure 5.1, Table Ai.5.1). A further 3.5% (175/4,999) of cases notified in 2015 are known to have completed treatment after 12 months, bringing the overall treatment completion to 86.9% (4,343/4,999) at the last recorded outcome (Table Ai.5.2).

For cases notified in 2015 who were known to have completed treatment at the last recorded outcome, with known timing of treatment completion, 95.9% (4,092/4,266) completed treatment within 12 months. The majority (73.7%, 3,145/4,266) of cases completed treatment between six and eight months. However, 5.0% (214/4,266) of cases completed treatment in less than six months (168 days), which is less than a full course of short-course treatment (Table Ai.5.3).

Figure 5.1: TB outcomes at 12 months for drug sensitive cases with expected treatment duration <12 months*, England, 2006-2015



* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

As in previous years, the proportion of cases that completed treatment within 12 months decreased with increasing age, from 94.8% (184/194) in those less than 15 years of age to 63.5% (447/704) in those aged 65 years or older (Table Ai.5.4). The proportion of cases aged 65 years and older completing treatment in 2015 (63.5%) is the lowest it has been since 2009 (66.7%). In comparison, for cases aged less than 15 years, there was a year-on-year improvement in treatment completion between 2011 (85.5%) and 2015 (94.8%). Treatment completion within 12 months was higher in females (84.9%, 1,739/2,048) than males (82.4%, 2,429/2,949).

Treatment completion at 12 months was lower in those with pulmonary disease only, compared to those with extra-pulmonary disease only (78.8%, 1,745/2,214 versus 88.2%, 2,005/2,274, respectively). A detailed breakdown of treatment completion by site of disease at last recorded outcome is available in Table Ai.5.10.

Treatment completion at 12 months varied by PHEC; from 86.6% (1,700/1,962) in London to 76.2% (189/248) in the South West (Table Ai.5.5). However, the South West has had a year-on-year improvement in treatment completion since 2011 (68.8%), while there has been a decline in treatment completion in the East Midlands from 88.1% in 2013 to 76.5% in 2015 (Table Ai.5.6).

Still on treatment

Five percent (5.3%, 267/4,999) of cases were still on treatment at 12 months (Table 5.1, Table Ai.5.1), although it is known from the last recorded outcome that the majority of these (65.5%, 175/267) go on to complete treatment (Table Ai.5.2). Thirty-one percent (30.7%, 63/205) of cases still on treatment at 12 months with known drug sensitivity results were resistant to isoniazid without MDR-TB.

Information on the reason for still being on treatment at 12 months was recorded for 90.3% (241/267) of cases notified in 2015, of which 25.3% (61) had their treatment changed, 53.5% (129) were known to be on a regimen exceeding 12 months, and 21.2% (51) had their treatment interrupted. For those with more detailed information on the reason for still being on treatment, 42 cases were reported to still be on treatment due to intolerance or side-effects, 15 had a poor clinical response to treatment and 14 had been non-compliant with treatment.

TB outcomes for drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated TB

Table 5.2: Last recorded TB outcome for drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated* TB, England, 2015

TB outcome	n	%
Treatment completed	484	73.2
Died	77	11.6
Lost to follow-up	36	5.4
Still on treatment	50	7.6
Treatment stopped	3	0.5
Not evaluated**	11	1.7
Total	**661**	**100.0**

* Excludes cases in the drug resistant cohort and only includes drug sensitive TB cases with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

At the last recorded outcome, 73.2% (484/661) of cases notified in 2015 had completed treatment and 7.6% (50) were still on treatment (Table 5.2, Table Ai.5.7). There is a shorter follow-up period for cases notified in 2015, so the proportion who finally complete treatment is expected to increase, as seen in previous years. For cases notified in 2014, 80.9% (558/690) completed treatment at the last recorded outcome (Table Ai.5.7).

TB outcomes in the entire drug sensitive cohort

Eighty five percent (85.3%, 4,827/5,660) of cases in this cohort had completed treatment, 6.1% (343) had died and 4.2% (239) were lost to follow-up at the last recorded outcome (Table 5.3, Table Ai.5.8).

Table 5.3: Last recorded TB outcome for the entire drug sensitive cohort*, England, 2015

TB outcome	n	%
Treatment completed	4,827	85.3
Died	343	6.1
Lost to follow-up	239	4.2
Still on treatment	136	2.4
Treatment stopped	59	1.0
Not evaluated**	56	1.0
Total	**5,660**	**100.0**

* Excludes cases in the drug resistant cohort
** Not evaluated includes missing, unknown and transferred out

Death in the entire drug sensitive cohort

Six percent (6.1%, 343/5,660) of cases notified in 2015 were reported to have died at the last recorded outcome, a slight increase compared with 2014 (5.5%) and the highest the proportion has been in the last ten years (Table Ai.5.8). For cases notified in 2015 that had died at the last recorded outcome, TB caused or contributed to 35.3% (121) of deaths, TB was incidental to 28.6% (98) of deaths, and the relationship between TB and death was unknown in 36.2% (124) of deaths (Table Ai.5.9). Among those reported to have died, 16.6% (57) were diagnosed post-mortem.

As in previous years, the majority (64.1%, 220) of those who died were aged 65 years and older, and a high proportion were male (62.7%, 215). A higher proportion of cases with pulmonary disease had died at the last recorded outcome compared with extra-pulmonary disease only (8.7%, 258/2,982 versus 3.1%, 84/2,668, respectively) (Table Ai.5.10).

Excluding those diagnosed post-mortem, time to death was known for 92.3% (264/286) of those who died. The median time to death after starting treatment was 38 days (range 0-394 days); 63.6% (168/264) died within two months of starting treatment. The proportion of deaths was nearly two times higher in cases with a previous diagnosis of TB (9.6%, 34/355), compared with cases without a previous diagnosis of TB (5.0%, 256/5,115). One-fifth (20.7%, 51/247) of deaths occurring in cases aged 15 years and older had at least one social risk factor, which was higher than in previous years (2014:

17.7% and 2013: 13.2%). Alcohol misuse (12.8%, 35/273) was the most frequent social risk factor among those who died (homelessness: 6.2%, 17/273, drug misuse: 4.6% , 12/260, imprisonment: 4.1%, 10/243. The proportion of deaths varied by PHEC; from 3.8% (86/2,251) in London to 10.9% (14/128) in the North East (Table Ai.5.11).

Lost to follow-up in the entire drug sensitive cohort

Four percent (4.2%, 239/5,660) of cases notified in 2015 were lost to follow-up at the last recorded outcome (Table 5.3), with a higher proportion of non-UK born cases (5.2%, 208/4,038) lost to follow-up than UK born cases (1.5%, 23/1,522) (Table Ai.5.12). Where the reason for lost to follow-up was recorded, 61.7% (116/188) of those born abroad had left the UK. The majority (72.8%, 174/239) of lost to follow-up cases occurred in those aged 15 to 44 years; overall, 5.3% (174/3,279) of this age group were lost to follow-up. Over half (59.8%, 143/239) of cases who were lost to follow-up had pulmonary disease and 13 cases were known to have been lost to follow-up before any treatment was started.

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

Please note that this chapter has been re-aligned to include reporting on cases in the **drug resistant cohort.** This includes cases with phenotypic drug susceptibility testing (DST) with initial and acquired multi-drug resistant/rifampicin resistant TB (MDR/RR-TB), as well as those treated with a second line regimen for MDR/RR-TB without resistant phenotypic DST results, as defined by WHO [5]. This differs from previous reporting, where characteristics were only described for those with phenotypic drug resistance.

Key messages

- the proportion of TB cases with initial resistance to isoniazid without MDR-TB has remained fairly stable (around 6%) over the past decade
- the number of TB cases in the drug resistant cohort (confirmed or treated as MDR/RR-TB) has remained fairly stable in the last three years, with 68 cases in 2016; however, the number (59) and proportion (1.7%) of TB cases confirmed with initial MDR/RR-TB has increased slightly since 2015 (53, 1.5%)
- ten cases of XDR-TB were notified in 2016, the same as in 2015, but higher than in previous years
- only 49% of MDR/RR-TB cases notified in 2014 completed treatment by 24 months, the lowest proportion since 2000
- at the last recorded outcome, 20% of drug resistant TB cases notified in 2014 were lost to follow-up, higher than in previous years (17% in 2014)

All culture confirmed cases should have DST performed for at least the first line drugs (isoniazid, rifampicin, ethambutol and pyrazinamide) by phenotypic methods [6], with additional testing for second line drugs performed on those with resistance to first line drugs. In addition to phenotypic testing, genotypic testing may be conducted using one of the available methods including GeneXpert, the Hain test and WGS. The results presented in this chapter are based on cases with phenotypic DST results, with some additional data presented on cases with genotypic results only, or treated with an MDR-TB regimen in the absence of phenotypic confirmation.

Drug resistance may be identified early in the diagnosis and treatment phase on isolates within three months of the first specimen taken (initial resistance), or can develop over time (acquired resistance) identified on repeat culture after three months of the first specimen. In addition, cases with a change from a sensitive to resistant result following treatment start are reclassified as acquired resistance, even if this is within the three month period.

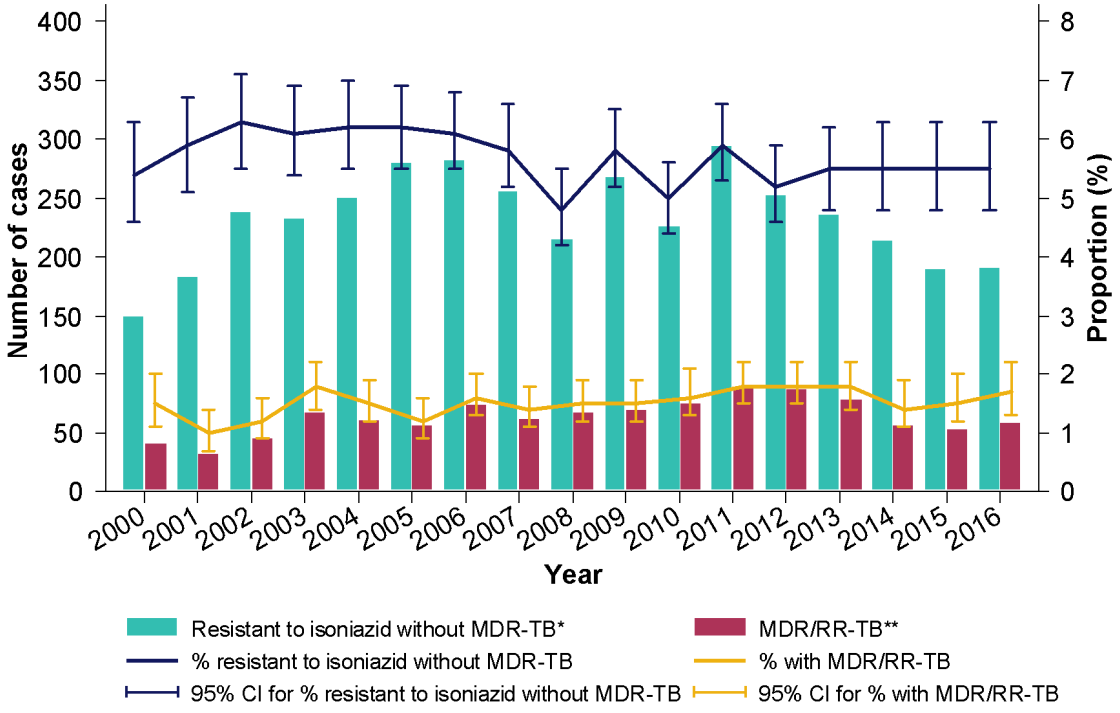
Initial first line drug resistance

In 2016, 98.5% (3,516/3,570) of culture confirmed notified cases had DST results for at least isoniazid and rifampicin, and 95.4% (3,404/3,570) had DST results for all first line drugs, a lower proportion than previous years (Table Ai.6.1). Of these, 7.0% (245/3,516) were resistant to isoniazid (INH-R), 1.7% (59/3,516) were resistant to rifampicin, 1.2% (43/3,503) were resistant to ethambutol and 0.6% (20/3,410) were resistant to pyrazinamide (Table Ai.6.2). Eight percent (7.5%, 262/3,516) were resistant to at least one first line drug, and 1.5% (53/3,516) had MDR-TB, with resistance to at least isoniazid and rifampicin (Tables Ai.6.2, Ai.6.3).

Isoniazid resistance without MDR-TB

Similar to previous years, in 2016, 5.5% (192/3,516) of TB cases had initial INH-R without MDR-TB (Figure 6.1, Table Ai.6.3). The most frequent countries of birth for these cases were the UK (47), Pakistan (23) and India (22) (Table 6.1).

Figure 6.1: Number and proportion of TB cases with initial drug resistance, England, 2000-2016



* Cases with phenotypic DST results for at least isoniazid and rifampicin, resistant to isoniazid without MDR-TB
** Cases with phenotypic DST results for at least isoniazid and rifampicin, resistant to rifampicin, including those with MDR-TB

Table 6.1: Most frequent countries of birth of TB cases with drug resistance, England, 2016

Country of birth*	Cases with DST results**	INH-R cases without MDR-TB**		DR Cohort		
				MDR/RR-TB** cases		All cases#
	n	n	%	n	%	n
United Kingdom	825	47	5.7	6	0.7	10
India	600	22	3.7	9	1.5	11
Pakistan	379	23	6.1	4	1.1	4
Romania	139	5	3.6	4	2.9	5
Somalia	120	9	7.5	0	0.0	0
Eritrea	82	7	8.5	1	1.2	1
Philippines	71	6	8.5	2	2.8	2
Poland	52	4	7.7	2	3.8	2
Lithuania	39	1	2.6	8	20.5	8
Vietnam	28	3	10.7	2	7.1	2
Uganda	28	4	14.3	1	3.6	1
Congo	18	4	22.2	0	0.0	0
Latvia	17	5	29.4	1	5.9	2

* Top 13 countries of birth for cases resistant to isoniazid without MDR-TB and MDR/RR-TB cases in 2016
** Cases with initial phenotypic DST results for at least isoniazid and rifampicin
# Cases with initial and acquired MDR/RR-TB and those treated with a second line regimen with no phenotypic DSTs

A high proportion (15.2%, 26/171) of cases with INH-R without MDR-TB had at least one known social risk factor (Table 6.2). In the five years from 2012 to 2016, the London PHEC had the highest number of TB cases with INH-R without MDR-TB (6.1%, 492/8,071), while the East of England PHEC had the highest proportion (6.4%, 88/1,383) (Table Ai.6.4).

Table 6.2: Number and proportion of TB cases with drug resistance by characteristic, England, 2016

Characteristic	Cases with DST results*	INH-R cases without MDR-TB*		DR Cohort				
				MDR/RR-TB cases*		XDR-TB cases*#		All cases^
	n	n	%	n	%	n	%	n
Sex								
Female	1,338	70	5.2	22	1.6	3	0.2	24
Male	2,178	122	5.6	37	1.7	4	0.2	44
Age (years)								
0-14	54	4	7.4	3	5.6	1	1.9	7
15-44	2,099	108	5.1	43	2.0	5	0.2	48
45-64	847	60	7.1	13	1.5	1	0.1	13
65+	516	20	3.9	0	0.0	0	0.0	0
Place of birth								
Non-UK born	2,612	140	5.4	49	1.9	5	0.2	54
UK born	825	47	5.7	6	0.7	2	0.2	10
At least one social risk factor	406	26	6.4	11	2.7	1	0.2	12
Previous TB diagnosis	185	10	5.4	12	6.5	1	0.5	14
Total	**3,516**	**192**	**5.5**	**59**	**1.7**	**7**	**0.2**	**68**

* Cases with initial phenotypic DST results for at least isoniazid and rifampicin
# XDR-TB cases are shaded in grey as they are a subset of the MDR/RR-TB cases
^ Cases with initial and acquired MDR/RR-TB and those treated with a second line regimen with no phenotypic DSTs

Drug resistant cohort

The drug resistant (DR) cohort includes culture confirmed cases with initial and acquired MDR/RR-TB, as well as those treated with a second line regimen for MDR/RR-TB without resistant phenotypic DST results. TB cases may be treated with a second line regimen in the absence of phenotypic DSTs if they were diagnosed abroad, were diagnosed with genotypic methods, were a contact of an MDR/RR-TB case or for other clinical reasons.

In this chapter, where possible, we report on the entire DR cohort. To report on the proportion of cases with MDR/RR-TB, only cases with initial MDR/RR-TB on phenotypic testing are reported, as there is no denominator data for cases with acquired MDR/RR-TB or those who were treated with a second line regimen in the absence of phenotypic DSTs.

Overall, the number of cases in the DR cohort has remained stable in the last three years with 68 cases notified in 2016 (Table 6.3). In 2016, there were six phenotypically

confirmed RR-TB cases and 62 cases with MDR-TB; 53 phenotypically confirmed MDR-TB cases, and 9 cases treated with a second line regimen for MDR-TB without phenotypic confirmation (Table 6.3). Of the nine who were not phenotypically confirmed with MDR/RR-TB, four were children who were contacts of confirmed MDR/RR-TB cases, three had entered the UK having had culture and DSTs performed abroad and two cases had genotyping results consistent with drug resistant TB. There were no TB cases that acquired resistance to become MDR-TB in 2016 (see acquired resistance section below for more information).

In 2016, the majority of cases in the DR cohort were aged 15 to 44 years (70.6%, 48/68) (Table 6.2). Ten percent (10.3%, 7/68) were children (aged less than 15 years), the highest proportion since 2000. The majority of cases in the DR cohort were non-UK born (84.4%, 54/64) (Table 6.2), and for those where year of entry to the UK was known, 60.4% (29/48) had entered the UK within the past six years. The most frequent countries of birth were India (11), the UK (10) and Lithuania (8) (Table 6.1).

Multi-drug resistant/rifampicin resistant (MDR/RR) TB

The number and proportion of MDR/RR-TB cases with initial resistance increased slightly from 1.5% (53/3,474) in 2015 to 1.7%, (59/3,516) in 2016 (Figure 6.1, Table Ai.6.3).

A very high proportion of TB cases born in Lithuania had MDR/RR-TB (20.5%, 8/39), compared with those born in India (1.5%, 9/600) (Table 6.1). The proportion of cases with MDR/RR-TB was higher among those with a previous diagnosis of TB compared to those without (6.5%, 12/185 versus 1.4%, 45/3,153) (Table 6.2). A high proportion of MDR/RR-TB cases in 2016 had at least one social risk factor (21.2%, 11/52). Between 2012 and 2016, London had the highest number of TB cases with MDR/RR-TB (1.7%, 140/8,071) (Table Ai.6.4).

Table 6.3: Number of TB cases with initial and acquired resistance to rifampicin and MDR-TB, England, 2000-2016

Year	Rifampicin resistant cases*			MDR-TB cases**				XDR-TB cases#				Drug resistant cohort$
	Initial resistance	Acquired resistance	Total	Initial resistance	Acquired resistance	Treated with an MDR-TB regimen	Total	Initial resistance	Acquired resistance	Treated with an XDR-TB regimen	Total	
2000	13	0	13	28	0	0	28	0	1	0	1	41
2001	10	0	10	22	0	3	25	0	0	0	0	35
2002	10	1	11	35	3	0	38	0	0	0	0	49
2003	19	0	19	49	2	0	51	1	0	0	1	70
2004	16	1	17	45	6	3	54	0	0	0	0	71
2005	15	1	16	41	4	1	46	0	0	0	0	62
2006	20	0	20	54	4	2	60	0	0	0	0	80
2007	13	2	15	49	5	3^	56	0	0	1	1	71
2008	18†	0	18	50	6	6	62	2	0	0	2	78
2009	11	1	12	59	2	4	65	2	0	0	2	77
2010	10	1	11	65	2	1	68	2	1	0	3	79
2011	8	0	8	81	4	2	87	6	0	0	6	95
2012	10	0	10	77	2	5	84	2	0	0	2	94
2013	10	1	11	68	0	6	74	3	0	0	3	85
2014	4	0	4	52	3	10	65	3	0	0	3	69
2015	8	0	8	45	2	12	59	10	0	0	10	67
2016	6	0	6	53	0	9	62	7	0	3§	10	68
Total	**201**	**8**	**209**	**873**	**45**	**66**	**984**	**38**	**2**	**4**	**44**	**1,191**

* Cases with initial phenotypic DST results for at least isoniazid and rifampicin

** MDR-TB includes those with XDR-TB

XDR-TB cases are shaded in grey as they are subset of the MDR-TB cases

$ Cases with initial and acquired MDR/RR-TB and those treated with a second line regimen with no phenotypic DSTs. Cases that go on to have initial and acquired XDR-TB or are treated with an XDR-TB regimen are only counted in the drug resistant cohort once

^ One case in 2007 was treated with XDR-TB regimen, and was counted in both 'Treated with MDR-TB regimen' and 'Treated with an XDR-TB regimen' columns. The total number in the drug resistant cohort for 2007 only counts this case once

† Two cases with initial resistance to rifampicin in 2008 acquired MDR-TB; these cases have been included in both initial rifampicin resistant cases and MDR-TB acquired resistance. The total number in the drug resistant cohort for 2008 only counts these two cases once

§ One case with initial MDR-TB in 2016 was treated with an XDR-TB regimen (with no phenotypic DSTs confirming XDR-TB); the case has been included in the initial MDR-TB cases and cases treated with an XDR-TB regimen. The remaining two cases treated with an XDR-TB regimen were counted in both 'Treated with MDR-TB regimen' and 'Treated with an XDR-TB regimen' columns. These three cases were counted once in the DR cohort.

Second line drug resistance and Extensively Drug Resistant (XDR) TB

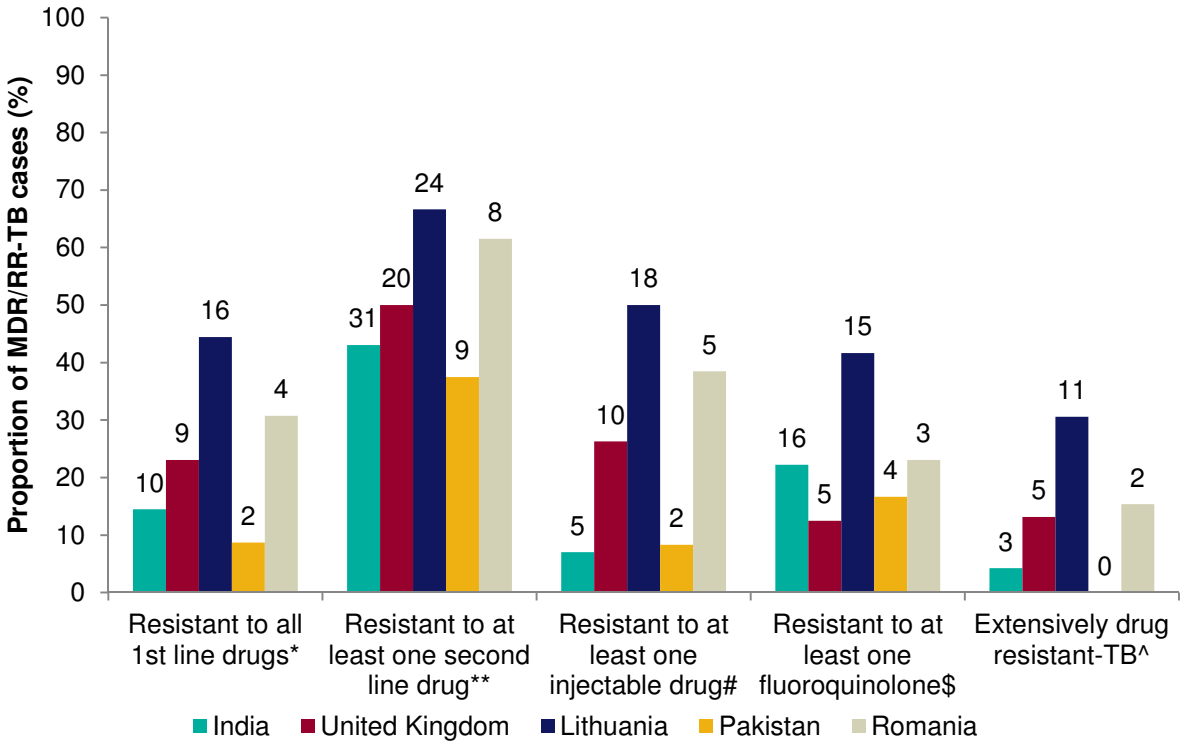
In 2016, of the 53 MDR/RR-TB cases (89.8%, 53/59) tested for all first line drugs, 15.1% (8/53) were resistant to all four. Among MDR/RR-TB cases tested for resistance to injectables[18] and/or fluoroquinolones[19], 24.1% (13/54) were resistant to at least one injectable agent and 20.4% (11/54) were resistant to a fluoroquinolone (Table Ai.6.5).The resistance patterns of MDR/RR-TB cases with injectable or fluoroquinolone resistance is strongly associated with the country of birth of MDR/RR-TB cases (Figure 6.2, Table Ai.6.6).

There were seven initial XDR-TB cases notified in 2016 and an additional three TB cases treated for XDR-TB without phenotypic DSTs, similar numbers to 2015 (Tables 6.3 and Ai.6.3). Two of the three cases treated with an XDR-TB regimen without phenotypic DSTs were contacts of XDR-TB cases and the other was diagnosed abroad. The majority of cases with XDR-TB (confirmed/treated) (hereafter referred to as XDR-TB) were aged 15 to 44 years (7/10), but two cases were in children, the first time XDR-TB has been diagnosed in children in England. Both children with XDR-TB were contacts of a confirmed XDR-TB case, one of whom was phenotypically confirmed. The majority of XDR-TB cases were non-UK born (6/9) (Table 6.2), all but one had pulmonary TB and only one had a previous history of TB diagnosis. Overall between 2012 and 2016, the highest number of XDR-TB cases were born in Lithuania (11), followed by a small number from the UK (6), India (3) and Romania (2) (Figure 6.2, Table Ai.6.6).

Six of the ten XDR-TB cases were in a single cluster, with evidence of transmission within a household and/or close friendship network.

[18] Injectables include amikacin, capreomycin or kanamycin
[19] Fluoroquinolones include ofloxacin, moxifloxacin or ciprofloxacin

Figure 6.2: Number and proportion of MDR/RR-TB cases with second-line drug resistance by most frequent country of birth, England, 2012-2016



* Cases with initial phenotypic DST results for at least isoniazid and rifampicin
** Cases with initial phenotypic DST results for at least isoniazid and rifampicin, and at least one second line drug
# Cases with initial phenotypic DST results for at least isoniazid and rifampicin and at least one injectable
$ Cases with initial phenotypic DST results for at least isoniazid and rifampicin and at least one fluoroquinolone
^ Cases with initial phenotypic DST results for at least isoniazid and rifampicin and at least one injectable and at least one fluoroquinolone

Please note: number of MDR/RR-TB cases are displayed as labels

Acquired drug resistance on repeat culture

Three culture confirmed TB cases notified in 2016 had acquired resistance on repeat DST. One drug sensitive case acquired resistance to isoniazid, one MDR-TB case acquired resistance to an injectable agent to become a pre-XDR TB case, and one XDR-TB case acquired further resistance.

Among cases that were notified between 2000 and 2016[20], 157 cases were known to have acquired resistance while on treatment in England, of which 32.5% (51) acquired resistance to rifampicin and 31.2% (49) acquired resistance to isoniazid.

[20] It should be noted that cases who acquire resistance are recorded in the year that they were notified, not the year that they acquired resistance, therefore the numbers for recent years may still increase for those still on treatment

TB outcomes for the drug resistant cohort

TB outcomes are reported for the entire DR cohort of cases notified in 2014. There were 69 cases in the drug resistant cohort notified in 2014; of these, four had initial rifampicin resistance without MDR-TB, 52 had initial MDR-TB (including three XDR-TB cases), three acquired MDR-TB and ten were treated with a second line regimen without phenotypic confirmation (Table 6.3).

Only 49.3% (34/69) of the cases in the DR cohort notified in 2014 had completed treatment within 24 months, which is considerably lower than the previous two years (60.6% in 2012) (Figure 6.3, Table 6.4, Table Ai.6.7). A further eight cases are known to have completed treatment after 24 months, bringing overall treatment completion for cases notified in 2014 to 60.9% (42/69), the lowest completion rate since 2000 (Table 6.4, Table Ai.6.8).

Table 6.4: 24-month and last recorded TB outcome for the drug resistant cohort*, England, 2014

TB outcome	At 24 months		At last recorded outcome	
	n	%	n	%
Treatment completed	34	49.3	42	60.9
Died	2	2.9	2	2.9
Lost to follow-up	14	20.3	14	20.3
Still on treatment	14	20.3	8	11.6
Treatment stopped	2	2.9	2	2.9
Not evaluated**	3	4.3	1	1.4
Total	**69**	**100.0**	**69**	**100.0**

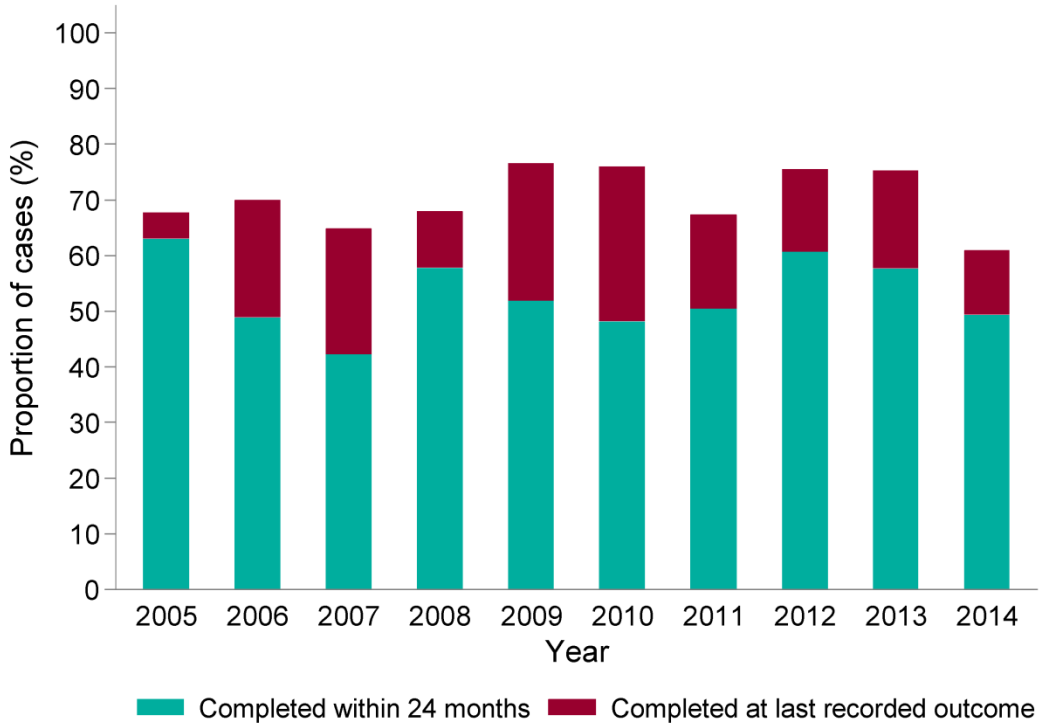
* Includes initial and acquired MDR/RR-TB and cases treated with a second line regimen without phenotypic DST results
** Not evaluated includes missing, unknown and transferred out

Among cases in the DR cohort notified in 2014 with known treatment start and treatment completion dates, seven (17.9%, 7/39) had less than 18 months of treatment, of which three had less than 12 months of treatment (Table Ai.6.9).

Two (2.9%, 2/69) cases in the DR cohort notified in 2014 had died at their last recorded outcome (Table 6.4, Table Ai.6.8). The most common reason for not completing treatment at the last recorded TB outcome was lost to follow-up, accounting for 14 (20.3%) of the drug resistant cases (Table 6.4, Table Ai.6.8). All but one were non-UK born, of which nine cases were reported to have been lost to follow-up abroad (Table Ai.6.10). Half (7/14) had pulmonary TB. Eight cases in the DR cohort notified in 2014 (11.6%, 8/69) were still on treatment at the last recorded outcome, and two (2.9%, 2/69) had had their treatment stopped.

Of the three XDR-TB cases notified in 2014, two had completed treatment, and one was lost to follow-up abroad at the last recorded outcome.

Figure 6.3: Treatment completion for the drug resistant cohort*, England, 2005-2014



* Includes initial and acquired MDR/RR-TB and cases treated with a second line regimen without phenotypic DST results

7. TB in under-served populations

Key messages

- in 2016, there was a small decrease in the proportion of TB cases with at least one social risk factor (SRF) from 11.7% in 2015 to 11.1% in 2016, but it remained higher than the annual proportion before 2015
- the proportion of UK born cases with at least one SRF (20%) was more than double that of non-UK born cases (8%)
- a higher proportion of cases with at least one SRF had pulmonary disease (78%) and just over half (52%) received directly observed therapy (DOT) compared to those without a SRF (50% and 9%, respectively)
- the proportion of cases with at least one SRF that had MDR/RR-TB (2.7%) was approximately two times that of cases without a SRF (1.4%)
- outcomes in drug sensitive cases with at least one SRF were worse (8.9% died and 6.3% were lost to follow-up) compared to those without a SRF (4.5% and 3.3%, respectively)

In the Enhanced TB Surveillance system (ETS), data is collected on the presence or absence of four social risk factors (SRF) known to increase the risk of TB: current or history of homelessness, imprisonment[21], and drug misuse, and current alcohol misuse. This chapter presents data for TB cases with SRFs and in addition, for TB cases who were current smokers, remanded in an immigration removal centre, identified as asylum seekers, or unemployed. TB rates by area level deprivation are also presented (see Appendix III: Methods). Data in this chapter, with the exception of area level deprivation, is presented for TB cases aged 15 years and older.

Social risk factors

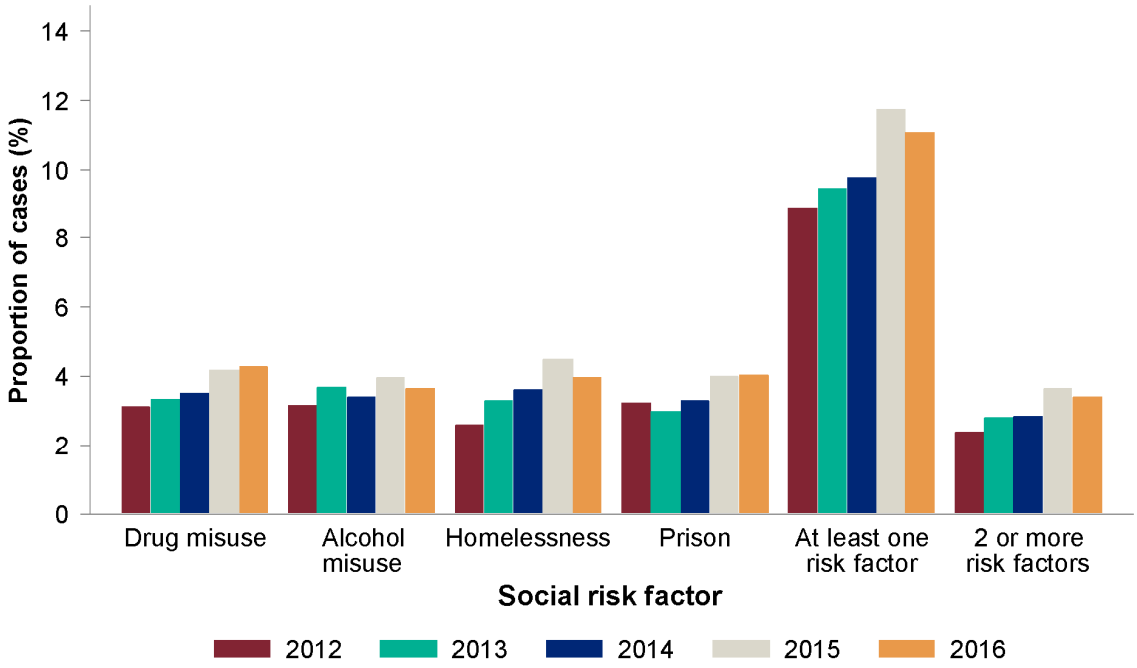
In 2016, 11.1% (534/4,828) of TB cases aged 15 years and older had at least one SRF, a slight decrease from 2015 (11.7%, 581/4,950) but still higher than the annual proportion before 2015 (Figure 7.1, Table Ai.7.1). Of the cases in 2016 with at least one SRF, one third (34.6%, 185/534) had two or more SRFs.

In 2016, among TB cases with known SRF information, 3.7% (187/5,118) had current alcohol misuse, 4.3% (218/5,109) had current or a history of drug misuse, 4.0% (202/5,098) of homelessness, and 4.0% (200/4,948) of imprisonment (Table Ai.7.1).

[21] For London TB cases a history of imprisonment is only recorded if imprisonment was in the UK, which will lead to an underestimate of the total number of cases with any history of imprisonment.

Between 2015 and 2016, there was a decrease in both the number and proportion of cases with alcohol misuse (2015: 4.0%, 206/5,210) and current or a history of homelessness (2015: 4.5%, 234/5,191), while there were similar numbers and proportions of cases with current or a history of drug misuse (2015: 4.2%, 218/5,200) and imprisonment (2015: 4.0%, 203/5,061) (Figure 7.1, Table Ai.7.1).

Figure 7.1: Proportion of TB cases with at least one social risk factor*, England, 2012-2016



* Includes those aged 15 years and older

In 2016, 56.0% (122/218) of those with current or history of drug misuse had known information about the timing of their drug misuse, of which 43.4% (53/122) were reported to have current drug misuse. Sixty-four percent (64.4%, 130/202) of those with current or history of homelessness had known information about the timing of their homelessness, of which 59.2% (77/130) were reported to be homeless while receiving care for TB. Sixty-four percent (63.5%, 127/200) of those currently in prison or with a history of imprisonment were reported to have been in prison in the UK, of which 27 cases were currently in prison.

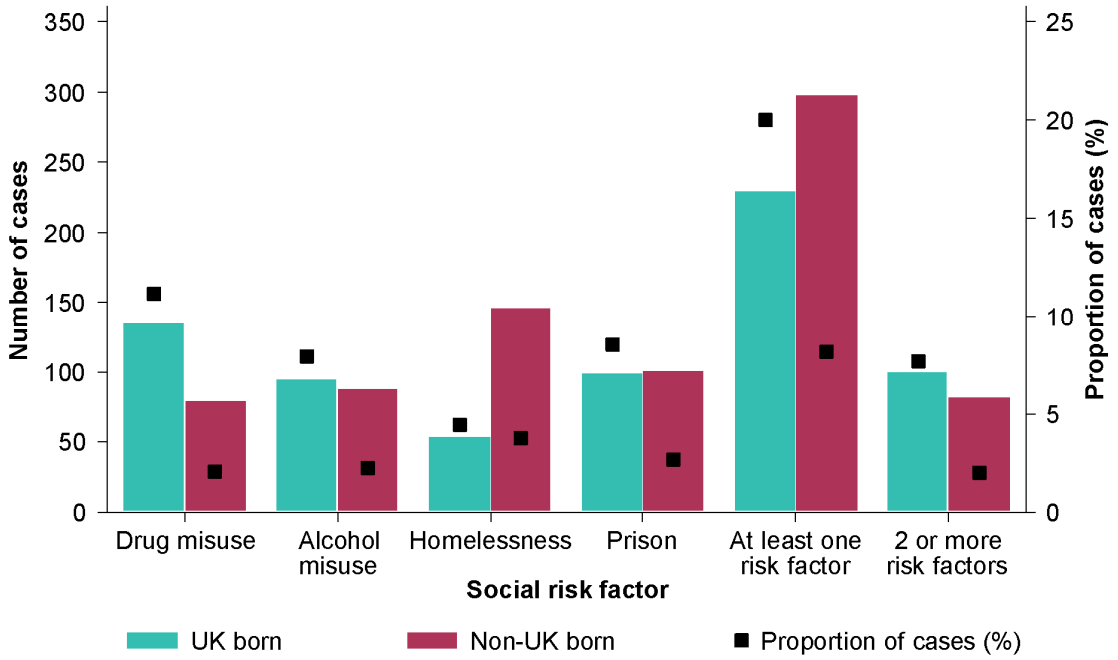
Demographic characteristics

Similar to previous years, in 2016 the proportion of UK born cases with at least one SRF was 2.4 times higher than non-UK born cases (20.0%, 230/1,148 versus 8.2%, 298/3,649) (Figure 7.2, Table 7.1). Between 2015 and 2016, the proportion of UK born cases with at least one SRF decreased (21.8% versus 20.0%) whereas the proportion of non-UK born cases remained stable (8.2% in both years). However the proportions of

both UK and non-UK born with at least one SRF were higher in 2016 and 2015 than in any year between 2010 and 2014 (Table Ai.7.1).

For each of the four SRFs in UK born cases, between 2015 and 2016, there was a decrease in the numbers and proportions, although longer term trends are unclear due to year-on-year variation (Table Ai.7.1). Among non-UK born cases, in 2016 there were small increases in proportions of cases with current or a history of drug misuse (2.0%, 79/3,864) and imprisonment (2.7%, 101/3,756), with both higher than any previous year (Table Ai.7.1).

Figure 7.2: Number and proportion of TB cases with social risk factors* by place of birth, England, 2016



* Includes those aged 15 years and older

Among UK born cases notified between 2010 and 2016, the Black-Caribbean ethnic group had the highest proportion with at least one SRF (33.1%, 163/492) (Table Ai.7.2). In non-UK born cases notified between 2010 and 2016, the largest number with at least one SRF were born in India (277), Somalia (213) and Pakistan (132), but the countries of birth with the highest proportion of cases with at least one SRF were Poland (33.6%, 123/366), Lithuania (32.6%, 76/233), and Ireland (28.6%, 58/203) (Table Ai.7.2).

As with previous years, the majority of cases notified in 2016 with at least one SRF were male (86.0%, 459/534) and 60.9% (325/534) were aged 15 to 44 years. The proportion of cases with at least one SRF was over four times higher in males (16.1%, 459/2,856) compared with females (3.8% 75/1,972) (Table 7.1). Among UK born male cases, 27.2% (190/699) had at least one SRF.

Table 7.1: Number and proportion of TB cases with social risk factors* by demographic characteristic, England, 2016

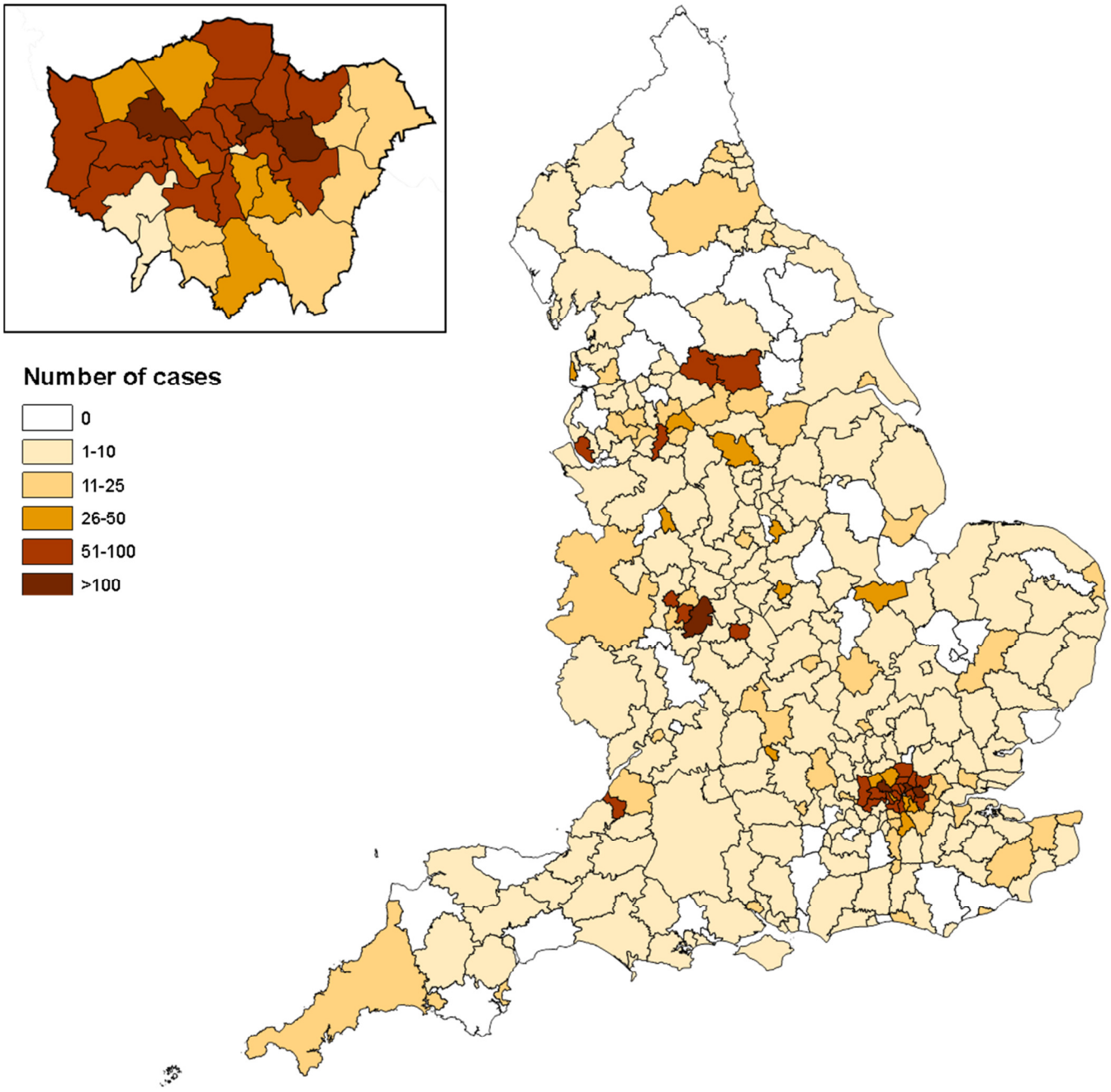
Demographic characteristics	Drug misuse		Alcohol misuse		Homeless		Prison		At least 1 SRF		2 or more SRF	
	n	%	n	%	n	%	n	%	n	%	n	%
Sex												
Female	30	1.4	26	1.2	30	1.4	14	0.7	75	3.8	19	0.9
Male	188	6.2	161	5.3	172	5.7	186	6.4	459	16.1	166	5.1
Age group (years)												
15-44	137	4.6	85	2.8	135	4.5	118	4.1	325	11.4	103	3.3
45-64	80	6.0	92	6.9	64	4.8	76	5.9	191	15.2	80	5.5
65+	1	0.1	10	1.3	3	0.4	6	0.8	18	2.5	2	0.2
Place of birth												
UK Born	135	11.2	95	7.9	54	4.5	99	8.5	230	20.0	100	7.7
Non-UK Born	79	2.0	88	2.3	146	3.8	101	2.7	298	8.2	82	2.0
Other												
Asylum seekers	0	0.0	0	0.0	22	38.6	9	18.8	28	51.9	3	4.8
Unemployed	134	17.8	110	14.6	104	13.9	101	14.1	252	34.8	124	15.4

* Includes those aged 15 years and older

Geographical distribution

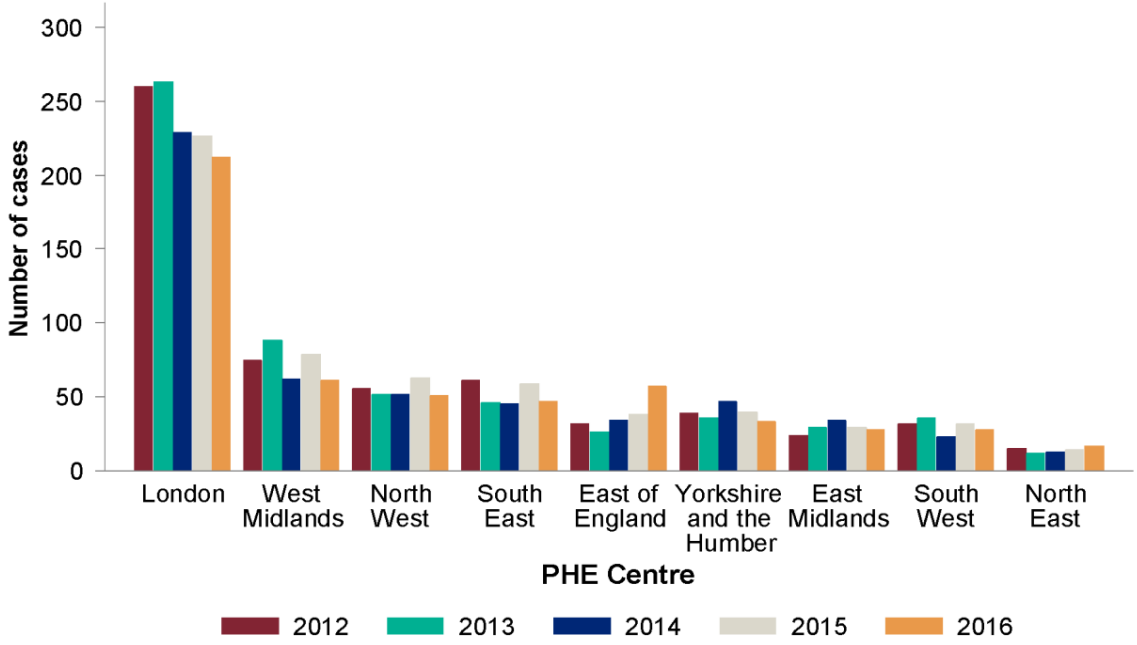
Between 2010 and 2016, there was considerable geographical variation by local authority in the number of TB cases with at least one SRF (Figure 7.3). In 2016, the North East (16.0%, 17/106), East of England (15.4%, 57/371) and South West (14.7%, 28/191) PHECs had the highest proportion of TB cases with at least one SRF (Figure 7.4, Table Ai.7.3). Between 2015 and 2016, the number and proportion of cases with at least one SRF remained stable or decreased for all PHECs, with the exception of the East of England (2015: 12.4%, 38/306 and 2016: 15.4%, 57/371) and the North East (2015: 13.0%, 14/108 and 2016, 16.0%, 17/106). In the East of England, between 2015 and 2016, there was an increase in the proportion of cases with drug misuse (4.0%, 13/328 to 6.1%, 24/392, respectively) and imprisonment (5.1%, 16/312 to 7.9%, 30/382, respectively).

Figure 7.3: Number of TB cases* with at least one SRF, by local authority, England, 2010-2016 (box shows enlarged map of London area)**



*Includes those aged 15 years and older
** SRF refers to current alcohol misuse, current or history of homelessness, imprisonment and drug misuse

Figure 7.4: Number of TB cases with at least one social risk factor* by PHE Centre, England, 2012-2016



* Includes those aged 15 years and older

Clinical characteristics

As in previous years, in 2016 a higher proportion of cases with at least one SRF had a previous history of TB compared to cases with no known SRFs (10.2%, 52/512 versus 6.3%, 264/4,224). The majority (77.5%, 414/534) of cases with at least one SRF had pulmonary TB (Table Ai.7.4).

Over half (52.1%, 260/499) of cases with at least one SRF received DOT in 2016 compared with 9.1% (380/4,157) of those without a SRF (Table Ai.7.4). The proportion of those with at least one SRF receiving DOT was lower in 2016 than in 2015 (56.4%, 305/541). Twenty-seven cases notified in 2016 were in prison at the time of notification, and 90.9% (20/22) of cases in prison with known information on DOT were known to have received DOT.

In 2016, there was no difference in the proportion of pulmonary cases with at least one SRF that experienced a delay from symptom onset to treatment start of more than four months as compared to those without a SRF (31.4%, 122/389 versus 31.4%, 620/1,973).

Where information was known, 20.0% (553/2,759) of TB cases aged 15 years and older were current smokers[22]. Sixty-seven percent (66.7%, 182/273) of TB cases with at least

[22] Excludes London cases, as smoking status was not available in LTBR in 2016.

one SRF were current smokers, compared to 13.6% (296/2,172) of cases without a SRF.

Drug resistance

In 2016, 6.4% (26/406) of TB cases with at least one SRF were resistant to isoniazid without MDR-TB compared to 5.4% (141/2,621) of those without a SRF. The proportion of TB cases with at least one SRF that had initial MDR/RR-TB (2.7%, 11/406), was approximately double that of cases without a SRF (1.4%, 38/2,621). Overall, for the period of 2010 to 2016, 7.8% (236/3,017) of TB cases with at least one SRF were resistant to isoniazid without MDR-TB compared to 5.2% (1,147/22,019) of those without a SRF. 2.5% (74/3,019) of TB cases with at least one SRF had initial MDR/RR-TB, compared to 1.6% (353/22,019) of cases without any SRFs.

TB outcomes

Treatment completion at the last recorded outcome was lower for drug sensitive cases notified in 2015 with at least one SRF (79.9%, 457/572) compared to cases without a SRF (88.2%, 3,813/4,322). Treatment completion at 12 months for cases with at least one SRF is TB Strategy Monitoring Indicator 17 and can be found at Appendix V. A higher proportion of drug sensitive cases with at least one SRF had died or were lost to follow-up at their last recorded outcome compared to cases with no SRFs (Table 7.2). The proportion of cases that had died at their last recorded outcome was 3.6 times higher in those with alcohol misuse (17.2%, 35/204) compared to those with no alcohol misuse (4.8%, 238/4,949).

Table 7.2: Last recorded TB outcome for the entire drug sensitive cohort by social risk factor*, England, 2015

TB outcome	With at least one social risk factor		With no social risk factor		Total**
	n	%	n	%	N
Treatment completed	457	79.9	3,813	88.2	4,270
Died	51	8.9	196	4.5	247
Lost to follow-up	36	6.3	142	3.3	178
Still on treatment	17	3.0	96	2.2	113
Treatment stopped	5	0.9	46	1.1	51
Not evaluated[#]	6	1.0	29	0.7	35
Total	**572**	**100.0**	**4,322**	**100.0**	**4,894**

* Includes those aged 15 years and older but excludes cases in drug resistant cohort
** Total cases with reported information on at least one social risk factor reported
[#] Not evaluated includes missing, unknown and transferred out

For MDR/RR-TB cases notified in 2014, five out of the nine cases (55.6%) with at least one SRF had completed treatment by last recorded outcome compared with 29 out of 43 cases (67.4%) with no SRFs, although only a small number of cases with at least one SRF were drug resistant. For all MDR/RR-TB cases notified between 2010 and 2014, 62.5% (35/56) with at least one SRF had completed treatment by the last recorded outcome compared with 73.7% (202/274) of those with no SRFs.

Unemployment

In 2016, sixteen percent (15.8%, 804/5,076) of TB cases notified with known information were recorded as being unemployed at notification. Of those that were unemployed and had information on social risk factors, one-third (34.8%, 252/725) had at least one SRF (Table 7.1).

TB cases that were asylum seekers or resident in an immigration removal centre

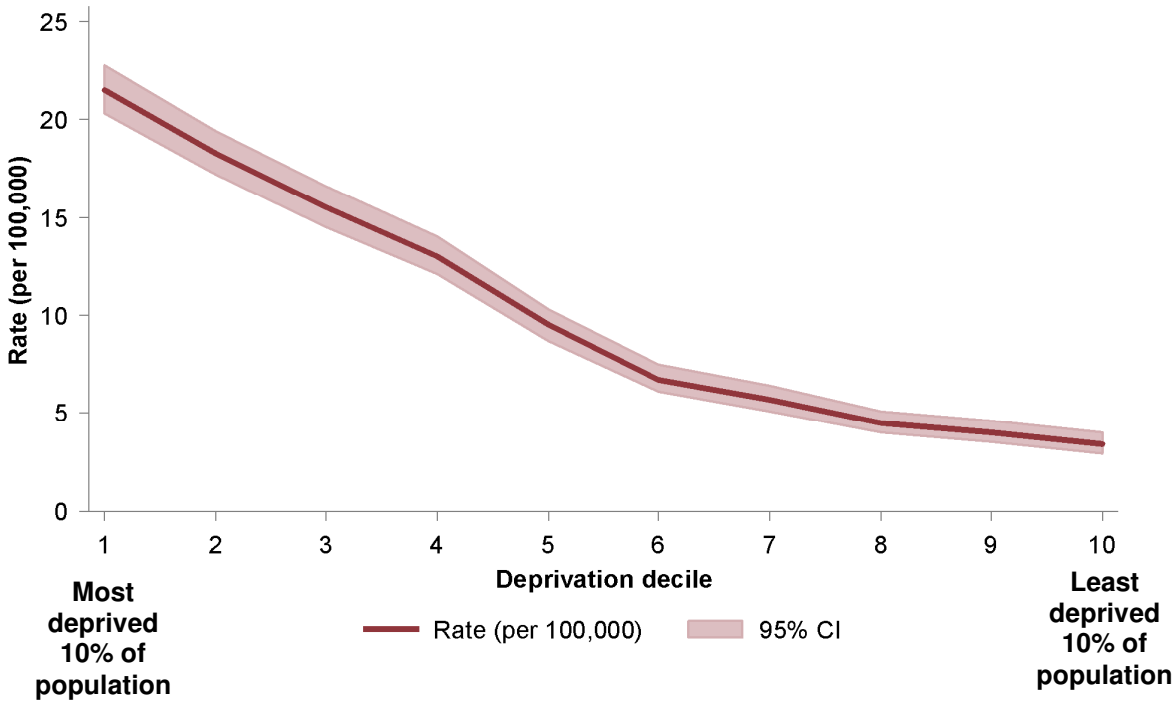
In 2016, 63 TB cases were recorded as being asylum seekers and 14 cases were recorded as being in an immigration removal centre. Forty percent (38.6%, 22/57) of TB cases that were asylum seekers were currently or had a history of homelessness (Table 7.1). A total of 99 cases notified between 2010 and 2016 were recorded as being in an immigration removal centre (range 8-20 per year).

Deprivation

In 2016, the rate of TB was 21.5 per 100,000 in the 10% of the population living in the most deprived areas compared with only 3.4 per 100,000 in the 10% of the population living in the least deprived areas[23], with a clear trend of an increasing rate of TB with increasing deprivation (Figure 7.5, Table Ai.7.5).

[23] The Index of Multiple Deprivation (IMD) 2015, part of the English Indices of Deprivation, is an overall measure of multiple deprivation experienced by people living in an area and is measured at Lower Super Output (LSOA) level. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf

Figure 7.5: Rate of TB by deprivation decile, England, 2016



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

Key messages

- in 2015, 3.8% of TB cases were co-infected with HIV compared with 3.3% in 2014
- the proportion of TB cases with HIV co-infection was highest in those aged 35 to 44 (6.8%) and lowest in those aged 65 years and older (1.0%)
- the majority (82%) of TB-HIV co-infected cases are non-UK born, of whom over two-thirds (69%) were born in sub-Saharan African countries
- in 2016, 93% of TB cases with a previously unknown HIV status were offered and received HIV testing; however, this was much lower for those aged less than 15 years (73%)

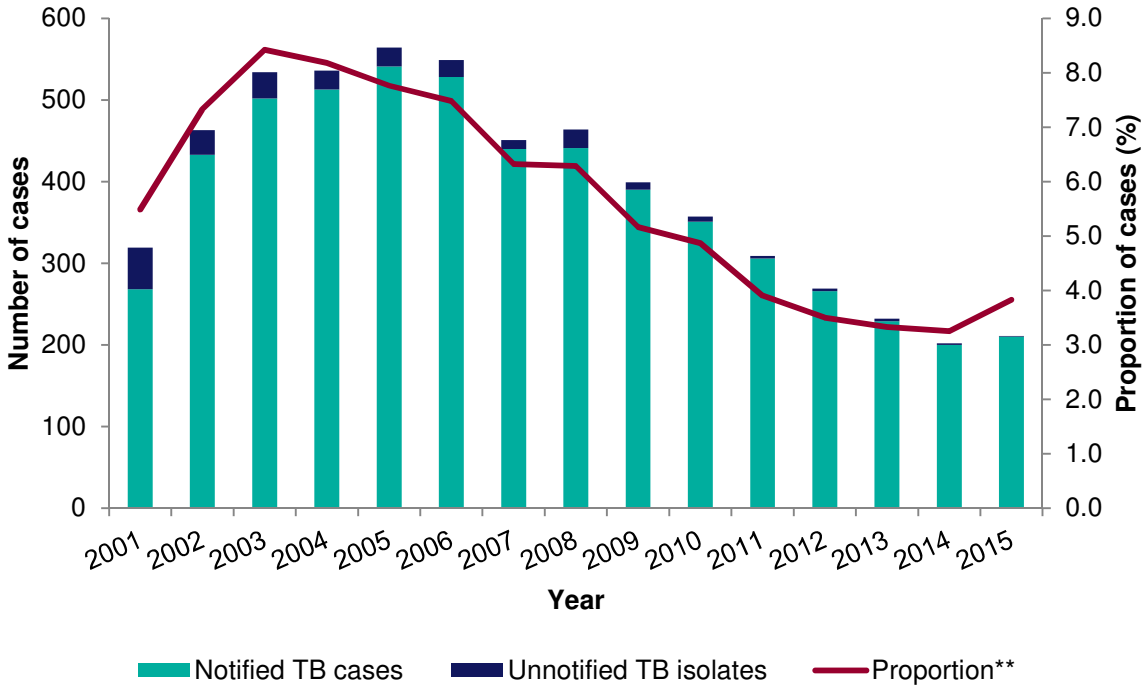
TB-HIV co-infection

HIV status is not collected in the Enhanced TB Surveillance system. To estimate TB-HIV co-infection, TB and HIV surveillance data are matched annually for cases aged 15 years and older (see Appendix III: Methods).

The most recent year for which TB-HIV co-infection data are available for England is 2015. In this year, 3.8% (211/5,513) of TB cases aged 15 years and older were estimated to be co-infected with HIV (Figure 8.1, Table Ai.8.1). This is a small increase in the annual proportion (2014: 3.3%) of TB cases co-infected with HIV following the downward trend since the peak of 8.4% in 2003. TB-HIV co-infection varied by PHEC (Table Ai.8.2).

In the past decade, the age group distribution of cases with TB-HIV co-infection has changed, with a reduction in the number of cases aged 25 to 44 years and an increase in the number of cases aged 45 to 54 years (Figure 8.2, Table Ai.8.3). The median age of TB-HIV co-infected cases increased over time from 34 years (IQR 30-41) in 2001 to 41 years (IQR 34-47) in 2015. Between 2014 and 2015, there was an increase in the proportion of TB-HIV co-infected cases among the 25 to 34 years age group (2014: 15.5% versus 2015: 21.4%). In 2015, the proportion of HIV co-infection was highest among TB cases aged 35 to 44 year olds (6.8%, 81/1,189) and 45 to 54 years (6.5%, 53/818).

Figure 8.1: Number and proportion of TB cases with HIV co-infection*, England, 2001-2015

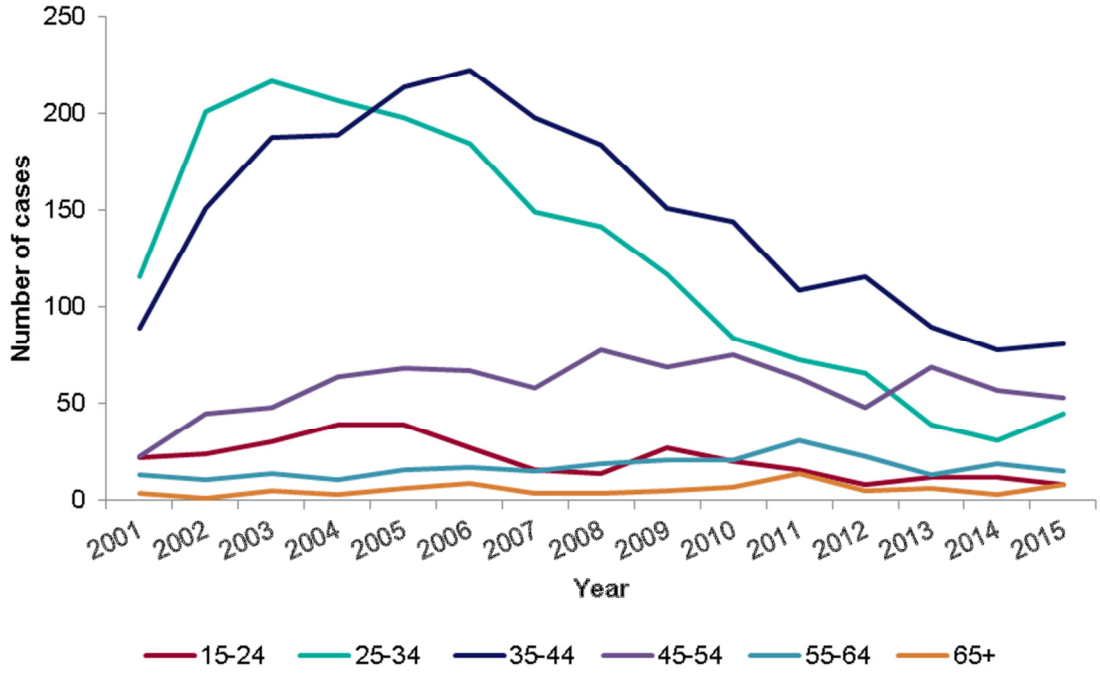


* Includes TB and HIV co-infected cases aged 15 years and older.
** Proportion is calculated using the number of notified TB cases with HIV co-infection plus the number of un-notified cases with an MTBC isolate which matched to an HIV case as the numerator, and the number of all notified TB cases (with or without HIV co-infection) plus the number of un-notified TB isolates which matched to an HIV case as the denominator.

In 2015, where place of birth was known, 81.8% (171/209) of TB-HIV co-infected cases were non-UK born, the lowest proportion since 2001 (range 2001-2014: 83%-93%). Where country of birth was known, 68.7% (114/166) of non-UK born co-infected cases were born in sub-Saharan African countries, the lowest number and proportion since 2001 (range 2001-2014: 73%-92%).

In 2015, 6.2% (8/130) of TB-HIV co-infected cases had isoniazid resistance without MDR-TB and 4.6% had MDR/RR-TB (6/130).

Figure 8.2: Number of TB-HIV co-infected case notifications by age group*, England, 2001-2015



* Based on age at TB notification

Testing for HIV in notified TB cases

Information on HIV testing was reported for 92.9% (5,059/5,445) of TB cases notified in 2016 with previously unknown HIV status. Of these, 93.2% (4,716) of cases were offered and received HIV testing, 3.4% (172) of cases were not offered testing, and 3.4% (171) were offered HIV testing but were not tested, of which 18.7% (32) declined (Table 8.2). The number and proportion of TB cases who were offered but did not receive a HIV test was higher in 2016 than in 2014 or 2015.

The proportion of cases who had HIV testing offered and received varied by PHEC; in 2016, the highest was in London (96.8%, 2,029/2,096), and the lowest was in East of England (79.0%, 290/367) and North East (84.9%, 90/106) (Table Ai.8.4). However, the reason for the low proportion differed between East of England and North East; in East of England 13.9% (51/367) of cases were offered but did not receive HIV testing, while in North East 11.3% (12/106) were not offered HIV testing.

Table 8.2: HIV testing in notified TB cases, England, 2011-2016

Year	HIV testing								
	Not offered		Offered and received		Offered but not received		Offered but declined		Total*
	n	%	n	%	n	%	n	%	n
2011	221	6.0	3,306	89.3	121	3.3	56	1.5	3,704
2012	379	6.8	4,905	87.9	195	3.5	104	1.9	5,583
2013	398	6.4	5,511	89.1	166	2.7	109	1.8	6,184
2014	260	4.6	5,248	92.7	95	1.7	58	1.0	5,661
2015	187	3.6	4,813	93.8	88	1.7	45	0.9	5,133
2016	172	3.4	4,716	93.2	139	2.7	32	0.6	5,059
Total	**1,617**	**5.2**	**28,499**	**91.0**	**804**	**2.6**	**404**	**1.3**	**31,324**

* Total with previously unknown HIV status where HIV testing is known and excluding those diagnosed post-mortem

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

The proportion of cases who were offered and received HIV testing was lower in those aged less than 15 years (72.6%, 135/186) and in those aged 65 years and older (86.6%, 644/744) compared with other age groups (Table 8.3). However, between 2015 and 2016 there has been an improvement in the proportion of cases aged less than 15 years who were offered and received HIV testing (2015: 66.7%, 126/189).

Table 8.3: HIV testing in notified TB cases by age group, England, 2016

Age group (years)	HIV testing								
	Not offered		Offered and received		Offered but not received		Offered but declined		Total*
	n	%	n	%	n	%	n	%	n
0-14	46	24.7	135	72.6	4	2.2	1	0.5	186
15-44	33	1.2	2,734	95.9	72	2.5	12	0.4	2,851
45-64	25	2.0	1,203	94.1	37	2.9	13	1.0	1,278
65+	68	9.1	644	86.6	26	3.5	6	0.8	744
Total	**172**	**3.4**	**4,716**	**93.2**	**139**	**2.7**	**32**	**0.6**	**5,059**

* Total with previously unknown HIV status where HIV testing is known and excluding those diagnosed post-mortem

9. BCG vaccination

Key messages

- in 2015/16, there was wide variability in BCG coverage in all universal coverage areas ranging from 5.3% in Havering to 92.1% in Tower Hamlets
- BCG vaccination coverage was lower in 2016/17 than 2015/16 in all areas
- of all TB cases notified in 2016, the vaccination status was known in 70.6% (3,996/5,664) of cases; 69.6% (2,781/3,996) of these had previously been vaccinated, with 63.7% (114/179) of TB cases aged less than 15 years vaccinated

BCG vaccine coverage data

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 the incidence of TB is ≥40 TB cases per 100,000 population should be offered the BCG vaccine [7]. Because of large cross-boundary movements in London, universal neonatal vaccination is in place across all London areas. There was a shortage of BCG vaccination in the UK from May 2015 and ordering of vaccines was temporarily suspended in April 2016 until a replacement BCG vaccine was made available in June 2016 [8, 9]. In some areas of London the universal BCG programme has not been resumed after the shortage.

From April 2015, as part of the Cover Of Vaccination Evaluated Rapidly (COVER) programme, neonatal BCG has been included in the data extraction template from local Child Health Information Systems (CHISS), alongside extraction of coverage data for other vaccines offered under the age of five years of age. This provides an opportunity for BCG vaccine coverage to be estimated for local authorities where a universal neonatal programme is in place [10]. It is not possible to calculate coverage for the selective programme offered in the rest of England as the denominator is not defined in the CHISS.

BCG coverage is measured in each local authority (LA) as the number of infants who receive vaccination by their first birthday out of all infants recorded in the CHISS who have their first birthday in that year. Coverage data are extracted and calculated quarterly, then re-extracted annually. Further details can be found in the Childhood Vaccination Coverage Statistics, England, 2016-17 [11].

Annual universal BCG programme vaccine coverage data

At the time when threshold levels for universal BCG vaccination were set (using the average annual rate of TB per 100,000 between 2012 and 2014), there were 11 LAs in England with a TB incidence of ≥40 cases per 100,000 population, nine of which were in London. Ten of the high incidence LAs reported that in 2016 they had a universal BCG programme in place. Additionally, all local authorities in London reported universal BCG programmes as part of the London-wide universal vaccination policy. Based on data submitted by CHISs to COVER for 2016/17, estimated coverage for nine London LAs with high TB incidence ranged from 23.8% to 85.4%, compared with 32.3% to 91.2% in financial year 2015/16 (Figure 9.1). In the remaining 24 London LAs with a universal programme in place, the estimated coverage ranged from 5.3% to 92.1% in 2016/17 (Table 9.1).

Although Leicester LA had a TB incidence of 48 per 100,000, they had a selective vaccination programme and it was therefore not possible to estimate coverage. Since COVER returns for BCG coverage have been only recently established, data are of variable quality. Estimates of low coverage may in part reflect poor data quality and future reports may provide more robust estimates.

Quarterly BCG coverage in London LAs with universal coverage

Quarterly BCG vaccination coverage data for financial years 2015/16 and 2016/17 for LAs with universal coverage varied considerably both between and within LAs (Figure 9.1, Table Ai.9.1). Newham had the highest BCG quarterly vaccine coverage, peaking in the first quarter of 2015/16 at 95.6% and decreasing to 78.8% in the fourth quarter of 2016/17. Compared with other LAs, quarterly BCG vaccine coverage estimates were lowest for Brent and Harrow which were consistently below 50% throughout 2015/16 and 2016/17. In Waltham Forest LA, coverage increased from 1.6% in the first quarter of 2015/16 to 88.3% in the third quarter, but decreased to 7.9% in the last quarter of 2016/17.

These changes may reflect data quality, vaccine shortage and other factors and should therefore be interpreted with caution. While the vaccine is now available the universal programme has not been re-started in all areas in London and it may take several quarters for the vaccine programme to be fully implemented in all areas. This may be reflected in future coverage estimates.

Table 9.1: BCG vaccine coverage estimates from CHISs for upper tier local authorities, England, April 2016 to March 2017 (April 2015 to March 2016)

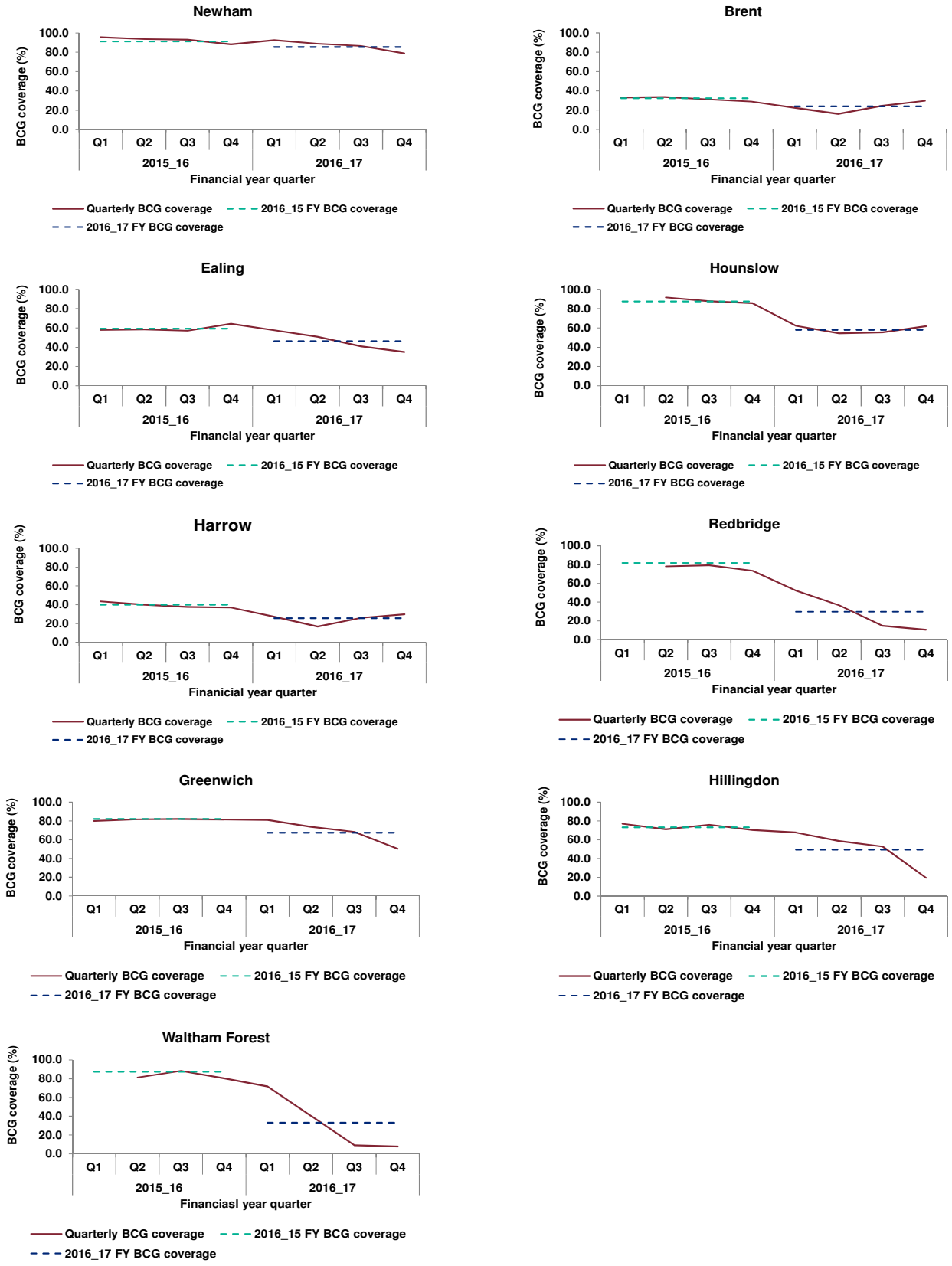
Upper Tier Local Authority	TB rate (per 100,000) 2012-14 estimates*	2015-16 Percent BCG Coverage (No. of eligible children)**	2016-17 Percent BCG Coverage (No. of eligible children)#
(a) TB incidence ≥40 per 100,000 and universal BCG vaccination policy			
Newham	100.0	91.2 (5,711)	85.4 (5,550)
Brent	82.9	32.3 (4,672)	23.8 (4,791)
Ealing	65.3	59.3 (5,059)	46.2 (4946)
Hounslow	64.0	87.4 (3,931)	58.0 (4,543)
Harrow	60.4	40.1 (3,327)	25.7 (3414)
Slough	51.5	*not available (2,384)*	11.1 (2460)
Redbridge	50.5	81.7 (4,607)	29.9 (4543)
Greenwich	42.0	82.1 (4,483)	67.5 (4,729)
Hillingdon	41.9	73.2 (4,138)	49.5 (4,032)
Waltham Forest	41.3	87.4 (4,521)	33.1 (4,327)
(b) TB incidence ≥40 per 100,000 and selective vaccination policy			
Leicester	48.0	*selective programme (5,207)*	*selective programme* (4,996)
(c) Other London boroughs with incidence <40 per 100,000 and universal BCG policy			
Tower Hamlets	38.3	91.6 (4,290)	92.1 (4,136)
Barking and Dagenham	35.0	70.1 (3,640)	16.8 (3,785)
Haringey	33.2	15.2 (3,940)	9.7 (4,084)
Hackney	32.4	68.3 (4,335)	58.5 (4,289)
Southwark	31.7	*not available (4,384)*	*not available* (4,283)
Merton	29.6	28.7 (2,903)	22.2 (2,840)
Islington	29.3	77.2 (2,667)	*not available* (2,376)
Croydon	27.6	*not available (5,629)*	24.0 (5,745)
Lambeth	26.6	*not available (4,686)*	*not available* (4,964)
Lewisham	25.9	69.6 (4,473)	54.0 (4,596)
Hammersmith and Fulham	24.2	39.2 (2,385)	33.5 (2,233)
Westminster	24.0	41.9 (2,647)	24.0 (2,438)
Barnet	23.2	37.9 (5,377)	35.0 (5,200)
Enfield	22.5	2.4 (4,388)	5.5 (4,620)
Kensington and Chelsea	22.2	42.0 (2,325)	25.6 (2,109)
Camden	21.8	77.7 (2,483)	47.7 (2,488)
Wandsworth	21.7	50.8 (5,180)	24.5 (4,946)
Kingston upon Thames	15.8	21.7 (2,566)	12.0 (2,709)
Sutton	13.3	28.7 (2,701)	22.2 (2,643)
City of London	12.9	37.3 (59)	33.9 (59)
Havering	10.9	26.5 (3,275)	5.3 (3,603)
Bexley	10.7	61.8 (3,106)	58.3 (3,133)
Bromley	8.1	24.1 (4,102)	20.3 (4,379)
Richmond upon Thames	5.9	34.0 (2,592)	23.3 (2,615)

* The BCG vaccination programme was based on the 2012-2014 LA TB rates, as published in Tuberculosis in England 2015 report

** Cohort born between 1 April 2015 and 31 March 2016

Cohort born between 1 April 2016 and 31 March 2017

Figure 9.1: Annual and quarterly proportion of BCG coverage for nine London local authorities with TB incidence ≥40 per 100,000 population and a universal BCG vaccination, for financial years 2015-16 and 2016-17



BCG vaccination status of TB cases

BCG vaccination status is recorded for TB case notifications in the Enhanced Tuberculosis Surveillance system (ETS).

In 2016, information on BCG vaccination status was known for 70.6% (3,996/5,664) of TB cases in England, of which 69.6% (2,781/3,996) had received BCG vaccination. Sixty four percent (63.7%, 114/179) of the cases aged less than 15 years had received the BCG vaccination. The proportion of cases aged less than 15 years, who had received a BCG vaccination was higher in non-UK born (77.1%, 27/35) cases compared to UK born cases (60.1%, 86/143).

10. Latent TB infection testing and treatment

Key messages

- as of June 2017, 56 of 59 of priority CCGs have received funding from NHS England with 51 of these reporting LTBI testing activity among eligible new migrants
- data submissions remain low with only 16 CCGs reporting testing data (GP data) and 23 CCGs reporting treatment data (secondary care); this impairs monitoring and evaluation of the programme
- 20,905 IGRA LTBI tests were reported to have been performed between July 2014 and June 2017, of which 20% were positive
- treatment uptake varied by CCG ranging between 22% and 82% while treatment completion ranges between 0% and 98%. About 47% of CCGs achieved more than 60% treatment uptake and 63% achieved more than 60% treatment completion

Implementing and monitoring systematic LTBI testing and treatment in England

In 2015, of the 209 CCGs, 59 with the highest incidence and burden of TB in England were prioritised for the new migrant LTBI systematic testing and treatment programme. The national LTBI programme is now in its third year of operation [12]. Eligibility for the national LTBI testing and treating programme is for persons aged 16 to 35 years, who entered the UK from a high incidence country (≥150/100,000 or sub-Saharan Africa) within the last five years and have been previously living in that high incidence country for six months or longer [13].

To ensure the programme is delivered effectively, the following indicators will be reported in this chapter:

- LTBI testing and treatment programme coverage
- LTBI testing acceptance
- IGRA test performance and LTBI positivity
- LTBI treatment uptake
- LTBI treatment completion
- Adverse events from LTBI treatment

Data in this chapter

Data presented in this chapter were reported from 16 CCGs (testing data), 23 CCGs (treatment data) and 47 CCGs (laboratory data) between July 2014 and June 2017 (including data from the NHS Newham LTBI pilot) (Table Ai.10.1). Only data submitted to PHE before 31 July 2017 has been included in this report.

LTBI testing and treatment programme coverage

Programme coverage

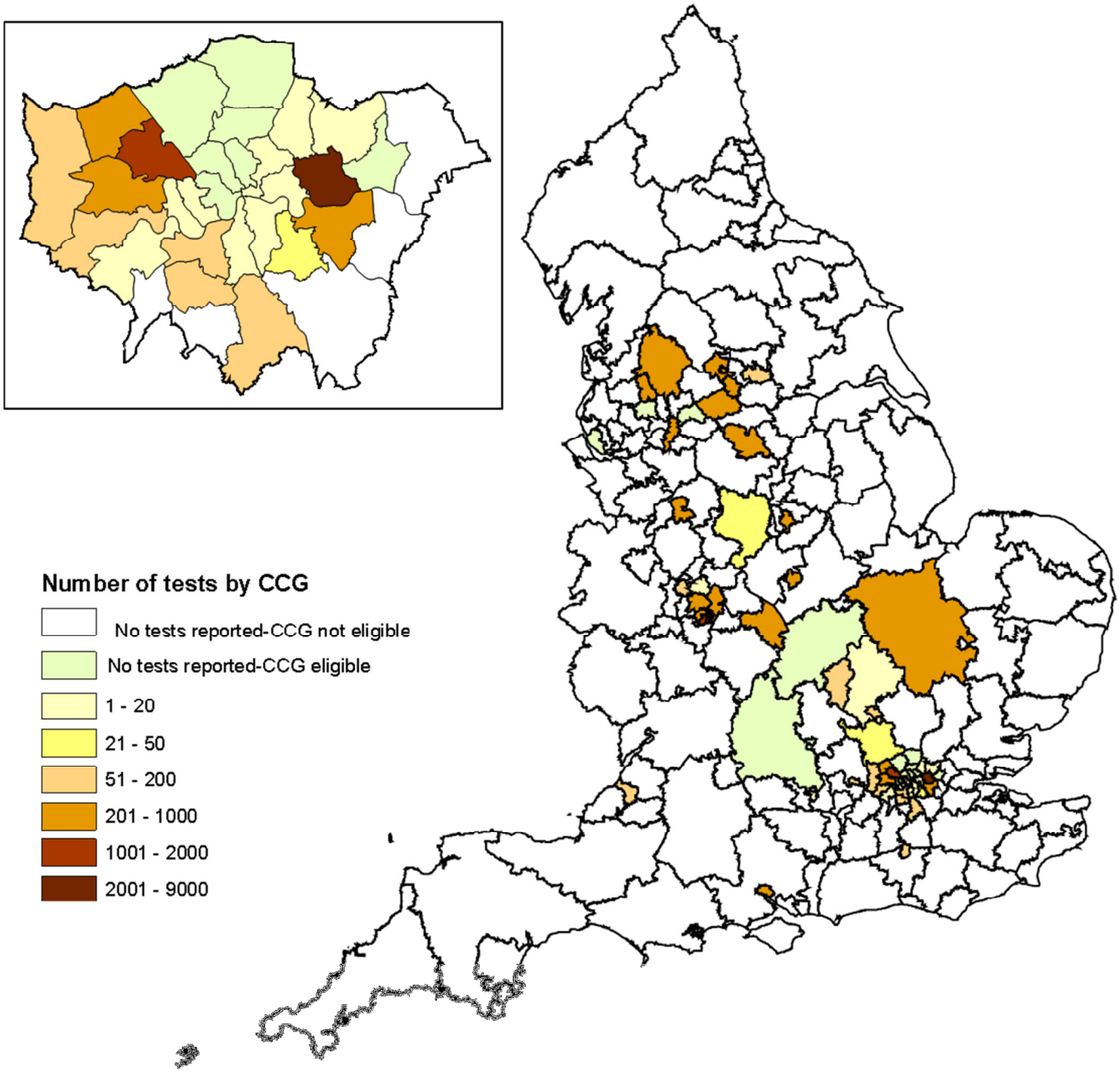
NHS England has fully supported the implementation and delivery of the LTBI testing and treatment programme for the financial years (FY) 2015/16, 2016/17 and 2017/18. Newham served as a pilot site for the national LTBI testing and treatment programme and was the first CCG to receive funding under the national LTBI testing and treatment programme in April 2015. As of June 2017, 56 of the 59 priority CCGs (94.9%) have received funding from NHS England. Of the 56 that have received funding, 51 (91.1%) have reported LTBI testing activity among eligible new migrants.

LTBI testing

Overall number of tests

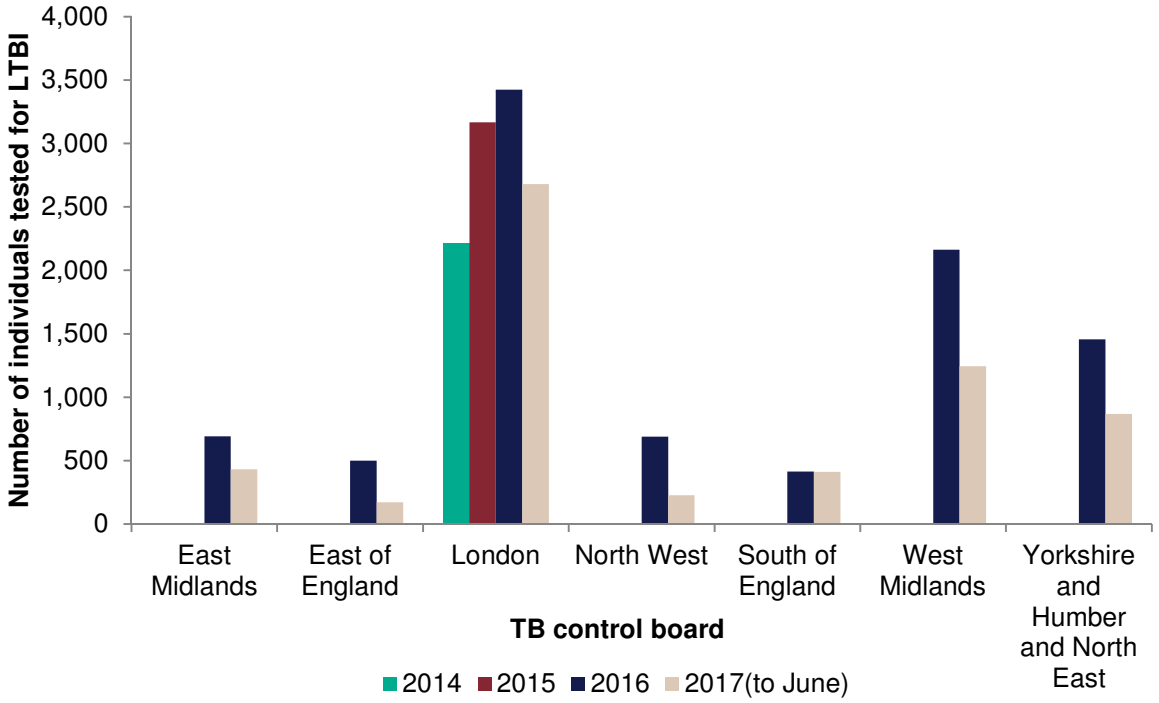
There were a total of 20,905 LTBI tests reported between July 2014 and June 2017 (Table Ai.10.2). Nearly half (41.8%, 8,730/20,905) of the tests were reported in Newham CCG (Figure 10.1). This is partly due to the fact that Newham was a pilot and early adopter. Testing activity varied by locality ranging between 670 and 11,497 tests by TB control board area and one and 8,730 tests for CCGs areas (Figure 10.2). The majority 45.0% (9,353/20,779) of tests were reported in 2016 but this may change once data for all of 2017 is available. The cumulative number of tests has steadily been increasing year on year (Figure 10.3).

Figure 10.1: Number of individuals tested for LTBI by CCG, July 2014-June 2017 (box shows enlarged map of London area)



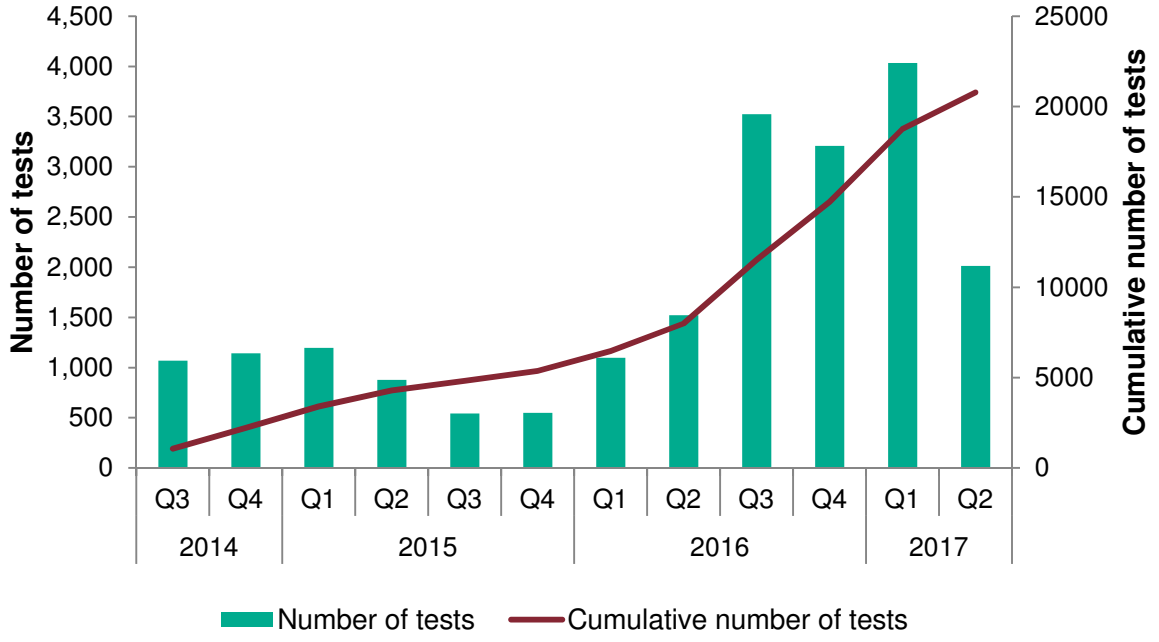
LTBI Indicator 1: The number of CCGs with systematic new entrant LTBI testing and treatment in place (England)

Figure 10.2: Number of individuals tested for LTBI by TB control board and year, July 2014-June 2017*



*2014 and 2015 data includes data from Newham CCG and Greenwich CCG only. Data for 2014 and 2017 only covers six months

Figure 10.3: Number of tests by year and quarter for latent TB testing, July 2014-June 2017

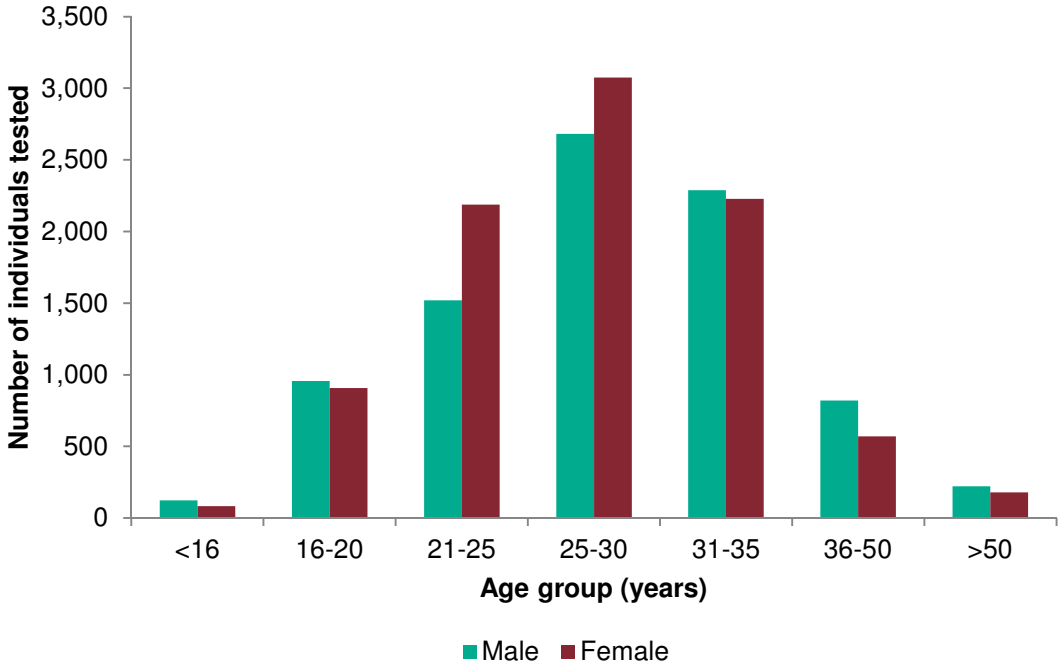


Demographic Characteristics

Age and Sex

Information on age and sex was available for 99.2% (20,744/20,905) and 85.9% (17,953/20,905) of individuals tested, respectively. Where known, 51.5% (9,243/17,953) of LTBI tests were among females. Among those tested, 89.0% (18,454/20,744) met the LTBI programme age eligibility criteria of 16 to 35 years and 11.0% (2,290/20,744) were aged either below 16 or above 35 years (outside the eligibility criteria). Distribution by age and sex is presented below (Figure 10.4).

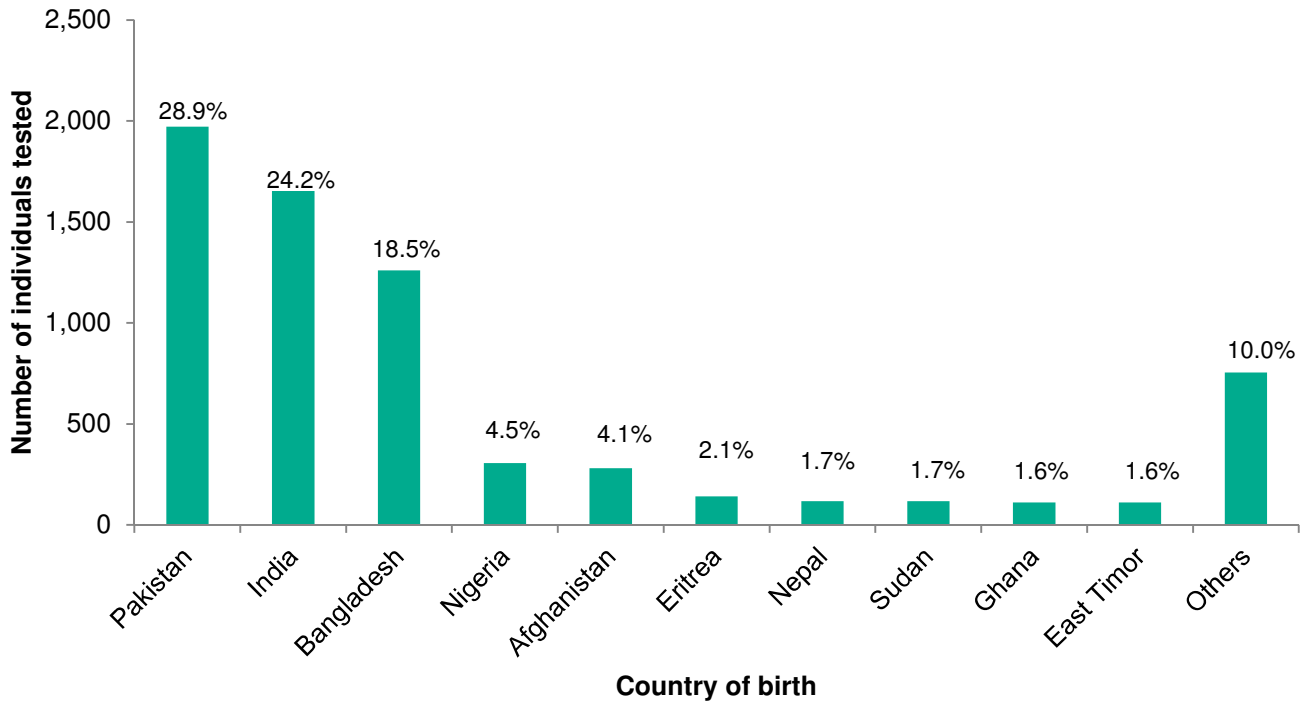
Figure 10.4: Number of tests by sex and age group for latent TB testing July 2014-June 2017



Country of birth

Country of birth was known for 32.7% (6,828/20,905) of people tested for LTBI. Among those with known country of birth, Pakistan (28.9% ,1,972/6,828), India (24.2%, 1,653/6,828) and Bangladesh (18.5%, 1,260/6,828) accounted for the majority of individuals tested (Figure 10.5,Table Ai.10.3).

Figure 10.5: Number and proportion* of individuals tested for LTBI by country of birth, July 2014-June 2017



*Figures above bars represent the percentage of LTBI tests from respective country

Ethnicity

Ethnicity was known for 25.6% (5,352/20,905) of individuals tested for LTBI. Similar to country of birth, Indian 26.7% (1,428/5,352), Pakistani 25.1% (1,314/5,352), and Bangladeshi 22.0% (1,176/5,352) ethnic categories accounted for the majority of individuals tested (Table Ai.10.4).

LTBI testing acceptance

LTBI testing acceptance varied across CCG areas. In 2016, acceptance ranged between 6.0% and 96.4%. For 2017, acceptance was calculated based on number of individuals invited to test between January and June and this ranged between 8.5% and 83.7%. Figures are presented for CCGs that provided this information to PHE (Table 10.1).

Table 10.1: LTBI testing acceptance by CCG, July 2015-June 2017

Clinical commissioning group (CCG)	2015	2016	2017
	(%)	(%)	(%)
NHS Bradford City CCG & NHS Bradford Districts CCG	-	NR*	69.6
NHS City And Hackney CCG	-	-	8.5
NHS Greater Huddersfield CCG	-	86.7	47.0
NHS Greenwich CCG	70.5	96.4	51.4
NHS Herts Valleys CCG	-	6.3	7.3
NHS Hounslow CCG	-	63.8	28.5
NHS Leeds South And East CCG	-	20.2	75.7
NHS Luton CCG	-	19.2	10.4
NHS Merton CCG	-	10.3	12.4
NHS Newham CCG	57.4	40.0	NR*
NHS North Kirklees CCG	-	NR*	78.9
NHS North Manchester CCG and Central Manchester CCG	-	-	83.7
NHS Southern Derbyshire CCG	-	40.0	22.8
NHS Tower Hamlets CCG	-		17.7
NHS Wandsworth CCG	-	NR*	63.9
NHS Wolverhampton CCG	-	36.4	19.4

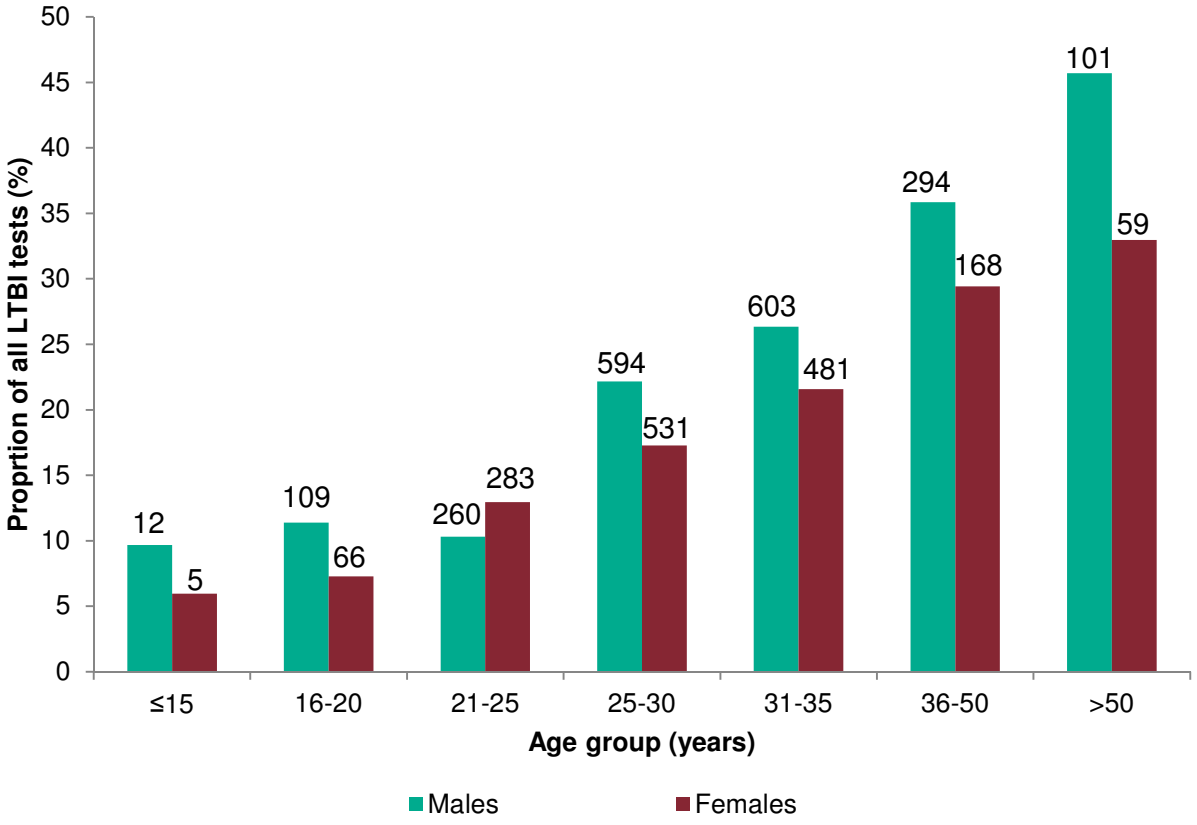
*Data not included as denominator provided exceeded number of tests submitted through laboratories
NR- Not reported

LTBI Indicator 2: Proportion of eligible new entrants covered by the LTBI testing programme who accept LTBI testing (England)

IGRA test performance and LTBI positivity

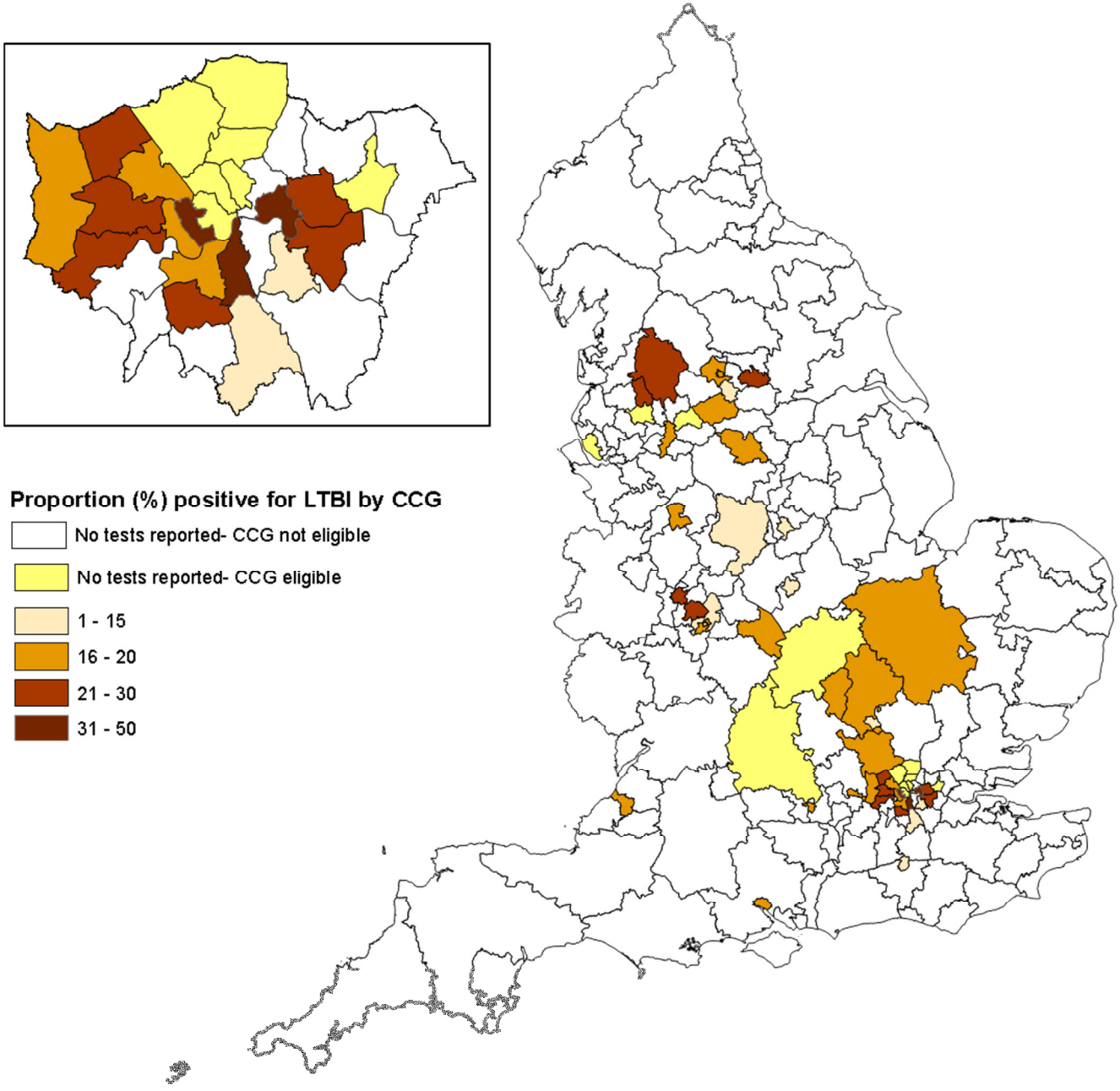
IGRA test results were available for 98.5% (20,592/20,905) of the individuals tested for LTBI. Among these, 20.2% (4,150/20,592 were positive, 78.6% (16,191/20,592) were negative and 1.2% (251/20,592) were indeterminate. The 1.5% (313/20,905) of tests with unknown results were either not processed due to insufficient sample or results had not yet been obtained at the time of submitting data to PHE. Figure 10.6 presents LTBI test results by gender and age group. Where test date was available, 26.9% (594/2,211) of patients tested positive for LTBI in 2014, 23.9% (758/3,167) in 2015, 18.6% (1,703/9,174) in 2016 and 17.5% (1,035/5,915) in 2017. The proportion of patients that tested positive for LTBI also varied by CCG, ranging from 0% to 45.5% (Figure 10.7, Table Ai.10.5).

Figure 10.6: Proportion and number* of patients that tested positive for LTBI by sex and age group, July 2014-June 2017



* Numbers above bars represent the number of patients that tested positive for LTBI

Figure 10.7: Proportion of patients that tested positive for LTBI by CCG, July 2014-June 2017 (box shows enlarged map of London area)



Treatment for LTBI

Treatment initiated, acceptance and completion

Treatment data was available for 19 CCGs, of which 2,694 individuals tested positive for LTBI. The proportion of LTBI positive patients who accepted treatment varied by CCG ranging between 22.1% (38/172) and 81.8% (18/22) and about 47% of CCGs achieved more than 60% treatment uptake (table 10.2). Treatment completion also varied between CCGs, with 63.2% achieving more than 60% (Table 10.2). It is worth noting that these figures could be low due to underascertainment (because of data quality) and that treatment uptake and completion can be subject to pathway delays, which may lower than the observed figures (as eligible patients may still be on the pathway at the time of reporting).

Table 10.2: Treatment acceptance and completion by for individuals tested positive for LTBI by CCG, July 2014-June 2017

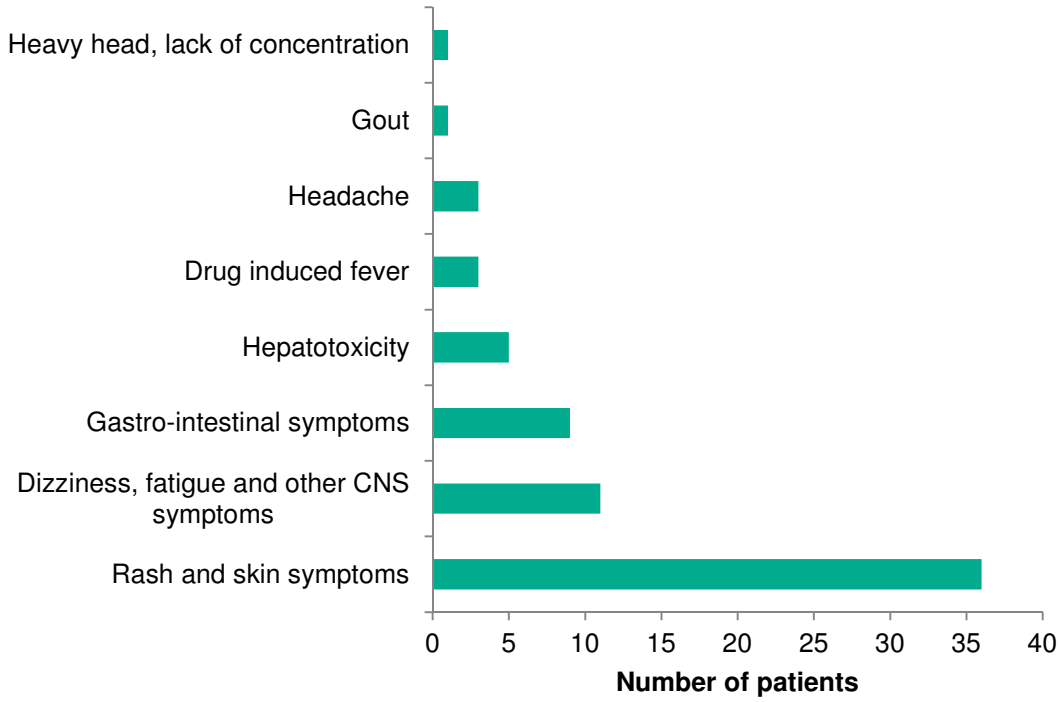
Clinical commissioning group (CCG)	Total number tested positive for LTBI	Started treatment (acceptance)		Completed treatment	
		n	%	n	%
NHS Birmingham South and Central	395	242	61.3	238	98.3
NHS Blackburn and Darwen	142	42	29.6	41	97.6
NHS Bradford City and NHS Bradford Districts	157	120	76.4	82	68.3
NHS Coventry and Rugby	47	14	29.8	5	35.7
NHS Croydon	8	1	12.5	0	0.0
NHS Ealing	75	32	42.7	10	31.3
NHS Greater Huddersfield	71	47	66.2	25	53.2
NHS Greenwich	92	62	67.4	17	27.4
NHS Hillingdon	22	18	81.8	15	83.3
NHS Newham	1,135	350	30.8	208	59.4
NHS North Kirklees	17	11	64.7	8	72.7
NHS North Manchester and NHS Central Manchester	62	22	35.5	14	63.6
NHS Nottingham City	25	16	64.0	15	93.8
NHS Sandwell and West Birmingham	172	38	22.1	23	60.5
NHS Sheffield	75	38	50.7	29	76.3
NHS Slough	41	14	34.1	8	57.1
NHS South Reading	42	14	33.3.	10	71.4
NHS Southampton	79	61	77.2	43	70.5
NHS Stoke on Trent	37	24	64.9	15	62.5
Total	**2,694**	**1,124**	**41.7**	**806**	**71.7**

LTBI Indicator 4: The proportion of patients who take up treatment amongst those who have been offered it (England)
LTBI Indicator 5: The proportion of patients who complete LTBI treatment amongst those who start treatment (England)

Adverse events

Among patients who started LTBI treatment, 6.1% (69/1,124) reported one or more adverse events through the course of treatment. Most reactions were mild with rash and skin symptoms the most reported treatment adverse events, 52.2% (36/69). Hepatotoxicity was rare, 7.2% (5/69). Figure 10.8 summarises all recorded adverse events.

Figure 10.8: Number and proportion of patients reporting adverse events following LTBI treatment, July 2014-June 2017



LTBI Indicator 6. The proportion of patients who experience significant drug events amongst those who initiated treatment (England)

11. UK tuberculosis pre-entry screening programme

Key messages

- all long term visa applicants (coming to stay in the UK for ≥6 months) from countries with an estimated TB incidence of ≥40 per 100,000 are required to undergo screening for active pulmonary TB prior to entry to the UK
- just under 1.5 million screening episodes were recorded to have taken place since October 2005, 247,780 of which took place in 2016
- a total of 249 TB cases were detected through screening in 2016
- as more cases were detected overseas, the number of prevalent pulmonary TB cases notified in the UK within 1 year of entry to the UK from countries within the pre-entry scheme decreased from 380 in 2006 to 57 in 2016

Following a successful pilot in 15 high TB incidence countries between 2005 and 2012, the UK replaced port based on-entry screening with pre-entry screening overseas. The global roll-out of pre-entry screening to 101 high incidence countries took place between September 2012 and March 2014, when on-entry screening ceased. Chest X-ray based active pulmonary TB screening is a requirement for all migrants from countries with a TB incidence of ≥40 per 100,000 who apply for a visa to stay in the UK for six months or longer. Applicants with chest X-ray changes consistent with TB are refered for sputum smear and culture tests. These tests are carried out by appointed panel clinics [14].

The number of applicants screened and the number of TB cases detected has increased as more countries have joined the TB pre-entry scheme. In total, 1,465,633 screening episodes have taken place since October 2005, and 247,780 of these were performed in 2016. In 2016, the majority of applicants were female (56.2%, 99,078/176,135) and 43.8% (77,057/176,135) were male (where sex was known). The majority of applicants were young adults, aged 15 to 34 years old (75.6%, 148,191/196,088) (where age was known). The largest number of screening episodes took place in China (29.3%, 85,114/247,780), India (22.0%, 54,606/247,780), Pakistan (7.7%, 19,097/247,780) and Nigeria (4.2%, 10,513/247,780).

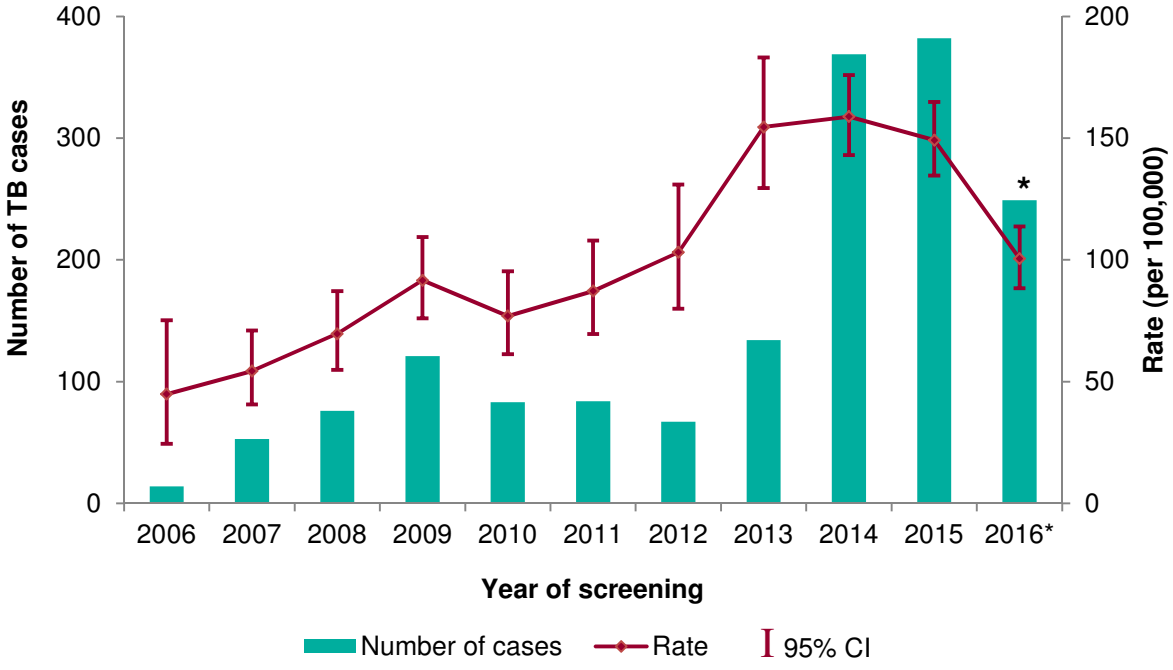
In total, 249 TB cases were detected in 2016, giving an overall TB detection yield of 100.5 per 100,000 applications. The TB rate was similar for female and male applicants. The number and rate of TB cases diagnosed through the pre-entry screening programme increased from 14 (45 per 100,000) in 2006 to 382 (149.5 per 100,000) in 2015, before decreasing to 249 (100.5 per 100,000) in 2016 (Figure 11.1, Table Ai.11.1). Increases in cases and detection rates during previous years are likely due to

improved procedures and the introduction of culture instead of smear confirmation. The reduction in 2016 is likely multifactorial and may be due to decreased case ascertainment, decreased TB rates in countries of origin, changing composition of migrants and improved health of applicants. More detailed analysis of these factors is planned.

The majority of TB cases in 2016 were found among applicants aged 15 to 34 years old (44.2%, 110/249) whilst older age groups had fewer cases (55 years and over: 8.0%, 20/249) but higher TB rates (15 to 34 years: 72.9 per 100,000 applicants versus ≥55 years: 540.1 per 100,000 applicants).

Between 2006 and 2016, pulmonary TB cases notified in the UK within one year of entry to the UK from countries covered by the programme (101 countries) decreased from 380 in 2006, to 57 in 2016 (Figure 11.2, Table Ai.11.2).

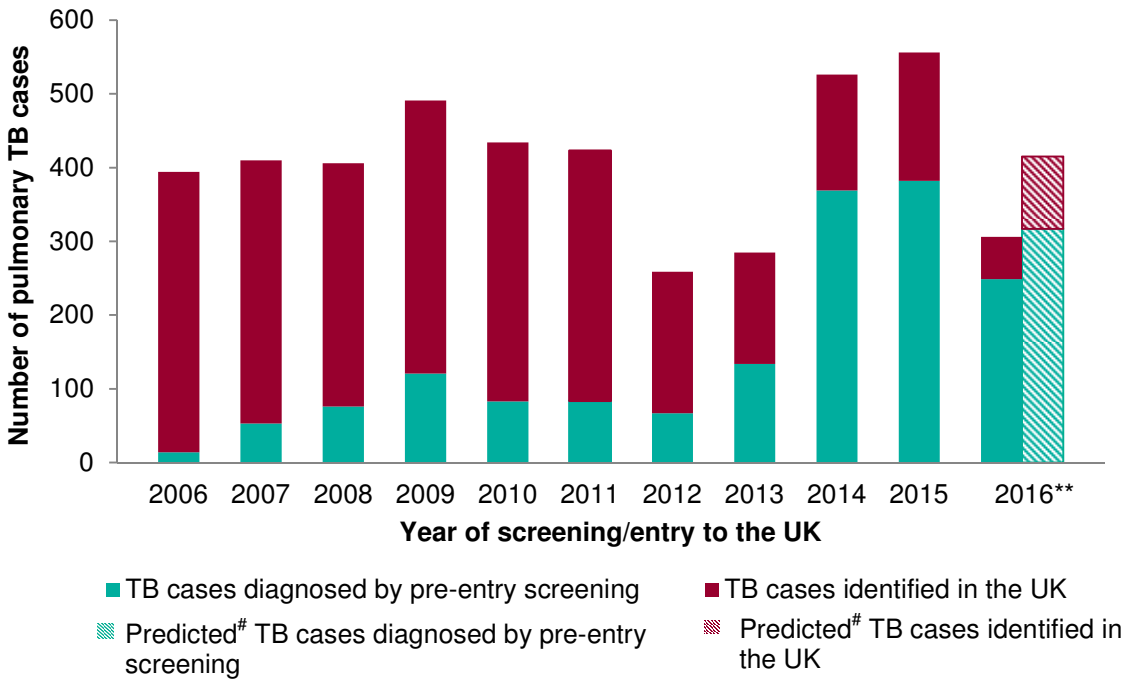
Figure 11.1: Number and rate of TB cases detected in high incidence countries through the UK pre-entry screening programme, 2006-2016[24]



* As of 10 June 2017, 759 sputum culture results are pending and the rate may increase when final results are available.

[24] For countries which became part of the pre-entry screening programme during the global roll-out, there is a possibility of under-ascertainment in 2012 and 2013, as clinics were establishing reporting systems during this transition phase.

Figure 11.2: Number of pulmonary TB cases diagnosed by pre-entry screening in the 101 programme countries and those identified within one year of UK entry*, 2006-2016[25]



* The number of pulmonary TB cases identified within one year of entry into the UK was from all 101 high incidence countries but the number of TB cases diagnosed by pre-entry screening were from an increasing number of countries as screening was rolled out; 5 pilot countries (2006), 15 pilot countries (2007 and 2012), 101 countries (by 2014).
** As of 10 June 2017, 759 sputum culture results were pending and the rate may increase when final results are available.
# The predicted TB cases are based on the assumption that 10% of the pending sputum culture results will be positive while there will be 72% more TB cases detected in the UK for 2016 in 2017 as the proxy entry date is set at 2 July each year.

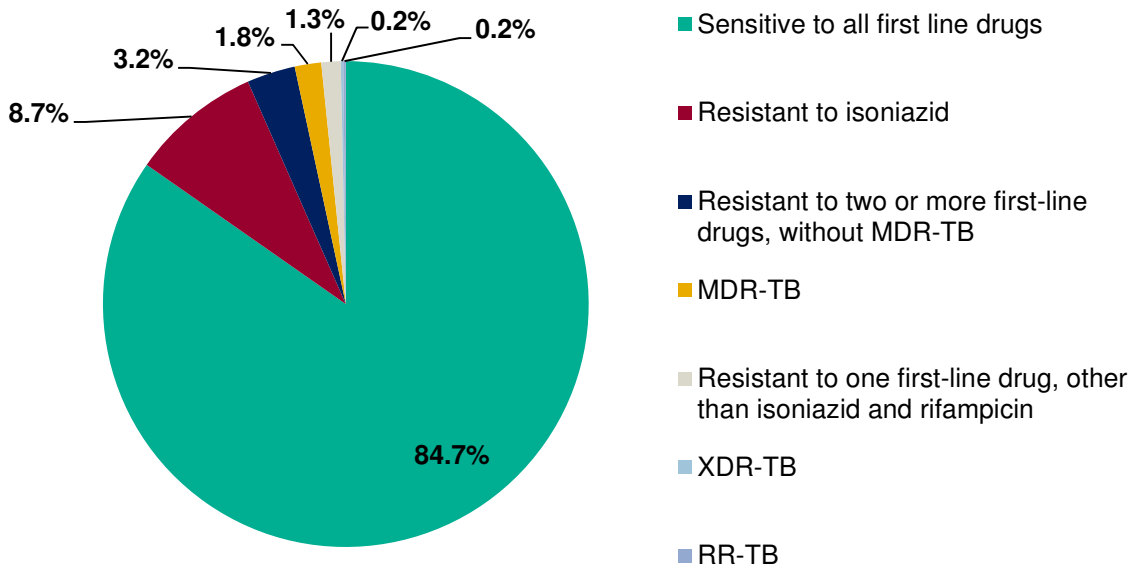
Drug susceptibility testing (DST)

Analysis of drug susceptibility testing (DST) on positive sputum cultures for TB cases was limited to International Organization for Migration (IOM) clinics as non-IOM returns had substantial missing data for DST. Within IOM clinics, 70.0% (621/887) of all positive cultures had DST results. The total number of TB cases detected between January 2007 and December 2016 by the IOM clinics was 1,045 with 15.1% (158/1,045) clinically detected cases. Whilst sputum culture testing increased significantly over the years, there is no clear temporal or geographical trend in the proportion of sputum culture tested cases with DST results (overall range 48.8% to 100.0%).

[25] For countries, which only became part of pre-entry screening during the global roll-out in 2012-13, there is a possibility of under-ascertainment, as clinics were establishing reporting systems during this transition phase

Between 2007 and 2016, the majority of sputum culture positive TB cases with DST results were sensitive to all first line drugs (84.7%, 526/621), with the remainder having resistance to at least one first line drug (15.3%, 95/621) (Figure 11.3 and Table Ai.11.3). 8.7% (54/621) of cases had isoniazid resistance only (with no further resistance to first-line drugs) and 3.2% (20/621) were resistant to more than one first-line drug (but not MDR-TB). There were eleven cases (1.8%, 11/621) with MDR-TB, and one case with XDR-TB. One case (0.2%, 1/621) had RR-TB only, and eight cases (1.3%, 8/621) had resistance to one of the other three first-line drugs.

Figure 11.3: Drug susceptibility testing results of culture confirmed TB cases detected in high incidence countries * through UK pre-entry screening programme, 2007-2016



* Cases detected in IOM clinics only

12. Conclusions

In 2016 there were 5,664 TB cases notified in England, down from 5,727 in 2015. Following a sustained 10% decline in the number of TB cases in England each year between 2012 and 2015, in 2016 the annual decline has slowed to 1%. The incidence rate in 2016 was 10.2 per 100,000 as compared with 10.5 per 100,000 in 2015 and is the lowest incidence in England since the start of enhanced TB surveillance in 2000.

As in previous years, TB continued to be concentrated in large urban areas, with the London PHE Centre (PHEC) accounting for 39% of cases, followed by the West Midlands PHEC with 13% of cases. TB continued to fall slightly in most PHEC areas, with a stable number in one PHEC area and small increases in two PHEC areas.

TB rates in the UK born population in 2016 remain low at 3.2 per 100,000, compared to 3.3 per 100,000 in 2015. The decline of TB cases in the UK born population was greatest in Black and Asian ethnic groups, with a smaller decline in White UK born cases.

In contrast to recent years, in 2016 there has been no decline in the number of cases among the non-UK born population. The rate of TB in the non-UK born population was 15 times higher than in the UK born population, with 74% of all TB cases notified in 2016 being born abroad. The majority of non-UK born TB cases (63%) occurred among those who have lived in the UK for more than six years, with a small increase in the proportion who have been in the UK for under two years, rising from 14.1% in 2014 to 16.6% in 2016. This increase has been in people who entered the UK one to two years prior to notification and further work is required to better understand the significance of these changes.

Although the number of persons detected through pre-entry TB screening overseas has decreased since 2015, the number of cases detected in the UK within one year of entry has decreased year on year and is at the lowest level since inception of the programme. These findings suggest that the pre-entry screening programme is effective in detecting prevalent pulmonary cases prior to entry to the UK.

Since the start of the LTBI testing and treatment programme, more than 20,000 individuals have been tested. About one-fifth of these were positive for LTBI and eligible for treatment and whilst pathway problems persist and need addressing, treatment completion rates tend to be reasonable. It is still too early to evaluate the effect of the programme on TB epidemiology in England, as the majority of prevented reactivation cases would be expected within four years of its full roll-out.

The number of TB cases in the drug resistant (DR) cohort (confirmed or treated as MDR/RR-TB) has remained fairly stable in the last three years (68 cases in 2016). However, the number (59) and proportion (1.7%) of TB cases with initial MDR/RR-TB has increased slightly since 2015 (53, 1.5%). In 2016, seven of the cases in the DR cohort were children. Ten cases had XDR-TB, the same number as in 2015 but higher than in previous years.

People with social risk factors are at increased risk of developing TB, are more likely to have drug resistant TB, to have worse TB outcomes, and are approximately twice as likely to be lost to follow-up or to have died. In 2016 there was a small decrease in both the number and proportion of TB cases with at least one social risk factor (SRF), with 11.1% of TB cases having at least one SRF, down from 11.7% in 2015 but still higher than seen prior to 2015. The proportion of UK born cases with at least one SRF (20%) was more than double that of non-UK born cases (8%).

There was a slight increase in the proportion of TB cases co-infected with HIV, from 3.3% in 2014 to 3.8% in 2015. Four out of five TB-HIV co-infected cases were born outside the UK, the majority of whom were born in countries in Africa with a high HIV prevalence.

The median delay between date of reported symptom onset and treatment start in 2016 was 77 days, up slightly from 72 days in 2015. Thirty-one percent of pulmonary cases and 40% of those aged 65 years and older experienced a delay of more than four months in 2016, whereas in 2015, these figures were 28% and 35%, respectively.

TB outcomes have not improved in the last year. The proportion of drug sensitive TB cases completing treatment by 12 months fell from a peak of 85.6% in 2013 to 83.4% in 2015. In this same period, the number and proportion of all drug sensitive cases who had died at the last recorded outcome increased slightly from 4.7% in 2013 to 6.1% in 2015; the majority of deaths were in those aged 65 years and older who often have co-morbidities. In the DR cohort, only 49% of MDR/RR-TB cases notified in 2014 had completed treatment by 24 months, the lowest proportion since 2000. At the last recorded outcome, 14 out of 69 cases in the DR cohort notified in 2014 were lost to follow-up, most of whom were lost to follow-up abroad (9/14).

Over the seven years from 2010 to 2016, MIRU-VNTR was used to assess clustering of cases. The roll-out of whole genome sequencing from 2017 will improve the detailed analysis of clustering and allow focus on clusters where public health action is likely to have a more direct impact on reducing transmission.

In summary, in 2016 there has been a marked slowing in the year-on-year reduction in TB cases compared to the previous four years. Case numbers in the non-UK born population have not fallen and there has only been a small reduction in the number of

cases among the UK born population and those with social risk factors. There is weak indirect evidence of increased transmission, with a small increase in the rate of TB among UK born children, together with a small increase in the number of new clusters and in the proportion of clustered TB cases. In addition, there have been small declines in treatment completion rates in both the drug sensitive and resistant cohorts, a small increase in deaths among drug sensitive cases, and persistent delays from symptom onset to treatment start. As these findings have only been observed in one year, their significance should be interpreted with caution.

Despite the slowing in decline in case notifications and rates, it is important to recognise that this is the fifth consecutive year of reductions in TB case notifications in England, and the number of cases in 2016 is the lowest in the past 17 years. This reflects the ongoing efforts of all public health and clinical staff in striving towards effective and sustained TB control though excellence in surveillance, treatment, prevention and the eventual elimination of TB as a public health problem in England.

13. Recommendations

In line with the aims of the Collaborative TB Strategy for England TB case numbers have declined for the fifth consecutive year. However, 2016 shows a slowing of the decline in case numbers (1% versus 10% year-on-year previously) with only a small decline in UK born cases and no decline in non-UK born cases.

Building on previous achievements further work is required to deliver the Strategy's 10 areas for action (AfA) and achieve ongoing reductions in TB incidence. Based on the findings in this report, a number of recommendations are outlined below. Wider recommendations on improving TB control in England can be found in the *Collaborative TB Strategy for England 2015-2020* [1].

To improve access to services and ensure early diagnosis (AfA1)

The delay between symptom onset and treatment start for pulmonary TB cases, remains unacceptably long.

Recommendations to reduce diagnostic delay:

- TB clinical teams to raise awareness of TB among local communities affected by TB, other service providers and primary care (as per the national TB clinical policy) by utilising the resources available from TB Alert http://www.thetruthabouttb.org/professionals/professional-education/
- TB Control Boards (TBCBs), CCGs and primary care to raise awareness of TB in primary care by encouraging use of the RCGP TB e-learning module http://elearning.rcgp.org.uk/course/info.php?id=107
- National TB Office to raise TB awareness in groups-at-risk of TB through a selective awareness raising campaign

To provide universal access to high quality diagnostics (AfA2)

In 2016, there was a 2% increase in the proportion of TB cases that were culture confirmed. However, a significant proportion of patients (29%) remain unconfirmed by any laboratory method. It is therefore important to utilise all diagnostic modalities and to ensure high culture confirmation rates to maximise the benefits of whole genome sequencing.

Recommendations to improve TB diagnostics:

- TB clinical teams to obtain diagnostic samples wherever possible

- National TB Office, National Mycobacterium Reference Service and TBCBs to use the outcomes of the national laboratory audit to improve TB diagnostics nationally and locally
- TBCBs and lead TB microbiologists to work with local laboratories to find solutions to any gaps identified by the laboratory audit and encourage use of the TB diagnostics standards of best practice

To improve treatment and care services (AfA3)

To ensure a continuing decline in TB case numbers, TBCBs, CCGs, primary care and TB services need to work collaboratively to further improve treatment and care for patients. This is important as after years of gradual improvement, we saw a slight decline in the proportion of patients completing treatment.

Recommendations to improve TB treatment and care:

- CCGs to use the 2017 national TB service specification and clinical policy to commission local TB services
- TB clinical teams to continue their supportive case management of complex TB patients, offer DOT where indicated and consider the use of innovative approaches such as Virtually Observed Treatement (VOT) to improve case management
- TBCBs, working with local TB stakeholders, are encouraged to work toward filling gaps identified by recent reviews of local TB service provision
- TB clinical teams to continue cohort review as a tool to improve local TB control and as a measure of treatment outcomes and contact tracing activity

To reduce drug-resistant TB (AfA6)

In 2016, the number of new MDR/RR-TB cases increased slightly and the number with XDR-TB remained unacceptably high. A decline in drug-resistant TB cases completing treatment by 24 months fell below 50%, indicating that work is needed to ensure better treatment completion in this group.

Recommendations to reduce drug resistant TB:

- TB clinical teams to continue supporting patients to complete treatment, using DOT or VOT where indicated, and to have plans in place to minimise patients being lost to follow-up
- TB clinicians and TB services to use the British Thoracic Society (BTS) MDR-TB Clinical Advice Service to support MDR-TB case management
- TBCBs to work with local stakeholders to support MDTs for MDR-TB patients led by the designated MDR-TB Centres

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

In 2016 it is encouraging to see a slight reduction in the number and proportion of TB cases with social risk factors (SRFs) but the number and proportion of cases with SRFs remains high. Patients with SRFs have more complex needs and worse TB outcomes, so an enhanced focus on preventing TB in USPs and improving the support available to these patients is important. This should, in turn, help to reduce health inequalities, one of the key aims of the Collaborative TB Strategy.

Recommendations to improve TB control among USPs:

- TBCBs and their partners are encouraged to use the Resource 'Tackling TB in Under-Served Populations' [15] to take appropriate local action and better meet the needs of USPs
- TBCBs and partners to work to provide more integrated services for USPs
- TBCBs, working with their partners, are encouraged to develop streamlined accommodation pathways to help support the provision of housing for homeless TB patients, particularly those who have no recourse to public funds
- TB commissioners, in both CCGs and local authorities, to ensure appropriate access to services, treatment and support to enable patients to complete treatment

To implement new entrant latent TB screening (AfA8)

The rate of TB in the non-UK born population remains considerably higher than in the UK born population with nearly three-quarters of all TB cases notified in 2016 born abroad. Driving forward the roll-out of the new migrant LTBI testing and treatment programme is key to the delivery of better TB control in England. It is encouraging to see progress in the roll-out of the programme.

Recommendations to sustain the roll-out of new migrant LTBI programmes:

- TBCBs should continue to work with CCGs and TB services in high TB burden areas to embed local new migrant LTBI testing and treatment programmes, facilitate data returns and encourage use of the LTBI toolkit to support this work http://www.tbalert.org/health-professionals/ltbi-toolkit/
- in high TB burden CCGs, primary and secondary care staff are encouraged to drive forward LTBI programmes, invite people for testing and encourage those identified with LTBI to consider treatment
- the national TB office to work with NHS England to sustain the funding for LTBI testing and treatment programmes through to 2020

Three final overarching recommendations that relate to the broader aspects of TB control include:

- TBCBs are encouraged to continue their work providing support to local TB control and overseeing local implementation of the TB strategy's ten areas for action
- CCGs and local authorities are encouraged to use the PHE TB Fingertips tool (http://fingertips.phe.org.uk/profile/tb-monitoring) to assess their local TB burden to support JSNA development and TB commissioning and monitoring
- TB services are encouraged to submit high quality data to strengthen surveillance to support appropriate public health decision making and commissioning

This year's annual TB report shows a slower rate of decline in TB case numbers and rates than in recent years. It is crucial that work to implement the Collaborative TB Strategy continues at pace to strengthen TB control, achieve the Strategy's goals of a year-on-year decrease in incidence, a reduction in health inequalities and, ultimately the elimination of TB as a public health problem in England.

References

1. Public Health England (2015). Collaborative tuberculosis strategy for England: 2015-2020. https://www.gov.uk/government/publications/collaborative-tuberculosis-strategy-for-england

2. Schurch AC, Kremer K, Daviena O, et al. High-resolution typing by integration of genome sequencing data in a large tuberculosis cluster. J Clin Microbiol. 2010; 48: 3403–06.

3. Gardy JL, Johnston JC, Sui SJH, et al. Whole-genome sequencing and social-network analysis of a tuberculosis outbreak. N Engl J Med. 2011; 364: 730–39.

4. Walker TM, Ip CL, Harrell RH, et al. Whole-genome sequencing to delineate Mycobacterium tuberculosis outbreaks: a retrospective observational study. The Lancet Infectious Diseases. 2013; 13(2):137-46.

5. World Health Organization (2013). Definitions and reporting framework for tuberculosis – 2013 revision. http://apps.who.int/iris/bitstream/10665/79199/1/9789241505345_eng.pdf

6. Public Health England (2012). Tuberculosis reference laboratories. https://www.gov.uk/guidance /tuberculosis-reference-laboratories

7. Joint Committee on Vaccination and Immunisation (2011). Tuberculosis: the green book, chapter 32. https://www.gov.uk/government/publications/tuberculosis-the-green-book-chapter-32

8. Vaccine Update Issue 244, April 2016. https://www.gov.uk/government/publications/vaccine-update-issue-244-april-2016-bcg-supply-special-edition

9. Vaccine Update Issue 247, June 2016. https://www.gov.uk/government/publications/vaccine-update-issue-247-june-2016-special-edition

10. Cover of vaccination evaluated rapidly (COVER) programme: information standards. https://www.gov.uk/government/publications/cover-of-vaccination-evaluated-rapidly-cover-programme-information-standards

11. Childhood Vaccination Coverage Statistics, England, 2016-17. http://digital.nhs.uk/catalogue/PUB30085

12. Public Health England (2016). Tuberculosis in England 2016 report: presenting data to end of 2015. https://www.gov.uk/government/publications/tuberculosis-in-england-annual-report

13. Public Health England (2015). Latent TB testing and treatment: a short introduction. https://www.gov.uk/government/publications/latent-tb-infection-ltbi-testing-and-treatment

14. Public Health England (2013). UK tuberculosis technical instructions. https://www.gov.uk/government/publications/uk-tuberculosis-technical-instructions

15. Public Health England (2017). Tackling tuberculosis in under-served populations. https://www.gov.uk/government/publications/tackling-tuberculosis-in-under-served-populations

16. Aldridge RW, Shaji K, Hayward AC, Abubakar I. Accuracy of probabilistic linkage using the enhanced matching system for public health and epidemiological studies. PLOS one 2015; 10(8): e0136179.

17. TB Strain Typing Cluster Investigation Handbook, 3rd Edition, 2014. http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317140774833

18. Department of Health. Tuberculosis prevention and treatment: a toolkit for planning, commissioning and delivering high-quality services in England, 2007. http://webarchive.nationalarchives.gov.uk/20130107105354/http:/www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_075621

Appendix I. Supplementary tables

Table Ai.1.1: TB case notifications, rates and annual percentage change, England, 2000-2016

Year	Total		Annual change in case numbers (%)	Annual change in rate (%)
	Number of cases	Rate per 100,000 (95% CI)		
2000	6,044	12.3 (12.0-12.6)	-	-
2001	6,169	12.5 (12.2-12.8)	2.1	1.6
2002	6,675	13.4 (13.1-13.8)	8.2	7.2
2003	6,631	13.3 (13.0-13.6)	-0.7	-0.7
2004	6,929	13.8 (13.5-14.1)	4.5	3.8
2005	7,658	15.1 (14.8-15.5)	10.5	9.4
2006	7,682	15.1 (14.7-15.4)	0.3	0.0
2007	7,577	14.7 (14.4-15.1)	-1.4	-2.6
2008	7,809	15.1 (14.7-15.4)	3.1	2.7
2009	8,112	15.5 (15.2-15.9)	3.9	2.6
2010	7,676	14.6 (14.3-14.9)	-5.4	-5.8
2011	8,280	15.6 (15.3-15.9)	7.9	6.8
2012	8,083	15.1 (14.8-15.4)	-2.4	-3.2
2013	7,263	13.5 (13.2-13.8)	-10.1	-10.6
2014	6,472	11.9 (11.6-12.2)	-10.9	-11.9
2015	5,727	10.5 (10.2-10.7)	-11.5	-11.8
2016	5,664	10.2 (10.0-10.5)	-1.1	-2.9

CI - confidence intervals

Table Ai.1.2: TB case notifications and rates by PHE Centre, England, 2000-2016

Year	London		West Midlands		North West		South East		East of England	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2000	2,632	36.4 (35.0-37.8)	699	13.3 (12.3-14.3)	624	9.2 (8.5-10.0)	442	5.7 (5.2-6.2)	299	5.4 (4.8-6.0)
2001	2,574	35.2 (33.8-36.5)	702	13.3 (12.3-14.3)	638	9.4 (8.7-10.2)	430	5.5 (5.0-6.1)	338	6.0 (5.4-6.7)
2002	3,055	41.4 (40.0-42.9)	794	15.0 (14.0-16.1)	638	9.4 (8.7-10.2)	481	6.1 (5.6-6.7)	355	6.3 (5.6-7.0)
2003	3,063	41.4 (40.0-42.9)	783	14.7 (13.7-15.8)	574	8.4 (7.7-9.1)	542	6.9 (6.3-7.5)	323	5.7 (5.1-6.3)
2004	3,111	41.9 (40.4-43.4)	920	17.2 (16.1-18.4)	569	8.3 (7.6-9.0)	557	7.0 (6.5-7.6)	405	7.1 (6.4-7.8)
2005	3,448	45.9 (44.3-47.4)	920	17.1 (16.0-18.2)	743	10.8 (10.1-11.6)	583	7.3 (6.7-7.9)	470	8.1 (7.4-8.9)
2006	3,328	43.8 (42.3-45.3)	927	17.1 (16.0-18.3)	694	10.1 (9.3-10.8)	607	7.5 (7.0-8.2)	479	8.2 (7.5-9.0)
2007	3,234	42.0 (40.6-43.5)	928	17.0 (15.9-18.2)	733	10.6 (9.8-11.4)	627	7.7 (7.1-8.4)	421	7.2 (6.5-7.9)
2008	3,362	43.0 (41.6-44.5)	1,008	18.3 (17.2-19.5)	730	10.5 (9.7-11.3)	629	7.7 (7.1-8.3)	506	8.5 (7.8-9.3)
2009	3,402	42.8 (41.4-44.3)	1,006	18.2 (17.1-19.4)	799	11.4 (10.7-12.3)	712	8.6 (8.0-9.3)	512	8.5 (7.8-9.3)
2010	3,241	40.2 (38.8-41.6)	872	15.7 (14.6-16.7)	809	11.5 (10.7-12.3)	711	8.5 (7.9-9.2)	506	8.4 (7.6-9.1)
2011	3,491	42.6 (41.2-44.0)	1,004	17.9 (16.8-19.0)	818	11.6 (10.8-12.4)	813	9.7 (9.0-10.4)	560	9.2 (8.4-10.0)
2012	3,401	40.9 (39.6-42.3)	1,076	19.1 (17.9-20.2)	775	10.9 (10.2-11.7)	778	9.2 (8.5-9.9)	497	8.1 (7.4-8.8)
2013	2,975	35.3 (34.1-36.6)	979	17.3 (16.2-18.4)	716	10.1 (9.4-10.8)	683	8.0 (7.4-8.6)	451	7.3 (6.6-8.0)
2014	2,555	29.9 (28.8-31.1)	775	13.6 (12.6-14.6)	642	9.0 (8.3-9.7)	664	7.7 (7.1-8.3)	436	6.9 (6.3-7.6)
2015	2,271	26.2 (25.1-27.3)	700	12.2 (11.3-13.1)	568	7.9 (7.3-8.6)	593	6.8 (6.3-7.4)	389	6.1 (5.5-6.8)
2016	2,210	25.1 (24.1-26.2)	721	12.4 (11.5-13.4)	600	8.3 (7.7-9.0)	567	6.5 (5.9-7.0)	436	6.8 (6.2-7.5)

CI - confidence intervals

Table Ai.1.2: TB case notifications and rates by PHE Centre, England, 2000-2016 continued

Year	Yorkshire and the Humber		East Midlands		South West		North East	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2000	544	11.0 (10.1-11.9)	414	9.9 (9.0-10.9)	230	4.7 (4.1-5.3)	157	6.2 (5.2-7.2)
2001	551	11.1 (10.2-12.0)	544	13.0 (11.9-14.1)	211	4.3 (3.7-4.9)	177	7.0 (6.0-8.1)
2002	505	10.1 (9.2-11.0)	471	11.2 (10.2-12.2)	220	4.4 (3.9-5.0)	149	5.9 (5.0-6.9)
2003	544	10.8 (9.9-11.8)	458	10.8 (9.8-11.8)	201	4.0 (3.5-4.6)	141	5.6 (4.7-6.5)
2004	535	10.6 (9.7-11.5)	418	9.7 (8.8-10.7)	263	5.2 (4.6-5.9)	143	5.6 (4.7-6.6)
2005	556	10.9 (10.0-11.8)	533	12.3 (11.3-13.4)	266	5.2 (4.6-5.9)	132	5.2 (4.3-6.1)
2006	661	12.9 (11.9-13.9)	566	13.0 (11.9-14.1)	278	5.4 (4.8-6.1)	141	5.5 (4.6-6.5)
2007	632	12.2 (11.3-13.2)	534	12.1 (11.1-13.2)	269	5.2 (4.6-5.9)	196	7.7 (6.6-8.8)
2008	635	12.2 (11.3-13.2)	483	10.9 (9.9-11.9)	279	5.4 (4.7-6.0)	177	6.9 (5.9-8.0)
2009	688	13.2 (12.2-14.2)	524	11.7 (10.7-12.8)	303	5.8 (5.2-6.5)	166	6.4 (5.5-7.5)
2010	628	12.0 (11.0-12.9)	494	11.0 (10.0-12.0)	265	5.0 (4.4-5.7)	150	5.8 (4.9-6.8)
2011	664	12.6 (11.6-13.5)	492	10.8 (9.9-11.8)	307	5.8 (5.2-6.5)	131	5.0 (4.2-6.0)
2012	592	11.1 (10.3-12.1)	497	10.9 (9.9-11.9)	300	5.6 (5.0-6.3)	167	6.4 (5.5-7.5)
2013	583	10.9 (10.1-11.8)	413	9.0 (8.1-9.9)	325	6.0 (5.4-6.7)	138	5.3 (4.4-6.2)
2014	516	9.6 (8.8-10.5)	400	8.6 (7.8-9.5)	316	5.8 (5.2-6.5)	168	6.4 (5.5-7.5)
2015	437	8.1 (7.4-8.9)	356	7.6 (6.8-8.4)	285	5.2 (4.6-5.9)	128	4.9 (4.1-5.8)
2016	425	7.8 (7.1-8.6)	342	7.2 (6.5-8.0)	239	4.3 (3.8-4.9)	124	4.7 (3.9-5.6)

CI - confidence intervals

Table Ai.1.3 TB case notifications and rates by age group and place of birth, England, 2016

Age group (years)	Place of Birth				Total*	
	UK born		Non-UK born			
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
0-4	80	2.4 (1.9-3.0)	6	6.2 (2.3-13.4)	87	2.6 (2.0-3.1)
5-9	35	1.1 (0.8-1.5)	4	1.6 (0.4-4.2)	40	1.2 (0.8-1.6)
10-14	47	1.7 (1.2-2.3)	32	11.5 (7.8-16.2)	80	2.6 (2.1-3.3)
15-19	89	3.3 (2.6-4.0)	164	47.8 (40.8-55.7)	257	8.3 (7.3-9.4)
20-24	104	3.5 (2.8-4.2)	316	58.6 (52.3-65.4)	430	12.2 (11.1-13.4)
25-29	117	4.1 (3.4-4.9)	574	61.6 (56.7-66.8)	699	18.5 (17.1-19.9)
30-34	95	3.6 (2.9-4.4)	532	48.3 (44.3-52.6)	636	17.1 (15.8-18.5)
35-39	93	3.7 (3.0-4.6)	526	51.7 (47.4-56.3)	621	17.6 (16.3-19.1)
40-44	78	2.9 (2.3-3.7)	433	51.3 (46.5-56.3)	516	14.7 (13.5-16.0)
45-49	123	3.9 (3.2-4.6)	344	49.7 (44.6-55.2)	473	12.3 (11.2-13.4)
50-54	114	3.4 (2.8-4.1)	240	47.5 (41.7-53.9)	363	9.5 (8.5-10.5)
55-59	91	3.2 (2.6-3.9)	236	49.9 (43.7-56.7)	335	10.0 (9.0-11.1)
60-64	83	3.3 (2.6-4.0)	187	52.4 (45.1-60.4)	274	9.4 (8.3-10.6)
65-69	75	2.7 (2.2-3.4)	124	44.8 (37.2-53.4)	204	6.8 (5.9-7.8)
70-74	70	3.3 (2.5-4.1)	121	60.5 (50.2-72.3)	195	8.3 (7.2-9.6)
75-79	69	4.4 (3.4-5.6)	123	62.9 (52.3-75.1)	200	11.4 (9.8-13.0)
80+	106	4.8 (3.9-5.8)	134	69.3 (58.1-82.1)	254	10.5 (9.3-11.9)

* Total cases including those with an unknown place of birth

CI - confidence intervals

Table Ai.1.4: TB case notifications, rates and annual percentage change by place of birth, England, 2000-2016

Year	Place of birth							
	UK born				Non-UK born			
	Number of cases	Rate per 100,000 (95% CI)	Annual change in case numbers (%)	Annual change in rate (%)	Number of cases	Rate per 100,000 (95% CI)	Annual change in case numbers (%)	Annual change in rate (%)
2000	1,830	4.1 (3.9 -4.3)	-	-	3,329	79.6 (76.9 -82.4)	-	-
2001	1,889	4.3 (4.1 -4.4)	3.2%	4.9%	3,431	79.1 (76.5 -81.8)	3.1%	-0.6%
2002	1,852	4.2 (4.0 -4.4)	-2.0%	-2.3%	4,111	90.5 (87.7 -93.3)	19.8%	14.4%
2003	1,703	3.8 (3.6 -4.0)	-8.0%	-9.5%	4,326	90.8 (88.1 -93.5)	5.2%	0.3%
2004	1,791	4.0 (3.8 -4.2)	5.2%	5.3%	4,570	95.1 (92.4 -97.9)	5.6%	4.7%
2005	1,804	4.0 (3.8 -4.2)	0.7%	0.0%	5,186	100.7 (98.0 -103.5)	13.5%	5.9%
2006	1,729	3.9 (3.7 -4.1)	-4.2%	-2.5%	5,175	92.9 (90.4 -95.5)	-0.2%	-7.7%
2007	1,799	4.0 (3.8 -4.2)	4.0%	2.6%	5,135	85.5 (83.2 -87.9)	-0.8%	-8.0%
2008	1,867	4.2 (4.0 -4.4)	3.8%	5.0%	5,417	86.0 (83.7 -88.3)	5.5%	0.6%
2009	1,907	4.2 (4.1 -4.4)	2.1%	0.0%	5,662	86.8 (84.6 -89.1)	4.5%	0.9%
2010	1,814	4.0 (3.8 -4.2)	-4.9%	-4.8%	5,515	83.1 (80.9 -85.3)	-2.6%	-4.3%
2011	1,958	4.3 (4.1 -4.5)	7.9%	7.5%	6,021	85.9 (83.7 -88.1)	9.2%	3.4%
2012	2,003	4.4 (4.2 -4.6)	2.3%	2.3%	5,840	81.4 (79.4 -83.6)	-3.0%	-5.2%
2013	1,842	4.0 (3.8 -4.2)	-8.0%	-9.1%	5,256	70.6 (68.7 -72.5)	-10.0%	-13.3%
2014	1,756	3.8 (3.6 -4.0)	-4.7%	-5.0%	4,611	60.2 (58.5 -62.0)	-12.3%	-14.7%
2015	1,529	3.3 (3.2 -3.5)	-12.9%	-13.2%	4,096	51.3 (49.7 -52.9)	-11.2%	-14.8%
2016	1,469	3.2 (3.0 -3.3)	-3.9%	-3.0%	4,096	49.4 (47.9 -50.9)	0.0%	-3.7%

CI - confidence intervals

Table Ai.1.5: TB case notifications and rates by place of birth and PHE Centre, England, 2000-2016

Year	London				West Midlands				North West			
	UK born		Non-UK born		UK born		Non-UK born		UK born		Non-UK born	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2000	446	8.5 (7.7-9.3)	1,775	92.4 (88.1-96.8)	293	6.0 (5.4-6.8)	380	105.4 (95.1-116.6)	261	4.1 (3.6-4.6)	348	126.4 (113.4-140.4)
2001	422	8.0 (7.2-8.8)	1,862	95.0 (90.8-99.4)	325	6.7 (6.0-7.5)	359	94.7 (85.2-105.1)	299	4.7 (4.2-5.2)	327	116.1 (103.9-129.4)
2002	540	10.3 (9.5-11.2)	2,264	110.0 (105.5-114.6)	300	6.2 (5.5-6.9)	448	119.7 (108.8-131.3)	258	4.0 (3.6-4.6)	352	118.5 (106.5-131.6)
2003	480	9.3 (8.5-10.1)	2,326	108.1 (103.8-112.6)	302	6.2 (5.5-6.9)	438	110.0 (99.9-120.8)	235	3.7 (3.2-4.2)	330	109.5 (98.0-122.0)
2004	535	10.3 (9.5-11.2)	2,299	105.6 (101.3-110.0)	322	6.6 (5.9-7.4)	551	137.2 (126.0-149.1)	198	3.1 (2.7-3.5)	357	110.1 (99.0-122.2)
2005	578	11.3 (10.4-12.2)	2,579	112.0 (107.7-116.4)	270	5.4 (4.8-6.1)	602	168.6 (155.4-182.6)	244	3.8 (3.3-4.3)	468	126.1 (114.9-138.1)
2006	546	10.6 (9.7-11.5)	2,564	108.3 (104.1-112.6)	282	5.8 (5.1-6.5)	580	125.0 (115.0-135.6)	229	3.6 (3.1-4.1)	426	104.9 (95.2-115.4)
2007	519	10.2 (9.4-11.1)	2,577	101.5 (97.6-105.5)	278	5.7 (5.0-6.4)	535	114.9 (105.4-125.1)	253	4.0 (3.5-4.5)	458	96.8 (88.1-106.1)
2008	553	10.8 (9.9-11.7)	2,669	102.4 (98.5-106.3)	350	7.2 (6.4-8.0)	599	110.1 (101.4-119.2)	231	3.6 (3.2-4.1)	474	95.4 (87.0-104.4)
2009	511	10.0 (9.1-10.9)	2,754	100.9 (97.2-104.8)	317	6.5 (5.8-7.3)	638	106.0 (97.9-114.6)	255	4.0 (3.5-4.5)	494	93.8 (85.8-102.5)
2010	503	9.6 (8.8-10.5)	2,696	98.0 (94.3-101.7)	283	5.7 (5.1-6.5)	559	97.4 (89.5-105.8)	270	4.2 (3.7-4.8)	491	90.5 (82.7-98.9)
2011	504	9.7 (8.9-10.6)	2,931	100.1 (96.5-103.8)	316	6.4 (5.7-7.1)	664	113.9 (105.4-122.9)	259	4.0 (3.6-4.6)	521	93.3 (85.4-101.7)
2012	560	10.6 (9.8-11.5)	2,798	94.8 (91.3-98.3)	335	6.7 (6.0-7.5)	704	117.3 (108.8-126.3)	262	4.1 (3.6-4.6)	494	89.5 (81.7-97.7)
2013	485	9.2 (8.4-10.1)	2,465	80.5 (77.4-83.8)	313	6.3 (5.6-7.0)	643	100.1 (92.5-108.2)	255	4.0 (3.5-4.5)	447	76.7 (69.8-84.2)
2014	477	9.0 (8.2-9.8)	2,075	66.2 (63.4-69.1)	267	5.3 (4.7-6.0)	501	77.0 (70.4-84.0)	226	3.5 (3.1-4.0)	405	66.1 (59.8-72.9)
2015	418	7.7 (7.0-8.5)	1,841	57.8 (55.2-60.5)	253	5.1 (4.5-5.7)	441	63.3 (57.6-69.5)	185	2.9 (2.5-3.3)	368	52.1 (46.9-57.7)
2016	400	7.5 (6.8-8.2)	1,785	52.6 (50.2-55.1)	231	4.6 (4.0-5.3)	485	68.3 (62.4-74.7)	217	3.4 (2.9-3.9)	370	55.7 (50.2-61.7)

CI - confidence intervals

Denominator data used to calculate rates among UK born and non-UK born are based on survey data, which have known limitations when broken down into smaller geographical areas, therefore rates and annual changes in rates should be interpreted with caution. For further information, see Appendix III: Methods.

Table Ai.1.5: TB case notifications and rates by place of birth and PHE Centre, England, 2000-2016 continued

Year	South East				East of England				Yorkshire and the Humber			
	UK born		Non-UK born		UK born		Non-UK born		UK born		Non-UK born	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2000	172	2.4 (2.0-2.7)	210	37.1 (32.2-42.5)	97	1.9 (1.6-2.4)	150	46.8 (39.6-54.9)	212	4.5 (4.0-5.2)	259	114.0 (100.5-128.7)
2001	152	2.1 (1.8-2.4)	228	38.9 (34.0-44.3)	111	2.2 (1.8-2.7)	164	45.4 (38.7-52.9)	245	5.2 (4.6-5.9)	270	111.1 (98.3-125.2)
2002	145	2.0 (1.7-2.3)	290	48.0 (42.7-53.9)	105	2.1 (1.7-2.5)	209	60.7 (52.8-69.5)	188	4.0 (3.5-4.6)	284	108.2 (96.0-121.6)
2003	118	1.6 (1.3-1.9)	364	55.1 (49.6-61.1)	97	1.9 (1.6-2.4)	198	53.4 (46.2-61.3)	201	4.3 (3.7-4.9)	334	116.1 (104.0-129.3)
2004	163	2.2 (1.9-2.6)	344	52.7 (47.3-58.6)	101	2.0 (1.6-2.4)	270	71.5 (63.2-80.5)	194	4.1 (3.6-4.7)	330	115.6 (103.5-128.8)
2005	129	1.7 (1.5-2.1)	416	61.5 (55.7-67.7)	129	2.6 (2.1-3.0)	304	69.0 (61.4-77.2)	180	3.8 (3.3-4.4)	341	97.7 (87.6-108.7)
2006	135	1.8 (1.5-2.2)	415	53.5 (48.5-58.9)	98	1.9 (1.6-2.4)	324	66.0 (59.0-73.6)	172	3.6 (3.1-4.2)	415	126.7 (114.8-139.5)
2007	164	2.2 (1.9-2.6)	415	52.2 (47.3-57.4)	111	2.2 (1.8-2.7)	275	51.1 (45.3-57.5)	179	3.8 (3.3-4.4)	356	95.0 (85.4-105.4)
2008	138	1.9 (1.6-2.2)	442	51.4 (46.7-56.4)	148	2.9 (2.5-3.4)	309	58.0 (51.8-64.9)	174	3.7 (3.2-4.3)	415	102.9 (93.2-113.3)
2009	180	2.4 (2.1-2.8)	474	53.9 (49.2-59.0)	132	2.6 (2.2-3.1)	339	60.9 (54.6-67.7)	212	4.4 (3.9-5.1)	406	105.7 (95.7-116.5)
2010	150	2.0 (1.7-2.4)	499	52.6 (48.1-57.4)	135	2.6 (2.2-3.1)	347	61.7 (55.4-68.6)	190	3.9 (3.4-4.6)	366	96.9 (87.2-107.4)
2011	204	2.7 (2.4-3.1)	577	59.0 (54.2-64.0)	147	2.8 (2.4-3.3)	387	65.1 (58.8-71.9)	220	4.6 (4.0-5.2)	389	94.6 (85.5-104.5)
2012	230	3.0 (2.6-3.4)	530	54.7 (50.2-59.6)	128	2.5 (2.1-2.9)	345	52.9 (47.4-58.7)	189	3.9 (3.4-4.5)	353	78.1 (70.1-86.6)
2013	172	2.3 (1.9-2.6)	505	48.1 (44.0-52.5)	120	2.3 (1.9-2.7)	314	48.4 (43.2-54.1)	182	3.8 (3.2-4.4)	360	79.8 (71.8-88.5)
2014	160	2.1 (1.8-2.4)	493	46.6 (42.6-50.9)	110	2.1 (1.7-2.5)	313	46.3 (41.3-51.8)	171	3.5 (3.0-4.1)	320	67.9 (60.7-75.8)
2015	168	2.2 (1.9-2.5)	406	37.4 (33.8-41.2)	102	1.9 (1.6-2.4)	279	37.4 (33.1-42.0)	126	2.6 (2.2-3.1)	293	60.0 (53.3-67.3)
2016	132	1.7 (1.4-2.0)	424	36.2 (32.8-39.8)	122	2.3 (1.9-2.7)	303	42.1 (37.5-47.1)	126	2.6 (2.2-3.1)	278	53.3 (47.2-59.9)

CI - confidence intervals

Denominator data used to calculate rates among UK born and non-UK born are based on survey data, which have known limitations when broken down into smaller geographical areas, therefore rates and annual changes in rates should be interpreted with caution. For further information, see Appendix III: Methods.

Table Ai.1.5: TB case notifications and rates by place of birth and PHE Centre, England, 2000-2016 continued

Year	East Midlands				South West				North East			
	UK born		Non-UK born		UK born		Non-UK born		UK born		Non-UK born	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2000	120	3.1 (2.6-3.7)	101	46.4 (37.8-56.4)	139	3.0 (2.5-3.6)	70	29.6 (23.1-37.5)	90	3.7 (2.9-4.5)	35	63.4 (44.2-88.2)
2001	120	3.1 (2.5-3.7)	100	44.7 (36.4-54.4)	123	2.7 (2.2-3.2)	61	25.8 (19.7-33.1)	92	3.8 (3.0-4.6)	59	88.5 (67.4-114.2)
2002	127	3.2 (2.7-3.9)	119	47.2 (39.1-56.5)	98	2.1 (1.7-2.6)	89	32.3 (25.9-39.7)	90	3.7 (3.0-4.6)	55	72.3 (54.5-94.1)
2003	116	2.9 (2.4-3.5)	182	72.9 (62.7-84.3)	87	1.9 (1.5-2.3)	93	33.0 (26.6-40.4)	67	2.7 (2.1-3.5)	60	91.0 (69.5-117.2)
2004	111	2.8 (2.3-3.4)	225	90.4 (78.9-103.0)	98	2.1 (1.7-2.5)	134	53.5 (44.8-63.3)	68	2.8 (2.2-3.6)	59	69.3 (52.8-89.4)
2005	95	2.4 (1.9-2.9)	291	99.4 (88.3-111.5)	123	2.6 (2.2-3.1)	124	46.0 (38.3-54.9)	55	2.3 (1.7-3.0)	60	66.3 (50.6-85.4)
2006	114	2.9 (2.4-3.5)	233	68.3 (59.8-77.6)	87	1.8 (1.5-2.3)	160	52.8 (44.9-61.7)	66	2.7 (2.1-3.5)	57	60.0 (45.4-77.7)
2007	118	3.0 (2.5-3.6)	278	75.7 (67.1-85.2)	97	2.1 (1.7-2.5)	151	42.1 (35.6-49.3)	79	3.2 (2.6-4.0)	90	95.1 (76.5-116.9)
2008	119	3.0 (2.5-3.6)	296	76.5 (68.0-85.7)	91	1.9 (1.5-2.3)	141	40.7 (34.2-47.9)	63	2.6 (2.0-3.3)	72	59.4 (46.5-74.8)
2009	146	3.6 (3.1-4.3)	340	89.8 (80.5-99.8)	99	2.1 (1.7-2.5)	147	45.2 (38.2-53.2)	55	2.3 (1.7-3.0)	70	48.9 (38.1-61.7)
2010	122	3.0 (2.5-3.6)	351	85.3 (76.6-94.8)	108	2.2 (1.8-2.7)	125	35.8 (29.8-42.6)	53	2.2 (1.6-2.9)	81	66.4 (52.7-82.5)
2011	142	3.5 (3.0-4.1)	331	76.1 (68.1-84.8)	127	2.6 (2.2-3.2)	150	36.7 (31.0-43.0)	39	1.6 (1.1-2.2)	71	62.2 (48.6-78.5)
2012	127	3.1 (2.6-3.7)	354	80.3 (72.1-89.1)	114	2.4 (2.0-2.8)	167	39.6 (33.8-46.0)	58	2.4 (1.8-3.1)	95	73.4 (59.4-89.7)
2013	116	2.8 (2.4-3.4)	292	63.3 (56.2-71.0)	151	3.1 (2.6-3.6)	155	39.1 (33.2-45.8)	48	2.0 (1.5-2.6)	75	48.6 (38.2-60.9)
2014	132	3.2 (2.7-3.8)	258	55.8 (49.2-63.0)	133	2.7 (2.3-3.2)	171	38.2 (32.7-44.3)	80	3.3 (2.6-4.1)	75	51.4 (40.4-64.4)
2015	99	2.4 (2.0-2.9)	250	50.7 (44.6-57.4)	123	2.5 (2.1-3.0)	146	31.9 (26.9-37.5)	55	2.2 (1.7-2.9)	72	57.6 (45.1-72.5)
2016	94	2.3 (1.8-2.8)	242	48.2 (42.3-54.7)	95	1.9 (1.5-2.3)	138	31.1 (26.1-36.8)	52	2.1 (1.6-2.8)	71	42.2 (33.0-53.2)

CI - confidence intervals

Denominator data used to calculate rates among UK born and non-UK born are based on survey data, which have known limitations when broken down into smaller geographical areas, therefore rates and annual changes in rates should be interpreted with caution. For further information, see Appendix III: Methods.

Table Ai.1.6: Number and proportion of TB case notifications by most frequent country of birth in non-UK born population, England, 2000-2016

Year	Country of birth														
	India		Pakistan		Somalia		Bangladesh		Romania		Nepal		Phillippines		Total*
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
2000	722	23.2	676	21.7	362	11.6	102	3.3	5	0.2	19	0.6	28	0.9	3,115
2001	668	20.6	715	22.1	360	11.1	109	3.4	5	0.2	28	0.9	35	1.1	3,236
2002	780	19.9	774	19.8	428	10.9	159	4.1	8	0.2	33	0.8	51	1.3	3,913
2003	789	19.3	729	17.9	473	11.6	182	4.5	11	0.3	34	0.8	52	1.3	4,083
2004	904	20.8	699	16.1	532	12.3	183	4.2	8	0.2	37	0.9	74	1.7	4,338
2005	1,099	22.4	832	16.9	581	11.8	191	3.9	11	0.2	36	0.7	69	1.4	4,917
2006	1,112	22.6	837	17.0	641	13.0	182	3.7	6	0.1	67	1.4	86	1.7	4,930
2007	1,187	24.3	796	16.3	551	11.3	243	5.0	15	0.3	69	1.4	92	1.9	4,886
2008	1,328	25.6	882	17.0	531	10.3	239	4.6	19	0.4	90	1.7	111	2.1	5,178
2009	1,531	28.2	921	16.9	535	9.8	235	4.3	25	0.5	114	2.1	114	2.1	5,436
2010	1,553	29.2	881	16.5	439	8.2	259	4.9	44	0.8	175	3.3	131	2.5	5,325
2011	1,787	30.4	1,061	18.0	415	7.1	285	4.8	54	0.9	214	3.6	101	1.7	5,884
2012	1,763	30.8	1,047	18.3	377	6.6	276	4.8	77	1.3	209	3.6	126	2.2	5,727
2013	1,546	29.9	1,045	20.2	290	5.6	237	4.6	69	1.3	163	3.2	123	2.4	5,162
2014	1,291	28.5	798	17.6	233	5.1	208	4.6	89	2.0	167	3.7	113	2.5	4,533
2015	1,068	26.5	640	15.9	178	4.4	208	5.2	120	3.0	125	3.1	105	2.6	4,036
2016	994	24.8	632	15.7	210	5.2	176	4.4	175	4.4	109	2.7	106	2.6	4,016
Total	**19,116**	**25.6**	**13,330**	**17.8**	**3,300**	**4.4**	**6,924**	**9.3**	**1,581**	**2.1**	**2,154**	**2.9**	**563**	**0.8**	**78,715**

* Total number of non-UK born cases where country of birth was known

Table Ai.1.6: Number and proportion of TB case notifications by most frequent country of birth in non-UK born population, England, 2000-2016 continued

Year	Country of birth																
	Eritrea		Nigeria		Zimbabwe		Sri Lanka		Poland		Kenya		Afghanistan		Other		Total*
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
2000	26	0.8	47	1.5	78	2.5	50	1.6	10	0.3	92	3.0	43	1.4	855	27.4	3,115
2001	18	0.6	47	1.5	110	3.4	66	2.0	9	0.3	109	3.4	66	2.0	891	27.5	3,236
2002	26	0.7	89	2.3	240	6.1	82	2.1	10	0.3	110	2.8	100	2.6	1,023	26.1	3,913
2003	43	1.1	116	2.8	275	6.7	66	1.6	15	0.4	109	2.7	65	1.6	1,124	27.5	4,083
2004	33	0.8	136	3.1	270	6.2	81	1.9	13	0.3	130	3.0	78	1.8	1,160	26.7	4,338
2005	43	0.9	153	3.1	269	5.5	85	1.7	12	0.2	134	2.7	83	1.7	1,319	26.8	4,917
2006	64	1.3	154	3.1	242	4.9	62	1.3	30	0.6	106	2.2	73	1.5	1,268	25.7	4,930
2007	66	1.4	150	3.1	203	4.2	92	1.9	36	0.7	126	2.6	83	1.7	1,177	24.1	4,886
2008	86	1.7	165	3.2	201	3.9	86	1.7	53	1.0	124	2.4	92	1.8	1,171	22.6	5,178
2009	93	1.7	174	3.2	158	2.9	91	1.7	43	0.8	110	2.0	97	1.8	1,195	22.0	5,436
2010	81	1.5	169	3.2	189	3.5	86	1.6	48	0.9	96	1.8	95	1.8	1,079	20.3	5,325
2011	98	1.7	190	3.2	152	2.6	107	1.8	61	1.0	116	2.0	104	1.8	1,139	19.4	5,884
2012	78	1.4	174	3.0	129	2.3	97	1.7	60	1.0	95	1.7	76	1.3	1,143	20.0	5,727
2013	58	1.1	156	3.0	105	2.0	96	1.9	63	1.2	85	1.6	66	1.3	1,060	20.5	5,162
2014	85	1.9	117	2.6	107	2.4	76	1.7	70	1.5	80	1.8	95	2.1	1,004	22.1	4,533
2015	91	2.3	120	3.0	103	2.6	59	1.5	72	1.8	61	1.5	69	1.7	1,017	25.2	4,036
2016	102	2.5	100	2.5	84	2.1	82	2.0	69	1.7	59	1.5	53	1.3	1,065	26.5	4,016
Total	**1,091**	**1.4**	**2,257**	**2.9**	**2,915**	**3.7**	**1,364**	**1.7**	**674**	**0.9**	**1,742**	**2.2**	**1,338**	**1.7**	**18,690**	**23.7**	**78,715**

* Total number of cases in the non-UK born population where country of birth was known

Table Ai.1.7: Time between entry to the UK and TB notification for non-UK born cases by year, England, 2007-2016

Year	Time (years) between entry to the UK and TB notification								
	<2		2-6		6-11		11+		Total*
	n	%	n	%	n	%	n	%	n
2007	1,097	24.6	1,448	32.5	683	15.3	1,224	27.5	4,452
2008	1,008	23.0	1,328	30.3	844	19.2	1,209	27.5	4,389
2009	967	20.5	1,398	29.7	971	20.6	1,371	29.1	4,707
2010	1,071	22.5	1,368	28.7	938	19.7	1,382	29.0	4,759
2011	1,185	22.4	1,408	26.6	1,087	20.5	1,612	30.5	5,292
2012	1,021	19.4	1,460	27.8	1,047	19.9	1,726	32.9	5,254
2013	687	14.2	1,418	29.3	1,013	20.9	1,726	35.6	4,844
2014	603	14.1	1,102	25.8	898	21.0	1,668	39.1	4,271
2015	598	15.3	876	22.4	785	20.1	1,649	42.2	3,908
2016	634	16.6	772	20.2	714	18.7	1,697	44.5	3,817

* Total number of cases in the non-UK born population where year of entry to the UK is known

Table Ai.1.8: TB case notifications and rates by ethnic group and place of birth, England, 2016

Ethnic group	Place of birth			
	UK born		Non-UK born	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
White	902	2.1 (2.0-2.3)	448	11.0 (10.0-12.0)
Black-Caribbean	79	18.6 (14.7-23.2)	65	27.6 (21.3-35.2)
Black-African	85	18.8 (15.0-23.3)	890	127.4 (119.2-136.0)
Black-Other	23	28.9 (18.3-43.3)	39	84.4 (60.0-115.4)
Indian	128	19.3 (16.1-22.9)	1,090	131.3 (123.6-139.4)
Pakistani	132	20.5 (17.2-24.3)	637	134.2 (124.0-145.0)
Bangladeshi	36	12.6 (8.8-17.5)	180	75.2 (64.6-87.0)
Chinese	5	6.5 (2.1-15.2)	60	25.3 (19.3-32.6)
Mixed/Other	71	5.4 (4.3-6.9)	650	45.3 (41.9-49.0)

CI - confidence intervals

Table Ai.1.9: Number of UK born TB case over time by ethnic group, England, 2000-2016

Year	White	Black*	South Asian**	Mixed/other#
	n	n	n	n
2000	1,262	173	346	35
2001	1,309	151	367	48
2002	1,229	178	391	38
2003	1,191	127	335	36
2004	1,164	204	345	59
2005	1,117	197	399	69
2006	1,094	189	373	62
2007	1,051	240	425	70
2008	1,049	235	483	81
2009	1,115	232	432	86
2010	1,054	225	436	70
2011	1,138	233	462	85
2012	1,182	242	474	83
2013	1,093	218	419	90
2014	1,073	224	363	89
2015	917	205	328	78
2016	902	187	296	76

* Cases with Black-Caribbean, Black-African and Black-Other ethnic groups were grouped as ‘Black’

** Cases with Indian, Pakistani and Bangladeshi ethnic groups were grouped as ‘South Asian’

Cases with Mixed/Other and Chinese ethnic groups were grouped as ‘Mixed/other’

Table Ai.1.10: Number and proportion of TB case notifications by site of disease and place of birth, England, 2007-2016

Year	All cases*					UK born					Non-UK born				
	Pulmonary**		Extra-pulmonary only#		Total	Pulmonary**		Extra-pulmonary only#		Total	Pulmonary**		Extra-pulmonary only#		Total
	n	%	n	%	n	n	%	n	%	n	n	%	n	%	n
2007	4,148	54.9	3,402	45.1	7,550	1,227	68.5	563	31.5	1,790	2,538	49.5	2,589	50.5	5,127
2008	4,286	55.3	3,464	44.7	7,750	1,328	71.5	529	28.5	1,857	2,664	49.5	2,718	50.5	5,382
2009	4,416	54.8	3,643	45.2	8,059	1,351	71.4	541	28.6	1,892	2,746	48.7	2,898	51.3	5,644
2010	4,070	53.2	3,575	46.8	7,645	1,248	69.1	558	30.9	1,806	2,589	47.1	2,909	52.9	5,498
2011	4,290	52.1	3,950	47.9	8,240	1,375	71.1	559	28.9	1,934	2,746	45.7	3,263	54.3	6,009
2012	4,188	52.1	3,848	47.9	8,036	1,360	68.4	629	31.6	1,989	2,694	46.3	3,130	53.7	5,824
2013	3,721	51.5	3,504	48.5	7,225	1,248	68.3	578	31.7	1,826	2,383	45.5	2,857	54.5	5,240
2014	3,400	52.7	3,057	47.3	6,457	1,188	67.8	563	32.2	1,751	2,145	46.6	2,456	53.4	4,601
2015	3,027	53.0	2,688	47.0	5,715	1,070	70.2	454	29.8	1,524	1,899	46.4	2,190	53.6	4,089
2016	3,041	53.9	2,601	46.1	5,642	998	68.1	467	31.9	1,465	1,986	48.6	2,103	51.4	4,089

* Total cases including those with an unknown place of birth

** With or without extra-pulmonary disease

Extra-pulmonary disease only

Table Ai.1.11: Number of TB cases receiving directly observed therapy (DOT) by age group, England, 2007-2016

Year	Age group (years)								Total*
	0-14		15-44		45-64		65+		
	n	%	n	%	n	%	n	%	
2007	53	11.7	234	5.0	76	5.4	48	4.8	7,500
2008	77	19.2	264	6.1	81	6.1	52	6.2	6,900
2009	58	22.8	293	9.0	116	10.8	54	8.4	5,224
2010	67	24.7	281	7.4	117	9.4	71	9.3	6,095
2011	72	20.3	364	7.6	145	9.2	100	10.8	7,654
2012	100	28.0	372	8.0	166	10.9	109	11.7	7,444
2013	65	24.3	349	8.4	183	12.1	113	13.0	6,815
2014	79	31.9	387	10.9	192	13.5	110	12.8	6,076
2015	57	28.8	378	11.8	196	15.3	130	17.4	5,439
2016	59	30.3	355	11.8	225	16.6	122	15.7	5,333

* Total number of cases where information on whether a case received DOT is known

Table Ai.2.1: Number and proportion of all TB cases that are culture confirmed by PHE Centre, England, 2007-2016

PHE Centre*	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
London	1,834	56.7	1,935	57.6	1,908	56.1	1,950	60.2	2,089	59.8	2,091	61.5	1,773	59.6	1,541	60.3	1,360	59.9	1,378	62.4
West Midlands	555	59.8	542	53.8	583	58.0	524	60.1	615	61.3	590	54.8	550	56.2	424	54.7	400	57.1	412	57.1
North West	430	58.7	427	58.5	481	60.2	490	60.6	507	62.0	469	60.5	447	62.4	392	61.1	359	63.2	377	62.8
South East	396	63.2	381	60.6	420	59.0	437	61.5	490	60.3	488	62.7	440	64.4	429	64.6	367	61.9	378	66.7
East of England	253	60.1	304	60.1	294	57.4	308	60.9	352	62.9	311	62.6	283	62.7	285	65.4	242	62.2	275	63.1
Yorkshire and the Humber	382	60.4	357	56.2	400	58.1	363	57.8	379	57.1	345	58.3	365	62.6	325	63.0	267	61.1	305	71.8
East Midlands	309	57.9	285	59.0	279	53.2	298	60.3	296	60.2	298	60.0	243	58.8	239	59.8	240	67.4	210	61.4
South West	160	59.5	191	68.5	195	64.4	142	53.6	200	65.1	190	63.3	186	57.2	174	55.1	172	60.4	149	62.3
North East	127	64.8	115	65.0	108	65.1	97	64.7	104	79.4	114	68.3	106	76.8	115	68.5	85	66.4	86	69.4
England**	**4,448**	**58.7**	**4,537**	**58.1**	**4,668**	**57.5**	**4,609**	**60.0**	**5,032**	**60.8**	**4,896**	**60.6**	**4,393**	**60.5**	**3,924**	**60.6**	**3,492**	**61.0**	**3,570**	**63.0**

* Ordered by decreasing total number of cases in 2016

** Total cases including those with an unknown PHE Centre of residence

Table Ai.2.2: Number and proportion of pulmonary TB cases that are culture confirmed by PHE Centre, England, 2007-2016

PHE Centre*	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
London	1,121	67.3	1,177	67.1	1,175	66.8	1,148	71.5	1,193	72.6	1,184	72.6	1,045	74.6	945	74.6	816	75.5	848	77.7
West Midlands	357	68.9	366	64.4	382	67.9	333	70.6	407	72.2	368	64.9	352	66.2	273	65.2	267	68.5	275	69.1
North West	293	72.7	277	74.9	317	72.7	312	73.8	298	72.3	286	73.3	265	74.9	255	72.6	238	78.5	246	71.5
South East	266	74.9	266	69.3	274	69.2	261	67.8	309	70.7	307	72.4	266	79.2	280	81.9	243	77.4	236	79.7
East of England	157	68.9	202	63.7	200	67.6	204	68.0	220	72.4	182	69.5	176	75.5	181	78.4	154	71.6	186	74.1
Yorkshire and the Humber	245	65.7	213	63.4	263	66.8	255	67.1	248	65.4	222	67.5	229	68.8	218	74.7	183	71.5	205	84.7
East Midlands	218	69.9	198	70.2	193	68.9	195	78.6	201	72.3	188	66.0	172	71.4	161	72.2	167	79.1	150	78.1
South West	107	63.3	130	74.7	133	69.3	99	56.9	141	70.1	143	70.1	131	63.9	113	58.5	123	65.1	106	68.8
North East	85	70.2	75	73.5	69	69.7	60	73.2	59	81.9	70	72.9	76	87.4	62	75.6	53	77.9	58	80.6
England**	**2,850**	**68.7**	**2,904**	**67.8**	**3,006**	**68.1**	**2,867**	**70.4**	**3,076**	**71.7**	**2,950**	**70.4**	**2,712**	**72.9**	**2,488**	**73.2**	**2,244**	**74.1**	**2,310**	**76.0**

* Ordered by decreasing total number of cases in 2016

** Total cases including those with an unknown PHE Centre of residence

TB Monitoring Indicator 8: Proportion of pulmonary TB cases that were culture confirmed (England, PHEC, UTLA and CCG data shown on Fingertips)

Table Ai.2.3: Species identification for culture confirmed TB cases, England, 2009-2016

Year	*M. tuberculosis*		*M. bovis*		*M. africanum*		*M. microti*		MTBC		Total
	n	%	n	%	n	%	n	%	n	%	n
2009	4,614	98.8	17	0.4	31	0.7	0	0.0	6	0.1	4,668
2010	4,503	97.7	31	0.7	26	0.6	2	0.0	47	1.0	4,609
2011	4,906	97.5	32	0.6	63	1.3	0	0.0	31	0.6	5,032
2012	4,769	97.4	32	0.7	70	1.4	2	0.0	23	0.5	4,896
2013	4,284	97.5	24	0.5	62	1.4	1	0.02	22	0.5	4,393
2014	3,834	97.7	34	0.9	47	1.2	0	0.0	9	0.2	3,924
2015	3,366	96.4	31	0.9	57	1.6	0	0.0	38	1.1	3,492
2016	3,434	96.2	34	1.0	51	1.4	3	0.1	48	1.3	3,570

* Data are only presented from 2009 onwards as all MTBCs were recorded as *M. tuberculosis* prior to 2009

Table Ai.3.1: Numbers and rate of TB in UK born children*, England, 2000-2016

Year	Number of cases	Rate per 100,000 (95% CI)
2000	209	2.3 (2.0-2.6)
2001	229	2.5 (2.2-2.9)
2002	228	2.6 (2.2-2.9)
2003	179	2.0 (1.7-2.3)
2004	264	3.0 (2.6-3.4)
2005	247	2.8 (2.5-3.2)
2006	209	2.4 (2.1-2.8)
2007	290	3.4 (3.0-3.8)
2008	294	3.4 (3.0-3.8)
2009	257	2.9 (2.6-3.3)
2010	238	2.7 (2.4-3.1)
2011	234	2.6 (2.3-3.0)
2012	254	2.9 (2.5-3.2)
2013	195	2.2 (1.9-2.5)
2014	187	2.1 (1.8-2.4)
2015	156	1.7 (1.4-2.0)
2016	162	1.8 (1.5-2.0)

* Aged 0 to 14 years

CI - confidence intervals

Table Ai.3.2: Number of TB clusters and proportion clustered cases by PHE Centre, England, 2010-2016

PHE Centre*	Notified cases	Culture confirmed cases		≥23 loci typed cases**		Clustered cases#		Number of clusters	Clusters by cluster size							
									2		3-4		5-9		≥10	
	n	n	%	n	%	n	%	n	n	%	n	%	n	%	n	%
London	20,144	12,182	60.5	10,733	88.1	5,665	52.8	1,272	624	49.1	371	29.2	192	15.1	85	6.7
West Midlands	6,127	3,515	57.4	2,867	81.6	1,420	49.5	322	167	51.9	94	29.2	40	12.4	21	6.5
North West	4,928	3,041	61.7	2,034	66.9	723	35.5	175	86	49.1	58	33.1	17	9.7	14	8.0
South East	4,809	3,029	63.0	2,654	87.6	963	36.3	278	159	57.2	74	26.6	35	12.6	10	3.6
East of England	3,275	2,056	62.8	1,798	87.5	581	32.3	188	112	59.6	53	28.2	19	10.1	4	2.1
Yorkshire and the Humber	3,845	2,349	61.1	1,660	70.7	580	34.9	147	80	54.4	40	27.2	18	12.2	9	6.1
East Midlands	2,994	1,824	60.9	1,464	80.3	509	34.8	143	68	47.6	49	34.3	18	12.6	8	5.6
South West	2,037	1,213	59.5	1,009	83.2	339	33.6	85	40	47.1	24	28.2	17	20.0	4	4.7
North East	1,006	707	70.3	472	66.8	128	27.1	37	18	48.6	12	32.4	5	13.5	2	5.4
England$	**49,165**	**29,916**	**60.8**	**24,691**	**82.5**	**14,733**	**59.7**	**2,878**	**1,310**	**45.5**	**831**	**28.9**	**483**	**16.8**	**254**	**8.8**

* Ordered by decreasing total number of cases in 2016
** Culture confirmed cases with a MIRU-VNTR profile with at least 23 complete loci
# Clustered cases are clustered with each other within the same geographical area
$ The number of clusters in England is higher than the sum of all PHE Centre clusters because it includes clusters that span more than one PHE Centre

Table Ai.4.1: Number and proportion of pulmonary TB cases by time from symptom onset to treatment start and PHE Centre, England, 2016

PHE Centre*	Time from symptom onset to treatment start						
	0-2 months		2-4 months		>4 months		Total**
	n	%	n	%	n	%	n
London	410	42.0	297	30.5	268	27.5	**975**
West Midlands	133	36.8	114	31.6	114	31.6	**361**
North West	118	40.3	84	28.7	91	31.1	**293**
South East	103	36.4	84	29.7	96	33.9	**283**
East of England	83	35.8	61	26.3	88	37.9	**232**
Yorkshire and the Humber	88	40.8	65	30.1	63	29.2	**216**
East Midlands	72	40.5	54	30.3	52	29.2	**178**
South West	46	33.6	39	28.5	52	38.0	**137**
North East	26	40.5	21	32.8	17	26.6	**64**
England	**1,079**	**39.4**	**819**	**29.9**	**841**	**30.7**	**2,739**

* Ordered by decreasing total number of cases in 2016
** The number of pulmonary cases with time between symptom onset to start of TB treatment available, excluding those diagnosed post-mortem and those who did not start treatment

Table Ai.4.2: Number and proportion of pulmonary TB cases by time from symptom onset to treatment start and place of birth, England, 2011-2016

Place of birth	Year	Time from symptom onset to treatment start						
		0-2 months		2-4 months		>4 months		Total*
		n	%	n	%	n	%	n
UK born	2011	393	41.1	272	28.4	292	30.5	**957**
	2012	414	40.9	293	29.0	305	30.1	**1,012**
	2013	381	38.3	291	29.2	324	32.5	**996**
	2014	401	39.4	284	27.8	335	32.8	**1,020**
	2015	374	38.6	280	28.8	317	32.6	**971**
	2016	330	37.6	250	28.4	299	34.0	**879**
Non-UK born	2011	885	46.9	561	29.7	441	23.4	**1,887**
	2012	925	45.5	616	30.2	496	24.3	**2,037**
	2013	822	42.5	604	31.2	510	26.3	**1,936**
	2014	744	39.7	594	31.6	539	28.7	**1,877**
	2015	796	44.5	541	30.2	453	25.3	**1,790**
	2016	738	40.2	563	30.7	535	29.1	**1,836**

* The number of pulmonary cases with time between symptom onset to start of TB treatment available, excluding those diagnosed post-mortem and those who did not start treatment

Table Ai.5.1: TB outcome at 12 months for drug sensitive cases with expected treatment duration <12months*, England, 2006-2015

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2006	5,214	75.5	353	5.1	372	5.4	457	6.6	79	1.1	428	6.2	6,903
2007	5,290	78.2	362	5.4	300	4.4	460	6.8	72	1.1	281	4.2	6,765
2008	5,602	80.3	351	5.0	318	4.6	407	5.8	68	1.0	234	3.4	6,980
2009	5,917	81.9	332	4.6	308	4.3	430	6.0	77	1.1	157	2.2	7,221
2010	5,650	82.9	312	4.6	290	4.3	381	5.6	60	0.9	122	1.8	6,815
2011	6,025	82.1	313	4.3	371	5.1	455	6.2	64	0.9	107	1.5	7,335
2012	6,016	83.8	308	4.3	294	4.1	401	5.6	69	1.0	94	1.3	7,182
2013	5,502	85.6	265	4.1	252	3.9	312	4.9	54	0.8	39	0.6	6,424
2014	4,847	84.8	277	4.8	226	4.0	269	4.7	61	1.1	33	0.6	5,713
2015	4,168	83.4	263	5.3	200	4.0	267	5.3	56	1.1	45	0.9	4,999
Total	**54,231**	**81.8**	**3,136**	**4.7**	**2,931**	**4.4**	**3,839**	**5.8**	**660**	**1.0**	**1,540**	**2.3**	**66,337**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

TB Monitoring Indicator 10: Proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months (England, PHEC, UTLA and CCG data shown on Fingertips)

Table Ai.5.2: Last recorded TB outcome for drug sensitive cases with expected treatment duration <12months*, England, 2006-2015

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2006	5,463	79.1	359	5.2	375	5.4	198	2.9	80	1.2	428	6.2	6,903
2007	5,581	82.5	367	5.4	302	4.5	161	2.4	73	1.1	281	4.2	6,765
2008	5,888	84.4	355	5.1	325	4.7	107	1.5	71	1.0	234	3.4	6,980
2009	6,234	86.3	341	4.7	309	4.3	102	1.4	78	1.1	157	2.2	7,221
2010	5,923	86.9	317	4.7	295	4.3	96	1.4	62	0.9	122	1.8	6,815
2011	6,467	88.2	316	4.3	373	5.1	5	0.1	67	0.9	107	1.5	7,335
2012	6,385	88.9	316	4.4	307	4.3	7	0.1	73	1.0	94	1.3	7,182
2013	5,799	90.3	268	4.2	254	4.0	2	0.0	62	1.0	39	0.6	6,424
2014	5,102	89.3	282	4.9	229	4.0	6	0.1	61	1.1	33	0.6	5,713
2015[#]	4,343	86.9	266	5.3	203	4.1	86	1.7	56	1.1	45	0.9	4,999
Total	**57,185**	**86.2**	**3,187**	**4.8**	**2,972**	**4.5**	**770**	**1.2**	**683**	**1.0**	**1,540**	**2.3**	**66,337**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out
[#] Reduced follow-up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

Table Ai.5.3: Time to treatment completion for drug sensitive cases with expected treatment duration <12months*, England, 2006-2015

Year	<6 months to complete**		6-8 months to complete**		8-10 months to complete		10-12 months to complete		>12 months to complete		Completion time known		Treatment completed#
	n	%	n	%	n	%	n	%	n	%	n	%	N
2006	249	5.8	3,116	72.1	475	11.0	252	5.8	228	5.3	4,320	79.1	5,463
2007	298	6.7	3,242	72.3	432	9.6	242	5.4	267	6.0	4,481	80.3	5,581
2008	273	5.6	3,521	72.7	514	10.6	272	5.6	263	5.4	4,843	82.3	5,888
2009	372	6.7	3,979	71.5	562	10.1	360	6.5	292	5.2	5,565	89.3	6,234
2010	321	5.9	3,998	72.9	583	10.6	332	6.1	250	4.6	5,484	92.6	5,923
2011	326	5.4	4,357	71.7	664	10.9	316	5.2	415	6.8	6,078	94.0	6,467
2012	302	5.0	4,422	73.0	614	10.1	367	6.1	350	5.8	6,055	94.8	6,385
2013	303	5.5	4,032	72.6	569	10.2	375	6.8	274	4.9	5,553	95.8	5,799
2014	265	5.3	3,577	71.4	538	10.7	389	7.8	244	4.9	5,013	98.3	5,102
2015	214	5.0	3,145	73.7	474	11.1	259	6.1	174	4.1	4,266	98.2	4,343
Total	**2,923**	**5.7**	**37,389**	**72.4**	**5,425**	**10.5**	**3,164**	**6.1**	**2,757**	**5.3**	**51,658**	**90.3**	**57,185**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Cases with completion between 168 and 180 days are included in the 6-8 months category
# Treatment completed at last recorded outcome

Table Ai.5.4: Treatment completion at 12 months by age group for drug sensitive cases with expected treatment duration <12months*, England, 2005-2014

Year	Age group (years)							
	0-14		15-44		45-64		65+	
	n	%	n	%	n	%	n	%
2006	286	85.4	3,398	78.5	978	76.2	552	57.6
2007	366	86.5	3,362	80.9	1,006	79.0	556	60.9
2008	380	90.5	3,600	82.7	1,073	81.2	547	62.0
2009	346	92.5	3,730	84.8	1,185	80.9	656	66.7
2010	301	91.8	3,566	85.7	1,151	82.4	632	68.0
2011	301	85.5	3,805	84.8	1,285	82.9	634	67.2
2012	335	91.3	3,781	86.4	1,252	84.2	648	68.0
2013	249	91.9	3,358	87.8	1,250	86.6	645	72.7
2014	231	93.5	2,913	88.2	1,110	84.4	593	69.9
2015	184	94.8	2,541	87.2	996	84.0	447	63.5
Total	**2,979**	**90.0**	**34,054**	**84.5**	**11,286**	**82.3**	**5,910**	**65.7**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB

Table Ai.5.5: TB outcome at 12 months for drug sensitive cases with expected treatment duration <12 months by PHE Centre*, England, 2015

PHE Centre**	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated[#]		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
London	1,700	86.6	63	3.2	66	3.4	97	4.9	20	1.0	16	0.8	1,962
West Midlands	517	83.1	38	6.1	24	3.9	34	5.5	9	1.4	0	0.0	622
North West	414	83.8	38	7.7	26	5.3	14	2.8	2	0.4	0	0.0	494
South East	432	82.4	45	8.6	15	2.9	21	4.0	5	1.0	6	1.1	524
East of England	271	77.9	22	6.3	19	5.5	29	8.3	1	0.3	6	1.7	348
Yorkshire and the Humber	322	84.3	16	4.2	18	4.7	19	5.0	1	0.3	6	1.6	382
East Midlands	231	76.5	17	5.6	18	6.0	24	7.9	6	2.0	6	2.0	302
South West	189	76.2	11	4.4	11	4.4	22	8.9	10	4.0	5	2.0	248
North East	92	78.6	13	11.1	3	2.6	7	6.0	2	1.7	0	0.0	117
England[$]	**4,168**	**83.4**	**263**	**5.3**	**200**	**4.0**	**267**	**5.3**	**56**	**1.1**	**45**	**0.9**	**4,999**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Ordered by decreasing total number of cases in 2016
[#] Not evaluated includes missing, unknown and transferred out
[$] Total cases including those with an unknown PHE Centre of residence

Table Ai.5.6: Treatment completion at 12 months for drug sensitive cases with expected treatment duration <12months* by PHE Centre, England, 2006-2015

PHE Centre**	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
London	2,428	81.9	2,338	82.8	2,539	85.4	2,580	86.5	2,435	86.0	2,619	85.5	2,573	86.1	2,250	86.7	1,951	87.4	1,700	86.6
West Midlands	565	67.7	673	77.3	761	83.0	743	81.8	633	80.0	724	81.3	825	85.7	736	85.9	575	83.2	517	83.1
North West	476	75.9	489	74.7	514	77.9	589	80.9	602	84.8	594	81.1	579	84.3	544	84.0	469	83.9	414	83.8
South East	382	70.0	405	70.8	414	74.6	507	80.0	516	80.8	606	83.7	583	82.9	535	88.1	524	87.2	432	82.4
East of England	328	75.8	291	78.2	325	71.9	352	78.0	372	80.7	405	82.2	350	79.2	340	84.4	316	80.8	271	77.9
Yorkshire and the Humber	420	72.4	405	70.9	435	76.2	468	77.2	428	75.8	431	72.9	440	82.2	458	86.6	401	85.0	322	84.3
East Midlands	389	74.8	382	80.6	333	77.6	392	81.2	371	85.3	362	82.5	354	80.8	317	88.1	278	82.0	231	76.5
South West	128	49.6	168	68.3	160	62.3	173	63.4	179	74.0	194	68.8	193	70.4	223	73.8	221	75.9	189	76.2
North East	98	71.0	139	78.1	121	73.3	113	73.4	114	81.4	90	74.4	119	78.3	99	81.1	112	82.4	92	78.6
England[#]	**5,214**	**75.5**	**5,290**	**78.2**	**5,602**	**80.3**	**5,917**	**81.9**	**5,650**	**82.9**	**6,025**	**82.1**	**6,016**	**83.8**	**5,502**	**85.6**	**4,847**	**84.8**	**4,168**	**83.4**

* Excludes cases in the drug resistant cohort and those with CNS, spinal, miliary or cryptic disseminated TB
** Ordered by decreasing total number of cases in 2016
[#] Total cases including those with an unknown PHE Centre of residence

Table Ai.5.7: Last recorded TB outcome by end of follow-up period for drug sensitive cases with CNS, spinal, miliary or cryptic disseminated TB*, England, 2006-2015

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2006	462	66.1	71	10.2	38	5.4	59	8.4	10	1.4	59	8.4	699
2007	527	71.1	65	8.8	43	5.8	64	8.6	8	1.1	34	4.6	741
2008	532	70.8	81	10.8	43	5.7	49	6.5	7	0.9	39	5.2	751
2009	603	74.1	78	9.6	45	5.5	54	6.6	8	1.0	26	3.2	814
2010	583	74.6	65	8.3	47	6.0	60	7.7	10	1.3	17	2.2	782
2011	703	82.7	67	7.9	52	6.1	0	0.0	10	1.2	18	2.1	850
2012	656	81.3	74	9.2	56	6.9	4	0.5	7	0.9	10	1.2	807
2013	628	83.3	68	9.0	44	5.8	2	0.3	6	0.8	6	0.8	754
2014	558	80.9	72	10.4	44	6.4	2	0.3	12	1.7	2	0.3	690
2015#	484	73.2	77	11.6	36	5.4	50	7.6	3	0.5	11	1.7	661
Total	**5,736**	**76.0**	**718**	**9.5**	**448**	**5.9**	**344**	**4.6**	**81**	**1.1**	**222**	**2.9**	**7,549**

* Excludes cases in the drug resistant cohort
** Not evaluated includes missing, unknown and transferred out
# Reduced follow-up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

Table Ai.5.8: Last recorded TB outcome by end of follow-up period for the entire drug sensitive cohort*, England, 2006-2015

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2006	5,925	77.9	430	5.7	413	5.4	257	3.4	90	1.2	487	6.4	7,602
2007	6,108	81.4	432	5.8	345	4.6	225	3.0	81	1.1	315	4.2	7,506
2008	6,420	83.0	436	5.6	368	4.8	156	2.0	78	1.0	273	3.5	7,731
2009	6,837	85.1	419	5.2	354	4.4	156	1.9	86	1.1	183	2.3	8,035
2010	6,506	85.6	382	5.0	342	4.5	156	2.1	72	0.9	139	1.8	7,597
2011	7,170	87.6	383	4.7	425	5.2	5	0.1	77	0.9	125	1.5	8,185
2012	7,041	88.1	390	4.9	363	4.5	11	0.1	80	1.0	104	1.3	7,989
2013	6,427	89.5	336	4.7	298	4.2	4	0.1	68	0.9	45	0.6	7,178
2014	5,660	88.4	354	5.5	273	4.3	8	0.1	73	1.1	35	0.5	6,403
2015[#]	4,827	85.3	343	6.1	239	4.2	136	2.4	59	1.0	56	1.0	5,660
Total	**62,921**	**85.2**	**3,905**	**5.3**	**3,420**	**4.6**	**1,114**	**1.5**	**764**	**1.0**	**1,762**	**2.4**	**73,886**

* Excludes cases in the drug resistant cohort
** Not evaluated includes missing, unknown and transferred out
[#] Reduced follow-up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

TB Monitoring Indicator 11: Proportion of drug sensitive TB cases who were lost to follow-up at last recorded outcome (England, PHEC, UTLA and CCG data shown on Fingertips)

TB Monitoring Indicator 12: Proportion of drug sensitive TB cases who had died at last recorded outcome (England, PHEC, UTLA and CCG data shown on Fingertips)

Table Ai.5.9: Died at last recorded outcome for the entire drug sensitive cohort*, England, 2006-2015

Year	TB caused or contributed to death		TB incidental to death		Unknown		Total deaths		Total cases
	n	%	n	%	n	%	n	%	n
2006	138	32.1	88	20.5	204	47.4	430	5.7	7,602
2007	142	32.9	85	19.7	205	47.5	432	5.8	7,506
2008	145	33.3	97	22.2	194	44.5	436	5.6	7,731
2009	149	35.6	88	21.0	182	43.4	419	5.2	8,035
2010	103	27.0	101	26.4	178	46.6	382	5.0	7,597
2011	105	27.4	88	23.0	190	49.6	383	4.7	8,185
2012	116	29.7	86	22.1	188	48.2	390	4.9	7,989
2013	109	32.4	71	21.1	156	46.4	336	4.7	7,178
2014	113	31.9	72	20.3	169	47.7	354	5.5	6,403
2015**	121	35.3	98	28.6	124	36.2	343	6.1	5,660
Total	**1,241**	**31.8**	**874**	**22.4**	**1,790**	**45.8**	**3,905**	**5.3**	**73,886**

* Excludes cases in the drug resistant cohort
** Reduced follow-up period for this group, therefore proportion expected to increase in future reporting

Table Ai.5.10: Last recorded TB outcome for the entire drug sensitive cohort* by site of disease, 2015

Site of disease**	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated#		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
Pulmonary	2,445	82.0	258	8.7	143	4.8	67	2.2	39	1.3	30	1.0	2,982
Pulmonary only	1,830	82.7	190	8.6	102	4.6	35	1.6	34	1.5	23	1.0	2,214
Miliary	121	69.1	32	18.3	11	6.3	9	5.1	0	0.0	2	1.1	175
Laryngeal	11	84.6	0	0.0	0	0.0	2	15.4	0	0.0	0	0.0	13
Extrapulmonary	2,989	87.0	152	4.4	137	4.0	101	2.9	25	0.7	32	0.9	3,436
Extrapulmonary only	2,374	89.0	84	3.1	96	3.6	69	2.6	20	0.7	25	0.9	2,668
Extra-thoracic lymph nodes	1,203	90.8	22	1.7	57	4.3	24	1.8	7	0.5	12	0.9	1,325
Intra-thoracic lymph nodes	707	91.6	14	1.8	21	2.7	18	2.3	8	1.0	4	0.5	772
Unknown extra-pulmonary	492	88.0	22	3.9	21	3.8	18	3.2	3	0.5	3	0.5	559
Pleural	410	84.9	28	5.8	24	5.0	11	2.3	2	0.4	8	1.7	483
Other extra-pulmonary	315	87.5	14	3.9	10	2.8	11	3.1	5	1.4	5	1.4	360
Gastrointestinal	288	85.7	17	5.1	17	5.1	8	2.4	3	0.9	3	0.9	336
Bone – spine	206	78.6	16	6.1	10	3.8	23	8.8	1	0.4	6	2.3	262
Bone – other	113	84.3	5	3.7	6	4.5	7	5.2	2	1.5	1	0.7	134
CNS – meningitis	93	65.0	23	16.1	11	7.7	13	9.1	0	0.0	3	2.1	143
Genitourinary	99	84.6	7	6.0	7	6.0	0	0.0	2	1.7	2	1.7	117
CNS – other	75	65.2	12	10.4	11	9.6	15	13.0	1	0.9	1	0.9	115
Cryptic	36	75.0	4	8.3	3	6.3	3	6.3	1	2.1	1	2.1	48

* Excludes cases in the drug resistant cohort
** With or without disease at another site
# Not evaluated includes missing, unknown and transferred out

Table Ai.5.11: Last recorded TB outcome for the entire drug sensitive cohort* by PHE Centre, England, 2015

PHE Centre**	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated#		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
London	2,002	88.9	86	3.8	82	3.6	38	1.7	20	0.9	23	1.0	2,251
West Midlands	590	85.3	51	7.4	28	4.0	12	1.7	11	1.6	0	0.0	692
North West	468	83.4	49	8.7	29	5.2	13	2.3	2	0.4	0	0.0	561
South East	484	82.7	52	8.9	19	3.2	15	2.6	5	0.9	10	1.7	585
East of England	307	79.7	28	7.3	22	5.7	20	5.2	2	0.5	6	1.6	385
Yorkshire and the Humber	365	86.1	21	5.0	18	4.2	13	3.1	1	0.2	6	1.4	424
East Midlands	278	78.5	28	7.9	21	5.9	15	4.2	6	1.7	6	1.7	354
South West	231	82.5	14	5.0	16	5.7	4	1.4	10	3.6	5	1.8	280
North East	102	79.7	14	10.9	4	3.1	6	4.7	2	1.6	0	0.0	128
England	**4,827**	**85.3**	**343**	**6.1**	**239**	**4.2**	**136**	**2.4**	**59**	**1.0**	**56**	**1.0**	**5,660**

* Excludes cases in the drug resistant cohort
** Ordered by decreasing total number of cases in 2016
# Not evaluated includes missing, unknown and transferred out

Table: Ai.5.12: Last recorded TB outcome for the entire drug sensitive cohort* by place of birth, England, 2015

TB outcome	Place of birth			
	UK born		Non-UK born	
	n	%	n	%
Completed	1,270	83.4	3,506	86.8
Died	145	9.5	170	4.2
Lost to follow-up	23	1.5	208	5.2
Still on treatment	43	2.8	92	2.3
Stopped	31	2.0	28	0.7
Not evaluated**	10	0.7	34	0.8
Total	**1,522**	**100.0**	**4,038**	**100.0**

* Excludes cases in the drug resistant cohort
** Not evaluated includes missing, unknown and transferred out

Table Ai.6.1: Number and proportion of TB cases with first line drug susceptibility results, England, 2000-2016

Year	Culture confirmed cases		Drug susceptibility testing (2 first line drugs)*		Drug susceptibility testing (all first line drugs)**	
	n	%	n	%	n	%
2000	2,797	46.3	2,797	100.0	2,779	99.4
2001	3,149	51.0	3,142	99.8	3,123	99.2
2002	3,847	57.6	3,823	99.4	3,793	98.6
2003	3,830	57.8	3,825	99.9	3,799	99.2
2004	4,078	58.9	4,037	99.0	4,020	98.6
2005	4,582	59.8	4,549	99.3	4,532	98.9
2006	4,668	60.8	4,631	99.2	4,607	98.7
2007	4,448	58.7	4,398	98.9	4,366	98.2
2008	4,537	58.1	4,480	98.7	4,429	97.6
2009	4,668	57.5	4,597	98.5	4,519	96.8
2010	4,609	60.0	4,559	98.9	4,517	98.0
2011	5,032	60.8	4,968	98.7	4,896	97.3
2012	4,896	60.6	4,851	99.1	4,786	97.8
2013	4,393	60.5	4,332	98.6	4,287	97.6
2014	3,924	60.6	3,899	99.4	3,833	97.7
2015	3,492	61.0	3,474	99.5	3,426	98.1
2016	3,570	63.0	3,516	98.5	3,404	95.4
Total	**70,520**	**58.5**	**69,878**	**99.1**	**69,116**	**98.0**

* Cases with phenotypic DSTs that have been tested for isoniazid and rifampicin

** Cases with phenotypic DSTs that have been tested for isoniazid, rifampicin, ethambutol and pyrazinamide

TB Monitoring Indicator 9: Proportion of microbiologically confirmed cases with drug susceptibility testing reported for the four first line agents (England, PHEC and UTLA data shown on Fingertips)

Table Ai.6.2: Number and proportion of TB cases with first line drug resistance*, England, 2000-2016

Year	Isoniazid resistant		Rifampicin resistant		Ethambutol resistant		Pyrazinamide resistant**		Resistant to any first line drug	
	n	%	n	%	n	%	n	%	n	%
2000	178	6.4	41	1.5	10	0.4	14	0.5	193	6.9
2001	206	6.6	32	1.0	12	0.4	16	0.5	224	7.1
2002	274	7.2	45	1.2	18	0.5	29	0.8	297	7.8
2003	282	7.4	68	1.8	17	0.4	19	0.5	308	8.1
2004	296	7.3	61	1.5	17	0.4	26	0.6	326	8.1
2005	322	7.1	56	1.2	18	0.4	14	0.3	346	7.6
2006	337	7.3	74	1.6	25	0.5	22	0.5	370	8.0
2007	305	6.9	62	1.4	26	0.6	26	0.6	332	7.5
2008	266	5.9	68	1.5	34	0.8	35	0.8	305	6.8
2009	327	7.1	70	1.5	27	0.6	49	1.1	369	8.0
2010	292	6.4	75	1.6	34	0.7	40	0.9	321	7.0
2011	376	7.6	89	1.8	55	1.1	46	0.9	413	8.3
2012	330	6.8	87	1.8	48	1.0	44	0.9	358	7.4
2013	305	7.0	78	1.8	41	0.9	38	0.9	332	7.7
2014	267	6.8	56	1.4	42	1.1	30	0.8	286	7.3
2015	236	6.8	53	1.5	27	0.8	23	0.7	253	7.3
2016	245	7.0	59	1.7	43	1.2	20	0.6	262	7.5
Total	**4,844**	**6.9**	**1,074**	**1.5**	**494**	**0.7**	**491**	**0.7**	**5,295**	**7.6**

* Cases with phenotypic DSTs for at least isoniazid and rifampicin
** Excludes *M. bovis* cases, which are inherently resistant to pyrazinamide

TB Monitoring Indicator 18: Number and proportion of culture confirmed TB cases with any first line drug resistance (England and PHEC)

Table Ai.6.3: Number and proportion of TB cases with drug resistance, England, 2000-2016

Year	Isoniazid resistance without MDR-TB cases*		Rifampicin resistance without MDR-TB cases**		MDR-TB cases		MDR/RR-TB cases#		Proportion of MDR/RR-TB cases that are rifampicin resistant cases without MDR-TB	XDR-TB cases	
	n	%	n	%	n	%	n	%	%	n	%
2000	150	5.4	13	0.5	28	1.0	41	1.5	31.7	0	0.0
2001	184	5.9	10	0.3	22	0.7	32	1.0	31.3	0	0.0
2002	239	6.3	10	0.3	35	0.9	45	1.2	22.2	0	0.0
2003	233	6.1	19	0.5	49	1.3	68	1.8	27.9	1	0.03
2004	251	6.2	16	0.4	45	1.1	61	1.5	26.2	0	0.0
2005	281	6.2	15	0.3	41	0.9	56	1.2	26.8	0	0.0
2006	283	6.1	20	0.4	54	1.2	74	1.6	27.0	0	0.0
2007	256	5.8	13	0.3	49	1.1	62	1.4	21.0	0	0.0
2008	216	4.8	18	0.4	50	1.1	68	1.5	26.5	2	0.04
2009	268	5.8	11	0.2	59	1.3	70	1.5	15.7	2	0.04
2010	227	5.0	10	0.2	65	1.4	75	1.6	13.3	2	0.04
2011	295	5.9	8	0.2	81	1.6	89	1.8	9.0	6	0.12
2012	253	5.2	10	0.2	77	1.6	87	1.8	11.5	2	0.04
2013	237	5.5	10	0.2	68	1.6	78	1.8	12.8	3	0.07
2014	215	5.5	4	0.1	52	1.3	56	1.4	7.1	3	0.08
2015	191	5.5	8	0.2	45	1.3	53	1.5	15.1	10	0.29
2016	192	5.5	6	0.2	53	1.5	59	1.7	10.2	7	0.20
Total	**3,971**	**5.7**	**201**	**0.3**	**873**	**1.2**	**1,074**	**1.5**	**19.7**	**38**	**0.05**

* Cases with phenotypic DST results for at least isoniazid and rifampicin who are resistant to isoniazid without MDR-TB
** Cases with phenotypic DST results for at least isoniazid and rifampicin who are resistant to rifampicin without MDR-TB
# Cases with phenotypic DST results for at least isoniazid and rifampicin who are resistant to rifampicin, including those with MDR-TB

TB Monitoring Indicator 19: Number and proportion of culture confirmed TB cases with multi-drug resistance TB (England)

Table Ai.6.4: Number and proportion of TB cases with drug resistance by PHE Centre, England, 2012-2016

PHE Centre*	Isoniazid resistance without MDR-TB cases		MDR-TB cases		MDR/RR-TB cases		XDR-TB cases		Total**
	n	%	n	%	n	%	n	%	n
London	492	6.1	124	1.5	140	1.7	7	0.1	8,071
West Midlands	91	3.9	38	1.6	45	1.9	2	0.1	2,332
North West	93	4.6	25	1.2	30	1.5	3	0.1	2,040
South East	110	5.3	22	1.1	24	1.2	2	0.1	2,076
East of England	88	6.4	24	1.7	25	1.8	3	0.2	1,383
Yorkshire and the Humber	78	4.9	30	1.9	33	2.1	4	0.3	1,587
East Midlands	66	5.4	16	1.3	18	1.5	3	0.2	1,214
South West	52	6.0	9	1.0	11	1.3	1	0.1	864
North East	18	3.6	7	1.4	7	1.4	0	0.0	505
England	**1,088**	**5.4**	**295**	**1.5**	**333**	**1.7**	**25**	**0.1**	**20,072**

* Ordered by decreasing total number of TB cases in 2016
** Cases with phenotypic DSTs for at least isoniazid and rifampicin

Table Ai.6.5: Number and proportion of MDR/RR-TB cases with resistance to an injectable agent or a fluoroquinolone, England, 2000-2016

Year	MDR/RR-TB cases	Tested for resistance to at least one injectable agent		Resistant to an injectable agent		Tested for resistance to at least one fluoroquinolone		Resistant to a fluoroquinolone	
	n	n	%	n	%	n	%	n	%
2000	41	1	2.4	0	0.0	1	2.4	0	0.0
2001	32	0	0.0	0	0.0	0	0.0	0	0.0
2002	45	34	75.6	1	2.9	37	82.2	1	2.7
2003	68	50	73.5	2	4.0	62	91.2	4	6.5
2004	61	48	78.7	1	2.1	45	73.8	3	6.7
2005	56	42	75.0	0	0.0	48	85.7	2	4.2
2006	74	58	78.4	3	5.2	73	98.6	0	0.0
2007	62	52	83.9	2	3.8	61	98.4	4	6.6
2008	68	62	91.2	3	4.8	67	98.5	11	16.4
2009	70	64	91.4	5	7.8	68	97.1	7	10.3
2010	75	70	93.3	11	15.7	71	94.7	9	12.7
2011	89	88	98.9	14	15.9	89	100.0	21	23.6
2012	87	85	97.7	14	16.5	86	98.9	4	4.7
2013	78	74	94.9	12	16.2	78	100.0	11	14.1
2014	56	56	100.0	7	12.5	56	100.0	14	25.0
2015	53	53	100.0	13	24.5	53	100.0	15	28.3
2016	59	54	91.5	13	24.1	54	91.5	11	20.4
Total	**1,074**	**891**	**83.0**	**101**	**11.3**	**949**	**88.4**	**117**	**12.3**

Table Ai.6.6: Number and proportion of MDR/RR-TB cases resistant to at least one injectable agent or at least one fluoroquinolone by most frequent country of birth, England, 2012-2016

Country of birth*	MDR/RR-TB cases	Resistant to an injectable agent**		Resistant to a fluoroquinolone#		XDR-TB$	
	n	n	%	n	%	n	%
India	73	5	7.0	16	22.2	3	4.2
United Kingdom	41	10	26.3	5	12.5	5	13.2
Lithuania	36	18	50.0	15	41.7	11	30.6
Pakistan	25	2	8.3	4	16.7	0	0.0
Romania	13	5	38.5	3	23.1	2	15.4
Somalia	12	1	8.3	0	0.0	0	0.0
Nigeria	12	1	8.3	1	8.3	0	0.0

* The table shows the top 7 countries of birth for MDR/RR-TB cases that are resistant to at least one injectable agent or at least one fluoroquinolone with more than ten MDR/RR-TB case from that country in 2012-2016. For these countries, the total number of cases and proportions with resistance are shown

** Cases with phenotypic DST results for at least isoniazid, rifampicin and at least one injectable, born in the respective country

Culture confirmed cases with phenotypic DST results for at least isoniazid, rifampicin and at least one fluoroquinolone, born in the respective country

$ Cases with phenotypic DST results for at least isoniazid, rifampicin and at least one injectable and at least one fluoroquinolone

Table Ai.6.7: TB outcome at 24 months for the drug resistant cohort*, England, 2005-2014

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2005	39	62.9	4	6.5	8	12.9	5	8.1	4	6.5	2	3.2	62
2006	39	48.8	2	2.5	8	10.0	24	30.0	3	3.8	4	5.0	80
2007	30	42.3	10	14.1	6	8.5	20	28.2	5	7.0	0	0.0	71
2008	45	57.7	6	7.7	10	12.8	10	12.8	4	5.1	3	3.8	78
2009	40	51.9	4	5.2	11	14.3	19	24.7	1	1.3	2	2.6	77
2010	38	48.1	0	0.0	9	11.4	25	31.6	4	5.1	3	3.8	79
2011	48	50.5	4	4.2	17	17.9	23	24.2	3	3.2	0	0.0	95
2012	57	60.6	3	3.2	10	10.6	16	17.0	5	5.3	3	3.2	94
2013	49	57.6	4	4.7	12	14.1	17	20.0	2	2.4	1	1.2	85
2014	34	49.3	2	2.9	14	20.3	14	20.3	2	2.9	3	4.3	69
Total	**419**	**53.0**	**39**	**4.9**	**105**	**13.3**	**173**	**21.9**	**33**	**4.2**	**21**	**2.7**	**790**

* Includes initial and acquired MDR/RR-TB cases and and cases treated with a second line regimen with no phenotypic DST results
** Not evaluated includes missing, unknown and transferred out

TB Monitoring Indicator 13: Proportion of TB cases with rifampicin resistance or MDR-TB who had completed treatment at 24 months (England)

Table Ai.6.8: Last recorded TB outcome for the drug resistant cohort*, England, 2005-2014

Year	Completed		Died		Lost to follow-up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2005	42	67.7	4	6.5	9	14.5	3	4.8	4	6.5	0	0.0	62
2006	56	70.0	3	3.8	8	10.0	9	11.3	3	3.8	1	1.3	80
2007	46	64.8	10	14.1	6	8.5	4	5.6	5	7.0	0	0.0	71
2008	53	67.9	7	9.0	10	12.8	4	5.1	4	5.1	0	0.0	78
2009	59	76.6	4	5.2	11	14.3	1	1.3	1	1.3	1	1.3	77
2010	60	75.9	1	1.3	9	11.4	4	5.1	5	6.3	0	0.0	79
2011	64	67.4	6	6.3	18	18.9	4	4.2	3	3.2	0	0.0	95
2012	71	75.5	4	4.3	11	11.7	3	3.2	5	5.3	0	0.0	94
2013	64	75.3	4	4.7	14	16.5	1	1.2	2	2.4	0	0.0	85
2014[#]	42	60.9	2	2.9	14	20.3	8	11.6	2	2.9	1	1.4	69
Total	**557**	**70.5**	**45**	**5.7**	**110**	**13.9**	**41**	**5.2**	**34**	**4.3**	**3**	**0.4**	**790**

* Includes initial and acquired MDR/RR-TB cases and cases treated with a second line regimen with no phenotypic DST results
** Not evaluated includes missing, unknown and transferred out
[#] Reduced follow-up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

TB Monitoring Indicator 14: Proportion of TB cases with rifampicin resistance or MDR-TB who are lost to follow-up at reported outcome (England)

TB Monitoring Indicator 15: Proportion of TB cases with rifampicin resistance or MDR-TB who had died at last reported outcome (England)

Table Ai.6.9: Time to treatment completion* for the drug resistant cohort**, England, 2005-2014

Year	< 12 months to complete		12-18 months to complete		18-20 months to complete		20-24 months to complete		>24 months to complete		Completion time known		Treatment completed[#]
	n	%	n	%	n	%	n	n	n	%	n	%	n
2005	2	6.9	6	20.7	13	44.8	5	17.2	3	10.3	29	69.0	42
2006	1	2.5	6	15.0	13	32.5	5	12.5	15	37.5	40	71.4	56
2007	2	5.7	5	14.3	6	17.1	8	22.9	14	40.0	35	76.1	46
2008	1	3.0	6	18.2	8	24.2	11	33.3	7	21.2	33	62.3	53
2009	1	2.2	2	4.3	11	23.9	17	37.0	15	32.6	46	78.0	59
2010	1	2.0	4	8.2	14	28.6	12	24.5	18	36.7	49	81.7	60
2011	1	1.7	8	13.6	11	18.6	23	39.0	16	27.1	59	92.2	64
2012	3	5.1	5	8.5	17	28.8	20	33.9	14	23.7	59	83.1	71
2013	4	6.3	8	12.7	14	22.2	23	36.5	14	22.2	63	98.4	64
2014	3	7.7	4	10.3	8	20.5	17	43.6	7	17.9	39	92.9	42
Total	**19**	**4.2**	**54**	**11.9**	**115**	**25.4**	**141**	**31.2**	**123**	**27.2**	**452**	**81.1**	**557**

* Completion time is from MDR/RR-TB start date until completion date
** Includes initial and acquired MDR/RR-TB cases and cases those treated with a second line regimen with no phenotypic DST results[#] Treatment completed at last recorded outcome

Table Ai.6.10: Number and proportion of the drug resistant* cohort reported as lost to follow-up at last recorded outcome by place of birth, England, 2005-2014

Year	Lost to follow-up								Total cases
	UK born		Non UK born		Lost to follow-up abroad**		Total cases lost to follow-up		
	n	%	n	%	n	%	n	%	N
2005	1	11.1	8	88.9	4	66.7	9	14.5	62
2006	1	12.5	7	87.5	4	80.0	8	10.0	80
2007	0	0.0	6	100.0	5	100.0	6	8.5	71
2008	0	0.0	10	100.0	8	80.0	10	12.8	78
2009	0	0.0	10	90.9	7	77.8	11	14.3	77
2010	0	0.0	9	100.0	9	100.0	9	11.4	79
2011	0	0.0	18	100.0	15	83.3	18	18.9	95
2012	1	9.1	10	90.9	7	77.8	11	11.7	94
2013	1	7.1	13	92.9	8	80.0	14	16.5	85
2014#	1	0.0	13	100.0	9	90.0	14	20.3	69
Total	**5**	**4.6**	**104**	**95.4**	**76**	**81.7**	**110**	**13.9**	**790**

* Includes initial and acquired MDR/RR-TB cases and cases those treated with a second line regimen with no phenotypic DST results
** Non-UK born cases with a known reason for lost to follow-up
# Reduced follow-up period for this group, therefore proportion lost to follow-up is expected to increase in future reporting

Table Ai.7.1: Number and proportion of TB cases with social risk factors* by place of birth, England, 2010-2016

	Year	Drug misuse		Alcohol misuse		Homelessness		Prison		At least 1 SRF		2 or more SRF	
		n	%	n	%	n	%	n	%	n	%	n	%
All cases	2010	188	2.9	257	4.0	201	3.0	177	2.8	584	9.9	164	2.2
	2011	204	2.8	236	3.3	196	2.7	212	3.0	592	8.9	188	2.4
	2012	220	3.1	220	3.1	185	2.6	225	3.2	594	8.9	184	2.4
	2013	217	3.3	239	3.7	217	3.3	192	3.0	588	9.5	195	2.8
	2014	203	3.5	197	3.4	210	3.6	187	3.3	539	9.8	176	2.8
	2015	218	4.2	206	4.0	234	4.5	203	4.0	581	11.7	202	3.7
	2016	218	4.3	187	3.7	202	4.0	200	4.0	534	11.1	185	3.4
UK born	2010	114	8.1	113	8.2	71	5.0	83	6.2	235	18.4	100	6.3
	2011	134	8.6	121	7.8	62	3.9	126	8.4	271	18.6	125	7.3
	2012	129	8.0	99	6.2	54	3.3	106	6.8	254	16.7	94	5.4
	2013	133	8.6	130	8.5	70	4.5	99	6.6	259	17.5	115	7.0
	2014	124	8.5	98	6.8	74	5.1	94	6.7	236	17.0	101	6.4
	2015	145	11.3	112	8.7	76	5.9	114	9.1	271	21.8	116	8.4
	2016	135	11.2	95	7.9	54	4.5	99	8.5	230	20.0	100	7.7
Non-UK born	2010	68	1.4	134	2.8	123	2.5	83	1.7	328	7.4	58	1.1
	2011	63	1.1	106	2.0	128	2.3	78	1.5	301	6.0	58	1.0
	2012	86	1.6	111	2.1	124	2.3	112	2.1	316	6.2	86	1.5
	2013	81	1.6	104	2.1	145	2.9	92	1.9	321	6.9	77	1.5
	2014	76	1.8	96	2.2	132	3.1	91	2.2	294	7.2	72	1.6
	2015	68	1.8	90	2.3	156	4.1	88	2.3	302	8.2	82	2.0
	2016	79	2.0	88	2.3	146	3.8	101	2.7	298	8.2	82	2.0

* Includes those aged 15 years and older

Table Ai.7.2: Number and proportion of TB cases with social risk factors*, by ethnicity and country of birth**, England, 2010-2016

Demographic characteristic		Drug misuse		Alcohol misuse		Homeless		Prison		At least 1 SRF		2 or more SRF	
		n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity (UK born)	White	623	9.7	634	9.9	371	5.7	472	7.8	1,255	20.9	567	8.0
	Black Caribbean	99	19.4	36	7.1	47	9.1	94	18.6	163	33.1	73	13.2
	Black-African	13	3.4	9	2.4	7	1.8	23	5.9	38	10.3	10	2.5
	Indian, Pakistani, Bangladeshi	114	5.2	55	2.5	13	0.6	77	3.5	185	8.8	58	2.5
	Other	57	12.5	28	6.2	20	4.3	47	10.3	97	21.7	37	7.6
Country of birth (Non-UK born)**	India	27	0.3	178	1.9	71	0.8	47	0.5	277	3.1	41	0.4
	Somalia	62	3.2	51	2.7	95	4.9	77	4.0	213	11.8	50	2.4
	Pakistan	32	0.6	46	0.8	46	0.8	43	0.8	132	2.5	28	0.5
	Poland	29	7.5	63	16.6	68	17.7	38	10.4	123	33.6	57	13.0
	Eritrea	5	1.0	4	0.8	91	17.4	39	7.7	119	24.4	17	3.0
	Romania	21	3.8	19	3.4	53	9.6	25	4.6	94	17.8	18	2.9
	Lithuania	24	10.0	32	13.6	44	18.4	34	14.5	76	32.6	43	16.4
	Nigeria	9	1.0	16	1.7	30	3.1	19	2.1	65	7.4	7	0.7
	Ireland	23	10.8	37	17.5	18	8.5	20	9.8	58	28.6	28	12.3
	Bangladesh	26	1.7	17	1.1	14	0.9	15	1.0	58	4.0	10	0.6

* Includes those aged 15 years and older
** The top ten countries of birth by the number of cases with at least 1 SRF were included

Table Ai.7.3: Number and proportion of TB cases with social risk factors* by PHE Centre, England, 2016

PHE Centre**	Drug misuse		Alcohol misuse		Homeless		Prison		At least 1 SRF		2 or more SRF	
	n	%	n	%	n	%	n	%	n	%	n	%
London	90	4.4	81	3.9	87	4.2	61	3.0	212	10.4	71	3.3
West Midlands	31	4.7	24	3.6	19	2.9	24	3.7	61	9.7	25	3.6
North West	20	4.0	25	5.0	15	3.1	20	4.6	51	11.9	17	3.0
South East	18	3.4	13	2.6	17	3.3	21	4.2	47	9.8	15	2.7
East of England	24	6.1	16	4.0	16	4.1	30	7.9	57	15.4	20	4.7
Yorkshire and the Humber	10	2.8	13	3.6	13	3.7	13	3.8	33	10.3	11	2.7
East Midlands	10	3.4	4	1.4	17	5.8	9	3.3	28	10.7	9	2.8
South West	10	4.7	8	3.6	13	6.0	13	6.6	28	14.7	13	5.5
North East	5	4.5	3	2.8	5	4.6	9	8.3	17	16.0	4	3.4

* Includes those aged 15 years and older
** Ordered by decreasing total number of TB cases in 2016

Table Ai.7.4: Number and proportion of TB cases with specific clinical characteristics, according to the presence of social risk factors*, England, 2016

Clinical characteristics	Drug misuse		Alcohol misuse		Homeless		Prison		At least 1 SRF		2 or more SRF		No SRF	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Previous TB diagnosis	19	9.0	17	9.7	25	12.8	20	10.5	52	10.2	19	10.9	264	6.3
Pulmonary with or without EP	180	82.6	152	81.3	157	77.7	164	82.0	414	77.5	158	85.4	2,122	49.5
On DOT	130	62.2	125	71.0	114	58.8	100	53.8	260	52.1	132	73.7	380	9.1
Time from symptom onset to treatment start														
0-2 months treatment delay	70	34.7	73	41.2	63	33.7	64	33.7	178	35.9	59	33.7	1,292	32.5
2-4 months treatment delay	57	28.2	54	30.5	59	31.6	53	27.9	152	30.6	50	28.6	1,210	30.4
>4 months treatment delay	75	37.1	50	28.2	65	34.8	73	38.4	166	33.5	66	37.7	1,475	37.1
Drug resistance														
INH-R without MDR-TB	13	7.7	8	5.3	10	6.3	13	8.3	26	6.4	10	6.6	141	5.4
MDR/RR-TB	6	3.6	6	4.0	6	3.8	7	4.5	11	2.7	8	5.3	38	1.4

* Includes those aged 15 years and older
EP - extra-pulmonary

Table Ai.7.5: TB case notifications and rates by deprivation decile*, England, 2016

Deprivation decile*	Number of cases	Rate per 100,000 (95% CI)
1	1,181	21.5 (20.3 - 22.8)
2	1,024	18.3 (17.2 - 19.4)
3	878	15.5 (14.5 - 16.6)
4	729	13.0 (12.1 - 14.0)
5	521	9.5 (8.7 - 10.3)
6	371	6.7 (6.1 - 7.5)
7	309	5.7 (5.1 - 6.4)
8	245	4.5 (4.0 - 5.1)
9	216	4.0 (3.5 - 4.6)
10	179	3.4 (2.9 - 4.0)

CI - confidence interval
* 1=most deprived 10% of population, 10=least deprived 10% of population

Table Ai.8.1: Number and proportion of notified and un-notified TB cases matched to an HIV case*, England, 2001-2015

Year	Notified TB cases	Notified TB cases matched to HIV case		Un-notified TB cases with an isolate matched to HIV case	Total TB cases matched to HIV case**	
	n	n	%	n	n	%
2001	5,761	268	4.7	51	319	5.5
2002	6,289	433	6.9	30	463	7.3
2003	6,308	502	8.0	32	534	8.4
2004	6,527	513	7.9	23	536	8.2
2005	7,243	541	7.5	23	564	7.8
2006	7,320	528	7.2	21	549	7.5
2007	7,121	440	6.2	11	451	6.3
2008	7,358	441	6.0	23	464	6.3
2009	7,720	390	5.1	9	399	5.2
2010	7,321	351	4.8	6	357	4.9
2011	7,904	306	3.9	3	309	3.9
2012	7,687	266	3.5	3	269	3.5
2013	6,972	229	3.3	3	232	3.3
2014	6,209	200	3.2	2	202	3.3
2015	5,513	210	3.8	1	211	3.8
Total	**103,253**	**5,618**	**5.4**	**241**	**5,859**	**5.7**

* Includes TB and HIV co-infected cases aged 15 years and older
** Proportion is calculated using the number of notified TB cases with HIV co-infection plus the number of un-notified cases with an MTBC isolate which matched to an HIV case as the numerator, and the number of all notified TB cases (with or without HIV co-infection) plus the number of un-notified TB isolates which matched to an HIV case as the denominator

Table Ai.8.2: Number and proportion of notified and un-notified TB cases matched to an HIV case by PHE Centre, England*, 2001-2015

Year	PHE Centre**																	
	London		West Midlands		South East		North West		Yorkshire and the Humber		East of England		East Midlands		South West		North East	
	n	%[#]	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2001	210	8.5	4	0.6	14	2.3	28	6.6	20	6.2	16	3.3	14	2.9	3	1.4	8	4.9
2002	259	8.9	23	3.2	23	3.8	53	11.5	44	12.7	15	3.3	24	5.3	11	5.1	9	6.3
2003	273	9.3	34	4.7	26	4.7	72	13.4	47	14.9	34	6.6	22	5.1	16	8.0	8	5.9
2004	256	8.7	45	5.3	36	6.6	46	8.6	63	16.1	35	7.0	31	7.7	16	6.3	8	5.8
2005	278	8.6	43	4.9	45	6.3	61	10.7	42	9.4	38	7.4	38	7.5	11	4.2	6	4.8
2006	239	7.6	42	4.8	49	7.3	50	8.4	54	11.7	43	6.8	41	7.5	22	8.1	8	6.3
2007	186	6.1	32	3.7	42	6.1	53	8.9	41	10.7	33	5.6	34	6.6	15	5.7	15	8.0
2008	207	6.5	34	3.6	37	5.4	47	7.6	44	9.3	35	5.9	37	8.0	16	5.9	6	3.4
2009	165	5.1	37	3.9	37	4.9	47	6.8	40	8.1	28	4.3	20	4.0	15	5.2	8	5.1
2010	146	4.7	22	2.6	40	5.3	40	5.9	33	6.9	27	4.6	33	6.9	12	4.7	4	2.8
2011	127	3.8	35	3.6	21	2.8	30	3.9	32	5.9	26	4.3	24	5.0	12	4.0	2	1.5
2012	117	3.6	29	2.8	21	2.9	32	4.3	19	3.9	16	3.0	25	5.2	9	3.1	1	0.6
2013	105	3.7	34	3.6	18	2.6	21	3.2	22	5.1	13	2.4	9	2.3	8	2.6	2	1.5
2014	72	2.9	22	2.9	22	3.6	26	4.0	22	5.2	14	2.8	9	2.3	9	3.0	6	3.8
2015	93	4.2	20	3.0	21	3.9	17	2.9	13	3.5	16	3.9	13	3.8	12	4.3	6	4.9
Total	**2,733**	**6.2**	**456**	**3.6**	**452**	**4.6**	**623**	**7.1**	**536**	**8.6**	**389**	**4.7**	**374**	**5.3**	**187**	**4.8**	**97**	**4.4**

* Includes TB and HIV co-infected cases aged 15 years and older
** Ordered by decreasing total number of TB cases in 2016
[#] Proportion is calculated using the number of notified TB cases with HIV co-infection plus the number of un-notified cases with an MTBC isolate which matched to an HIV case as the numerator, and the number of all notified TB cases (with or without HIV co-infection) plus the number of un-notified TB isolates which matched to an HIV case as the denominator

Table Ai.8.3: Number and proportion of TB-HIV co-infected case notifications by age group, England, 2001-2015

Year	Age group (years)											
	15-24		25-34		35-44		45-54		55-64		65+	
	n	%	n	%	n	%	n	%	n	%	n	%
2001	22	8.2	116	43.4	89	33.3	23	8.6	13	4.9	4	1.5
2002	24	5.5	201	46.4	151	34.9	45	10.4	11	2.5	1	0.2
2003	30	6.0	217	43.2	188	37.5	48	9.6	14	2.8	5	1.0
2004	39	7.6	207	40.4	189	36.8	64	12.5	11	2.1	3	0.6
2005	39	7.2	198	36.6	214	39.6	68	12.6	16	3.0	6	1.1
2006	27	5.1	185	35.0	223	42.2	67	12.7	17	3.2	9	1.7
2007	16	3.6	149	33.9	198	45.0	58	13.2	15	3.4	4	0.9
2008	14	3.2	142	32.2	184	41.7	78	17.7	19	4.3	4	0.9
2009	27	6.9	117	30.0	151	38.7	69	17.7	21	5.4	5	1.3
2010	20	5.7	84	23.9	144	41.0	75	21.4	21	6.0	7	2.0
2011	16	5.2	73	23.9	109	35.6	63	20.6	31	10.1	14	4.6
2012	8	3.0	66	24.8	116	43.6	48	18.0	23	8.6	5	1.9
2013	12	5.2	39	17.0	90	39.3	69	30.1	13	5.7	6	2.6
2014	12	6.0	31	15.5	78	39.0	57	28.5	19	9.5	3	1.5
2015	8	3.8	45	21.4	81	38.6	53	25.2	15	7.1	8	3.8
Total	**314**	**5.5**	**1,870**	**31.2**	**2,205**	**39.1**	**885**	**17.2**	**259**	**5.2**	**84**	**1.7**

Table Ai.8.4: HIV testing in notified TB cases by PHE Centre, England, 2016

PHE Centre**	HIV testing*								
	Not offered		Offered and received		Offered but not received		Offered but declined		Total*
	n	%	n	%	n	%	n	%	n
London	23	1.1	2,029	96.8	31	1.5	13	0.6	2,096
West Midlands	25	4.1	563	93.1	12	2.0	5	0.8	605
North West	27	4.9	513	93.8	3	0.5	4	0.7	547
South East	16	3.2	465	92.4	22	4.4	0	0.0	503
East of England	24	6.5	290	79.0	51	13.9	2	0.5	367
Yorkshire and the Humber	8	2.3	323	94.7	8	2.3	2	0.6	341
East Midlands	25	8.3	269	89.4	5	1.7	2	0.7	301
South West	12	6.2	174	90.2	4	2.1	3	1.6	193
North East	12	11.3	90	84.9	3	2.8	1	0.9	106
England	**172**	**3.4**	**4,716**	**93.2**	**139**	**2.7**	**32**	**0.6**	**5,059**

* Total with previously unknown HIV status where HIV testing is known and excluding those diagnosed post-mortem
** Ordered by decreasing total number of TB cases in 2016

Table Ai.9.1: Proportion of BCG coverage by financial year and quarter for nine London upper-tier local authorities with TB incidence ≥40 per 100,000, 2015-2017

Upper-tier local authority	Financial year	Quarter	Quarterly BCG coverage (%)	Financial year BCG coverage (%)
Newham	2015-2016	Q1	95.6	91.2
	2015-2016	Q2	93.7	91.2
	2015-2016	Q3	93.0	91.2
	2015-2016	Q4	88.1	91.2
	2016-2017	Q1	92.6	85.4
	2016-2017	Q2	88.8	85.4
	2016-2017	Q3	86.6	85.4
	2016-2017	Q4	78.7	85.4
Brent	2015-2016	Q1	33.2	32.3
	2015-2016	Q2	33.6	32.3
	2015-2016	Q3	31.2	32.3
	2015-2016	Q4	28.9	32.3
	2016-2017	Q1	22.3	23.8
	2016-2017	Q2	16.0	23.8
	2016-2017	Q3	24.5	23.8
	2016-2017	Q4	29.6	23.8
Ealing	2015-2016	Q1	57.8	59.3
	2015-2016	Q2	58.4	59.3
	2015-2016	Q3	57.0	59.3
	2015-2016	Q4	64.3	59.3
	2016-2017	Q1	57.6	46.2
	2016-2017	Q2	50.8	46.2
	2016-2017	Q3	40.9	46.2
	2016-2017	Q4	35.1	46.2
Hounslow	2015-2016	Q1	-	87.4
	2015-2016	Q2	91.5	87.4
	2015-2016	Q3	87.7	87.4
	2015-2016	Q4	85.6	87.4
	2016-2017	Q1	62.2	58.0
	2016-2017	Q2	54.3	58.0
	2016-2017	Q3	55.4	58.0
	2016-2017	Q4	61.7	58.0
Harrow	2015-2016	Q1	43.6	40.1
	2015-2016	Q2	40.0	40.1
	2015-2016	Q3	37.7	40.1
	2015-2016	Q4	37.0	40.1
	2016-2017	Q1	27.2	25.7
	2016-2017	Q2	16.8	25.7
	2016-2017	Q3	26.1	25.7
	2016-2017	Q4	29.8	25.7

Upper-tier local authority	Financial year	Quarter	Quarterly BCG coverage (%)	Financial year BCG coverage (%)
Redbridge	2015-2016	Q1	-	81.7
	2015-2016	Q2	78.0	81.7
	2015-2016	Q3	79.2	81.7
	2015-2016	Q4	73.4	81.7
	2016-2017	Q1	52.2	29.9
	2016-2017	Q2	36.6	29.9
	2016-2017	Q3	14.7	29.9
	2016-2017	Q4	10.6	29.9
Greenwich	2015-2016	Q1	79.9	67.5
	2015-2016	Q2	81.7	67.5
	2015-2016	Q3	82.0	67.5
	2015-2016	Q4	81.5	67.5
	2016-2017	Q1	81.0	82.1
	2016-2017	Q2	73.7	82.1
	2016-2017	Q3	68.5	82.1
	2016-2017	Q4	50.5	82.1
Hillingdon	2015-2016	Q1	77.0	73.2
	2015-2016	Q2	71.1	73.2
	2015-2016	Q3	76.0	73.2
	2015-2016	Q4	70.3	73.2
	2016-2017	Q1	67.6	49.5
	2016-2017	Q2	58.6	49.5
	2016-2017	Q3	52.8	49.5
	2016-2017	Q4	19.4	49.5
Waltham Forrest	2015-2016	Q1	1.6	87.4
	2015-2016	Q2	81.2	87.4
	2015-2016	Q3	88.3	87.4
	2015-2016	Q4	80.4	87.4
	2016-2017	Q1	71.7	33.1
	2016-2017	Q2	40.5	33.1
	2016-2017	Q3	9.1	33.1
	2016-2017	Q4	7.9	33.1

Table Ai.10.1: Availability of data by source and CCG for latent TB testing, July 2014 - June 2017

NHS Clinical commissioning group (CCG)	Testing	Treatment	Laboratory
NHS Barking and Dagenham CCG			
NHS Barnet CCG	✓		
NHS Bedfordshire CCG			✓
NHS Birmingham Crosscity CCG	✓	✓	✓
NHS Birmingham South and Central CCG	✓	✓	✓
NHS Blackburn with Darwen CCG		✓	
NHS Bolton CCG			
NHS Bradford City CCG	✓	✓	✓
NHS Bradford Districts CCG	✓	✓	✓
NHS Brent CCG	✓		✓
NHS Bristol CCG			✓
NHS Cambridgeshire and Peterborough CCG			✓
NHS Camden CCG			
NHS Central London (Westminster) CCG		✓	✓
NHS City and Hackney CCG			✓
NHS Coventry & Rugby CCG		✓	✓
NHS Crawley CCG			✓
NHS Croydon CCG		✓	✓
NHS Ealing CCG		✓	✓
NHS East Lancashire CCG		✓	
NHS Enfield CCG			
Find & Treat*			
NHS Greater Huddersfield CCG	✓	✓	✓
NHS Greenwich CCG	✓	✓	✓
NHS Hammersmith and Fulham CCG			✓
NHS Haringey CCG			
NHS Harrow CCG	✓		✓
NHS Herts Valleys CCG			✓
NHS Hillingdon CCG	✓	✓	✓
NHS Hounslow CCG			✓
NHS Islington CCG			
NHS Lambeth CCG			✓
NHS Leeds South and East CCG			✓
NHS Leicester City CCG			✓
NHS Lewisham CCG	✓		✓
NHS Liverpool CCG	✓		
NHS Luton CCG			✓
NHS Merton CCG			✓
NHS Milton Keynes CCG			✓
NHS Nene CCG			
NHS Newham CCG	✓	✓	✓

NHS Clinical commissioning group (CCG)	Testing	Treatment	Laboratory
NHS North and Central Manchester CCG		✓	✓
NHS North Kirklees CCG		✓	✓
NHS Nottingham City CCG		✓	✓
NHS Oldham CCG			
NHS Oxfordshire CCG			
NHS Redbridge CCG			✓
NHS Sandwell and West Birmingham CCG	✓	✓	✓
NHS Sheffield CCG	✓	✓	✓
NHS Slough CCG		✓	✓
NHS South Reading CCG		✓	✓
NHS Southampton CCG		✓	✓
NHS Southern Derbyshire CCG			✓
NHS Southwark CCG			✓
NHS Stoke on Trent CCG	✓	✓	✓
NHS Tower Hamlets CCG			✓
NHS Walsall CCG			✓
NHS Waltham Forest CCG			✓
NHS Wandsworth CCG			✓
NHS West London CCG			✓
NHS Wolverhampton CCG			✓

* Funded as part of the LTBI testing and treating programme but not a CCG

Table Ai.10.2: Number of individuals tested for LTBI by CCG and year, July 2014-June 2017

NHS clinical commissioning group (CCG)	2014	2015	2016	2017 (to June)	Total*
NHS Bedfordshire CCG	0	0	5	10	15
NHS Birmingham Crosscity CCG	0	0	364	276	640
NHS Birmingham South and Central CCG	0	0	911	453	1,364
NHS Blackburn and Darwen CCG	0	1	417	125	543
NHS Bradford City and Bradford Districts CCG	0	0	579	374	953
NHS Brent CCG	0	0	591	413	1,004
NHS Bristol CCG	0	0	102	51	153
NHS Cambridgeshire and Peterborough CCG	0	0	314	83	397
NHS Central London(Westminster) CCG	0	0	2	1	3
NHS City And Hackney CCG	0	0	0	5	5
NHS Coventry And Rugby CCG	0	0	79	158	237
NHS Crawley CCG	0	0	68	28	96
NHS Croydon CCG	0	0	16	39	55
NHS Ealing CCG	0	0	162	215	377
NHS Greater Huddersfield CCG	0	0	312	134	446
NHS Greenwich CCG	2	31	80	322	435
NHS Hammersmith and Fulham CCG	0	0	1	7	8
NHS Harrow CCG	0	0	122	94	216
NHS Herts Valleys CCG	0	0	6	32	38
NHS Hillingdon CCG	0	0	119	34	153
NHS Hounslow CCG	0	0	67	125	192
NHS Lambeth CCG	0	0	0	13	13
NHS Leeds South And East CCG	0	0	35	159	194
NHS Leicester City CCG	0	0	433	413	846
NHS Lewisham CCG	0	0	8	21	29
NHS Luton CCG	0	0	125	29	154
NHS Merton CCG	0	0	14	37	51
NHS Milton Keynes CCG	0	0	49	17	66
NHS Newham CCG	2,209	3,136	2,143	1,242	8,730
NHS North Kirklees CCG	0	0	158	86	244
NHS North Manchester CCG and Central Manchester CCG	0	0	273	103	376
NHS Nottingham City CCG	0	0	225	5	230
NHS Redbridge CCG	0	0	2	0	2
NHS Richmond CCG	0	0	0	1	1
NHS Sandwell and West Birmingham CCG	0	0	530	272	802

NHS clinical commissioning group (CCG)	2014	2015	2016	2017 (to June)	Total*
NHS Sheffield CCG	0	0	373	116	489
NHS Slough CCG	0	0	0	65	65
NHS South Reading CCG	0	0	12	6	18
NHS Southampton CCG	0	0	233	261	494
NHS Southern Derbyshire CCG	0	0	34	13	47
NHS Southwark CCG	0	0	0	3	3
NHS Stoke-on-Trent CCG	0	0	155	49	204
NHS Tower Hamlets CCG	0	0	0	3	3
NHS Walsall CCG	0	0	1	0	1
NHS Waltham Forest CCG	0	0	0	14	14
NHS Wandsworth CCG	0	0	90	83	173
NHS West London CCG	0	0	6	7	13
NHS Wolverhampton CCG	0	0	122	35	157
Unknown	0	0	15	15	30
Total	**2,211**	**3,168**	**9,353**	**6,047**	**20,779**

*Data with unknown test year were excluded

Table Ai.10.3: Number and proportion of latent TB tests by country of birth, July 2014-June 2017

Country of birth	Number	Proportion (%)
Afghanistan	281	4.12
Africa	8	0.12
Algeria	1	0.01
Angola	17	0.25
Asian	1	0.01
Azerbaijan	1	0.01
Bangladesh	1,262	18.45
Bhutan	2	0.03
Botswana	2	0.03
Brunei	1	0.01
Burkina Faso	1	0.01
Burma	15	0.22
Cambodia	2	0.03
Cameroon	20	0.29
Cape Verde	2	0.03
Central African Republic	2	0.03
China	1	0.01
Congo	19	0.28
Democratic Republic Of Congo	3	0.04
Djibouti	1	0.01
East Timor	111	1.63
Equatorial Guinea	3	0.04
Eritrea	142	2.08
Ethiopia	39	0.57
Gambia	13	0.19
Guyana	1	0.01
Ghana	112	1.64
Guinea	39	0.57
Hong Kong	3	0.04
India	1,653	24.21
Israel	2	0.03
Ivory Coast	3	0.04
Jamaica	1	0.01
Kenya	31	0.45
Lesotho	1	0.01
Liberia	5	0.07
Macau	1	0.01
Madagascar	1	0.01
Malawi	3	0.04
Total	**6,828**	**100.0**

Country of birth	Number	Proportion (%)
Malaysia	1	0.01
Mali	1	0.01
Mauritania	2	0.03
Mauritius	23	0.34
Moldova	63	0.92
Mongolia	4	0.06
Morocco	2	0.03
Mozambique	4	0.06
Myanmar	4	0.06
Nepal	118	1.73
Niger	13	0.19
Nigeria	306	4.48
Pakistan	1,972	28.88
Palestine	1	0.01
Peru	8	0.12
Philippines	44	0.64
Russia	2	0.03
Rwanda	6	0.09
Sao Tome And Principe	13	0.19
Senegal	11	0.16
Sierra Leone	17	0.25
Somali	95	1.39
South Africa	23	0.34
Sri Lanka	5	0.07
Sudan	118	1.73
Swaziland	1	0.01
Tanzania	18	0.26
Thailand	2	0.03
Tibet	1	0.01
Togo	2	0.03
Tunisia	1	0.01
Uganda	36	0.53
UK	1	0.01
Venezuela	1	0.01
Vietnam	78	1.14
Zambia	8	0.12
Zimbabwe	17	0.25
Total	**6,828**	**100.0**

Table Ai.10.4: Number and proportion of latent TB tests by ethnicity, July 2014 to June 2017

Ethnicity	Number	Proportion (%)
Indian	1,428	26.7
Pakistani	1,314	24.6
Bangladeshi	1,176	22.0
Black-African	862	16.1
Mixed/Other	462	8.6
White	51	1.0
Chinese	18	0.3
Black-other	12	0.2
Black-Caribbean	2	0.0
Total	**5,352**	**100.0**

Table Ai.10.5: Number and percentage of patients that tested positive for LTBI by CCG, July 2014-June 2017

NHS clinical commissioning group (CCG)	LTBI positive		Total tested
	n	%	
NHS Bedfordshire CCG	2	20.0	10
NHS Birmingham Crosscity CCG	76	12.8	594
NHS Birmingham South and Central CCG	219	16.6	1,319
NHS Blackburn and Darwen CCG	142	21.8	651
NHS Bradford City and Bradford Districts CCG	157	16.6	946
NHS Brent CCG	196	20.0	979
NHS Bristol CCG	27	17.8	152
NHS Cambridgeshire and Peterborough CCG	65	16.7	389
NHS Central London(Westminster) CCG	0	0.0	2
NHS City and Hackney CCG	0	0.0	4
NHS Coventry and Rugby CCG	47	20.0	235
NHS Crawley CCG	14	14.6	96
NHS Croydon CCG	8	14.8	54
NHS Ealing CCG	75	20.6	364
NHS Greater Huddersfield CCG	71	16.0	443
NHS Greenwich CCG	92	21.6	426
NHS Hammersmith and Fulham CCG	1	16.7	6
NHS Harrow CCG	47	23.0	204
NHS Herts Valleys CCG	6	15.8	38
NHS Hillingdon CCG	22	17.2	128
NHS Hounslow CCG	38	21.3	178
NHS Lambeth CCG	5	45.5	11
NHS Leeds South And East CCG	43	22.2	194
NHS Leicester City CCG	119	14.1	846
NHS Lewisham CCG	3	10.3	29
NHS Luton CCG	22	14.3	154
NHS Merton CCG	11	20.8	53
NHS Milton Keynes CCG	13	20.0	65
NHS Newham CCG	2,051	23.5	8,730
NHS North Kirklees CCG	27	11.1	244
NHS North Manchester CCG and Central Manchester CCG	62	16.5	376
NHS Nottingham City CCG	25	10.9	230
NHS Redbridge CCG	0	0.0	1
NHS Richmond CCG	0	0.0	1
NHS Sandwell and West Birmingham CCG	172	22.3	770
NHS Sheffield CCG	75	15.8	475
NHS Slough CCG	12	18.5	65
NHS South Reading CCG	3	16.7	18
NHS Southampton CCG	79	16.0	494
NHS Southern Derbyshire CCG	6	12.8	47
NHS Southwark CCG	0	0.0	2
NHS Stoke-on-Trent CCG	37	18.1	204

NHS clinical commissioning group (CCG)	LTBI positive		Total tested
	n	%	
NHS Tower Hamlets CCG	1	33.3	3
NHS Walsall CCG	0	0.0	1
NHS Waltham Forest CCG	0	0.0	13
NHS Wandsworth CCG	28	18.2	154
NHS West London CCG	5	38.5	13
NHS Wolverhampton CCG	44	29.1	151
Unknown	2	6.7	30
Total	**4,150**	**20.2**	**20,592**

Table Ai.11.1: Number and rate of TB cases detected in high incidence countries through the UK pre-entry screening programme, 2006-2016

Year	Number of cases	Rate per 100,000 (95% CI)
2006	14	44.8 (24.5 - 75.2)
2007	53	54.3 (40.7 - 71.0)
2008	73	67.0 (52.5 - 84.2)
2009	117	88.4 (73.1 - 105.9)
2010	83	77.1 (61.4 - 95.6)
2011	83	86.4 (68.9 - 107.1)
2012	63	97.1 (74.6 - 124.3)
2013	118	136.1 (112.7 - 163.0)
2014	334	128.8 (115.4 - 143.4)
2015	382	149.2 (134.6 - 165.0)
2016	249	100.5 (88.4 - 113.8)

CI - confidence intervals

Table Ai.11.2: Number of pulmonary TB cases diagnosed by pre-entry screening* and identified within one year of UK entry**, 2007-2016

Year of screening/ entry to the UK	TB cases diagnosed by pre-entry screening	TB cases identified in the UK
2006	14	380
2007	53	357
2008	76	330
2009	121	370
2010	83	351
2011	84	339
2012	67	192
2013	134	151
2014	369	157
2015	382	174
2016**	249	57
2016#	317	98

*The number of pulmonary TB cases identified within one year of entry into the UK was from all 101 high incidence countries but the number of TB cases diagnosed by pre-entry screening were from an increasing number of countries as screening was rolled out; 5 pilot countries (2006), 15 pilot countries (2007 and 2012), 101 countries (by 2014)
** As of 10th June 2017, 759 sputum culture results are pending and the rate may increase when final results are available
# The predicted TB cases are based on the assumption that 10% of the pending sputum cultures will be positive while there will be 72% more TB cases detected in the UK for 2016 in 2017, as the proxy entry date is the 2 of July each year

Table A11.3: Drug susceptibility testing results of culture confirmed TB cases detected in high incidence* countries through UK pre-entry screening programme, 2007-2016

Drug susceptibility	Number of TB cases	Proportion (%)
Sensitive to all first line drugs	526	84.7
Resistant to a isoniazid	54	8.7
Resistant to two or more first-line drugs, without MDR-TB	20	3.2
MDR-TB	11	1.8
Resistant to one first-line drug, other than isoniazid and rifampicin	8	1.3
XDR-TB	1	0.2
RR-TB	1	0.2
Total	**621**	**100.0**

*Includes cases detected in IOM clinics only

Appendix II. Supplementary tables of local level data

Table Aii.1.1: Three-year average number of TB case notifications and rates by upper tier local authority and local authority district, England, 2014-2016

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
London		**2,345**	**27.1 (26.4-27.7)**
	Barking and Dagenham	58	28.7 (24.6-33.3)
	Barnet	74	19.5 (17.0-22.2)
	Bexley	22	9.1 (7.0-11.6)
	Brent	187	57.8 (53.1-62.7)
	Bromley	21	6.6 (5.1-8.4)
	Camden	43	18.0 (15.0-21.4)
	City of London	0	3.8 (0.1-21.2)
	Croydon	84	22.1 (19.4-25.0)
	Ealing	162	47.3 (43.2-51.7)
	Enfield	69	20.9 (18.2-24.0)
	Greenwich	83	30.2 (26.6-34.2)
	Hackney	68	25.4 (22.1-29.2)
	Hammersmith and Fulham	37	20.5 (16.8-24.7)
	Haringey	71	26.1 (22.7-29.9)
	Harrow	95	38.6 (34.2-43.3)
	Havering	24	9.8 (7.7-12.3)
	Hillingdon	102	34.4 (30.6-38.5)
	Hounslow	128	47.5 (42.9-52.6)
	Islington	49	21.6 (18.2-25.3)
	Kensington and Chelsea	26	16.4 (12.9-20.4)
	Kingston upon Thames	19	11.2 (8.5-14.4)
	Lambeth	65	20.1 (17.4-23.1)
	Lewisham	65	21.9 (18.9-25.2)
	Merton	48	23.5 (19.8-27.7)
	Newham	230	69.0 (64.0-74.4)
	Redbridge	123	41.5 (37.4-46.0)
	Richmond upon Thames	11	5.5 (3.7-7.7)
	Southwark	78	25.3 (22.2-28.8)
	Sutton	24	11.8 (9.2-14.9)
	Tower Hamlets	89	30.1 (26.6-33.9)
	Waltham Forest	90	33.0 (29.2-37.2)
	Wandsworth	54	17.1 (14.5-19.9)
	Westminster	44	18.1 (15.1-21.5)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
West Midlands		**732**	**12.7 (12.2-13.3)**
	Birmingham	279	25.1 (23.4-26.9)
	Coventry	89	25.8 (22.8-29.1)
	Dudley	25	7.9 (6.2-9.9)
	Herefordshire, County of	3	1.6 (0.7-3.0)
	Sandwell	87	27.3 (24.1-30.8)
	Shropshire	9	2.8 (1.8-4.1)
	Solihull	14	6.5 (4.7-8.8)
	Staffordshire	35	4.1 (3.3-4.9)
	Cannock Chase	2	1.7 (0.5-3.9)
	East Staffordshire	8	6.9 (4.4-10.2)
	Lichfield	5	4.5 (2.5-7.6)
	Newcastle-under-Lyme	7	5.2 (3.2-8.1)
	South Staffordshire	3	3.0 (1.4-5.5)
	Stafford	7	5.0 (3.1-7.7)
	Staffordshire Moorlands	3	2.7 (1.2-5.4)
	Tamworth	1	1.7 (0.5-4.4)
	Stoke-on-Trent	30	11.8 (9.5-14.5)
	Telford and Wrekin	6	3.7 (2.2-5.8)
	Walsall	38	13.9 (11.5-16.7)
	Warwickshire	36	6.4 (5.3-7.8)
	North Warwickshire	2	2.7 (0.9-6.2)
	Nuneaton and Bedworth	12	9.5 (6.6-13.1)
	Rugby	8	7.4 (4.7-11.1)
	Stratford-on-Avon	2	1.9 (0.8-4.0)
	Warwick	12	8.6 (6.0-11.9)
	Wolverhampton	60	23.6 (20.2-27.3)
	Worcestershire	21	3.6 (2.8-4.6)
	Bromsgrove	3	3.1 (1.4-5.9)
	Malvern Hills	2	2.2 (0.7-5.1)
	Redditch	6	6.7 (3.9-10.7)
	Worcester	6	5.9 (3.5-9.3)
	Wychavon	3	2.2 (0.9-4.3)
	Wyre Forest	2	2.0 (0.7-4.4)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
North West		**603**	**8.4 (8.0-8.8)**
	Blackburn with Darwen	36	24.3 (19.9-29.3)
	Blackpool	14	10.3 (7.4-13.8)
	Bolton	50	17.6 (14.9-20.7)
	Bury	18	9.4 (7.0-12.3)
	Cheshire East	16	4.2 (3.1-5.5)
	Cheshire West and Chester	10	3.0 (2.0-4.3)
	Cumbria	10	2.1 (1.4-2.9)
	Allerdale	3	3.1 (1.4-5.9)
	Barrow-in-Furness	2	2.5 (0.8-5.8)
	Carlisle	2	1.5 (0.5-3.6)
	Copeland	1	1.0 (0.1-3.5)
	Eden	0	0.6 (0.0-3.5)
	South Lakeland	3	2.9 (1.3-5.5)
	Halton	2	1.8 (0.7-3.8)
	Knowsley	2	1.6 (0.6-3.3)
	Lancashire	65	5.5 (4.7-6.3)
	Burnley	4	4.2 (2.1-7.5)
	Chorley	3	3.0 (1.4-5.4)
	Fylde	1	1.7 (0.5-4.4)
	Hyndburn	6	7.9 (4.7-12.3)
	Lancaster	5	3.3 (1.8-5.5)
	Pendle	13	14.8 (10.6-20.1)
	Preston	21	14.9 (11.4-19.0)
	Ribble Valley	1	2.3 (0.6-5.8)
	Rossendale	3	4.8 (2.3-8.8)
	South Ribble	4	3.3 (1.7-6.0)
	West Lancashire	2	1.5 (0.5-3.5)
	Wyre	1	1.2 (0.3-3.1)
	Liverpool	37	7.7 (6.4-9.3)
	Manchester	131	24.7 (22.3-27.3)
	Oldham	50	21.5 (18.2-25.3)
	Rochdale	32	14.9 (12.1-18.2)
	Salford	29	12.0 (9.6-14.7)
	Sefton	8	2.8 (1.8-4.2)
	St. Helens	3	1.7 (0.8-3.2)
	Stockport	15	5.3 (3.9-7.1)
	Tameside	19	8.7 (6.6-11.3)
	Trafford	24	10.4 (8.2-13.1)
	Warrington	9	4.2 (2.7-6.1)
	Wigan	13	4.1 (3.0-5.6)
	Wirral	10	3.0 (2.0-4.3)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
South East		**608**	**7.0 (6.7-7.3)**
	Bracknell Forest	8	6.7 (4.3-10.0)
	Brighton and Hove	22	7.6 (5.9-9.7)
	Buckinghamshire	44	8.4 (7.0-9.9)
	Aylesbury Vale	12	6.2 (4.3-8.6)
	Chiltern	6	6.7 (4.0-10.5)
	South Bucks	7	9.6 (5.9-14.9)
	Wycombe	20	11.2 (8.5-14.4)
	East Sussex	23	4.2 (3.3-5.4)
	Eastbourne	7	6.5 (4.0-10.1)
	Hastings	7	8.0 (5.0-12.1)
	Lewes	3	3.0 (1.4-5.7)
	Rother	3	3.6 (1.7-6.6)
	Wealden	3	1.7 (0.7-3.4)
	Hampshire	54	4.0 (3.4-4.6)
	Basingstoke and Deane	12	6.9 (4.8-9.6)
	East Hampshire	2	1.7 (0.6-3.7)
	Eastleigh	3	2.1 (0.9-4.1)
	Fareham	2	2.0 (0.8-4.2)
	Gosport	1	0.8 (0.1-2.8)
	Hart	2	2.1 (0.8-4.6)
	Havant	3	2.4 (1.1-4.6)
	New Forest	3	1.9 (0.9-3.4)
	Rushmoor	20	20.6 (15.7-26.5)
	Test Valley	3	2.8 (1.3-5.1)
	Winchester	3	2.2 (1.0-4.4)
	Isle of Wight	2	1.7 (0.7-3.4)
	Kent	95	6.2 (5.5-7.0)
	Ashford	13	10.7 (7.6-14.6)
	Canterbury	9	5.4 (3.5-7.9)
	Dartford	9	8.3 (5.4-12.2)
	Dover	3	2.3 (1.0-4.6)
	Gravesham	18	17.0 (12.7-22.1)
	Maidstone	12	7.1 (4.9-9.9)
	Sevenoaks	4	3.4 (1.7-5.9)
	Shepway	5	4.5 (2.5-7.5)
	Swale	5	3.3 (1.8-5.5)
	Thanet	10	6.9 (4.6-9.9)
	Tonbridge and Malling	4	2.9 (1.5-5.2)
	Tunbridge Wells	5	4.6 (2.6-7.4)
	Medway	14	5.1 (3.7-6.8)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
South East ***continued***	**Oxfordshire**	54	8.0 (6.8-9.3)
	Cherwell	14	9.9 (7.1-13.3)
	Oxford	28	17.3 (13.8-21.5)
	South Oxfordshire	4	2.7 (1.3-4.8)
	Vale of White Horse	4	3.2 (1.6-5.5)
	West Oxfordshire	5	4.3 (2.4-7.2)
	Portsmouth	13	6.1 (4.4-8.4)
	Reading	43	26.4 (22.0-31.4)
	Slough	61	41.8 (36.0-48.3)
	Southampton	29	11.5 (9.2-14.2)
	Surrey	69	5.9 (5.1-6.7)
	Elmbridge	5	4.0 (2.3-6.5)
	Epsom and Ewell	6	8.0 (4.8-12.5)
	Guildford	7	5.0 (3.2-7.6)
	Mole Valley	2	2.3 (0.9-5.1)
	Reigate and Banstead	11	7.9 (5.4-11.0)
	Runnymede	6	6.6 (3.9-10.6)
	Spelthorne	8	8.1 (5.2-12.1)
	Surrey Heath	5	6.1 (3.5-9.8)
	Tandridge	2	2.7 (1.1-5.6)
	Waverley	4	3.2 (1.7-5.7)
	Woking	11	11.1 (7.6-15.5)
	West Berkshire	6	3.8 (2.3-6.1)
	West Sussex	41	4.9 (4.1-5.9)
	Adur	0	0.0 (0.0-0.0)
	Arun	6	3.9 (2.3-6.1)
	Chichester	5	4.6 (2.6-7.4)
	Crawley	18	16.6 (12.5-21.6)
	Horsham	3	2.0 (0.8-3.9)
	Mid Sussex	4	2.7 (1.4-4.8)
	Worthing	5	4.6 (2.6-7.7)
	Windsor and Maidenhead	13	8.6 (6.1-11.7)
	Wokingham	17	10.8 (8.1-14.2)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
East of England		**420**	**6.6 (6.3-7.0)**
	Bedford	20	12.0 (9.2-15.5)
	Cambridgeshire	36	5.6 (4.6-6.8)
	Cambridge	13	10.0 (7.1-13.6)
	East Cambridgeshire	3	3.1 (1.3-6.0)
	Fenland	5	5.4 (3.1-8.7)
	Huntingdonshire	8	4.6 (2.9-6.8)
	South Cambridgeshire	7	4.7 (3.0-7.2)
	Central Bedfordshire	7	2.4 (1.5-3.8)
	Essex	60	4.2 (3.6-4.8)
	Basildon	14	7.7 (5.5-10.4)
	Braintree	3	2.0 (0.9-3.8)
	Brentwood	6	7.5 (4.3-11.9)
	Castle Point	2	2.6 (1.1-5.4)
	Chelmsford	6	3.5 (2.1-5.5)
	Colchester	7	3.6 (2.2-5.6)
	Epping Forest	5	4.1 (2.4-6.7)
	Harlow	8	9.0 (5.7-13.5)
	Maldon	2	2.6 (0.9-6.2)
	Rochford	2	2.0 (0.6-4.6)
	Tendring	3	2.4 (1.1-4.3)
	Uttlesford	3	3.5 (1.6-6.7)
	Hertfordshire	87	7.4 (6.6-8.4)
	Broxbourne	7	6.9 (4.2-10.7)
	Dacorum	6	4.2 (2.5-6.5)
	East Hertfordshire	6	4.4 (2.6-6.8)
	Hertsmere	11	11.0 (7.6-15.4)
	North Hertfordshire	7	5.3 (3.3-8.1)
	St Albans	7	4.8 (3.0-7.3)
	Stevenage	8	9.2 (5.9-13.8)
	Three Rivers	6	6.6 (3.9-10.4)
	Watford	17	17.7 (13.2-23.2)
	Welwyn Hatfield	11	9.2 (6.4-13.0)
	Luton	62	29.0 (24.9-33.4)
	Milton Keynes	24	9.0 (7.1-11.4)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
East of England *continued*	**Norfolk**	37	4.1 (3.4-5.0)
	Breckland	3	2.0 (0.8-3.9)
	Broadland	1	0.5 (0.1-1.9)
	Great Yarmouth	12	11.8 (8.2-16.4)
	King's Lynn and West Norfolk	7	4.6 (2.9-7.1)
	North Norfolk	1	1.0 (0.2-2.8)
	Norwich	11	7.9 (5.4-11.1)
	South Norfolk	3	2.0 (0.9-4.0)
	Peterborough	38	19.8 (16.3-23.7)
	Southend-on-Sea	11	6.0 (4.1-8.4)
	Suffolk	30	4.0 (3.3-5.0)
	Babergh	2	2.6 (1.1-5.4)
	Forest Heath	2	3.7 (1.5-7.6)
	Ipswich	10	7.6 (5.2-10.8)
	Mid Suffolk	3	3.0 (1.4-5.7)
	St Edmundsbury	6	5.0 (2.9-8.1)
	Suffolk Coastal	2	1.6 (0.6-3.5)
	Waveney	4	3.7 (2.0-6.4)
	Thurrock	9	5.4 (3.6-7.9)
Yorkshire and the Humber		**459**	**8.5 (8.1-9.0)**
	Barnsley	10	4.0 (2.7-5.8)
	Bradford	96	18.1 (16.0-20.3)
	Calderdale	16	7.8 (5.8-10.4)
	Doncaster	20	6.6 (5.0-8.4)
	East Riding of Yorkshire	6	1.9 (1.1-2.9)
	Kingston upon Hull, City of	16	6.2 (4.6-8.2)
	Kirklees	72	16.6 (14.4-19.0)
	Leeds	89	11.5 (10.2-13.0)
	North East Lincolnshire	7	4.2 (2.6-6.5)
	North Lincolnshire	7	4.3 (2.7-6.5)
	North Yorkshire	14	2.4 (1.7-3.2)
	Craven	2	3.0 (1.0-7.0)
	Hambleton	2	1.8 (0.6-4.3)
	Harrogate	3	2.1 (1.0-3.9)
	Richmondshire	3	5.0 (2.2-9.9)
	Ryedale	1	1.3 (0.2-4.5)
	Scarborough	3	2.5 (1.1-4.9)
	Selby	2	1.9 (0.6-4.5)
	Rotherham	13	5.1 (3.7-7.0)
	Sheffield	73	12.8 (11.1-14.6)
	Wakefield	17	5.1 (3.8-6.7)
	York	3	1.3 (0.6-2.5)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
East Midlands		**366**	**7.8 (7.4-8.3)**
	Derby	33	13.1 (10.7-15.9)
	Derbyshire	18	2.3 (1.8-3.0)
	Amber Valley	4	3.0 (1.5-5.3)
	Bolsover	1	1.7 (0.5-4.4)
	Chesterfield	4	3.8 (2.0-6.7)
	Derbyshire Dales	1	1.4 (0.3-4.1)
	Erewash	3	2.9 (1.4-5.4)
	High Peak	2	2.2 (0.8-4.8)
	North East Derbyshire	1	1.3 (0.4-3.4)
	South Derbyshire	2	1.7 (0.5-3.9)
	Leicester	132	38.5 (34.8-42.5)
	Leicestershire	22	3.3 (2.6-4.2)
	Blaby	3	3.1 (1.4-5.9)
	Charnwood	6	3.2 (1.9-5.1)
	Harborough	3	3.7 (1.8-6.9)
	Hinckley and Bosworth	2	1.5 (0.5-3.6)
	Melton	0	0.0 (0.0-0.0)
	North West Leicestershire	3	2.7 (1.2-5.4)
	Oadby and Wigston	6	10.7 (6.4-17.0)
	Lincolnshire	34	4.6 (3.7-5.5)
	Boston	8	12.4 (8.1-18.4)
	East Lindsey	6	4.3 (2.6-6.9)
	Lincoln	4	4.1 (2.1-7.2)
	North Kesteven	3	2.4 (1.0-4.7)
	South Holland	4	4.0 (2.0-7.2)
	South Kesteven	7	4.8 (2.9-7.4)
	West Lindsey	2	2.5 (1.0-5.2)
	Northamptonshire	48	6.7 (5.6-7.9)
	Corby	4	6.0 (3.1-10.5)
	Daventry	2	2.5 (0.9-5.4)
	East Northamptonshire	3	3.7 (1.8-6.8)
	Kettering	3	3.1 (1.4-5.8)
	Northampton	27	12.1 (9.6-15.1)
	South Northamptonshire	2	2.6 (1.1-5.4)
	Wellingborough	7	8.6 (5.3-13.3)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
East Midlands *continued*	Nottingham	50	15.8 (13.3-18.5)
	Nottinghamshire	26	3.3 (2.6-4.1)
	Ashfield	6	4.9 (2.9-7.7)
	Bassetlaw	2	1.5 (0.5-3.4)
	Broxtowe	4	3.9 (2.1-6.6)
	Gedling	5	4.6 (2.6-7.5)
	Mansfield	4	3.4 (1.7-6.2)
	Newark and Sherwood	2	2.0 (0.8-4.1)
	Rushcliffe	3	2.6 (1.2-5.0)
	Rutland	1	3.5 (1.0-8.9)
South West		**280**	**5.1 (4.8-5.5)**
	Bath and North East Somerset	12	6.5 (4.5-9.0)
	Bournemouth	12	6.0 (4.2-8.3)
	Bristol, City of	81	18.1 (15.9-20.6)
	Cornwall	13	2.3 (1.6-3.2)
	Devon	27	3.5 (2.8-4.3)
	East Devon	2	1.7 (0.7-3.5)
	Exeter	5	4.2 (2.4-6.8)
	Mid Devon	2	2.5 (0.9-5.5)
	North Devon	3	3.2 (1.5-6.0)
	South Hams	3	3.2 (1.4-6.2)
	Teignbridge	9	7.0 (4.6-10.2)
	Torridge	1	1.5 (0.3-4.4)
	West Devon	2	3.1 (1.0-7.1)
	Dorset	9	2.2 (1.5-3.2)
	Christchurch	1	2.0 (0.4-5.9)
	East Dorset	2	2.3 (0.8-4.9)
	North Dorset	1	1.4 (0.3-4.1)
	Purbeck	1	2.2 (0.4-6.3)
	West Dorset	1	1.3 (0.4-3.4)
	Weymouth and Portland	3	4.6 (2.1-8.7)
	Gloucestershire	24	3.8 (3.0-4.8)
	Cheltenham	5	4.0 (2.2-6.7)
	Cotswold	1	1.2 (0.2-3.4)
	Forest of Dean	1	1.6 (0.4-4.0)
	Gloucester	9	7.3 (4.9-10.6)
	Stroud	4	3.2 (1.6-5.6)
	Tewkesbury	4	4.2 (2.1-7.5)
	Isles of Scilly	0	0.0 (0.0-0.0)
	North Somerset	8	3.8 (2.4-5.7)
	Plymouth	16	6.0 (4.4-7.9)
	Poole	5	3.5 (2.0-5.7)

PHE Centre*	Upper tier local authority and local authority district**	Average annual number of cases#	Average annual rate per 100,000 (95% CI)
South West ***continued***	**Somerset**	10	1.9 (1.3-2.7)
	Mendip	3	3.0 (1.4-5.5)
	Sedgemoor	2	1.7 (0.6-3.6)
	South Somerset	3	2.0 (1.0-3.7)
	Taunton Deane	2	1.5 (0.5-3.4)
	West Somerset	0	0.0 (0.0-0.0)
	South Gloucestershire	18	6.7 (5.0-8.7)
	Swindon	23	10.8 (8.4-13.6)
	Torbay	7	5.0 (3.1-7.7)
	Wiltshire	15	3.0 (2.2-4.1)
North East		**140**	**5.3 (4.8-5.9)**
	County Durham	9	1.8 (1.2-2.6)
	Darlington	6	5.7 (3.4-9.0)
	Gateshead	15	7.5 (5.4-10.0)
	Hartlepool	3	3.6 (1.7-6.6)
	Middlesbrough	14	9.8 (7.0-13.3)
	Newcastle upon Tyne	41	14.1 (11.7-16.8)
	North Tyneside	7	3.5 (2.1-5.3)
	Northumberland	8	2.4 (1.5-3.6)
	Redcar and Cleveland	4	3.0 (1.5-5.2)
	South Tyneside	9	5.8 (3.8-8.5)
	Stockton-on-Tees	11	5.5 (3.7-7.7)
	Sunderland	13	4.8 (3.4-6.5)

* Ordered by decreasing total number of cases in 2016

** Those highlighted in bold are upper tier local authority only, those indented are local authority district only, and those neither highlighted nor indented are both an upper tier local authority and a local authority district.

Average number of cases in a local authority district may not be the same as the sum of the average number of cases in the corresponding upper tier local authority due to rounding.

CI - confidence intervals

Table Aii.1.2: Three-year average number of TB case notifications and rates by clinical commissioning group (CCG), England, 2014-2016

Clinical commissioning group	Average annual number of cases	Average annual rate per 100,000 (95% CI)
NHS Airedale, Wharfedale and Craven CCG	8	5.0 (3.2-7.5)
NHS Ashford CCG	13	10.8 (7.7-14.7)
NHS Aylesbury Vale CCG	12	6.0 (4.2-8.3)
NHS Barking and Dagenham CCG	58	28.9 (24.8-33.5)
NHS Barnet CCG	74	19.6 (17.1-22.3)
NHS Barnsley CCG	10	4.0 (2.7-5.8)
NHS Basildon and Brentwood CCG	20	7.6 (5.8-9.9)
NHS Bassetlaw CCG	2	1.5 (0.5-3.4)
NHS Bath and North East Somerset CCG	12	6.5 (4.6-9.0)
NHS Bedfordshire CCG	27	6.1 (4.8-7.6)
NHS Bexley CCG	22	9.1 (7.0-11.6)
NHS Birmingham CrossCity CCG	144	19.5 (17.7-21.4)
NHS Birmingham South and Central CCG	46	22.9 (19.3-27.1)
NHS Blackburn with Darwen CCG	36	24.3 (19.9-29.4)
NHS Blackpool CCG	14	10.2 (7.4-13.8)
NHS Bolton CCG	50	17.7 (14.9-20.7)
NHS Bracknell and Ascot CCG	9	6.8 (4.5-9.9)
NHS Bradford City CCG	41	48.6 (40.4-58.1)
NHS Bradford Districts CCG	49	14.4 (12.2-17.0)
NHS Brent CCG	187	58.0 (53.3-63.0)
NHS Brighton and Hove CCG	22	7.6 (5.9-9.7)
NHS Bristol CCG	81	18.2 (16.0-20.6)
NHS Bromley CCG	21	6.6 (5.1-8.4)
NHS Bury CCG	18	9.4 (7.0-12.3)
NHS Calderdale CCG	16	7.9 (5.8-10.4)
NHS Cambridgeshire and Peterborough CCG	77	8.8 (7.7-10.0)
NHS Camden CCG	43	18.1 (15.1-21.5)
NHS Cannock Chase CCG	2	1.5 (0.5-3.2)
NHS Canterbury and Coastal CCG	10	4.7 (3.1-6.7)
NHS Castle Point and Rochford CCG	4	2.3 (1.2-4.0)
NHS Central London (Westminster) CCG	26	15.3 (12.1-19.1)
NHS Chiltern CCG	32	9.9 (8.0-12.1)
NHS Chorley and South Ribble CCG	6	3.3 (1.9-5.3)
NHS City and Hackney CCG	69	24.9 (21.6-28.6)
NHS Coastal West Sussex CCG	17	3.4 (2.6-4.5)
NHS Corby CCG	4	6.0 (3.1-10.5)
NHS Coventry and Rugby CCG	97	21.7 (19.3-24.3)
NHS Crawley CCG	18	16.6 (12.5-21.6)
NHS Croydon CCG	83	22.0 (19.3-24.9)

Clinical commissioning group	Average annual number of cases	Average annual rate per 100,000 (95% CI)
NHS Darlington CCG	6	5.7 (3.4-9.0)
NHS Dartford, Gravesham and Swanley CCG	28	10.9 (8.7-13.5)
NHS Doncaster CCG	20	6.6 (5.0-8.5)
NHS Dorset CCG	26	3.4 (2.7-4.3)
NHS Dudley CCG	25	7.9 (6.2-9.9)
NHS Durham Dales, Easington and Sedgefield CCG	4	1.3 (0.7-2.4)
NHS Ealing CCG	162	47.3 (43.2-51.7)
NHS East Lancashire CCG	28	7.4 (5.9-9.2)
NHS East Leicestershire and Rutland CCG	13	4.1 (2.9-5.6)
NHS East Riding of Yorkshire CCG	6	1.9 (1.1-3.0)
NHS East Staffordshire CCG	8	6.6 (4.3-9.8)
NHS East Surrey CCG	9	5.1 (3.4-7.4)
NHS East and North Hertfordshire CCG	38	6.8 (5.6-8.2)
NHS Eastbourne, Hailsham and Seaford CCG	8	4.4 (2.9-6.6)
NHS Eastern Cheshire CCG	10	4.9 (3.3-7.1)
NHS Enfield CCG	69	21.0 (18.2-24.1)
NHS Erewash CCG	3	3.5 (1.7-6.4)
NHS Fareham and Gosport CCG	3	1.5 (0.7-2.9)
NHS Fylde & Wyre CCG	2	1.2 (0.4-2.6)
NHS Gloucestershire CCG	24	3.8 (3.0-4.9)
NHS Great Yarmouth and Waveney CCG	16	7.5 (5.5-9.9)
NHS Greater Huddersfield CCG	35	14.5 (11.9-17.6)
NHS Greater Preston CCG	23	11.2 (8.7-14.2)
NHS Greenwich CCG	83	30.4 (26.8-34.5)
NHS Guildford and Waverley CCG	9	4.6 (3.0-6.6)
NHS Halton CCG	2	1.8 (0.7-3.8)
NHS Hambleton, Richmondshire and Whitby CCG	3	2.2 (1.1-4.0)
NHS Hammersmith and Fulham CCG	37	20.5 (16.8-24.7)
NHS Hardwick CCG	1	1.2 (0.3-3.1)
NHS Haringey CCG	71	26.3 (22.9-30.1)
NHS Harrogate and Rural District CCG	3	2.1 (1.0-3.9)
NHS Harrow CCG	95	38.6 (34.3-43.4)
NHS Hartlepool and Stockton-on-Tees CCG	14	4.9 (3.5-6.6)
NHS Hastings and Rother CCG	11	5.8 (4.0-8.2)
NHS Havering CCG	24	9.8 (7.7-12.3)
NHS Herefordshire CCG	3	1.6 (0.7-3.0)
NHS Herts Valleys CCG	48	8.1 (6.9-9.6)
NHS Heywood, Middleton and Rochdale CCG	32	15.0 (12.1-18.3)
NHS High Weald Lewes Havens CCG	4	2.3 (1.2-4.1)
NHS Hillingdon CCG	102	34.6 (30.8-38.7)
NHS Horsham and Mid Sussex CCG	6	2.6 (1.5-4.1)
NHS Hounslow CCG	128	47.7 (43.0-52.7)
NHS Hull CCG	16	6.2 (4.6-8.2)

Clinical commissioning group	Average annual number of cases	Average annual rate per 100,000 (95% CI)
NHS Ipswich and East Suffolk CCG	15	3.8 (2.7-5.0)
NHS Isle of Wight CCG	2	1.7 (0.7-3.5)
NHS Islington CCG	49	21.7 (18.4-25.5)
NHS Kernow CCG	13	2.3 (1.6-3.2)
NHS Kingston CCG	19	11.2 (8.5-14.5)
NHS Knowsley CCG	2	1.6 (0.6-3.3)
NHS Lambeth CCG	64	19.9 (17.1-22.9)
NHS Leeds North CCG	24	12.0 (9.4-15.1)
NHS Leeds South and East CCG	41	16.7 (13.9-19.9)
NHS Leeds West CCG	24	7.3 (5.7-9.2)
NHS Leicester City CCG	132	38.7 (35.0-42.7)
NHS Lewisham CCG	65	21.9 (18.9-25.2)
NHS Lincolnshire East CCG	15	6.5 (4.7-8.7)
NHS Lincolnshire West CCG	8	3.3 (2.1-4.9)
NHS Liverpool CCG	37	7.8 (6.4-9.3)
NHS Luton CCG	62	29.0 (25.0-33.5)
NHS Manchester CCG	131	24.9 (22.5-27.4)
NHS Mansfield and Ashfield CCG	7	3.7 (2.3-5.7)
NHS Medway CCG	14	5.1 (3.7-6.9)
NHS Merton CCG	48	23.5 (19.8-27.7)
NHS Mid Essex CCG	11	2.8 (1.9-3.9)
NHS Milton Keynes CCG	24	8.9 (6.9-11.2)
NHS Morecambe Bay CCG	10	3.0 (2.0-4.2)
NHS Nene CCG	43	6.7 (5.6-8.0)
NHS Newark & Sherwood CCG	2	2.0 (0.8-4.1)
NHS Newbury and District CCG	5	5.0 (2.9-8.2)
NHS Newcastle Gateshead CCG	56	11.4 (9.8-13.3)
NHS Newham CCG	229	69.5 (64.4-74.9)
NHS North & West Reading CCG	7	7.0 (4.3-10.7)
NHS North Cumbria CCG	6	1.8 (1.0-2.9)
NHS North Derbyshire CCG	8	2.8 (1.8-4.2)
NHS North Durham CCG	6	2.3 (1.3-3.7)
NHS North East Essex CCG	10	3.1 (2.1-4.4)
NHS North East Hampshire and Farnham CCG	23	11.0 (8.6-13.9)
NHS North East Lincolnshire CCG	7	4.2 (2.6-6.4)
NHS North Hampshire CCG	13	6.1 (4.3-8.2)
NHS North Kirklees CCG	37	19.3 (15.8-23.2)
NHS North Lincolnshire CCG	7	4.3 (2.7-6.5)
NHS North Norfolk CCG	1	0.8 (0.2-2.0)
NHS North Somerset CCG	8	3.8 (2.4-5.7)
NHS North Staffordshire CCG	9	4.0 (2.6-5.9)
NHS North Tyneside CCG	7	3.5 (2.1-5.3)
NHS North West Surrey CCG	27	7.9 (6.3-9.8)
NHS Northern, Eastern and Western Devon CCG	33	3.7 (3.0-4.5)

Clinical commissioning group	Average annual number of cases	Average annual rate per 100,000 (95% CI)
NHS Northumberland CCG	8	2.4 (1.5-3.6)
NHS Norwich CCG	11	5.3 (3.7-7.4)
NHS Nottingham City CCG	50	15.9 (13.4-18.6)
NHS Nottingham North and East CCG	8	5.1 (3.3-7.7)
NHS Nottingham West CCG	4	3.9 (2.1-6.6)
NHS Oldham CCG	50	21.6 (18.3-25.3)
NHS Oxfordshire CCG	54	8.2 (7.0-9.6)
NHS Portsmouth CCG	13	6.2 (4.4-8.4)
NHS Redbridge CCG	123	41.6 (37.5-46.1)
NHS Redditch and Bromsgrove CCG	9	4.8 (3.1-7.0)
NHS Richmond CCG	11	5.5 (3.8-7.7)
NHS Rotherham CCG	13	5.1 (3.7-7.0)
NHS Rushcliffe CCG	3	2.6 (1.2-5.0)
NHS Salford CCG	29	12.0 (9.6-14.8)
NHS Sandwell and West Birmingham CCG	176	36.2 (33.2-39.5)
NHS Scarborough and Ryedale CCG	3	2.4 (1.0-4.8)
NHS Sheffield CCG	73	12.8 (11.2-14.6)
NHS Shropshire CCG	9	2.8 (1.8-4.1)
NHS Slough CCG	61	42.0 (36.1-48.5)
NHS Solihull CCG	14	6.5 (4.7-8.8)
NHS Somerset CCG	10	1.9 (1.3-2.7)
NHS South Cheshire CCG	6	3.4 (2.0-5.3)
NHS South Devon and Torbay CCG	17	6.0 (4.4-7.9)
NHS South East Staffordshire and Seisdon Peninsula CCG	8	3.7 (2.4-5.5)
NHS South Eastern Hampshire CCG	4	1.9 (1.0-3.3)
NHS South Gloucestershire CCG	18	6.7 (5.0-8.7)
NHS South Kent Coast CCG	8	3.7 (2.4-5.6)
NHS South Lincolnshire CCG	6	3.9 (2.3-6.2)
NHS South Norfolk CCG	5	2.1 (1.1-3.5)
NHS South Reading CCG	36	32.8 (26.9-39.6)
NHS South Sefton CCG	5	2.9 (1.6-4.9)
NHS South Tees CCG	18	6.4 (4.8-8.4)
NHS South Tyneside CCG	9	5.8 (3.8-8.5)
NHS South Warwickshire CCG	14	5.5 (4.0-7.4)
NHS South West Lincolnshire CCG	5	4.3 (2.5-7.0)
NHS South Worcestershire CCG	10	3.5 (2.4-4.9)
NHS Southampton CCG	28	11.3 (9.0-14.0)
NHS Southend CCG	11	6.0 (4.1-8.4)
NHS Southern Derbyshire CCG	39	7.5 (6.2-9.0)
NHS Southport and Formby CCG	3	2.6 (1.2-5.0)
NHS Southwark CCG	78	25.4 (22.3-28.9)
NHS St Helens CCG	3	1.7 (0.8-3.2)
NHS Stafford and Surrounds CCG	7	4.6 (2.8-7.0)
NHS Stockport CCG	15	5.3 (3.9-7.1)

Clinical commissioning group	Average annual number of cases	Average annual rate per 100,000 (95% CI)
NHS Stoke on Trent CCG	30	11.7 (9.4-14.3)
NHS Sunderland CCG	13	4.8 (3.4-6.6)
NHS Surrey Downs CCG	15	5.3 (3.9-7.1)
NHS Surrey Heath CCG	6	5.9 (3.5-9.5)
NHS Sutton CCG	24	11.9 (9.3-15.0)
NHS Swale CCG	4	3.3 (1.6-5.9)
NHS Swindon CCG	23	10.5 (8.2-13.3)
NHS Tameside and Glossop CCG	19	7.6 (5.8-9.8)
NHS Telford and Wrekin CCG	6	3.7 (2.2-5.8)
NHS Thanet CCG	10	6.9 (4.6-10.0)
NHS Thurrock CCG	9	5.5 (3.6-8.0)
NHS Tower Hamlets CCG	89	30.4 (26.9-34.3)
NHS Trafford CCG	24	10.4 (8.2-13.1)
NHS Vale Royal CCG	3	2.9 (1.3-5.5)
NHS Vale of York CCG	6	1.8 (1.1-2.8)
NHS Wakefield CCG	17	5.1 (3.8-6.7)
NHS Walsall CCG	38	13.9 (11.5-16.7)
NHS Waltham Forest CCG	90	33.2 (29.3-37.4)
NHS Wandsworth CCG	54	17.1 (14.6-20.0)
NHS Warrington CCG	9	4.2 (2.7-6.1)
NHS Warwickshire North CCG	14	7.2 (5.2-9.8)
NHS West Cheshire CCG	7	3.0 (1.9-4.6)
NHS West Essex CCG	16	5.3 (3.9-7.1)
NHS West Hampshire CCG	12	2.2 (1.5-3.0)
NHS West Kent CCG	23	4.9 (3.8-6.2)
NHS West Lancashire CCG	2	1.5 (0.5-3.5)
NHS West Leicestershire CCG	10	2.7 (1.8-3.8)
NHS West London CCG	43	19.1 (16.0-22.7)
NHS West Norfolk CCG	8	4.4 (2.8-6.6)
NHS West Suffolk CCG	11	4.7 (3.2-6.7)
NHS Wigan Borough CCG	13	4.1 (3.0-5.6)
NHS Wiltshire CCG	14	3.0 (2.1-4.0)
NHS Windsor, Ascot and Maidenhead CCG	12	8.3 (5.7-11.5)
NHS Wirral CCG	10	3.0 (2.0-4.3)
NHS Wokingham CCG	17	10.8 (8.1-14.2)
NHS Wolverhampton CCG	60	23.6 (20.3-27.3)
NHS Wyre Forest CCG	2	2.0 (0.7-4.4)

CI - confidence intervals

Appendix III. Methods

Data production

Case notifications

Cases in England are notified to the Enhanced Tuberculosis Surveillance system (ETS), other than in London where cases are notified to the London TB Register (LTBR). Data from the LTBR is routinely imported to ETS. ETS is also used in Wales and Northern Ireland, but only cases resident in England, or those that are homeless or from abroad and assigned to a clinic in England are included in this report.

Data on cases notified between 2000 and 2016 were extracted from ETS at the end of March 2017, then cleaned and validated by end of August 2017.

Matching laboratory isolates to case notifications

Data from all TB isolates sent to Mycobacteria Reference Laboratories for culture between January 2015 and March 2017 was deduplicated and a summary record was generated from all the isolates from the same individual within a 12-month period. In the instance that a patient received treatment for longer than 12 months, the summary record was generated from all the isolates that existed within the treatment period, even if this was outwith the 12-month period.

Isolates and cases are matched in ETS; automatically where patient identifiers are identical or manually by users where differences in patient identifiers occur. For the production of the full dataset, these matches were included. For isolates that were not matched in ETS, these data were then matched to TB case notifications from 2015 and 2016, through a probabilistic matching process based on patient identifiers common to both the laboratory isolate and the case notification [16]. Matches were also subject to manual review to identify any false positive or false negative matches. For TB cases notified before 2015, results from matching conducted in prior years (using the same process described above) were retained and included in the final dataset.

Matching TB and HIV data

Data from TB cases notified between 2001 and 2015 and data from unmatched laboratory TB isolates with specimen dates between 2001 and 2015 were matched

to HIV data from Survey of Prevalent HIV Infections Diagnosed (SOPHID) and HIV & AIDS New Diagnoses Database (HANDD) for the same time period as above, for those aged 15 years and above in England. Data was matched using a probabilistic matching process based on patient identifiers common to both the TB and HIV datasets, followed by deterministic matching and manual review. The identified matches were all classified as TB-HIV co-infected cases.

Data cleaning to improve data quality

In addition to validation checks at data entry and routine cleaning queries that identify missing or inconsistent data within ETS, the following cleaning was subsequently carried out to produce the dataset used in reporting for cases notified from 2000 to 2016.

The postcode field (used to map postcodes to geographic areas, including CCGs) was cleaned by identifying postcodes with an incorrect number of characters or those with obvious errors in the postcode (i.e. symbols). Where cleaning was necessary, the correct postcode was identified using the address fields. For cases that were homeless or who had a residence outside the UK, but were notified in England, the postcode of the clinic/hospital that they were treated at was assigned to the case. For cases with no postcode or treatment clinic/hospital, the local authority and PHEC were updated using the local authority field recorded in ETS (based on the area that the notifying case manager was located in). Cases were assigned to PHECs by matching the local authority of residence to the relevant PHEC.

Cases of BCGosis, patients with latent TB on chemoprophylaxis and cases of non-tuberculosis mycobacteria who were notified in error were identified using comments fields, and denotified. Cases with culture confirmation who had been denotified were queried with clinics, and lab contaminations were removed or cases were renotified if they were found to have been denotified in error.

The site of disease was reclassified to pulmonary if a positive sputum smear (microscopy) sample was recorded or if a positive culture was grown from a pulmonary laboratory specimen. Cases with laryngeal TB were included in pulmonary breakdowns, and cases with miliary TB were included in both pulmonary and extra-pulmonary breakdowns. Site of disease for culture confirmed cases was reclassified based on the site in the body where the specimen was taken. Site of disease classifications were also updated using the free text field site of disease in ETS.

Occupation was re-categorised into the main occupational groups (agricultural/animal care worker, social service/prison, laboratory/pathology, healthcare worker and education) if the occupation documented in the free text field (which is available within ETS for occupational groups recorded as none or other), could be classified in one of these occupational groups.

The presence or absence of social risk factors (current or a history of drug misuse, alcohol misuse, homelessness and prison) was updated based on information recorded in free text comments fields within ETS. Drug misuse (including if it was current or past use) was updated to “yes” if recorded as unknown but current or past drug misuse was mentioned in the comments fields. Alcohol misuse was updated if alcohol misuse was mentioned in the comments along with evidence that the patient was non-compliant or on DOT, in line with the definition that alcohol misuse affects the ability to self-administer treatment. Homelessness was updated to “yes” if mentioned in the comments fields or if the address given was “no fixed abode” or a shelter/hostel for homeless people was named. Prison (including if it was current or past use) was updated to “yes” if mentioned in the comments fields or if HMP or a prison name was recorded as the address. Data on incident TB cases reported to the Public Health in Prisons (PHiP) log were used to validate cases reported with a current imprisonment on ETS and updates were made where required. Cases remanded in an immigration removal centre were identified through the address given at notification, comments fields or occupation field showed the case to be an immigration detainee. Cases were identified as asylum seekers through the occupation field sub-category under those grouped as having occupation as ‘none’.

Data cleaning of TB outcomes

If a case was reported on ETS to have died without a date of death entered, Office for National Statistics (ONS) mortality data was used where available. If a case was reported on ETS to have died with a date of death entered, these were reviewed and validated against the ONS mortality data. In addition to deaths reported as diagnosed at post-mortem on ETS (where the case was not suspected/diagnosed with TB before death) additional deaths diagnosed at post-mortem were identified through review of information in the comments fields and the date of diagnosis and the date of death. Deaths were re-classified as diagnosed at post-mortem if the date of death was earlier than the date of diagnosis, where date of diagnosis was available. Deaths were re-classified as not diagnosed at post-mortem if a case had a start date of treatment and the TB outcome entered stated that the patient died before treatment or while on treatment (indicating that the case was suspected to have TB before death).

For cases who died and treatment start date was available, cases were reclassified as died at 12, 24 or 36 months based on the time between the date of starting treatment and the date of death. Where the date of treatment start was not available, the notification date was used. Similarly, for cases who completed treatment and treatment start date was available, cases were reclassified as completed at 12, 24 or 36 months based on the time between the date of treatment start and the date of treatment completion. Where treatment start date was not available the notification date was used if appropriate.

For MDR/RR-TB cases, the start date of MDR/RR-TB treatment was used to reclassify TB outcome at 12, 24 or 36 months. MDR-TB/RR cases that died were reclassified based on the time between date of starting MDR/RR-TB treatment and the date of death. Similarly, for MDR/RR-TB cases that had completed treatment, cases were reclassified using the date of starting MDR-TB treatment and date of treatment completion. Where the MDR/RR-TB treatment start date was not known, MDR/RR-TB cases were not reclassified and the original TB outcome that was recorded on ETS was used.

Comments fields were also used to identify additional outcomes (completed treatment, died, lost to follow-up, treatment stopped) that were not recorded on ETS. For cases who were transferred to another clinic but a duplicate was entered in error, the TB outcome was used from the record where it was recorded and the duplicate was removed.

LTBI data

Data production

To obtain a more consistent and robust dataset, data from all three sources have been merged using the patient NHS number, forename and surname. Where no NHS number was provided, the forename, surname and date of birth were used to obtain one from the NHS so that the datasets could be matched.

LTBI data limitations

The recording of some key variables (e.g. ‘test invitation or offer’ and ‘IGRA test result’) has not always been consistent and these fields contain missing data (Table Ai.10.1). Data from laboratory services is now routinely collected by PHE with well completed variables although there may be undereporting for some CCGs. Laboratory data was used to determine the number of LTBI tests and calculate the positivity for each CCG except where denoted otherwise. CCGs were requested to

submit the number of people offered or invited to be tested obtained from their systems and acceptance was only calculated for CCGs that provided these figures.

Laboratory data only provides data on two demographic characteristics (age and sex). Other demographic characteristics such as country of birth and ethnicity were only available for patients whose record from laboratory data could be matched to their GP data or treatment data.

LTBI testing acceptance

LTBI testing acceptance was calculated using the number of people invited for testing as the denominator and the number of tests carried out as the numerator. CCGs were requested to provide the number of people invited per year.

Reporting methodology

Time periods

TB rates are presented from the year 2000, the first year of enhanced surveillance for TB. TB-HIV co-infection trends are presented from 2001 onwards, the first year both TB and HIV data are available. All other trends are presented displaying the 10 most recent years of data, with the following exceptions; Mycobacterium speciation, MIRU-VNTR clustering, treatment delay, social risk factors and HIV testing. MIRU-VNTR clustering, social risk factors and HIV testing are presented from the first year data were collected. Mycobacterium speciation is presented from 2009 onwards as MTBC was reclassified as Mycobacterium tuberculosis prior to 2009 and treatment delay is presented from 2011 onward when data completeness for symptom onset data and treatment start date were both above 66%. For social risk factors, data was presented from 2010 when data were available. Where presenting a single year of data would have resulted in the display of small numbers, five years have been combined.

Tuberculosis rates

Rates are presented from 2000 to 2016 with overall TB rates per 100,000 population, as well as those by age, sex and area of reporting, calculated using the mid-year population estimates provided by ONS. Average annual rates per 100,000 for a three-year period were calculated by dividing the numerator (the number of TB notifications in the three-year period) by the denominator (the sum of the mid-year population estimates for the same three-year period) and multiplying by 100,000.

Rates by place of birth and by ethnic group were calculated using population estimates from the Labour Force Survey (LFS) http://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.

CCGs were placed into priority groups for LTBI testing based on the average CCG TB rate per 100,000 between 2011 and 2014, and the TB burden (the proportion of cases the CCG contributes to the overall number of cases for England). High incidence CCGs are defined as those with an incidence of 20.0 per 100,000 or above. High burden CCGs are defined as those with a case number equal to or over 0.5% of the total case number in England.

TB rates detected during pre-entry TB screening were calculated by taking the cases detected as the numerator and the number of applicants screened in the same year as the denominator.

Social risk factors and health inequalities

Cases were reported as having at least one social risk factor (yes) if any of the four social risk factors (current alcohol misuse, current or a history of homelessness, drug misuse, and imprisonment) had “yes” recorded. Cases were only reported to have no social risk factor where all of the four risk factors were recorded as “no”. Information on individual social risk factors was also reported separately, regardless of whether information was known for all four risk factors. Because of this, the denominator for reporting of at least one social risk factor and individual social risk factors may differ.

TB cases were assigned an Index of Multiple Deprivation (IMD) 2015 rank based on Lower Super Output Area (LSOA) of residence (2011 census). To assign LSOAs to deprivation categories, the LSOAs were first sorted from most to least deprived using the IMD 2015 rank, before being divided into deciles. The LSOA mid-year population estimates were also assigned to these deciles and the rate per decile was calculated by dividing the TB cases per decile by the population per decile and multiplying by 100,000.

DOT interpretation

The variables for collecting information on DOT are different in ETS and LTBR. In ETS, the relevant variable is “Is the patient to begin a course of treatment under direct observation?”. In LTBR the relevant variable is “Patient was taking Directly Observed Therapy at any time during the episode of care”. For the purposes of this

report, a report of “yes” for either variable was taken as an indication that the patient had received DOT.

Reporting of *Mycobacterium* species

Species was reclassified based on 24 loci MIRU-VNTR phylotypic lineage (see below); those reported as MTBC with a phylotypic lineage of EAI, Beijing, CAS, or Euro-american were reclassified as *M. tuberculosis*. Those reported as *M. tuberculosis* or MTBC with phylotypic lineage of *M. bovis* or *M. africanum* were reclassified as *M. bovis* or *M. africanum*, respectively.

Reporting drug resistance

Initial resistance was classed as resistance identified within three months of the first specimen date. Cases with a change from a sensitive to resistant result following treatment were reclassified as acquired resistance, even if this is within the three month period. If no drug susceptibility results were available for isolates cultured in the first three months, any subsequent susceptibility results were not used, unless MDR-TB was identified. To ensure that all MDR-TB cases were counted, where the first available drug susceptibility test was after the three month cut off and positive for MDR-TB (with no evidence of acquired resistance), this MDR-TB result was classified as initial resistance.

Additional cases with no phenotypic DST results who were treated with an MDR/RR-TB regimen were identified from those that had indicated on ETS that the case had started MDR treatment (new field in ETS in 2016) or using key word searches on the comment fields on the ETS case reports, where there were no phenotypic DSTs available from the reference laboratory.

Strain typing

Strain types were assigned cluster numbers and phylogenetic lineage (based on MIRU-VNTR) using the cluster numbers assigned in the Strain Typing Module (STM) of ETS for those with a strain type with at least 23 loci.

A cluster was defined as two or more cases with indistinguishable 24 loci MIRU-VNTR strain types with at least one case with a complete 24 loci profile [17]. Additional cases in the cluster may each have one missing loci. In addition, clusters identified by the Mycobacteria Reference Laboratories where all cases in the cluster have one untypable locus at the same locus are designated as “u clusters”. The year a cluster was assigned to being a new cluster was the year of notification of the second case in the cluster.

Cases that are part of a cluster are referred to as clustered cases. Clustered cases were presented for England and PHEC. Clustered cases within a PHEC were only defined as clustered if they were in a cluster with other cases within the same PHEC.

TB outcome cohorts

TB outcomes are reported for all notified TB cases which includes those who started treatment and those who did not (for example diagnosed post-mortem, died without starting treatment, lost to follow-up without starting treatment). For the purposes of TB outcome reporting, the drug sensitive cohort is defined as all TB cases, excluding those with rifampicin resistant TB or MDR-TB (initial or acquired), or with no phenotypic DSTs treated with an MDR/RR-TB regimen [5]. In this report, TB outcomes for drug sensitive TB cases were reported separately for the following groups:

- 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 for the purposes of reporting
- for cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded TB outcome is reported

The drug resistant cohort included any cases with MDR/RR-TB (initial or acquired) as well as those without phenotypic DST confirmation treated with an MDR/RR-TB regimen.

A TB outcome is assigned to each member of these cohorts; those that have an unknown TB outcome, or recorded as transferred to another clinic are assigned the outcome “not evaluated”.

As well as reporting outcomes at defined time periods (at 12 and 24 months for drug sensitive and drug resistant cohorts, respectively), a last recorded outcome based on the last known outcome was derived and presented for those still on treatment beyond the 12 and 24 month time periods.

Specifically, for this report the following groups have been presented:

- drug sensitive cohort with expected course of treatment less than 12 months TB outcomes were reported at 12 months, with analysis of treatment completion at 12 months
- drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated TB had outcomes reported for the last recorded outcome
- analysis of deaths in the entire drug sensitive cohort (including CNS, spinal, miliary or cryptic disseminated TB) were presented for the last recorded outcome
- analysis of lost to follow-up in the entire drug sensitive cohort was presented for the last recorded outcome
- drug resistant cohort had TB outcomes reported at 24 months, with analysis of treatment completion at 24 months
- deaths and lost to follow-up of the drug resistant cohort were reported at last recorded outcome

Confidence intervals

95% confidence intervals for incidence rates were calculated using a Poisson distribution. For proportions a binomial distribution was used.

Software packages

All statistical analysis was carried out using Stata 13. ArcGIS 10.2 was used to produce all maps shown in the report.

Appendix IV. Surveillance data quality

Data completeness overview

Audits of records are undertaken annually based on the criteria suggested in the 2007 Department of Health TB Toolkit for Commissioners [18] which outlines the minimum quality standards for surveillance. Data presented in the completeness tables are based on data that was entered into the Enhanced TB Surveillance system (ETS) before additional cleaning had been undertaken for presentation in the rest of the report. Table IV.1 shows the level of completeness of the information for the Toolkit fields which have a 95% target. To further categorise completeness <95%, 95-98% and 99-100% completeness is colour coded in the table. The fields “forename”, “surname”, “postcode”, “date of birth” and “sex”, are mandatory fields in ETS, thus completeness is not reported. Since May 2015, it has been mandatory to enter a valid NHS number or select “no NHS number” for all cases (with the exception of cases notified to LTBR).

In general, data completeness is high and has improved moderately over time for many variables collected in ETS (Table Aiv.1- Aiv.7). However, completeness could still be improved further for some variables, in particular for newly introduced variables such as travel and visitor risk factors and co-morbidities.

Demographic variables completeness (Table Aiv.1 and Aiv.2)

NHS Number

This variable is used for matching TB notifications to TB isolates to ensure information on culture confirmation, drug resistance and strain typing is available for each case. In addition, this data helps identify duplicate notifications. High completion is therefore extremely important.

- in 2016 NHS number completeness was 94%
- in 2016 London PHE Centre had the lowest completeness at 90%
- in 2016 NHS number completeness on TB isolates received from Mycobacterium Reference Laboratories was 82%; there was a 4% increase between 2015 and 2016

Clinical variables completeness (Table Aiv.1 and Aiv.2)

Previous TB treatment

For those known (yes/no) to have a previous diagnosis, information on previous treatment is also collected, which is important for understanding the role of previous treatment in drug resistance. However, until completion of the previous treatment variable improves, previous diagnosis has to be used as a proxy measure when reporting nationally and internationally.

- in 2016, among those with a previous diagnosis of TB, reporting (yes/no/unknown) of previous TB treatment was low (81%) across all PHE Centres
- in 2016, completeness of previous TB treatment was lowest in Yorkshire and the Humber PHE Centre (71%)

Diagnosis and Treatment variables completeness (Table Aiv.3 and Aiv.4)

Sputum smear status

Sputum smear status among pulmonary cases enables quantification of the number and proportion of TB cases that are likely to be most infectious. Results of sputum smear status are collected through manual data entry onto ETS. While onerous, entry of this data is important as currently there are no automated systems available for data collection.

- in 2016, only 63% of pulmonary cases had a sputum smear status reported
- completeness was less than 50% in East of England and North East PHE Centres
- London and North East had the largest decrease in completeness between 2015 and 2016 (-4%) while Yorkshire and the Humber had the highest increase (9%)

Symptom onset date completeness

This variable is used in the TB Strategy Monitoring indicators 6 and 7, and is vital to assess diagnostic and treatment delays

- in 2016 completeness of symptom onset date was 92%
- there was a 2% decrease in completeness between 2015 and 2016

Date presented completeness[26]

The definition of this variable is the date a case first presented to a healthcare service, and is not when first presented to TB services (unless this was the first contact with healthcare). It is important to collect this to assess patient delays in diagnosis compared with healthcare delays, to monitor and improve access to healthcare and early diagnosis.

- in 2016 completeness of date presented was only 87%; the lowest of the four key dates used in delay monitoring (symptom onset date, date first presented, date of diagnosis and date of treatment start)
- there was a 3% decrease in completeness between 2015 and 2016

Death variables completeness

Completion of the date of death variable is important to assess the timing of the death in relation to treatment start. Information on the relationship between TB and death is also important to be able to assess the proportion of TB cases who die where TB is the cause of death.

- in 2016 completeness of date of death was 87%; there was a 3% decrease between 2015 and 2016
- completeness of the relationship between TB and death (TB caused death/TB contributed to death/TB incidental to death) was low (77%)
- however, there was a 15% increase in completeness between 2015 and 2016

[26] Completion of this field does not include London cases, as this data field is not available in LTBR

New variables introduced to ETS[27]

Co-morbidities (Table Aiv.5 and Aiv.6)

The co-morbidity variables (diabetes, hepatitis B, hepatitis C, chronic liver disease, chronic renal disease, immunosuppression) and smoking status were introduced to ETS in July 2015.

- in 2016 completeness for reporting (yes/no/unknown) was moderate for all co-morbidity variables (range 92%-93%)
- completeness on known status (yes/no) of each co-morbidity varied; diabetes had the highest completeness (93%), and Hepatitis B and Hepatitic C had the lowest completeness (both 77%)
- between 2015 and 2016, there was an improvement in completeness on known status for each co-morbidity; the highest increase (+5%) was on known status of hepatitis C, followed by hepatitis B (+4%) and smoking (+4%)

Travel and visitor risk factor variables (Table Aiv.7)

The travel and visitor history risk factor variables were introduced to ETS in May 2015.

- in 2016 completeness for reporting (yes/no/unknown) on travel history and visitor history was moderate (93% for both variables)
- in 2016 travel history was known (yes/no) for only 78% of cases and visitor history was known (yes/no) for only 71% cases

[27] Completion of this field does not include London cases, as this data field is not available in LTBR

Table Aiv.1: Percentage completeness of key data fields in ETS by PHE Centre, England, 2016

	Demographic				Clinical				Social risk factor							
	NHS Number**		Ethnic group	UK/non-UK born	HIV Testing#	Previous TB diagnosis		Previous TB treatment^	Drug misuse		Alcohol misuse		Homelessness		Prison	
PHE Centre*	ETS	Lab	Known	Known	Known	Known	Reported$	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported
London	90	75	98	99	99	97	99	84	97	99	97	98	97	99	97	98
West Midlands	96	97	100	99	87	98	100	74	95	98	96	98	95	99	93	98
North West	98	97	98	98	96	91	96	76	89	95	89	95	87	94	78	93
South East	98	83	98	98	92	96	98	81	94	98	92	97	94	97	90	95
East of England	98	72	98	97	90	96	99	94	92	97	94	97	92	98	89	97
Yorkshire and the Humber	99	99	95	95	85	91	98	71	88	98	89	97	87	97	83	96
East Midlands	96	100	100	98	92	90	94	75	93	99	93	99	92	98	85	97
South West	97	30	99	97	90	95	97	76	90	94	94	96	92	97	84	93
North East	95	92	100	99	91	97	98	100	95	98	92	96	93	96	93	95
England	**94**	**82**	**98**	**98**	**94**	**95**	**98**	**81**	**94**	**98**	**94**	**98**	**94**	**98**	**91**	**97**

Table Aiv.2: Percentage difference in completeness of key fields in ETS between 2015 and 2016 by PHE Centre, England

	Demographic				Clinical				Social risk factor							
	NHS Number**		Ethnic group	UK/non-UK born	HIV Testing#	Previous TB diagnosis		Previous TB treatment^	Drug misuse		Alcohol misuse		Homelessness		Prison	
PHE Centre*	ETS	Lab	Known	Known	Known	Known	Reported$	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported
London	0	+8	-1	0	0	-2	-1	-3	-1	0	0	-1	-1	0	-1	-1
West Midlands	-1	-0	-	0	-7	0	+1	+2	-1	0	0	0	-2	0	-3	-1
North West	+2	+4	-1	+1	+3	-2	-2	+1	+1	-1	-1	-2	-3	-3	-5	-4
South East	+2	+3	0	+1	-5	0	-1	0	0	0	-3	-2	-1	-1	-2	-3
East of England	+2	-4	-1	-1	-1	+3	+2	+9	+4	+2	+6	+4	+5	+3	+5	+2
Yorkshire and the Humber	+2	+1	-2	-1	0	-4	-1	-5	-7	-1	-4	-1	-5	-1	-5	-1
East Midlands	+2	-	+1	0	0	-4	-4	-17	+1	0	+1	0	+3	-1	+5	-1
South West	-1	+5	0	+3	+4	0	-1	+6	-1	0	+1	0	+1	+2	-4	-3
North East	0	-6	-	0	-7	-1	-2	+40	+4	0	-2	-2	-1	-3	+2	-4
England	**0**	**+4**	**-1**	**0**	**-1**	**-2**	**-1**	**+1**	**0**	**0**	**-1**	**0**	**0**	**0**	**-1**	**-1**

Some of the fields included here are mandatory data entry fields within ETS therefore it is not necessary to show "reported" and "known" for all fields. Please note that for NHS number completion, London obtained additional NHS numbers from the Patient Demographic Service (PDS) and updated the data before the extraction of the data, so the proportion completed does not necessarily reflect NHS numbers entered by case managers.

* Ordered by decreasing total number of cases in 2016
** Data are reported and has a known value
$ Data are reported but may be reported as unknown
^ Includes cases with previous TB diagnosis only
# Excludes cases diagnosed post-mortem

Table Aiv.1 key: 99-100% complete | 95-98% complete | <95% complete

Table Aiv.2 key: % increase | No change | % decrease | 100% reached

Table Aiv.3: Percentage completeness of data fields for diagnosis, death and treatment in ETS by PHE Centre, England, 2016

PHE Centre*	Diagnosis					Death		Treatment					
	Sputum smear status**	Site of disease$	Symptom onset date^	Date first presented	Date diagnosed^	Date of death†	Relationship between TB and death§	Start of treatment date^	Date treatment completed†	Treatment Outcome reported at 12 months§		Treatment Outcome reported at 24 months¥	
	Known#	Known	Known	Known	Known	Known	Known	Known	Known	Known	Reported‡	Known	Reported
London	75	100	90	N/A	88	63	80	98	100	99	100	100	100
West Midlands	55	99	91	91	98	98	85	98	98	100	100	100	100
North West	54	100	88	82	97	98	74	97	93	100	100	97	97
South East	59	100	98	89	98	92	75	98	99	98	99	100	100
East of England	49	100	95	82	98	93	80	99	99	98	99	100	100
Yorkshire and the Humber	65	97	92	88	99	91	76	97	97	98	99	86	86
East Midlands	60	100	96	87	92	100	62	99	100	98	99	100	100
South West	55	99	92	87	98	93	75	94	99	98	99	97	97
North East	49	98	94	98	100	100	67	99	99	100	100	100	100
England	**63**	**100**	**92**	**87**	**94**	**87**	**77**	**98**	**98**	**99**	**100**	**99**	**99**

Table Aiv.4: Percentage difference in completeness of data fields for diagnosis, death and treatment in ETS between 2015 and 2016 by PHE Centre, England

PHE Centre*	Diagnosis					Death		Treatment					
	Sputum smear status**	Site of disease$	Symptom onset date^	Date first presented	Date diagnosed^	Date of death†	Relationship between TB and death §	Start of treatment date^	Date treatment completed†	Treatment Outcome reported at 12 months§		Treatment Outcome reported at 24 months¥	
	Known#	Known	Known	Known	Known	Known	Known	Known	Known	Known	Reported‡	Known	Reported
London	-4	-	-3	N/A	0	-13	-3	-1	-	-1	-	-	-
West Midlands	+4	-1	-5	-4	-1	-2	+28	0	0	-	-	-	-
North West	0	-	-5	-6	-1	+7	+26	-2	-6	-	-	-3	-3
South East	+3	+1	0	-3	-1	-5	+8	0	0	-1	-1	-	-
East of England	+3	-	+2	0	+1	+7	+13	+1	+1	0	0	-	-
Yorkshire and the Humber	+9	-3	-1	-1	0	-3	+9	-1	0	-1	-1	-9	-14
East Midlands	+3	-	-3	+4	+3	-	+12	0	+1	-2	-1	-	-
South West	+4	-1	-4	-7	-1	+4	+35	-5	-1	-1	0	-3	-3
North East	-4	-1	-3	+2	+1	-	+37	0	+3	+1	-	-	-
England	**+1**	**0**	**-2**	**-3**	**0**	**-3**	**+15**	**-1**	**-1**	**0**	**-**	**-1**	**-1**

For treatment outcome variables - recording of 'not completed', or 'transferred out' are counted as unknown and not reported. Date first presented completness does not include London cases, as this data field is not available in LTBR

* Ordered by decreasing total number of cases in 2016
** Pulmonary cases only
# Data are reported and has a known value
$ For cases with unknown site of disease
† Cases notified in 2015 that have completed treatment only
^ Excludes cases diagnosed post-mortem
§ For cases notified in 2015
‡ Data are reported but may be reported as unknown
¥ For cases notified in 2014 and still on treatment at 12 months

Table Aiv.3 key: 99-100% complete | 95-98% complete | <95% complete

Table Aiv.4 key: % increase | No change | % decrease | 100% reached

Table Aiv.5: Percentage completeness of data fields for co-morbidities in ETS by PHE Centre, England, 2016^

	Co-morbidities													
	Diabetes		Hepatitis B		Hepatitis C		Chronic liver disease		Chronic renal disease		Immunosuppression		Smoker	
PHE Centre**	Known#	Reported$	Known	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported
West Midlands	91	96	84	95	83	94	90	95	90	94	87	94	88	95
North West	90	96	75	94	75	95	87	95	88	93	87	95	86	95
South East	89	90	78	89	78	89	86	89	87	89	86	89	85	90
East of England	83	88	73	85	73	84	81	86	82	86	80	86	79	87
Yorkshire and the Humber	78	96	72	94	72	94	75	94	76	95	76	95	75	95
East Midlands	87	92	75	91	74	92	83	90	83	90	84	92	81	91
South West	87	92	72	89	72	87	81	90	82	90	83	90	74	91
North East	94	95	86	94	85	94	92	94	94	94	93	94	91	95
England	**87**	**93**	**77**	**92**	**77**	**92**	**85**	**92**	**85**	**92**	**84**	**92**	**83**	**93**

Table Aiv.6 Percentage difference in completeness of data fields for co-morbidities in ETS between 2015 and 2016 by PHE centre, England~

	Co-morbidities													
	Diabetes		Hepatitis B		Hepatitis C		Chronic liver disease		Chronic renal disease		Immunosuppression		Smoker	
PHE Centre**	Known#	Reported$	Known	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported
West Midlands	+3	-3	+10	-3	+9	-4	+6	-4	+5	-4	+3	-4	+3	-4
North West	-1	-2	+6	-4	+7	-3	+3	-1	+1	-4	+1	-2	+3	-2
South East	+2	-2	+2	-2	+3	-1	+1	-2	0	-1	0	-3	+4	-2
East of England	+2	+2	-3	-1	-2	0	+2	+1	+3	+1	+3	+1	+1	0
Yorkshire and the Humber	+3	+1	+9	-1	+9	0	+3	-1	+2	+2	+3	+1	+5	0
East Midlands	-4	-5	+3	-3	+4	-2	-1	-3	-4	-4	-1	-4	-2	-5
South West	+4	-3	-2	-5	-3	-6	+3	-3	+4	-2	+5	-4	+14	-3
North East	-5	-4	-4	-5	-5	-5	-1	-3	-5	-5	-3	-5	+3	-2
England	**+1**	**-2**	**+4**	**-2**	**+5**	**-2**	**+3**	**-2**	**+1**	**-2**	**+2**	**-2**	**+4**	**-2**

^ Includes all cases notified on or after 02/07/2015 and excludes all London cases as these data fields are not available in LTBR
** Ordered by decreasing total number of cases in 2016
~ compares 2016 data against 2015 data (from 02/07/2015)
$ Data reported but may be reported as unknown
# Data are reported and has a known value

Table Aiv.5 key: 99-100% complete | 95-98% complete | <95% complete

Table Aiv.6 key: % increase | No change | % decrease | 100% reached

Table Aiv.7: Percentage completeness and difference of data fields for travel and visitor history in ETS by PHE centre, England*, 2016

PHE Centre**	Risk factor							
	Travel history outside the UK^				Visitors received from outside the UK^			
	Known#		Reported$		Known#		Reported$	
	Completed %	Difference %	Completed %	Difference %	Completed %	Difference %	Completed %	Difference %
West Midlands	89	+4	96	-2	87	+3	96	-3
North West	71	-3	94	-4	66	-3	94	-4
South East	80	-1	89	-3	75	+4	90	-2
East of England	75	+6	88	+2	68	+6	87	+3
Yorkshire and the Humber	70	+2	96	-1	56	+7	96	-2
East Midlands	73	-6	92	-4	61	+1	91	-6
South West	73	+11	94	-1	62	+17	93	-1
North East	91	+2	96	-4	89	+4	97	-3
England	**78**	**+2**	**93**	**-2**	**71**	**+5**	**93**	**-2**

For travel history and visitor history variables, completeness does not include London cases as these data fields were not available in LTBR at the time of reporting. For 'percentage difference' between 2015 and 2016, cases notified on or after 02/07/2015 until 31/12/2015 were included as notified in 2015, compared to all cases notified in 2016.

* Excludes London cases (as these data fields are not available in LTBR)
** Ordered by decreasing total number of cases in 2016
^ Excluding countries within Western Europe, US, Canada, New Zealand and Australia
# Data are reported and has a known value
$ Data reported but may be reported as unknown

Table Aiv.7 key:

Completed%:	99-100% complete	95-98% complete	<95% complete	
Difference%:	% increase	No change	% decrease	100% reached

Appendix V. National level data for TB strategy monitoring indicators, England, 2000-2016

Year	Indicator 1			Indicator 2						Indicator 5		
	Overall TB incidence per 100,000 population			TB incidence in UK born and non-UK born populations						Incidence of TB in UK born children aged under fifteen years		
				UK born			Non- UK born					
	Number of cases	Rate	95% CI	Number of cases	Rate	95% CI	Number of cases	Rate	95% CI	Number of cases	Rate	95% CI
2000	6,044	12.3	12.0-12.6	1,830	4.1	3.9-4.3	3,329	79.6	76.9-82.4	209	2.3	2.0-2.6
2001	6,169	12.5	12.2-12.8	1,889	4.3	4.1-4.4	3,431	79.1	76.5-81.8	229	2.5	2.2-2.9
2002	6,675	13.4	13.1-13.8	1,852	4.2	4.0-4.4	4,111	90.5	87.7-93.3	228	2.6	2.2-2.9
2003	6,631	13.3	13.0-13.6	1,703	3.8	3.6-4.0	4,326	90.8	88.1-93.5	179	2.0	1.7-2.3
2004	6,929	13.8	13.5-14.1	1,791	4.0	3.8-4.2	4,570	95.1	92.4-97.9	264	3.0	2.6-3.4
2005	7,658	15.1	14.8-15.5	1,804	4.0	3.8-4.2	5,186	100.7	98.0-103.5	247	2.8	2.5-3.2
2006	7,682	15.1	14.7-15.4	1,729	3.9	3.7-4.1	5,175	92.9	90.4-95.5	209	2.4	2.1-2.8
2007	7,577	14.7	14.4-15.1	1,799	4.0	3.8-4.2	5,135	85.5	83.2-87.9	290	3.4	3.0-3.8
2008	7,809	15.1	14.7-15.4	1,867	4.2	4.0-4.4	5,417	86.0	83.7-88.3	294	3.4	3.0-3.8
2009	8,112	15.5	15.2-15.9	1,907	4.2	4.1-4.4	5,662	86.8	84.6-89.1	257	2.9	2.6-3.3
2010	7,676	14.6	14.3-14.9	1,814	4.0	3.8-4.2	5,515	83.1	80.9-85.3	238	2.7	2.4-3.1
2011	8,280	15.6	15.3-15.9	1,958	4.3	4.1-4.5	6,021	85.9	83.7-88.1	234	2.6	2.3-3.0
2012	8,083	15.1	14.8-15.4	2,003	4.4	4.2-4.6	5,840	81.4	79.4-83.6	254	2.9	2.5-3.2
2013	7,263	13.5	13.2-13.8	1,842	4.0	3.8-4.2	5,256	70.6	68.7-72.5	195	2.2	1.9-2.5
2014	6,472	11.9	11.6-12.2	1,756	3.8	3.6-4.0	4,611	60.2	58.5-62.0	187	2.1	1.8-2.4
2015	5,727	10.5	10.2-10.7	1,529	3.3	3.2-3.5	4,096	51.3	49.7-52.9	156	1.7	1.4-2.0
2016	5,664	10.2	10.0-10.5	1,469	3.2	3.0-3.3	4,096	49.4	47.9-50.9	162	1.8	1.5-2.0

Year	Indicator 6			Indicator 7			Indicator 8			Indicator 9		
	Number and proportion of pulmonary TB cases starting treatment within two months of symptom onset			Number and proportion of pulmonary TB cases starting treatment within four months of symptom onset			Number and proportion of pulmonary TB cases that were culture confirmed			Number and proportion of microbiologically confirmed cases with drug susceptibility testing reported for the four first line agents		
	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI
2000	-	-	-	-	-	-	1,862	52.1	50.5-53.7	2,779	99.4	99.0-99.6
2001	-	-	-	-	-	-	2,037	56.4	54.8-58.0	3,123	99.2	98.8-99.4
2002	-	-	-	-	-	-	2,622	64.9	63.4-66.4	3,793	98.6	98.2-98.9
2003	-	-	-	-	-	-	2,585	66.0	64.5-67.5	3,799	99.2	98.9-99.4
2004	-	-	-	-	-	-	2,740	68.4	66.9-69.8	4,020	98.6	98.2-98.9
2005	-	-	-	-	-	-	2,989	69.1	67.7-70.5	4,532	98.9	98.6-99.2
2006	-	-	-	-	-	-	2,980	69.4	68.0-70.7	4,607	98.7	98.3-99.0
2007	-	-	-	-	-	-	2,850	68.7	67.3-70.1	4,366	98.2	97.7-98.5
2008	-	-	-	-	-	-	2,904	67.8	66.3-69.1	4,429	97.6	97.1-98.0
2009	-	-	-	-	-	-	3,006	68.1	66.7-69.4	4,519	96.8	96.3-97.3
2010	-	-	-	-	-	-	2,867	70.4	69.0-71.8	4,517	98.0	97.6-98.4
2011	1,318	45.0	43.2-46.8	2,173	74.2	72.6-75.8	3,076	71.7	70.3-73.0	4,896	97.3	96.8-97.7
2012	1,371	44.1	42.4-45.8	2,294	73.8	72.2-75.3	2,950	70.4	69.0-71.8	4,786	97.8	97.3-98.1
2013	1,224	41.2	39.4-43.0	2,124	71.5	69.8-73.1	2,712	72.9	71.4-74.3	4,287	97.6	97.1-98.0
2014	1,158	39.5	37.7-41.3	2,046	69.8	68.1-71.4	2,488	73.2	71.7-74.6	3,833	97.7	97.2-98.1
2015	1,184	42.4	40.6-44.2	2,015	72.2	70.5-73.8	2,244	74.1	72.5-75.7	3,426	98.1	97.6-98.5
2016	1,079	39.4	37.6-41.2	1,898	69.3	67.5-71.0	2,310	76.0	74.4-77.4	3,404	95.4	94.6-96.0

Year	Indicator 10			Indicator 11			Indicator 12		
	Number and proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months			Number and proportion of drug sensitive TB cases who were lost to follow-up at last reported outcome			Number and proportion of drug sensitive TB cases who had died at last reported outcome		
	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI
2000	-	-	-	-	-	-	-	-	-
2001	3,631	63.7	62.4-64.9	237	3.9	3.4-4.4	377	6.1	5.6-6.8
2002	4,111	67.4	66.2-68.5	296	4.5	4.0-5.0	437	6.6	6.0-7.2
2003	4,191	69.6	68.4-70.7	290	4.4	3.9-4.9	407	6.2	5.6-6.8
2004	4,426	70.1	69.0-71.2	333	4.9	4.4-5.4	402	5.9	5.3-6.4
2005	4,877	70.3	69.3-71.4	380	5.0	4.5-5.5	447	5.9	5.4-6.4
2006	5,214	75.5	74.5-76.5	413	5.4	4.9-6.0	430	5.7	5.2-6.2
2007	5,290	78.2	77.2-79.2	345	4.6	4.1-5.1	432	5.8	5.3-6.3
2008	5,602	80.3	79.3-81.2	368	4.8	4.3-5.3	436	5.6	5.1-6.2
2009	5,917	81.9	81.0-82.8	354	4.4	4.0-4.9	419	5.2	4.7-5.7
2010	5,650	82.9	82.0-83.8	342	4.5	4.1-5.0	382	5.0	4.6-5.5
2011	6,025	82.1	81.2-83.0	425	5.2	4.7-5.7	383	4.7	4.2-5.2
2012	6,016	83.8	82.9-84.6	363	4.5	4.1-5.0	390	4.9	4.4-5.4
2013	5,502	85.6	84.8-86.5	298	4.2	3.7-4.6	336	4.7	4.2-5.2
2014	4,847	84.8	83.9-85.7	273	4.3	3.8-4.8	354	5.5	5.0-6.1
2015	4,168	83.4	82.3-84.4	239	4.2	3.7-4.8	343	6.1	5.5-6.7
2016	-	-	-	-	-	-	-	-	-

Year	Indicator 13			Indicator 14			Indicator 15		
	Number and proportion of TB cases with rifampicin resistance or MDR-TB who had completed treatment at 24 months			Number and proportion of TB cases with rifampicin resistance or MDR-TB who were lost to follow-up at last reported outcome			Number and proportion of TB cases with rifampicin resistance or MDR-TB who had died at last reported outcome		
	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI
2000	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-
2004	37	52.1	40.7-63.3	9	12.7	6.8-22.4	4	5.6	2.2-13.6
2005	39	62.9	50.5-73.8	9	14.5	7.8-25.3	4	6.5	2.5-15.4
2006	39	48.8	38.1-59.5	8	10.0	5.2-18.5	3	3.8	1.3-10.5
2007	30	42.3	31.5-53.8	6	8.5	3.9-17.2	10	14.1	7.8-24.0
2008	45	57.7	46.6-68.0	10	12.8	7.1-22.0	7	9.0	4.4-17.4
2009	40	51.9	41.0-62.7	11	14.3	8.2-23.8	4	5.2	2.0-12.6
2010	38	48.1	37.4-58.9	9	11.4	6.1-20.3	1	1.3	0.2-6.8
2011	48	50.5	40.6-60.4	18	18.9	12.3-28.0	6	6.3	2.9-13.1
2012	57	60.6	50.5-69.9	11	11.7	6.7-19.8	4	4.3	1.7-10.4
2013	49	57.6	47.0-67.6	14	16.5	10.1-25.8	4	4.7	1.8-11.5
2014	34	49.3	37.8-60.8	12	17.4	12.5-31.2	2	2.9	0.8-10.0
2015	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-

Year	Indicator 16			Indicator 17			Indicator 18			Indicator 19		
	Number and proportion of TB cases offered an HIV test			Number and proportion of drug sensitive TB cases with at least one social risk factor who completed treatment within 12 months			Number and proportion of culture confirmed TB cases with any first line drug resistance			Number and proportion of culture confirmed TB cases with multi-drug resistance TB		
	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI	Number of cases	Proportion (%)	95% CI
2000	-	-	-	-	-	-	193	6.9	6.0-7.9	28	1.0	0.7-1.4
2001	-	-	-	-	-	-	224	7.1	6.3-8.1	22	0.7	0.5-1.1
2002	-	-	-	-	-	-	297	7.8	7.0-8.7	35	0.9	0.7-1.3
2003	-	-	-	-	-	-	309	8.1	7.3-9.0	49	1.3	1.0-1.7
2004	-	-	-	-	-	-	326	8.1	7.3-9.0	45	1.1	0.8-1.5
2005	-	-	-	-	-	-	346	7.6	6.9-8.4	41	0.9	0.7-1.2
2006	-	-	-	-	-	-	370	8.0	7.2-8.8	54	1.2	0.9-1.5
2007	-	-	-	-	-	-	332	7.5	6.8-8.4	49	1.1	0.8-1.5
2008	-	-	-	-	-	-	306	6.8	6.1-7.6	50	1.1	0.8-1.5
2009	-	-	-	-	-	-	371	8.1	7.3-8.9	59	1.3	1.0-1.7
2010	-	-		371	73.5	69.4-77.1	322	7.1	6.4-7.8	65	1.4	1.1-1.8
2011	-	-		370	71.4	67.4-75.2	413	8.3	7.6-9.1	81	1.6	1.3-2.0
2012	5,204	93.2	92.5-93.8	393	74.7	70.8-78.2	358	7.4	6.7-8.1	77	1.6	1.3-2.0
2013	5,786	93.6	92.9-94.1	402	77.3	73.5-80.7	332	7.7	6.9-8.5	68	1.6	1.2-2.0
2014	5,401	95.4	94.8-95.9	361	74.7	70.7-78.4	286	7.3	6.6-8.2	52	1.3	1.0-1.7
2015	4,946	96.4	95.8-96.8	385	74.6	70.7-78.2	253	7.3	6.5-8.2	45	1.3	1.0-1.7
2016	4,887	96.6	96.1-97.1	-	-	-	262	7.5	6.6-8.4	53	1.5	1.2-2.0

Metadata for TB Strategy Monitoring Indicators, England

Rates presented are crude rates per 100,000 population. 95% confidence intervals (CI) for rates were calculated assuming a Poisson distribution. The remaining indicators are all presented as proportions, with 95% binomial CIs.

Indicator 1: TB incidence per 100,000 population.
Numerator: Annual TB case notifications, England.
Denominator: Office for National Statistics mid-year population estimate, England.

Indicator 2: TB incidence per 100,000 population by place of birth.
Numerator: Annual TB notifications, England, by place of birth.
Denominator: Labour Force Survey annual population estimates by place of birth, England.

Indicator 5: TB incidence per 100,000 population in UK born children aged under fifteen years.
Numerator: Annual TB case notifications in UK born children aged under fifteen years, England.
Denominator: Labour Force Survey annual population estimate of UK born children aged under fifteen years, England.

Indicator 6: Number and proportion of pulmonary TB cases starting treatment within two months of symptom onset.
Numerator: Annual number of pulmonary TB cases starting treatment within 61 days of symptom onset. Denominator: Annual number of pulmonary TB cases notified.
Exclusions: TB cases with no date of symptom onset or no date of treatment start.

Indicator 7: Number and proportion of pulmonary TB cases starting treatment within four months of symptom onset.
Numerator: Annual number of pulmonary TB cases starting treatment within 121 days of symptom onset. Denominator: Annual number of pulmonary TB cases notified.
Exclusions: TB cases with no date of symptom onset or no date of treatment start.

Indicator 8: Number and proportion of pulmonary TB cases that were culture confirmed.
Numerator: Annual number of pulmonary TB cases with a positive culture for *Mycobacterium tuberculosis* complex.
Denominator: Annual number of notified pulmonary TB cases.

Indicator 9: Number and proportion of culture confirmed TB cases with drug susceptibility testing reported for the four first line agents.
Numerator: Annual number of culture confirmed notified TB cases with drug susceptibility testing reported for all of the following drugs: isoniazid, rifampicin, ethambutol and pyrazinamide.
Denominator: Annual number of culture confirmed notified TB cases.

Indicator 10: Number and proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months.
Numerator: Number of drug sensitive TB cases notified in a given year who had completed a full course of treatment within 12 months of treatment start date.
Denominator: Number of drug sensitive TB cases notified with TB that year.
Exclusions: cases with rifampicin resistance or multi-drug resistant TB (MDR-TB), and cases with CNS, spinal, miliary or disseminated TB who may require longer than the standard 6 month treatment course.

Indicator 11: Number and proportion of drug sensitive TB cases that were lost to follow-up at last reported outcome.
Numerator: Number of drug sensitive TB cases notified in a given year who were lost to follow-up at last reported outcome.
Denominator: Number of drug sensitive TB cases notified in that year.
Exclusions: cases with rifampicin resistance or MDR-TB.

Indicator 12: Number and proportion of drug sensitive TB cases that had died at last reported outcome.
Numerator: Number of drug sensitive TB cases notified in a given year who had died at last reported outcome.
Denominator: Number of drug sensitive TB cases notified in that year.
Exclusions: as for indicator 11.

Indicator 13: Number and proportion of drug resistant TB cases who had completed treatment at 24 months.
Numerator: Annual number of notified TB cases with rifampicin resistance or MDR-TB who had completed treatment within 24 months of start of treatment.
Denominator: Annual number of notified TB cases with rifampicin resistance or MDR-TB.

Indicator 14: Number and proportion of drug resistant TB cases who were lost to follow-up at last reported outcome.
Numerator: Annual number of notified TB cases with rifampicin resistance or MDR-TB who were lost to follow-up at last reported outcome.
Denominator: Annual number of notified TB cases with rifampicin resistance or MDR-TB.

Indicator 15: Number and proportion of drug resistant TB cases who had died at last reported outcome.
Numerator: Annual number of notified TB cases with rifampicin resistance or MDR-TB who had died at last reported outcome.
Denominator: Annual number of notified TB cases with rifampicin resistance or MDR-TB.

Indicator 16: Number and proportion of TB cases offered an HIV test.
Numerator: Annual number of notified TB cases reported to have been offered an HIV test.
Denominator: Annual number of notified TB cases.
Exclusions: cases where HIV status already known, and cases diagnosed post mortem.

Indicator 17: Number and proportion of drug sensitive TB cases with at least one social risk factor who completed treatment within 12 months.
Numerator: Annual number of drug sensitive TB cases with at least one social risk factor (current or past history of drug or alcohol misuse, homelessness or imprisonment) who have completed treatment within 12 months of treatment start date.
Denominator: Number of drug sensitive TB cases with at least one social risk factor notified with TB that year. Exclusions: as for indicator 10.

Indicator 18: Number and proportion of culture confirmed TB cases with any first line drug resistance. Numerator: Annual number of culture confirmed TB cases with resistance to isoniazid, rifampicin, ethambutol or pyrazinamide.
Denominator: Annual number of culture confirmed TB cases.
Exclusions: *Mycobacterium bovis* cases.

Indicator 19: Annual number and proportion of culture confirmed TB cases with MDR-TB.
Numerator: Number of culture confirmed cases with resistance to at least isoniazid and rifampicin.
Denominator: Annual number of notified culture confirmed TB cases.

List of acronyms

BCG	Bacillus Calmette-Guérin vaccination
BTS	British Thoracic Society
CCG	Clinical commissioning group
CHIS	Child Health Information systems
CI	Confidence Intervals
COVER	Cover of Vaccination Evaluated Rapidly
CNS	Central nervous system
DOT	Directly Observed Therapy
DST	Drug susceptibility testing
ETS	Enhanced TB Surveillance system
GP	General Practice
HANDD	HIV & AIDS New Diagnosis Database
HIV	Human immunodeficiency virus
HMP	Her Majesty's Prison service
IRC	Immigration removal centre
IGRA	Interferon gamma release assay
INH-R	Isoniazid resistance
IMD	Index of Multiple Deprivation
IOM	International Organisation of Migration
IQR	Inter-quartile range
JSNA	Joint Strategic Needs Assessment
LA	Local authority
LFS	Labour Force Survey
LSOA	Lower Super Output Area
LTBI	Latent TB infection
LTBR	London TB Register
MDR-TB	Multi-drug resistant TB
MDR/RR-TB	Multi-drug resistant/rifampicin resistant TB
MDT	Multidisciplinary team
MIRU-VNTR	Mycobacterial Interspersed Repetitive Uni-Variable Number Tandem Repeats
MTBC	Mycobacterium tuberculosis complex
NHS	National Health Service
ONS	Office for National Statistics
PCR	Polymerase chain reaction
PDS	Personal Demographic Service
PHE	Public Health England
PHEC	Public Health England Centre
PHiP	Public Health in Prisons
RCGP	Royal College of General Practitioners
SNP	Single Nucleotide Polymorphism
SRF	Social risk factor
SCCI	Standardisation Committee for Care Information
SOPHID	Survey of Prevalent HIV Infections Diagnosed
TB	Tuberculosis
TBCBs	TB Control Boards
VOT	Virtually Observed Treatment
USPs	Under-served populations
WGS	Whole genome sequencing
XDR-TB	Extensively drug resistant TB

Glossary

Acquired resistance

Acquired resistance is classed as resistance identified on repeat culture after three months of the first specimen date. Cases with a change from a sensitive to resistant result following treatment start are reclassified as acquired resistance, even if this is within the three-month period.

Cluster

Clusters in this document refer to molecular clusters only. These are defined as two or more patients who are infected with a strain of *Mycobacterium tuberculosis* complex with indistinguishable MIRU-VNTR profiles. Each cluster must have at least one person with a full 24 MIRU-VNTR profile, and other members of the cluster may have a maximum of one missing loci.

Drug resistant cohort

The drug resistant cohort includes any cases with rifampicin resistant TB (initial or acquired), including MDR-TB (initial or acquired), as well as casestreated witth a second line regimen without phenotypic DSTs.

Drug sensitive cohort

The drug sensitive cohort excludes all TB cases with rifampicin resistant TB (initial or acquired) including MDR-TB (initial, acquired or treated).

Extensively-drug resistant TB (XDR-TB)

XDR-TB is defined as resistance to isoniazid and rifampicin (MDR-TB), at least one injectable agent (capreomycin, kanamycin or amikacin) and at least one fluoroquinolone (moxifloxacin, ofloxacin, ciprofloxacin).

First-line drug resistance

First-line drug resistance is defined as resistance to at least one of the first line drugs (isoniazid, rifampicin, ethambutol, pyrazinamide).

Initial resistance

Initial resistance is class as resistance identified within three months of the first specimen date.

Latent TB infection (LTBI)

LTBI is defined as a state of persistent immune response to stimulation by Mycobacterium tuberculosis antigens without evidence of active TB disease.

Last recorded outcome
Last known outcome, irrespective of when it occurred.

Multi-drug resistant TB (MDR-TB)
MDR-TB is defined as resistance to at least isoniazid and rifampicin, with or without resistance to other drugs.

Multi-drug resistant/Rifampicin resistant TB (MDR/RR-TB)
MDR/RR-TB is defined as resistance to rifampicin including MDR-TB cases.

Post-mortem diagnosis
A case diagnosed at post-mortem is defined as a case 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 case with pulmonary TB is defined as a case with TB involving the lungs and/or tracheo-bronchial 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, and laryngeal TB is also classified as pulmonary TB.

Social risk factor
Social risk factors for TB include current alcohol misuse, current or history of homelessness, current or history of imprisonment and current or history of drug misuse.

Under-served populations
Under-served populations refers to cases with a social risk factor (current alcohol misuse, current or history of homelessness, imprisonment and drug misuse), as well as cases who were remanded in an immigration removal centre, identified as asylum seekers or unemployed.