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Tuberculosis in the South West Annual Review

Presenting data from 2000 to 2016

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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 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 FES network, excellence and innovation is encouraged, we foster academic collaborations and take active part and lead in research, development and training.

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Authors

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Executive summary

- in 2016, there were 239 cases of tuberculosis (TB) notified among residents of the South West, a rate of 4.3 per 100,000 population (95% confidence interval (CI): 3.8 to 4.9)
- the UK-wide TB rate for 2016 was 10.2 per 100,000 population
- the following local authorities had the highest notification rates: City of Bristol (14.8 per 100,000 population), Swindon (13.8 per 100,000 population), and South Gloucestershire (6.5 per 100,000 population)
- the rate of notifications for males and females were 5.1 and 3.6 per 100,000 population respectively
- the highest rates were observed in the following age groups: 30 to 39 (8.7 per 100,000 population), 20 to 29 (7.6 per 100,000 population), and ≥70 (4.9 per 100,000 population) years
- the rate for UK born children under 15 years (an indicator for ongoing local transmission) was 0.1 per 100,000 population, the second lowest recorded since 2000
- the rate of TB among non-UK born persons was 31.1 per 100,000 population (138 cases) and the rate of TB among UK born persons was 1.9 per 100,000 population (95 cases)
- the largest proportion of non-UK born cases were born in India (33, 23.9%) followed by Romania (9, 6.5%), Pakistan (9, 6.5%) and Somalia (8, 5.8%)
- ethnicity for the majority of cases was White (113, 47.7%) followed by Indian (36, 15.2%) and Black African (35, 14.8%)
- the majority of cases were diagnosed with pulmonary disease (154, 65.0%)
- in all, 149 (62.3%) cases were culture confirmed and 42 (49.4%) pulmonary cases were sputum smear positive
- the median delay between symptom onset and diagnosis was 92.0 days (inter-quartile range (IQR): 48.0 to 173.5)
- the median delay between symptom onset and treatment start date was 96.0 days (IQR: 50.0 to 175.5)
- social risk factors (alcohol abuse, drug use, homelessness and/or imprisonment) were reported for 29 (15.0%) cases
- the postcodes of cases were linked to an Index of Multiple Deprivation (IMD) score as an indicator of socio-economic status; in 2016, the largest proportion of cases lived in areas from the most deprived IMD decile (60, 25.1%)

- HIV tests were offered to 181 (84.6%) cases and HIV status was already known for 21 (9.8%) cases
- in 2016 there were 39 clustered cases within the South West including 10 newly identified clusters
- resistance to at least one first-line drug was present in 18 (12.1%) notifications, this is the highest proportion recorded since 2000
- there were 3 (2.0%) cases of multi-drug resistant (MDR) TB
- there were 4 (2.7%) notifications that were resistant to at least one second-line TB drug; 2 of these were also MDR TB
- following a 12-month follow-up period, 185 (75.5%) cases notified in 2015 successfully completed treatment, 22 (9.0%) were still on treatment, 10 (4.1%) stopped treatment, 11 (4.5%) died, 12 (4.9%) were lost to follow up and 5 (2.0%) cases were not evaluated

Introduction

The South West PHE centre (PHEC) covers the upper tier local authority areas of Bath and North East Somerset, Bournemouth, the City of Bristol, Cornwall, Devon, Dorset, Gloucestershire, Isles of Scilly, North Somerset, Plymouth, Poole, Somerset, South Gloucestershire, Swindon, Torbay, and Wiltshire. The South West is traditionally a low incidence area for TB when compared to the rest of the UK. This reflects the socio-demographic characteristics of the population (low level of non-UK born migrants and a rural environment). There is only one local authority, the City of Bristol, with an annual incidence of TB routinely greater than the national rate. In 2016, the incidence of TB in Swindon was higher than the national rate for the first time since 2000. See Appendix A for a description of data sources and definitions.

Enhanced TB surveillance in England and Wales was launched in January 1999. It has the aim of providing detailed, comparable information on the epidemiology of TB following the worldwide resurgence of the disease, which prompted the World Health Organization to declare a ‘global emergency’ in 1993. The minimum dataset in the surveillance system includes notification, demographic, clinical and microbiological information on all cases of TB reported by clinicians at local level. In 2008 a new Enhanced Tuberculosis Surveillance (ETS) system was rolled out across the UK. The ETS system is a secure website, enabling users to notify and de-notify cases, add treatment outcome monitoring information, generate reports and export case or laboratory information. The ETS system was implemented in the South West in November 2008. The system is real-time; once information is entered onto the website it is accessible at clinic, regional and national level.

As part of the Collaborative TB Strategy for England 2015 to 2020, a suite of TB Strategy Monitoring Indicators has been developed in this document [1]. Where data for these indicators are presented in this report, the indicator name is shown. Data for indicators which are presented for upper tier local authority can be found at: http://fingertips.phe.org.uk/profile/tb-monitoring

Data for this report come principally from 3 different years:

1. Case data are from TB notifications occurring in 2016.
2. Outcome data for patients with drug sensitive TB infections are from 2015 notifications.
3. Outcome data for patients with drug resistant TB are from 2014 notifications.

Objectives

The objectives of this report are to:

1. Describe the overall epidemiology of TB in the South West.
2. Highlight recent trends in TB epidemiology.
3. Identify areas of high burden of disease.
4. Identify at-risk population groups.
5. Assist in the identification of opportunities to prevent further cases.

Tuberculosis epidemiology

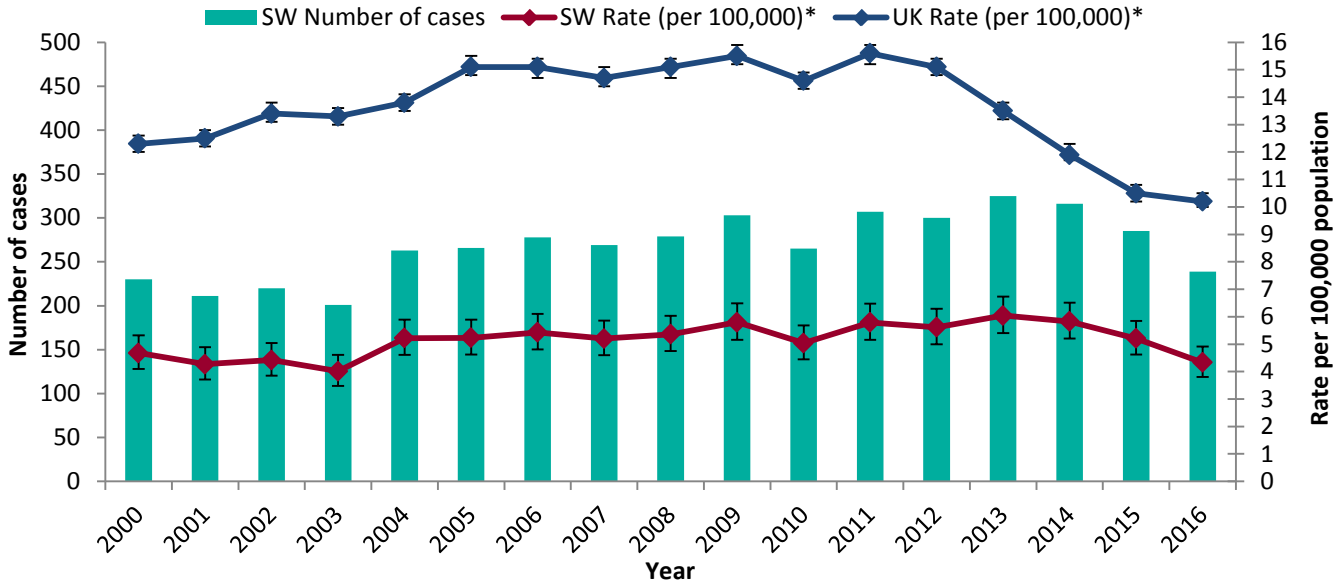
Overall numbers, rates and geographical distribution

In 2016, there were 239 cases of TB notified among residents of the South West PHEC. This equates to a rate of 4.3 per 100,000 population (95% CI: 3.8 to 4.9). The rate in 2016 was a continuation of a year on year decrease that has occurred since 2013, see Figure 1. It is also the lowest rate recorded since 2003. The South West rate was lower than the overall UK rate of 10.2 per 100,000 population. England has experienced a decrease in its annual TB incidence for a fifth consecutive year.

Within the South West, the highest TB rates were observed in the following local authorities in order of decreasing incidence: the City of Bristol (14.8 per 100,000 population), Swindon (13.8 per 100,000 population), South Gloucestershire (6.5 per 100,000 population), Plymouth (6.5 per 100,000 population) and Gloucester (6.2 per 100,000 population). The burden of TB infection in the City of Bristol means the area has a considerable effect on the epidemiology of TB in the South West.

The incidence rate for Bristol has now decreased in 3 consecutive years since 2013 and is the lowest recorded since 2003. Figure 2 is a map displaying the 2016 TB notification rates by upper tier local authority.

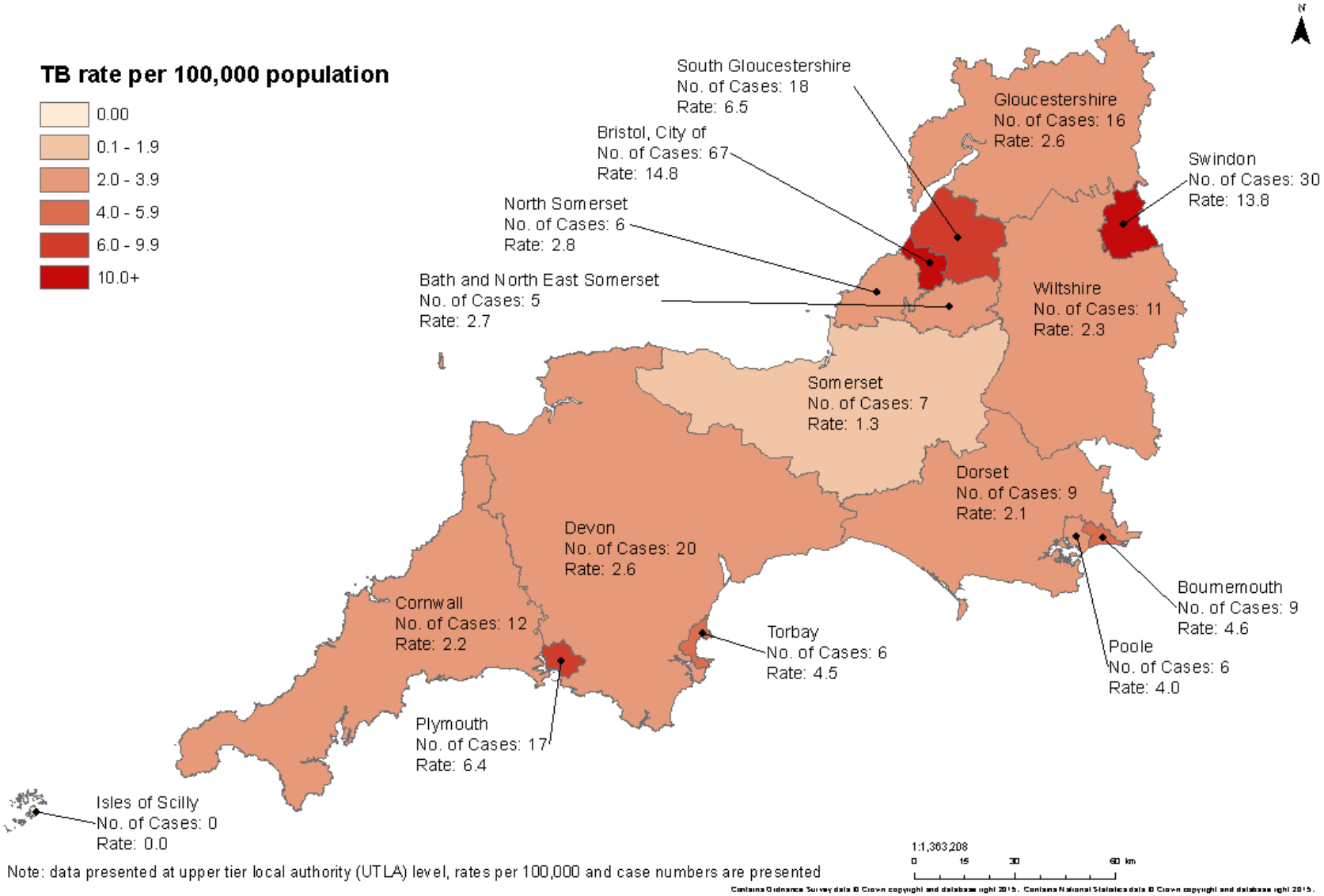
Figure 1. Number of TB cases, rate and 95% confidence intervals, South West and England, 2000 to 2016



* Rate calculated using Office of National Statistics mid-year population estimates.

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

Figure 2. TB rate per 100,000 population by upper tier local authority of residence, South West, 2016



Note: data presented at upper tier local authority (UTLA) level, rates per 100,000 and case numbers are presented

Demographic characteristics

Age and sex

Data on age and sex were available for all TB notifications in 2016. There were 139 male (58.2%) and 100 female (41.8%) cases. This equates to a rate of 5.1 per 100,000 population for males (95% CI: 4.3 to 6.1) and 3.6 per 100,000 population for females (95% CI: 2.9 to 4.3). These rates have remained relatively stable over the past 4 years.

The age of cases ranged from 6 months to 91 years and the median age was 40.0 years (IQR: 28.5 to 61.0). The age distribution was similar for men and women. Male cases had a median age of 42.0 years (IQR: 31.0 to 58.5) and for females the median age was 37.0 years (IQR: 26.8 to 63.3). The highest rates of TB were observed in those aged 30 to 39 (8.7 per 100,000 population), 20 to 29 (7.6 per 100,000 population) and ≥70 (4.9 per 100,000 population) years. When cases were stratified by age and sex, the highest rates were found in males aged 30 to 39 years (10.2 per 100,000 population) and 20 to 29 years (6.9 per 100,000 population). The highest rates for females were in those aged 20 to 29 years (8.3 per 100,000 population) and 30 to 39 years (7.3 per 100,000 population), see Figure 3.

There were 2 notifications of TB in children aged 0 to 14 years giving a rate of 0.2 per 100,000 population (95% CI: 0.0 to 0.8). The rate in children under 5 years was 0.3 cases per 100,000 population (95% CI: 0.0 to 1.8).

In 2016 there was a drop in the rate of disease in the 10 to 19 age group to its lowest level since 2010. The rate in age groups 40 to 49 and 50 to 59 have decreased over the past 2 years. The rates in the 60 to 69 and ≥70 age groups have remained relatively unchanged from 2015. Further trends in TB rate by age group are displayed in Figure 4.

Figure 3. Number of TB cases and rate by age and sex, South West, 2016

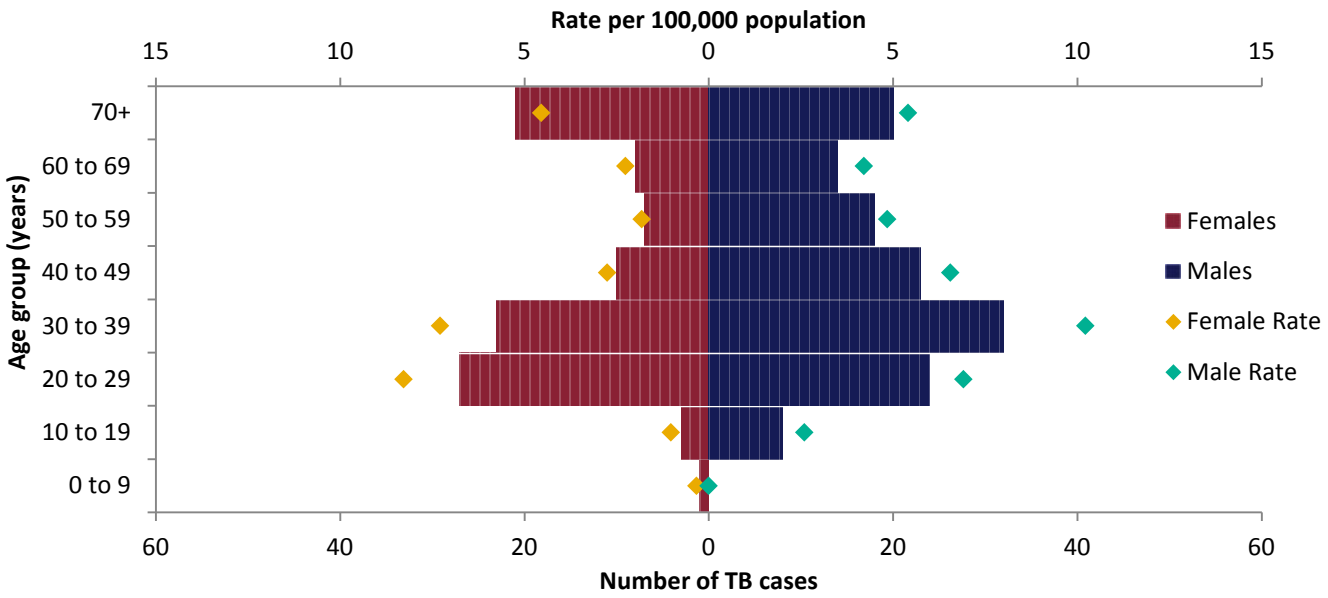
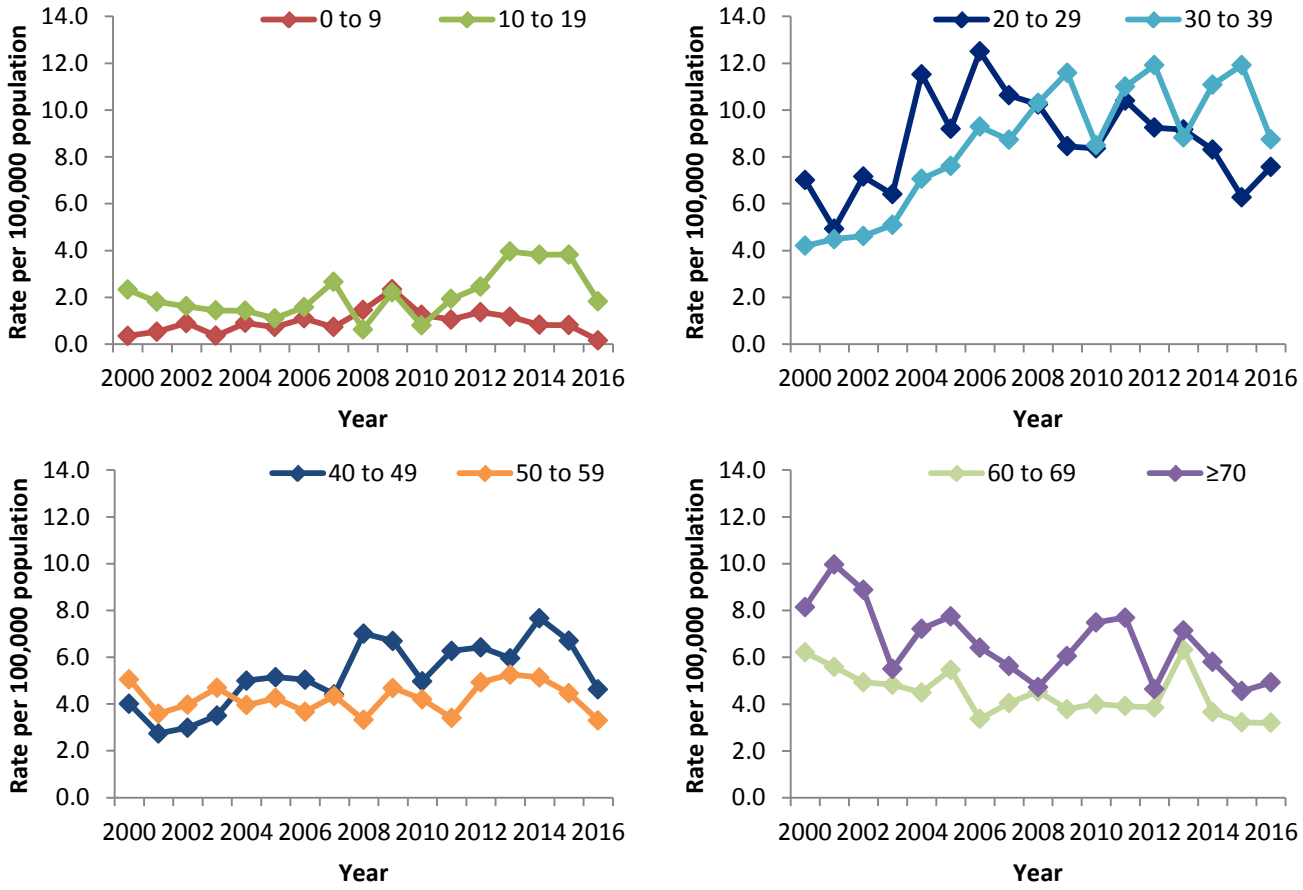


Figure 4. TB rate by age group, South West, 2000 to 2016

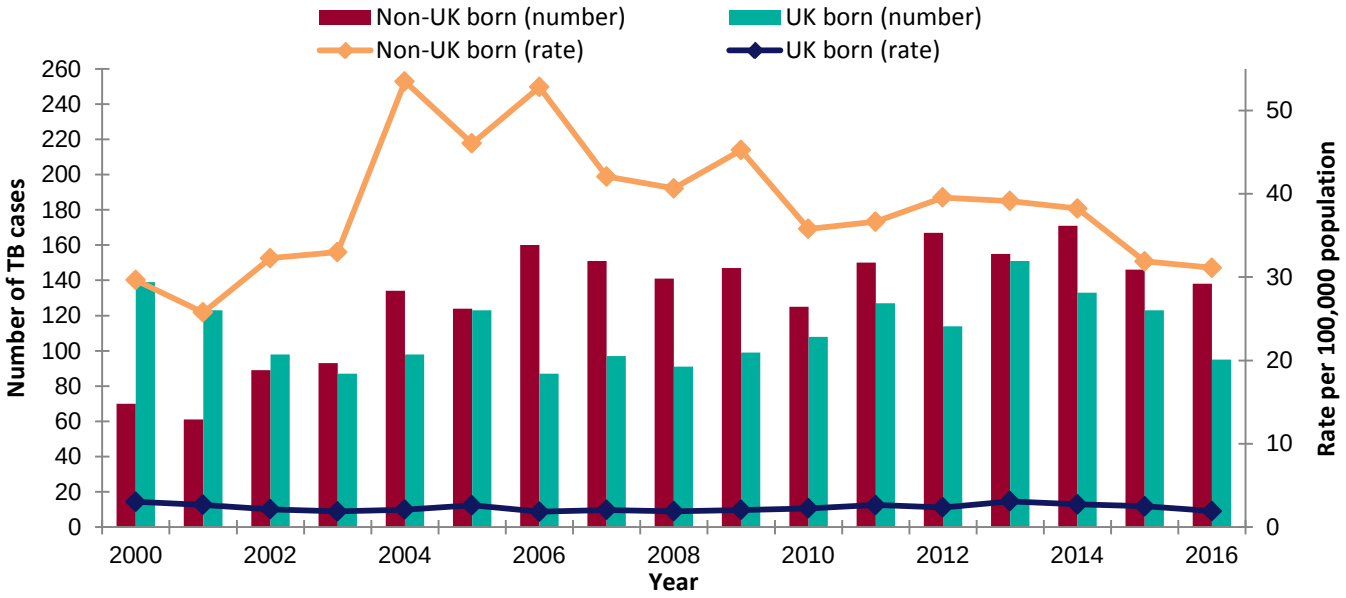


Place of birth and time since entry to the UK

In 2016, data were available on whether a case was born in the UK for 233 (97.5%) cases. Of these cases 138 (59.2%) were born outside of the UK, resulting in a non-UK born rate of 31.1 per 100,000 population. This is the lowest rate recorded for the non-UK born population since 2001 but is not substantially different from 2015. However this was substantially higher than the rate of 1.9 per 100,000 population observed in the UK-born population, see Figure 5.

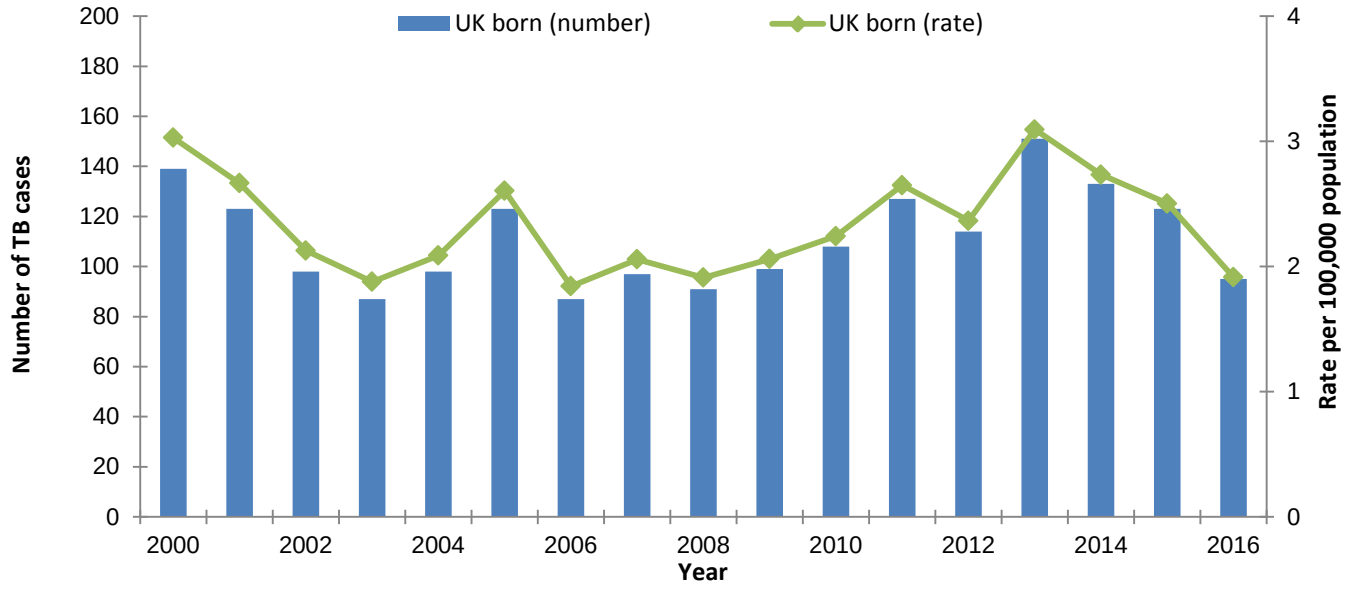
The rate of TB in the South West's UK born population has continued a recent decrease from a peak of 3.1 per 100,000 population in 2013. The UK born rate for 2016 was 1.9 per 100,000 population, see Figure 6.

Figure 5. TB cases and rate by place of birth, South West, 2000 to 2016



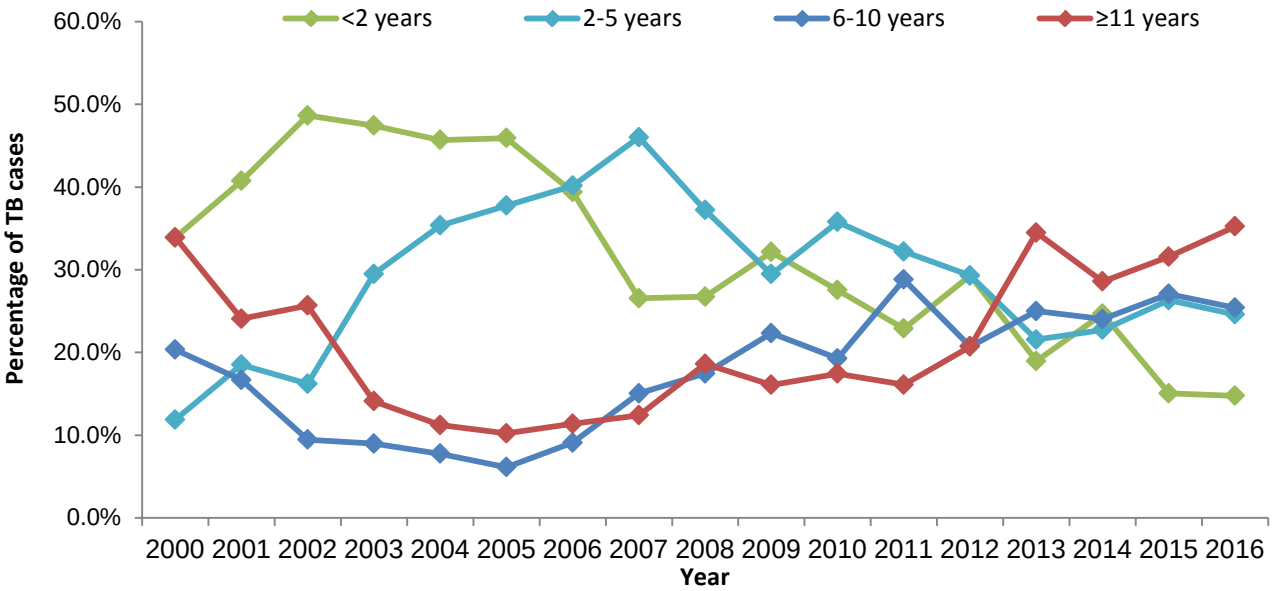
TB Monitoring Indicator 2: TB incidence in UK born and non-UK born populations (England).

Figure 6. TB cases and rate for the UK born population, South West, 2000 to 2016



In 2016, data were available on time since entry to the UK for 122 (88.4%) non-UK born cases. A total of 43 (35.2%) had a time between entry to the UK and TB diagnosis of ≥11 years, 61 (50.0%) entered the UK between 2 and 10 years prior to diagnosis and 18 (14.8%) had a time between entry and diagnosis of less than 2 years. The median time from entry to diagnosis was 8 years in 2016, this is the highest recorded since 2000. Since 2005, the proportion of cases with a time between entry and diagnosis less than 2 years has been decreasing and this trend continued in 2016. This has occurred in conjunction with an increase in the percentage of cases diagnosed ≥11 years since entry to the UK, see Figure 7.

Figure 7. Time between entry to the UK and TB diagnosis for non-UK born cases by year, South West, 2000 to 2016



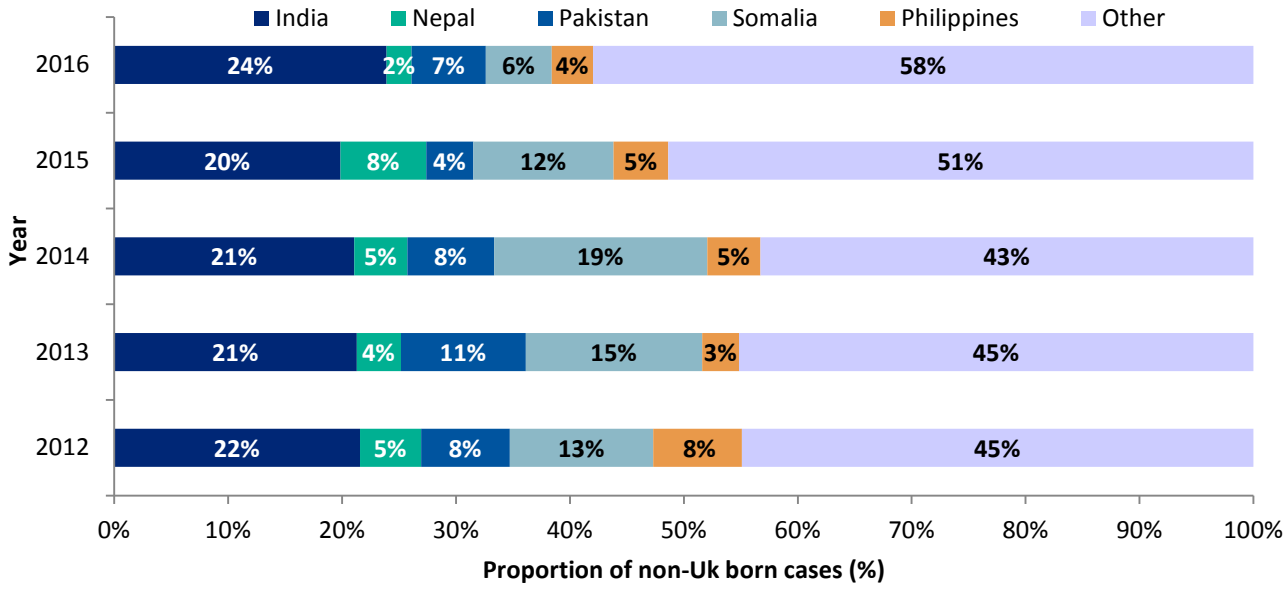
Country of birth data were available for 136 (98.6%) non-UK born cases. The largest proportion were born in India (33, 23.9%) followed by Romania (9, 6.5%) and Pakistan (9, 6.5%), see Table 1. The modal average time between entry to the UK and TB diagnosis varied by country of birth. Those born in India were most frequently in the 2 to 5 years group, Romania the 0 to 1 years group and Pakistan the ≥11 years group. However, it is difficult to draw conclusions from the modes due to the low numbers involved.

Over the past 5 years, people born in India have made up the highest proportion of non-UK born cases. In 2016, the proportion of non-UK born cases from Somalia decreased. For the past 2 years the proportion of cases from countries other than those in the top 5 has increased, see Figure 8.

Table 1. Ten most common countries of birth for non-UK born TB cases, South West, 2016

Country of birth	Number of cases	Percentage of non-UK born patients (%)
India	33	23.9
Romania	9	6.5
Pakistan	9	6.5
Somalia	8	5.8
Poland	6	4.3
Thailand	6	4.3
Philippines	5	3.6
Eritrea	4	2.9
Bangladesh	4	2.9
Spain	4	2.9

Figure 8. Five-year trend in the percentage of non-UK born TB cases in the 5 most common countries of birth, South West, 2012 to 2016



Ethnicity

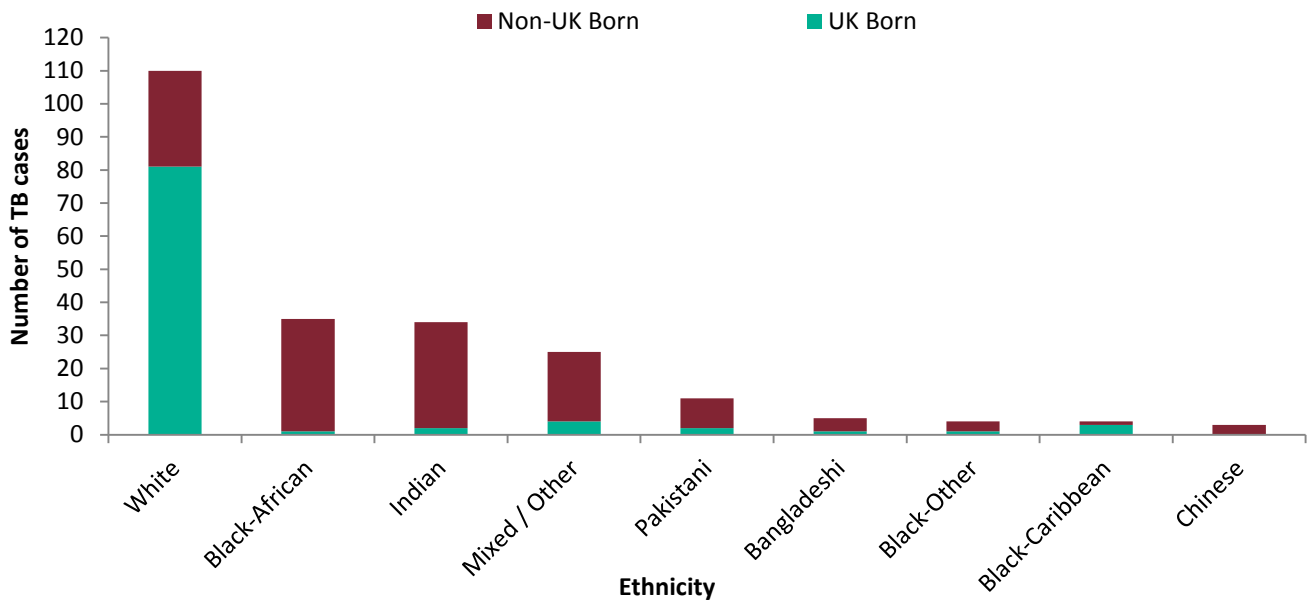
Data on ethnic group were available for 237 (99.2%) cases in 2016. The most frequent ethnicity was White (113, 47.7%) followed by Indian (36, 15.2%) and Black-African (35, 14.8%), see Table 2. White ethnicity has consistently made up the majority of TB cases in the South West since 2000. The proportion of each ethnicity has remained reasonably stable over time apart from a large decrease in White ethnicity cases between 2000 and 2004.

The majority of cases with White or Black-Caribbean ethnicity were UK born, see Figure 9. For all other ethnic groups the majority were non-UK born.

Table 2. Percentage of TB cases by ethnicity and year, South West, 2012 to 2016

Ethnicity	2012	2013	2014	2015	2016
Bangladeshi (%)	1.1	2.3	2.9	1.4	2.5
Black African (%)	16.3	14.7	20.6	18.1	14.8
Black Caribbean (%)	2.1	3.3	0.3	0.7	1.7
Black Other (%)	0.7	0.7	1.3	0.7	1.7
Chinese (%)	1.4	1.0	1.6	1.1	1.3
Indian (%)	15.9	11.8	12.3	13.2	15.2
Mixed Other (%)	12.7	9.2	9.7	9.6	10.5
Pakistani (%)	4.6	5.2	5.2	2.5	4.6
White (%)	45.2	52.0	46.1	52.7	47.7

Figure 9. Frequency of ethnicity by place of birth for TB cases, South West, 2016*



* Excludes cases with a missing place of birth.

Occupation

In 2016, 185 (77.4%) cases were aged between 16 and 64 and therefore considered of working age. Information on occupation was available for 175 (94.6%) of these cases. The most common occupational category was 'Other' (84, 48.0%), followed by 'None' (53, 30.3%) 'Education' (19, 10.9%) and 'Healthcare worker' (16, 9.1%), see Table 3. The most common occupations in the 'Other' category were builder and warehouse worker, each accounting for 4 cases (4.8%). In the 'None' category people most frequently reported unemployment (25, 47.1%) or housewife/husband (13, 24.5%). The majority of people in the education and healthcare category were students (16, 84.2%) and other healthcare workers (12, 75.0%) respectively.

Table 3. Occupational category of TB patients aged 16 to 64 years, South West, 2016

Occupational category	Number of TB Cases	Percentage of cases (%)
Agricultural/animal care worker	2	1.1
Education	19	10.9
Healthcare worker	16	9.1
Social service/prison worker	1	0.6
Other	84	48.0
None	28	16.0
Unemployed	25	14.3
Total	**175**	**100.0**

Clinical characteristics

Site of disease

Site of disease was known for 237 (99.2%) cases in 2016. The majority of these cases were diagnosed with pulmonary disease (154, 65.0%) with the remaining cases experiencing non-pulmonary disease only (83, 35.0%). Of the pulmonary cases, 38 (24.7%) also had non-pulmonary disease.

The distribution in site of disease has remained relatively stable over the past 10 years (the proportion of pulmonary disease has ranged from 61.3% to 68.3%). The most commonly recorded non-pulmonary sites of disease were extra thoracic lymph nodes (48, 20.3%), non-pulmonary unknown (34, 14.3%) and pleural (26, 11.0%), see Table 4.

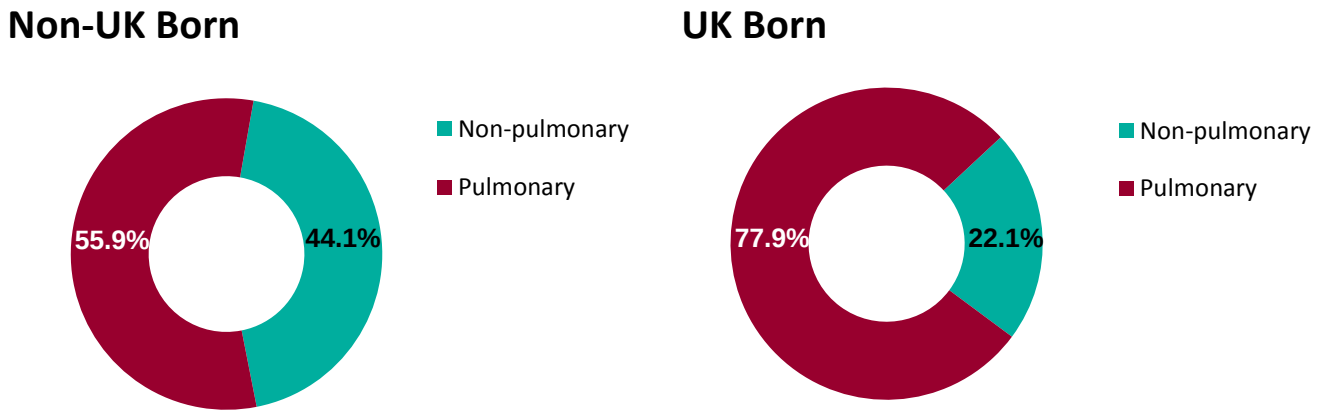
Table 4. Site of disease for TB patients, South West, 2016*

Site of disease	Number of cases	Percentage of cases (%)
Pulmonary	**154**	**65.0**
Miliary	7	3.0
Laryngeal	0	0.0
Non-Pulmonary	**83**	**35.0**
ET Lymph nodes	48	20.3
Non-Pulmonary Unknown	34	14.3
Pleural	26	11.0
IT Lymph nodes	16	6.8
Gastro-Intestinal	16	6.8
Non-Pulmonary Other	8	3.4
Bone - Spine	8	3.4
Bone - Not Spine	8	3.4
CNS - Other	8	3.4
CNS - Meningitis	4	1.7
Genitourinary	3	1.3
Cryptic	1	0.4

* Patients may have disease at more than one site.

There was a higher proportion of UK born cases with pulmonary disease (74, 77.9%) compared to non-UK born cases (76, 55.9%), see Figure 10. Site of disease also varied by ethnicity; White ethnicity cases had the highest proportion of pulmonary disease (92, 81.4%) followed by Black-Caribbean (3, 75.0%) and Black-Other (3, 75.0%). The lowest proportion of pulmonary cases were in Indian (7, 20.6%), Chinese (1, 33.3%) and Pakistani (4, 36.4%) ethnicities.

Figure 10. Proportion of pulmonary and non-pulmonary TB by place of birth, South West, 2016*



* For cases where place of birth is known. Pulmonary cases include those with both pulmonary and non-pulmonary TB.

Previous diagnosis of tuberculosis

Data on whether a case had been previously diagnosed with TB were available for 226 (94.6%) notifications in 2016. A previous diagnosis of TB was recorded for 17 (7.5%) of these patients. A similar proportion of UK born cases (7, 7.6%) had a previous TB diagnosis compared with non-UK born cases (10, 7.6%). Non-UK born cases that reported a previous TB diagnosis had a lower median age, 34.5 years (IQR: 32.0 to 40.0), compared to UK born cases, 68.0 years (IQR: 67.0 to 88.0).

The median ages were similar between non-UK born cases with a previous diagnosis (34.5 years; IQR: 32.0 to 40.0) and those without a previous diagnosis (35.0 years; IQR: 26.0 to 47.0). However, the median age of UK born cases with a previous diagnosis was higher (68.0 years; IQR: 67.0 to 88.0) compared to those without (54.0 years; IQR: 35.0 to 71.0).

BCG vaccination

BCG status was available for 159 (66.5%) cases in 2016. A total of 92 (57.9%) cases had received the BCG vaccination, which is the highest proportion since 2009. There was one child under 5 years old with TB in 2016 and this patient was recorded as having received the BCG vaccine. BCG vaccination had been administered to 69.7% (62) of non-UK born cases whereas 42.6% (29) of UK born cases had received the vaccination, see Table 5.

Table 5. Number and proportion of TB patients with BCG vaccination, South West, 2016

	<5 years old BCG vaccination			<15 years old BCG vaccination			All ages BCG vaccination		
	n	%	N	n	%	N	n	%	N
Non-UK born	0	-	0	0	-	0	62	69.7	89
UK born	1	100.0	1	1	100.0	1	29	42.6	68
All cases*	1	100.0	1	1	100.0	1	92	57.9	159

* Including cases with missing place of birth but with BCG status recorded.

Microbiological information

Culture confirmation and speciation

In 2016, data on culture confirmation were available for all cases. During this time period there were 149 (62.3%) culture confirmed cases of TB in the South West region. This proportion was higher than in the previous 3 years but lower than both 2011 (200, 65.2%) and 2012 (190, 63.3%). A total of 106 (68.8%) pulmonary cases were culture confirmed and 43 (51.8%) non-pulmonary cases were culture confirmed. A similar proportion of UK born cases (60, 63.2%) were culture confirmed when compared to non-UK born (84, 60.9%).

Information on mycobacterial species was available for all culture confirmed cases. There were 141 (94.6%) cases of *Mycobacterium tuberculosis*, 7 (4.7%) cases of *Mycobacterium bovis* and one (0.7%) case of *Mycobacterium africanum*.

Sputum smear status

Data on sputum smear status were available for 85 (55.2%) pulmonary cases. During 2016, 42 (49.4%) pulmonary cases were sputum smear positive. This is the second lowest proportion recorded since 2001.

TB transmission

Rate of TB in UK born children

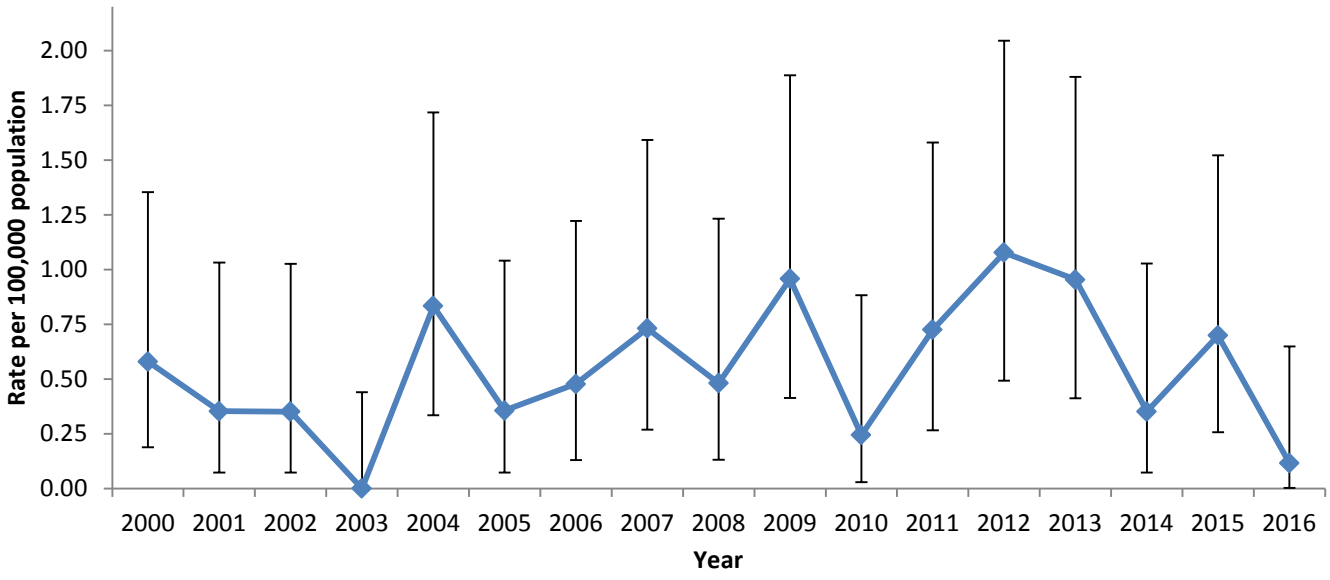
An indicator for ongoing local transmission is the rate of TB in UK born children under the age of 15. In 2016, the rate was 0.1 per 100,000 population, the lowest rate reported since 2003, see Table 6. This appears to be a continuation of a downward trend in rate since it peaked in 2012, see Figure 11. Please note that, when interpreting differences between annual rates, the 95% confidence intervals in Figure 11 are wide and represent uncertainty in the measure.

Table 6. Number and rate of UK born TB cases by age, South West, 2000 to 2016

Year	Age < 5 years		Age < 15 years		All ages	
	TB Cases	Rate per 100,000 population	TB Cases	Rate per 100,000 population	TB Cases	Rate per 100,000 population
2000	1	0.4	5	0.6	139	3.0
2001	2	0.8	3	0.4	123	2.7
2002	2	0.8	3	0.4	98	2.1
2003	0	0.0	0	0.0	87	1.9
2004	4	1.6	7	0.8	98	2.1
2005	2	0.8	3	0.4	123	2.6
2006	2	0.8	4	0.5	87	1.8
2007	0	0.0	6	0.7	97	2.1
2008	2	0.7	4	0.5	91	1.9
2009	6	2.2	8	1.0	99	2.1
2010	1	0.4	2	0.2	108	2.2
2011	3	1.0	6	0.7	127	2.6
2012	4	1.4	9	1.1	114	2.4
2013	3	1.0	8	1.0	151	3.1
2014	0	0.0	3	0.4	133	2.7
2015	4	1.3	6	0.7	123	2.5
2016	1	0.3	1	0.1	95	1.9

TB Monitoring Indicator 5: Incidence of TB in UK born children aged less than 15 years.

Figure 11. Rate of TB with 95% confidence intervals in UK born cases under the age of 15, South West, 2000 to 2016



Strain typing and clustering

The M. tuberculosis genome possesses repetitive sequences of DNA located at specific loci (a particular position, point, or place in the genome). These repeats are referred to as mycobacterial interspersed repeat units (MIRU) and variable number tandem repeats (VNTR). These vary in number between different loci and different strains. The strain typing method used in England distinguishes between M. tuberculosis complex strains by comparing the number of repeats present at 24 specific loci across the genome. Therefore the MIRU-VNTR profile of a TB isolate consists of a maximum of 24 digits, each of which represents the number of repeats at each of these loci.

The National TB Strain Typing Service in England, established in 2010, prospectively types TB isolates using MIRU-VNTR. Clusters of TB cases with indistinguishable MIRU-VNTR strain types may reflect cases that are part of the same chain of transmission, but could also reflect common endemic strains circulating either within England or abroad. Strain typing with MIRU-VNTR can be used to refute transmission between individuals that have different strain types. However, a common strain type does not confirm transmission; additional epidemiological information is required to assess whether a common strain type is likely to reflect recent transmission. In order to identify molecularly clustered cases the MIRU-VNTR profiles of isolates need to be matched at a minimum of 23 typed loci. It is important to note that molecular clustering does not imply that there are epidemiological links between the cases, only that their strains have a similar genetic makeup.

Proportion of clustered cases and geographical distribution

A total of 110 (73.8%) culture confirmed cases were typed to 24 loci and 125 (83.2%) to at least 23 loci. This was the second highest proportion of isolates that have been typed to 24 loci since this form of microbiological typing started in 2010. Since 2010, 1213 (59.5%) isolates were culture confirmed and of these 1009 (83.2%) and 735 (60.6%) have been typed to at least 23 or 24 loci respectively, see Table 7.

Since 2010 there have been 339 (33.6%) cases that were molecularly linked with at least one other South West case. These cases were part of 85 distinct molecular clusters. The remaining 670 (66.4%) cases were not identified as molecularly linked with another South West case during the same time period, see Table 8. Out of these cases, 250 (37.3%) were found to be molecularly linked to another case reported in England. In total, cases from the South West have been molecularly linked with 328 clusters within England since 2010. However, due to the low sensitivity associated with MIRU-VNTR when detecting true clusters, some of these matches may be false positives.

Table 7. Number and proportion of culture confirmed TB cases typed, typed to 23 loci and typed to 24 loci, South West, 2010 to 2016

Year	Notified cases	Culture confirmed cases		Typed cases*		≥23 loci typed cases**		24 loci typed cases#	
	N	n	%	n	%	n	%	n	%
2010	265	142	53.6	135	95.1	78	57.8	53	39.3
2011	307	200	65.1	199	99.5	169	84.9	98	49.2
2012	300	190	63.3	189	99.5	180	95.2	131	69.3
2013	325	186	57.2	168	90.3	151	89.9	94	56
2014	316	174	55.1	165	94.8	153	92.7	113	68.5
2015	285	172	60.4	164	95.3	153	93.3	136	82.9
2016	239	149	62.3	135	90.6	125	92.6	110	81.5
Total	2037	1213	59.5	1155	95.2	1009	87.4	735	63.6

* Percentage typed is the proportion of culture confirmed cases which have had at least one loci typed.
** Percentage ≥23 loci typed is the proportion of culture confirmed cases which have had at least 23 loci typed.
# Percentage 24 loci typed is the proportion of culture confirmed cases which have had all 24 loci typed.

Table 8. Number and proportion of non-clustered TB cases, clustered cases and new clusters by year, South West, 2000 to 2016

Year	Notified cases	Culture confirmed cases		≥23 loci typed cases		Non-clustered cases*		Clustered Cases South West**		Number of new clusters per year#
	N	n	%	n	%	n	%	n	%	n
2010	265	142	53.6	78	54.9	46	59.0	32	41.0	7
2011	307	200	65.1	169	84.5	114	67.5	55	32.5	14
2012	300	190	63.3	180	94.7	121	67.2	59	32.8	19
2013	325	186	57.2	151	81.2	108	71.5	43	28.5	12
2014	316	174	55.1	153	87.9	106	69.3	47	30.7	8
2015	285	172	60.4	153	89.0	89	58.2	64	41.8	15
2016	239	149	62.3	125	83.9	86	68.8	39	31.2	10
Total	2037	1213	59.5	1009	83.2	670	66.4	339	33.6	85

* Non-clustered cases have a MIRU-VNTR profile that does not match another case in the South West. These cases may have a MIRU-VNTR profile that matches another case in England.
** Clustered in time period 2010 to 2016.
# A new cluster forms at the point when a second case is notified with the same MIRU-VNTR strain type as an existing case.

Size of clusters

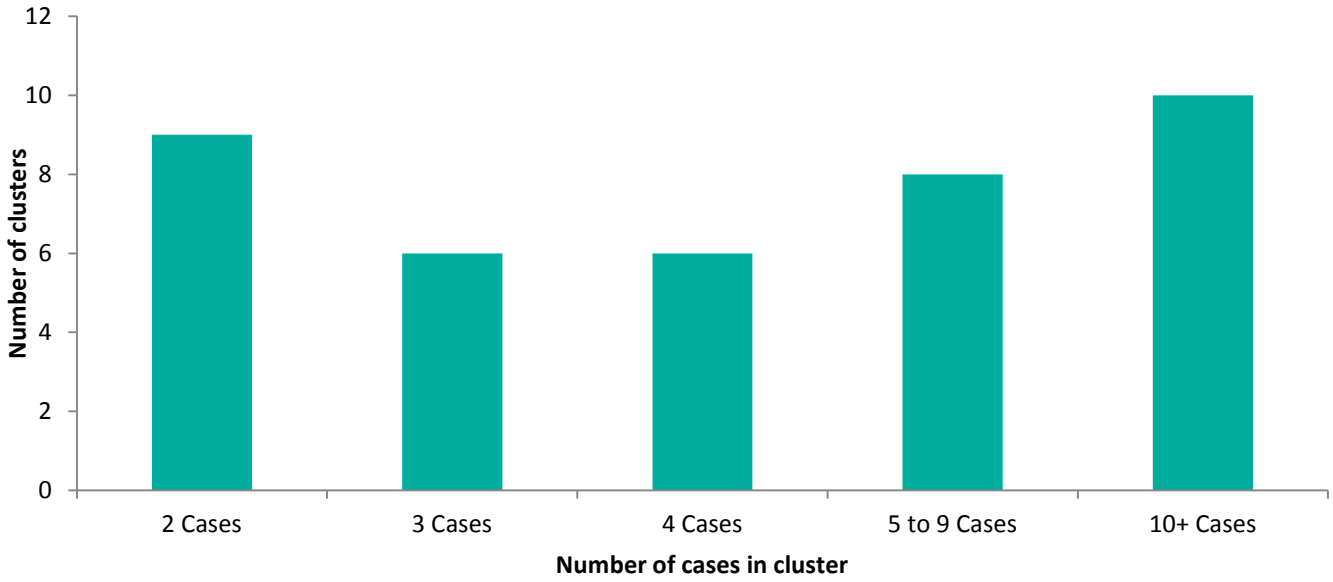
Since 2010, there have been 85 different molecular clusters involving 2 or more South West residents. Most frequently these clusters involved 2 cases (40, 47.1%), 3 cases (16, 18.8%) and 5 to 9 cases (17, 20.0%). In 2016, it was most common to have 10 or more cases in clusters seen in the South West, see Figure 12.

During 2016, one cluster expanded by 5 additional cases, the most of any cluster including South West residents. The suspected index case attended an educational institution whilst symptomatic. Since being identified and investigated in 2015 the cluster has continued to expand and is now amongst the largest clusters in the South West with a total of 11 cases at the end of 2016.

The largest cluster in the South West, which includes a total of 24 cases, expanded in 2016 by a single case. This cluster originally centred in a pub before becoming more established across a community. This cluster was active prior to the availability of strain typing and remains difficult to control due to no specific contextual setting to target public health intervention where more recent cases have been identified.

In 2016, one other cluster expanded by 3 cases, 7 clusters expanded by 2 cases and 16 clusters expanded by one case.

Figure 12. Number of TB clusters by size, South West, 2016



Characteristics of cases in clusters

In 2016 the majority of South West clustered cases were male (28, 71.8%), aged between 15 and 44 (22, 56.4%), UK born (20, 51.3%) and of White ethnicity (29, 74.4%). There were 6 (20.0%) clustered cases that reported at least one social risk factor. The most prevalent risk factor reported was homelessness (3, 11.1%), followed by imprisonment (2, 9.5%), drug use (2, 6.9%) and alcohol misuse (1, 3.3%). Please note that differences in percentages for the individual risk factors where the same absolute number was reported are due to data completion. The majority of clustered cases had pulmonary disease (31, 79.5%) and of these 8 (47.1%) were sputum smear positive. When examining drug resistance among clustered cases, 3 (7.7%) had resistance to at least one first-line drug.

Non-clustered South West cases had a similar age distribution to clustered cases but were 58.1% (50) male. A lower proportion of non-clustered cases were UK born (30, 36.1%) compared to the clustered cases. White ethnicity was still the most prevalent (34, 40.0%). Eleven (15.7%) non-clustered cases reported at least one social risk factor. Of non-clustered South West cases, 58 (67.4%) experienced pulmonary disease and 26 (44.8%) of these were sputum smear positive. There were a higher proportion of non-clustered cases (12, 14.1%) with an isolate resistant to at least one first-line drug when compared to clustered cases.

Whole genome sequencing

Whole genome sequencing of Mycobacterium tuberculosis complex isolates provides data on single nucleotide polymorphism (SNP) differences. This provides more information than the current MIRU-VNTR strain typing method on how isolates are related to each other. Whole genome sequencing will provide greater understanding of whether isolates are part of the same transmission chain, and may also help determine the timing and direction of transmission [2, 3, 4].

PHE is close to deploying the use of whole genome sequencing for TB throughout England. Whole genome sequencing has been carried out retrospectively on some isolates from TB cases epidemiologically and molecularly linked by MIRU-VNTR to support cluster investigation and to inform public health action going forward. It is hoped that this new technology will add to the understanding of TB transmission by providing robust genomic information to be used in conjunction with epidemiological and surveillance information.

Time delays from onset of symptoms to diagnosis and treatment

Delay from onset of symptoms to diagnosis

Data on the time between symptom onset and diagnosis were available for 216 (90.4%) cases in 2016. During this year, the median time between symptom onset and date of diagnosis was 92.0 days (IQR: 48.0 to 173.5), see Table 9. The minimum was one and the maximum was 4,532 days. The median is the highest reported since 2005, however it should be noted that symptom onset date can be highly variable due to errors in reporting and difficulties in confirming a specific date when symptoms began.

In 2016, the median time between symptom onset and diagnosis for pulmonary disease was 89.0 days (IQR: 45.0 to 164.0). This median time was an increase over 2015 data (77.5 days (IQR: 41.0 to 158.0) and is the highest median time delay since 2005 for this group. The proportion of pulmonary cases with a time delay greater than 4 months was 37.9% (53). This is higher than in 2015 (54, 31.0%), 2014 (50, 29.9%) and 2013 (62, 36.5%).

Pulmonary sputum smear positive cases had a higher median delay (100.5 days, IQR: 41.0 to 183.0) than pulmonary sputum smear negative cases (68.0 days, IQR: 39.0 to 131.5). Non-pulmonary cases had a median delay of 96.0 days (IQR: 62.0 to 184.0), the largest recorded since 2004.

Table 9. Time between symptom onset and date of TB diagnosis*, South West, 2016

	Median days (IQR)	0-2 months		2-4 months		>4 months		All
		n	%	n	%	n	%	N
Non-pulmonary	**96.0 (62.0-184.0)**	18	24.3	23	31.1	33	44.6	74
Pulmonary	**89.0 (45.0-164.0)**	50	35.7	37	26.4	53	37.9	140
Pulmonary smear positive	**100.5 (41.0-183.0)**	13	32.5	9	22.5	18	45.0	40
Pulmonary smear negative	**68.0 (39.0-131.5)**	17	42.5	13	32.5	10	25.0	40
All cases	**92.0 (48.0-173.5)**	69	31.9	60	27.8	87	40.3	216

* Excluding asymptomatic cases, and those with missing onset dates or information on sputum smear status.

Delay from onset of symptoms to treatment

In 2016, data on time between symptom onset and treatment start date were available for 212 (88.7%) cases. The median delay in 2016 was 96.0 days (IQR: 50.0 to 175.5). This is the highest median delay recorded since 2000. In all, 62 (29.3%) cases started treatment within 2 months of symptom onset and 87 (41.0%) had a delay of greater than 4 months.

In 2015 there was a higher median delay between symptom onset and diagnosis for females (90.5 days; IQR: 48.0 to 184.0) than males (79.5 days; IQR: 44.5 to 148.5), there was a similar difference recorded in 2014. However, in 2016 the median time for males (96.0 days; IQR: 54.0 to 172.0) had increased to a similar level to females (95.0 days; IQR: 48.0 to 204.5). The proportion of female cases with a delay to treatment from symptom onset of over 4 months was 43.2% (38) and for males was 39.5% (49).

The median delay for UK born cases was 107.0 days (IQR: 63.0 to 231.0) and for non-UK born cases was 84.0 days (IQR: 45.0 to 164.0).

The median delay for cases reporting at least one social risk factor was 83.0 days (IQR: 62.0 to 129.0). This is compared to a median delay of 97.0 days (IQR: 50.0 to 182.0) in those with no social risk factors. Among cases that did not report any social risk factors, 44.3% (66) experienced a delay of greater than 4 months compared to 29.6% (8) in cases reporting a social risk factor, see Table 10.

Table 10. Social risk factors and time between symptom onset and TB treatment, South West, 2016

	0-2 months		2-4 months		>4 months		All
	n	%	n	%	n	%	N
No social risk factors	43	28.9	40	26.8	66	44.3	149
At least one social risk factor	6	22.2	13	48.1	8	29.6	27

TB Monitoring Indicator 6: Proportion of pulmonary TB cases starting treatment within 2 months of symptom onset (England, PHEC and Upper Tier Local Authority (UTLA) data shown on Fingertips).

TB Monitoring Indicator 7: Proportion of pulmonary TB cases starting treatment within 4 months of symptom onset (England, PHEC and UTLA data shown on Fingertips).

TB outcomes in 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 [5]. Treatment outcomes for the drug sensitive cohort are reported separately for the following groups:

1. For cases with an expected duration of treatment less than 12 months, the outcomes at 12 months from treatment start date are reported. This group excludes cases with central nervous system (CNS) disease with 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.
2. For cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported.

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

Outcomes in this section and the following section use a different dataset to the rest of the report. Cases in the dataset presented are based on the region where the last case manager was assigned to the case on ETS, that is, the treatment region. Therefore, the hospital variable may not correspond to the last case manager because of data validation rules on ETS. This data is therefore not comparable to the national annual report.

Treatment completion data were available for all drug sensitive cases notified in 2015. During this year, there were 31 (11.2%) drug sensitive cases that reported CNS TB and these were excluded from the following analysis.

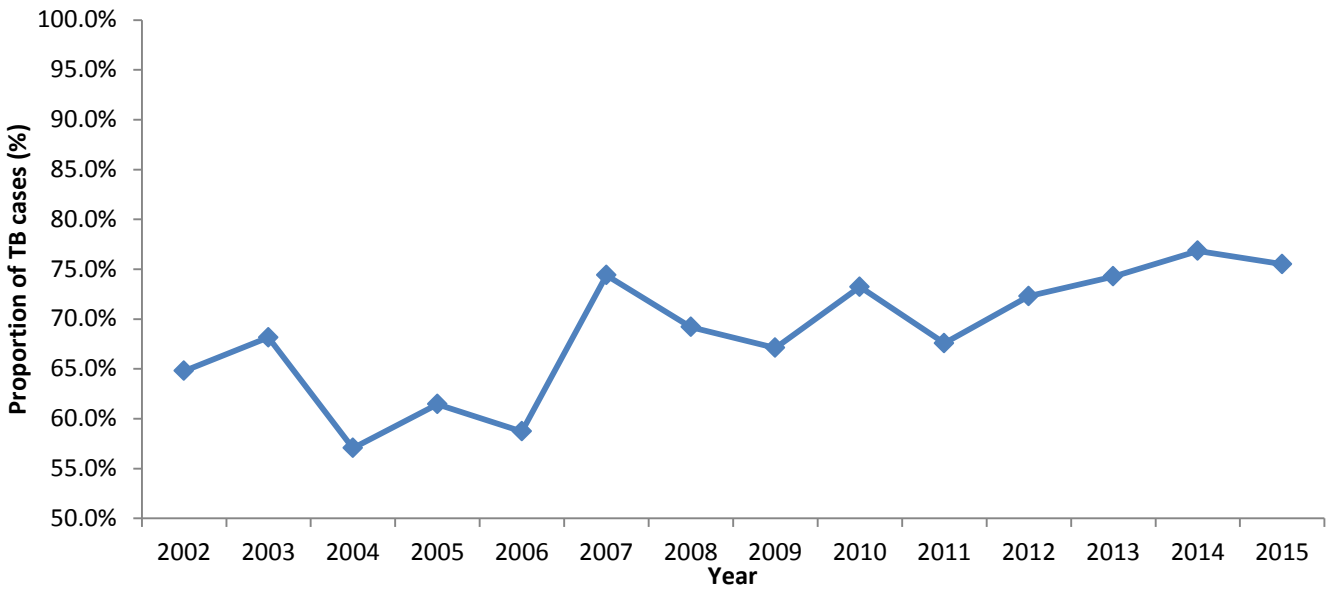
In the cohort without CNS disseminated disease and with TB infection sensitive to treatment using rifampicin, 185 (75.5%) cases completed treatment after a 12-month follow-up period, see Table 11. This is the second highest proportion of notifications that have completed treatment since 2002, see Figure 13. When compared to cases notified in 2014, the proportion falling into the outcome categories ‘died’ and ‘lost to follow up’ were higher, see Table 12. The proportion of cases that stopped treatment was the highest it has been since 2006.

Table 11. TB outcome at 12 months, South West, cases diagnosed in 2015*

Outcome at 12 months	n	%
Completed	185	75.5
Died	11	4.5
Lost to follow up	12	4.9
Still on treatment	22	9.0
Treatment stopped	10	4.1
Not evaluated	5	2.0
Total	245	100.0

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

Figure 13. Proportion of TB cases completing treatment at 12 months, South West, 2002 to 2015*



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

Table 12. The proportional distribution of TB treatment outcomes at 12 months, 2002 to 2015*

Year	Completed (%)	Died (%)	Lost to follow up (%)	Still on treatment (%)	Treatment stopped (%)	Not evaluated (%)
2001	65.4	10.3	5.1	6.6	2.2	10.3
2002	64.8	12.0	7.7	5.6	2.8	7.0
2003	68.1	8.1	3.0	2.2	3.7	14.8
2004	57.1	7.1	5.9	4.7	0.6	24.7
2005	61.5	12.8	7.3	7.3	5.0	6.1
2006	58.7	9.0	7.9	9.0	4.2	11.1
2007	74.4	6.0	4.8	10.1	0.6	4.2
2008	69.2	7.0	5.4	13.5	1.1	3.8
2009	67.1	7.5	8.3	10.1	0.4	6.6
2010	73.2	7.1	3.0	7.6	1.0	8.1
2011	67.6	5.4	6.3	12.6	0.0	8.1
2012	72.3	8.5	4.2	7.0	0.0	8.0
2013	74.0	5.8	5.1	6.9	0.7	7.6
2014	76.8	7.7	6.3	7.4	0.7	1.1
2015	75.5	4.5	4.9	9.0	4.1	2.0

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

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

TB Monitoring Indicator 11: Number and proportion of drug sensitive TB cases that were lost to follow up at last reported outcome (England, PHEC and UTLA data shown on Fingertips).

TB Monitoring Indicator 12: Number and proportion of drug sensitive TB cases that had died at last reported outcome (England, PHEC and UTLA data shown on Fingertips).

Five (50.0%) notifications that were lost to follow up left the UK whilst undergoing treatment and 5 (50.0%) were recorded as having other reasons for disengagement with TB services. When looking at patients that died prior to treatment completion, 4 (36.4%) were categorised as ‘TB incidental to death’, 3 (27.3%) ‘TB contributed to death’, one (9.1%) ‘TB caused death’ and 3 (27.3%) had an unknown relationship between death and TB. Two cases (18.2%) were diagnosed upon post-mortem examination and both of these cases had an unknown link between death and TB infection. The median age of people that died during their treatment for TB was 75.0 years (IQR: 66.0 to 85.0 years). The reasons given for people still being on treatment after the 12-month follow-up period were that treatment was extended (7, 31.8%), interrupted (5, 22.7%), or changed (2, 9.1%).

A higher proportion of males (104, 80.0%) completed treatment than females (81, 70.4%). Of those females with incomplete treatment 7 (6.1%) died, 4 (3.5%) were lost to follow up, 15 (13.0%) were still on treatment, 5 (4.4%) stopped treatment and 3 (2.6%) were not evaluated. This is compared to male outcomes with 4 (3.1%) that died, 8 (6.2%) lost to follow up, 7 (5.4%) still on treatment, 5 (3.9%) stopped treatment and 2 (1.5%) not evaluated. The oldest age group (≥65) had the lowest proportion of people completing treatment (29, 61.7%). This was due to a substantially higher proportion dying prior to treatment completion (9, 19.2%) and the highest proportion of stopped treatment (5, 10.6%). The age group with the highest proportion of people lost to follow up was 15 to 44 years (9, 6.9%). Treatment was completed for all 5 cases (100.0%) in the 0 to 14 age category.

Non-UK born patients had a similar treatment completion rate (89, 75.4%) to UK born individuals (86, 76.1%). However a higher proportion of UK born cases did not complete treatment due to death (8, 7.1%) and stopping treatment (8, 7.1%) compared to non-UK born cases with 2 (1.7%) cases deceased and 2 (1.7%) stopping treatment. A higher proportion of non-UK born cases were lost to follow up (11, 9.3%) compared to UK born notifications (1, 0.9%).

The ethnic groups with the highest proportion of cases completing treatment were Black-Other (2, 100.0%), Pakistani (5, 100.0%), Bangladeshi (3, 100.0%) and Chinese (3, 100.0%). The lowest proportions were associated with Indian (20, 62.5%), White (101, 74.8%) and Mixed Other (17, 77.3%) ethnicities. White ethnicity notifications had the highest proportion of deaths during treatment (10, 7.4%). The highest proportion of cases lost to follow up were in the Indian ethnicity group (6, 18.6%).

People that reported at least one social risk factor had a slightly lower proportion of cases completing treatment (21, 72.4%) compared to people reporting no social risk factors (133, 77.3%).

Upper tier local authorities with 5 or more cases that had a treatment completion rate of 70% or more were: Bath and North East Somerset (8, 72.7%), City of Bristol (47, 78.3%), Cornwall (7, 77.8%), Devon (24, 80.0%), Dorset (5, 83.3%), Gloucestershire (21, 84.0%), Plymouth (14, 82.4%), Swindon (13, 72.2%) and Torbay (7, 87.5%). Somerset had the lowest completion rate of areas with 5 or more cases (2, 40.0%). However the other 3 cases (60.0%) in this area were recorded as still undergoing treatment.

Outcomes: patients with CNS, spinal, miliary or cryptic disseminated disease

This section looks at the outcomes of patients with CNS, spinal, miliary or cryptic disseminated TB that are sensitive to treatment with rifampicin.

There were 31 (11.2%) cases of TB sensitive to rifampicin treatment with CNS, spinal, miliary or cryptic dissemination notified in 2015. All of these notifications were evaluated for treatment completion. Of these cases 14 (45.2%) were found to have completed treatment and 11 (35.5%) were still on treatment, see Table 13. This is a large increase in the proportion of cases completing treatment compared to 2014 when 28.6% (6) of cases completed treatment. However it is a similar proportion to other previous years.

Table 13. Outcome at 12 months for TB patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, South West, cases diagnosed in 2015*

Outcome at 12 months	n	%
Completed	14	45.2
Died	3	9.7
Lost to follow up	3	9.7
Still on treatment	11	35.5
Treatment stopped	0	0.0
Not evaluated	0	0.0
Total	31	100.0

* Excludes rifampicin resistant TB.

For 2015 notifications, the 3 people with drug sensitive CNS, spinal, miliary or cryptic disseminated disease that were lost to follow up left the UK. Of the 3 people that died, one (33.3%) case was recorded as ‘TB caused death’ while the other 2 (66.6%) had an unknown relationship between death and TB infection. None of the cases were diagnosed post-mortem. Those that died whilst on TB treatment had a median age of 72.0 (IQR: 68.0 to 87.0) years. The majority of people (9, 81.8%) that were still on treatment had their treatment extended. Treatment was extended due to initial drug resistance on one case (9.1%) or for ‘other reasons’ (8, 72.7%).

A higher proportion of men with rifampicin sensitive CNS, spinal, miliary or cryptic disseminated disease completed treatment (9, 60.0%) than women (5, 31.6%). Females had a higher proportion of cases still on treatment (7, 43.8%) than males (4, 26.7%). All 3 deaths were female and in the age group ≥65 years. Of 2 cases in the 0 to 14 age group both completed treatment. Four (80.0%) cases aged 45 to 64 years completed treatment whereas 7 (36.8%) 15 to 44 year olds completed treatment. Of the 15 to 44 year olds that did not complete treatment, 47.4% (9) were still on treatment and 15.8% (3) were lost to follow up. One (20.0%) case aged ≥65 years completed treatment.

UK born patients had a higher proportion completing treatment (5, 62.5%) than their non-UK born counterparts (8, 36.4%). Nine (40.9%) non-UK born cases were still on treatment and 3 (13.6%) were lost to follow up. This is in contrast to zero UK born cases lost to follow up and 2 (25.0%) still on treatment.

Three (10.3%) drug sensitive CNS, spinal, miliary or cryptic TB cases reported at least one social risk factor. One completed treatment, one was lost to follow up and the other was still on treatment after 12 months.

The City of Bristol had the largest number of cases in this group of any South West upper tier local authority. Six (42.9%) completed treatment, one (7.1%) died and 7 (50.0%) were still on treatment.

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

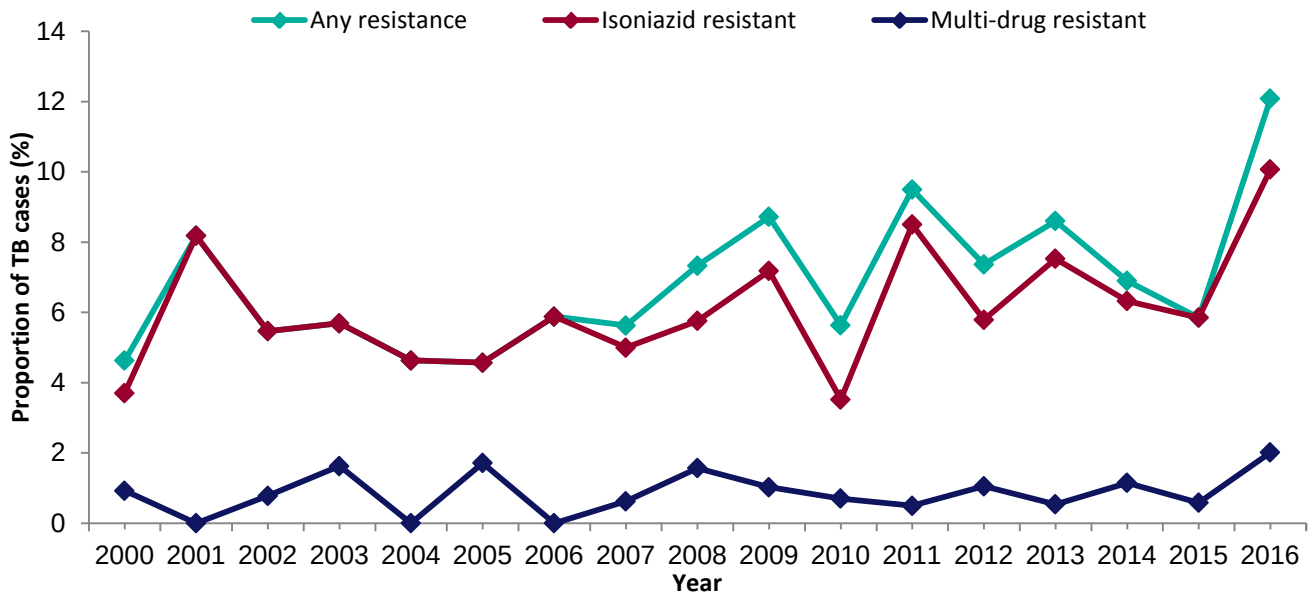
The number and distribution of drug resistant cases notified in 2016 has been analysed. Outcomes related to drug resistant TB are presented for cases notified in 2014 due to the 24-month follow-up period.

Overall drug resistance and geographical distribution

In 2016, 18 (12.1%) culture confirmed cases exhibited resistance to at least one first-line drug, see Figure 14. This was the highest proportion of resistant isolates since 2000. Three (20.0%) cases resistant to at least one first-line drug were from separate clusters. In 2016, 15 (10.1%) isolates had isoniazid resistance, 2 (1.3%) had ethambutol resistance and 4 (2.7%) rifampicin resistance. One (0.7%) isolate had pyrazinamide resistance (excluding M. bovis cases).

Three (2.0%) TB cases were found to be multi-drug resistant (MDR). These were resistant to isoniazid and rifampicin. This was 2 more MDR cases than reported in 2015 but matches the number reported in 2005 and 2008. None of the MDR cases were from clusters.

Figure 14. Proportion of TB cases with first-line drug resistance, South West, 2000 to 2016



TB Monitoring Indicator 9: Number and proportion of culture confirmed TB cases with drug susceptibility testing reported for the 4 first-line agents (England, PHEC and UTLA data shown on Fingertips).

TB Monitoring Indicator 18: Number and proportion of culture confirmed TB cases with any first-line drug resistance (England, PHEC and UTLA data shown on Fingertips).

TB Monitoring Indicator 19: Annual number and proportion of culture confirmed TB cases with MDR-TB (England, PHEC and UTLA data shown on Fingertips).

Characteristics of patients with drug resistant TB

Non-UK born cases that were culture confirmed had a higher proportion of isolates resistant to any first-line drug (13, 15.5%) when compared to UK born (4, 6.8%). All the UK born notifications with drug resistance were found to be resistant to isoniazid. The 3 MDR cases were all non-UK born.

The proportion of resistant isolates in female cases was 17.2% (10) compared to 8.9% (8) in males. The highest proportion of resistant isolates were identified in cases with White ethnicity (8, 44.4%), followed by Mixed Other (4, 22.2%) and Indian (3, 16.7%) ethnicities. One (12.5%) notification with a drug resistant isolate had a previous diagnosis of TB recorded.

Cases reporting at least one social risk factor had a higher proportion of isolates that were resistant to at least one first-line drug (4, 21.1%) compared to those not reporting social risk factors (12, 12.5%). A higher proportion of drug resistant notifications was present in pulmonary cases (15, 14.3%) than non-pulmonary cases (3, 7.0%).

Second-line drug resistance and extensively drug resistant (XDR) TB

There were 4 (2.7%) notifications in 2016 with an infection resistant to second-line drugs. This is an increase of 2 from 2015 but one less than in 2014. None of the cases in 2016 were found to be extensively drug resistant (XDR) or pre-XDR. Only one case in the South West has ever been reported XDR and this occurred in 2014.

Three (75.0%) of the cases with resistance to second-line drugs were male and one (25.0%) female. Three (75.0%) were non-UK born. All cases had pulmonary disease and were without a previous TB diagnosis. Of the 3 with social risk factor data available, one (33.3%) had at least one social risk factor.

Outcomes: patients with rifampicin resistant TB at 24 months

Outcomes in this section of the report use a different dataset to the rest of the report. Cases in this dataset are based on the region where the last case manager assigned to the case on ETS operates, that is, the treatment region. Therefore, the hospital variable

may not correspond to the last case manager because of data validation rules on ETS. This data is therefore not comparable to the national annual report.

Of cases notified in 2014, 2 were rifampicin resistant and both had treatment completion data available. One case was recorded as treatment completed, the other was lost to follow up. Both cases were male and in the 15 to 44 age group. Both cases were non-pulmonary and neither had a previous diagnosis of TB. One case was UK born and the other was non-UK born.

TB Monitoring Indicator 13: Number and proportion of drug resistant TB cases that had completed treatment at 24 months (England, PHEC and UTLA data shown on Fingertips).

TB Monitoring Indicator 14: Number and proportion of drug resistant TB cases that were lost to follow up at last reported outcome (England, PHEC and UTLA data shown on Fingertips).

TB Monitoring Indicator 15: Number and proportion of drug resistant TB cases that had died at last reported outcome (England, PHEC and UTLA data shown on Fingertips).

TB in those with social risk factors and health inequalities

Social risk factors

In 2016, data on social risk factors were available for 193 (80.8%) notifications. During this year, 29 (15.0%) cases reported at least one social risk factor (alcohol abuse, drug use, homelessness and/or imprisonment), see Table 14. This is the highest proportion of cases reporting at least one social risk factor since 2009. The majority reported one of the social risk factors only (16, 55.2%), followed by 2 (10, 34.5%) and 3 (3, 10.3%) risk factors respectively.

A higher proportion of people with at least one social risk factor had pulmonary disease (26, 89.7%). This is in contrast to 60.7% (99) pulmonary disease in those reporting no social risk factors.

At least one social risk factor was reported by 13 (16.5%) UK born cases while 15 (13.4%) non-UK born cases reported at least one social risk factor. The ethnicity with the highest proportion of people reporting social risk factors in UK born cases was White (8, 61.5%). For non-UK born cases the most prevalent ethnicity was Black-African (7, 46.7%).

Among people reporting social risk factors, the joint most prevalent risk factors were homelessness and imprisonment, see Table 15.

Table 14. TB patients reporting at least one social risk factor, South West, 2009 to 2016

Year	Any risk factor		Total
	n	%	
2009	31	18.1	171
2010	21	11.9	177
2011	23	10.9	211
2012	32	13.4	238
2013	37	13.7	271
2014	23	8.6	268
2015	32	13.6	236
2016	29	15.0	193

Table 15. Individual social risk factors among TB patients, South West, 2016

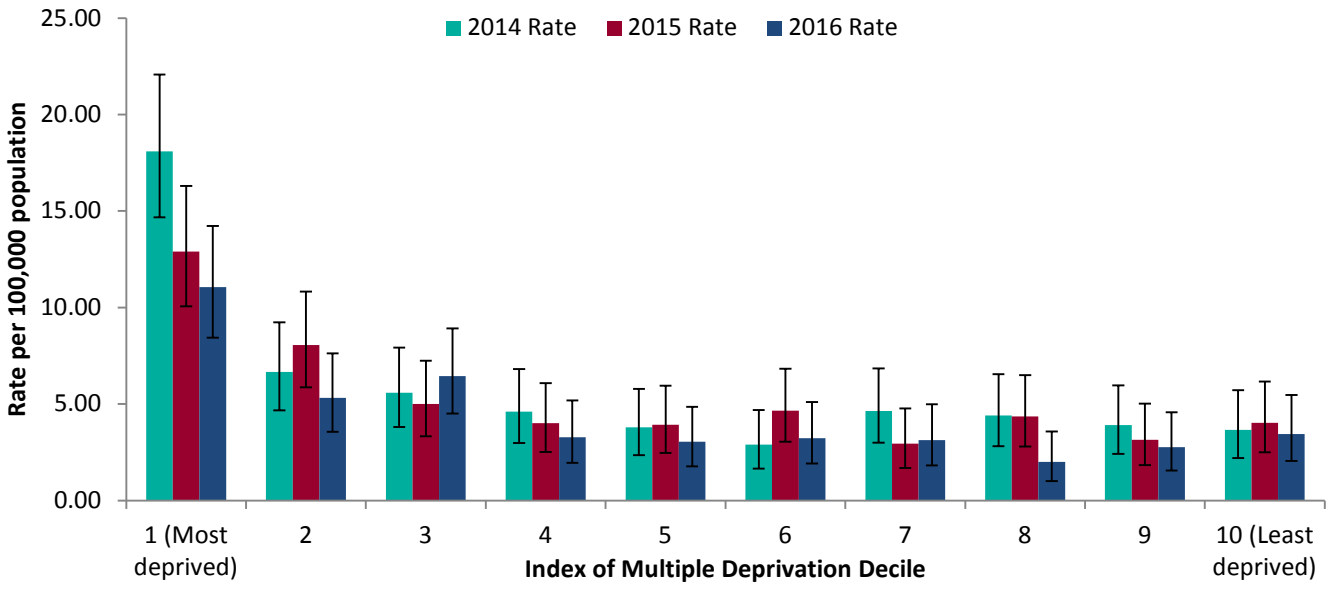
Social risk factor	n	%
Homelessness	13	6.7
Imprisonment	13	6.7
Drug misuse	10	5.2
Alcohol misuse	9	4.7

Deprivation

The Index of Multiple Deprivation (IMD), part of the English Indices of Deprivation, is an overall measure of deprivation experienced by people living in an area. It is measured at the level of lower super output areas. The postcodes of cases were linked to an IMD score as an indicator of socio-economic status. In 2016, data on IMD were available for all notifications. During this year, the largest proportion of cases lived in areas from the most deprived IMD decile (60, 25.1%), see Figure 15. The highest rates were also observed in the most deprived decile in 2015 and 2014. However, in 2016 the rate in the most deprived decile was reduced when compared to the previous 2 years.

There appears to be a trend towards higher rates of TB with increasing socio-economic deprivation. In 2016, the lowest rates are in deciles 4 to 10. The rate then appears elevated in deciles 2 and 3 and then is highest in decile one. This relationship appears far more pronounced at a national level where the TB rate increases at every decile from 10 through one.

Figure 15. TB case rate and 95% confidence intervals by Index of Multiple Deprivation decile, South West, 2016



HIV testing, directly observed therapy (DOT), and hospital admissions

HIV testing

In 2016, data on HIV testing were available for 214 (89.5%) cases. During this year, most cases (181, 84.6%) were offered an HIV test, see Table 16. The majority of cases had an HIV test performed (174, 81.3%), while for 21 (9.8%) HIV status was already known. A test was offered but refused by 3 (1.4%) patients and offered but not done for 4 (1.9%).

Table 16. HIV testing for TB cases, South West, 2016*

HIV testing status	n	%
HIV test offered and done	174	81.3
HIV test offered but not done	4	1.9
HIV test offered but refused	3	1.4
HIV status already known	21	9.8
HIV test not offered	12	5.6
All cases with data available	214	100.0

* Excludes cases diagnosed post-mortem.

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

Hospital inpatient and directly observed therapy (DOT)

In 2016, data on inpatient treatment for TB were available for 224 (93.7%) cases. A total of 59 (26.3%) cases were treated as an inpatient at some point during their care, see Table 17. Data on DOT were available for 210 (87.9%) cases. Seventeen (8.1%) patients received DOT as part of their care in 2016. This was a slight decrease from the previous 2 years.

Table 17. Hospital inpatient and DOT use for TB cases, South West, 2016

	n	%	Total
Hospital inpatient*	59	26.3	224
DOT given*	17	8.1	210

* At any time during treatment.

Comparing the South West with England

In 2016, the rate of TB in the South West (4.3 per 100,000 population) was less than half that observed nationally (10.2 per 100,000 population). The South West had the lowest regional rate, with the second lowest rate in the North East at 4.7 per 100,000 population. The highest rate nationally was in London with 25.1 per 100,000 population.

The South West region had the lowest rate of disease in the non-UK born population (31.1 per 100,000 population) and the second lowest UK born rate (1.9 per 100,000 population). England as a whole experienced a non-UK born rate of 49.4 per 100,000 population and 3.2 per 100,000 population for UK born. The year on year increase in the proportion of non-UK born cases diagnosed ≥11 years after entry to the UK seen in the South West also occurred at a national level.

In the South West the percentage of pulmonary cases (65.0%) was higher than recorded nationally (53.9%). In England 63.0% of all TB cases and 76.0% of pulmonary cases were culture confirmed in 2016. In the South West 62.3% of all cases and 68.8% of pulmonary cases were culture confirmed. The region had the lowest proportion of culture confirmed pulmonary cases.

The proportion of pulmonary notifications with a delay greater than 4 months between symptom onset and treatment start date in the South West was 38.0%. This was the highest proportion out of the regions in England. The South West region had the third highest proportion of cases reporting at least one social risk factor (15.0%). Nationally this figure was 11.1%. The South West had the highest proportion of cases reporting homelessness as a risk factor.

Excluding cases where HIV status was known, 90.2% of cases in the South West had an HIV test offered and completed compared to 93.2% in England. Nationally DOT was received in 14.3% of cases. In the South West it was used in 8.1% of cases.

The South West recorded 12.1% of culture confirmed cases exhibiting resistance to at least one first-line drug. Nationally 7.5% of cases displayed the same resistance. Two percent of cases in the South West were MDR compared to 1.5% nationally.

In relation to outcome at 12 months for drug sensitive 2015 notifications, the South West had a treatment completion rate of 75.5% which was the lowest of any region. Nationally the completion rate was 83.4% over the same time period. This was due to a comparatively high proportion of cases still on treatment or not evaluated in the South West.

Latent TB infection testing and treatment

In January 2015, the 'Collaborative Tuberculosis Strategy for England' identified £10 million of funding to establish new migrant Latent TB infection (LTBI) testing and treatment services in areas with high TB incidence (>20.0 cases per 100,000 population). The only clinical commissioning group (CCG) to meet this threshold in the South West was Bristol.

The Bristol LTBI testing and treatment service is delivered through primary care and aims to prevent active TB by identifying and treating latent TB infection. Those eligible for the service are people registering with a GP practice in Bristol who:

1. Were born or spent more than 6 months in a high TB incidence country (>150.0 per 100,000 population or Sub-Saharan Africa).
2. Entered the UK within the last 5 years.
3. Are aged between 16 to 35 years.
4. Have no history of TB, either treated or untreated.
5. Have never been screened for TB in the UK.

Data on GP patient registrations were analysed to estimate the number of patients that would be eligible for LTBI screening. Based on an average of 3 years of data, the expected screening cohort for a full year was estimated as:

- number of new migrants eligible for screening: 1,025 to 1,324
- number requiring treatment for latent TB (20% positivity): 205 to 265
- number requiring treatment for active TB (<1%): <10

All new patients registering with a GP practice (or identified through The Haven[1]) that meet the eligibility criteria are offered LTBI screening, which comprises a single blood test. A positive result leads to a referral to the TB secondary care providers for treatment and support.

The service has been delivered in 2 phases. Phase one commenced in February/March 2016 and saw the service being delivered across 5 GP practices that had the highest need and The Haven. Phase 2 saw the service delivered to the next cohort of GP practices in Bristol CCG identified with high need.

[1] The Haven offers asylum seekers and refugees across Bristol a comprehensive health assessment.

For phase one, 3 practices (and the Haven) signed up to deliver the service. Approximately, 65 patients were invited to be tested for LTBI, 53 patients were tested and 11 found to be positive with LTBI. Two results were indeterminate and it was recommended that practices should re-test these patients. One patient was identified with active TB and was referred appropriately.

Phase 2 was launched on 27 September 2016 and offered to an additional 5 practices in Bristol. Two of these practices agreed to sign up to the service. From the start of phase 2 until November 2016 an additional 14 individuals were screened and 3 found to be positive for LTBI.

Discussion

This report provides an epidemiological overview of TB in the South West. It uses notification data from 2016 and outcome data for cases notified in 2015 and 2014. There has been a year-on-year decrease in the incidence of TB in the South West since 2013 and the rate in 2016 was the lowest since 2003. The decrease has been seen in both UK and non-UK born populations. The decrease in non-UK born TB rate was not as pronounced between 2015 and 2016 as it was between 2014 and 2015.

In 2016, the rate in the non-UK born population was 16 times higher than in the UK born population and this group made up the majority of notified cases. Therefore TB in the non-UK born population remains a significant driver of TB incidence in the South West. The further decrease in TB rate in this population in 2016 could be a result of the UK pre-entry screening programme in high TB incidence countries. In addition, the number of migrants arriving in the UK from high TB burden countries has decreased in recent years and this may have affected the number of non-UK born cases in the South West.

In recent years there has been an increase in the proportion of cases diagnosed with TB ≥11 years after entering the country. This group accounted for 35.2% of non-UK born TB cases in 2016 compared to a low of 10.2% in 2005. There has also been an increase in the proportion of those diagnosed 6 to 10 years after entering the country and a corresponding decrease in those diagnosed less than 2 years and 2 to 5 years after entering the country.

For the first time since 2003, the rate of TB in the UK born population has decreased for 3 consecutive years. The decrease in the incidence of TB in the UK born population may indicate an improvement in local TB control. The rate of TB in UK born children under the age of 15 also decreased and this is also likely to be a positive indicator of decreased transmission within the community.

The geographical distribution of TB in the South West shows a concentration of cases within urban upper tier local authorities. This is similar to the distribution seen nationally. Rates of infection in the City of Bristol and Swindon were more than double those in any other South West local authority and these regions contain some of the largest urban areas in the South West. The incidence rate for Bristol has now decreased in 2 consecutive years and is the lowest recorded since 2003. Despite the similarity in rate with Swindon, the City of Bristol contributed more than double the number of TB cases to the South West total.

Resistance to any first-line drug has seen an increase to the highest proportion recorded since 2000. There was also an increase in the proportion of cases with resistance to second-line drugs when compared to 2015. There were 3 cases with MDR

TB and there were no cases of XDR TB. The data appeared to indicate that those reporting at least one social risk factor were more likely to have first-line drug resistant TB.

The South West had the lowest culture confirmation rate for pulmonary cases (68.8%) of any region in England. TB cases at any site were 62.3% culture confirmed. Culture confirmation supports confirmation of clinical and radiological TB diagnosis, selection of appropriate treatment regimens, and microbiological reference typing for public health investigations. Culture confirmation is growing in importance in the context of increasing drug resistance of TB isolates from cases notified in the South West. TB services across the South West should target improvement in culture confirmation rates.

The proportion of cases in 2016 with a delay of more than 4 months between symptom onset and treatment start date was the highest recorded since 2000. Groups experiencing a particularly high proportion of cases with a delay of greater than 4 months in 2016 were UK born cases and persons without social risk factors. Shortening treatment delays should be a priority for South West TB services as this is likely to reduce transmission and ensure better treatment outcomes.

In 2016 an increase in the proportion of TB cases reporting one or more social risk factors was observed. This may be a cause for concern because this group is more likely to have drug resistant infections and experience worse treatment outcomes, with a high proportion being lost to follow up.

Conclusion

The third consecutive annual decrease in the number of notified TB cases in the South West, although not necessarily part of a statistically significant downward trend, is promising. The data suggests that TB control in the South West is improving. However, a number of challenges remain which include:

- increased cases experiencing delays greater than 4 months from symptom onset to treatment start
- increased length of time since entry to the UK to TB diagnosis for non-UK born cases
- the number of cases occurring in certain groups may be increasing eg those with social risk factors
- low rates of culture confirmation
- higher rates of TB in areas with the most socio-economic deprivation
- increased drug resistance

It is expected that as cohort review evolves it will facilitate services to improve TB detection, reduce healthcare associated delays and improve treatment outcomes. TB remains concentrated within vulnerable societal groups that may have complex social and clinical needs, which need to be taken into account when providing services.

References

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Appendix A: Methods, description of data sources and definitions

Methods

For a full description of the methods used to collect, manage, and clean the data see the national TB annual report: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/654152/TB_Annual_Report_2017.pdf

Data sources

Data on TB cases in the South West come from the national Enhanced TB Surveillance (ETS) system. Data collected includes notification, demographic, clinical and microbiological information, including drug resistance and strain type, provided by the Cardiff Reference Laboratory and the National Mycobacterium Reference Laboratory.

Definitions

Amplified resistance: Amplified resistance is classed as resistance identified on repeat culture after 3 months of the first specimen date. Cases with a change from a sensitive to resistant result following treatment start are reclassified as amplified resistance, even if this is within the 3-month period.

BCG: Bacillus Calmette-Guérin vaccination.

Cluster: Clusters in this document refer to molecular clusters only. These are defined as a group of 2 or more patients that are infected with a strain of *Mycobacterium tuberculosis* complex with indistinguishable MIRU-VNTR profiles. Each cluster must have at least one notification with a full 24 MIRU-VNTR profile, and other members of the cluster may have a maximum of one missing loci.

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

Drug resistant cohort: The drug resistant cohort includes any cases with rifampicin resistant TB (initial or amplified), including MDR-TB (initial or amplified), as well as those without culture confirmation treated for MDR-TB.

Drug sensitive cohort: 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.

Extensively drug resistant TB (XDR-TB): XDR-TB is defined as resistance to isoniazid and rifampicin (MDR-TB), at least one injectable agent (capreomycin, kanamycin or amikacin) and at least one fluoroquinolone.

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

Initial resistance: Initial resistance is classed as resistance identified within 3 months of the first specimen date.

Interquartile range: A measure of statistical dispersion, being equal to the difference between the upper and lower quartiles (IQR = $Q_3 - Q_1$).

Latent TB infection (LTBI): LTBI is defined as a state of persistent immune response to stimulation by *Mycobacterium tuberculosis* antigens without evidence of active TB disease.

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

Median: Denoting or relating to a value or quantity lying at the midpoint of a frequency distribution of observed values or quantities, such that there is an equal probability of falling above or below it.

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

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

Population denominator: Tuberculosis rates by geographical area, age, sex and place of birth were calculated using ONS mid-year population estimates (http://www.ons.gov.uk/ons/about-ons/get-involved/taking-part-in-a-survey/information-for-households/a-to-z-of-household-and-individual-surveys/labour-force-survey/index.html). Rates by place of birth and by ethnic group were calculated using population estimates from the Labour Force Survey (http://www.esds.ac.uk/findingData/qlfs.asp). The Labour Force Survey is based on a population sample, so estimates are liable to sampling errors, particularly for small population subgroups, and should be interpreted with caution.

Post-mortem diagnosis: A post-mortem diagnosis is an unexpected diagnosis of TB made after death, usually during an autopsy examination.

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

Pulmonary tuberculosis: A pulmonary case is defined as a case with TB involving the lungs and/or tracheo-bronchial tree, with or without non-pulmonary TB diagnosis. In this report, in line with the World Health Organisation's recommendation and international reporting definitions, miliary TB is classified as pulmonary TB due to the presence of lesions in the lungs.

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

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

Appendix B: TB among South West residents

Table Bi. TB cases by local authority of residence, South West, 2000 to 2016

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Bath and North East Somerset	6	11	11	12	9	18	4	5	8	12	12	4	11	9	19	12	5
Bournemouth	17	12	17	13	13	24	23	13	18	14	15	24	16	11	13	13	9
Bristol, City of	48	40	63	51	75	66	81	81	71	84	81	82	88	97	98	79	67
Cheltenham	8	7	10	6	8	6	14	8	13	8	5	7	5	13	7	5	2
Christchurch	4	4	1	2	2	3	3	4	0	3	1	2	2	0	0	1	2
Cornwall & Isles of Scilly	13	10	13	12	20	13	10	21	11	13	7	23	18	14	17	9	12
Cotswold	2	3	0	0	1	1	2	1	2	2	1	3	5	3	1	1	1
East Devon	8	2	5	1	6	5	1	3	2	5	4	3	1	0	1	4	2
East Dorset	3	6	2	2	3	1	1	2	2	5	1	1	2	3	3	1	2
Exeter	3	6	2	1	7	7	6	8	7	9	1	8	14	7	5	5	6
Forest of Dean	3	3	2	2	1	2	3	3	1	1	0	1	1	0	1	2	1
Gloucester	7	1	7	7	8	6	12	13	11	8	7	13	11	21	8	12	8
Mendip	2	2	5	2	10	9	3	3	4	1	4	2	2	6	5	3	2
Mid Devon	2	0	0	1	0	2	1	0	4	0	2	2	3	1	3	2	1
North Devon	3	0	0	0	1	0	0	1	0	1	0	0	1	3	3	4	2
North Dorset	1	2	2	3	2	3	4	0	1	4	3	2	4	1	0	3	0
North Somerset	3	7	4	3	5	10	6	5	10	13	10	6	9	7	8	10	6
Plymouth	11	15	12	9	12	5	16	12	13	13	11	16	20	12	11	19	17
Poole	12	8	10	5	10	11	6	8	11	5	7	2	1	5	1	9	6
Purbeck	0	2	1	2	2	1	3	2	1	3	3	2	1	2	1	0	2
Sedgemoor	1	0	5	0	2	0	0	3	2	1	2	7	3	2	4	2	0
South Gloucestershire	8	11	5	12	12	10	9	8	16	25	13	18	13	17	21	16	18
South Hams	2	6	0	0	1	1	2	2	2	1	6	3	1	2	4	3	1

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
South Somerset	2	2	4	2	2	9	5	5	2	3	5	2	5	5	8	0	2
Stroud	6	3	0	6	3	4	4	3	7	4	2	2	5	7	5	5	1
Swindon	11	9	8	12	11	10	21	24	13	18	21	23	18	29	18	22	30
Taunton Deane	4	2	4	1	3	2	0	1	4	2	1	6	6	3	2	0	3
Teignbridge	11	12	5	8	2	2	5	4	8	8	5	9	4	9	7	13	7
Tewkesbury	5	1	1	2	3	4	2	2	1	1	2	4	2	4	4	4	3
Torbay	9	8	6	3	8	12	10	4	11	14	12	11	5	10	6	8	6
Torridge	1	1	0	0	1	0	0	1	0	0	0	1	1	0	2	0	1
West Devon	1	1	1	2	3	0	2	1	2	1	2	0	5	5	4	1	0
West Dorset	3	1	2	3	2	5	3	2	4	2	2	2	2	2	4	0	0
West Somerset	0	0	1	1	0	1	0	1	1	0	2	0	0	0	0	0	0
Weymouth and Portland	4	2	0	1	3	4	4	6	0	6	0	1	1	3	5	1	3
Wiltshire	6	11	11	14	12	9	12	9	16	13	15	15	14	12	17	16	11

Table Bii. TB rate per 100,000 population by local authority of residence, South West, 2000 to 2016

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Bath and North East Somerset	3.6	6.5	6.5	7.0	5.3	10.5	2.3	2.9	4.6	6.9	6.9	2.3	6.2	5.0	10.4	6.5	2.7
Bournemouth	10.4	7.3	10.3	7.9	7.9	14.5	13.8	7.6	10.5	8.0	8.4	13.1	8.6	5.8	6.8	6.7	4.6
Bristol, City of	12.3	10.3	16.2	13.0	19.0	16.3	19.8	19.7	17.1	20.0	19.1	19.2	20.3	22.2	22.1	17.6	14.8
Cheltenham	7.3	6.4	9.1	5.5	7.3	5.4	12.5	7.1	11.5	7.0	4.4	6.1	4.3	11.2	6.0	4.3	1.7
Christchurch	8.9	8.9	2.2	4.4	4.4	6.6	6.5	8.6	0.0	6.3	2.1	4.2	4.2	0.0	0.0	2.0	4.0
Cornwall & Isles of Scilly	2.6	2.0	2.6	2.3	3.9	2.5	1.9	4.0	2.1	2.5	1.3	4.3	3.3	2.6	3.1	1.6	2.2
Cotswold	2.5	3.7	0.0	0.0	1.2	1.2	2.4	1.2	2.4	2.4	1.2	3.6	6.0	3.6	1.2	1.2	1.2
East Devon	6.4	1.6	4.0	0.8	4.7	3.9	0.8	2.3	1.5	3.8	3.0	2.3	0.7	0.0	0.7	2.9	1.4
East Dorset	3.6	7.1	2.4	2.3	3.5	1.2	1.2	2.3	2.3	5.7	1.1	1.1	2.3	3.4	3.4	1.1	2.2
Exeter	2.7	5.4	1.8	0.9	6.3	6.2	5.3	7.0	6.1	7.9	0.9	6.8	11.7	5.7	4.0	3.9	4.6
Forest of Dean	3.8	3.7	2.5	2.5	1.2	2.5	3.7	3.7	1.2	1.2	0.0	1.2	1.2	0.0	1.2	2.4	1.2
Gloucester	6.3	0.9	6.3	6.3	7.1	5.3	10.4	11.1	9.3	6.7	5.8	10.7	8.9	16.9	6.4	9.4	6.2
Mendip	1.9	1.9	4.8	1.9	9.5	8.5	2.8	2.8	3.7	0.9	3.7	1.8	1.8	5.4	4.5	2.7	1.8
Mid Devon	2.9	0.0	0.0	1.4	0.0	2.7	1.3	0.0	5.2	0.0	2.6	2.6	3.8	1.3	3.8	2.5	1.3
North Devon	3.4	0.0	0.0	0.0	1.1	0.0	0.0	1.1	0.0	1.1	0.0	0.0	1.1	3.2	3.2	4.2	2.1
North Dorset	1.6	3.2	3.2	4.7	3.1	4.6	6.0	0.0	1.5	5.9	4.4	2.9	5.8	1.4	0.0	4.2	0.0
North Somerset	1.6	3.7	2.1	1.6	2.6	5.1	3.0	2.5	5.0	6.4	4.9	3.0	4.4	3.4	3.8	4.8	2.8
Plymouth	4.6	6.2	4.9	3.7	4.9	2.0	6.4	4.8	5.1	5.1	4.3	6.2	7.8	4.6	4.2	7.2	6.4
Poole	8.7	5.8	7.2	3.6	7.2	7.9	4.3	5.6	7.6	3.4	4.8	1.4	0.7	3.4	0.7	6.0	4.0
Purbeck	0.0	4.5	2.2	4.5	4.5	2.2	6.7	4.4	2.2	6.7	6.6	4.4	2.2	4.4	2.2	0.0	4.3
Sedgemoor	1.0	0.0	4.7	0.0	1.8	0.0	0.0	2.7	1.8	0.9	1.8	6.1	2.6	1.7	3.4	1.7	0.0
South Gloucestershire	3.3	4.5	2.0	4.8	4.8	3.9	3.5	3.1	6.2	9.6	5.0	6.8	4.9	6.3	7.7	5.8	6.5
South Hams	2.4	7.3	0.0	0.0	1.2	1.2	2.4	2.4	2.4	1.2	7.2	3.6	1.2	2.4	4.8	3.6	1.2

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
South Somerset	1.3	1.3	2.6	1.3	1.3	5.8	3.2	3.1	1.2	1.9	3.1	1.2	3.1	3.0	4.9	0.0	1.2
Stroud	5.6	2.8	0.0	5.5	2.7	3.6	3.6	2.7	6.3	3.6	1.8	1.8	4.4	6.1	4.3	4.3	0.9
Swindon	6.1	5.0	4.4	6.5	5.9	5.3	10.9	12.2	6.5	8.8	10.1	11.0	8.5	13.5	8.3	10.1	13.8
Taunton Deane	4.0	1.9	3.8	1.0	2.8	1.9	0.0	0.9	3.7	1.8	0.9	5.4	5.4	2.7	1.8	0.0	2.6
Teignbridge	9.1	9.9	4.1	6.5	1.6	1.6	4.0	3.2	6.4	6.4	4.0	7.2	3.2	7.1	5.5	10.1	5.4
Tewkesbury	6.5	1.3	1.3	2.6	3.8	5.1	2.5	2.5	1.3	1.2	2.5	4.9	2.4	4.7	4.7	4.6	3.4
Torbay	7.0	6.2	4.6	2.3	6.1	9.1	7.6	3.0	8.3	10.6	9.1	8.4	3.8	7.6	4.5	6.0	4.5
Torridge	1.7	1.7	0.0	0.0	1.6	0.0	0.0	1.6	0.0	0.0	0.0	1.6	1.5	0.0	3.0	0.0	1.5
West Devon	2.1	2.0	2.0	4.0	6.0	0.0	3.9	1.9	3.8	1.9	3.8	0.0	9.3	9.3	7.4	1.8	0.0
West Dorset	3.3	1.1	2.1	3.2	2.1	5.2	3.1	2.0	4.1	2.0	2.0	2.0	2.0	2.0	4.0	0.0	0.0
West Somerset	0.0	0.0	2.8	2.8	0.0	2.9	0.0	2.8	2.8	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0
Weymouth and Portland	6.3	3.1	0.0	1.5	4.7	6.2	6.2	9.2	0.0	9.2	0.0	1.5	1.5	4.6	7.7	1.5	4.6
Wiltshire	1.4	2.5	2.5	3.2	2.7	2.0	2.6	2.0	3.4	2.8	3.2	3.2	2.9	2.5	3.5	3.3	2.3

Table Biii. TB cases and rate by age and sex, South West, 2016

Age Group (years)	Male		Female	
	Count	Rate	Count	Rate
0-9	0	0.0	1	0.3
10-19	8	2.6	3	1.0
20-29	24	6.9	27	8.3
30-39	32	10.2	23	7.3
40-49	23	6.6	10	2.8
50-59	18	4.8	7	1.8
60-69	14	4.2	8	2.3
≥70	20	5.4	21	4.5

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

Year	Any resistance		Isoniazid resistant		Multi-drug resistant		Ethambutol		Rifampicin		Total	Pyrazinamide		Total excluding M. bovis
	n	%	n	%	n	%	n	%	n	%	N	n	%	n
2000	5	4.6	4	3.7	1	0.9	0	0.0	2	1.9	108	0	0.0	104
2001	9	8.2	9	8.2	0	0.0	0	0.0	0	0.0	110	0	0.0	108
2002	7	5.5	7	5.5	1	0.8	0	0.0	1	0.8	128	0	0.0	124
2003	7	5.7	7	5.7	2	1.6	0	0.0	2	1.6	123	0	0.0	121
2004	7	4.6	7	4.6	0	0.0	0	0.0	0	0.0	151	0	0.0	148
2005	8	4.6	8	4.6	3	1.7	1	0.6	3	1.7	175	0	0.0	171
2006	10	5.9	10	5.9	0	0.0	0	0.0	0	0.0	170	0	0.0	165
2007	9	5.6	8	5.0	1	0.6	1	0.6	1	0.6	160	2	1.3	155
2008	14	7.3	11	5.8	3	1.6	2	1.0	4	2.1	191	3	1.6	188
2009	17	8.7	14	7.2	2	1.0	2	1.0	3	1.5	195	4	2.1	189
2010	8	5.6	5	3.5	1	0.7	1	0.7	2	1.4	142	2	1.5	132
2011	19	9.5	17	8.5	1	0.5	2	1.0	1	0.5	200	1	0.5	190
2012	14	7.4	11	5.8	2	1.1	1	0.5	3	1.6	190	3	1.6	182
2013	16	8.6	14	7.5	1	0.5	1	0.5	1	0.5	186	2	1.1	177
2014	12	6.9	11	6.3	2	1.1	2	1.1	2	1.1	174	0	0.0	165
2015	10	5.8	10	5.8	1	0.6	0	0.0	1	0.6	171	1	0.6	162
2016	18	12.1	15	10.1	3	2.0	2	1.3	4	2.7	149	1	0.7	136

* Culture confirmed cases, Pyrazinamide resistance excluding M. bovis cases.

Appendix C: Local authority TB epidemiological summaries

Local authority TB epidemiological summaries will provide further information about TB cases among residents of South West upper tier local authorities with an average of at least 50 TB cases per year over the previous 3 years. These will be published online shortly by your local FES team.