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Tuberculosis in the South East Centre: Annual review (2016 data)

Data from 2000 to 2016

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Published: November 2017
PHE publications
gateway number: 2017606

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About the Field Epidemiology Service

The Field Epidemiology Service (FES) supports Public Health England (PHE) Centres and partner organisations through the application of epidemiological methods to inform public health action. FES does this in 2 main ways. Firstly, by providing a flexible expert resource, available as and when needed to undertake epidemiological investigations for key health protection work. Secondly, through the expert analysis, interpretation and dissemination of surveillance information to PHE Centres, local health partners, service providers and commissioners of services.

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The data presented in this report are correct as at March 2017.

Acknowledgements

We are grateful to all those who contribute information on tuberculosis cases in the South East of England, including nurses, physicians, microbiologists, scientists, outreach and social care and administrative staff. We also acknowledge colleagues at the National Mycobacterium Reference Service (South) for information on culture confirmation and drug susceptibility testing. Further thanks are due to the National Centre for Infectious Disease Surveillance and Control for matching the clinical and laboratory information, the South East Centre Health Protection Teams and the Field Epidemiology South East and London team for their work supporting Enhanced Tuberculosis Surveillance.

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Suggested citation

Public Health England. (2017) Tuberculosis in the South East Centre: Annual review (2016 data), 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. In particular we aim to update the South TB Control Board.

Aim of report

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

Data sources

This report presents detailed data on TB case notifications made to the Enhanced Tuberculosis Surveillance system (ETS) in England to the end of 2016. Data from notifications made to ETS from 2000 are updated annually to take into account denotifications, late notifications and other updates. The data presented in the current year's report supersedes data in previous reports.

Cases in England are notified to the Enhanced Tuberculosis Surveillance system (ETS). Only cases resident in South East England, or those that are homeless or from abroad and assigned to a clinic in South East 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.

Detailed information on surveillance data, including matching to reference laboratory data and HIV datasets, and LTBI screening data, is included in the national report www.gov.uk/government/uploads/system/uploads/attachment_data/file/654152/TB_Annual_Report_2017.pdf

Other data displays

The national report presenting recent epidemiology of TB in England is available at: www.gov.uk/government/publications/tuberculosis-in-england-annual-report. Additional high-level data on TB notifications in the UK to the end of 2016, and breakdowns by country, can be found in the Official Statistic for TB, 'Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: United Kingdom, 2000 to 2015'. This is available at: www.gov.uk/government/statistics/reports-of-cases-of-tb-to-uk-enhanced-tuberculosis-surveillance-systems.

Data for indicators presented at Upper Tier Local Authority and Clinical Commissioning Group can be found at: http://fingertips.phe.org.uk/profile/tb-monitoring.

Executive summary

In 2016, 567 cases of tuberculosis (TB) were notified among South East of England residents, a rate of 6.5 per 100,000 population. This was a 5% decrease from the rate in 2015, and a 33% decrease from the peak of 9.7 per 100,000 in 2011. The rate remains below the England average of 10.2 per 100,000 population, with very few cases occurring across most of the South East.

As in 2015, the decrease in 2016 was driven by a reduction in cases among residents of Thames Valley, although rates remain highest in this area, particularly in Slough and Reading. Case numbers and rates elsewhere had little change. The decrease was also among adults aged 20 to 39, with little change in rates among other age groups.

Cases among the non-UK born had decreased steadily 2011 to 2015. Initially, mostly, among very recent entrants (arrived less than 2 years before diagnosis) and from 2013 to 2015 mostly among those who had arrived 2-5 years previously. However, in 2016, an increasing number and proportion of TB patients were born outside the UK, particularly in Kent and Surrey and Sussex, although rates remained stable due to an increasing population of non-UK born residents. In 2016, 40% of all non-UK born patients had been in the UK long term (11 or more years) before diagnosis.

India, Pakistan and Nepal were the place of origin of nearly half of non-UK born patients, with the number from these countries similar in 2016 to 2015.

TB rates fell among the UK born population, and were lower than those in the UK born population of England overall. The rate of TB in UK born children in the South East, 0.9 per 100,000 population, was half the national rate. However, 7 cases of TB were still notified among UK born children aged under 5 during 2016.

Overall in the South East the most common ethnic group was white (28%), although this decreased compared to 2015. The next most common ethnic group was mixed/other (26%), which increased in 2016 compared to 2015 due to a rise in patients born in the Philippines.

Similar to recent years, just over half of TB patients in 2016 had pulmonary disease, with extra-thoracic lymph node TB the next most common site. In 2016, 67% of cases were culture confirmed. This was higher among those with pulmonary TB (80% compared to 53% of patients with exclusively extra-pulmonary TB). Only 23% of cases

in 2016 were clustered within the South East and the majority of these clusters were small (57% had only 2 cases).

The median time symptomatic for pulmonary patients was 84 days, a decrease of 1 week from 2015 but still 1 week longer than in England overall (77 days). This varied across the South East, and was longest in residents of Surrey and Sussex health protection team area.

Treatment completion at 12 months for those with rifampicin-sensitive and non-CNS, spinal, miliary or cryptic disseminated disease, decreased to 82% for patients notified in 2015. Treatment completion was lower among residents of Kent and Hampshire and Isle of Wight health protection team areas. Completion was also lower among men, those over 70 and also those born in the UK, particularly among the UK born of white ethnicity.

Death was the most common reason for not completing treatment (9%). TB was reported to have caused or contributed to over a third of these deaths (37%), been incidental to 21% but had an unknown relationship to the remaining 42%. 12 cases were diagnosed post-mortem. The median age at death was 75 years, but TB contributed to or caused the death of 5 individuals under the age of 59. 4 of these were white and UK born.

The trend in drug resistance varied across the South East, but small numbers mean trends should be interpreted with caution. Numbers of multi-drug resistant (MDR) disease remain very small, and in 2016 all MDR-TB cases occurred in patients born abroad.

The number and proportion of patients with social risk factors reduced in 2016 compared to 2015, particularly in Surrey and Sussex and Hampshire and Isle of Wight. This reflected a reduction in the number with a history of homelessness, drug or alcohol misuse recorded, while the proportion with history of imprisonment increased. Social risk factors were more common among the UK born, and those of white ethnicity. Patients with these risk factors were more likely to be infectious, be a hospital inpatient and were less likely to complete treatment.

While the offer and testing of HIV among TB patients continues to increase, there are still a high proportion of patients missing this information. Co-infection estimates have decreased from a peak in 2003, but increased slightly in 2014/2015 compared to between 2011 and 2013.

In conclusion, TB rates remain very low across most of the South East, and continue to decline. However, small areas of higher incidence remain. The majority of cases occur among those born outside the UK, within a wide range of ethnic groups and ages. The above average delays in starting treatment, and fall in proportion completing treatment are of concern, as this risks further transmission and development of drug resistance.

Recommendations:

- results of reviews into the delays experienced by South East residents should be shared and reviewed by the South TB Control Board and TB networks

- The South TB Control Board should continue to prioritise and work with wider stakeholders to develop strategies to improve outcomes for under-served populations

- continued support by NHS, PHE and allied services of cohort review as the tool to quality assure TB case and contact management according to national guidance. Issues and themes identified at cohort reviews across the South East to be reported to the South TB Control Board in a systematic way. Particular attention should be paid to delays and treatment outcomes

- TB staff in the South East should engage in the combined London and South East MDR-TB cohort review, and ensure the BTS MDR advisory service is notified and used to support care for all MDR cases

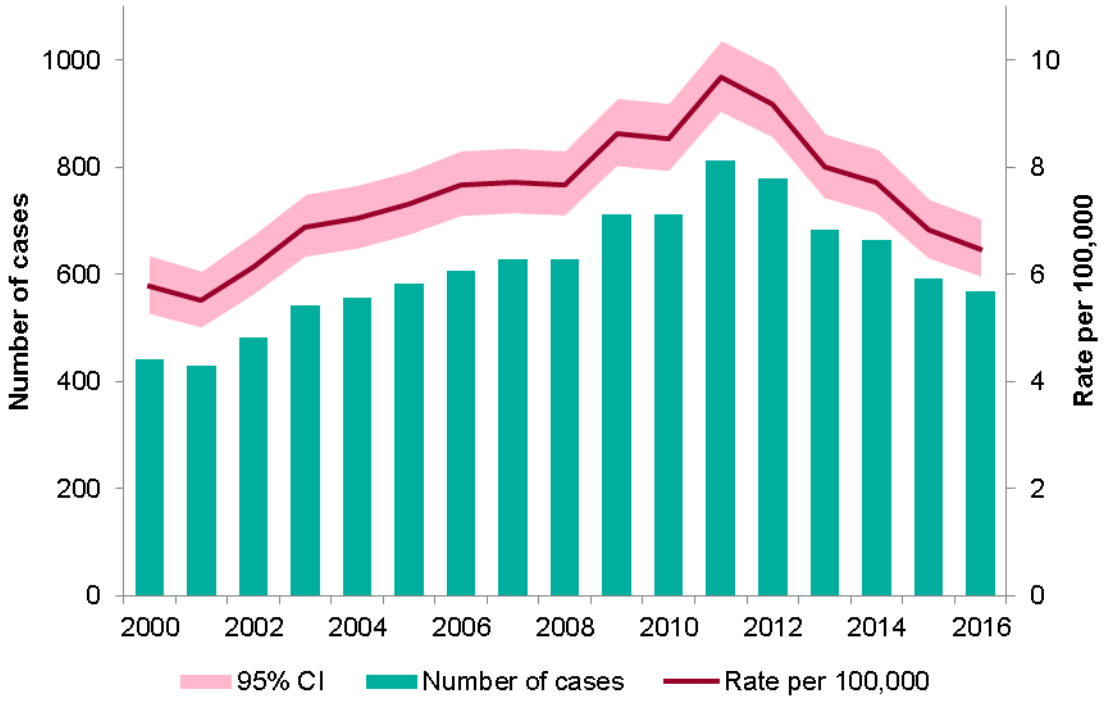
1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2016, 567 cases of tuberculosis (TB) were notified among South East of England residents, a rate of 6.5 per 100,000 population. This was a 5% decrease from the rate in 2015, and a 33% decrease from the peak of 9.7 per 100,000 in 2011, which followed a decade of increasing case numbers and rates (Figure 1).

Out of the 9 PHE Centres, the South East had the third lowest TB notification rate (below the England average of 10.2 per 100,000 population) and accounted for 10% of the 5,664 TB cases in England. [1]

Figure 1: TB case notifications and rate, South East, 2000 to 2016

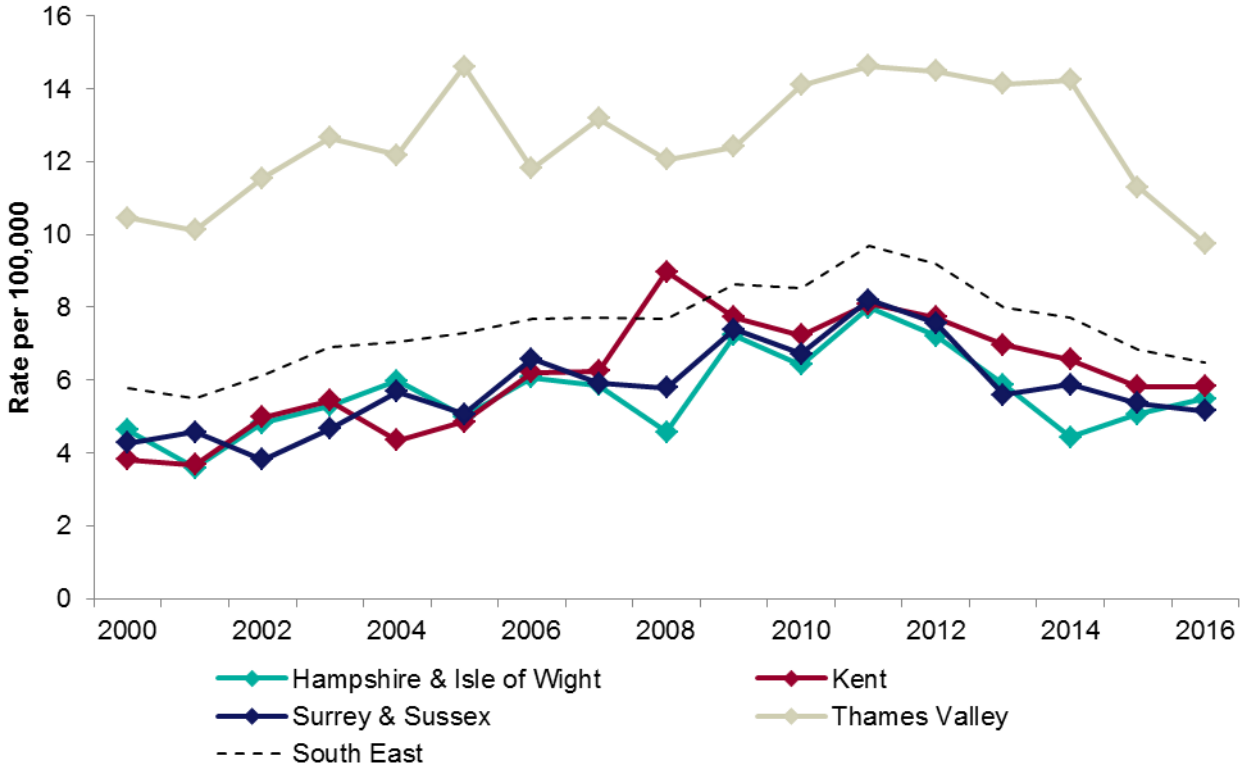


There was substantial geographic variation in the rate of notifications, with very few cases occurring across most of the South East (Figure 3).

As in previous years, numbers and rates were higher among residents of Thames Valley compared to those of other PHE health protection team areas. However, rates in Thames Valley decreased by 14% compared to 2015. This was the second year of a marked decrease since rates stabilised at 14 per 100,000 population in 2010.

Relative to 2015, rates remained stable in Kent and Surrey and Sussex. Rates increased for the second year in Hampshire and Isle of Wight, but numbers remain low. Overall, rates have decreased in all health protection team areas since the peak in the South East in 2011.

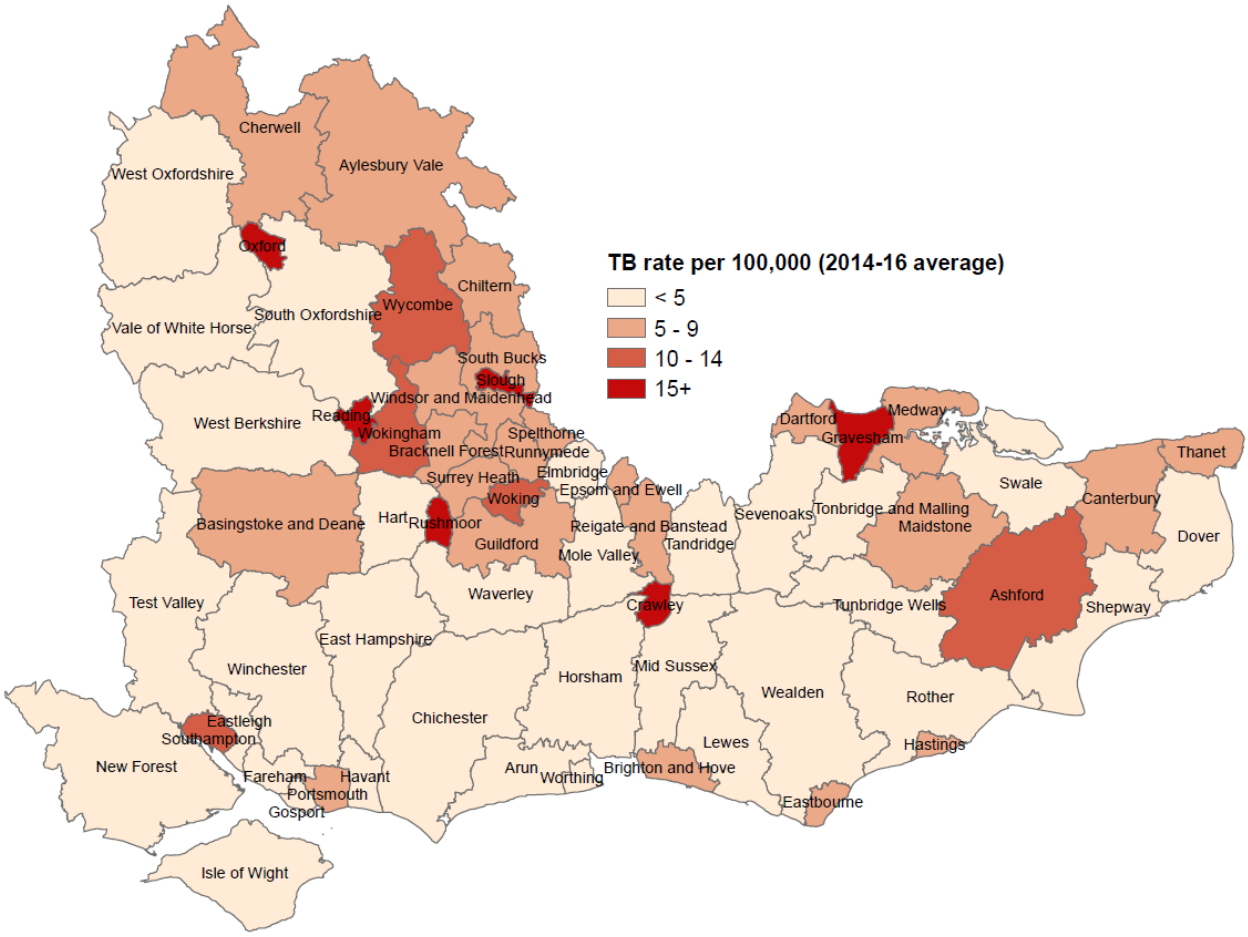
Figure 2: TB case rate by health protection team area of residence, South East, 2000 to 2016



In 2016, as in previous years, residents of Slough experienced the highest burden of TB disease (54 cases, 37 per 100,000) of all upper tier or unitary authorities. However, this did represent a 25% decrease relative to 2015. At 17 per 100,000 population, the second highest rate of TB disease was among residents of Reading, but this was a 27% decrease from the rate in 2015. With the exception of Southampton (34 cases, 13.4 per 100,000), TB notification rates in all other upper tier or unitary local authorities were below the national average of 10.2 per 100,000 population in 2016.

Residents of Slough (41 per 100,000) and Reading (27 per 100,000) also reported the highest three-year average TB rates (Figure 3). These were followed by the lower tier local authority areas of Rushmoor in Hampshire (21 per 100,000), Oxford in Thames Valley (17 per 100,000), Gravesham in Kent (17 per 100,000), and Crawley in Sussex (17 per 100,000).

Figure 3: Three-year average TB case rate by unitary or lower tier local authority of residence, South East, 2014 to 2016



Demographic characteristics

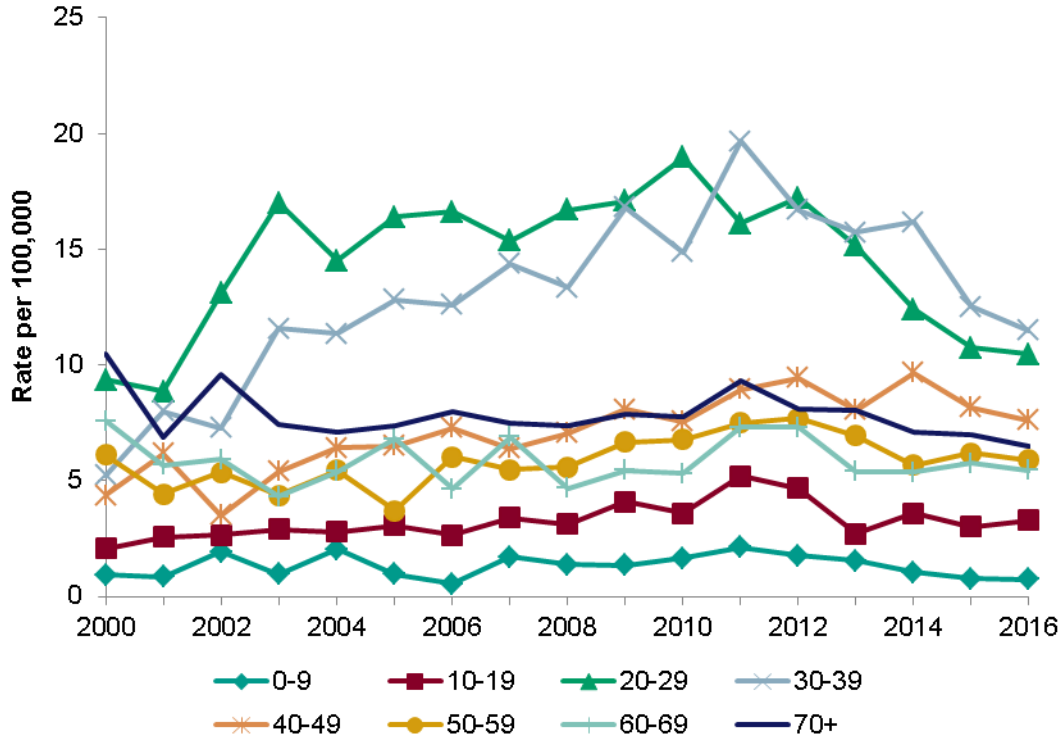
Age and sex

In 2016, 55% (309) of TB patients were male. Rates were slightly higher among men than women (7 per 100,000 vs 6 per 100,000) as seen in previous years.

TB notification rates among men were highest in the 30 to 39 year age group, while rates among women were highest in the 20 to 29 year age group (Figure 4). Rates in these age groups have decreased since approximately 2011, while rates remained lower and stable in all other age groups (Figure 5).

Figure 4: TB case reports and rate by age and sex, South East, 2016

Figure 5: TB case rates by age group, South East, 2000 to 2016

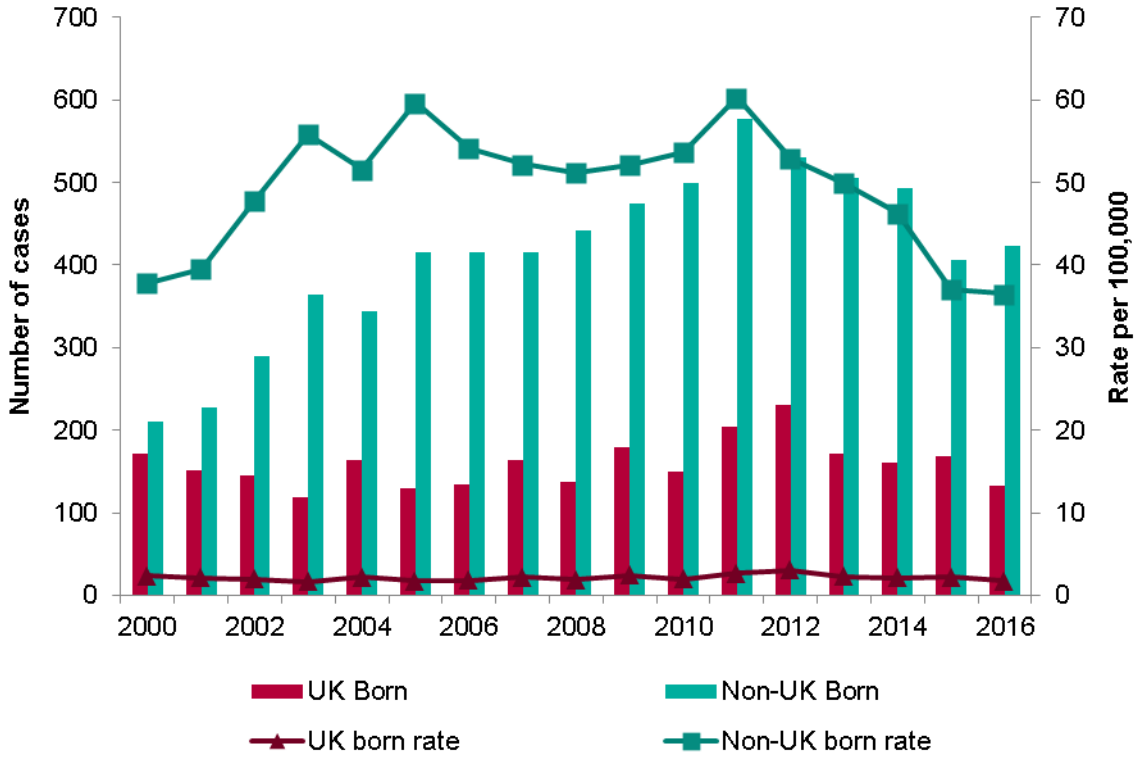


In 2016, 14 children under the age of 15 were notified in the South East, a small increase compared to 2015 (12). All but 1 of these patients were UK born. 7 cases of TB were notified in children aged less than 5 years. All were UK born of different ethnicities. Of these, 5 had not received BCG vaccination, 1 of whom had meningitis and miliary disease.

Place of birth and time since entry

In 2016, country of birth was known for 98% of patients (553/567). Of the 14 without known country of birth, 3 were known to be born outside of the UK. Overall, 76% (424/556) were born outside of the UK, which was greater than the proportion observed in 2015 (70%). This reflected an increase in the number and proportion born abroad in Kent (61%, 62/102 in 2015 to 73%, 75/103 in 2016), Surrey and Sussex (63%, 88/139 in 2015 to 72%, 104/144 in 2016). In addition, although the overall number decreased, the proportion born abroad in Thames Valley increased (76%, 180/236 in 2015 to 81%, 165/204 in 2016). The number and proportion in Hampshire and Isle of Wight (76%, 80/105 in 2016) was similar to 2015 (78%, 74/95). Similar to previous years, in the highest incidence areas of Slough and Reading, more than 85% of patients were born outside the UK.

Figure 6: TB case reports and rate by place of birth, South East, 2000 to 2016



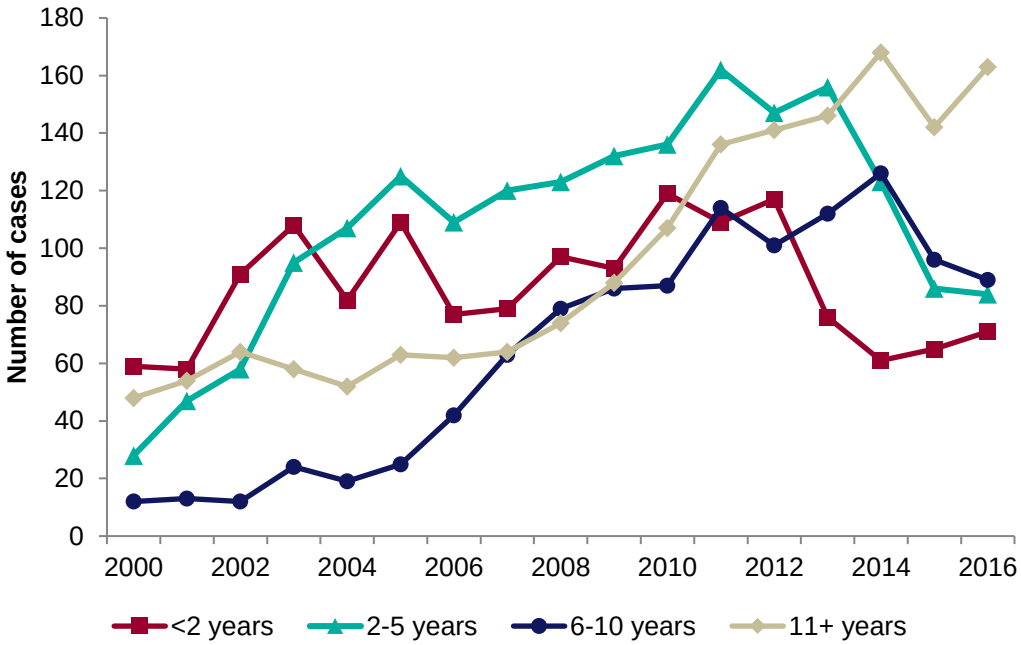
After a large decline from 2011 to 2015, the number of diagnoses among the non-UK born population increased for the first time, but this reflects an increase in the size of the non-UK born population, as the rate was similar to the rate in 2015 (37 per 100,000; Figure 6).

The TB notification rate among the UK born population was 1.7 per 100,000 in 2016, the lowest rate observed since 2005, and lower than the rate among the UK born population of England overall. The number of cases among those born in the UK decreased in all areas other than Hampshire and Isle of Wight.

In 2016, information on the time between entry to the UK and TB notification was available for 96% (407/424) of those born abroad. The median time since entry was 8 years (IQR 3-16 years), the same as in 2015. After a large decline between 2012 and 2014, there was a second year of slightly more cases among recent entrants to the UK (diagnosed within 2 years after entry) (71/407, 17% of patients; Figure 7).

There was little change in numbers of patients diagnosed 2-5 and 6-10 years after entry, after decreases in recent years. There was an increase in the number diagnosed 11 or more years after entry compared to 2015, which comprised 40% of all non-UK born patients in 2016. In Thames Valley and Surrey and Sussex, almost half of all patients born abroad had been in the UK for 11 or more years (48%, 76/160 in Thames Valley, 47%, 46/98 in Surrey and Sussex). The median time since entry was 10 years for Thames Valley (IQR 4-22) and 9 for Surrey and Sussex (IQR 3-18).

Figure 7: Time between entry to the UK and TB notification for non-UK born cases by year, South East, 2000 to 2016



Country of birth was known for 421/424 patients born outside the UK. As in previous years, India, Pakistan and Nepal were the most common (Table 1). Together, these countries were the place of origin of nearly half (48%, 203) of non-UK born cases and over a third of all TB patients in the South East. This compares with the most common countries of birth in the non-UK born general population of South East England, which in 2016 were India, Poland and Pakistan.[2] This again varied by health protection team area. India was the most common country of birth in all areas apart from Hampshire Isle of Wight, where it was Nepal.

Median time since entry for patients from India and Pakistan increased since 2015 (from 7 years to 9.5 and from 10.5 to 13.5, respectively). Median time since entry decreased slightly for those born in Nepal (from 6 to 5 years).

Table 1: 10 most common countries of birth of non-UK born TB cases, South East, 2016

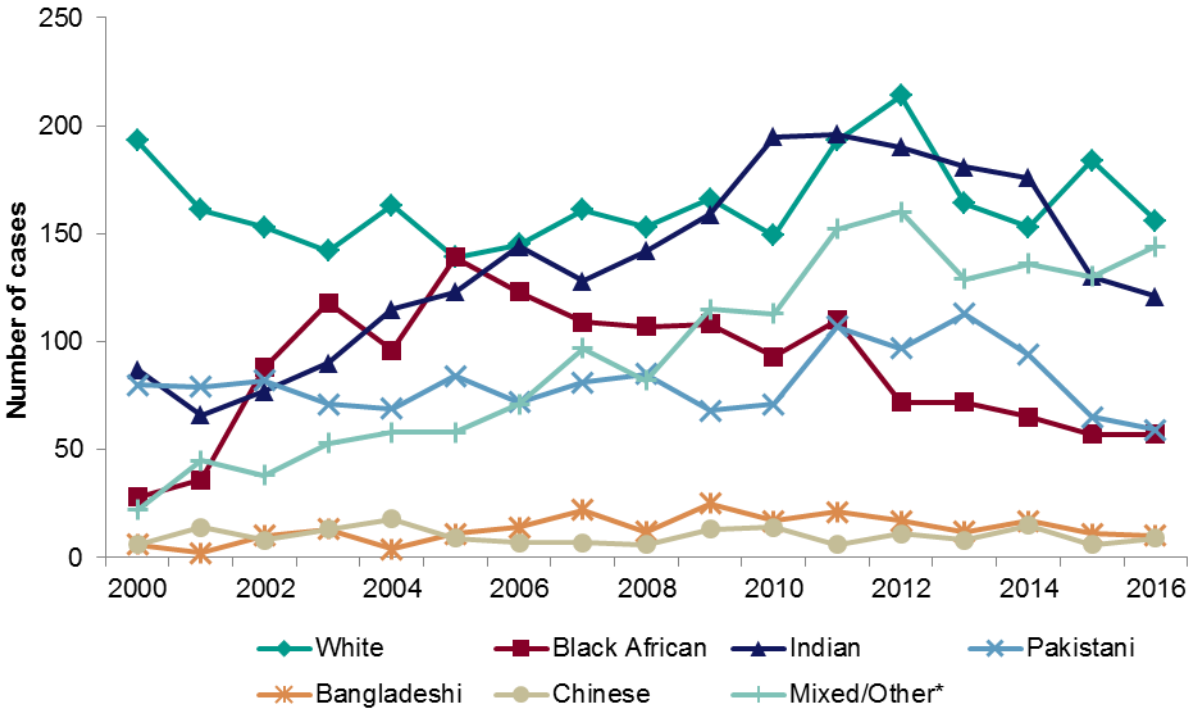
Country of birth	n	% of non-UK born patients	median years since entry
India	111	26.4	9.5
Pakistan	50	11.9	13.5
Nepal	42	10.0	5
Philippines	32	7.6	8
Zimbabwe	15	3.6	12
Romania	13	3.1	1.5
Nigeria	11	2.6	9
Timor-Leste	10	2.4	1.5
Bangladesh	9	2.1	20
Hong Kong	7	1.7	47

Ethnicity

Data on ethnicity was known for 98% (556/567) of patients in 2016. The most common ethnicity was white (28%, 156/556), although this decreased from 2015 (32%, 184/583; Figure 8). Most white patients were UK born (64%, 96/150); of those born abroad, most were from Eastern Europe (39%, 31/54) and Northern Europe (22%, 12/54).

The next most common ethnic group was mixed/other (26%, 144/556). As in 2015 Nepal was the most common country of birth for those of mixed/other ethnicity (29%, 41/143), followed by the Philippines (22%, 31 cases). Numbers of patients of mixed/other ethnicity increased compared to 2015, mostly due to an increase in those born in the Philippines.

Figure 8: TB case numbers by ethnic group, South East, 2000 to 2016



* Cases with mixed/other, black Caribbean and black other ethnic groups were grouped as 'Mixed/Other'.

White was the most common ethnic group in Surrey and Sussex health protection team area, whereas Indian was the most common group in Thames Valley. In Hampshire and Isle of Wight and Kent, mixed/other ethnicity was the most common group.

Occupation

In 2016, occupation was known for 97% (522) of the 537 patients aged 18 years or older (Table 2). Of these, 192 (37%) were not currently working, of whom half were retired. The majority of the healthcare workers diagnosed with TB were non-UK born (92%, 58/63). Similarly, of those working or engaged in education, 79% (26/33) were known to have been born abroad.

Table 2: Occupational category of persons with TB aged 18 years and older, South East, 2016

Occupation	n	%
Healthcare worker	63	12.1
Education	34	6.5
Agricultural/animal care worker	<5	<1
Social service/prison worker	<5	<1
Other	229	43.9
None	192	36.8
Total	**522**	

Clinical characteristics

Previous history of tuberculosis

In 2016, data on previous diagnosis was available for 96% (545) of cases. As in recent years, a small number of cases (7%, 37) were previously diagnosed with TB. The median time between diagnoses was 7 years (IQR 2 to 20).

Site of disease

Similar to recent years, just over half (51%, 292/567) of TB patients in 2016 had pulmonary disease (Table 3). The second most common site was extra-thoracic lymph node TB, accounting for over a quarter of cases (28%, 160/567).

Pulmonary TB was more common among UK born (46%, 197/424) than non-UK born patients (71%, 93/131). It was also more common among those of white ethnicity (74%, 116/156) than any other ethnic group.

Table 3: Site of TB disease, South East, 2016

Site of Disease	n	%
Pulmonary	292	51
Lymph Nodes (extra thoracic)	160	28
Lymph Nodes (intra thoracic)	69	12
Pleural	43	8
Gastrointestinal/Peritoneal	36	6
Other	34	6
Miliary	19	3
Bone/Joint (spine)	17	3
CNS (meningitis)	16	3
Bone/Joint (other - not spine)	15	3
Genitourinary	13	2
CNS (Other - not meningitis)	10	2
Cryptic Disseminated	1	0
Laryngeal	1	0
Total patients*	567	

* Patients may have disease at more than one site, so the counts will not equal the total number of patients, and the percentages will sum to over 100%.

Hospital inpatient and directly observed therapy

Continuing an increase since 2011, 28% (150/539) of cases notified in 2016 had been a hospital inpatient at the point of diagnosis. A higher proportion of adults aged 65 years and older were hospitalised (33%, 31/93), as were children under the age of 15 (38%, 5/13), although numbers in this age group remain small. As seen previously, being an inpatient was almost twice as common among those with social risk factors (47%, 22/47 vs. 25%, 107/432 among those without any risk factors), particularly for those with a history of homelessness (59%, 10/17) or imprisonment (52%, 11/21).

Overall, 14.5% (77/532) of cases notified in 2016 were recorded as having received directly observed therapy (DOT) at some point during treatment. This continues a small increase in the proportion receiving DOT, although the numbers have stayed fairly stable since 2011 (between 70-81 individuals per year). However, over half of children under the age of 15 were placed on DOT (54%, 7/13), as were almost two thirds of those with at least 1 social risk factor (61%, 27/44). DOT was more common among men (17%, 50/292 vs 11%, 27/240 among women) and more common among those with resistance to at least 1 first-line drug (26%, 6/23) and 57% (4/7) of the MDR-TB cases. Lastly, almost a quarter (24%, 30/126) of UK born TB cases received DOT, compared to only 12% (47/401) of non-UK born cases.

BCG vaccination

Information on BCG vaccination was available for 74% (421/567) of South East patients notified in 2016, of whom 74% (310) were vaccinated (Table 4). Consistent with previous years, a higher proportion of non-UK born cases had been vaccinated (77%, 246/319) than UK born cases (63%, 62/99). 5 of the 7 UK born children less than 5 years of age had not been vaccinated: 3 were white, 1 black African and the other of mixed/other ethnicity.

Experimental BCG coverage data is included in routine COVER reports, extracted from Child Health Information Systems for local authorities running a universal neonatal programme in England. Only Slough in the South East of England has a universal programme. The BCG vaccine shortage which started in May 2015 is likely to have impacted on coverage for those evaluated. Annual data is included in NHS Immunisation Statistics for England. No published information on BCG coverage was included in this report due to concerns over data quality.

Table 4: Number and proportion of TB patients with BCG vaccination, South East, 2016

	< 5 years old			< 15 years old			All ages		
	n	N	%	n	N	%	n	N	%
UK born	2	7	29	6	12	50	62	99	63
Non-UK born	-	-	-	1	1	100	246	319	77
All cases*	**2**	**7**	**29**	**7**	**13**	**54**	**310**	**421**	**74**

* Including missing place of birth.

2. Laboratory confirmation of TB

Laboratory tests data collection

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

Culture confirmation and speciation

In 2016 in the South East, 67% of cases were culture confirmed (378/567). This was higher among those with pulmonary TB (80%, 236/296 vs. 53%, 142/270 of patients with exclusively extra-pulmonary TB).

Of those cases that were culture confirmed, the vast majority were *Mycobacterium tuberculosis* (98%, 373) with 3 cases of *M. africanum* and 1 case of each *M. bovis* and *M. tuberculosis* complex.

Of the 189 cases without culture confirmation, 45 had positive histology, 16 had positive microscopy and 2 had a positive PCR. 1 had both a positive histology and PCR and two had both a positive microscopy and histology result. In total, 129 cases, 22% of the 567 cases in 2016, had no recorded laboratory evidence of TB.

Sputum smear

In 2016, sputum-smear results were available for 60% (175/292) of patients with pulmonary TB. Of these, 61% tested smear positive (106/175).

3. TB transmission

Rate of TB in UK born children

In 2016, the rate of TB in UK born children under 15 years of age in the South East – an indirect indicator of recent transmission – was estimated at 0.9 per 100,000 population (95% CI 0.5 to 1.5, 13 cases). Cases of TB in children under 15 are very few in the South East, so year on year changes should be interpreted with caution (Figure 9).

Figure 9: Rate of TB in UK born children under 15 years of age, South East, 2000 to 2016

Strain typing and clustering

The National TB Typing service in England prospectively typed all TB isolates since 2010 using 24 loci Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR). Such strain typing identifies clusters of cases with indistinguishable strains that may be due to recent transmission.

While these clustered cases may reflect cases that are part of the same chain of recent transmission. This could also reflect common endemic strains circulating either within England or abroad. Thus, the detection of a common strain type among cases does not confirm recent transmission. Additional epidemiological information is required to assess whether a common strain type is likely to reflect recent transmission.

MIRU-VNTR strain typing can be used to refute transmission between individuals who have different strain types.

Proportion of cases clustered and geographical distribution

In 2016, 23% (132) of all 567 notified cases (including those without culture confirmation) in South East were identified as clustered with 1 or more South East residents in the period 2010 to 2016 (Table 5). Identification of clustering using MIRU-VNTR requires specimens to be cultured and typed to at least 23 loci. The proportions of cases where this was achieved remained similar over time with around 60% of cases culture confirmed each year between 2010 and 2016 and over 90% of these had isolates that were strain typed to at least 23 loci between 2014 and 2016.

The proportion of strain typed cases (with at least 23 loci) that clustered with at least 1 other case in South East remained at between 36% and 39% between 2013 and 2016. The number of new clusters that formed each year fell from 50 in 2011 to less than 40 in 2015 and 2016.

Table 5: Number and proportion of unique cases, clustered cases and new clusters by year, South East, 2010 to 2016

Year	Notified cases	Culture confirmed		Strain typed cases (≥23 loci)		Clustered[a]		New clusters (per year)[b]
	N	n	%	n	%	n	%	n
2010	711	437	61	293	67	106	36	17
2011	813	490	60	428	87	157	37	50
2012	778	488	63	446	91	150	34	45
2013	683	440	64	392	89	142	36	47
2014	664	429	65	394	92	144	37	42
2015	593	367	62	341	93	132	39	38
2016	567	378	67	360	95	132	37	39
Total	**4,809**	**3,029**	**63**	**2,654**	**88**	**963**	**36**	**278**

[a] South East TB cases clustered with at least 1 other case in a South East resident between 2010 and 2016.
[b] New clusters identified that included at least 1 South East resident. A new cluster is identified at the point when a second case is notified with the same MIRU-VNTR strain type as an existing case within South East.

Size of clusters

Of the 278 clusters in South East between 2010 and 2016, the median cluster size was 4 cases (range 2 to 37). The majority of clusters (84%; 233/278) were small in size (less than 5 cases) with 57% (159) having only 2 cases in the cluster. 10 clusters (4%) had 10 or more cases (Figure 10).

Figure 10: Proportion of clusters by size, South East, 2010 to 2016

Cluster lineage

The most common lineage of clusters was Euro American, which accounted for 41% (114/278) of clusters between 2010 and 2016 (Table 6). The next most common was Central Asian (28%, 78). The distribution of cluster size tended to be similar across lineages (median cluster size 2 to 3).

Table 6: Cluster lineage and size, South East 2010 to 2016

Cluster size	Number of clusters	Euro American		Central Asian		East African Indian		Beijing		Other*	
	n	n	%	n	%	n	%	n	%	n	%
2	159	69	61	47	60	16	55	10	37	17	31
3	50	20	18	15	19	4	14	7	26	4	7
4	24	9	8	4	5	4	14	4	15	3	5
5 - 9	35	14	12	9	12	4	14	3	11	5	9
≥10	10	2	2	3	4	1	3	3	11	1	2
Total	**278**	**114**	**100**	**78**	**100**	**29**	**100**	**27**	**100**	**55**	**55**

*Includes cases with M.bovis, M.africanum, multiple lineages and cases where no lineage has been identified.

Whole Genome sequencing

Whole genome sequencing (WGS) of *M. tuberculosis* complex isolates provides information on Single Nucleotide Polymorphism (SNP) differences between isolates. This provides more information than MIRU-VNTR on how isolates are related to each other. PHE began deploying WGS for TB in December 2016, and is expected to provide this service to the South East by the end of 2017. This new technology, in conjunction with epidemiological data, will improve our understanding of TB transmission.

4. Delay from onset of symptoms to start of treatment

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

Information on delay from symptom onset to treatment start was available for 96% (283/296) of pulmonary TB cases in 2016. 3 were diagnosed post-mortem. Overall delay includes time from symptom onset to the patient presenting to healthcare, and from the initial presentation to diagnosis and start of TB treatment.

In 2016, the median time symptomatic was 84 days (IQR 44-157), 1 week longer than for pulmonary patients in England overall (77 days, IQR 38-141). This represents a decrease of 1 week from 2015 (median 91 days).

Table 7: Time between symptom onset and treatment start in pulmonary TB cases*, South East, 2012 to 2016

	0-2 months		2-4 months		>4 months				Total
Year	n	%	n	%	n	%	Median days (IQR)		N
2012	146	40	113	31	108	29	73	(38 - 140)	367
2013	119	38	92	29	101	32	74	(38 - 154.5)	312
2014	98	31	103	33	113	36	87	(52 - 160)	314
2015	103	35	83	28	108	37	91	(45 - 165)	294
2016	103	36	84	30	96	34	84	(44 - 157)	283

*Excluding those with missing onset and treatment start dates.

The median delay was longest in Hampshire and Isle of Wight (93 days, IQR 39-180) followed by Surrey and Sussex (90 days, IQR 50-158) and Kent (85 days IQR 49-175). Delays were shortest in Thames Valley (median 72 days, IQR 46-143).

South East England was the PHE Centre with the second highest proportion of pulmonary patients who waited in excess of 4 months to start treatment (34%), after the East of England Centre. The average for England was 31%.

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

Delays greater than 4 months were slightly more common among men at 36%, (57/159) than among women 31% (39/124). This is consistent with recent years except for 2015,

when such delays were longer among women (48%, vs. 30% among men). As in recent years, the proportion of cases that experienced a delay of more than 4 months was higher in older age groups, with almost half of cases (45%, 22/49) aged 65 and above experiencing delays in excess of 4 months. It was also more common among UK born cases (44%, 40/90 vs. 29%, 55/191 among non-UK born cases), as it was for those of white ethnicity (46%, 51/111 vs. 26%, 43/167 among those of non-white ethnicity).

In contrast to the data from 2015, delays were only slightly more common among those with a social risk factor (38%, 13/34 vs. 34%, 73/213 among those with no social risk factors).

Table 8 shows the proportion of patients who experienced delays in treatment of over 4 months by PHE Health Protection Team area. The proportion of patients with delays of more than 4 months ranged from 31% in Thames Valley to 36% in Hampshire and Isle of Wight. Men were more likely than women to experience delays in all areas except Surrey and Sussex where women were more likely to have delays of more than 4 months. Individuals born in the UK were more likely to be delayed compared to those born abroad in all areas apart from Surrey and Sussex.

Table 8: Proportion of patients with pulmonary TB with a delay from onset of symptoms to treatment of more than 4 months by PHE health protection team area, sex and place of birth, South East, 2016

		Kent n=58		Surrey & Sussex n=74		Hampshire & Isle of Wight n=61		Thames Valley n=90		Total n=283	
		n	%	n	%	n	%	n	%	n	%
Sex	Male	15	45	13	29	11	38	18	35	57	36
	Female	5	20	13	45	11	34	10	26	39	31
Place of birth	UK born	8	40	9	35	12	55	11	50	40	44
	Non-UK born	12	32	16	34	10	26	17	25	55	29
Overall delayed		**20**	**34**	**26**	**35**	**22**	**36**	**28**	**31**	**96**	**34**

5. TB outcome in drug sensitive cohort

Drug sensitive cohort

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

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

- 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 treatment outcome is reported

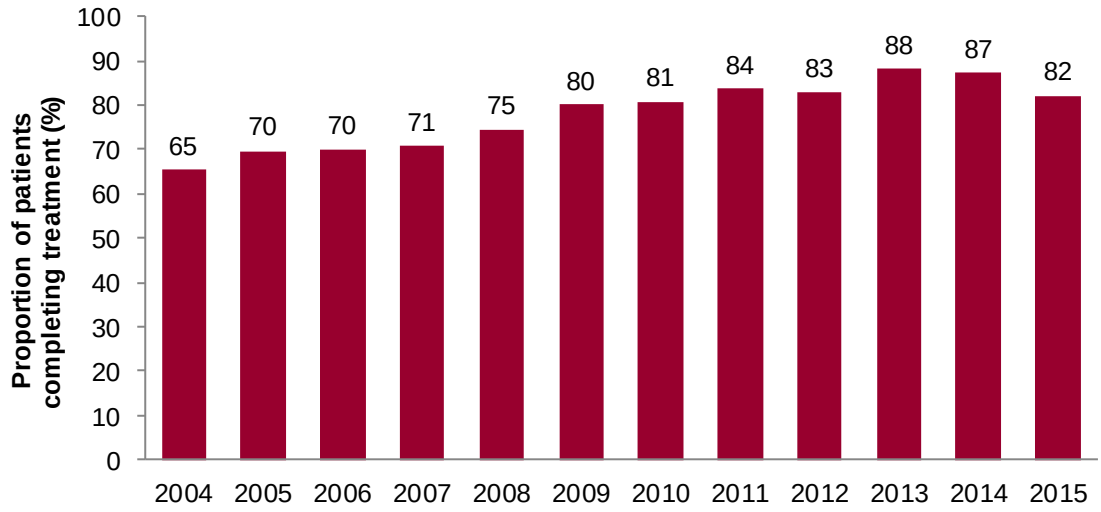
1: Outcomes for TB patients with expected duration of treatment less than 12 months

The majority (90%, 526/587) of those notified with rifampicin-sensitive TB in 2015 did not have CNS, spinal, miliary or cryptic disseminated disease. Of these, 82% (432/526) had completed treatment at 12 months, a decrease from those diagnosed in 2014 (87%, 524/601).

The overall trend in treatment completion in the South East has improved from just 70% in 2006, but has decreased in recent years from a high of 88% in 2013 to 82% in 2015 (Figure 11). Treatment completion was lowest in Kent (74%, 68/92) and Hampshire and Isle of Wight (75%, 64/85) and much higher in Surrey and Sussex (83%, 105/126) and Thames Valley (88%, 193/219).

The most common reason for patients notified in 2015 not completing treatment was due to death (9%).

Figure 11: Proportion completing treatment at 12 months, South East, 2004 to 2015*



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

At 12 months, 4% (21) of patients were still on treatment (Table 9), the reason for which was provided for most (17). Of these, 9 were on a planned treatment regime that exceeded 12 months (none of whom were reported as being resistant to isoniazid), 5 had their treatment interrupted (3 due to intolerance/side effects) and 3 had their treatment changed due to initial drug resistance.

Table 9: TB outcome at 12 months, South East, patients notified in 2015*

Outcome at 12 months	n	%
Completed	432	82.1
Died	45	8.6
Lost to follow-up	15	2.9
Still on treatment	21	4.0
Treatment stopped	5	1.0
Not evaluated	8	1.5
Total	**526**	

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

More so than in recent years, treatment completion was lower among men (78%, 229/295 vs. 89% for women, 203/229). A higher proportion of men also remained on treatment (4.4%, 13/295 vs. 3.5%, 8/229 among women). Treatment completion was lowest among adults over 70 (49%, 34/70).

As in recent years, treatment completion in 2015 was worse among those born in the UK (72%, 108/150 vs. 88%, 316/358 among those born abroad). This was particularly low among the UK born of white ethnicity (64%, 75/115 vs. 97%, 34/35 of all other UK born ethnic groups). Treatment completion was also much lower among those with at

least 1 social risk factor (70%, 38/54 vs. 87%, 367/422 among those with no social risk factors).

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

Of the 61 cases of CNS, spinal, miliary or cryptic disseminated disease in patients notified in 2014, 57% (35) had completed treatment at 12 months (Table 10). This increased to 67% (41) by the last recorded outcome with 5 cases (8%) still on treatment. Among the 39 cases for whom duration of treatment was known, the median treatment time was 357 days (IQR 190-365).

Table 10: TB outcome at 12 months for patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, South East, patients notified in 2015*

Outcome at 12 months	n	%
Completed	35	57.4
Died	7	11.5
Lost to follow-up	4	6.6
Still on treatment	11	18.0
Treatment stopped	0	0.0
Not evaluated	4	6.6
Total	**61**	

*Excludes rifampicin resistant TB.

Deaths and loss to follow up in the drug sensitive cohort

Of rifampicin sensitive cases diagnosed in 2015, 8.9% (52/587) died before completing treatment. While just 4% of patients died in Thames Valley (8/219), more than 10% died in all other parts of the South East (11% in both Kent (10/92) and Surrey and Sussex (14/126) and 15% (13/85) in Hampshire and Isle of Wight).

TB was reported to have caused or contributed to over a third of these deaths (37%, 19/52). 11 deaths were reported as not related to TB (21%). Information on whether TB was part of the reason for death was not known for the remaining 22 (42%). 12 cases were diagnosed post-mortem.

The median age at death was 75 years (IQR 62.5 – 85) but TB contributed to or caused the death of 5 individuals under the age of 59. 4 of these were white and UK born. As in recent years, death was more common among the UK born (19%, 31/166 vs. 3%, 14/402), although this patient population was also a slightly older age cohort (median age of 51 vs 38 in non-UK born). Death was almost 3 times as common among those

with at least 1 social risk factor (17%, 10/58 vs. 6%, 26/473 in those without any risk factors). Of these, TB caused or contributed to 5 deaths, was incidental to 2, and had an unknown relationship to 3.

Consistent with recent years, 3% (19/587) of patients with rifampicin sensitive disease notified in 2015 were lost to follow up within 12 months. Where known, the majority of those lost to follow up had left the UK (64%, 9/14). Loss to follow up was more common among the non-UK born (3.5%, 15/401 vs. 1.2%, 2/165 among the UK born), and among those with at least one social risk factor (5.2%, 3/58, vs. 2.3%, 11/471 among those without any social risk factors).

In addition, treatment was reported as stopped for 5 individuals. For 3 of these, comments indicated the patient had refused/decided to stop treatment, and should have been recoded as lost to follow up (this is routinely done via surveillance data validation). For the remaining 2, the medical team agreed to stop due to side effects of the medication.

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

Drug resistance

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.[3] This differs from previous reporting, where characteristics were only described for those with phenotypic drug resistance.

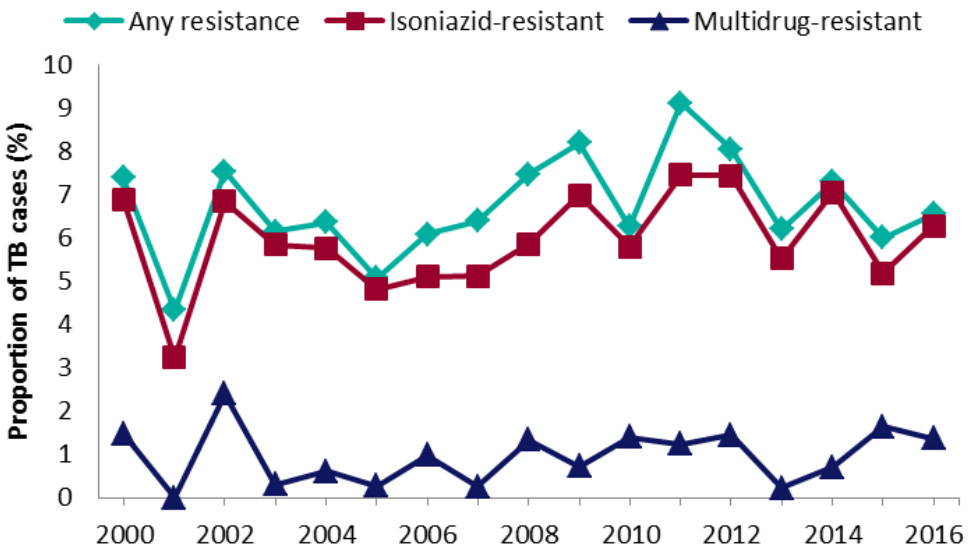
Initial first line drug resistance and geographical distribution

In 2016, resistance profiles were available for 96.8% (366/378) culture confirmed cases. This was the lowest proportion ever recorded for the South East, which has remained above 98% since 2000.

The proportion of TB culture confirmed TB cases resistant to 1 or more first line drug increased slightly to 6.6% (24/366) relative to 2015 (6.0%, 22/366). This reflected an increase in the proportion resistant to isoniazid (from 5.2% to 6.3%). Prevalence of resistance to other first-line drugs remained relatively stable, except for ethambutol, which decreased from 1.9% (7/366) to 0.3% (1/365). However, numbers of cases resistant to drugs other than isoniazid were small, so year-on-year changes should be interpreted with caution. Overall, since 2000 the proportion resistant to at least 1 first-line drug has remained between 4% and 9% (Figure 12).

The trend in drug resistance varied across the South East. There was a large increase in the proportion of drug-resistant cases in Kent, from 5.8% (4/69) in 2015 to 12.7% (7/55) in 2016. Smaller increases were seen in Surrey and Sussex (4.2%, 4/96 to 6.0%, 6/100) and Hampshire & Isle of Wight (3.4%, 2/58 to 4.1%, 3/73). There was a decrease in proportion of resistant cases in Thames Valley from 8.5% (12/141) to 5.8% (8/138).

Figure 12: Proportion of TB cases with initial first line drug resistance, South East, 2000 to 2016



Characteristics of patients with drug resistant TB

Any first line drug resistance

In 2016, similar proportions of men (6.0%, 12/201) and women (7.3%, 12/165) with TB were resistant to at least 1 first line drug. The majority (67%, 16/24) of resistant cases occurred among individuals aged 15 to 44 years, although culture confirmation was also more common in this age group (66% vs 57% in older people and only 26% in children less than 15 years of age).

A slightly higher proportion of non-UK born cases had drug resistant disease (7.3%, 20/276 vs 4.9%, 4/81 of UK born cases). In recent years there has been little difference in those born in the UK compared to those born abroad. The most common countries of birth for all drug resistant cases in 2016 were Pakistan (21%, 5/24) and the United Kingdom (17%, 4/24).

Slightly more cases with pulmonary disease were drug resistant (7.0%, 16/229 compared to exclusively extra-pulmonary 5.8%, 8/137). Drug resistance was more common among those who had a previous diagnosis of TB (16%, 4/25) than those who did not (5.5%, 18/326).

Drug resistance was more common among those with at least 1 social risk factor (10%, 3/30 compared to 7.4%, 21/283). All 3 of these cases were isoniazid-resistant.

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

Small numbers mean the following information should be interpreted with caution. In 2016 there were 5 cases with phenotypic resistance to isoniazid and rifampicin, 1.4% of culture confirmed cases in South East residents. In addition, 2 further patients were treated for MDR-TB (1 due to reported diagnosis abroad, and 1 due to PCR result).

4 of the 7 patients with MDR-TB were female. Ages ranged from 20-49 years old. 4 of the patients were of mixed/other ethnicity and the remaining 3 were white. All were born abroad.

2 of the 6 MDR cases occurred in patients with exclusively extra-pulmonary TB. 3 had a previous history of TB and 1 had a social risk factor.

XDR-TB

There were no cases of XDR-TB in 2016.

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

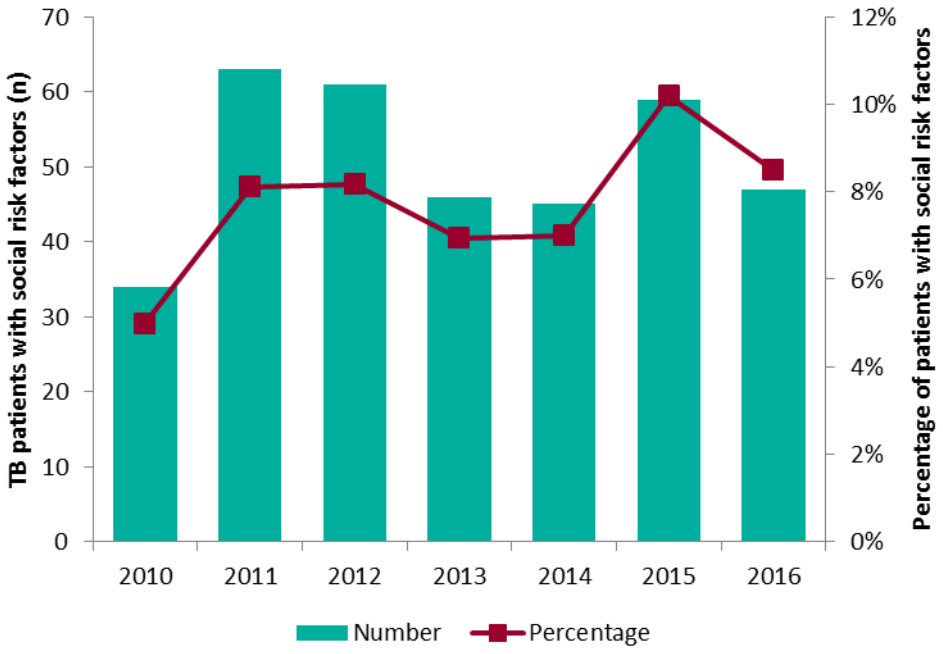
Of the 3 cases in the rifampicin-resistant TB cohort notified in 2014, 1 was marked as having completed treatment at 24 months. The most recent information indicates that 2 of the 3 have now completed treatment, while the other has been lost to follow-up after leaving the UK.

7. TB in under-served populations

Social risk factors

In this section, social risk factors are presented for TB cases aged 15 years and older. Social risk factors include current alcohol misuse, and current or previous homelessness, drug use, and imprisonment. In 2016, 8.5% (47/553) of South East cases aged 15 years and older had 1 or more social risk factor (Figure 13). This was a decrease from 2015 (10.2%).

Figure 13: Social risk factors among TB patients aged 15 years and older, South East, 2010 to 2016



The decrease in the proportion of patients with social risk factors observed in the South East was due to decreases in the HPT areas Surrey and Sussex (from 14%, 18/126 in 2015 to 10%, 11/112 in 2016), and Hampshire and Isle of Wight (from 7.8%, 7/90 in 2015 to 5.7%, 5/88 in 2016). Proportions in Kent (19%, 18/95) and Thames Valley (7.1%, 13/184) remained similar to those in 2015.

The proportion of patients with a history of imprisonment increased and it was the most common risk factor in 2016 (4.2%, 21/501). The next most common risk factors were drug use (3.4%, 18/522), homelessness (3.3%, 17/521), and alcohol misuse (2.6%,

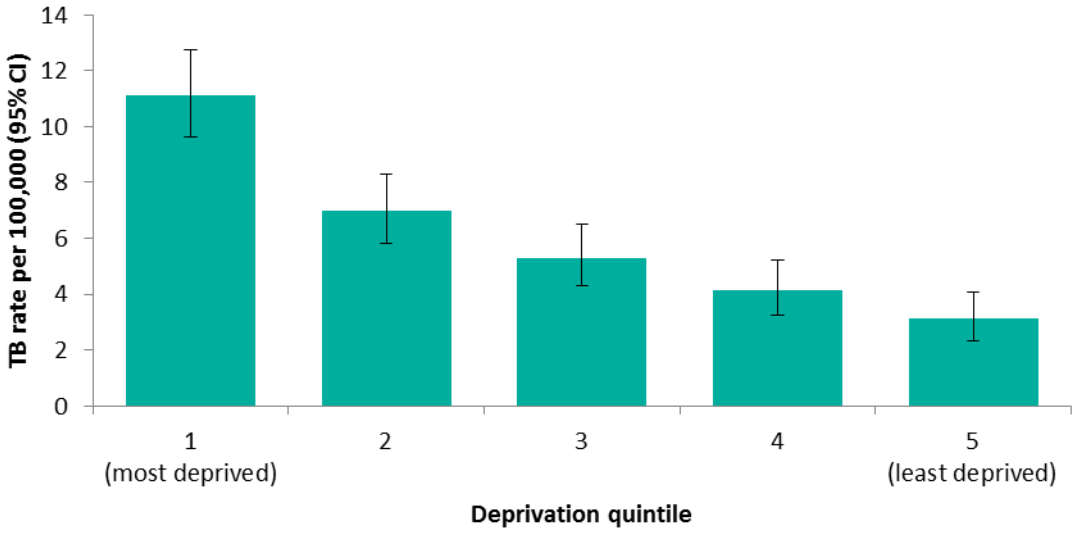
13/509). There was a decrease in all risk factors except imprisonment since 2015. Almost a third of those with at least 1 risk factor had multiple issues (32%, 15/47).

Consistent with recent years, social risk factors were over 3 times more common among UK born (19%, 26/138) compared with non-UK born patients (4.2%, 19/452). They were also more common among men than women (13%, 42/324 vs. 1.1%, 3/268). Nearly a quarter of patients of white ethnicity had at least 1 social risk factor, regardless of where they were born (23%, 17/73 among UK born; 25%, 12/48 among non-UK born). Overall, social risk factors were nearly 5 times more common among those of white compared with all other ethnic groups (23%, 29/124 vs. 4.9%, 17/350).

As seen in recent years, individuals with social risk factors were more often infectious, as defined by having sputum-positive pulmonary TB (28%, 13/47 had sputum smear positive pulmonary TB vs. 18%, 76/432 of those without social risk factors).

Deprivation

Figure 14: TB case rate by deprivation, South East, 2016



Deprivation was assessed using the 2010 Index of Multiple Deprivation. In 2016, over a third of cases (37%, 203/553) were resident in the most deprived quintile of the South East, and another 23% (127) in the second most deprived quintile (Figure 14). Rates were also highest in these areas (11 and 7 per 100,000 respectively). Rates decreased further across the remaining quintiles, with only 10% of cases (54) living in the least deprived quintile, which had a rate of 3 cases per 100,000.

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

HIV testing

Of the 567 patients notified in 2016, HIV status was already known for 17 patients, and a further 4 were diagnosed post mortem. Of the remaining 546, information on HIV testing was available for 92% (503/546).

Of these, 92% (465/503) were offered and received testing; similar to the national figure of 93%. A further 4.4% (22) were offered but did not receive testing, although none declined, and 3.2% (16) were not offered testing. Although this represents a continuing improvement in the proportion of South East cases offered testing since 2013, when 6.2% (38/609) of cases were not offered an HIV test, information was missing on a further 8% (43 patients).

The lowest proportion offered and tested was in Thames Valley (88%, 167/190 patients).

TB-HIV co-infection

The latest available information on TB-HIV co-infection for notified adults 15 years and older, estimated that 3.9% (21) of South East TB patients in 2015 were co-infected with HIV.[1] This was similar to the proportion in 2014, and slightly higher than between 2011-2013, although remaining lower than the proportion reported since 2003.

9. Latent TB infection testing and treatment

Eligibility for the national LTBI testing and treating programme is for persons aged 16-35 years, from a high incidence country (≥150/100,000 or sub-Saharan Africa) within the last 5 years and previously living in that high incidence country for 6 months or longer. As of June 2017, 56 of 59 of priority CCGs in England received funding from NHS England with 51 of these reporting LTBI testing activity.[1] This included Crawley, Oxfordshire, Slough, South Reading and Southampton CCGs in the South East. Testing and treatment data was available for Slough, South Reading and Southampton. Data was only available on testing for Crawley CCG. At the time of this report, new entrant LTBI testing had not started in Oxfordshire.

According to the laboratory reports, the number of individuals tested ranged from 96 in Crawley to 714 in Southampton (Table 11). The proportion testing positive for latent infection ranged from 12-19%. From treatment data provided by TB clinics, acceptance was around 1 in 3 for Slough and South Reading, but 77% for Southampton (Table 12). Treatment completion was over 70% in South Reading, but only 57% in Slough and 50% in Southampton. However, as patients may still be on treatment, the proportion completing treatment should be interpreted cautiously.

Table 11: Individuals tested and proportion positive for latent TB infection by CCG*

	Individuals tested					Testing positive	
CCG	2014	2015	2016	2017 (to June)	Total	n	%
Crawley	0	0	68	28	96	14	14.6
Slough	0	0	76	274	350	41	11.7
South Reading	0	0	110	185	295	42	14.2
Southampton	0	0	453	261	714	111	15.5

*Results from laboratory reports and TB clinics.

Table 12: Treatment acceptance and completion by for individuals tested positive for LTBI by CCG*, July 2014-June 2017

CCG	Tested positive July 2014-June 2017	Started treatment (acceptance)		Completed treatment	
		N	%	n	%
Crawley	-	-	-	-	-
Slough	41	14	34.1	8	57.1
South Reading	42	14	33.3	10	71.4
Southampton	111	85	76.6	43	50.1

*Results from TB clinics/secondary care.

Discussion

TB rates remain very low across most of the South East, below the average for England, and have continued to decline year-on-year since 2011.

The greatest decline has been seen in the highest incidence areas within Thames Valley, with less change in other lower incidence parts of the South East.

Encouragingly, the number of cases among UK born residents declined in 2016, and was particularly low for UK born children. However, a small number of cases continue to occur in very young children born in the UK. The increased case numbers among long term non-UK born residents (particularly from India, but also a large number of other countries, including Bangladesh, Philippines, Zimbabwe), shows the complexity in TB epidemiology across this mostly very low incidence area.

Although the delays before patients start treatment have improved compared to 2015, they remain worse than the national average. The drop in treatment completion is concerning, as only 82% of patients who would be expected to complete a standard 6 month treatment regimen had completed by 12 months. The level of completion varied across the South East, but was particularly poor among those with social risk factors. The most common reason for not completing was death, with limited information on the role of TB as contributing factor.

The increase in HIV testing is encouraging, but there are still a high proportion of patients missing this information. While HIV co-infection estimates are low, these increased slightly in the most recent years, and TB diagnosis remains an important opportunity for HIV diagnosis.

Conclusion and recommendations

In conclusion, TB rates remain very low across most of the South East, and continue to decline. However, small areas of higher incidence remain. The majority of cases occur among those born outside the UK, within a wide range of ethnic groups and ages. The above average delays in starting treatment, and fall in proportion completing treatment are of concern, as this risks further transmission and development of drug resistance. Local investigation of these issues is needed to determine opportunities to improve the outcome for TB patients in the South East. Ongoing efforts by public health and clinical staff in controlling TB will need to be sustained to further control TB in this low incidence area.

Recommendations:

- results of reviews into the delays experienced by South East residents should be shared and reviewed by the South TB Control Board and TB networks. Opportunities for raising awareness among local communities affected by TB, primary care and other service providers should be considered

- The South TB Control Board should continue to prioritise and work with wider stakeholders to develop strategies to improve outcomes for under-served populations

    - clinical services to continue their supportive case management of complex TB patients, including use of innovative approaches such as Virtually Observed Treatment

    - work with local stakeholders to ensure access to services, treatment and support, including other social needs such as housing

- continued support by NHS, PHE and allied services of cohort review as the tool to quality assure TB case and contact management according to national guidance. Issues and themes identified at cohort reviews across the South East to be reported to the South TB Control Board in a systematic way. Particular attention should be paid to delays and treatment outcomes

- TB staff in the South East should engage in the combined London and South East MDR-TB cohort review, and ensure the BTS MDR advisory service is notified and used to support all MDR-TB case management

References

1. Public Health England. (2017) Tuberculosis in England: 2017. Public Health England, London: www.gov.uk/government/uploads/system/uploads/attachment_data/file/654152/TB_Annual_Report_2017.pdf

2. Office for National Statistics. Population of the UK by country of birth and nationality, January 2016 to December 2016. London: ONS; 2017: www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/datasets/populationoftheunitedkingdombycountryofbirthandnationality

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

Appendix A: Methods

Data sources
Cases in England are notified to the Enhanced Tuberculosis Surveillance system (ETS). Only cases resident in the South East, or those that are homeless or from abroad and assigned to a clinic in the South East 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.

Detailed information on surveillance data, including matching to reference laboratory data and HIV datasets, and LTBI screening data, is included in the national report: www.gov.uk/government/uploads/system/uploads/attachment_data/file/654152/TB_Annual_Report_2017.pdf

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

Treatment outcome
Information on outcomes was reported for all cases notified in the previous year, excluding those with known rifampicin resistant disease: outcomes for these cases were reported at 24 months. Definitions for outcome are based on World Health Organization (WHO) and European definitions, but adapted to the UK context. In this report, all data was obtained from the ETS matched dataset provided in August 2017.

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

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

Population denominator
Tuberculosis rates by geographical area (Centre, local authority, MSOA and LSOA), age, sex and place of birth were calculated using ONS mid-year population estimates for the most recently available year: www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/datasets/populationoftheunitedkingdombycountryofbirthandnationality

Cluster definitions

Strain typing was performed at the TB reference laboratories using 24 MIRU-VNTR profiling. Analysis was undertaken on strain type clusters defined as 2 or more people with TB caused by indistinguishable strains, with at least 23 complete VNTR loci. Analysis of clustering in the South East was carried out on cases that clustered in the South East and were notified between 2010 and 2016.

Appendix B: TB among South East residents

Table Bi: TB cases numbers by local authority of residence, South East, 2000 to 2016

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hampshire	34	30	41	42	51	38	47	54	37	66	67	79	67	53	44	58	59
Isle of Wight	<5	7	<5	<5	<5	<5	<5	7	<5	<5	<5	6	7	<5	<5	<5	<5
Portsmouth	24	12	15	16	23	20	23	23	23	30	24	16	23	19	10	17	12
Southampton	18	15	27	36	33	30	33	24	24	36	27	51	41	39	29	23	34
Hampshire & Isle of Wight	**76**	**64**	**86**	**95**	**108**	**91**	**103**	**108**	**85**	**135**	**121**	**152**	**138**	**113**	**86**	**99**	**108**
Kent	47	37	66	67	61	65	86	86	129	111	104	112	115	107	101	91	94
Medway	13	21	13	20	9	14	16	18	22	20	20	28	20	16	16	14	12
Kent & Medway	**60**	**58**	**79**	**87**	**70**	**79**	**102**	**104**	**151**	**131**	**124**	**140**	**135**	**123**	**117**	**105**	**106**
Brighton and Hove	17	24	6	<5	14	15	15	30	28	35	22	23	31	15	22	24	19
East Sussex	13	28	25	13	20	15	16	12	17	27	24	25	34	20	25	23	21
Surrey	42	31	28	60	61	64	79	57	72	88	86	100	98	57	77	67	62
West Sussex	37	34	39	44	52	38	63	58	38	49	51	77	46	64	41	38	45
Surrey & Sussex	**109**	**117**	**98**	**120**	**147**	**132**	**173**	**157**	**155**	**199**	**183**	**225**	**209**	**156**	**165**	**152**	**147**
Bracknell Forest	8	<5	<5	6	<5	10	<5	6	7	9	12	10	10	6	14	7	<5
Buckinghamshire	42	38	51	47	32	40	41	37	34	30	48	52	54	45	39	42	52
Oxfordshire	36	33	26	43	64	60	52	75	53	56	60	71	70	64	74	51	38
Reading	29	30	41	39	34	59	44	55	60	57	59	52	43	66	64	37	27
Slough	56	64	68	73	71	75	62	54	59	61	72	85	84	78	58	71	54
West Berkshire	6	5	8	<5	9	11	<5	10	5	11	7	6	9	11	7	5	6
Windsor and Maidenhead	11	12	11	15	7	17	8	9	11	13	9	10	12	9	21	7	10
Wokingham	9	5	9	13	11	9	15	12	9	10	16	10	14	12	19	17	16
Thames Valley	**197**	**191**	**218**	**240**	**232**	**281**	**229**	**258**	**238**	**247**	**283**	**296**	**296**	**291**	**296**	**237**	**206**
South East	**442**	**430**	**481**	**542**	**557**	**583**	**607**	**627**	**629**	**712**	**711**	**813**	**778**	**683**	**664**	**593**	**567**

Table Bii: TB rate* per 100,000 by local authority of residence, South East, 2000 to 2016

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hampshire	2.7	2.4	3.3	3.4	4.1	3.0	3.7	4.2	2.9	5.1	5.1	6.0	5.0	4.0	3.3	4.3	4.3
Isle of Wight	0.0	5.3	2.2	0.7	0.7	2.2	0.0	5.1	0.7	2.2	2.2	4.3	5.0	1.4	2.2	0.7	2.1
Portsmouth	12.8	6.4	8.0	8.4	11.9	10.2	11.7	11.8	11.7	15.1	11.8	7.8	11.1	9.2	4.8	8.0	5.6
Southampton	8.3	6.8	12.2	16.2	14.8	13.2	14.6	10.6	10.5	15.7	11.6	21.6	17.1	16.1	11.8	9.2	13.4
Hampshire & Isle of Wight	**4.3**	**3.6**	**4.8**	**5.3**	**6.0**	**5.0**	**5.6**	**5.9**	**4.6**	**7.2**	**6.4**	**8.0**	**7.2**	**5.9**	**4.4**	**5.1**	**5.5**
Kent	3.5	2.8	4.9	5.0	4.5	4.7	6.2	6.1	9.1	7.7	7.2	7.6	7.8	7.2	6.7	6.0	6.1
Medway	5.2	8.4	5.2	8.0	3.6	5.6	6.3	7.0	8.5	7.7	7.6	10.6	7.5	5.9	5.8	5.1	4.3
Kent & Medway	**3.8**	**3.7**	**5.0**	**5.4**	**4.3**	**4.9**	**6.2**	**6.3**	**9.0**	**7.7**	**7.2**	**8.1**	**7.7**	**7.0**	**6.6**	**5.8**	**5.8**
Brighton and Hove	6.8	9.6	2.4	1.2	5.6	5.9	5.9	11.6	10.7	13.2	8.2	8.4	11.2	5.4	7.8	8.4	6.6
East Sussex	2.6	5.7	5.0	2.6	4.0	2.9	3.1	2.3	3.3	5.2	4.6	4.7	6.4	3.7	4.6	4.2	3.8
Surrey	4.0	2.9	2.6	5.6	5.7	6.0	7.3	5.2	6.5	7.9	7.6	8.8	8.6	4.9	6.6	5.7	5.3
West Sussex	4.9	4.5	5.2	5.8	6.8	4.9	8.1	7.4	4.8	6.2	6.3	9.5	5.6	7.8	4.9	4.5	5.3
Surrey & Sussex	**4.3**	**4.6**	**3.8**	**4.7**	**5.7**	**5.1**	**6.6**	**5.9**	**5.8**	**7.4**	**6.7**	**8.2**	**7.6**	**5.6**	**5.9**	**5.4**	**5.1**
Bracknell Forest	7.3	3.6	3.7	5.5	3.7	9.1	3.6	5.4	6.3	8.0	10.6	8.8	8.7	5.1	11.9	5.9	2.5
Buckinghamshire	8.8	7.9	10.7	9.8	6.6	8.2	8.4	7.5	6.8	6.0	9.5	10.3	10.6	8.7	7.5	7.9	9.7
Oxfordshire	5.9	5.4	4.3	7.0	10.3	9.6	8.2	11.8	8.3	8.7	9.2	10.8	10.6	9.6	11.0	7.5	5.6
Reading	20.2	20.7	28.5	27.1	23.5	40.2	29.7	36.7	39.6	37.4	38.2	33.5	27.4	41.4	39.8	22.9	16.6
Slough	46.8	53.1	56.2	60.4	58.8	61.0	49.5	42.2	44.9	45.3	52.2	60.4	59.2	54.5	40.1	48.7	36.7
West Berkshire	4.2	3.5	5.6	2.8	6.2	7.5	2.0	6.7	3.3	7.2	4.5	3.9	5.8	7.1	4.5	3.2	3.8
Windsor and Maidenhead	8.2	9.0	8.2	11.2	5.2	12.5	5.8	6.4	7.8	9.1	6.3	6.9	8.2	6.2	14.2	4.7	6.7
Wokingham	6.0	3.3	6.0	8.7	7.4	6.0	10.0	7.9	5.9	6.5	10.3	6.5	8.9	7.6	11.9	10.6	9.9
Thames Valley	**10.5**	**10.1**	**11.5**	**12.6**	**12.2**	**14.6**	**11.8**	**13.2**	**12.0**	**12.4**	**14.1**	**14.6**	**14.5**	**14.1**	**14.2**	**11.3**	**9.7**
South East	**5.7**	**5.5**	**6.1**	**6.9**	**7.0**	**7.3**	**7.5**	**7.7**	**7.7**	**8.6**	**8.5**	**9.7**	**9.2**	**8.0**	**7.7**	**6.8**	**6.5**

* Rates calculated using ONS mid-year population estimates.

Table Biii: TB case numbers and rate* per 100,000 by age and sex, South East, 2016

Age group (years)	Female		Male	
	n	rate	n	rate
0-9	3	0.6	5	0.9
10-19	19	3.9	14	2.7
20-29	57	11.1	54	9.9
30-39	48	8.7	76	14.3
40-49	39	6.4	53	8.9
50-59	30	5.0	40	6.8
60-69	27	5.4	26	5.5
70+	35	5.3	41	7.9

* Rates calculated using ONS mid-year population estimates.

Table Biv: Drug resistance among TB patients with culture confirmed disease*, South East, 2000 to 2016

Year	Any resistance		Isoniazid resistant		Multi-drug resistant		Total*
	n	%	n	%	n	%	
2000	15	7.4	14	6.9	3	1.5	203
2001	8	4.3	6	3.2	0	0.0	185
2002	22	7.5	20	6.8	7	2.4	292
2003	20	6.2	19	5.8	1	0.3	325
2004	21	6.4	19	5.8	2	0.6	330
2005	19	5.1	18	4.8	1	0.3	374
2006	25	6.1	21	5.1	4	1.0	411
2007	25	6.4	20	5.1	1	0.3	391
2008	28	7.5	22	5.9	5	1.3	375
2009	34	8.2	29	7.0	3	0.7	415
2010	27	6.3	25	5.8	6	1.4	431
2011	44	9.1	36	7.5	6	1.2	483
2012	39	8.1	36	7.4	7	1.4	484
2013	27	6.2	24	5.5	1	0.2	435
2014	31	7.3	30	7.1	3	0.7	425
2015	22	6.0	19	5.2	6	1.6	366
2016	24	6.6	23	6.3	5	1.4	366

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