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Tuberculosis in the South West: 2018

Presenting data to end of 2017

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About the Field Service

The Field Service (FS) supports Public Health England (PHE) Centres and partner organisations through the application of epidemiological methods to inform public health action. FS 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 FS network, excellence and innovation is encouraged, we foster academic collaborations and take active part and lead in research, development and training.

Executive summary

In 2017, there were 234 cases of tuberculosis (TB) notified among residents of the South West, a rate of 4.2 per 100,000 population (95% confidence interval (CI): 3.7 to 4.8). The England-wide TB rate for 2017 was 9.2 per 100,000 population.

The following local authorities had the highest notification rates: City of Bristol (13.5 per 100,000 population), Swindon (11.3 per 100,000 population), and Plymouth (8.0 per 100,000 population).

The rate of notifications for females and males were 3.0 and 5.4 per 100,000 population respectively.

The highest rates were observed in the following age groups: 30-39 (6.7 per 100,000 population), 20-29 (6.4 per 100,000 population), and 40-49 (5.3 per 100,000 population) years.

The rate for UK born children under 15 years (an indicator for ongoing local transmission) was 0.9 per 100,000 population. This rate in 2016 was 0.1 per 100,000 and the rate in 2015 was 0.7 per 100,000. The 2017 rate is the highest recorded since 2013.

The rate of TB among non-UK born persons was 22.2 per 100,000 population (120 cases) and the rate of TB among UK born persons was 2.2 per 100,000 population (109 cases).

The largest proportion of non-UK born cases were born in India (28, 23.3%) followed by Romania (9, 7.5%), Somalia (8, 6.7%) and Nepal (7, 5.8%).

Ethnicity for the majority of cases was White (124, 53.9%) followed by Indian (33, 14.3%) and Black African (30, 13.0%).

The majority of cases were diagnosed with pulmonary disease (156, 67.0%).

In total, 144 (61.5%) cases were culture confirmed and 46 (57.5%) pulmonary cases were sputum smear positive.

The median delay between symptom onset and diagnosis was 95.0 days (inter-quartile range (IQR): 41.5 to 192.0).

The median delay between symptom onset and treatment start date was 98.0 days (IQR: 41.0 to 193.0).

Social risk factors (alcohol abuse, drug use, homelessness and/or imprisonment) were reported for 25 (14.0%) cases.

The postcodes of cases were linked to an Index of Multiple Deprivation (IMD) score as an indicator of socio-economic status. In 2017, the largest proportion of cases lived in areas from the most deprived IMD decile (51, 21.8%).

HIV status was already known for 23 (10.6%) cases. Of those where status was not known, HIV tests were offered to 183 (84.3%) cases.

In 2017 there were 51 clustered cases within the South West including 22 newly identified clusters.

Resistance to at least 1 first-line drug was present in 13 (9.0%) cases.

There were 4 (2.8%) cases of multi-drug resistant (MDR) TB.

There were 3 (2.1%) cases that were resistant to at least 1 second-line TB drug. Two of these were also MDR TB.

There was 1 case of extensively-drug resistant (XDR) TB. This is the second case ever reported in the South West.

Following a 12-month follow-up period, 167 (78.8%) drug sensitive cases notified in 2016 successfully completed treatment, 11 (5.2%) were still on treatment, 4 (1.9%) stopped treatment, 8 (3.8%) died, 11 (5.2%) were lost to follow up and 11 (5.2%) 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 1 local authority, the City of Bristol, with an annual incidence of TB routinely greater than the national rate. In 2016 and 2017, the incidence of TB in Swindon was higher than the national rate. 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 the 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 2015-2020, 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 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 2017.

2. Outcome data for patients with drug sensitive TB infections are from 2016 notifications.

3. Outcome data for patients with drug resistant TB are from 2015 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

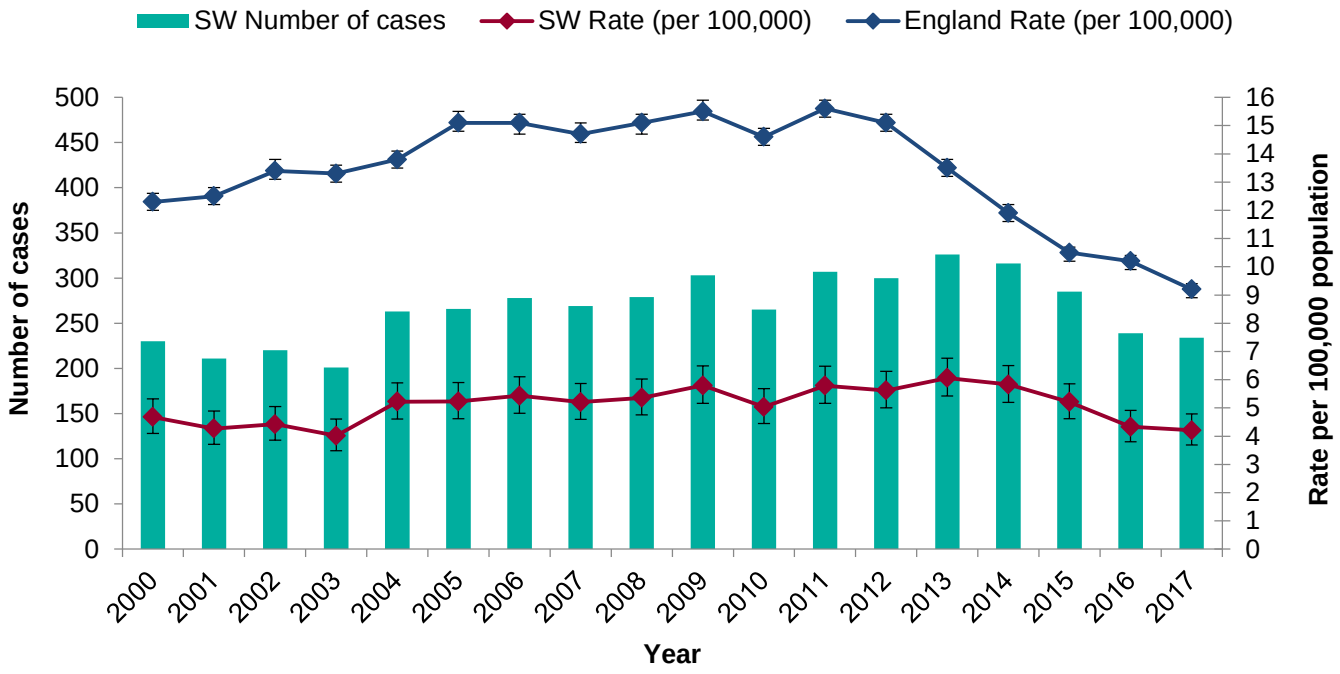
Overall numbers, rates and geographical distribution

In 2017, there were 234 cases of TB notified among residents of the South West PHEC. This equates to a rate of 4.2 per 100,000 population (95% CI: 3.7 to 4.8). The rate in 2017 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 England rate of 9.2 per 100,000 population. England has experienced a decrease in its annual TB incidence for a sixth 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 (13.5 per 100,000 population), Swindon (11.3 per 100,000 population), Plymouth (8.0 per 100,000 population), Bournemouth (7.2 per 100,000 population) and Gloucestershire (3.7 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.

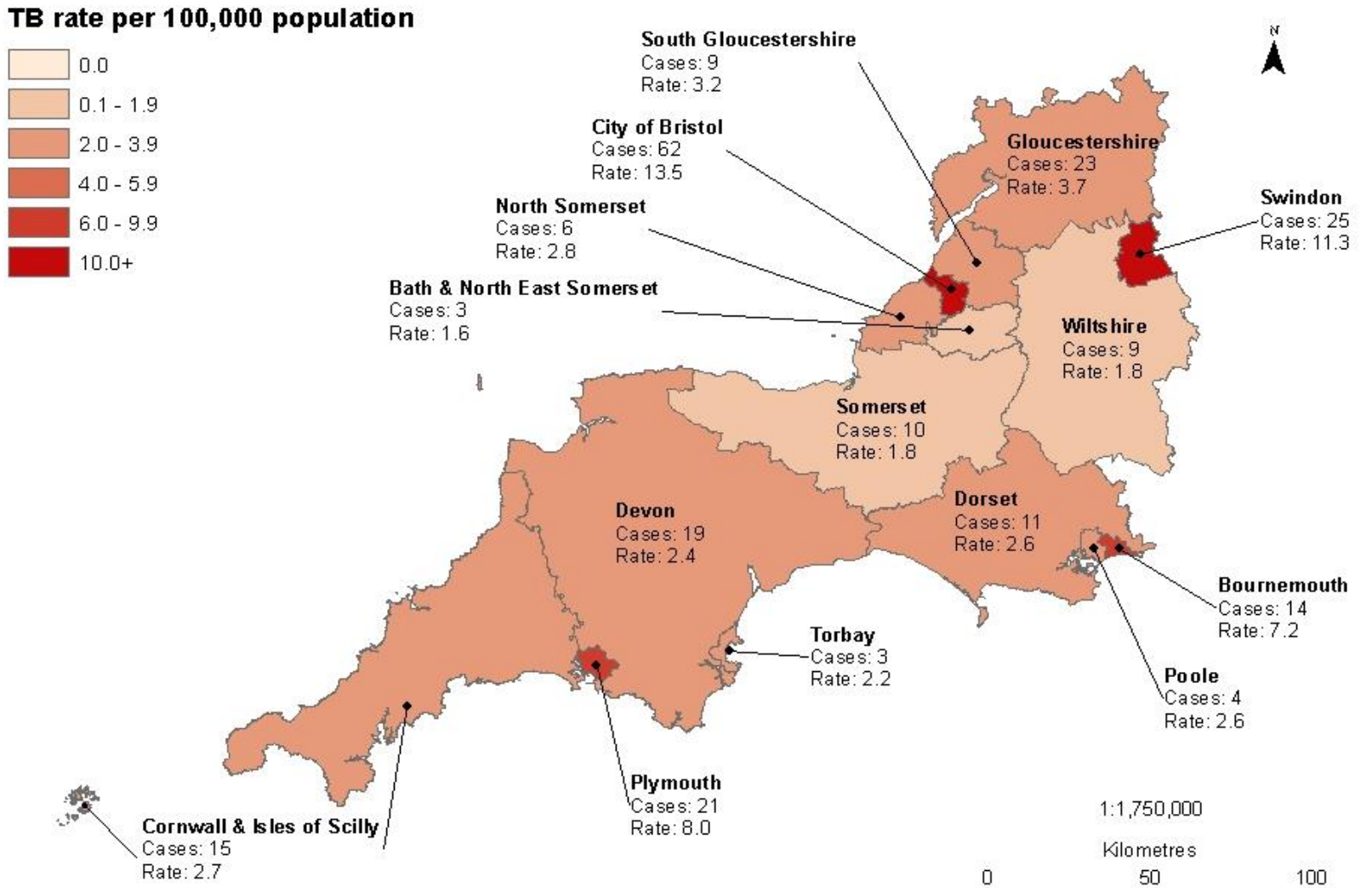
The incidence rate for Bristol has now decreased in 4 consecutive years since 2013 and is the lowest recorded since 2003.

Figure 1. Number of TB cases, rate and 95% confidence intervals, South West and England, 2000-2017



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, 2017



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 2017. There were 148 male (63.2%) and 86 female (36.8%) cases. This equates to a rate of 5.4 per 100,000 population for males (95% CI: 4.6 to 6.4) and 3.0 per 100,000 population for females (95% CI: 2.4 to 3.8). These rates have generally decreased over the past 5 years, although the 2017 rate for males shows an increase from 2016 (5.1 per 100,000 population, 95% CI 4.3 to 6.1).

The age of cases ranged from 1 to 91 years and the median age was 42.0 years (IQR: 29.0 to 60.0). Male cases had a median age of 46.0 years (IQR: 31.5 to 61.5) and for females the median age was 38.0 years (IQR: 24.0 to 55.0).

When examining age groups, the highest rates of TB were observed in those aged 30-39 (6.7 per 100,000 population), 20-29 (6.4 per 100,000 population) and 40-49 (5.3 per 100,000 population) years. The age distribution was similar for women and men but there was a substantially higher rate of male cases aged 60-69, see Figure 3. The highest rates were found in males aged 30-39 years (8.2 per 100,000 population) and 40-49 years (7.6 per 100,000 population). The highest rates for females were in those aged 30-39 years (5.3 per 100,000 population) and 20-29 years (5.2 per 100,000 population), see Figure 3.

There were 11 notifications of TB in children aged 0-14 years giving a rate of 1.2 per 100,000 population (95% CI: 0.6 to 2.1). This marks an increase compared to 2016 when the rate in this population was 0.2 (95% CI: 0.0 to 0.8). The rate in children under 5 years was 1.3 cases per 100,000 population (95% CI: 0.4 to 3.4), compared to 0.3 cases per 100,000 (95% CI: 0.0 to 1.8) in 2016. The rate in children aged 5-9 years was 1.9 per 100,000 (95% CI: 0.7 to 4.0) which is higher than the rate in 2016 of 0.0 per 100,000 (95% CI: 0.0 to 1.2). The rate in those aged 10-14 years was 0.3 per 100,000 (95% CI: 0.0 to 1.9), the same rate as 2016 (95% CI: 0.0 to 1.9), and the rate in those aged 15-19 years was 3.3 per 100,000 (95% CI: 1.6 to 6.0), compared to 3.2 per 100,000 in 2016 (95% CI: 1.5 to 5.9).

In 2017, the rates in the 20-29 and 30-39 age groups decreased the most compared to 2016. The rates in the 40-49, 50-59 and 60-69 age groups increased in 2017 after decreasing or remaining stable since 2014. 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, 2017

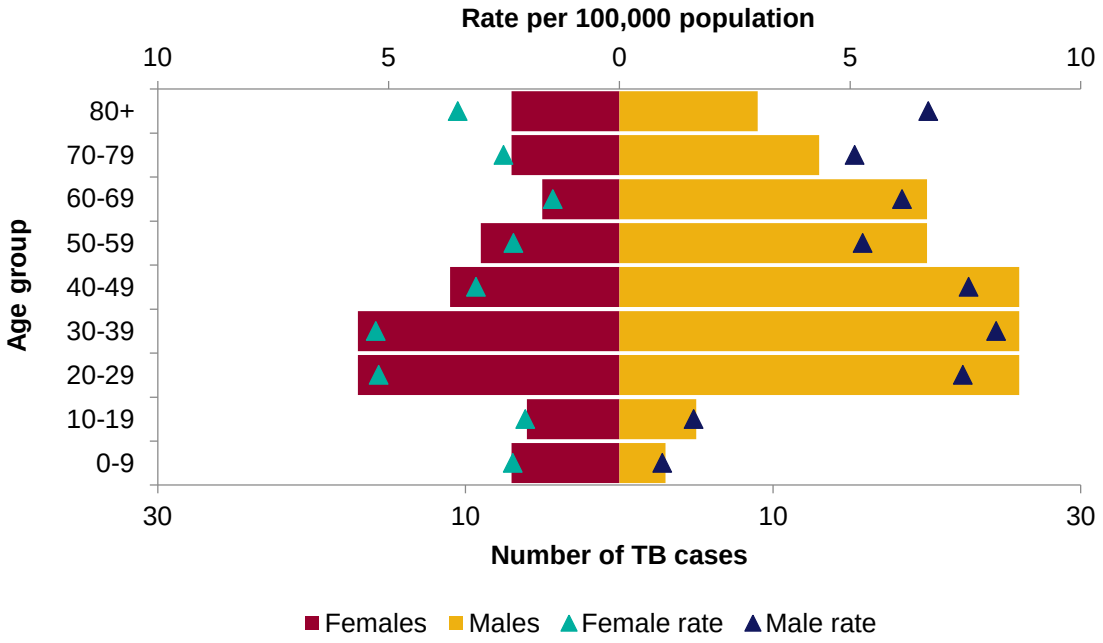
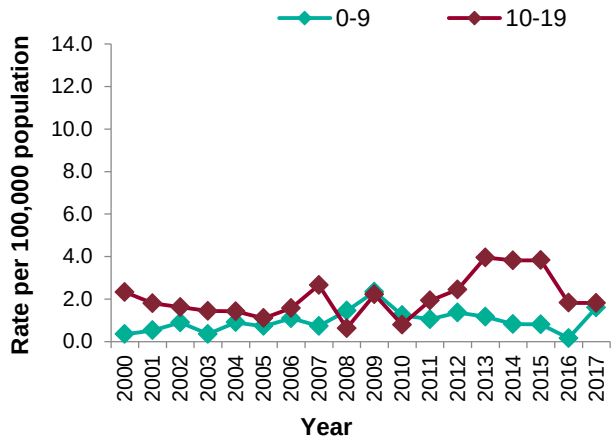


Figure 4. TB rate by age group, South West, 2000-2017



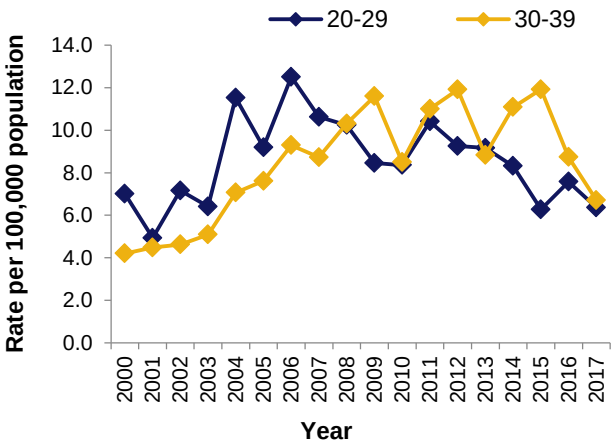
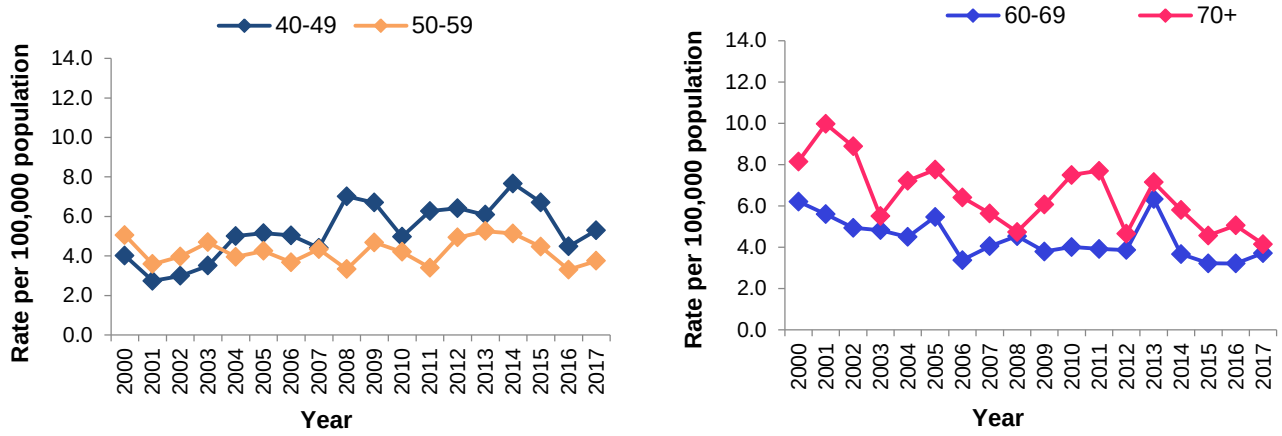


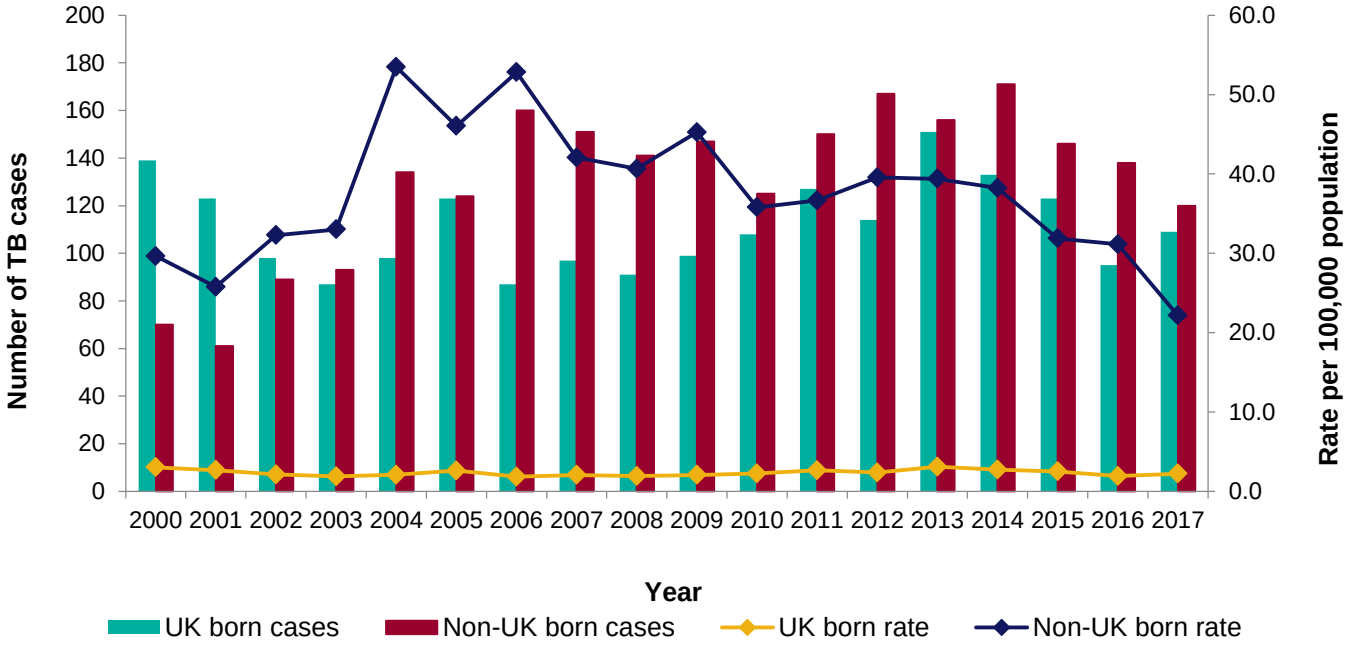
Figure 4 continued.



Place of birth and time since entry to the UK

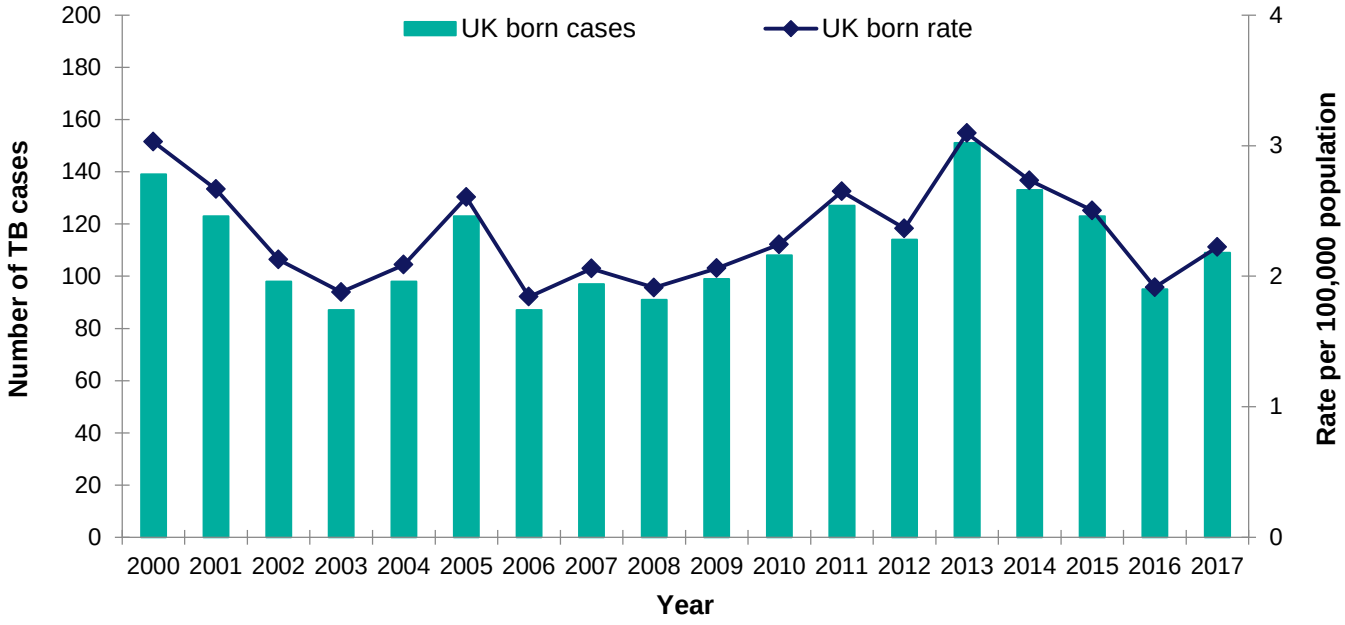
In 2017, data on whether a case was born in the UK were available for 229 (97.9%) cases. Of these cases 120 (52.4%) were born outside the UK, resulting in a non-UK born rate of 22.2 per 100,000 population. This is the lowest rate recorded for the non-UK born population since 2000 and is substantially lower than the rate in 2016 (31.1 per 100,000). However, as in previous years, this rate is significantly higher than the rate of 2.2 per 100,000 population observed in the UK born population, see Figure 5. The UK born rate increased in 2017 for the first time since 2013 but remains low, see Figure 6.

Figure 5. TB cases and rate by place of birth, South West, 2000-2017



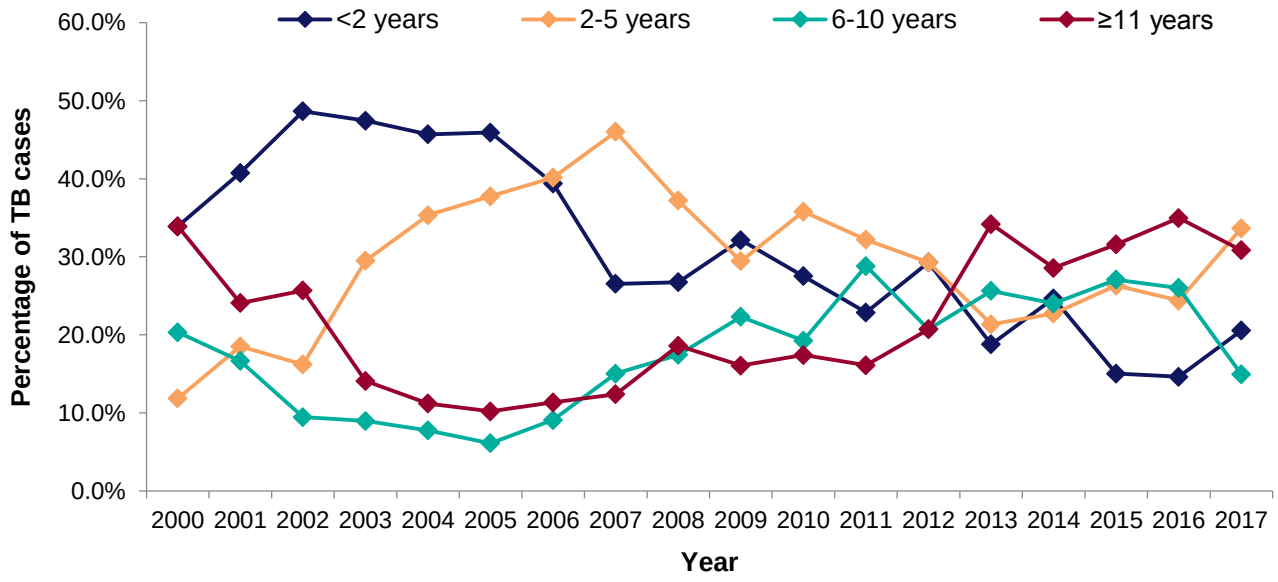
TB Monitoring Indicator 2: TB incidence in UK born and non-UK born populations (England)

Figure 6. TB cases and rate for the UK born population, South West, 2000-2017



In 2017, data were available on time since entry to the UK for 107 (89.2%) non-UK born cases. Of these, a total of 33 (30.8%) had a time between entry to the UK and TB diagnosis of ≥11 years, 52 (48.6%) entered the UK between 2 and 10 years prior to diagnosis and 22 (20.6%) had a time between entry and diagnosis of less than 2 years. The median time between entry and diagnosis was 5 years in 2017. In 2017 the proportion of cases with a time between entry and diagnosis of less than 2 years increased after decreasing since 2014. In 2016 this proportion was 14.6% (18). The proportion of cases diagnosed between 2 and 5 years after entry also increased in 2017 from 24.4% (30) in 2016. The proportion of cases diagnosed 6 to 10 years after entry fell from 27.1% (36) in 2015 to 26.0% (32) in 2016 to 15.0% (16) in 2017. This is the lowest proportion recorded since 2007. The proportion of cases diagnosed more than 10 years after entry decreased from 35.0% (43) in 2016 to 30.8% (33) in 2017. This proportion has been greater than 30% since 2013, see Figure 7.

Figure 7. Time between entry to the UK and TB diagnosis for non-UK born cases by year, South West, 2000-2017



*Excludes non-UK born cases with no information on time since entry.

Country of birth data were available for 119 (99.2%) non-UK born cases. The largest proportion were born in India (28, 23.5%) followed by Romania (9, 7.6%) and Somalia (8, 6.7%), see Table 1. Those born in India or Romania were most frequently diagnosed between 2 and 5 years after entry, with a median time between entry and diagnosis of 3.5 years (IQR: 2.0 to 11.5) and 2.0 years (IQR: 1.0 to 4.0) respectively. Cases born in Somalia were most likely to be diagnosed ≥11 years after entry to the UK, with a median time since entry of 9.0 years (IQR: 5.0 to 13.0). However, it is difficult to draw conclusions from these medians due to the low numbers involved.

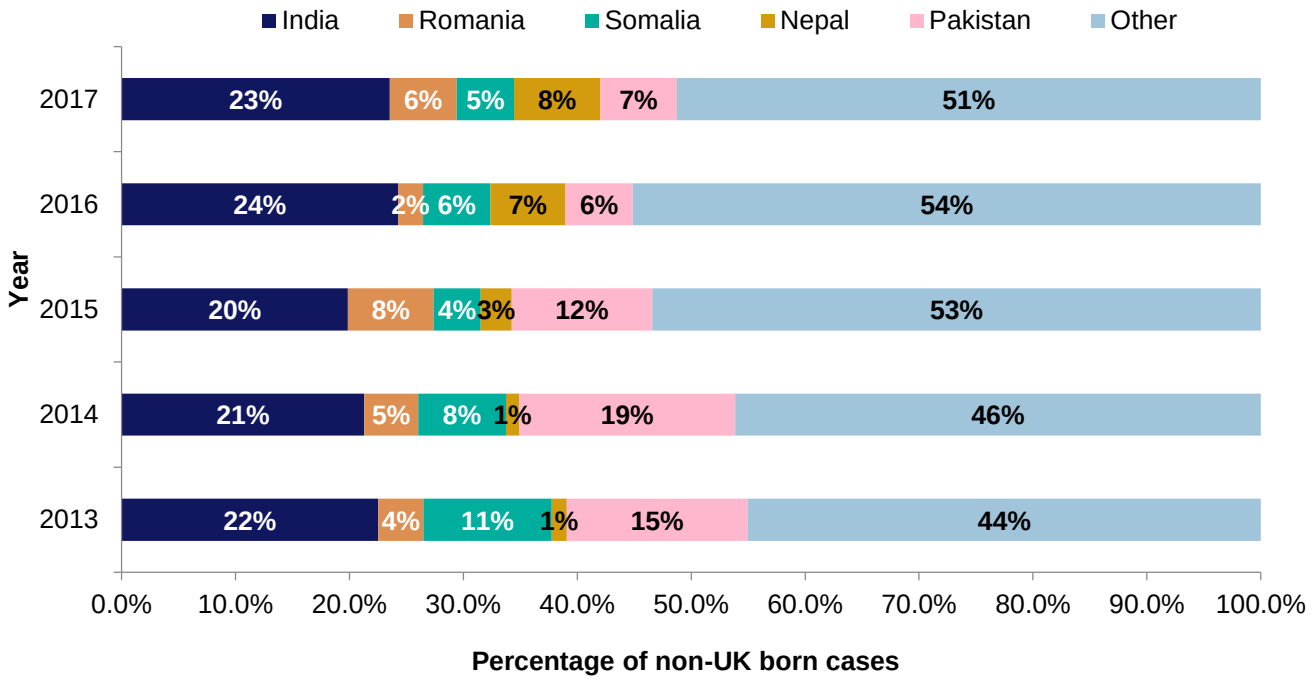
Over the past 5 years, people born in India have made up the highest proportion of non-UK born cases. The proportions from Somalia and Pakistan have decreased substantially, see Figure 8.

Table 1. Most common countries of birth for non-UK born TB cases*, South West, 2017

Country of birth	Number of cases	Percentage of non-UK born cases (%)
India	28	23.3
Romania	9	7.5
Somalia	8	6.7
Nepal	7	5.8
Pakistan	6	5.0
Poland	6	5.0

*All countries with at least 5 notifications.

Figure 8. Five-year trend in the percentage of non-UK born TB cases in the 5 most common countries of birth, South West, 2013-2017



Ethnicity

Data on ethnicity were available for 230 (98.3%) cases in 2017. The most frequently reported ethnicity was White (124, 53.9%) followed by Indian (33, 14.3%) and Black-African (30, 13.0%), see Table 2. The proportion of each ethnicity has remained reasonably stable over time apart from a large decrease in White ethnicity cases between 2000 and 2006 and a concurrent increase in Black-African cases.

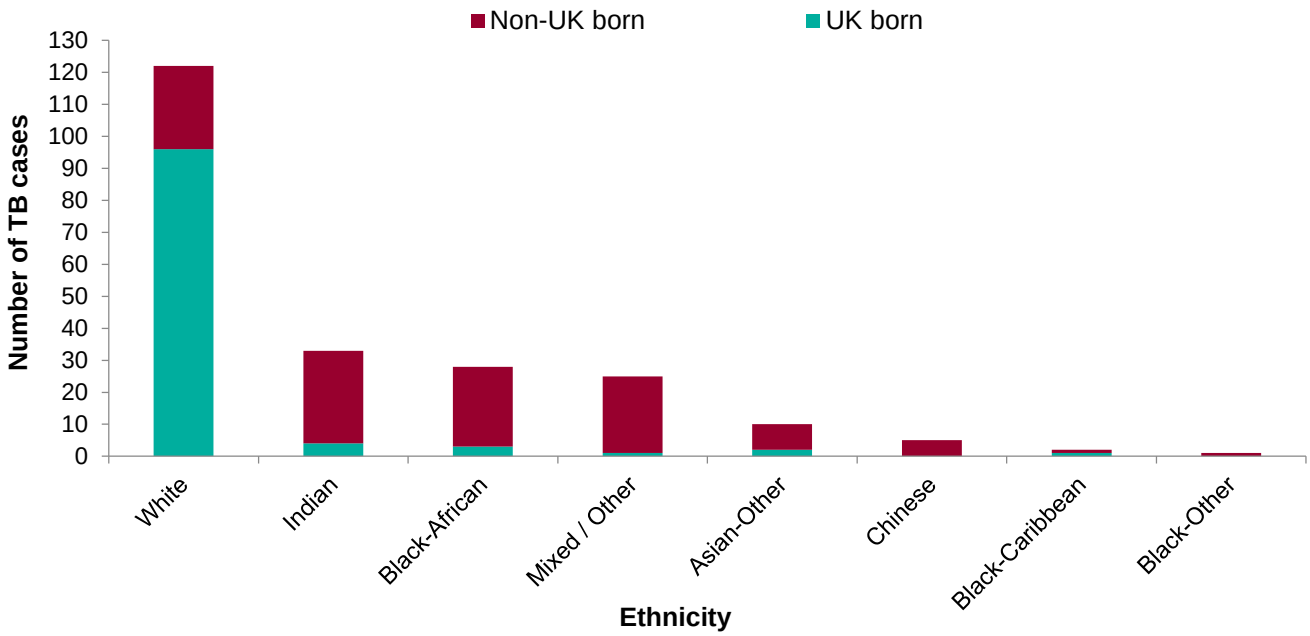
Table 2. Percentage of TB cases by ethnicity and year, South West, 2013-2017

Ethnicity	2013	2014	2015	2016	2017
Asian Other (%)	7.5	8.1	3.9	6.8	4.3
Black African (%)	14.7	20.6	18.1	14.8	13.0
Black Caribbean (%)	3.3	0.3	0.7	1.7	0.9
Black Other (%)	0.7	1.3	0.7	1.7	0.4
Chinese (%)	1.0	1.6	1.1	1.3	2.2
Indian (%)	12.1	12.3	13.2	15.2	14.3
Mixed Other (%)	9.1	9.7	9.6	10.5	10.9
White (%)	51.8	46.1	52.7	48.1	53.9

As in previous years, the vast majority of UK born cases in 2017 had White ethnicity (89.7%). The next most common ethnicity among UK born cases was Indian (3.7%) whilst all other ethnicities made up less than 3% of UK born cases. The majority of non-UK born cases had Indian ethnicity (29, 24.4%), followed by White (26, 21.8%).

The majority of cases with White ethnicity were UK born but for all other ethnic groups the majority were non-UK born, see Figure 9.

Figure 9. Frequency of ethnicity by place of birth for TB cases, South West, 2017*



* Excludes cases with a missing place of birth.

Occupation

In 2017, 173 (73.9%) cases were aged between 16 and 64 and therefore considered of working age[2]. Information on occupation was available for 165 (95.4%) of these cases. More cases were reported among healthcare workers (19, 11.5%) than those in the 'Education' category (17, 10.3%), see Table 3. The most common occupations in the 'Other' category were builder, chef and factory worker, accounting for 7.3% of all cases with occupation information.

In the 'None' category people most frequently reported being unemployed (25, 53.2%) or a housewife/husband (10, 21.3%). The number of cases reported in the unemployed population has decreased since 2012. The majority of people in the 'Education' category were students (15, 88.2%).

Table 3. Occupational category of TB patients aged 16 to 64 years, South West, 2017

Occupational category	Number of cases	Percentage of cases (%)
Agricultural/animal care worker	<5	<3
Education	17	10.3
Healthcare worker	19	11.5
Laboratory/pathology	<5	<1
Social service/prison worker	<5	<1
Other	76	46.1
None	47	28.5
All cases	**165**	**100.0**

Clinical characteristics

Site of disease

Site of disease was known for 233 (99.6%) cases in 2017. The majority of these cases were diagnosed with pulmonary disease (156, 67.0%). Some pulmonary cases also had TB at a non-pulmonary site (27, 14.1%). There were 77 (33.0%) cases with only non-pulmonary TB.

The distribution in site of disease has remained relatively stable over the last 10 years (the proportion of pulmonary cases has ranged from 61.3% to 68.3%). The most commonly recorded non-pulmonary site of disease was extra thoracic lymph nodes (51, 21.9%), see Table 4.

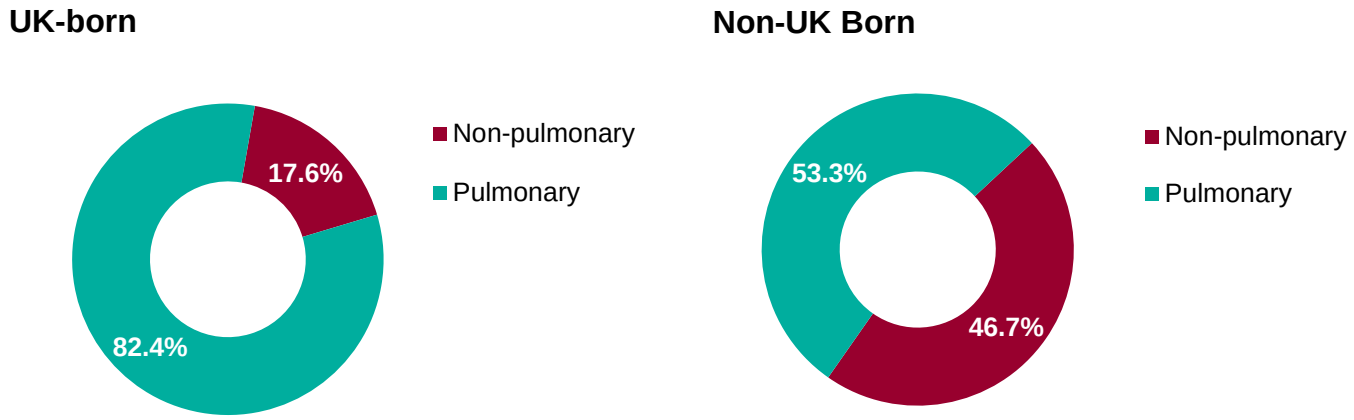
Table 4. Site of disease for TB patients, South West, 2017*

Site of disease	Number of cases	Percentage of cases (%)
Pulmonary	**156**	**67.0**
Miliary	6	2.6
Laryngeal	1	0.4
Non-Pulmonary	**77**	**33.0**
ET Lymph nodes	51	21.9
IT Lymph nodes	23	9.9
Unknown non-pulmonary site	23	9.9
Pleural	20	8.6
Other non-pulmonary site	12	5.2
CNS - Other	7	3.0
Gastro-Intestinal	6	2.6
Bone - Spine	4	1.7
Genitourinary	4	1.7
Bone - Not Spine	2	0.9
CNS - Meningitis	2	0.9
Cryptic	1	0.4

* Patients may have disease at more than 1 site.

There was a higher proportion of UK born cases with pulmonary disease (89, 82.4%) compared to non-UK born cases (64, 53.3%), see Figure 10. Site of disease also varied by ethnicity; the highest proportion of pulmonary cases was observed in the White ethnicity group (107, 87.0%), followed by Asian-Other (7, 70.0%). The lowest proportion of pulmonary cases were in Black-Other (0, 0.0%), Indian (10, 30.3%) and Black-African (12, 40.0%) ethnicities.

Figure 10. Proportion of cases with pulmonary and non-pulmonary TB by place of birth, South West, 2017*



* 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 219 (93.6%) notifications in 2017. A previous diagnosis of TB was recorded for 16 (7.3%) of these patients. Among UK born cases, 8.5% (9) had a previous TB diagnosis, compared with 6.5% (7) of non-UK born cases. Non-UK born cases that reported a previous TB diagnosis had a lower median age, 37.0 years (IQR: 29.0 to 48.0), compared to UK born cases, 73.0 years (IQR: 69.0 to 87.0).

Among cases who were provided with directly-observed therapy (DOT), 4 (12.9%) cases had a previous TB diagnosis.

BCG vaccination

BCG vaccination status was available for 145 (62.0%) cases in 2017. A total of 81 (55.9%) cases had received a BCG vaccination. There were 4 cases under 5 years old in 2017 and 1 of these patients was recorded as having received a BCG vaccination. Non-UK born cases were more likely to be vaccinated (53, 44.2%) than UK born cases (26, 23.9%), see Table 5. The rate of BCG vaccination increased from 2013 to 2016 but decreased in 2017. Among those cases where vaccination status was known, the highest rate of vaccination was amongst those aged 50-59 (12, 70.6%).

Table 5. Number and proportion of TB patients with BCG vaccination by place of birth, South West, 2017

Place of birth	Cases with BCG vaccination	Percentage of cases (%)
UK born	26	23.9
Non-UK born	53	44.2
All cases*	**81**	**55.9**

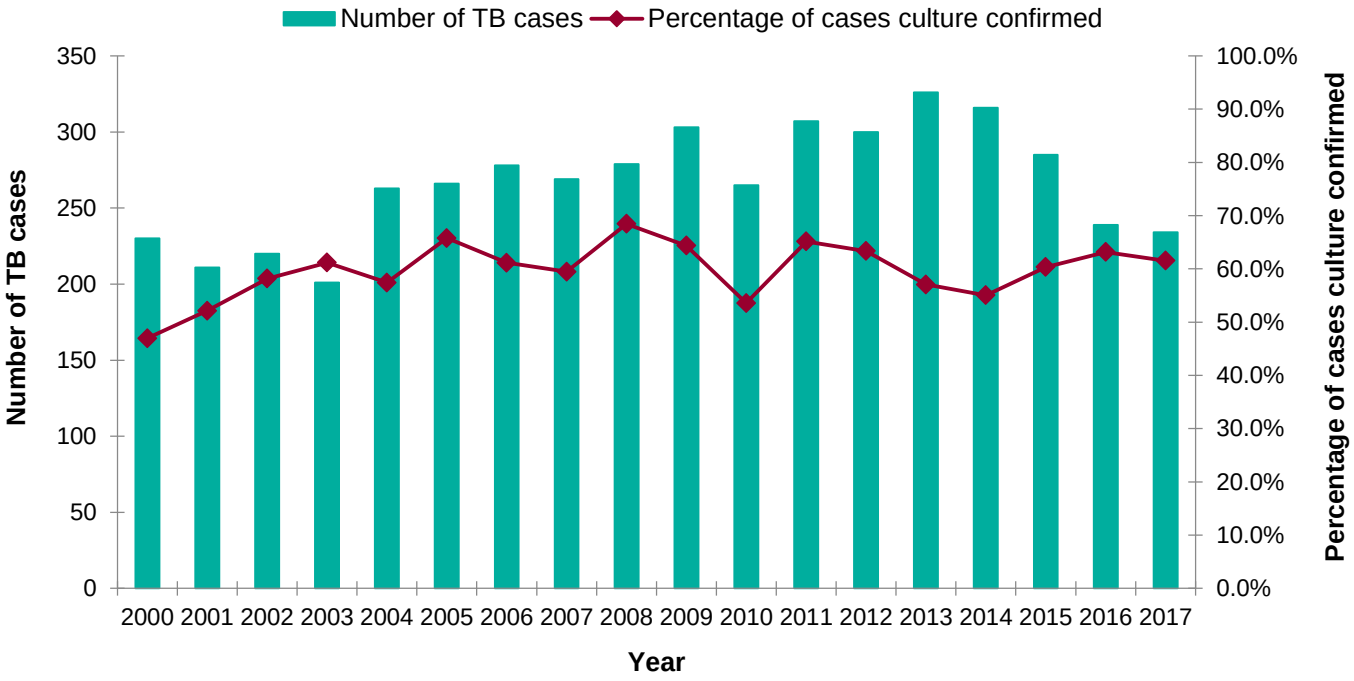
*Including cases with missing place of birth but with BCG vaccination recorded.

Microbiological information

Culture confirmation and speciation

In 2017, data on culture confirmation were available for all cases. During this time period there were 144 (61.5%) culture confirmed cases of TB in the South West region. This proportion was lower than 2016 (151, 63.2%), see Figure 11. A total of 107 (68.6%) pulmonary cases were culture confirmed and 37 (48.1%) non-pulmonary cases were culture confirmed.

Figure 11. Number of TB cases and percentage of cases culture confirmed, 2000-2017



A greater proportion of non-UK born cases (77, 64.2%) were culture confirmed when compared to UK born cases (64, 58.7%).

Information on mycobacterial speciation was available for all culture confirmed cases. There were 130 (90.3%) cases of *Mycobacterium tuberculosis* and 11 (7.6%) cases of *Mycobacterium bovis*. Of the remaining 3 cases, 1 (0.7%) case was *Mycobacterium africanum,* 1 (0.7%) was *Mycobacterium microti* and 1 (0.7%) was not speciated.

Sputum smear status

Data on sputum smear status were available for 80 (51.3%) pulmonary cases in 2017. Of all pulmonary cases with sputum smear information, 46 (57.5%) pulmonary cases were sputum smear positive. This is the largest proportion recorded since 2013 and an increase of 11 percentage points since 2016.

TB transmission

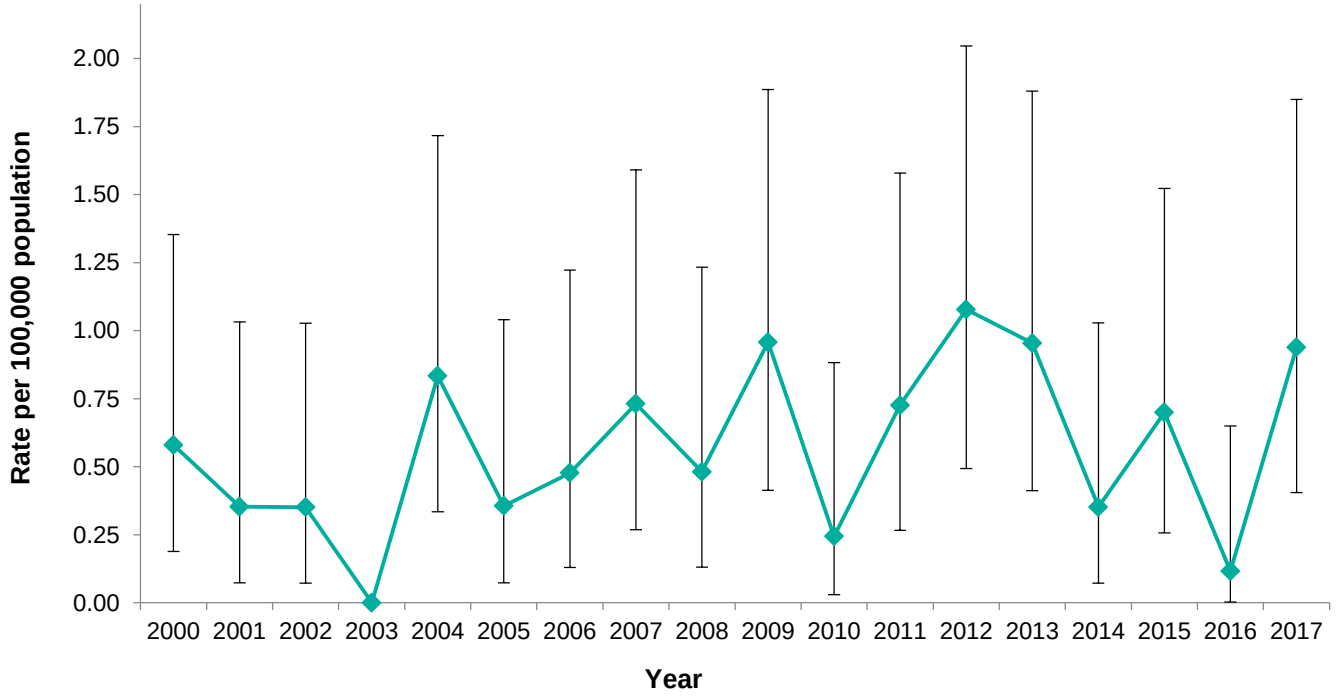
Rate of TB in UK born children

An indicator for ongoing local transmission is the rate of TB in UK born children under the age of 15. In 2017, the rate was 0.9 per 100,000 population, the highest rate reported since 2013 and a substantial increase since 2016, see Table 6. Please note that, when interpreting differences between annual rates, the 95% confidence intervals in Figure 12 are wide and represent uncertainty in the measure.

Table 6. Number and rate of UK born TB cases by age, South West, 2000-2017

Year	Age < 15 years		All ages	
	Number of cases	Rate per 100,000 population	Number of cases	Rate per 100,000 population
2000	5	0.6	139	3.0
2001	3	0.3	123	2.7
2002	3	0.3	98	2.1
2003	0	0.0	87	1.9
2004	7	0.8	98	2.1
2005	3	0.3	123	2.6
2006	4	0.5	87	1.8
2007	6	0.7	97	2.1
2008	4	0.5	91	1.9
2009	8	0.9	99	2.1
2010	2	0.2	108	2.2
2011	6	0.7	127	2.6
2012	9	1.0	114	2.4
2013	8	0.9	151	3.1
2014	3	0.3	133	2.7
2015	6	0.7	123	2.5
2016	1	0.1	95	1.9
2017	8	0.9	109	2.2

Figure 12. Rate of TB with 95% confidence intervals in UK born cases under 15, South West, 2000-2017



TB Monitoring Indicator 5: Incidence of TB in UK born children aged (<15 years) (England)

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, conducts strain typing on isolates from TB cases 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.

Whole genome sequencing

Whole genome sequencing (WGS) of *Mycobacterium tuberculosis* complex isolates provides data on single nucleotide polymorphism (SNP) differences. This provides more information than the MIRU-VNTR strain typing method on how isolates are related to each other. WGS provides greater understanding of whether isolates are part of the same transmission chain, and may also help determine the timing and direction of transmission [3, 4, 5]. WGS replaced MIRUVNTR in December 2016 in North and Central England. It was rolled out in January 2018 in the South of England.

PHE is close to deploying the use of WGS for all TB cases throughout England. WGS has been carried out retrospectively on some isolates from TB cases epidemiologically and molecularly linked by MIRU-VNTR to support cluster investigation and to inform public health action going forward. 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.

Because of the change in the method used to identify clusters, it is not possible to report on national clustering using a single method for the transition year of 2017. As has been done in previous years, clustering within the South West identified by MIRU-VNTR will be reported.

Proportion of clustered cases and geographical distribution

A total of 104 (72.2%) culture confirmed cases were typed to 24 loci and 129 (89.6%) to at least 23 loci. This is the second highest proportion of isolates that have been typed to at least 23 loci since this form of microbiological typing started in 2010, and the highest proportion since 2012. The proportion of cases typed to 24 loci has decreased for the last 2 years. Since 2010, 1359 (59.8%) isolates were culture confirmed and of these 1143 (84.1%) and 841 (61.9%) have been typed to at least 23 or 24 loci respectively, see Table 7.

If a case is molecularly linked with at least 1 other South West case, it is considered part of a cluster. South West cases may also be clustered with cases outside the South West and appropriate public health action is taken in these situations, however the analysis presented here is limited to clustering within the South West. Information on whether a case was molecularly linked with at least 1 other South West case was available for all cases typed to at least 23 loci, which is 50.3% of all cases since 2010 (1143). Of these there have been 417 (36.5%) clustered cases which were part of 111 distinct molecular clusters. The remaining 726 (63.5%) cases were not identified as molecularly linked with another South West case during the same time period, see Table 8.

Cases which were not clustered with another South West case may have been clustered with other cases in England. However, because some regions of England were conducting WGS on all TB isolates in 2017 whilst others were primarily conducting MIRU-VNTR strain typing, wider clustering can only be analysed in relation to cases in the south of England. In 2017, 233 (32.1%) cases were found to be molecularly linked to another case reported in the south of England. In total, cases from the South West have been molecularly linked with 340 clusters within the South of England since 2010. However, MIRU-VNTR is known to have low sensitivity when detecting true clusters and this sensitivity varies by the lineage of the TB strain. Therefore, 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, 2010-2017

Year	All 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	54.9	53	37.3
2011	307	200	65.1	199	99.5	169	84.5	98	49.0
2012	300	190	63.3	189	99.5	180	94.7	131	68.9
2013	325	186	57.1	168	90.3	151	81.2	94	50.5
2014	316	174	55.1	165	94.8	153	87.9	113	64.9
2015	285	172	60.4	164	95.3	153	89.0	136	79.1
2016	239	151	63.2	143	94.7	130	86.1	112	74.2
2017	234	144	61.5	139	96.5	129	89.6	104	72.2
All cases	**2272**	**1359**	**59.8**	**1302**	**95.8**	**1143**	**84.1**	**841**	**61.9**

* Percentage typed is the proportion of culture confirmed cases which have had at least 1 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, 2000-2017

Year	All cases	Non-clustered cases*		Clustered Cases South West**		Number of new clusters per year#
	N	n	%	n	%	n
2010	265	44	31.0	34	23.9	8
2011	307	108	54.0	61	30.5	13
2012	300	117	61.6	63	33.2	17
2013	326	104	55.9	47	25.3	16
2014	316	103	59.2	50	28.7	9
2015	285	87	50.6	66	38.4	15
2016	239	85	56.3	45	29.8	11
2017	234	78	54.2	51	35.4	22
All cases	**2272**	**726**	**63.5**	**417**	**30.7**	**111**

* 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 2010-2016. Percentage is percentage of culture confirmed cases.
# 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 111 different molecular clusters involving 2 or more South West residents. Most frequently these clusters involved 2 cases (62, 55.9%), followed by clusters involving 3 to 4 cases (25, 22.5%) then 5 to 9 cases (17, 15.3%). In 2017, the majority of clusters had only 2 molecularly linked cases (21, 55.3%), see Figure 13.

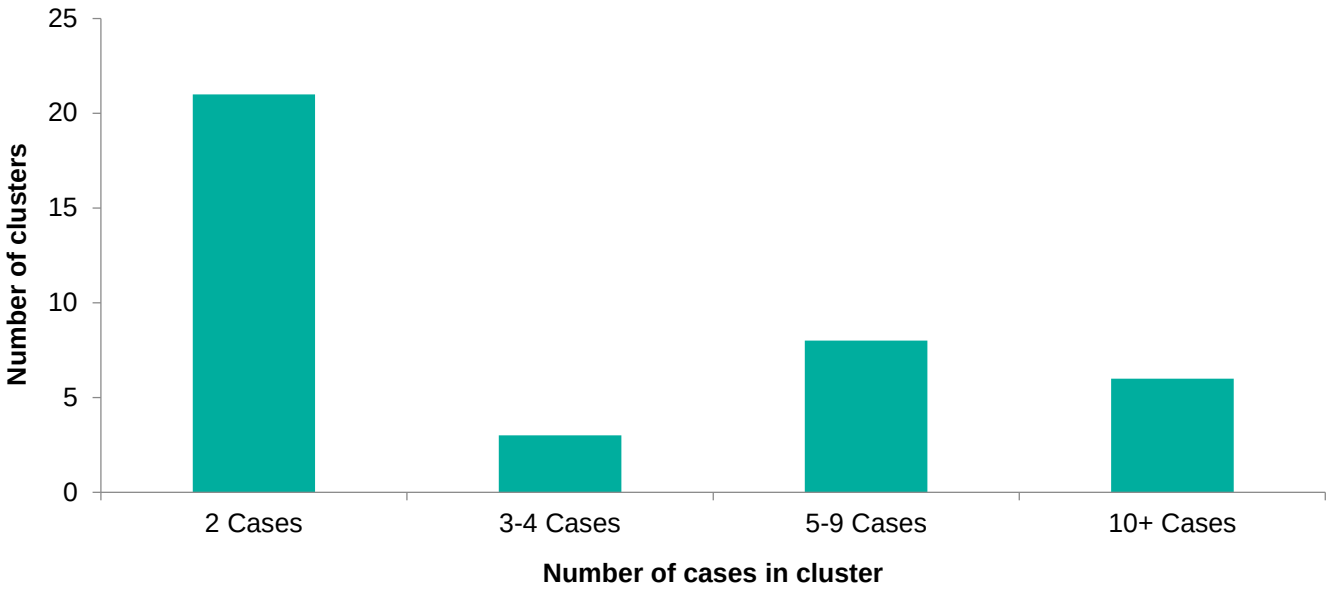
During 2017, 1 cluster expanded by 4 additional cases, the most of any South West cluster. The suspected index case was diagnosed post-mortem in 2012. The cluster was identified in 2016 and since then 2 cases have been linked to the same caravan park. Four cases in this cluster were born in Poland and all have been identified as drug sensitive. However this cluster is not among the largest in the South West, with 6 cases at the end of 2017.

In 2017, 2 clusters expanded by 3 cases, 2 clusters expanded by 2 cases and 29 clusters expanded by 1 case. There were also 4 completely new clusters reported in 2017 (where all cases in the cluster were reported in 2017).

The largest cluster in the South West, which includes a total of 24 cases, expanded in 2016 by a single case but did not expand in 2017. 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.

Figure 13. Number of TB clusters by size, South West, 2017



Characteristics of cases in clusters

In 2017 the majority of South West clustered cases were male (34, 66.7%), aged 15-44 (23, 45.1%), UK born (31, 60.8%) and of White ethnicity (36, 70.6%). There were 11 (21.6%) clustered cases that reported at least 1 social risk factor. The most prevalent risk factor reported was drug use (8, 15.7%), followed by imprisonment and homelessness drug use (6 each, 11.8% each) and alcohol misuse (4, 7.8%). The majority of clustered cases had pulmonary disease (43, 84.3%) and of these 17 (39.5%) were sputum smear positive. When examining drug resistance among clustered cases, 7 (13.7%) had resistance to at least 1 first-line drug.

Non-clustered South West cases had a similar age and sex distribution to clustered cases, but a lower proportion of non-clustered cases were UK born (29, 37.2%). White ethnicity was still the most prevalent but made up a much smaller proportion of cases (36, 46.2%). Ten (12.8%) non-clustered cases reported at least 1 social risk factor and the most commonly reported risk factor was imprisonment (5, 6.4%). A lower proportion (54, 69.2%) of non-clustered South West cases experienced pulmonary disease than clustered cases and 22 (40.7 %) of these were sputum smear positive. There was a lower proportion of non-clustered cases (6, 7.7%) with an isolate resistant to at least 1 first-line drug when compared to clustered cases.

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 215 (91.9%) cases in 2017. During this year, the median time between symptom onset and date of diagnosis was 95.0 days (IQR: 41.5 to 192.0), see Table 9. The minimum was 1 day and the maximum was 3671 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 2017, the median time between symptom onset and diagnosis for pulmonary cases was 104.0 days (IQR: 39.0 to 186.0). This median time was a substantial increase over 2016 data (92.0 days (IQR: 46.0 to 168.5)) and is the highest median time delay since 2003 for this group. Of pulmonary cases, 44.9% (70) experienced a delay greater than 4 months. This proportion has increased substantially over recent years, from a minimum of 6.3% (12) in 2005.

Pulmonary sputum smear positive cases had a lower median delay (69.0 days, IQR: 34.0 to 138.0) than pulmonary sputum smear negative cases (141.0 days, IQR: 88.0 to 202.0). Non-pulmonary cases had a median delay of 71.0 days (IQR: 48.0 to 207.0), the lowest recorded since 2001.

Table 9. Time between symptom onset and date of TB diagnosis*, South West, 2017

	Median days (IQR)	0-2 months		2-4 months		>4 months		All
		n	%	n	%	n	%	N
Pulmonary**	**104.0 (39.0-186.0)**	50	34.0	27	18.4	70	47.6	147
Non-pulmonary**	**71.0 (48.0-207.0)**	25	38.5	17	26.2	23	35.4	65
Pulmonary smear positive	**69.0 (34.0-138.0)**	20	46.5	7	16.3	16	37.2	43
Pulmonary smear negative	**141.0 (88.0-202.0)**	6	18.2	7	21.2	20	60.6	33
All cases**	**95.0 (41.5-192.0)**	75	35.4	44	20.8	93	43.9	212

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

Delay from onset of symptoms to treatment

In 2017, data on time between symptom onset and treatment start date were available for 213 (91.0%) cases. The median delay in 2017 was 98.0 days (IQR: 41.0 to 193.0). This is the highest median delay recorded since 2000. In all, 72 (33.8%) cases started treatment within 2 months of symptom onset and 95 (44.6%) had a delay of greater than 4 months.

In 2016 the median delay for males (95.0 days; IQR: 54.0 to 172.0) had increased to a similar level to females (96.5 days; IQR: 48.0 to 211.0), but in 2017 the median delay for females increased to 110.0 days (IQR: 61.0 to 217.0). The proportion of female cases with a delay from symptom onset to treatment of over 4 months was 48.1% (38) and for males was 42.5% (57).

The median delay for UK born cases was 96.0 days (IQR: 38.0 to 181.0) and for non-UK born cases was 104.5 days (IQR: 51.5 to 202.5).

The median delay for cases reporting at least 1 social risk factor was 120.0 days (IQR: 53.5 to 182.0). This is compared to a median delay of 102.5 days (IQR: 38.5 to 194.0) in those with no social risk factors. Among cases that did not report any social risk factors, 46.1% (70) experienced a delay of greater than 4 months compared to 50.0% (12) 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, 2017

	0-2 months		2-4 months		>4 months		All
	n	%	n	%	n	%	n
No social risk factors	49	32.2	33	21.7	70	46.1	152
At least 1 social risk factor	7	29.2	5	20.8	12	50.0	24

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 Upper Tier Local Authority (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 including MDR-TB, and non-culture confirmed cases treated as MDR-TB [6]. Treatment outcomes for the drug sensitive cohort are reported separately for the following groups:

1. For cases with an expected duration of treatment less than 12 months, 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 2016. During this year, there were 23 (9.8%) drug sensitive cases that reported CNS TB and these were excluded from the following analysis.

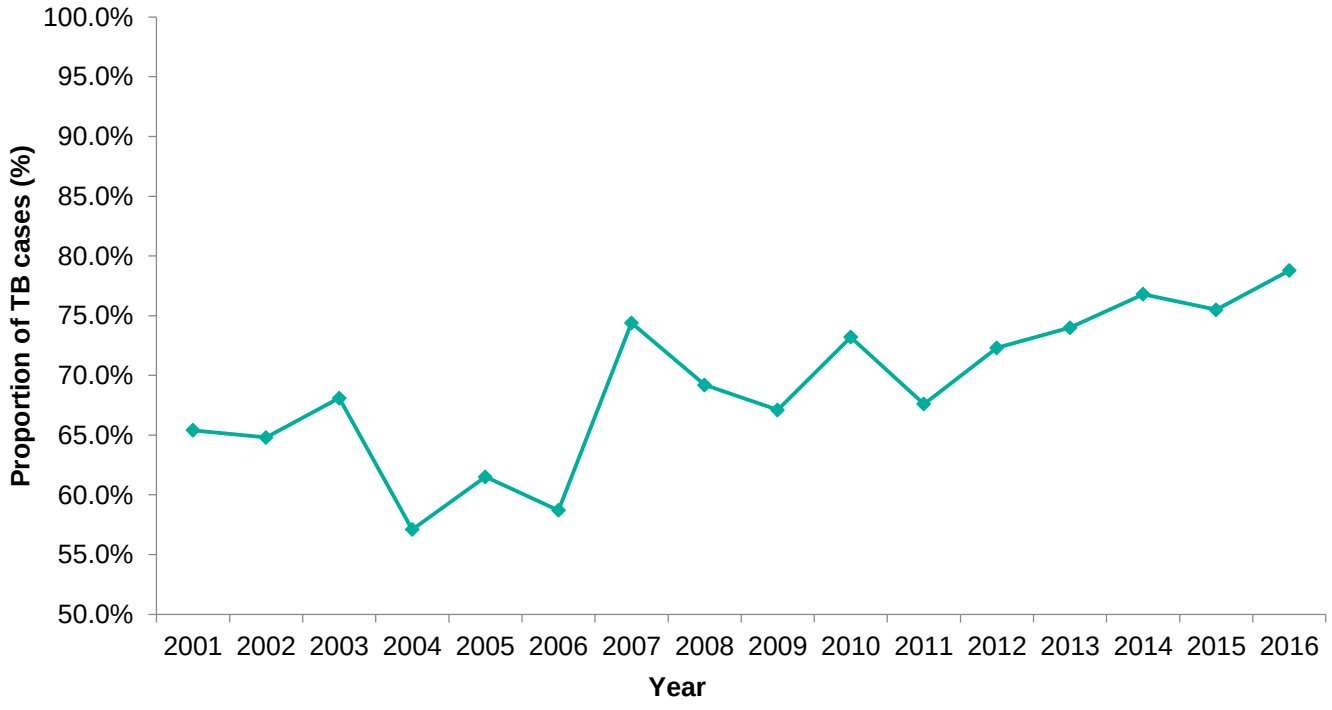
In the cohort without CNS disseminated disease and with TB infection sensitive to treatment using rifampicin, 167 (78.8%) cases completed treatment after a 12-month follow-up period, see Table 11. This is the highest proportion of notifications that have completed treatment since 2001, see Figure 14. When compared to cases notified in 2015, the proportion falling into the outcome categories ‘lost to follow up’ and ‘not evaluated’ were higher, see Table 12.

Table 11. TB outcome at 12 months, South West, cases diagnosed in 2016*

Outcome at 12 months	Number of cases	Percentage of cases (%)
Completed	167	78.8
Died	8	3.8
Lost to follow up	11	5.2
Still on treatment	11	5.2
Treatment stopped	4	1.9
Not evaluated	11	5.2
All cases	**212**	**100.0**

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

Figure 14. Proportion of TB cases completing treatment at 12 months, South West, 2001-2016*



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

Table 12. TB treatment outcomes at 12 months, 2002-2016*

Year	Completed (%)	Died (%)	Lost to follow up (%)	Still on treatment (%)	Treatment stopped (%)	Not evaluated (%)
2001	67.2	10.9	4.7	5.7	3.1	8.3
2002	61.5	11.7	6.3	7.3	2.9	10.2
2003	64.0	7.5	6.5	2.2	3.8	16.1
2004	59.5	8.3	7.0	5.8	1.2	18.2
2005	57.7	11.8	7.3	8.9	4.5	9.8
2006	49.8	8.1	7.7	7.3	3.1	23.9
2007	68.1	6.5	4.0	10.5	0.4	10.5
2008	62.3	9.3	6.6	14.8	1.2	5.8
2009	63.4	7.7	8.4	11.4	0.4	8.8
2010	74.0	7.0	3.3	7.4	0.8	7.4
2011	68.8	4.3	7.1	11.7	0.4	7.8
2012	70.4	7.7	5.1	8.4	0.4	8.0
2013	73.9	5.9	5.3	7.3	0.7	6.9
2014	75.7	7.5	6.5	7.9	1.0	1.4
2015	77.8	4.4	4.4	8.1	4.0	1.2
2016	78.8	3.8	5.2	5.2	1.9	5.2

* 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 7: 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 7: Number and proportion of drug sensitive TB cases that had died at last reported outcome (England, PHEC and UTLA data shown on Fingertips)

7 (63.6%) notifications that were lost to follow up left the UK whilst undergoing treatment and 2 (18.2%) were recorded as having other reasons for disengagement with TB services. When looking at patients that died prior to treatment completion, 4 (50.0%) were categorised as ‘TB incidental to death’. For 1 (12.5%) case, it was recorded that ‘TB contributed to death’, and 3 (37.5%) had an unknown relationship between death and TB. No cases were diagnosed post-mortem in 2016. The median age of people that died during their treatment for TB was 78.5 years (IQR: 67.0 to 87.0 years). For 5 (45.5%) cases which were still on treatment, a reason for this was given. Treatment was extended for 4 (36.4%) cases and treatment was interrupted for 1 (9.1%) case.

A similar proportion of females (71, 78.0%) completed treatment than males (96, 79.3%). The remaining females most commonly were still on treatment (8, 8.8%). Five (5.5%) female cases were not evaluated, 3 (3.3%) stopped treatment, 2 (2.2%) died and 2 (2.2%) were lost to follow up. This is compared to male outcomes with 9 (7.4%) that were lost to follow up, 6 (5.0%) died, 6 (5.0%) were not evaluated, 3 (2.5%) were still on treatment and 1 (0.8%) stopped treatment. The age group with the largest proportion of cases completing treatment was the 15-44 age group (100, 86.2%). Of the 2 youngest cases in the cohort (0-14), 1 (50.0%) completed treatment and the other was still on treatment. A substantially higher proportion of those in the oldest age group (≥65) died prior to treatment completion (6, 13.6%). Two cases (4.0%) aged 45-64 also died, whilst 4 (8.0%) each were still on treatment and not evaluated. The age group with the highest proportion of people lost to follow up was 15-44 years (9, 7.8%).

There was a higher treatment completion rate among non-UK born patients (99, 82.5%) than UK born individuals (65, 74.7%), but there was also a higher proportion of non-UK born patients lost to follow up (10, 8.3%) than UK born patients (1, 1.1%). However a higher proportion of UK born cases died (6, 6.9%) compared to non-UK born cases where 1 (0.8%) case died. A higher proportion of UK born cases were still on treatment (6, 6.9%) compared to non-UK born notifications (4, 3.3%).

All cases (100.0%) in the Black-Caribbean (4), Bangladeshi (3) and Chinese (2) ethnic groups completed treatment. The lowest treatment completion rates were observed in the White (74, 70.5%) and Black-Other (3, 75.0%) ethnicities. The highest proportion of notifications with deaths occurring during treatment was observed in the population with White ethnicity (7, 6.7%). The highest proportion of cases lost to follow up were in the Black-African (3, 9.7%) and Asian-Other (1, 9.1%) groups.

Treatment completion was reported for a slightly lower proportion of cases reporting at least 1 social risk factor (20, 76.9%) compared to cases reporting no social risk factors (114, 79.7%).

Upper tier local authorities with 5 or more cases that had a treatment completion rate of 70% or more were: Bournemouth (9, 100.0%), City of Bristol (49, 86.0%), Cornwall (9, 81.8%), Dorset (7, 77.8%), Gloucestershire (11, 84.6%), Poole (5, 100.0%), Swindon (24, 85.7%), Torbay (5, 100.0%) and Wiltshire (10, 100.0%). North Somerset had the lowest completion rate of areas with 5 or more cases (2, 33.3%). North Somerset also had the highest proportion of cases whose outcome was not evaluated (3, 50.0%).

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

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

There were 23 (9.8%) cases of TB sensitive to rifampicin treatment with CNS, spinal, miliary or cryptic dissemination notified in 2016. Of these cases 9 (39.1%) completed treatment and 9

(39.1%) were still on treatment, see Table 13. This is a decrease in the proportion of cases completing treatment compared to 2015 when 43.8% (14) of cases completed treatment. This is the highest proportion of cases still on treatment since 2001.

Table 13. Outcome at 12 months for TB patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, South West, cases diagnosed in 2016*

Outcome at 12 months	Number of cases	Percentage of cases (%)
Completed	9	39.1
Died	3	13.0
Lost to follow up	0	0.0
Still on treatment	9	39.1
Treatment stopped	0	0.0
Not evaluated	2	8.7
All cases	**23**	**100.0**

* Excludes rifampicin resistant TB.

Of the 3 people who died amongst 2016 notifications, 1 (33.3%) case was recorded as 'TB incidental to death' whilst 'TB contributed to death' for the other 2 (66.7%) cases. None of the cases were diagnosed post-mortem. Those that died whilst on TB treatment had a median age of 81.0 (IQR: 48.0 to 88.0) years. The majority of people (6, 66.7%) that were still on treatment had their treatment extended. Treatment was changed for 1 (11.1%) case.

A much higher proportion of men with rifampicin sensitive CNS, spinal, miliary or cryptic disseminated disease completed treatment (8, 53.3%) than women (1, 12.5%). Females had a higher proportion of cases still on treatment (5, 62.5%) than males (4, 26.7%). 2 (25.0%) female cases died and 1 (6.7%) male case died. No cases with drug sensitive CNS, spinal, miliary or cryptic TB were aged 0-14. Of those cases aged 15-44, 4 (30.8%) completed treatment, 7 (53.8%) were still on treatment and 2 (15.4%) were not evaluated. Of the 3 cases aged 45-64 years, 1 (33.3%) case each completed treatment, died and were still on treatment. Two (28.6%) cases aged ≥65 years died, whilst 4 (57.1% cases in this group completed treatment.

Non-UK born cases had a higher treatment completion rate (6, 42.9%) than their UK born counterparts (3, 37.5%). 6 (42.9%) non-UK born cases were still on treatment and 1 (7.1%) was lost to follow up. This compares to 2 (25.0%) UK born cases lost to follow up and 3 (37.5%) still on treatment.

One (4.8%) drug sensitive CNS, spinal, miliary or cryptic TB cases reported at least 1 social risk factor. There was no evaluation of the outcome for this patient.

The City of Bristol had the largest number of cases in this group of any South West upper tier local authority (7). Four (57.1%) completed treatment and 3 (42.9%) were still on treatment. South Gloucestershire had the second largest number of cases in this group (5), of which 3 (60.0%) were still on treatment, 1 (20.0%) died and 1 (20.0%) completed treatment.

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

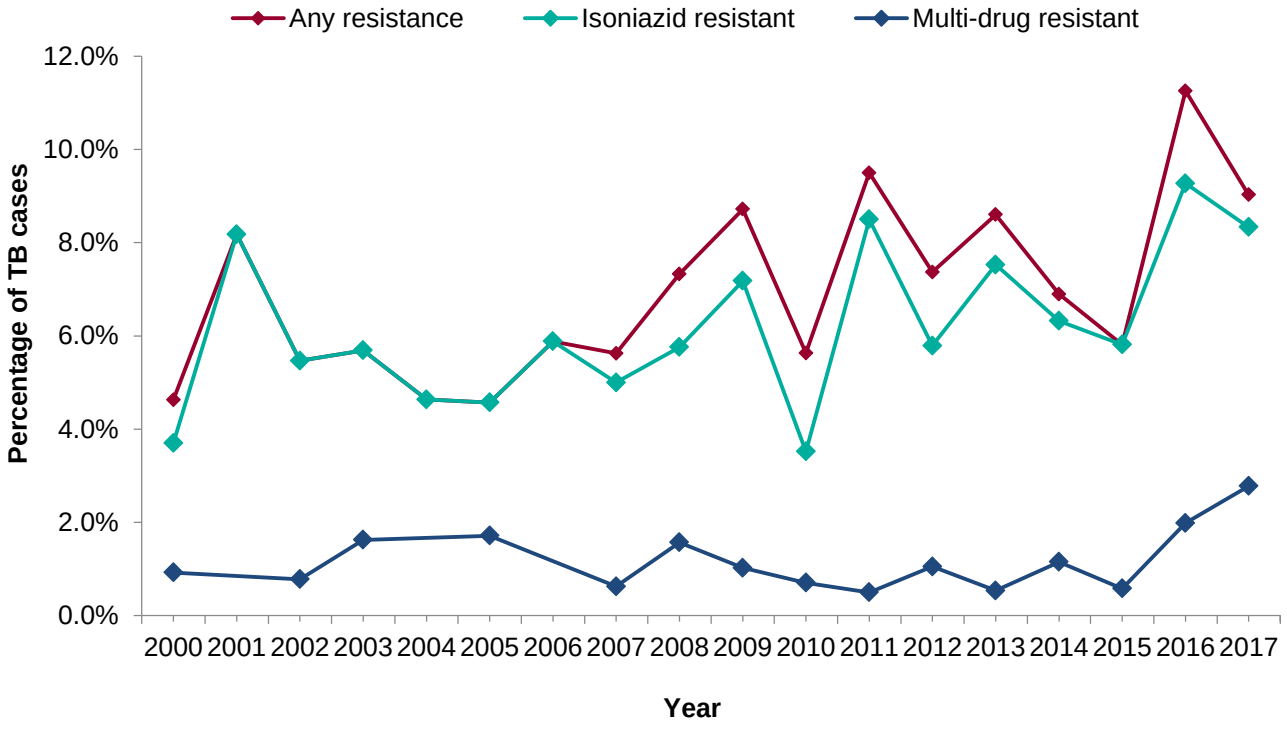
The number and distribution of drug resistant cases notified in 2017 has been analysed. Outcomes related to drug resistant TB are presented for cases notified in 2015 due to the 24-month follow-up period. Proportions in this section refer to the proportion of all culture confirmed cases unless otherwise stated.

Overall drug resistance and geographical distribution

In 2017, 13 (9.0%) culture confirmed cases exhibited resistance to at least 1 first-line drug, see Figure 15. 11 (7.6%) of these were from separate clusters. In 2017, 12 (8.3%) culture confirmed isolates had isoniazid resistance, 2 (1.4%) had ethambutol resistance and 4 (2.8%) rifampicin resistance. 5 (3.5%) isolates had pyrazinamide resistance (excluding *M. bovis* cases as *M. bovis* is resistant to pyrazinamide).

Four (2.8%) culture confirmed TB cases were found to be multi-drug resistant (MDR). All of these were resistant to isoniazid and rifampicin, 2 (1.4%) were resistant to ethambutol and 3 (2.1%) were resistant to pyrazinamide (excluding *M. bovis* cases). This was the largest number of MDR cases reported since 2000. 3 (2.1%) of the MDR cases were from 3 different clusters.

Figure 15. Percentage of culture confirmed TB cases with first-line drug resistance, South West, 2000-2017



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)

In 2017, the local authorities with the largest proportion of culture confirmed cases showing resistance to a first-line drug were Plymouth and Somerset. Eight local authorities in the South West had no cases in 2017 with resistance to a first-line resistance.

Characteristics of patients with drug resistant TB

Of culture confirmed non-UK born cases, 8 (10.4%) cases were resistant to a first-line drug, compared to 4 (6.3%) of the UK born culture confirmed cases. All UK born notifications with drug resistance were found to be resistant to isoniazid. Of the MDR cases, 3 (75.0%) were non-UK born.

The proportion of resistant isolates among culture confirmed female cases was 16.3% (8) compared to 5.3% (5) in males. The highest proportion of resistant isolates were identified in cases with Chinese ethnicity (1, 33.3%), followed by Asian-Other (1, 14.3%) and Black-African (2, 11.8%) ethnicities. Most cases with a drug resistant isolate were aged 15-44 (6, 8.0%), but the 45-64 age group had the highest proportion of culture confirmed cases exhibiting resistance (5, 13.9%). No cases with a drug resistant isolate had a previous diagnosis of TB recorded.

Culture confirmed cases reporting at least 1 social risk factor had a lower proportion of isolates that were resistant to at least 1 first-line drug (1, 4.8%) compared to those not reporting social risk factors (7, 7.5%). A higher proportion of drug resistant notifications was present in pulmonary cases (10, 9.3%) than non-pulmonary cases (3, 8.1%).

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

There were 3 (2.1%) culture confirmed notifications in 2017 with an infection resistant to second-line drugs. This is a decrease of 1 from 2016 but 1 more than in 2015. 2 (1.4%) of the cases with resistance to second-line drugs were male and 1 (0.7%) female. Two (1.4%) were UK born and 2 (1.4%) had White ethnicity and pulmonary disease. No cases had a previous TB diagnosis. Social risk factor information was available for 2 cases but neither reported any risk factor.

In 2017 1 case was found to be extensively drug resistant (XDR). This case was a UK born White male aged over 65 with pulmonary disease. Only 1 other case in the South West has ever been reported as XDR and this occurred in 2014.

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 2015, 1 was rifampicin resistant. This case was recorded as having treatment stopped. This case was female aged 15-44. The case was pulmonary and did not have a previous diagnosis of TB. The case was UK born with White ethnicity.

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 2017, data on social risk factors were available for 178 (79.8%) notifications aged 15 and over. During this year, 25 (14.0%) cases reported at least 1 social risk factor (alcohol abuse, drug use, homelessness and/or imprisonment), see Table 14. The majority of these reported 1 of the social risk factors only (13, 52.0%), with 5 (20.0%) cases reporting 2 or 3 risk factors. In 2017, 2 (8.0%) cases reported all 4 risk factors.

A higher proportion of people with pulmonary disease reported at least 1 social risk factor (23, 15.5%), than people with non-pulmonary disease (2, 2.7%).

At least 1 social risk factor was reported by 16 (15.8%) UK born cases while 9 (7.6%) non-UK born cases reported at least 1 social risk factor. Of all male TB cases aged 15 and over, 20 (13.8%) cases reported at least 1 risk factor, compared to 5 (6.4%) female cases.

Among people reporting at least 1 social risk factor, the most prevalent risk factor was drug use, reported by 15 (60.0%) of cases, followed by imprisonment (12, 48.0%), see Table 15.

Table 14. TB cases reporting at least 1 social risk factor, South West, 2009-2017

Year	Cases reporting at least 1 risk factor		All cases
	Number of cases	Percentage of cases (%)	
2009	30	19.0	158
2010	21	12.4	170
2011	23	11.3	204
2012	32	14.1	227
2013	36	13.8	260
2014	23	9.0	255
2015	32	13.9	230
2016	28	14.7	191
2017	25	14.0	178

Table 15. Individual social risk factors among TB cases, South West, 2017

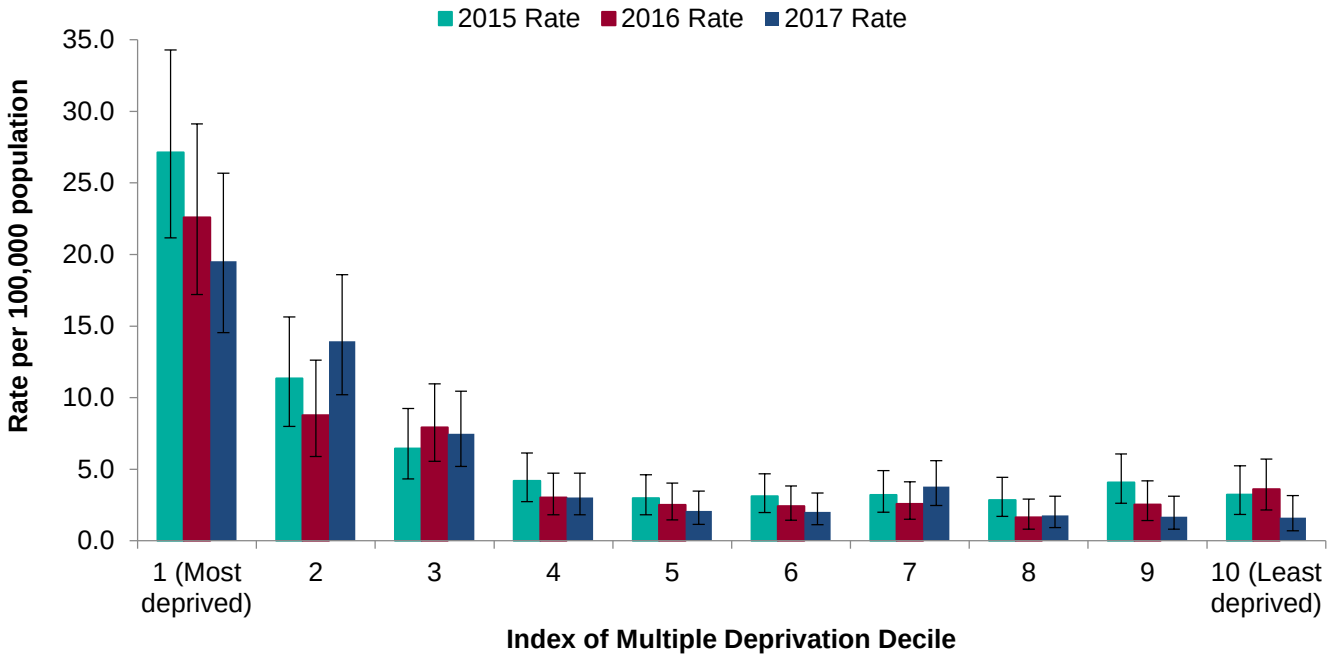
Social risk factor	Number of cases	Percentage of cases (%)
Homelessness	11	44.0
Drug use	15	60.0
Alcohol	8	32.0
Imprisonment	12	48.0

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 and was last updated in 2015. The postcodes of cases were linked to an IMD score as an indicator of socio-economic status. In 2017, 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 (51, 21.8%). The highest rate of TB was also observed in this decile, see Figure 16 where rates are calculated based on IMD rankings within the South West. However, in 2017 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 2017, the highest rates are in deciles 1 to 3. The rate then remains low through deciles 4 to 6 but appears slightly elevated in decile 7 before reducing to the lowest rate in decile 10.

Figure 16. TB rate and 95% confidence intervals by Index of Multiple Deprivation decile, South West, 2015-2017



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

HIV testing

In 2017, data on HIV testing were available for 217 (92.7%) cases. For some cases, HIV status was already known (23, 10.6%). Of those where status was unknown, most (181, 93.3%) were offered an HIV test and had this completed, see Table 16. 11 (5.7%) cases were not offered an HIV test.

Table 16. HIV testing for TB cases, South West, 2017*

HIV testing status	Number of cases	Percentage of cases (%)
HIV test offered and done	181	83.4
HIV test offered but not done	2	0.9
HIV test offered but refused	0	0.0
HIV status already known	23	10.6
HIV test not offered	11	5.1
All cases with data available	**217**	**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 2017, data on inpatient treatment for TB were available for 219 (93.6%) cases. A total of 64 (29.2%) cases were treated as an inpatient at some point during their care, see Table 17. Data on DOT were available for 212 (90.6%) cases. 31 (14.6%) patients received DOT as part of their care in 2017. This is nearly double the number of cases receiving DOT in 2016 (17).

Table 17. Hospital inpatient and DOT use* for TB cases, South West, 2017

	Number of cases	Percentage of cases (%)	All cases
Hospital inpatient	64	29.2	219
DOT given	31	14.6	212

* At any time during treatment.

Comparison between South West and England

In 2017, the rate of TB in the South West (4.2 per 100,000 population) was less than half that observed nationally (9.2 per 100,000 population). The South West and North East both had the lowest regional rate, with the next lowest rate in Yorkshire and the Humber at 6.3 per 100,000 population. The highest rate nationally was in London with 21.7 per 100,000 population.

In 2017, the rate of TB in UK born children (<15 years) in the South West (0.9 per 100,000) was lower than in England (1.4 per 100,000). The rate peaked nationally at 3.4 per 100,000 in 2007-2008, whilst the rate in the South West peaked in 2012 at 1.0 per 100,000. This rate in the South West increased between 2016 and 2017 whilst a decrease was observed nationally.

The South West region had the lowest rate of disease in the non-UK born population (22.2 per 100,000 population). England as a whole experienced a non-UK born rate of 41.1 per 100,000 population and 3.1 per 100,000 population for UK born. Until 2016, there was a 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 which also occurred at a national level. However, although this trend continued at the national level in 2017, this was not reflected in the South West where this proportion dropped to 27.5%.

In the South West the percentage of pulmonary cases (67.0%) was higher than recorded nationally (54.4%). In England 61.8% of all TB cases and 74.7% of pulmonary cases were culture confirmed in 2017. In the South West 61.5% of all cases and 68.6% of pulmonary cases were culture confirmed. In both 2016 and 2017, 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 46.6%. This was the highest proportion out of the regions in England.

The South West region had the fourth highest proportion of cases reporting at least 1 social risk factor (14.0%). Nationally this figure was 12.6%, the largest proportion since data collection began in 2010, but the South West was 1 of 4 centres to observe a decrease in the proportion of cases reporting at least 1 social risk factor between 2016 and 2017. The South West had the highest proportion of cases reporting drug use and imprisonment as risk factors.

Excluding cases where HIV status was known, 93.3% of cases in the South West had an HIV test offered and completed, which matched the proportion in England. Nationally DOT was received in 13.5% of cases. In the South West it was used in 14.6% of cases.

The South West recorded 9.0% of culture confirmed cases exhibiting resistance to at least 1 first-line drug. Nationally 8.5% of cases displayed the same resistance. In the South West between 2013 and 2017, 1.3% of cases were MDR compared to 1.4% nationally. In 2017, 3 cases nationally were XDR, 1 of which occurred in the South West.

In relation to outcome at 12 months for drug sensitive 2016 notifications, the South West had a treatment completion rate of 78.8% which was the second lowest of any region. The lowest rate was observed in East Midlands (74.8%). Nationally the completion rate was 84.4% over the same time period. This discrepancy between the England and South West completion rate was due to a comparatively high proportion of cases lost to follow up 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 16-35 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 1 commenced in February/March 2016 and saw the service being delivered across 5 GP practices that had the highest need and The

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

Haven. Phase 2 saw the service delivered to the next cohort of GP practices in Bristol CCG identified with high need.

For phase 1, 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 2017 and outcome data for cases notified in 2016 and 2015. There has been a year-on-year decrease in the incidence of TB in the South West since 2013 and the rate in 2017 was the lowest since 2003, although the decrease between 2016 and 2017 was only slight compared to the decreases seen in previous years.

The England TB rate has also been decreasing in recent years and the decrease between 2016 and 2017 was more pronounced than the decrease seen in the South West.

The age distribution of TB cases has remained largely similar throughout recent years, with variation generally reflecting changes in population-wide age distribution.

This year saw the first increase in the rate of TB in the UK born population since 2013, though the rate in the non-UK born continued to decrease. Indeed, the decrease seen in the non-UK born TB rate was more pronounced between 2016 and 2017 than it was between 2015 and 2016.

However, in 2017, the rate in the non-UK born population was still 10 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 2017 could be a result of the UK pre-entry screening programme in high TB incidence countries. This may be corroborated by the increase in the proportion of non-UK born cases diagnosed with TB less than 2 years after entry. 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.

For the first time in recent years there has been a decrease in the proportion of non-UK born cases diagnosed with TB ≥11 years after entering the country. This group accounted for 30.8% of non-UK born TB cases in 2017 compared to 35.0% in 2016, following a low of 10.2% in 2005. There has also been a decrease in the proportion of those diagnosed between 6 and 10 years after entering the country and a corresponding increase in those diagnosed less than 2 years and between 2 and 5 years after entering the country. Whether this reflects more rapid onset of active TB since entering the UK, earlier presentation to health services, re-activation of latent infection, exposure to an infectious case or another factor is unclear. Early diagnosis of active TB reduces the risk of transmission.

Between 2013 and 2016 there was a decrease in the rate of TB in the UK born population, but this rate increased in 2017. The rate in UK born children under the age of 15 also increased

substantially this year following a concurrent 3 year decrease. Although this rate remains lower than the national rate, this should be a focus for improvement in South West TB services.

The geographical distribution of TB in the South West continues to show a concentration of cases within urban upper tier local authorities. This is similar to the distribution seen nationally. The highest rates of TB were observed in the City of Bristol, Swindon, Plymouth and Bournemouth. These local authorities contain some the largest urban areas in the South West region. The incidence rate for Bristol has now decreased in 3 consecutive years and is the lowest recorded since 2003. The rate in Plymouth increased between 2016 and 2017 whilst the rate in Swindon decreased over the same period. Despite this, the City of Bristol contributed more than double the number of TB cases to the South West total than any other area.

High rates in urban areas may reflect the relative ease of transmission of respiratory infections in more densely populated areas. Also, these cities contain some of the most deprived areas in the South West, according to IMD ranking. As has been shown, TB rates are higher in more deprived areas. This may explain some of the geographic inequality in TB rate.

The proportion of cases which were resistant to at least 1 first-line drug increased in 2016 but decreased in 2017, but the proportion of cases with MDR TB has increased to the highest proportion since 2000. In 2017 there was also the second ever XDR case reported in the South West. Female cases were much more likely to show first-line drug resistance than male cases.

As in 2016, in 2017 the South West had the lowest culture confirmation rate for pulmonary cases (68.6%) of any region in England. TB cases at any site were 61.5% 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 will also support WGS typing of TB isolates in the future. TB services across the South West should target improvement in culture confirmation rates.

The proportion of cases in 2017 with a delay of more than 4 months between symptom onset and treatment start date was the highest recorded since 2000. This was also the highest rate in any area of England, with the next highest being observed in the East of England (36.9%). Groups reporting a social risk factor had a longer median delay that those reporting no social risk factor, perhaps reflecting the difficulties often encountered with treating these groups. 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 2017 the proportion of TB cases reporting 1 or more social risk factors was lower than in 2016, but cases reporting a risk factor were more likely to be non-UK born and have pulmonary disease.

The continuity of treatment and follow up in the South West appears to be a concern, as the region had the second highest proportion of drug sensitive cases with a last recorded outcome

as ‘not evaluated’. The region also had the second lowest treatment completion rate for the drug sensitive cohort. The South West has regularly missed the recommended target for 12 month treatment completion of 85% of cases [7,8].

Conclusion

The fourth 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 proportion of cases experiencing delays greater than 4 months from symptom onset to treatment start
- high or increasing rates of TB in population sub-groups, such as the non-UK born cohort, the most deprived areas and among UK born children
- low rates of culture confirmation
- increased reports of multi-drug resistance
- low rates of treatment completion and variation in these rates between different types of TB cases

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

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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:

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.

Population denominators come from the Office for National Statistics (ONS) mid-year population estimates and the Labour Force Survey 2018.

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 1 notification with a full 24 MIRU-VNTR profile, and other members of the cluster may have a maximum of 1 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 1 injectable agent (capreomycin, kanamycin or amikacin) and at least 1 fluoroquinolone.

First-line drug resistance: First-line drug resistance is defined as resistance to at least 1 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 (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 (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 August 2018.

Appendix B: TB among South West residents

Table Bi. TB cases by local authority of residence, South West, 2000-2017

Local authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bath and North East Somerset	6	11	11	12	9	18	4	5	8	12	12	4	11	9	19	12	5	3
Bournemouth	17	12	17	13	13	24	23	13	18	14	15	24	16	11	13	13	9	14
Bristol, City of	48	40	63	51	75	66	81	81	71	84	81	82	88	97	98	79	66	62
Cheltenham	8	7	10	6	8	6	14	8	13	8	5	7	5	13	7	5	2	5
Christchurch	4	4	1	2	2	3	3	4	0	3	1	2	2	0	0	1	2	1
Cornwall and Isles of Scilly	13	10	13	12	20	13	10	21	11	13	7	23	18	14	17	9	12	15
Cotswold	2	3	0	0	1	1	2	1	2	2	1	3	5	3	1	1	1	1
East Devon	8	2	5	1	6	5	1	3	2	5	4	3	1	0	1	4	2	1
East Dorset	3	6	2	2	3	1	1	2	2	5	1	1	2	3	3	1	2	7
Exeter	3	6	2	1	7	7	6	8	7	9	1	8	14	7	5	5	6	7
Forest of Dean	3	3	2	2	1	2	3	3	1	1	0	1	1	0	1	2	1	1
Gloucester	7	1	7	7	8	6	12	13	11	8	7	13	11	21	8	12	8	6
Mendip	2	2	5	2	10	9	3	3	4	1	4	2	2	6	5	3	2	3
Mid Devon	2	0	0	1	0	2	1	0	4	0	2	2	3	1	3	2	1	5
North Devon	3	0	0	0	1	0	0	1	0	1	0	0	1	3	3	4	2	1
North Dorset	1	2	2	3	2	3	4	0	1	4	3	2	4	1	0	3	0	3
North Somerset	3	7	4	3	5	10	6	5	10	13	10	6	9	7	8	10	6	6
Plymouth	11	15	12	9	12	5	16	12	13	13	11	16	20	12	11	19	17	21
Poole	12	8	10	5	10	11	6	8	11	5	7	2	1	5	1	9	6	4
Purbeck	0	2	1	2	2	1	3	2	1	3	3	2	1	2	1	0	2	0
Sedgemoor	1	0	5	0	2	0	0	3	2	1	2	7	3	2	4	2	0	3
South Gloucestershire	8	11	5	12	12	10	9	8	16	25	13	18	13	17	21	16	18	9
South Hams	2	6	0	0	1	1	2	2	2	1	6	3	1	2	4	3	1	2
South Somerset	2	2	4	2	2	9	5	5	2	3	5	2	5	5	8	0	2	2
Stroud	6	3	0	6	3	4	4	3	7	4	2	2	5	7	5	5	1	4
Swindon	11	9	8	12	11	10	21	24	13	18	21	23	18	30	18	22	30	25
Taunton Deane	4	2	4	1	3	2	0	1	4	2	1	6	6	3	2	0	3	2

Teignbridge	11	12	5	8	2	2	5	4	8	8	5	9	4	9	7	13	7	3
Tewkesbury	5	1	1	2	3	4	2	2	1	1	2	4	2	4	4	4	3	6
Torbay	9	8	6	3	8	12	10	4	11	14	12	11	5	10	6	8	6	3
Torridge	1	1	0	0	1	0	0	1	0	0	0	1	1	0	2	0	1	0
West Devon	1	1	1	2	3	0	2	1	2	1	2	0	5	5	4	1	0	0
West Dorset	3	1	2	3	2	5	3	2	4	2	2	2	2	2	4	0	0	0
West Somerset	0	0	1	1	0	1	0	1	1	0	2	0	0	0	0	0	1	0
Weymouth and Portland	4	2	0	1	3	4	4	6	0	6	0	1	1	3	5	1	3	0
Wiltshire	6	11	11	14	12	9	12	9	16	13	15	15	14	12	17	16	11	9

Table Bii. TB rate per 100,000 population by local authority of residence, South West, 2000-2017

Local authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
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	10.5	6.5	2.7	1.6
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	5.9	6.9	6.8	4.6	7.2
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	22.1	22.1	17.5	14.5	13.5
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	4.3
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	2.0
Cornwall and 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	2.7
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	1.1
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	0.7
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	7.8
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	11.8	5.8	4.1	4.0	4.7	5.4
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	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	4.6
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	2.6
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	6.2
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	1.0
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	4.2
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	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	7.3	6.5	8.0
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	2.6
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	0.0
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	2.5
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	3.2
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	4.7	3.5	1.2	2.3
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	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	3.4
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	14.0	8.3	10.1	13.7	11.3
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	1.7
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	2.3
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	6.6
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	2.2
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	0.0

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	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	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	2.9	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	0.0
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	2.2	1.8

Table Biii. TB cases and rate by age and sex, South West, 2017

Age Group (years)	Male		Female	
	Count	Rate	Count	Rate
0-9	3	0.9	7	2.3
10-19	5	1.6	6	2.0
20-29	26	7.4	17	5.2
30-39	26	8.2	17	5.3
40-49	26	7.6	11	3.1
50-59	20	5.3	9	2.3
60-69	20	6.1	5	1.4
≥70	22	5.7	14	2.9

Table Biv. Drug resistance among TB patients with culture confirmed disease*, South West, 2000-2017

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	125
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	151
2005	8	4.6	8	4.6	3	1.7	1	0.6	3	1.7	175	0	0.0	174
2006	10	5.9	10	5.9	0	0.0	0	0.0	0	0.0	170	0	0.0	166
2007	9	5.6	8	5.0	1	0.6	1	0.6	1	0.6	160	2	1.3	156
2008	14	7.3	11	5.8	3	1.6	2	1.0	4	2.1	191	3	1.6	189
2009	17	8.7	14	7.2	2	1.0	2	1.0	3	1.5	195	4	2.1	192
2010	8	5.6	5	3.5	1	0.7	1	0.7	2	1.4	142	2	1.4	138
2011	19	9.5	17	8.5	1	0.5	2	1.0	1	0.5	200	1	0.5	195
2012	14	7.4	11	5.8	2	1.1	1	0.5	3	1.6	190	3	1.6	183
2013	16	8.6	14	7.5	1	0.5	1	0.5	1	0.5	186	2	1.1	180
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	172	1	0.6	162
2016	17	11.3	14	9.3	3	2.0	2	1.3	4	2.6	151	1	0.7	144
2017	13	9.0	12	8.3	4	2.8	2	1.4	4	2.8	144	5	3.5	133

* 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 FS team.