Public Health England

Protecting and improving the nation's health

Tuberculosis in London

Annual review (2018 data)

Data from 2000 to 2018

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Executive summary

While London remains the area of highest TB incidence in England, accounting for 36% of all people with TB in 2018 and over double the national rate, case numbers continue to decline. In 2018 1,691 people notified with TB in 2018; a rate of 19.0 per 100,000 of the population. This was a drop of more than half from the peak in 2011.

The London borough of Newham was the only area with a rate above 40 per 100,000, and most boroughs saw decreases in TB rates. Some very low incidence areas, however, such as Kingston upon Thames, did have an increase in cases in 2018.

Rates decreased among both those born abroad and those born in the UK, to their lowest levels since 2000. The majority (82%) of people with TB in London were born outside the UK, most of whom had been in the UK a long time prior to TB notification. The most common countries of birth were India, Pakistan, Somalia and Bangladesh, with median time from entry to notification between 9 and 14 years. The fifth most common country of birth was Romania: people from here with TB had been in the UK a median of 3 years prior to notification, with 37% entering diagnosed less than a year after entering.

Just over half of all people with TB had pulmonary disease, with extra-thoracic lymph node the next most common site. In 2018, 61% of people with TB had their TB culture confirmed; 75% among those with pulmonary TB. Of those with pulmonary disease, 77% had a known sputum smear result, of whom 51% were sputum smear positive.

TB rates among UK born children have declined over the last decade, evidence of declining transmission. From the first year of using WGS to determine relatedness between people with TB, 25% were clustered within 12 SNPs of another individual. Rates of clustering were higher among people who were UK born, had one or more social risk factor and among those with isoniazid resistant disease.

More than 1 in 5 people had a key co-morbidity (diabetes, hepatitis B, hepatitis C, chronic renal disease, chronic liver disease or immunosuppression), most commonly diabetes. These were more common among older people (almost half of those aged 65 or older). Almost all people with TB in London were tested for HIV. In 2018 2.9% of people with TB in London were estimated to be co-infected with HIV.

People with TB in London had shorter periods from becoming unwell to starting treatment that on average for England (70 days compared to 75).

Of those people with TB notified in 2016 that would be expected to receive 6 months standard treatment, (excluding those with rifampicin resistant, CNS, spinal, miliary or cryptic disseminated disease) 86% had completed at 12 months. People who were

older (65 years of more), had at least one social risk factor or one of the key co-morbidities were less likely to complete treatment. In addition, only 73% of those with CNS, spinal, miliary or cryptic disseminated TB had completed treatment by the last recorded outcome. Overall, 4% of people with rifampicin sensitive TB died before completing treatment and TB was reported to have caused or contributed to over half of these deaths.

The proportion of people with TB resistant to 1 or more first line drug increased to 12%, mostly due to an increase in isoniazid mono-resistance. The proportion with multi-drug resistant disease remained around 1%.

An increasing proportion of adults with TB had a social risk factor (14% in 2018), defined as homelessness, prison history, drug or alcohol misuse. Experience of one or more social risk factor was more common among people born in the UK, men and those of white ethnicity. People with TB with a social risk factor were more likely to be infectious and less likely to complete treatment.

In conclusion, it is encouraging that TB rates in London continue to decline and are now at to their lowest level since 2000. However, 1 in 3 people with TB in London have either a social risk factor or key co-morbidity. This medical and social complexity provides significant challenges to TB control and the achievement of TB elimination in England by 2035

Recommendations

Further reductions in TB in London will require:

- work to reduce diagnostic delay and ensure a prompt start of appropriate treatment, as well as ongoing work to ensure completion of treatment
- robust contact tracing and further development of WGS cluster investigation to interrupt transmission
- prioritization of work to improve outcomes for underserved populations and people with drug resistant TB

The Cohort Review process provides a critical forum for local oversight of these key aspects of TB control.

TB networks should ensure Cohort review and MDR cohort review continue to play a vital role in quality assurance of TB case and contact management with identification and escalation of issues to TB control board.

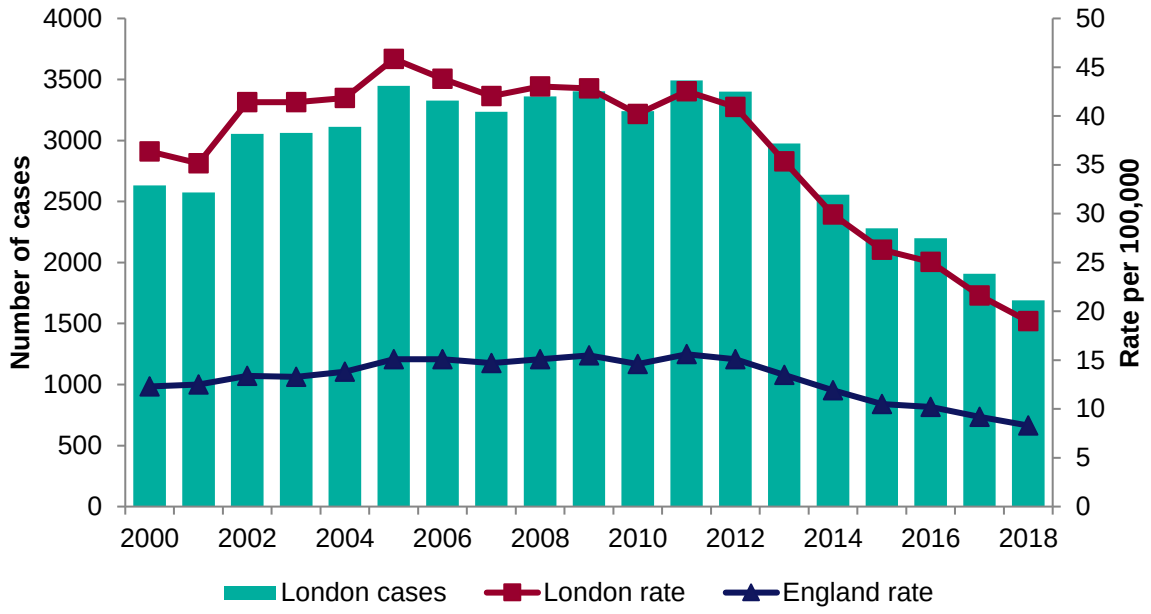
The TB Control Board working with TB Networks will need to consider changing epidemiology and case mix to ensure appropriate service provision.

1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2018, there were 1,691 cases of tuberculosis (TB) notified in London residents; a rate of 19.0 per 100,000 of the population (Figure 1). This was the lowest rate of TB in London since 2000, 12% lower than in 2017, and 55% lower than in 2011, after which there has been a continuous decline. A similar decline of 44% was seen in the number of people with TB in England from 2011 to 2018.

Figure 1: TB case reports and rates, London, 2000-2018

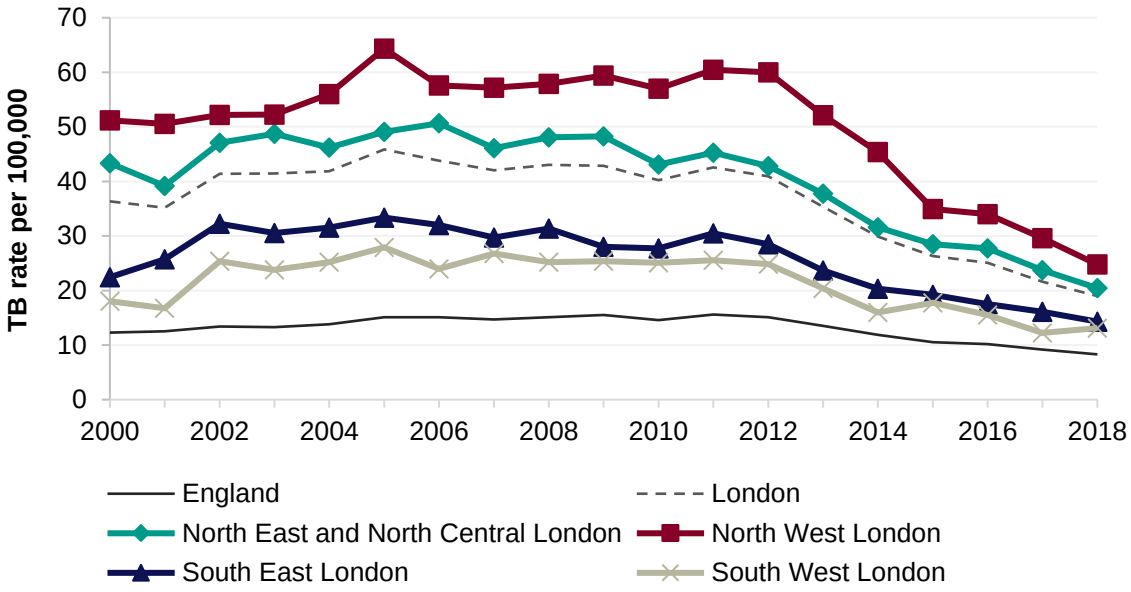


Despite this, the rate of TB in London in 2018 remains over twice as high as the rate for England (8.3 per 100,000) and continues to account for the highest proportion of cases in England (36% of the 4,655 cases in 2018).[1]

The highest TB rate was among residents of the North West London Health Protection Team area, 24.8 per 100,000 of the population – despite a 16% reduction since 2017. Only South West London had a small increase (by 7% from 12.2 per 100,000 in 2017 to 13.1 per 100,000 in 2018) although remained the area with lowest rates (Figure 2).

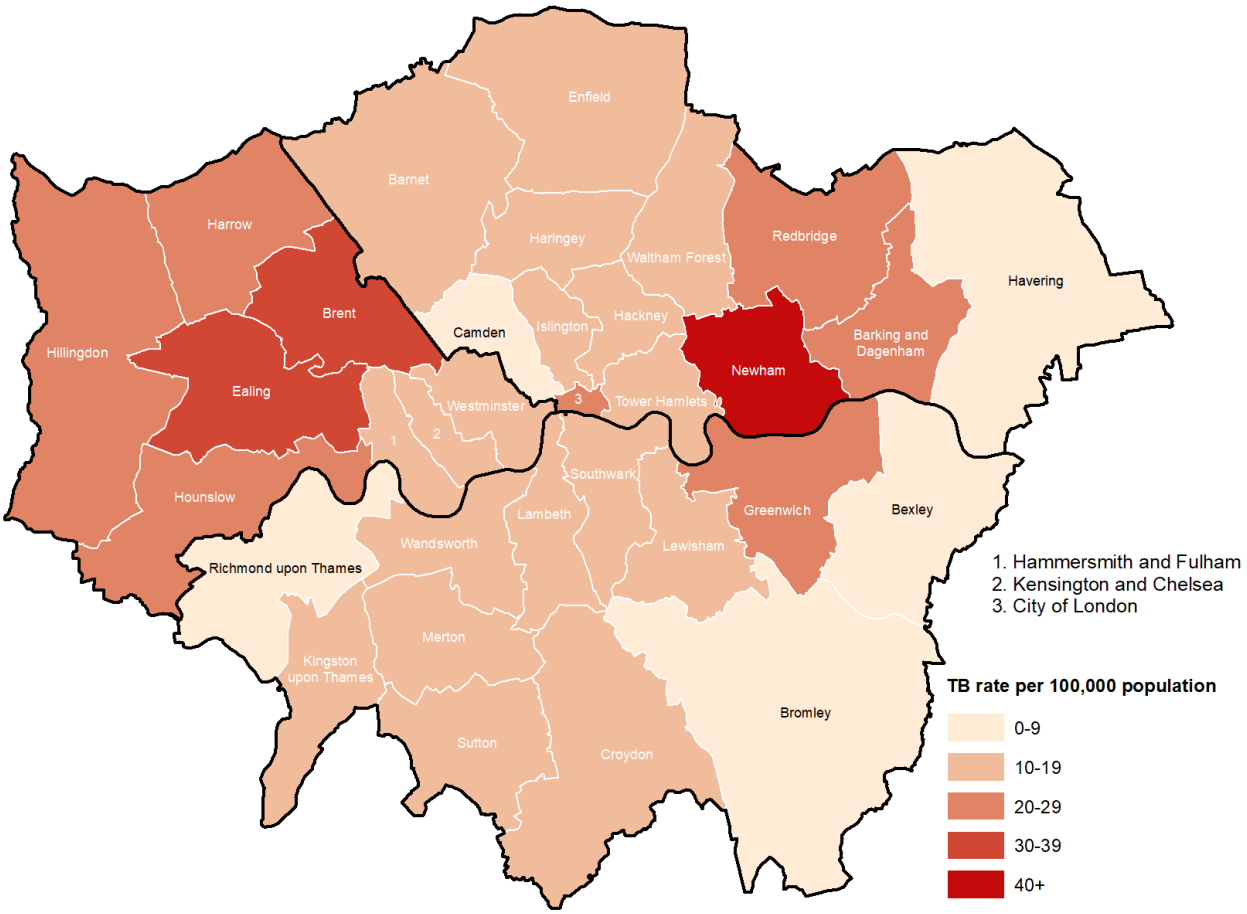
[1] Tuberculosis in England: 2018 (presenting data to end of 2017), Public Health England, prepared by: Tuberculosis Unit, National Infection Service
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742782/TB_Annual_Report_2018.pdf

Figure 2: TB case rates, by Health Protection Team of residence, London, 2000-2017



The London borough of Newham still had the highest rate of TB (47 per 100,000, 165 cases) and was the only borough with a rate above 40 per 100,000 in 2018 (Figure 3)

Figure 3: TB case rate by upper tier local authority of residence, London, 2018

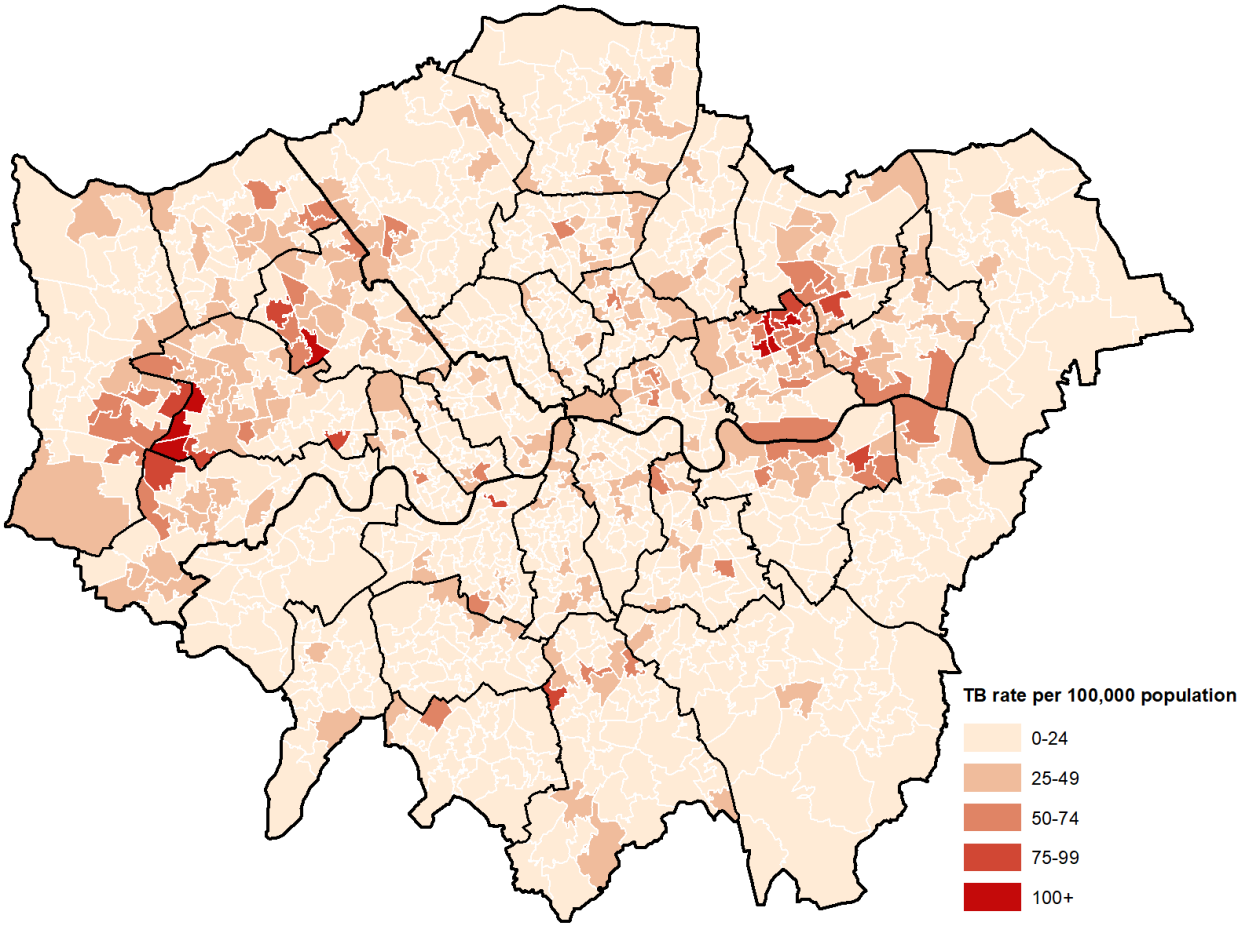


The second highest rate was in Ealing (38 per 100,000, 129 cases). Rates and case numbers were similar to last year in both these boroughs. There was a sharp decrease in the rate in Brent (from 46 to 33 per 100,000, 110 cases), which had the second highest rate in 2017.

Rates in most other boroughs continued to decline, particularly Camden (47%, from 17.4 in 2017 to 9.2 per 100,000 in 2018), Waltham Forest (42%, 29.0 to 17.0 per 100,000), Hammersmith and Fulham (42%, 18.6 to 10.8 per 100,000), Southwark (38%, 22.3 to 13.9 per 100,000), and Islington (32%, 17.9 to 12.1 per 100,000). There were some increased rates in lower-incidence boroughs, but these should be treated with caution due to small numbers (Appendix Cii).

At a higher geographical resolution, more variation was seen in the incidence of TB in London, such that high overall rates in boroughs, could be attributed to a relatively small number of very high incidence middle super output areas (Figure 4). This was particularly the case for Brent, Ealing, Redbridge, Newham and Hounslow.

Figure 4: TB case rate by Middle Super Output Area of residence, London, 2018



Demographic characteristics

Age and sex

The decline in case numbers since 2011 has been most pronounced in those aged 15 to 44 years (Figure 5). In 2018, 60% (1,016/1,691) of people with TB in London were male, and the rate was higher among males (22.8 per 100,000) than females (15.1 per 100,000). Among men, rates were close to 30 per 100,000 in all age groups above 30 years, except for the 50-59 age group (24.1 per 100,000) (Figure 6). Among women, rates were similar (just under 20 per 100,000) for all adults over 20 years up to 80 years or older.

Figure 5: TB case rates by age group, London, 2000-2018

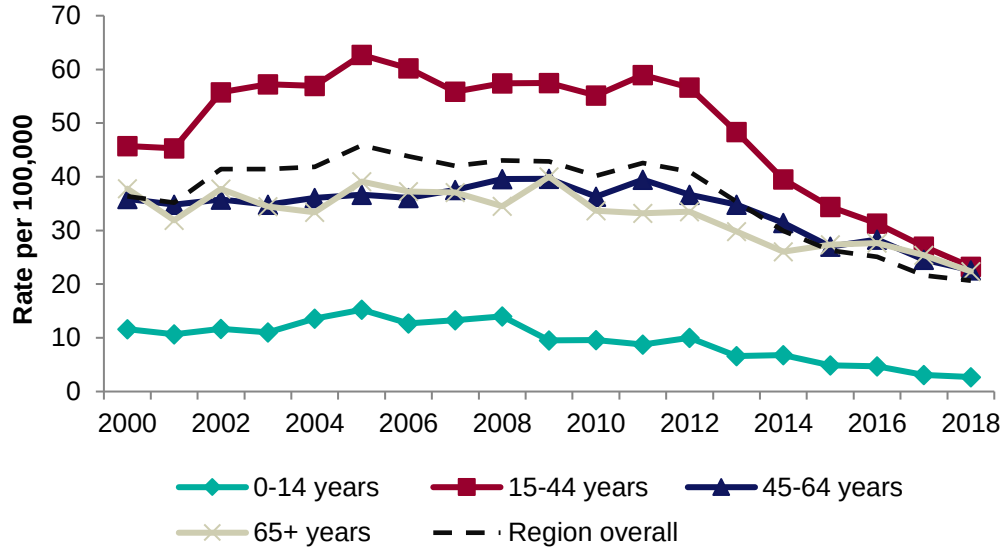
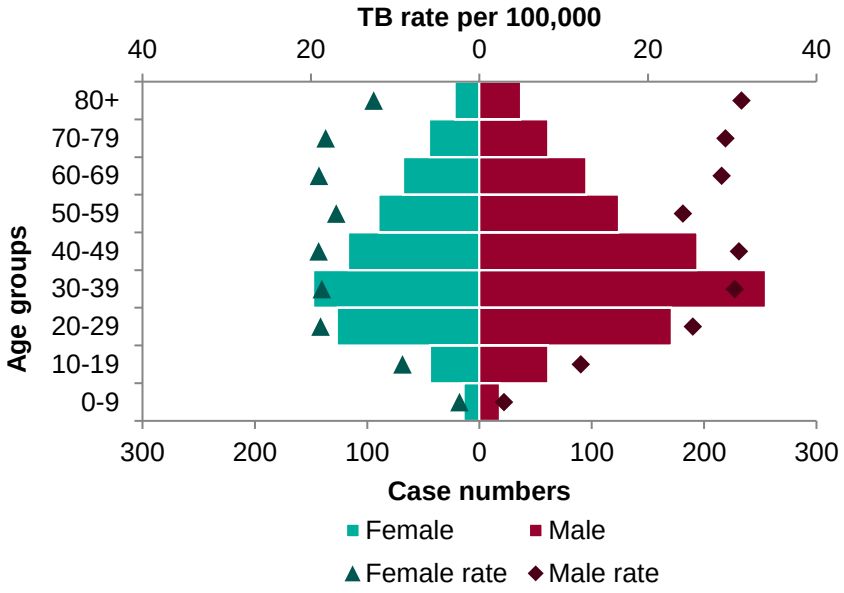


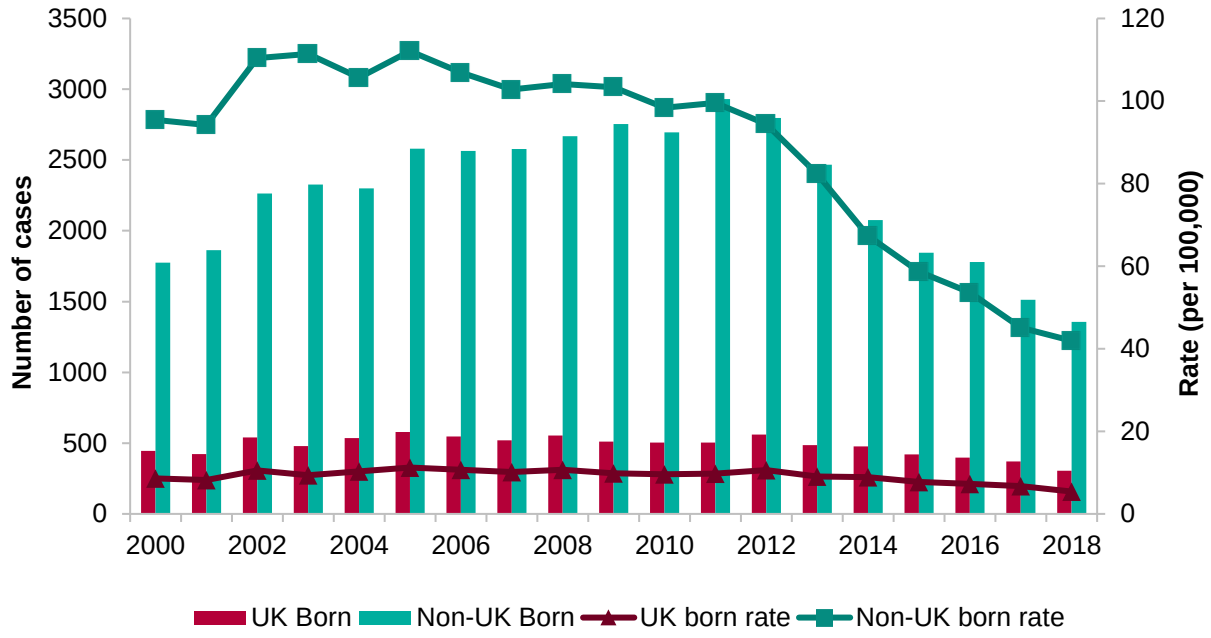
Figure 6: TB case reports and rate by age and sex, London, 2018



Place of birth and time since entry

In 2018, country of birth was known for 98% of people with TB (1,653/1,691). Overall, 82% (1,357/1,663) were born outside of the UK, similar to the proportion in 2017 (80%, 1,513/1,884). The proportion born abroad ranged from 41% in Bromley to 93% in Hounslow.

Figure 7: TB case reports and rate by place of birth, London, 2000-2018

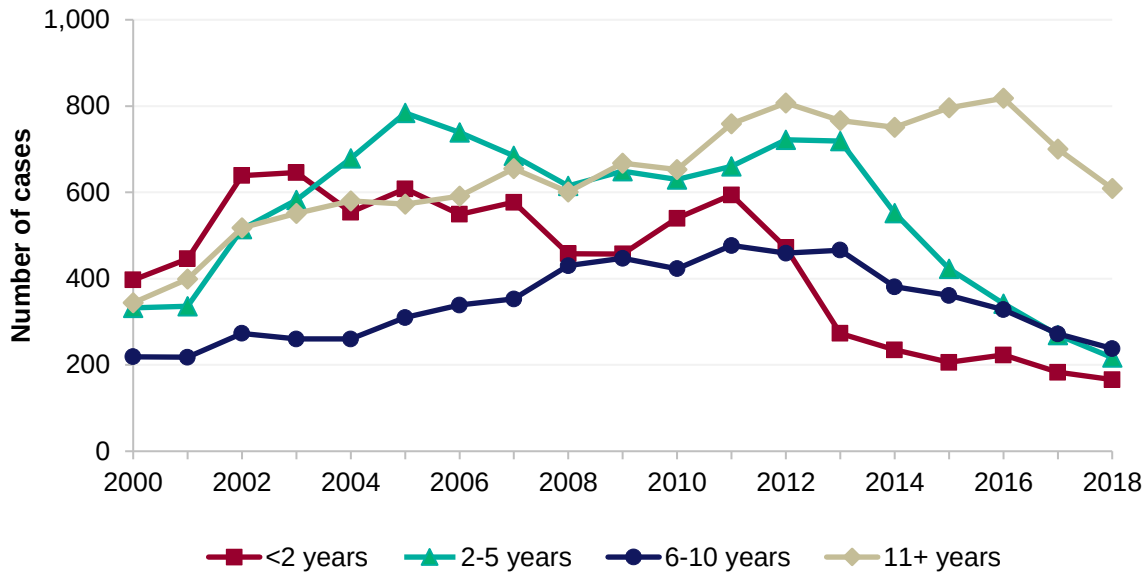


In 2018, the rate of TB among people born outside the UK was 41.9 per 100,000. This was the lowest rate observed since 2000, 7% decrease since 2017 (45.1 per 100,000), and a 58% decrease from 2011 (99.5 per 100,000).

There were 306 people with TB born in the UK notified in 2018, a rate of 5.4 per 100,000 population. This was the lowest rate since 2000, and a 19% decrease since 2017 (6.7 per 100,000), but still almost twice the rate for England.

In 2018, information on the time between entry to the UK and TB notification was available for 91% (1,230/1,357) of those born abroad. Numbers of new cases of TB continued to decrease in 2018 across all groups (Figure 8). The sharpest decrease was among people who had been in the UK for 11 or more years, although this was still by far the largest group, accounting for half of all people with TB born outside the UK (50%, 609/1320). There were similar numbers of people who had been in the UK between 2-5 years (217, 18%) and between 6-10 years (238, 19%). The smallest group was recent entrants who had been in the UK for less than 2 years (166, 13%).

Figure 8: Time between entry to the UK and TB notification for people born outside the UK, London, 2000-2018



As in previous years, India, Pakistan, Somalia, Bangladesh and Romania were the most common countries of birth for people born outside the UK (Table 1). Together, these countries were the place of origin of half (51%, 689/1,347) of people born outside the UK and 42% of all people with TB in London (689/1,653). The most common countries of birth in the non-UK born general population of London in 2018 were India, Bangladesh, Poland, Romania, and Italy.

India was the most common foreign country of birth in all Health Protection Team areas, but there were more UK born people with TB in South London and North East North Central London. The UK born proportion was highest in Bromley (59%, 10/17), Camden (46%, 11/24), Bexley (43%, 10/23), and Havering (41%, 9/22).

Table 1: 10 most common countries of birth outside the UK for people with TB and time between entry to the UK and TB notification, London, 2018

Country of birth	n	% of non-UK born patients	median years since entry (IQR)
India	334	24.8	9 (3 to 18)
Pakistan	120	8.9	12 (6 to 22)
Somalia	83	6.2	14 (9 to 20)
Bangladesh	77	5.7	10 (4 to 26)
Romania	75	5.6	3 (1 to 5)
Nigeria	51	3.8	13 (8 to 21)
Philippines	40	3.0	10.5 (3.5 to 17)
Sri Lanka	31	2.3	10 (4 to 17)
Eritrea	29	2.2	3 (0 to 14)
Kenya	29	2.2	38 (17.5 to 48.5)

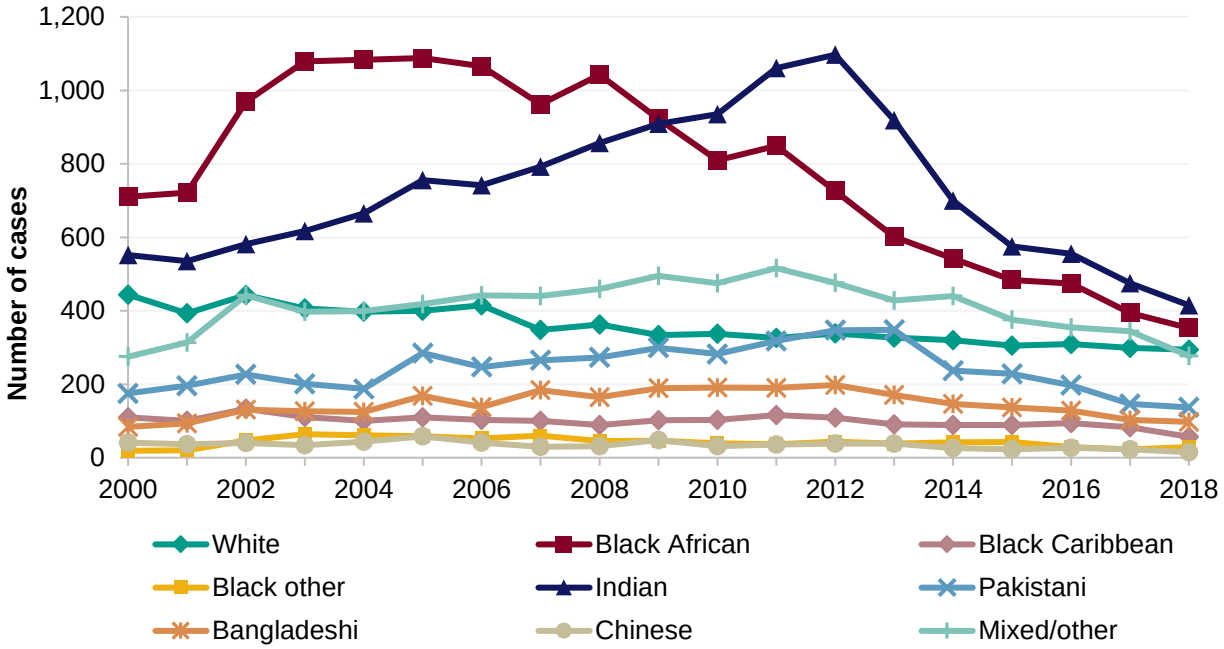
The median time since entry was 10 years (IQR 4-19), similar to 2017 but longer than any other year since 2000. Among common countries of birth, the median time since entry was shortest for people from Romania (3 years, IQR 1 to 5). Romania also had the highest proportion of recent entrants: 37% (24/65) had entered the UK less than a year before diagnosis.

Ethnicity

In 2018, 99% (1,675/1,691) of people with TB in London had their ethnicity recorded. The most common ethnicity was Indian, accounting for a quarter of all people with TB (25%, 415/1675). Most people with Indian ethnicity were born in India (82%, 332/403).

The second most common ethnic group was black African (21%, 353/1,675), among whom the most common countries of birth were Somalia (22%, 76/349), Nigeria (14%, 49/349), and the UK (14%, 48/349). The third most common ethnicity was white (18%, 294/1,675). The most common country of birth was the UK (43%, 125/292), followed by Romania (17%, 51/292). Among people of mixed/other ethnicity, the fourth largest group (18%, 277/1,675), the most common countries of birth were the Philippines (14%, 39/275) and Sri Lanka (10%, 27/275).

Figure 9: TB case numbers by ethnic group, London, 2000 to 2018



Occupation

In 2018, occupation was known for 92% (1,473/1,595) of people with TB aged 18 years or older (Table 2). Of these, 42% were not working: 46% (286/620) unemployed and 39% retired. Most healthcare workers (88%, 53) were born abroad. Most of those in education (85%, 82/97) were students, and most were also born abroad (67%, 65/97).

Table 2: Occupational category of people with TB aged 18 years and older, London, 2018

Occupation	n	%
Education	97	6.6
Healthcare	60	4.1
Social service/prison	<5	<1
Agricultural/animal care	<5	<1
Laboratory/pathology	<5	<1
Other	692	47.0
None	620	42.1
Total	**1473**	

Clinical characteristics

Site of disease

Like in recent years, just over half (54%, 908/1,691) of people notified with TB in 2018 had pulmonary disease (Table 3). Pulmonary TB was more common among children under 15 years (83%, 39/47 vs 53%, 870/1,644 among older people) and people born in the UK (67%, 204/306 vs. 51%, 691/1,357 among people born abroad). It was also more common among people of white ethnicity (77%, 225/294) than any other ethnic groups, especially South Asian ethnic groups (43%, 279/650 including Indian, Bangladeshi, and Pakistani). People with a social risk factor also had pulmonary TB more often (69%, 148/216) than those without (51%, 728/1,414).

Table 3: Number of people with TB by site of disease, London, 2018

Site of Disease	n	%
Pulmonary	908	54
Lymph nodes (extra-thoracic)	383	23
Lymph nodes (intra-thoracic)	237	14
Pleural	176	10
Other	163	10
Gastrointestinal/Peritoneal	84	5
Bone/Joint (spine)	67	4
Miliary	48	3
CNS (meningitis)	46	3
(Bone/Joint (other - not spine)	42	2
Genitourinary	37	2
CNS (Other - not meningitis)	35	2
Cryptic disseminated	15	1
Laryngeal	0	0
Total patients*	**1691**	

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

Previous history of tuberculosis

In 2018, data on previous diagnosis was available for 98% (1,660/1,691) of people with TB. As in recent years, a small number (5%, 88/1,660) was previously diagnosed with TB. The median time between diagnoses was 11 years (IQR 3-22). Having been diagnosed with TB before was more common among people born outside the UK 6%, 82/1,338) than those born in the UK (2%, 6/305).

Hospital inpatient

Data on whether people were hospital inpatients at the point of diagnosis was available for 98% (1,656/1,691) people with TB in 2018. Around a third (30%, 501/1,656) were hospital inpatients at the time of diagnosis.

The proportion was higher among men (35%, 351/993) compared to women (23%, 150/663) and among adults aged 65 years and older (41%, 93/228). Being an inpatient was more common among those with social risk factors (50%, 108/215 compared to 26%, 367/1,394 among those without any risk factors), one of the key co-morbidities (41%, 148/364 versus 27%, 353/1,292 without), or pulmonary TB (38%, 337/896 compared to 22%, 164/760 among people with extra-pulmonary disease only).

Directly observed therapy

Overall, one in 5 (19%, 327/1,689) of people notified with TB in 2018 were recorded as having received directly observed therapy (DOT) at some point during treatment. This proportion has increased from 11% (373/3,491) in 2011.

Half of children under the age of 15 (49%, 23/47) and people with social risk factors (50%, 109/216) received DOT. DOT was more common among those with resistance to at least one first-line drug (29%, 35/122, vs 21%, 185/901 among those with fully sensitive TB), and was used for 62% (8/13) of the people with multidrug-resistant TB (MDR-TB). DOT was also more common among UK born UK (25%, 78/306 compared to 18%, 245/1,356 among those born abroad), men (22%, 224/1,014 versus 15%, 103/675 among women), people with pulmonary TB (25%, 226/908 compared to 13%, 101/781 with extra-pulmonary disease only), and among people with one of the key comorbidities (28%, 102/369 versus 17%, 225/1,320 among those without).

Comorbidities

Data on selected key co-morbidities, diabetes, hepatitis B and C, chronic liver disease, chronic renal disease, and immunosuppression, has been routinely collected in London since 2016. People recorded as having any of these conditions are classified as having a comorbidity. If they are not listed as having any of these, they are classified as having no comorbidity, even if some of the data is missing. This is not the case for individual comorbidities.

In 2018, 22% (370/1,691) of people with TB were recorded as having at least one co-morbidity. The most common was diabetes, reported for 13% (213/1,645) of people with TB (Table 4), followed by immunosuppression (7%, 109/1,634).

Table 4: Co-morbidities among people with TB, London, 2018

Co-morbidity	n	%	Total
Diabetes	213	13%	1645
Hepatitis B	27	2%	1589
Hepatitis C	22	1%	1586
Chronic liver disease	27	2%	1640
Chronic renal disease	53	3%	1641
Immunosuppression	109	7%	1634

The prevalence of co-morbidities increased with age, with only 1 reported among children under 15 years, up to 46% (108/237) for people aged 65 years and older. People born abroad were more likely to have diabetes (15%, 200/1127) and chronic renal disease (3.8%, 50/1274).

People with social risk factors were more likely to have hepatitis C (5%, 10/202) and chronic liver disease (5.7%, 12/210).

2. Laboratory confirmation of TB

Laboratory tests data collection

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

Culture confirmation and speciation

In 2018 in London, 61% of people with TB had their diagnosis confirmed by culture 1,036/1,691), the same proportion as seen nationally. This was higher among those with pulmonary TB (75%, 685/909 vs. 45%, 351/782 of people with exclusively extra-pulmonary TB).

Of those people with TB who had a positive culture diagnosis, the vast majority had *Mycobacterium tuberculosis* (98%, 1,018/1,036), 14 had *M. africanum*, and 4 had *M. bovis*.

Of the 655 who did not have their diagnosis confirmed by culture, 31 had positive microscopy, 16 had positive a positive PCR result, and 7 had positive histology. In total, 30% (503/1,691) of the people who had TB in 2018 had no recorded laboratory evidence of TB, similar to previous years. The proportion without a recorded laboratory result was highest among those under 15 years old (66%, 31/47), those with extra-pulmonary TB (42%, 332/782 vs 19%, 171/ 909 among those with pulmonary disease), and those with no social risk factors (31%, 444/1,414 vs 19%, 42/ 216 among those with social risk factors).

Sputum smear

In 2018, sputum-smear results were known for 77% (701/909) of people with pulmonary TB, similar to recent years and the highest proportion recorded by any PHE Centre. Results were more likely to be known among people with a social risk factor (86%, 128/148) than those without (75%, 547/728), among people with first-line drug resistance (91%, 71/78) than those with fully sensitive TB (81%, 482/597). It was least likely to be known among children under 15 years (56%, 22/39).

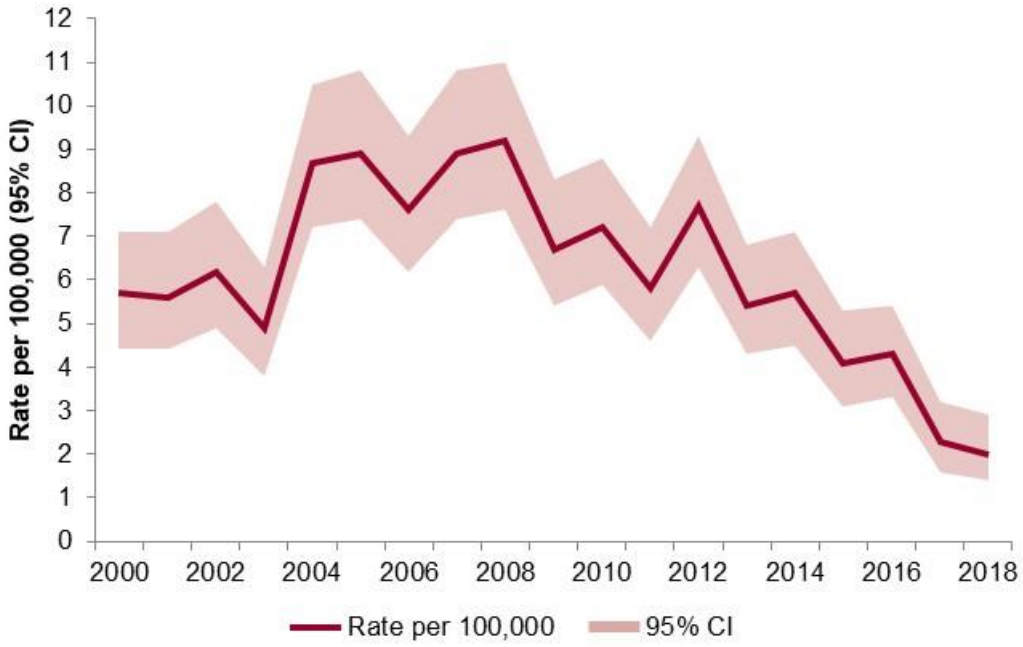
Where known, 51% (360/701) of people with pulmonary TB had sputum smear positive disease, similar to previous years.

3. TB transmission

Rate of TB in UK born children

TB in UK born children is used as a proxy indicator for recent TB transmission, since it is likely to be caused by recent exposure. In 2018, the rate of TB in UK born children under 15 years of age in London was 2.0 per 100,000 population (95% CI 1.4 to 2.9, 32 cases) compared to 1.2 per 100,000 in the UK in 2018. Small numbers mean year on year changes should be interpreted with caution, however these data indicate a decline in TB transmission in London over the last decade (Figure 10).

Figure 10: Rate of TB in UK born children under 15 years of age, London, 2000-2018



Whole Genome Sequencing (WGS) of Mycobacterium isolates

In January 2018 PHE began using whole genome sequencing (WGS) for routine TB speciation, drug resistance predictions and relatedness in London. People are assigned to a WGS cluster based on an isolate within 12 single nucleotide polymorphisms (SNPs) of another person in England, replacing the MIRU-VNTR[2] typing method used previously. During 2018 PHE London and the Field Service implemented a process to systematically collect and review TB relatedness information

[2] The National TB Strain Typing Service was established in 2010 to prospectively type TB isolates using 24 loci mycobacterial interspersed repetitive units - variable number tandem repeats (MIRU-VNTR)

to better understand TB transmission in London and identify where public health action may be applied to interrupt this. In May 2018, the Field Service began notifying TB services in London if someone they were treating was identified as being within 5 SNPs of another person.

Characteristics of people with TB in clusters in 2018

Of the 1,036 people with culture confirmed TB in 2018, 980 (94.6%) had a WGS result that could be used to report relatedness (based on sequencing coverage and quality). Of these a quarter (246/980) were identified as being within 12 SNPs of another person notified in England in 2018 and featured in 108 12 SNP clusters (Table 5). Note this is a more conservative definition of clustering than is used for routine reporting by PHE that includes clustering with all people within 12 SNPs regardless of year of notification.

One in 5 people with TB (20%, 199/980) were within 5 SNPs of another and 17% (168/980) were within 2 SNPs; over two thirds (168/246) of people with TB in London that were clustered were within 2 SNPs of a neighbour in 2018.

Table 5: Number and proportion of people with TB clustered using WGS by SNP distance and characteristics, London 2018

SNP cut off applied	Clustered		Non-UK born clustered		UK born clustered		Social risk factors[b] clustered		Isoniazid resistance		Number of clusters
	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n	%[a]	n
2 SNPs	168	16.9	120	15.0	46	26.4	36	23.4	22	22.2	73
5 SNPs	199	20.0	142	18.0	55	32.0	44	28.6	29	29.3	86
12 SNPs	246	25.1	174	21.7	69	39.7	53	34.4	36	36.4	108

[a] Denominator restricted to those with each characteristic

[b] One or more of history of drug use, homelessness, alcohol misuse or prison

People who were UK born or had one or more social risk factor were more likely to be clustered within 12 SNPs of another individual. In addition, people who had isoniazid resistant disease were also more often clustered.

4. Delay from onset of symptoms to start of treatment

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

Overall delay includes time from symptom onset to the people presenting to healthcare, and from the initial presentation to diagnosis and start of TB treatment. Information on delay was available for 90% (816/909) of people with pulmonary TB in 2018. No people were diagnosed post-mortem. The median time from symptom onset to start of treatment was 70 days (Table 6). This was 3 days shorter than in 2017 and 5 days shorter than the median of 75 (IQR 37-136) for England in 2018.

Table 6: Time between symptom onset and treatment start in people with pulmonary TB*, London, 2013-2018

	0-2 months		2-4 months		>4 months				Total
Year	n	%	n	%	n	%	Median days (IQR)		N
2013	500	45	323	29	278	25	65	(33 - 121)	1,101
2014	441	42	316	30	288	28	69	(35 - 129)	1,045
2015	462	46	304	30	240	24	67	(34 - 116)	1,006
2016	410	42	297	30	268	27	72	(36 - 129)	975
2017	355	41	281	32	234	27	73	(37 - 128)	870
2018	337	41	272	33	207	25	70	(35 - 122)	816

* Excluding asymptomatic individuals, and those with missing onset dates

The median delay was longest in North East North Central London (78 days, IQR 41-123), followed by North West London (70 days, IQR 35-124). The shortest delays were in South London (median 65 days, IQR 33-113), 9 days shorter than in 2017 (74 days, IQR 40-124).

Characteristics of people with pulmonary TB with a delay from onset of symptoms to treatment of more than 4 months

One in 4 London residents with TB had a delay of more than 4 months. As in recent years, older adults were more likely than other age groups to experience delays: 31% of adults over the age of 65 experienced a delay longer than 4 months. People with negative sputum smears were also more likely to experience delays (29%, 88/302 vs 18%, 59/325 among people with positive results). Delays were similar for males and females, those born abroad or in the UK, and those with and without a social risk factor.

5. TB outcomes in drug-sensitive cohort

Drug-sensitive cohort

For the purposes of reporting outcomes for people with TB, the drug-sensitive cohort is defined as all people notified with TB excluding those in the drug-resistant cohort (see Chapter 6). Under this definition, people with TB resistant to isoniazid, ethambutol and/or pyrazinamide but without resistance to rifampicin are included in the drug-sensitive cohort. Outcomes are reported according to year of notification.

Treatment outcomes for the drug-sensitive cohort are reported separately for:

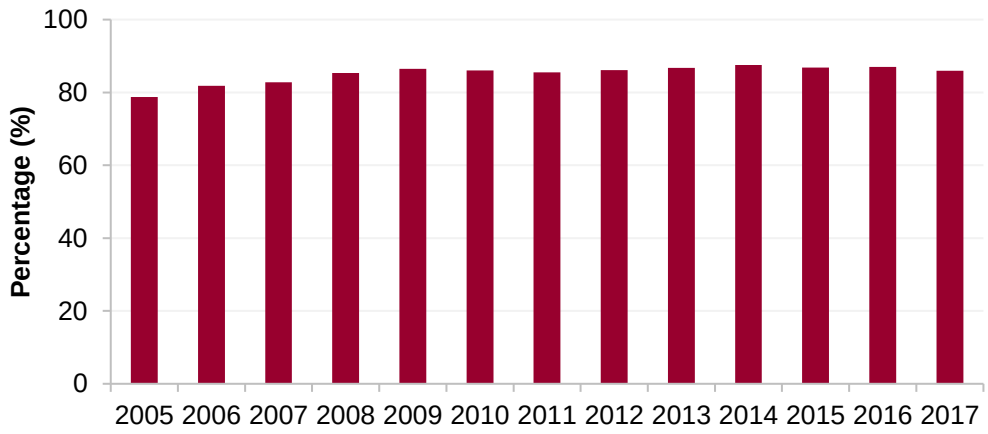
- people with TB with expected duration of treatment less than 12 months, outcomes at 12 months are reported - this excludes individuals with central nervous system (CNS) disease, who would be treated for 12 months. In addition, those with spinal, cryptic disseminated or miliary disease are also excluded,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

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

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

In 2017, 86%, (1,439/1,675) of those with rifampicin-sensitive TB (and without CNS, spinal, miliary or cryptic disseminated disease) completed treatment at 12 months.

Figure 11: Proportion completing treatment at 12 months, London, 2005-2017*



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

This was similar to that nationally (85%, 3,796/4,482). Among the 1,473 people for whom duration of treatment was known, the median treatment time was 185 days (IQR 181-239). The proportion completing treatment has remained stable for more than a decade (Figure 11).

The most common reasons for not completing were loss to follow-up (5%, 50/1,675) and still being on treatment (5%, 80/1,675), followed by death (3% 50/1,675) (Table 7). More information on deaths and loss to follow up is in section 3 of this chapter. Further information was available on 79 of the 80 people who were still on treatment at 12 months. Half (48%, 38/79) were on a planned treatment regime that exceeded 12 months (9 due to initial drug resistance), 30% (24/79) had their treatment changed, and 22% (17/79) were still on treatment due to treatment interruptions.

Table 7: TB outcome at 12 months for people diagnosed in London in 2018*

Outcome	n	%
Treatment completed	1,439	85.9
Lost to follow-up	81	4.8
Still on treatment	80	4.8
Died	50	3.0
Treatment stopped	15	0.9
Not evaluated	10	0.6
Total	**1,675**	

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

People aged 65 and older were less likely to complete treatment (73%, 165/225). More than half of those who didn't complete treatment (55%, 33/60) had died. Treatment completion was also lower among people with a social risk factor (76%, 135/178 vs 89%, 1,282/1,447 among those with no risk factors), the primary reason being loss to follow-up (54%, 23/43). People with one of the key comorbidities were also less likely to complete (76%, 248/325 vs 88%, 1,191/1,350 among those without). The most common reason in this group was death (39%, 30/77).

Outcomes for people with isoniazid-resistant TB

There were 79 people with isoniazid-resistant TB in the 2017 drug-sensitive cohort. This includes 11 with CNS, spinal, miliary or cryptic disseminated disease, and 68 without.

At 12 months, only half (51%, 40/79) of people with isoniazid resistance had completed treatment. There has been no clear trend in recent years. The most common reason for not having completed treatment was still being on treatment (29%, 23/79), followed by loss to follow-up (10%, 8/79). By the last recorded outcome, completion had increased to 71% (56/79), and 9% (7/79) were still on treatment.

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

Of the 215 people with CNS, spinal, miliary, or cryptic disseminated TB notified in 2017, 53% had completed treatment at 12 months (Table 8). The most common reason for not completing was still being on treatment, although by the last recorded outcome 73% (156) had completed, just below that seen nationally (75%, 392/526) and only 6% of people (13) were still on treatment. The next most common reason for not completing treatment was death (11%), and 7% were lost to follow up. For those who completed treatment, the median treatment time was 356 days (IQR 260-366).

Table 8: TB outcome at 12 months for people with rifampicin-sensitive, CNS, spinal, military, or cryptic disseminated diagnosed in London in 2016

Outcome at 12 months	n	%
Completed	115	53.5
Still on treatment	54	25.1
Died	24	11.2
Lost to follow-up	15	7.0
Treatment stopped	3	1.4
Not evaluated	4	1.9
Total	215	

Deaths and loss to follow-up in the drug-sensitive cohort

4% of people with rifampicin-sensitive disease (74/1,890) died before completing treatment, slightly below the national average (5.3%, 264/5,008). TB caused/contributed to 54% of these deaths (40/74); 19 deaths (26%) were not related to TB and information on whether TB was part of the reason for death was not known for the remaining 15 individuals (20%). None were diagnosed with TB post-mortem. The median age at death was 71 years (IQR 59-83). TB contributed to the death of 15 individuals under the age of 65. These were mostly born outside of the UK (11/14), most frequently from India (5 people). 3 people had a social risk factor. Deaths were more common among people aged 65 and older (18%, 47/261) and among people with one of the key comorbidities (11%, 45/392, vs 2%, 29/1,498 among those without).

5 % (96/1,890) of people with rifampicin-sensitive TB notified in 2017 were lost to follow-up within 12 months. For 36% of those lost to follow-up, the reason was recorded as having left the UK (35/96). People with a social risk factor were most likely to be lost to follow-up (14%, 28/206).

In addition, treatment was reported as stopped for 18 people. Of these, 12 were born abroad and 2 had a social risk factor. The median age was 61 (IQR 47-70). No further information on the reason for stopping was reported.

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

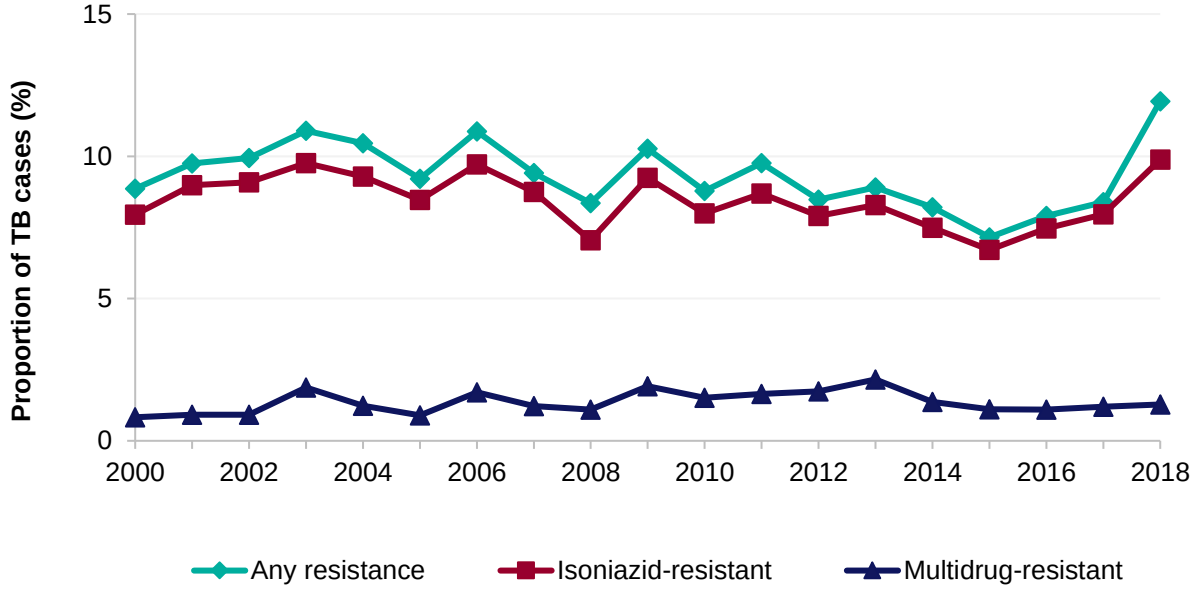
Drug resistance

Anti-TB antibiotic drugs are a large family and resistance may occur to 1 or more of these antibiotics and may be in complex combinations. A distinction is made between first, second and third-line TB antibiotic drugs depending upon their clinical effectiveness. First-line drugs include isoniazid, rifampicin, pyrazinamide and ethambutol. Second-line drugs are injectable agents (for example amikacin, capreomycin, kanamycin), fluoroquinolones (such as moxifloxacin, ofloxacin, ciprofloxacin) and other oral bacteriostatic agents. MDR-TB cases are initially resistant to at least isoniazid and rifampicin. Extensively drug-resistant TB cases (XDR-TB) are initially MDR and resistant to at least 1 injectable agent and at least 1 fluoroquinolone.

Overall initial drug resistance and geographical distribution

In 2018, resistance profiles were available for 99% (1,022/1,036) of culture-confirmed TB cases. The proportion of cases resistant to at least 1 first-line drug among people with culture-confirmed TB was 12% (122/1,022), the highest recorded since 2000 (Figure 12).

Figure 12: Proportion of TB cases with initial first-line drug resistance, London, 2000 to 2018



Most people with resistance to a first-line drug had resistance to isoniazid (83%, 101/122). Of the 21 people who did not have resistance to isoniazid, 16 had resistance to pyrazinamide, 3 to rifampicin, 2 to ethambutol.

There were no recorded cases of acquired drug resistance in 2018.

Characteristics of people with drug-resistant TB

Any first-line drug resistance

Drug resistance was more prevalent among people with a previous diagnosis of TB (18%, 8/44 vs 12%, 112/956 among those without). Among common ethnicities, there was the least resistance among people of Indian ethnicity (8%, 12/244), and most among people of mixed/other (15%, 26/173) and black African (14% 31/214) ethnicity. Drug resistance did not differ based on sex, social risk factors, comorbidities or site of disease.

Multidrug-resistance (MDR) and extensively drug-resistant (XDR) TB

Small numbers mean the following information should be interpreted with caution. In 2018, there were 13 people with MDR-TB (resistance to isoniazid and rifampicin), 1% of the 1,036 culture-confirmed cases of TB among London residents. 7 were also resistant to ethambutol, 5 to pyrazinamide, 5 to streptomycin, and 1 each to moxifloxacin, ofloxacin, and prothionamide. One person had XDR-TB, with resistance to isoniazid, rifampicin, ethambutol, pyrazinamide, streptomycin, moxifloxacin, and ofloxacin.

Ages ranged from 15 to 83 years, 7 were female, and 12 were born abroad, including 3 each in India, the Philippines, and Somalia. Their time since entry to the UK ranged from 0 to 48 years. 3 were known to have been treated for TB previously. One was reported as having a social risk factor (alcohol misuse).

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

Of the 16 people in the rifampicin-resistant TB cohort notified in 2016, 12 had completed treatment at 24 months, while the others were either still on treatment or not evaluated. At the last known outcome, 14 people had completed treatment, 1 was still on treatment, and 1 had died.

7. TB in under-served populations

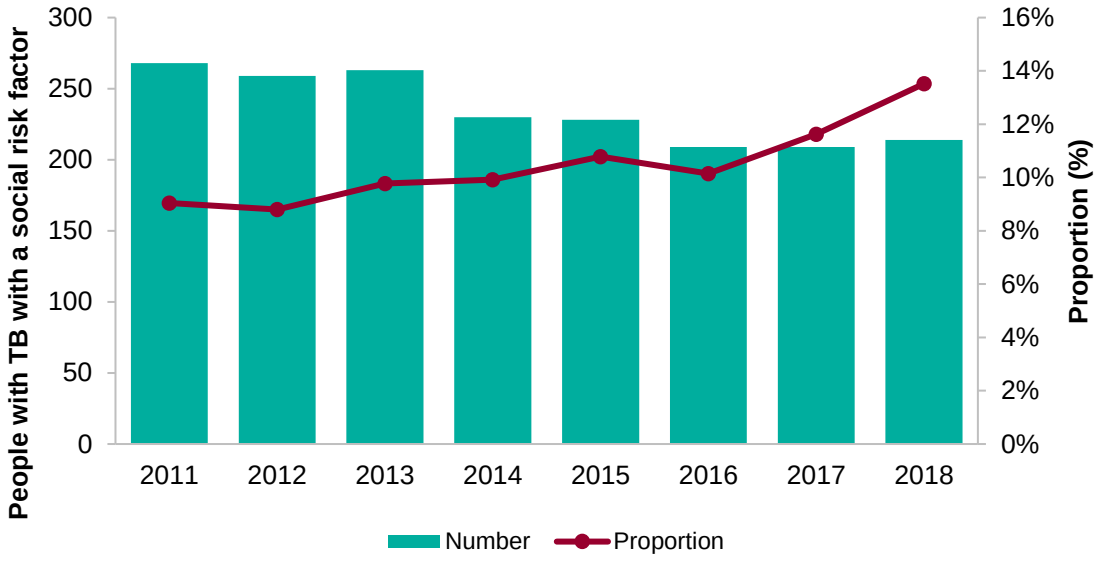
Social risk factors

In this chapter, social risk factors (defined as current or previous history of homelessness, drug use or imprisonment, or current alcohol misuse) are described for people with TB aged 15 years or over.

In 2018, 14% (214/1,583) of people with TB resident in London who were aged over 15 years old had at least one social risk factor. The prevalence of risk factors has increased since 2011, especially in the past 2 years (10%, 209/2,060 in 2010).

The most common social risk factors in 2018 were alcohol misuse (6%, 90/1,595), followed by homelessness (5%, 84/1,597), drug misuse (5%, 81/1,586), and history of imprisonment (4%, 61/1,585). Of those with at least one social risk factor, 33% (70/214) experienced multiple.

Figure 13: Social risk factors among people with TB, London, 2011-2018



Consistent with recent years, people born in the UK were more likely to have experienced a social risk factor (20%, 53/269) than those born abroad (12%, 159/1,302). Among common countries of birth outside the UK, risk factors were most prevalent among people born in Poland (50%, 13/26), Eritrea (46%, 13/28), Romania (19%, 14/72), and Somalia (18%, 14/80).

Risk factors were more common among men (19%, 185/951) than women (5%, 29/632). Almost all of the increase since 2011 has been among men, while prevalence

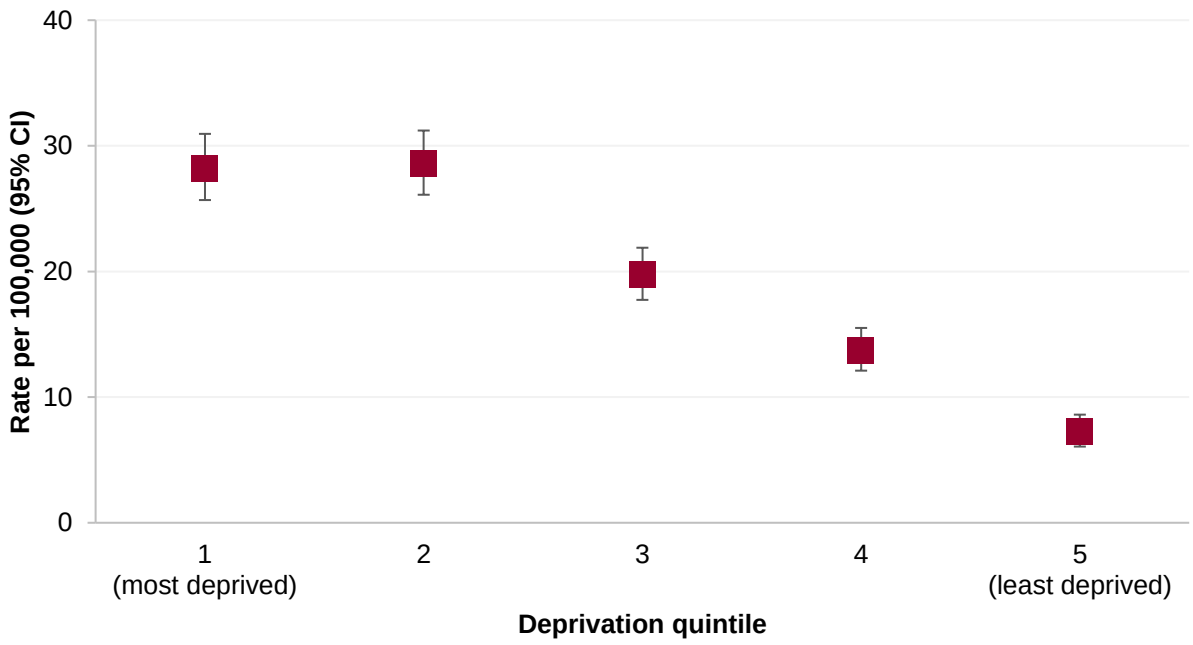
among women has remained stable. They were also more prevalent among people of white ethnicity (25%, 68/275) than people of other ethnicities (11%, 145/1,303), and among people with pulmonary TB (17%, 146/837) than those with exclusively extra-pulmonary disease (9%, 68/746).

People with TB who experienced social risk factors were more likely to have infectious disease (defined as having sputum-smear positive pulmonary TB): 41% (87/214), compared to those with no social risk factors (19%, 254/1,369).

Deprivation

Deprivation was assessed using the 2015 Index of Multiple Deprivation. In 2018, more than half of all people with TB were resident in the 2 most deprived quintiles of London (55%, 944/1,691) (Figure 14). Rates were also highest in these 2 quintiles (28 and 29 per 100,000, respectively). The rate progressively decreased along with decreasing deprivation, reaching 7.3 per 100,000 in the least deprived quintile.

Figure 14: TB case rate by deprivation, London, 2018



8. TB-HIV co-infection and HIV testing of people with TB

HIV testing

Of the 1,691 people with TB notified in 2018, HIV status was already known for 63. Of the remaining 1,628, information on HIV testing was available for 98% (1,609). Of these, 97% (1,558) were offered and received testing; higher than the national figure of 95%. A further 2% (26) were offered but did not receive testing, and 1 person refused testing. The proportion not offered testing was 2% (24). Children under 15 were less likely to be offered HIV testing (83%, 38/46).

TB-HIV co-infection rates

The latest available information on TB-HIV co-infection for notified adults 15 years and older, estimated that 2.9% (48) of people with TB in London in 2018 were co-infected with HIV.[3] This was similar to recent years, and remains considerably lower than the highest estimate of 10% in 2003.

For England in 2017, only 2.7% of people with TB were co-infected with HIV, the lowest since the peak of 8.4% in 2004, with an increase in the median age of people with co-infection (from 34 in 2001 to 46 in 2018).

[3] Tuberculosis in England: 2018 (presenting data to end of 2017), Public Health England, prepared by: Tuberculosis Unit, National Infection Service
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742782/TB_Annual_Report_2018.pdf

9. BCG

BCG vaccination status of people with TB

BCG immunisation is recommended for people at higher risk of exposure to TB, particularly to protect against serious forms of disease in infants.

Information on BCG vaccination was available for 81% (1,376/1,691) of London residents notified in 2018, of whom 65% (895) were vaccinated (Table 9), lower than previous years (72% in 2017). Consistent with previous years, a higher proportion of non-UK born cases had been vaccinated.

Table 9: BCG vaccination coverage among people with TB, London, 2018

	< 5 years old			< 15 years old			All ages		
	n	N	%	n	N	%	n	N	%
UK born	8	18	44%	15	29	52%	155	246	63%
Non-UK born	2	2	100%	9	12	75%	735	1123	65%
All cases*	**10**	**20**	**50%**	**25**	**42**	**60%**	**895**	**1376**	**65%**

* Including missing place of birth

Of the 22 children aged less than 5 years old with TB, 20 were UK born and only 10 were vaccinated. Of the 10 UK born not vaccinated, 4 were white, 1 was black African, 1 black Caribbean, 1 Indian, 1 Pakistani, 1 black-other and 1 was of mixed/other ethnicity. One had CNS disease (not meningitis) and none had miliary disease.

Discussion

TB rates in London continue to decline, having dropped by more than half the number notified since the peak in 2011. Rates decreased both among people born abroad and those born in the UK.

Most cases still occurred among people born in the Indian sub-continent, although most of these had been in the UK for a very long time before diagnosis. People with TB from East and Central Europe were more likely to have recently arrived in the UK.

People with TB frequently have complex medical and social needs. Almost 1 in 3 had one of either the key social risk factors or co-morbidities (32%, 533). Diabetes was particularly common, affecting 13% of all people with TB in London in 2018. People with social risk factors continue to have worse outcomes, being less likely to complete treatment.

London maintained excellent levels of HIV testing among people with TB, and shorter delays from symptom onset to start of treatment than the national average.

Increasing isoniazid resistance is of concern, although multi-drug resistant disease remains at low levels. This highlights the importance of obtaining culture confirmation: rates were still low, only 61% of all people with TB (and 75% of those with pulmonary disease) had a culture result.

Rates of clustering were higher among people who were UK born, had one or more social risk factor and among those with isoniazid resistant disease, indicating recent transmission is occurring among these groups in London.

A continued focus on early diagnosis and support through treatment, particularly for people with social risk factors, must therefore remain a priority for successful TB control in London.

Conclusion and recommendations

In conclusion, it is encouraging that TB rates in London continue to decline and are now at to their lowest level since 2000. However, 1 in 3 people with TB in London have either a social risk factor or key co-morbidity. This medical and social complexity provides significant challenges to TB control and the achievement of TB elimination in England by 2035.

Recommendations

Further reductions in TB in London will require:

- work to reduce diagnostic delay and ensure a prompt start of appropriate treatment, as well as ongoing work to ensure completion of treatment
- robust contact tracing and further development of WGS cluster investigation to interrupt transmission
- prioritisation of work to improve outcomes for underserved populations and people with drug resistant TB

The Cohort Review process provides a critical forum for local oversight of these key aspects of TB control

TB networks should ensure Cohort review and MDR cohort review continue to play a vital role in quality assurance of TB case and contact management with identification and escalation of issues to TB control board

The TB Control Board working with TB Networks will need to consider changing epidemiology and case mix to ensure appropriate service provision.

Appendix A: Notes on the report

About the Field Service

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

Intended audience

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

Aim of report

This report describes the recent epidemiology of TB in London. It includes local trends, areas and population groups with a high burden of disease, and detail on the care of people with TB.

Further TB information

The national report of TB in England www.gov.uk/government/publications/tuberculosis-in-england-annual-report.

Official Statistic for TB www.gov.uk/government/collections/tuberculosis-and-other-mycobacterial-diseases-diagnosis-screening-management-and-data.

TB Strategy Monitoring Indicators Collaborative TB Strategy for England 2015-2020 www.gov.uk/government/uploads/system/uploads/attachment_data/file/403231/Collaborative_TB_Strategy_for_England_2015_2020_.pdf).

TB indicators at Upper Tier Local Authority and Clinical Commissioning Group level http://fingertips.phe.org.uk/profile/tb-monitoring

Appendix B: Description of data sources and definitions

Data sources

This report is based on TB case notifications made to the PHE Enhanced TB Surveillance system (ETS) and London TB Register in England to the end of 2018. This information is updated annually to take into account denotifications (if the patient was found not to have TB), late notifications and other updates. The data presented in this report supersedes data in previous reports.

Diagnostic laboratories serving acute hospitals are the first place in which TB infection-related samples are received and processed within the pathway of clinical diagnosis and management of suspected TB. Results for microscopy, polymerase chain reaction (PCR), histology and culture are collected in ETS. The National Mycobacterium Reference Service (NMRS) receives these diagnostic materials and undertake characterisation using culture and molecular diagnostic methods to define species of *Mycobacterium*, TB antibiotic (drug) susceptibility and organism relatedness.

Definitions

BCG	Bacillus Calmette-Guérin vaccination
CI	Confidence interval
CCG	Clinical Commissioning Group
Cluster	2 or more people notified within the time period of analysis caused by indistinguishable strains, with at least 23 complete MIRU-VNTR loci
CNS	Central nervous system
Cohort review	The systematic review of all people with TB notified by a TB service in a 3-4 month period, looking at standard outcomes in terms of care and contacts tracing
Cryptic disseminated TB	Systemic illness without localising features
DOT	Directly observed treatment

Drug	In the context of TB control, a drug is an anti-TB antibiotic
Drug-resistant cohort	The drug-resistant cohort includes any people with rifampicin-resistant TB (initial or acquired), including MDR-TB (initial or acquired), as well as those without culture confirmation treated with an MDR-TB regimen
Drug-sensitive cohort	The drug-sensitive cohort excludes all people with rifampicin-resistant TB (initial or acquired) including MDR-TB (initial or acquired), and non-culture confirmed treated with an MDR-TB regimen
DST	Drug sensitivity testing, based on phenotypic analysis of cultured TB isolates
ETS	Enhanced TB surveillance system
First-line drug resistance	First-line anti-TB antibiotic drug resistance is defined as resistance to at least one of the first-line antibiotics (isoniazid, rifampicin, ethambutol, pyrazinamide)
HAART	Highly active antiretroviral therapy
IGRA	Interferon-gamma release assay – blood test for TB infection which does not differentiate between active disease and LTBI
IMD 2015	The Index of Multiple Deprivation 2010 rank for each LSOA, based on deprivation score assigned, relative to other LSOAs
IQR	Interquartile range
LSOA	Lower super output area (geographic definition)
LTBI	Latent TB infection
MDR	Multidrug-resistance: cases initially resistant to at least isoniazid and rifampicin
Miliary TB	TB infection spread via the bloodstream to all parts of the body
MIRU-VNTR	Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats
PCR	Polymerase chain reaction

Post-mortem diagnosis	A post-mortem diagnosis is defined as where TB was not suspected before death, but a TB diagnosis was made at post-mortem, with pathological and/or microbiological findings consistent with active TB that would have warranted anti-TB treatment if discovered before death
Pulmonary TB	A pulmonary case is defined as involving the lungs and/or tracheobronchial tree, with or without extra-pulmonary TB diagnosis. In this report, in line with the WHO's recommendation and international reporting definitions, miliary TB is classified as pulmonary TB due to the presence of lesions in the lungs
Second-line drugs	Second-line drugs include injectable agents (for example amikacin, capreomycin, kanamycin), fluoroquinolones (for example moxifloxacin, ofloxacin, ciprofloxacin) and other oral bacteriostatic agents.
SNP	Single nucleotide polymorphism – mutation of one base pair in the genome of an *M. tuberculosis complex* isolate
TB	Tuberculosis
UTLA	Upper tier local authority (geographic definition)
VOT	Video observed therapy
WGS	Whole genome sequencing
XDR	Extensive drug resistance: cases initially MDR and resistant to at least one injectable agent (amikacin, capreomycin or kanamycin) and at least one fluoroquinolone (moxifloxacin, ofloxacin or ciprofloxacin)

Treatment outcome

Information on outcomes were reported for all people notified in the previous year, excluding those with known rifampicin-resistant disease: outcomes for these were reported at 24 months. Definitions for outcome are based on World Health Organization (WHO) and European definitions but adapted to the UK context. In this report, all data was obtained from the ETS matched dataset provided in July 2019.

Proportions

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

Confidence intervals

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

Population denominator

TB rates by geographical area, age, sex and place of birth were calculated using ONS mid-year population estimates. TB rates by ethnic group were calculated using population estimates from the Labour Force Survey (www.esds.ac.uk/findingData/qlfs.asp). This is based on a population sample, so estimates are liable to sampling errors, particularly for small population subgroups, and should be interpreted with caution.

Appendix C: TB among London residents

Table Ci: TB case numbers by upper tier local authority of residence, London 2000-2018

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Barking and Dagenham	39	29	35	41	43	60	49	62	69	72	69	61	65	71	67	42	65	53	55
Barnet	87	77	103	102	93	116	124	104	113	105	115	98	111	73	73	74	74	64	58
Camden	65	86	118	108	77	101	96	90	85	100	69	70	62	45	43	37	50	44	24
Enfield	79	90	84	98	95	103	100	72	100	116	95	75	79	68	68	70	66	54	62
Hackney & City of London	132	126	147	157	157	130	135	142	124	118	94	91	89	88	74	61	69	63	57
Haringey	134	147	139	128	150	130	155	93	104	132	100	134	100	86	76	64	73	59	45
Havering	31	16	20	13	12	30	23	16	20	30	13	18	27	28	24	23	25	30	25
Islington	87	78	105	94	86	86	96	93	93	91	63	82	69	63	59	48	42	42	29
Newham	244	203	219	245	241	256	261	277	283	309	301	370	367	334	252	248	188	163	165
Redbridge	88	83	92	111	109	120	144	135	162	147	137	161	154	150	130	113	124	109	90
Tower Hamlets	88	64	126	148	118	128	132	153	132	139	153	140	120	100	93	82	90	66	60
Waltham Forest	90	66	106	100	99	114	120	91	129	92	114	122	123	119	86	99	85	81	47
North East North Central London	**1164**	**1065**	**1294**	**1345**	**1280**	**1374**	**1435**	**1328**	**1414**	**1451**	**1323**	**1422**	**1366**	**1225**	**1045**	**961**	**951**	**828**	**717**
Brent	221	225	214	216	229	283	240	274	305	297	295	311	308	281	204	166	191	149	110
Ealing	214	185	201	186	254	237	233	236	198	219	207	242	246	213	210	160	118	129	129
Hammersmith and Fulham	83	67	73	66	70	89	80	67	67	73	53	68	46	48	36	40	34	32	20
Harrow	93	95	118	115	99	132	123	122	125	135	138	153	184	151	111	83	92	83	62
Hillingdon	70	91	106	115	117	137	124	124	151	121	125	130	139	101	122	98	87	66	74
Hounslow	81	121	119	102	115	167	134	134	134	170	197	181	190	162	152	111	119	89	71
Kensington and Chelsea	46	40	32	51	48	47	53	32	52	50	36	47	33	35	36	21	21	29	21
Westminster	90	77	76	91	85	95	84	85	69	81	62	67	53	59	52	37	39	37	32
North West London	**898**	**901**	**939**	**942**	**1017**	**1187**	**1071**	**1074**	**1101**	**1146**	**1113**	**1199**	**1199**	**1050**	**923**	**716**	**701**	**614**	**519**
Bexley	14	17	22	25	30	22	19	26	21	17	20	35	25	33	17	19	30	34	24
Bromley	23	16	27	31	29	29	41	33	19	32	34	42	29	30	18	24	22	23	18
Greenwich	49	68	81	72	88	87	98	104	138	121	119	111	131	105	97	92	62	68	68
Lambeth	107	125	158	156	126	144	134	104	126	117	114	97	98	76	77	62	58	49	52
Lewisham	60	68	96	80	77	98	84	100	82	73	73	106	84	70	69	63	63	49	53
Southwark	84	96	106	100	132	136	125	103	117	95	95	118	115	92	76	79	79	68	44
South East London	**337**	**390**	**490**	**464**	**482**	**516**	**501**	**470**	**503**	**455**	**455**	**509**	**482**	**406**	**354**	**339**	**314**	**291**	**259**
Croydon	96	96	109	113	118	113	102	115	111	124	110	132	120	109	79	90	84	71	68
Kingston upon Thames	11	14	20	20	22	28	25	29	29	31	37	30	28	25	26	21	11	6	18
Merton	43	31	55	41	62	61	66	57	63	61	54	64	72	60	47	51	46	35	26
Richmond upon Thames	9	11	16	11	12	19	20	14	13	20	16	16	13	12	9	14	11	10	14
Sutton	11	17	32	31	24	25	28	32	18	30	33	32	29	25	24	22	26	15	24
Wandsworth	63	49	100	96	94	125	80	115	110	84	100	87	92	63	48	63	52	49	46
South West London	**233**	**218**	**332**	**312**	**332**	**371**	**321**	**362**	**344**	**350**	**350**	**361**	**354**	**294**	**233**	**261**	**230**	**186**	**196**
London	**2632**	**2574**	**3055**	**3063**	**3111**	**3448**	**3328**	**3234**	**3362**	**3402**	**3241**	**3491**	**3401**	**2975**	**2555**	**2277**	**2196**	**1919**	**1691**

Table Cii: TB rate* per 100,000 by local authority of residence, London, 2000-2018

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Barking and Dagenham	23.8	17.5	21.0	24.7	26.0	36.1	29.3	36.7	40.0	40.5	37.7	32.6	34.1	36.5	33.7	20.7	31.2	25.2	25.9
Barnet	27.6	24.1	32.1	31.7	28.7	35.4	37.5	31.1	33.3	30.4	32.7	27.4	30.5	19.8	19.5	19.5	19.2	16.5	14.8
Camden	33.1	42.5	57.9	52.9	37.1	47.8	45.5	42.5	40.4	47.0	32.1	31.8	27.6	19.5	18.2	15.2	20.1	17.4	9.2
Enfield	28.7	32.5	29.9	34.8	33.7	36.2	34.8	24.7	33.6	38.4	30.9	23.9	24.9	21.2	21.0	21.3	19.9	16.2	18.6
Hackney & City of London	62.7	58.7	67.4	71.5	71.1	58.1	59.4	61.2	52.0	48.3	37.7	35.7	34.4	33.4	27.5	22.2	24.6	22.2	19.8
Haringey	61.0	66.4	61.9	56.9	66.2	56.7	66.5	39.3	42.5	52.8	39.6	52.4	38.8	32.9	28.7	23.9	26.8	21.8	16.6
Havering	13.8	7.1	8.9	5.8	5.3	13.2	10.1	7.0	8.6	12.8	5.5	7.6	11.3	11.6	9.8	9.2	9.9	11.7	9.7
Islington	48.9	43.5	58.3	52.0	47.6	46.9	51.8	49.3	48.4	46.3	31.5	39.8	32.7	29.2	26.6	21.1	18.1	17.9	12.1
Newham	99.4	81.4	85.8	95.6	94.7	100.9	101.2	104.0	102.4	107.9	100.6	119.2	116.0	103.9	76.8	73.8	54.6	46.8	46.9
Redbridge	36.7	34.3	37.7	44.9	43.8	47.7	56.3	51.9	61.0	54.4	49.8	57.2	54.1	51.9	44.2	37.9	41.2	36.1	29.6
Tower Hamlets	44.6	31.8	60.9	70.9	55.9	60.0	60.4	67.9	56.9	57.8	61.6	54.7	45.5	36.5	32.7	27.9	29.9	21.4	18.9
Waltham Forest	40.7	29.7	47.4	44.6	44.0	50.3	52.0	38.6	53.3	37.1	44.9	47.0	46.9	44.8	32.1	36.6	31.0	29.4	17.0
North East North Central London	**43.3**	**39.2**	**47.0**	**48.7**	**46.2**	**49.1**	**50.6**	**46.1**	**48.1**	**48.2**	**43.1**	**45.3**	**42.8**	**37.8**	**31.6**	**28.7**	**27.9**	**23.3**	**20.4**
Brent	83.4	83.5	79.3	80.5	85.3	104.5	86.8	96.7	104.8	99.6	96.8	99.6	97.9	88.6	63.7	51.3	58.5	45.3	33.3
Ealing	70.3	60.2	65.0	60.4	81.9	75.8	73.9	74.1	61.1	66.4	62.0	71.3	72.3	62.3	61.2	46.5	34.2	37.6	37.7
Hammersmith and Fulham	50.5	39.6	42.4	38.5	40.7	51.4	45.8	38.0	37.8	40.5	29.3	37.3	25.3	26.5	19.8	22.0	18.7	17.5	10.8
Harrow	44.5	45.2	55.6	53.8	45.8	59.7	55.0	53.9	54.5	57.8	58.1	63.6	76.0	62.1	45.3	33.6	37.0	33.3	24.8
Hillingdon	28.5	37.0	42.9	46.4	47.0	54.5	48.7	48.3	57.8	45.5	46.4	47.2	49.4	35.3	41.9	33.1	29.0	21.8	24.3
Hounslow	37.7	56.0	54.9	47.1	52.4	74.6	58.7	57.4	56.3	69.9	79.0	71.0	73.5	62.0	57.6	41.7	44.4	33.1	26.2
Kensington and Chelsea	29.7	24.7	19.5	30.9	29.0	27.9	32.1	19.6	32.0	30.9	22.4	29.7	21.0	22.3	22.8	13.2	13.4	18.6	13.4
Westminster	45.8	37.9	36.5	43.1	39.6	42.6	37.7	38.5	31.6	37.3	28.5	30.5	23.7	26.2	22.6	15.5	16.1	15.1	12.5
North West London	**51.2**	**50.5**	**52.2**	**52.3**	**56.0**	**64.3**	**57.6**	**57.2**	**57.9**	**59.4**	**57.0**	**60.5**	**60.1**	**52.1**	**45.4**	**34.5**	**33.9**	**29.6**	**24.8**
Bexley	6.4	7.8	10.0	11.4	13.6	9.9	8.5	11.6	9.3	7.5	8.7	15.0	10.7	13.9	7.1	7.8	12.2	13.8	9.7
Bromley	7.8	5.4	9.1	10.4	9.8	9.7	13.6	10.9	6.2	10.4	11.0	13.5	9.2	9.4	5.6	7.4	6.7	7.0	5.4
Greenwich	22.9	31.3	36.6	32.1	38.7	37.7	41.9	44.0	57.6	49.7	47.8	43.4	50.4	39.8	36.1	33.5	22.2	24.0	23.8
Lambeth	39.6	45.7	57.9	57.3	45.9	51.9	47.8	36.5	43.6	39.8	38.3	31.9	31.7	24.3	24.3	19.3	18.0	15.1	16.0
Lewisham	23.8	26.7	37.8	31.8	30.5	38.4	32.6	38.3	30.8	27.0	26.8	38.3	29.9	24.6	23.8	21.4	21.1	16.3	17.5
Southwark	33.2	37.4	41.4	39.2	51.3	51.9	46.7	37.8	42.2	33.8	33.5	40.9	39.2	30.8	25.1	25.6	25.3	21.6	13.9
South East London	**22.4**	**25.7**	**32.2**	**30.5**	**31.5**	**33.4**	**32.0**	**29.7**	**31.4**	**28.0**	**27.7**	**30.5**	**28.6**	**23.6**	**20.3**	**18.8**	**12.7**	**16.2**	**14.3**
Croydon	28.7	28.6	32.5	33.6	35.0	33.3	30.0	33.4	31.8	35.2	30.7	36.2	32.5	29.2	21.0	23.7	21.9	18.4	17.6
Kingston upon Thames	7.5	9.4	13.4	13.4	14.6	18.4	16.3	18.8	18.6	19.7	23.3	18.7	17.2	15.1	15.4	12.2	6.3	3.4	10.3
Merton	22.8	16.2	28.9	21.7	32.8	32.0	34.3	29.3	32.2	30.8	27.1	31.9	35.6	29.5	23.0	24.8	22.3	17.0	12.6
Richmond upon Thames	5.2	6.3	9.1	6.2	6.7	10.5	11.0	7.7	7.1	10.8	8.6	8.5	6.9	6.3	4.7	7.2	5.6	5.1	7.1
Sutton	6.1	9.4	17.7	17.1	13.3	13.7	15.3	17.4	9.7	15.9	17.4	16.7	15.0	12.8	12.1	11.0	12.9	7.4	11.7
Wandsworth	23.5	18.0	36.4	34.7	33.7	44.1	27.8	39.5	37.4	28.1	33.0	28.3	29.7	20.1	15.2	19.7	16.2	15.2	14.1
South West London	**18.0**	**16.7**	**25.4**	**23.8**	**25.2**	**27.9**	**24.0**	**26.8**	**25.2**	**25.4**	**25.1**	**25.6**	**24.9**	**20.3**	**16.0**	**17.5**	**15.1**	**12.5**	**13.1**
London	**36.4**	**35.2**	**41.4**	**41.4**	**41.9**	**45.9**	**43.8**	**42.0**	**43.0**	**42.8**	**40.2**	**42.6**	**41.0**	**35.3**	**29.9**	**26.2**	**24.2**	**21.7**	**19.0**

* Rates calculated using ONS mid-year population estimates

Table Ciii: TB case numbers and rate* by age and sex, London, 2018

Age Group	Female		Male	
	n	rate	n	rate
0-9	14	2.4	18	2.9
10-19	44	9.1	61	12.0
20-29	127	18.9	171	25.3
30-39	148	18.7	255	30.3
40-49	117	19.1	194	30.8
50-59	90	17.0	124	24.1
60-69	68	19.0	95	28.7
70-79	45	18.2	61	29.2
80+	22	12.6	37	31.1

* Rates calculated using ONS mid-year population estimates

Table Civ: Drug resistance among people with culture confirmed TB*, London, 2000-2018

	Any first-line resistance		Isoniazid resistance		Multidrug resistance		Total*
	n	%	n	%	n	%	
2000	107	8.9	96	7.9	10	0.8	1,208
2001	127	9.7	117	9.0	12	0.9	1,303
2002	173	9.9	158	9.1	16	0.9	1,740
2003	192	10.9	172	9.8	33	1.9	1,762
2004	187	10.5	166	9.3	22	1.2	1,788
2005	186	9.2	171	8.5	18	0.9	2,020
2006	217	10.9	194	9.7	34	1.7	1,996
2007	170	9.4	158	8.7	22	1.2	1,806
2008	160	8.4	135	7.0	21	1.1	1,916
2009	192	10.3	173	9.2	36	1.9	1,871
2010	168	8.8	153	8.0	29	1.5	1,913
2011	201	9.8	179	8.7	34	1.7	2,059
2012	176	8.5	164	7.9	36	1.7	2,076
2013	157	8.9	146	8.3	38	2.2	1,762
2014	126	8.2	115	7.5	21	1.4	1,536
2015	97	7.2	91	6.7	15	1.1	1,356
2016	108	7.9	102	7.5	15	1.1	1,367
2017	98	8.4	93	8.0	14	1.2	1,169
2018	122	11.9	101	9.9	13	1.3	1,022

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