Public Health England

Protecting and improving the nation's health

Tuberculosis in the South West
Annual review (2015 data)

Data from 2000 to 2015

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The data presented in this report are correct as of September 2016.

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Authors

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Executive summary

- In 2015, there were 290 cases of tuberculosis (TB) notified among residents of the South West, a rate of 5.3 (95% confidence interval [CI] 4.7 to 5.9) per 100,000 population.
- The following local authorities had the highest notification rates: City of Bristol (17.6/100,000), Swindon (10.1/100,000), and Bournemouth (7.7/100,000).
- The rate of notifications for males and females were 5.8 and 4.8/100,000 cases, respectively.
- The highest rates were observed in the following age groups: 30-39 (11.9/100,000), 40-49 (6.7/100,000), and 20-29 (6.3/100,000) years.
- The rate for UK born children under 15 (an indicator for ongoing local transmission) was 0.70/100,000 population, the second lowest rate for five years (2011 to 2015).
- The non-UK born case rate was 31.9/100,000 (146 cases) and the UK born population 2.6/100,000 (128 cases).
- The largest proportion of non-UK born cases were born in India (19.9%) followed by Somalia (12.3%) and Nepal (7.5%).
- The majority of cases were white (153 cases, 53.5%) followed by Black-African (51 cases, 17.8%) and Indian (37 cases, 12.9%) ethnicities.
- The majority of cases were diagnosed with pulmonary disease (192 cases, 66.2%).
- In all, 171 (59.0%) cases were culture confirmed and 56 (57.7%) pulmonary cases were sputum smear positive.
- The median delay between symptom onset and diagnosis was 82 days (inter-quartile range [IQR] 45 to 173).
- HIV tests were offered (201) or status was already known (20) for 89.8% of cases
- Over the six-year period where typing data were available (2010 to 2015), there were 288 molecularly clustered notifications in the South West and these were associated with 75 different clusters. The remaining 596 cases had a strain type

unique to the South West (210 of these cases had a strain type that matched another case reported in the rest of England).

- Following a 12-month follow-up period of cases notified in 2014, 75.8% cases successfully completed treatment, 8.1% were still on treatment, 7.7% died, 6.3% were lost to follow up and 1.4% of cases were not evaluated (data missing or not complete).

- Nine (5.3%) notifications had *Mycobacterium tuberculosis* isolated that were resistant to at least one first-line drug, lower than in 2014 (6.8%), 2013 (8.3%), 2012 (7.4%), and 2011 (9.8%) and 2010 (5.9%).

- There was one case of multi-drug resistant (MDR) TB.

- There were two (1.2%) notifications that had *Mycobacterium tuberculosis* isolated that were resistant to at least one second-line TB drug.

Introduction

The South West PHE centre (PHEC) covers the unitary or 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 greater than the national rate (10.5/100,000). See Appendix A for a description of data sources and definitions.

Enhanced surveillance in England and Wales was launched in January 1999 with the aim of providing detailed comparable information on the epidemiology of TB following the global resurgence of the disease, which prompted the World Health Organization (WHO) to declare a ‘global emergency’ in 1993. The minimum dataset includes notification details, demographic, clinical and microbiological information on all cases of TB reported by clinicians at local level. At the end of 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 (TOM) 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 at upper tier local authority can be found at http://fingertips.phe.org.uk/profile/tb-monitoring.

Data for this report come principally from three different years:

1. Case data are from notifications occurring in 2015.

2. Outcome data for patients with drug sensitive infections are from 2014 notifications.

3. Outcome data for patients with drug resistant cases are from 2013 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. Identify opportunities for interventions to prevent further cases.

Tuberculosis epidemiology

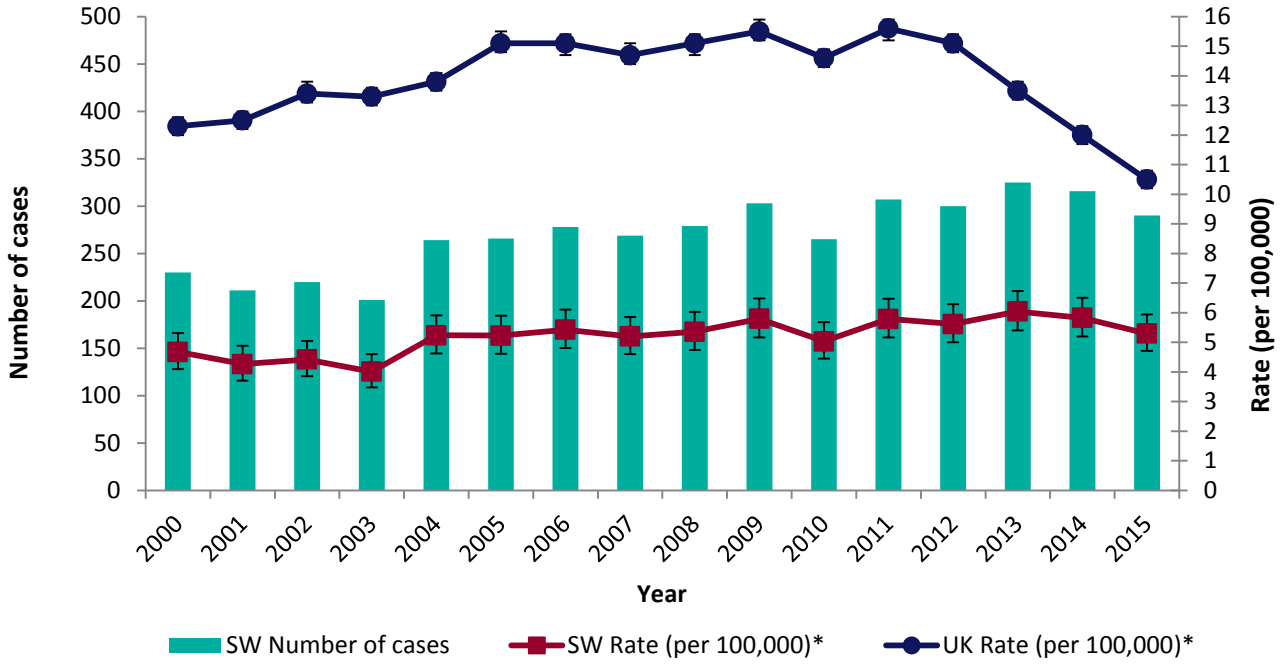
Overall numbers, rates and geographical distribution

In 2015, there were 290 cases of tuberculosis notified among residents of the South West PHEC, a rate of 5.3 (95% CI 4.7 to 5.9) per 100,000 population. The rate in 2015 was lower when compared to both 2014 (5.8/100,000) and 2013 (6.0/100,000). The South West rate was lower than the overall UK rate of 10.5/100,000. England has experienced a decrease in its annual TB incidence for a fourth consecutive year, with 2015 data representing a 32% decrease since 2011, whereas the South West has observed two consecutive annual decreases. The South West rate for 2015 is the lowest observed since 2010 (see Figure 1).

Within the South West, the highest TB rates were observed in the following local authorities (LA) in order of decreasing incidence: the City of Bristol (17.6/100,000), Swindon (10.1/100,000), Bournemouth (7.7/100,000), Plymouth (7.2/100,000) and Bath and North East Somerset (7.0/100,000). The burden of TB infection in the City of Bristol means the city has a considerable effect on the epidemiology of TB in the South West.

The incidence rate for Bristol decreased in 2015 for the first time since 2010, having increased over each of the preceding four years. Figure 2 shows a map giving the 2015 notification rates by unitary and upper tier local authority (UTLA); the majority (12/14) experienced an incidence rate of between 0 and 9.9/100,000.

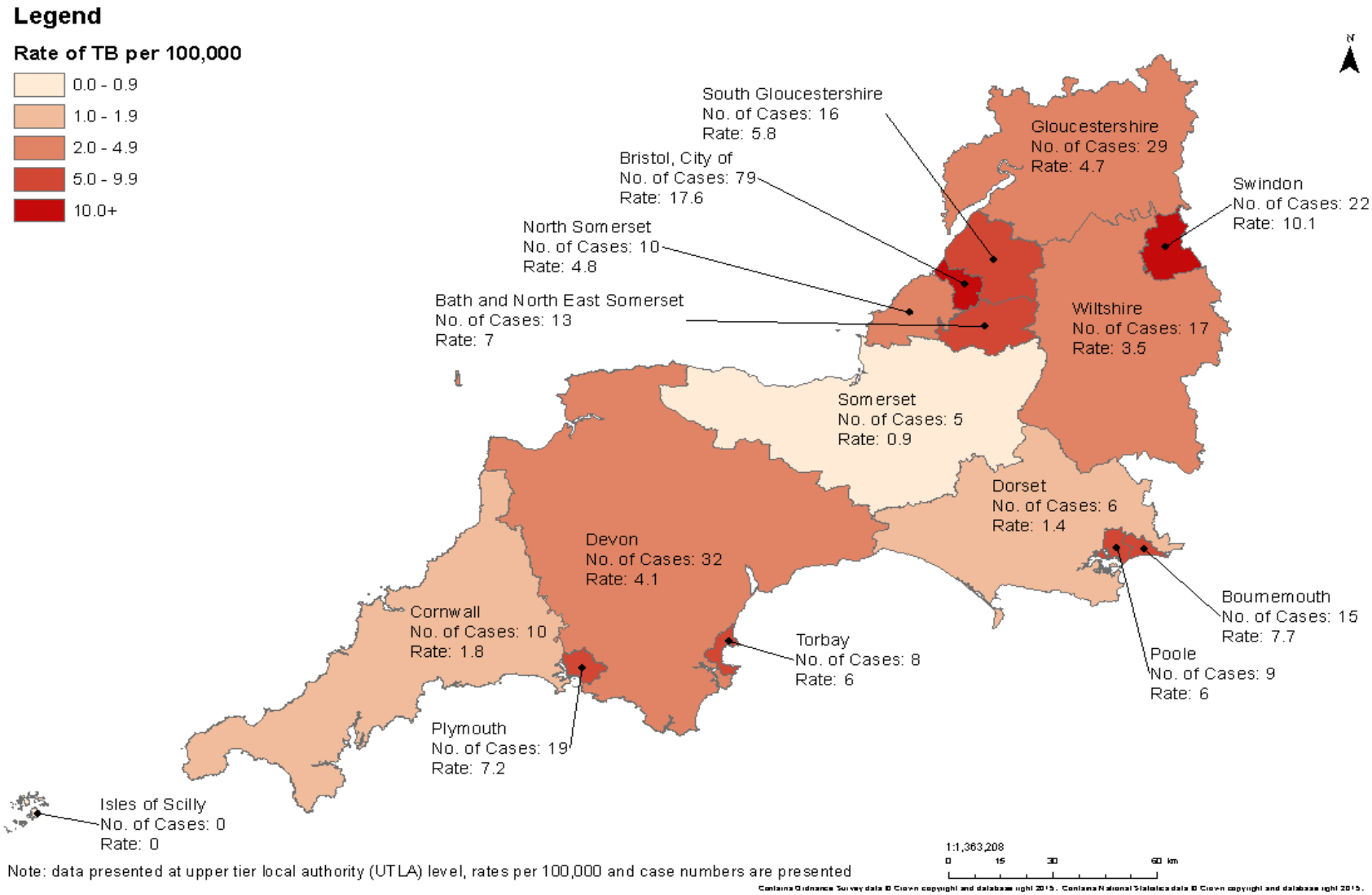
Figure 1: TB case reports and rates and 95% confidence intervals, South West and England, 2000–2015



*rate calculated using ONS 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 populations by unitary authority and upper tier local authority of residence, South West, 2015



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 sex were available for all notifications. There were 156 male (53.8%) and 134 female (46.2%) cases of TB. This equates to a rate of 5.80 per 100,000 (95% CI: 4.93 to 6.79) for males and 4.81 per 100,000 (95% CI: 4.03 to 5.70) for females. These rates have remained relatively stable over the past four years. The age of cases ranged from new born to 93 years and the median age was 40 years (IQR 30 to 56).

The age distribution was similar for men and women, with a median age of 41 years (IQR 31 to 55) for male cases and 38.5 years (IQR 29 to 59) for female cases. The highest rates were observed in those aged 30-39 (11.9/100,000), 40-49 (6.7/100,000) and 20-29 (6.3/100,000) years. When stratifying cases by age and sex, the highest rates were found in males aged 30-39 years (13.9/100,000) and 40-49 years (7.8/100,000). The highest rate for females was in those aged 30-39 years (9.9/100,000), see Figure 3.

There were seven notifications of TB in children aged 0–14 years with a rate of 0.78/100,000 (95% CI 0.31 to 1.61). These notifications were in Bristol (28.6%), Poole (28.6%), Devon (14.2%), Gloucestershire (14.2%) and Wiltshire (14.2%). The rate in children under five years was 1.3 cases per 100,000 of population.

Since 2011, there has been a consistent decline in the rate of disease in cases aged 20-29 years. However, the rate in the 30-39 age group has seen an increase in the past two years. Further trends of TB rate by age group can be seen in Figure 4.

Figure 3: TB case reports and rate by age and sex, South West, 2015

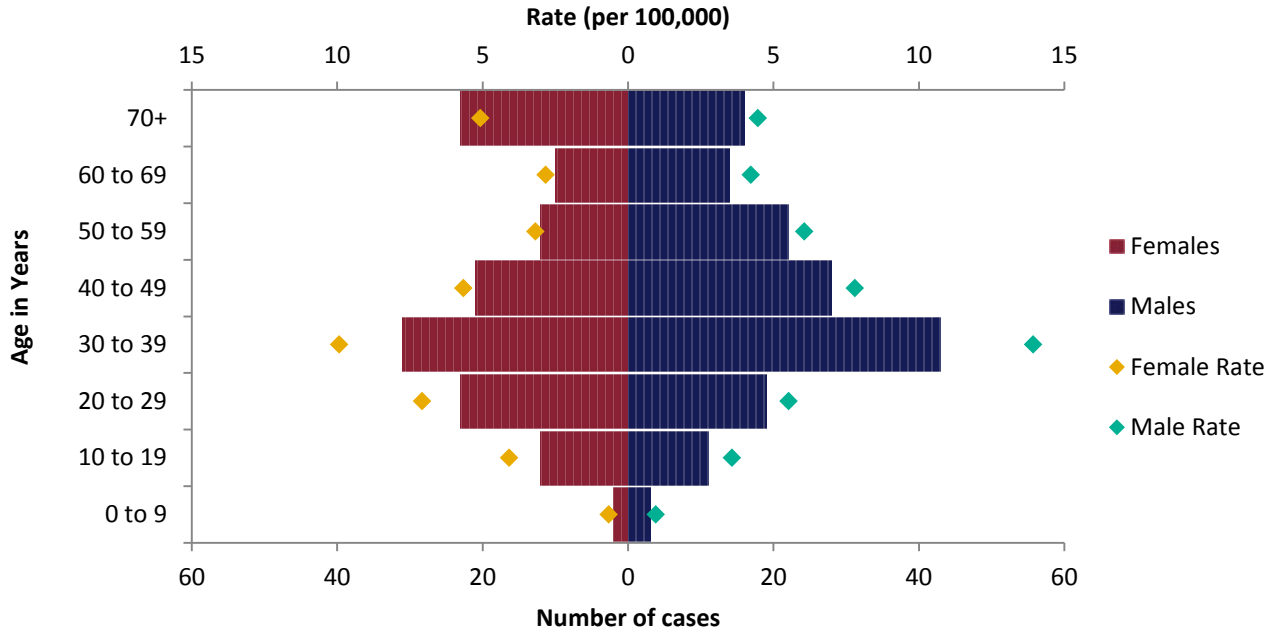
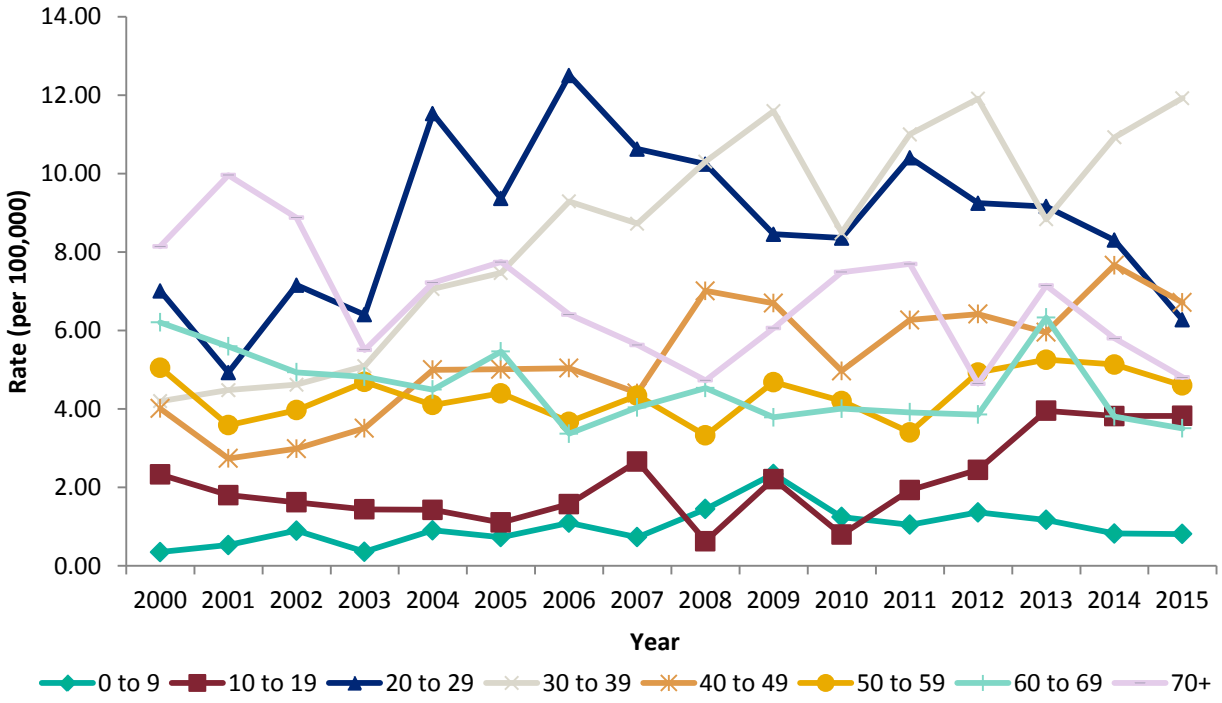


Figure 4: TB case rates by age group, South West, 2000–2015

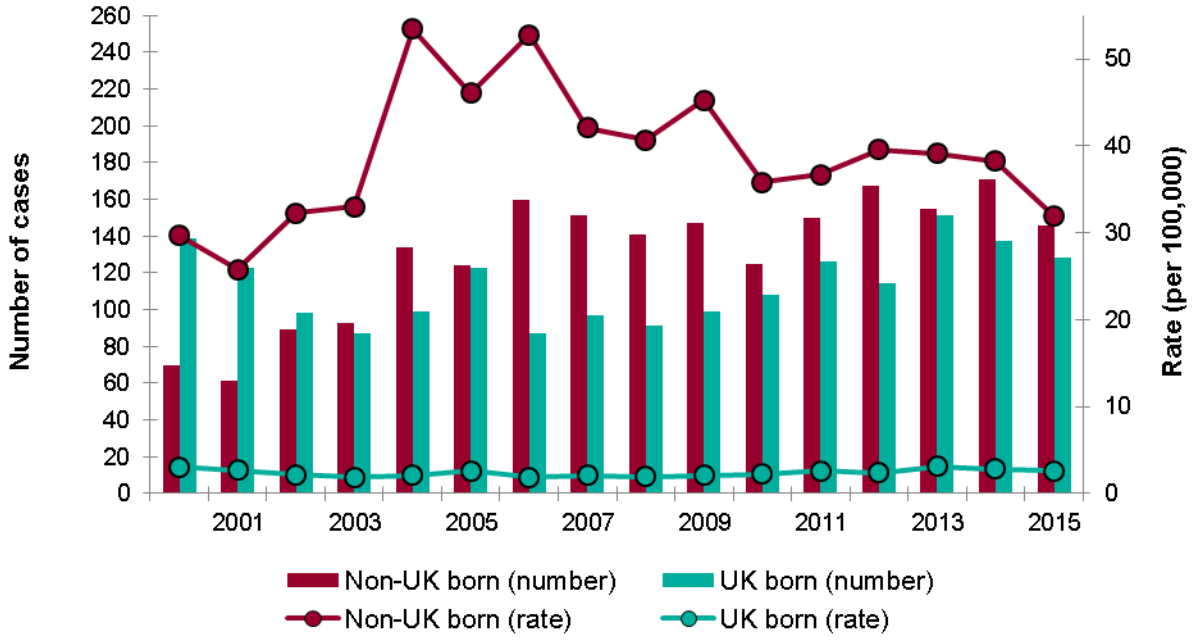


Place of birth and time since entry to the UK

In 2015, data were available on whether a case was born in the UK for 94.5% of cases. Just over half (53.3%; 146 cases) were born outside the UK, resulting in a rate of 31.9 cases per 100,000 population. This was substantially higher than the rate observed in the UK-born population (2.6/100,000), see Figure 5. The rate of TB in the South West's UK-born population has ranged from a low of 1.8/100,000 in 2006 to a high of 3.1/100,000 in 2013.

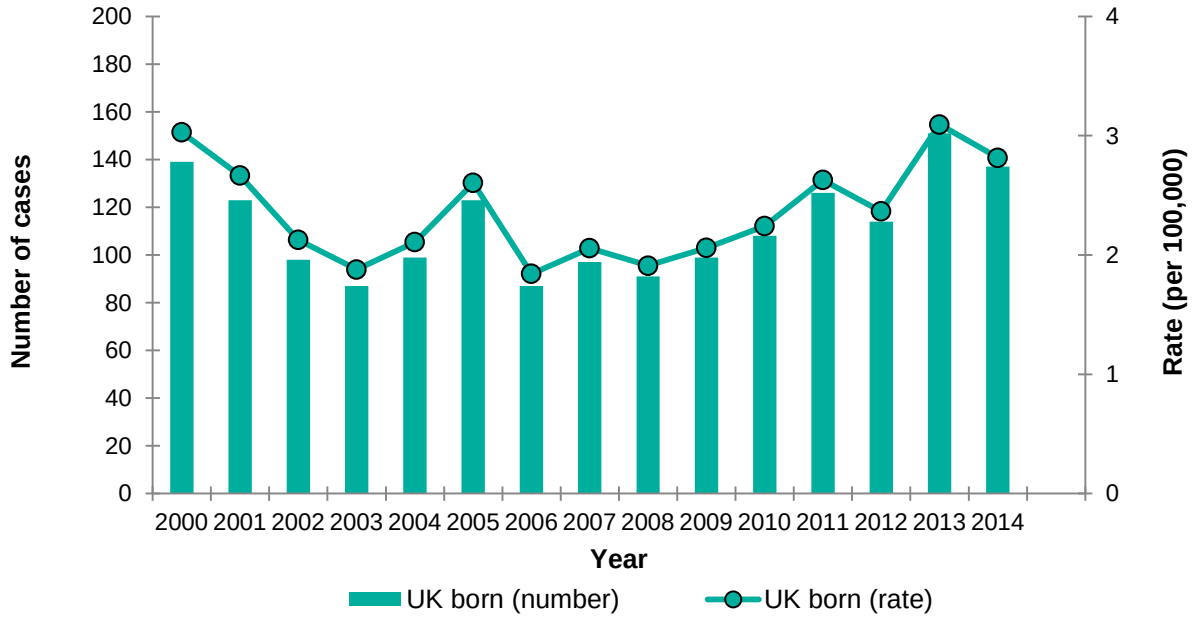
A general decline in the rate of TB cases in the UK born population was observed from 2000 to 2006. However, this did not continue with rates generally increasing between 2006 and 2013. Since 2013, UK born rates have decreased year on year, see Figure 6. In contrast, the non-UK born population experienced an overall decrease in the rate of TB from 2006 to 2010, and rates remained broadly stable between 2010 and 2014 (range: 35.8/100,000 in 2010 and 39.6/100,000 in 2012). In 2015, the rate of TB in the non-UK born population decreased, see Figure 5.

Figure 5: TB case reports and rate by place of birth, South West, 2000–2015



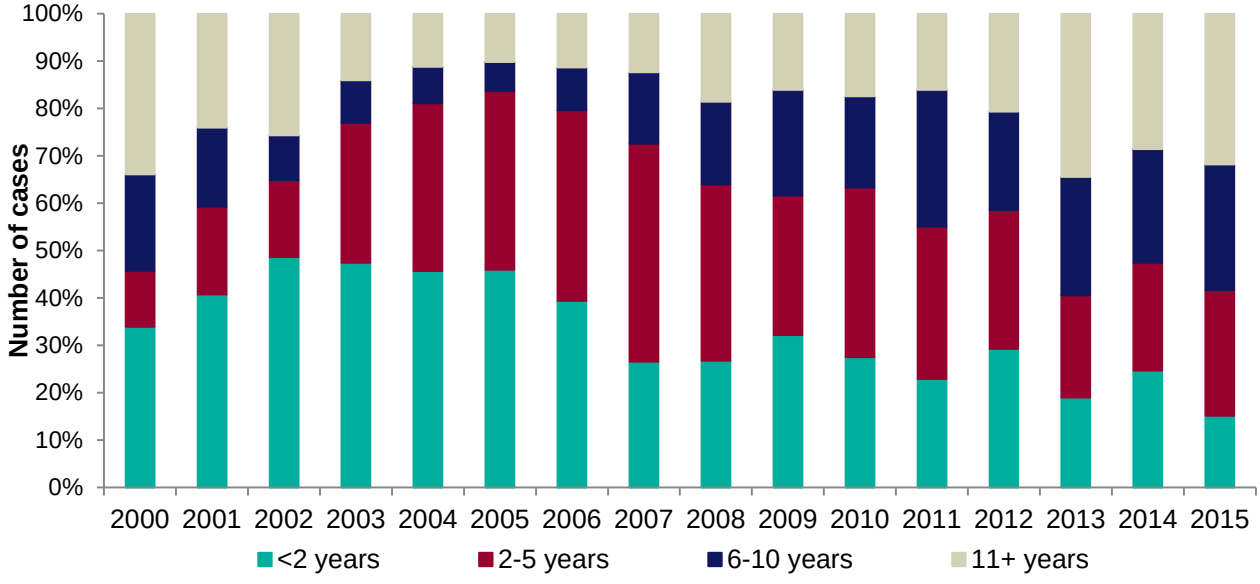
TB Monitoring Indicator 2: TB incidence in UK born and non-UK born populations (England)

Figure 6: TB case reports and rate for the UK born population, South West, 2000–2015



In 2015, data were available on time since entry to the UK and TB diagnosis for 90.4% of non-UK born cases. A total of 31.8% had been in the UK for over 11 years prior to diagnosis, 15.2% had entered the UK less than a year prior, and the remaining cases (53.0%) entered between two and ten years prior to diagnosis. Between 2001 and 2012 the median time between entry to the UK and diagnosis remained broadly stable at two years; from 2013 onward the median time to diagnosis after entry has been three years. This is reflected in Figure 7, showing a smaller proportion of cases diagnosed less than two years after entry since 2013.

Figure 7: Time between entry to the UK and TB notification for non-UK born cases by year, South West, 2000–2015



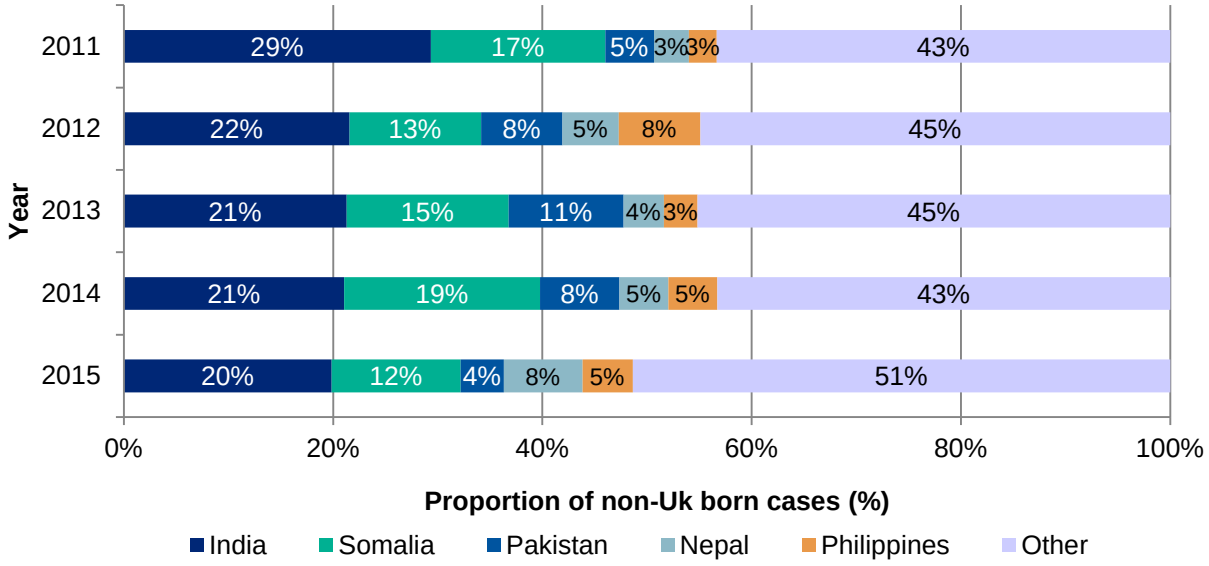
Data on country of birth were available for all non-UK born cases. The largest proportion were born in India (19.9%) followed by Somalia (12.3%) and Nepal (7.5%), see Table 1. When looking at notifications from countries with greater than or equal to five cases, people born in Zimbabwe (14 years) and Pakistan (12 years) were found to have the highest median time between entry to the UK and TB diagnosis. Cases born in Nepal (5 years) and South Africa (4.5 years) had the lowest median time.

Over the past five years, people born in India have made up the highest proportion of non-UK born cases; a peak of 29.3% was observed in 2011 but the proportion has subsequently declined. In 2015, the proportion of non-UK born cases from Somalia decreased, while there was an increase in the proportion from Nepal (see Figure 1).

Table 1: Ten most common countries of birth of non-UK born TB patients, South West, 2015

Country of birth	n	% of non-UK born patients	Median time since UK entry (years)
India	29	19.9	6
Somalia	18	12.3	10
Nepal	11	7.5	5
South Africa	8	5.5	4.5
Philippines	7	4.8	8
Zimbabwe	7	4.8	14
Pakistan	6	4.1	12
Poland	5	3.4	8
Romania	4	2.7	0
Bangladesh	3	2.1	10

Figure 8: Five-year trend in the percentage of non-UK born TB cases in the five most common countries of birth, South West, 2000–2015



Ethnicity

Data on ethnic group were available for 98.6% of cases in 2015. The majority of these people were white (153 cases, 53.5%) followed by Black-African (51 cases, 17.8%) and Indian (37 cases, 12.9%) ethnicities. White ethnicity has consistently made up the majority of the TB cases in the South West since 2000. Figure 10 shows that the majority of cases with white ethnicity were UK born in 2015.

The proportion of cases made up by each ethnicity has remained reasonably stable over time. Since 2011 Indian ethnicity has decreased from 19% to 13%, while Black African ethnicity has increased from 15% to 18% to become the second most common ethnicity after White (see Figure 9 and Figure 11).

Figure 9: Proportion of TB cases by ethnic group and year, South West, 2000–2015

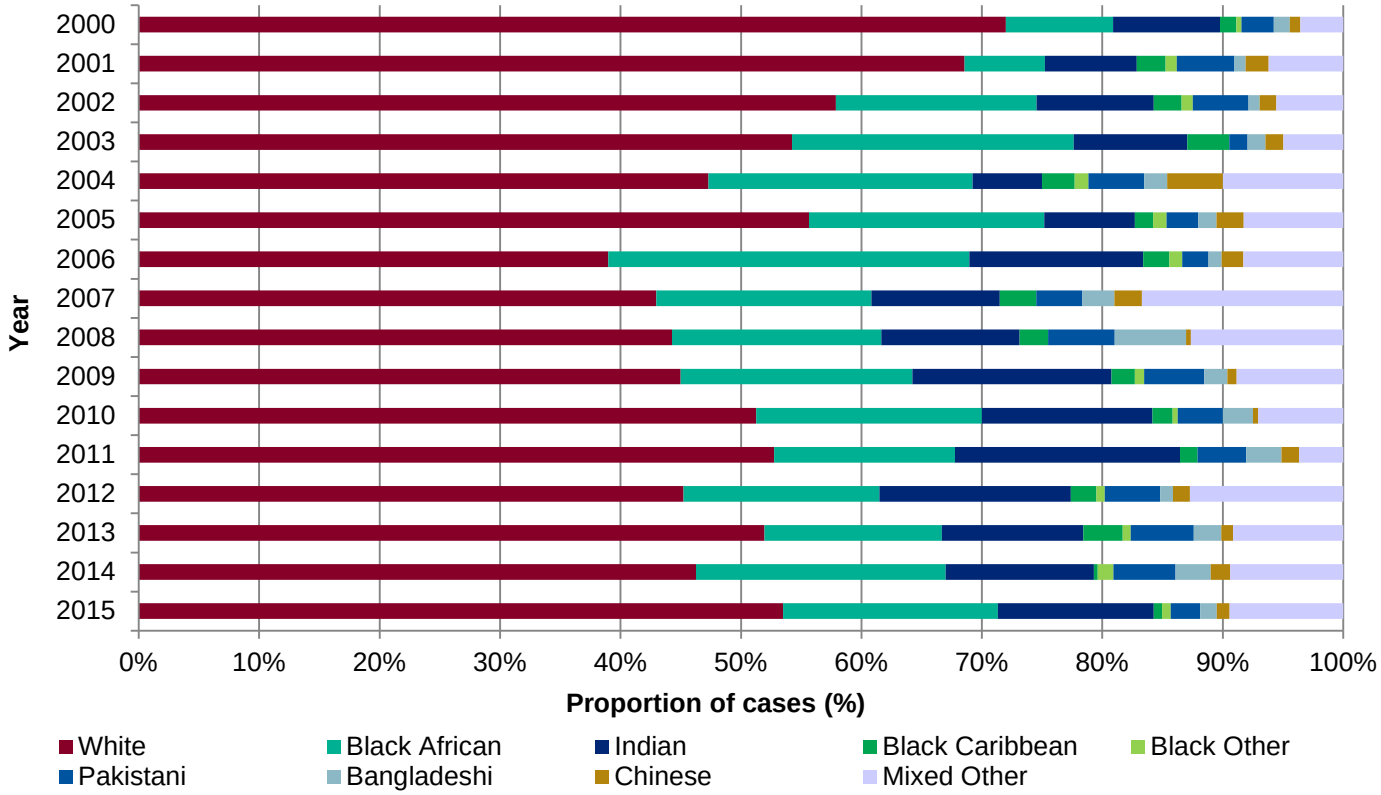
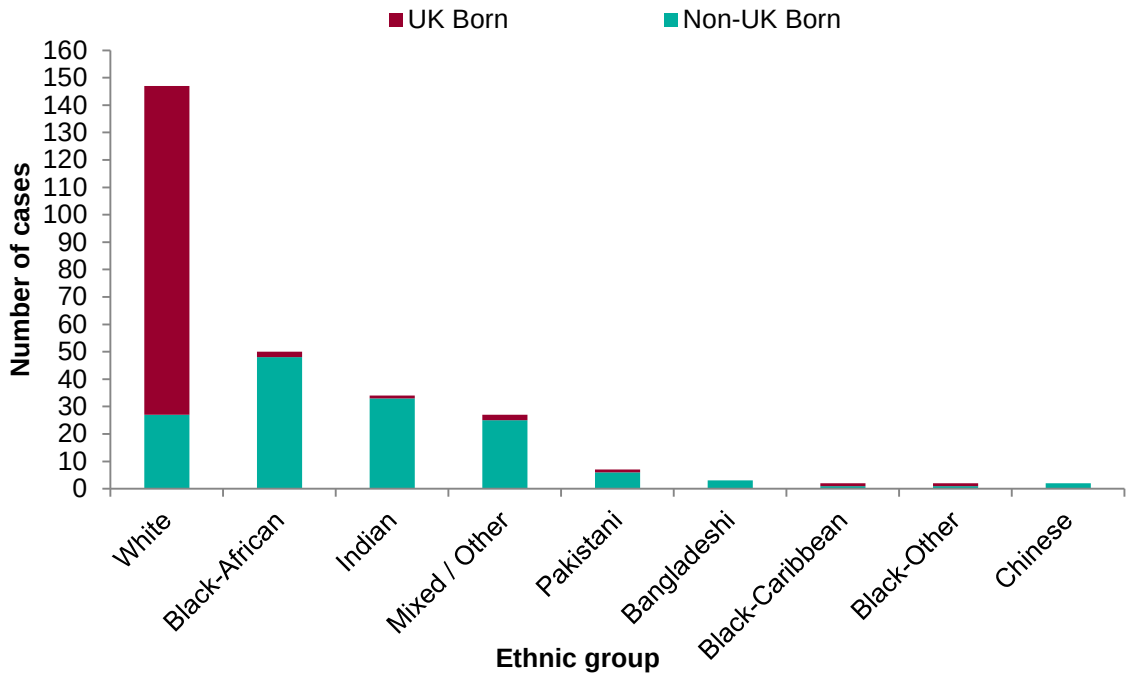
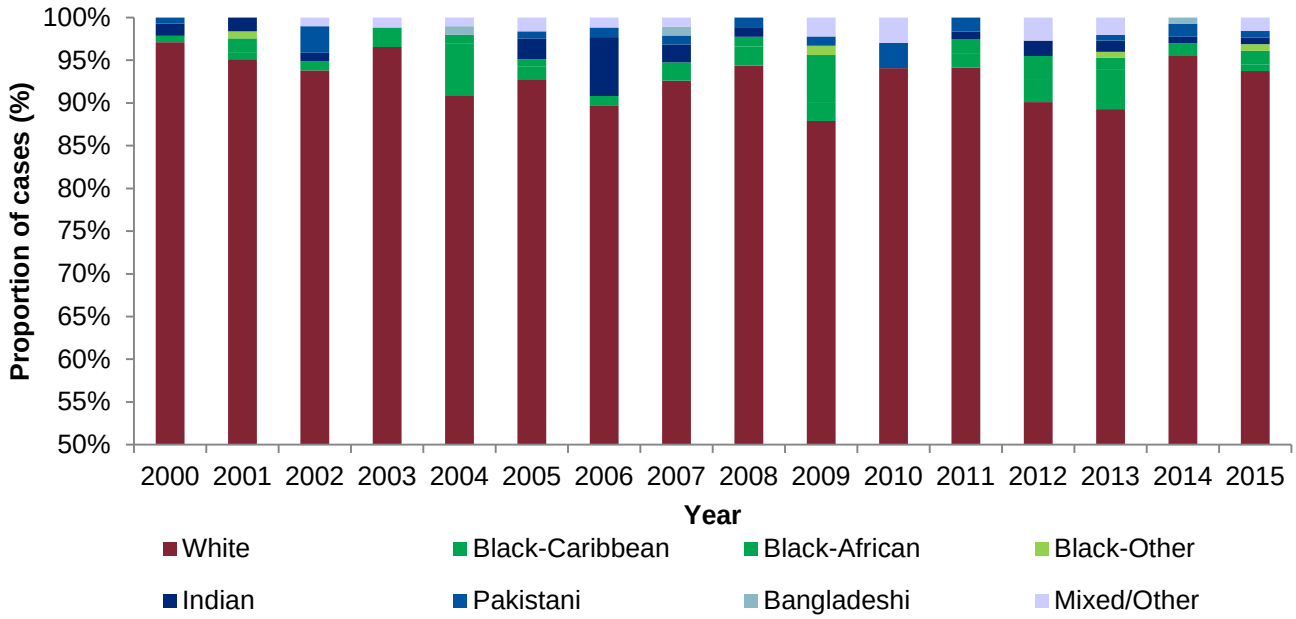


Figure 10: Frequency of ethnic group by place of birth, South West, 2015*



*Excludes persons with a missing place of birth.

Figure 11: Proportion of UK born TB patients by ethnic group, South West, 2000–2015



Occupation

In 2015, most cases were working age (77.2%, 224 cases) and information on occupation was available for 91.1% of these (16-64 years) cases. The most common occupational category was ‘Other’ (86 cases, 42.2%), followed by ‘None’ (56 cases, 27.5%) and then ‘Education’ (30, 14.7%) and ‘Healthcare worker’ (29, 14.2%) see Table 2. The most common occupation in ‘Other’ category was either builder, cleaner, or shop keeper with nine (10.5%) cases each reporting one of these roles (3 per category). In the ‘None’ category people most frequently reported unemployment (28, 50.0%) or housewife/husband (21, 37.5%) status. The majority of people in the education and healthcare category were students (24, 80.0%) and nurses (14, 48.3%), respectively.

Table 2: Occupational category of TB patients aged 16 to 64 years, South West, 2015

Occupation	Cases	Proportion (%)
Agricultural/animal care worker	2	1.0
Education	30	14.7
Healthcare worker	29	14.2
Social service/prison worker	1	0.5
Other	86	42.2
None	56	27.5
Total	204	100

Clinical characteristics

Site of disease

Site of disease was known for all cases in 2015. The majority of these cases were diagnosed with pulmonary disease (192 cases, 66.2%) with the remaining 98 people (33.8%) experiencing extra-pulmonary disease only. Of the pulmonary cases, 28 (14.6%) also had extra-pulmonary disease.

The distribution in site of disease has remained relatively stable over the past ten years (the proportion of pulmonary disease range 61.6% to 68.3%). The most common extra-pulmonary sites of diseases were extra thoracic lymph nodes (50 cases, 17.2%), intra-thoracic lymph nodes (26 cases, 9%) and pleural (19 cases, 6.6%). There were 41 cases (14.1%) with an unknown site of extra pulmonary TB infection, see Table 3.

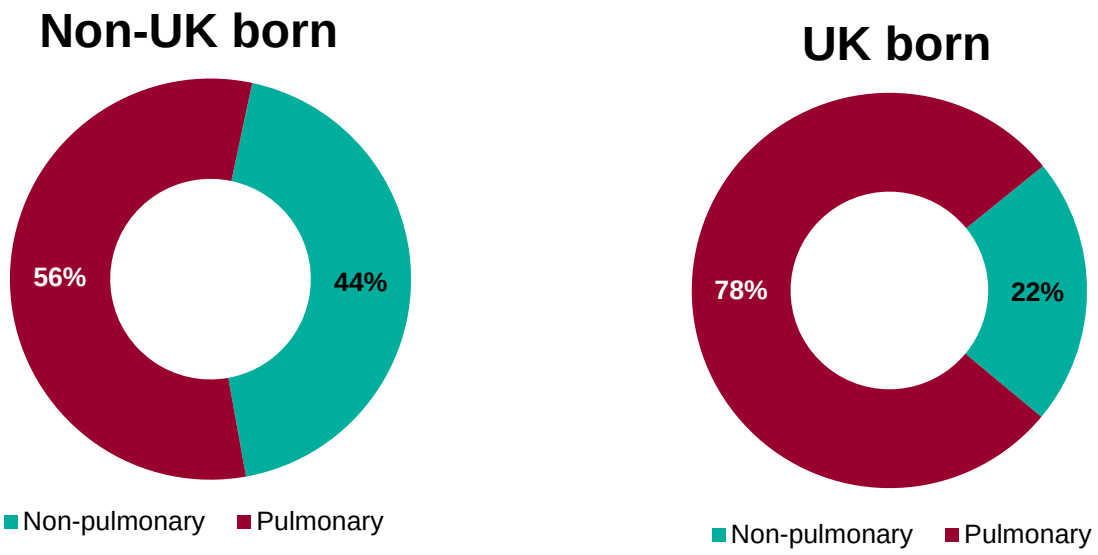
Table 3: Site of disease of TB patients, South West, 2015

Site of disease*	Number of cases	Proportion of cases (%)
Pulmonary	**192**	**66.2**
Miliary	13	4.5
Laryngeal	2	0.7
Extra-Pulmonary	**126**	**43.4**
Extra-thoracic lymph nodes	50	17.2
Intra-thoracic lymph nodes	26	9.0
Pleural	19	6.6
Extra-pulmonary other	13	4.5
Gastro-intestinal	13	4.5
Bone - spine	12	4.1
Bone - non-spine	7	2.4
CNS - other	7	2.4
CNS - meningitis	6	2.1
Genitourinary	6	2.1
Cryptic	2	0.7
Extra-pulmonary unknown	41	14.1

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

There was a higher proportion of UK born persons with pulmonary disease (78.1%) compared to non-UK born persons (56.2%), see Figure 12. Site of disease also varied by ethnicity; White (79.7%), Black African (54.9%), Chinese (66.7%), and ‘Mixed/other’ (59.3%) ethnicities all had a majority of persons with pulmonary disease, whereas Indian (40.5%), Pakistani (42.9%) and Bangladeshi (25.0%) ethnicities had less than 50.0% notifications with pulmonary disease.

Figure 12: Proportion of pulmonary and non-pulmonary TB by place of birth, South West 2015*



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

Previous diagnosis of tuberculosis

Data on whether a case had been previously diagnosed with TB was available for 94.8% of cases in 2015. There were 24 (8.7%) cases that had a previous diagnosis of TB recorded, which is the highest proportion in the past five years (the lowest was 6.9% in 2012). A higher proportion of UK born cases (11.0%) had a previous TB diagnosis recorded compared with non-UK born cases (7.6%). Non-UK born people who reported a previous TB diagnosis had a lower median age, 37.5 (IQR: 30 to 43) years, compared to UK born people, 79 years (IQR: 69 to 86) years. The median ages were similar between non-UK born people with and without a previous diagnosis (37.5 vs 36) whereas UK born people had considerably different median ages (79 vs 48).

BCG vaccination

BCG status was available for 60.0% of cases in 2015. A total of 56.3% of cases had received the BCG vaccination, which is an increase from 51.0% in 2014 and is the highest proportion since 2009. There were four cases of TB in children under five years old in 2015, one of whom was recorded as having received the BCG vaccination. There were eight cases under the age of 16 and two of these had been vaccinated, all of which were UK-born. Vaccination status was not recorded for two of these cases, see Table 4.

Table 4: Number and proportion of TB patients with BCG vaccination, South West, 2015

	<5 years old BCG vaccination			<16 years old BCG vaccination			All ages BCG vaccination		
	n	%	N	n	%	N	n	%	N
Non-UK born	0	0.0	0	0	0.0	0	63	71.6	88
UK born	1	25.0	4	2	25.0	8	34	42.0	81
All cases*	1	25.0	4	2	22.2	9	98	56.3	174

*including person with missing UK born but with BCG status recorded

Microbiological information

Culture confirmation and speciation

In 2015, data on culture confirmation was available for all cases. During this time period there were 171 (59.0%) culture confirmed cases of TB in the South West region. This proportion was higher than in the previous two years (55.1% in 2014 and 57.2% in 2013) but lower than in both 2011 (65.2%) and 2012 (63.3%). When stratified by site of disease there were 50 (51.0%) non-pulmonary and 121 (63.0%) pulmonary cases with culture confirmation. The proportion of culture confirmed pulmonary cases in 2015 was the second lowest annual proportion between 2011 and 2015 (range 58.3% to 70.2%). In contrast, the proportion of non-pulmonary cases with culture confirmation in 2015 was the second highest between 2012 and 2015 (47.4% to 56.2%).

In 2015, a higher proportion of non-UK (63.0%) born people were culture confirmed when compared to UK born (57.0%). This is in contrast to 2014 when the proportion was similar (54.4% non-UK and 55.6% UK born). Information on mycobacterial species was available for 100.0% of culture confirmed cases. There were 159 (93.0%) cases of *Mycobacterium tuberculosis*, 11 (6.4%) *Mycobacterium bovid*, and 1 (0.6%) *Mycobacterium africanum*.

Sputum smear status

Data on sputum smear status were available for 50.5% of pulmonary cases. During this year there were 56 sputum smear positive pulmonary cases (57.7%). This proportion was similar to both 2013 (60.4%) and 2012 (59.8%), however, it was an increase when compared to 2014 (34, 38.6%).

TB transmission

Rate of TB in UK born children

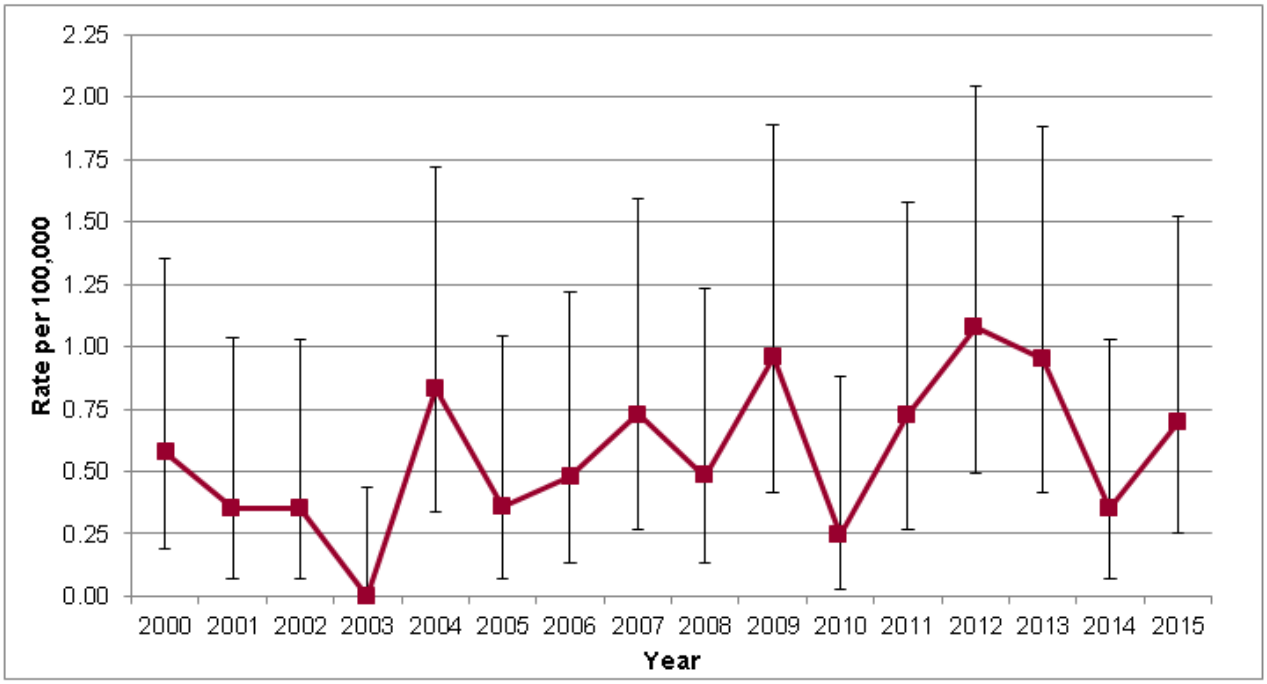
In the South West the rate of TB notifications in the UK born population has typically been low and only during 2000 and 2013 has the rate exceeded 3.0 per 100,000 populations. An indicator for ongoing local transmission is the rate of TB in UK born children under the age of 15. In 2015, the rate was 0.70/100,000, twice the rate observed during 2014 (0.35 / 100,000), however, it remains the second lowest rate reported during the past five years (range: 0.35 to 1.08 / 100,000). When interpreting differences between annual rates it should be noted that the 95% confidence intervals in Figure 13 are wide and frequently overlap between years. This represents uncertainty in the point estimates; see Figure 13 and Table 5.

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

Table 5: Number and rate per 100,000 of UK born TB cases by age, South West, 2000–2015

UK Born	< 5 years		< 15 years		All ages	
Year	Cases	Rate per 100,000	Cases	Rate per 100,000	Cases	Rate per 100,000
2000	1	0.37	5	0.58	139	3.03
2001	2	0.76	3	0.35	123	2.67
2002	2	0.77	3	0.35	98	2.13
2003	0	0.00	0	0.00	87	1.88
2004	4	1.57	7	0.83	99	2.11
2005	2	0.79	3	0.36	123	2.61
2006	2	0.78	4	0.48	87	1.84
2007	0	0.00	6	0.73	97	2.06
2008	2	0.74	4	0.48	91	1.91
2009	6	2.17	8	0.96	99	2.06
2010	1	0.35	2	0.24	108	2.24
2011	3	1.02	6	0.73	127	2.65
2012	4	1.36	9	1.08	114	2.37
2013	3	1.01	8	0.95	151	3.09
2014	0	0.00	3	0.35	133	2.73
2015	4	1.33	6	0.70	128	2.61

Figure 13: Rate of TB with 95% confidence intervals in UK born persons under the age of 15, South West, 2000–2015



Strain typing and clustering

The *M. tuberculosis* complex 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) and 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 consists of a maximum of 24 digits each of which represents the number of repeats at each of these loci (for example, 232425673216524316425375).

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 (clustered cases) may reflect cases that are part of the same chain of transmission, but could also reflect common endemic strains circulating either within England or abroad. MIRU-VNTR strain typing can be used to refute transmission between individuals who have 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 ≥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

In 2015, there were 171 culture confirmed cases and of these 137 (80.1%) were typed to 24 loci and 153 (89.5%) to at least 23 loci. This was the highest proportion of isolates that have been typed to 24 loci since this form of microbiological typing started in 2010. Over the six-year period (2010 to 2015), 59.0% of isolates were culture confirmed and of these 83.2% and 58.8% have been typed to at least 23 or 24 loci respectively, see Table 6. Isolates that are typed to ≥23 loci can be compared with other isolates and the presence of molecular clustering determined (see Table 6).

During the past six years (2010–2015), there have been 288 cases that were molecularly linked with at least one other South West case. These cases were part of 75 distinct molecular clusters. The remaining 596 cases were not identified as molecularly linked with another South West case during the same time period, see Table 7. Out of these cases, 210 (35.2%) were found to be molecularly linked to another case reported in England. In total, people from the South West were molecularly linked with 279 clusters within England. Due to the low sensitivity associated with MIRU-VNTR when detecting true clusters these matches may be spurious.

Table 6: Number and proportion of culture confirmed cases typed, or with 23 or 24 loci typed, South West, 2010–2015

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	52	38.5
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	56.0
2014	316	174	55.1	165	94.8	153	92.7	113	68.5
2015	290	171	59.0	163	95.3	153	93.9	137	84.0
Total	1803	1063	59.0	1019	95.9	884	86.8	625	61.3

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

Table 7: Number and proportion of unique cases, clustered cases and new clusters by year, South West, 2000–2015

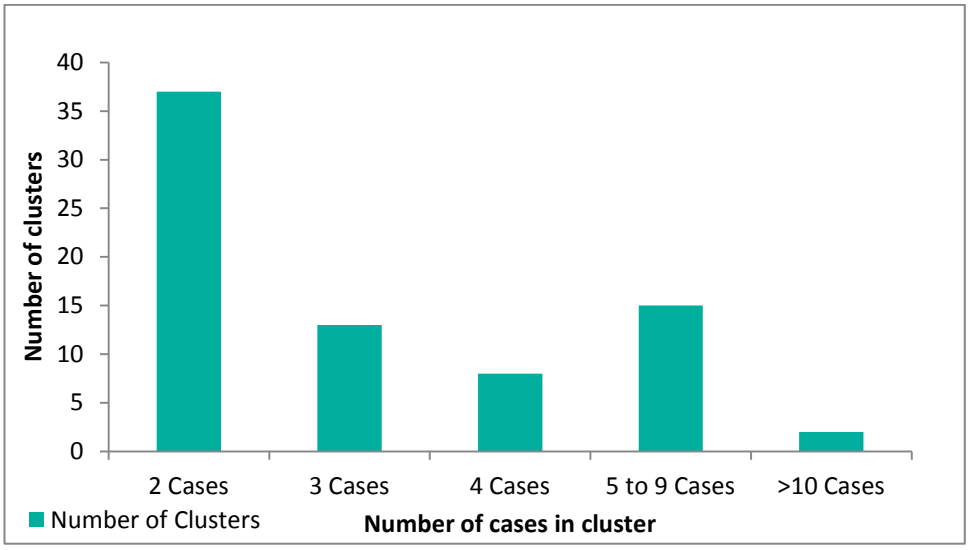
Year	Notified cases	Culture confirmed cases		≥23 loci typed cases		Unique cases*		Clustered Cases PHEC **		Number of new clusters (per year) ***
	n	n	%	n	%	n	%	n	%	n
2010	265	142	53.6	78	54.9	48	61.5	30	38.5	7
2011	307	200	65.1	169	84.5	117	69.2	52	30.8	14
2012	300	190	63.3	180	94.7	122	67.8	58	32.2	19
2013	325	186	57.2	151	81.2	108	71.5	43	28.5	12
2014	316	174	55.1	153	87.9	107	69.9	46	30.1	8
2015	290	171	59.0	153	89.5	94	61.4	59	38.6	15
Total	1803	1063	59.0	884	83.2	596	67.4	288	32.6	75

* Cases have a MIRU profile that doesn't match another case in the South West PHEC. These cases can have a MIRU profile that matches another case in England.
** Clustered in time period (2010-2015), clustered cases notified in year.
*** 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

Within the past six years there have been 75 different molecular clusters involving two or more South West residents. Most frequently these clusters involved two cases (37 clusters, 49.3%), followed by five to nine cases (15 clusters, 20.0%) and three cases (13 clusters, 17.3%). The median number of cases per South West cluster was three persons and this ranged from two to a maximum of 23 cases, see Figure 14.

Figure 14: **Number of clusters by size, South West, 2000–2015**



Characteristics of cases in clusters

The majority of South West PHEC clustered cases were male (63.1%), aged between 15 and 44 (55.9%), UK born (62.6%) and White ethnicity (65.5%). There were 24.7% of clustered cases that reported at least one social risk factor. The most prevalent risk factor reported was drug use (9.9%), followed by alcohol use (9.4%), homelessness (7.3%) and imprisonment (6.6%). There were only 15 (5.6%) cases that had a previous diagnosis of TB.

Unique South West PHEC cases had a similar age and sex distribution, however, a high proportion of unique cases were aged 65 plus. A substantially higher proportion of clustered cases were UK born, with only 38.6% of unique cases born within the UK. This impacted on ethnicity, with a lower proportion of unique cases identifying as white (47.6%) and a higher proportion Indian (19.0%). A higher proportion of clustered cases reported at least one social risk factor compared to unique cases (11.9%).

The majority of clustered cases had pulmonary disease (81.5%) and of these 74.7% were sputum smear positive. When looking at drug resistance among clustered cases, there were 18 (6.3%) cases with resistance to at least one first-line drug and of these 17 were found to be resistant to isoniazid and one was found to be multi-drug resistant.

A lower proportion of unique South West PHEC cases (67.0%) experienced pulmonary disease compared to clustered cases. However, there were a similar proportion of pulmonary cases that were sputum smear positive (68.0%). There were a higher proportion of unique cases (8.0%) with an isolate resistant to at least one first-line drug compared to clustered cases).

Whole genome sequencing

Whole genome sequencing (WGS) of *Mycobacterium tuberculosis* complex (MTBC) isolates provides information on single nucleotide polymorphism (SNP) differences between isolates, which provides more information than the currently deployed method (MIRU-VNTR strain typing) on how isolates are related to each other. WGS may therefore provide greater understanding of whether isolates are likely to be part of the same transmission chain, and may also help determine the timing and direction of transmission [2, 3, 4]. PHE is close to deploying the use of whole genome sequencing for TB for the NHS throughout England. It is hoped that this new technology will continue to add to the understanding of TB transmission by providing robust genomic information to be used in conjunction with epidemiological and surveillance information.

Delay from onset of symptoms to diagnosis

Time symptomatic

Data on the time between symptom onset and diagnosis were available for 92.1% of cases in 2015. During this year, the median delay between symptom onset and date of diagnosis was 82 (IQR: 45 to 173) days, the minimum was three and the maximum was 3,838 days. The case with the delay of 3,838 days was non-pulmonary. It should be noted that symptom onset can be highly variable and can be biased by errors in reporting. When comparing this median delay to previous years it was similar to 2014 and together these were the joint second highest values observed in the past five years (range 80 to 86 days).

In 2015, the median delay between symptom onset and diagnosis for pulmonary disease (n=177) was 77 days (IQR: 42 to 158). The median delay was higher than in 2014 (70 days) and 2011 (76 days), however, it was lower than 2012 (79 days) and 2013 (85.5 days). The proportion of pulmonary cases with a delay greater than four months was 31.1%. This is higher than in 2014 (29.9%) but lower than in 2011 (32.9%), 2012 (34.0%) and 2013 (36.5%). Nearly seven out of ten (68.9%) pulmonary cases were diagnosed within four months, which is lower than 2014 (70.1%) but higher than 2011 to 2013 (range 63.5% to 67.1%). Pulmonary sputum smear positive cases had a higher median delay (86, IQR: 51 to 183) and 33.3% of these cases had a delay of greater than four months. This is in comparison to pulmonary sputum smear negative cases, who had a median delay of 73 days (IQR: 42 to 118). Extra-pulmonary cases had a median delay of 92 days (IQR: 52 to 184). This was the second largest median delay in five years (range 86 to 93 days), see Table 8.

Table 8: Time between symptom onset and date of diagnosis*, South West, 2015

		0-2 months		2-4 months		>4 months		
	Median days (IQR)	n	%	n	%	n	%	N
Extra-pulmonary	92 (52-184)	28	31.1	29	32.2	33	36.7	90
Pulmonary	77 (42-158)	62	35.0	60	33.9	55	31.1	177
Pulmonary smear positive	86 (51-183)	16	29.6	20	37.0	18	33.3	54
Pulmonary smear negative	73 (42-118)	16	43.2	13	35.1	8	21.6	37
All cases	82 (45-173)	90	33.7	89	33.3	88	33.0	267

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

In 2015, data on time between symptom onset and treatment start date were available for 92.8% of persons, the median delay in 2015 was 83 (IQR: 46 to 174) days. In all, 30.9% of cases started treatment within two months of symptom onset and 33.8% had a delay of greater than four months.

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

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

Characteristics of pulmonary TB cases with a delay from onset of symptoms to treatment of more than four months

Females were found to have a higher median delay between symptom onset and diagnosis (80, IQR: 39 to 149 days) than males (77, IQR: 43 to 182 days). However, males had a higher proportion of cases with a delay of greater than four months than females (33.7% vs 27.9%). The median delay was the same for UK and non-UK born cases (79 days). UK born cases had a higher proportion of delay of greater than four months when compared to non-UK born cases (35.6% vs 28.8%). The ethnic group with the highest median delay was Chinese (304 days) followed by Black Other ethnicity (159 days), however, these ethnic groups only contained one person each. People who did not have at least one social risk factor had a higher delay than those reporting one of alcohol abuse, drug use, homelessness, or imprisonment (82 days compared to 59 days). Among cases who did not report any social risk factors, 35.2% experienced a delay of greater than four months compared to 20.0% in persons reporting a social risk factor.

TB outcomes in drug sensitive cohort (2013 data)

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:

- For cases with an expected duration of treatment less than 12 months, TB outcomes at 12 months from treatment start date are reported. This group excludes cases with CNS disease, who have an expected duration of treatment of 12 months. In addition, those with spinal, cryptic disseminated or miliary disease are excluded from this group, as CNS involvement cannot be reliably ruled out for the purposes of reporting.

- For cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported.

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

Outcomes in this section and the following 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 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 2014. During this year, there were 21 (6.9%) drug sensitive cases that reported CNS TB and these were excluded from the following analysis.

In the cohort without CNS disseminated disease and with disease sensitive to treatment using rifampicin, 75.8% of cases completed treatment following a 12-month follow-up period, see Table 9. This is the highest proportion of notifications that have completed treatment since 2001, see Table 10.

However, this is some way below the proportion of drug sensitive cases who completed treatment at an English level, 84.5%. When compared to 2013, the proportion of cases falling into the outcome categories died, lost to follow up, and still on treatment, were all higher. This is explained by the reduction from 2013 to 2014 in the proportion of people recorded as not evaluated, see Figure 15.

Table 9: TB outcome at 12 months, South West, cases diagnosed in 2014*

Outcome at 12 months	n	%
Completed	216	75.8
Died	22	7.7
Lost to follow up	18	6.3
Still on treatment	23	8.1
Treatment stopped	2	0.7
Not evaluated	4	1.4
Total	285	100.0

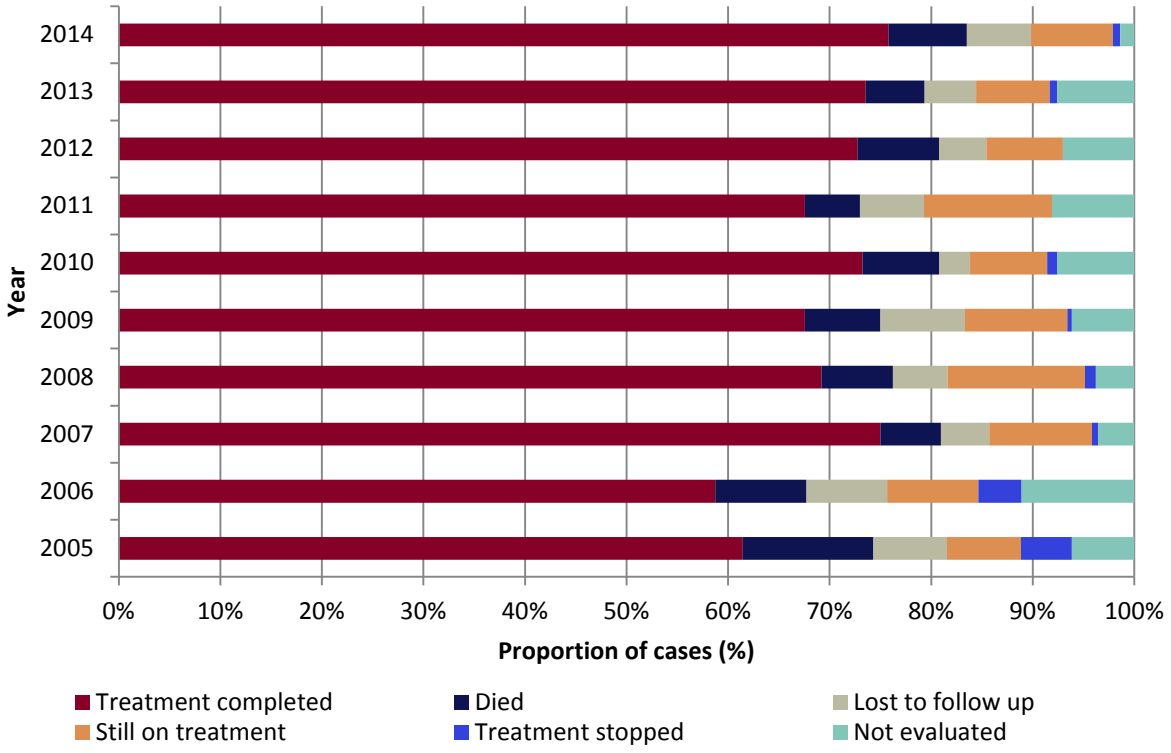
*excludes rifampicin resistant TB, and patients with CNS, spinal, miliary or cryptic disseminated disease.

Table 10: Number and proportion completing treatment at 12 months, South West, 2002–2014*

Year	Cases	Proportion (%)	Total
2002	92	64.8	142
2003	92	68.1	135
2004	97	57.1	170
2005	110	61.5	179
2006	111	58.7	189
2007	126	75.0	168
2008	128	69.2	185
2009	154	67.5	228
2010	145	73.2	198
2011	150	67.6	222
2012	155	72.8	213
2013	203	73.6	276
2014	216	75.8	285

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

Figure 15: The proportional distribution of treatment outcomes at 12 months, 2005–2014*



*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 who 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).

In 2014, 10 (76.9%) people who were lost to follow up left the UK whilst undergoing treatment and three were recorded as having other reasons for disengagement with TB services. When looking at persons who died prior to treatment completion, the majority (12, 54.6%) had an unknown relationship between death and TB. There were five (22.7%) people where TB contributed to death, three (13.6%) where TB was incidental to death and two (9.1%) where TB caused a person's death. One case was diagnosed upon post-mortem and this person had an unknown link between death and TB infection. The median age of people who died during their treatment for TB was 77 years (IQR: 56 to 84 years). Reasons given for people still being on treatment after the 12-month follow-up period were that treatment was extended (19, 82.6%), interrupted (2, 8.7%), or changed (1, 4.4%).

A lower proportion of males (72.7%) completed treatment than females (80.0%). This can be explained by a higher proportion of males not competing treatment due to death during their treatment (9.1% vs 5.8%), being lost to follow up (7.3% vs 5.0%), or still being on treatment (8.5% vs 7.5%) at 12 months. The oldest age group (65+) had the lowest proportion of people completing treatment (53.6%) and this was due to a substantially higher proportion dying prior to treatment completion (26.8%). The age group with the highest proportion of people lost to follow up were 15 to 44 (9.3%) years with the next highest 65+ (5.4%) years.

Non-UK born persons had a higher treatment completion rate (79.1%) compared to UK born individuals (70.5%). This was due to a substantially higher proportion of UK born cases not completing treatment due to death (14.8%). A higher proportion of non-UK born cases were lost to follow up (9.8%) compared to UK born notifications (2.5%).

The ethnic group with the highest proportion of people completing treatment was Black-Caribbean (1, 100.0%), Indian (29, 90.6%), Bangladeshi (8, 88.9%) and Black African (49, 84.5%). The lowest proportions were associated with Pakistani (8, 57.1%), Chinese (3, 60.0%) and Black-Other (2, 66.7%) ethnicity. Ethnically white (19, 14.2%) and Pakistani (2, 14.3%) notifications had the highest proportion of deaths during treatment. The highest proportion of cases lost to follow up were Chinese (2, 40.0%) and Pakistani (3, 21.4%) ethnicities.

People who reported at least one social risk factor had a lower proportion of cases completing treatment (62.5%) compared to people reporting no social risk factors (79.6%). This was due to a substantially larger proportion of these people being lost to follow up (16.7%).

Upper tier local authorities with greater than or equal to five cases that had a treatment completion rate of greater than or equal to 70% were: Bath and North east Somerset, Bournemouth, City of Bristol, Devon, Gloucestershire, Plymouth, Swindon, Torbay, and Wiltshire. However, only Bath and North East Somerset (18, 94.7%), Bournemouth (11, 84.6%), City of Bristol (66, 81.5%), Swindon (16, 94.1%), Torbay (6, 100.0%) had a rate of greater than 80.0%. North Somerset was the only UTLA with a treatment completion rate less than 50% at 12.5%. This was due to a high proportion of cases who died (3, 37.5%) or were lost to follow up (2, 25.0%).

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

This section looks at the outcomes of patients with CNS disseminated TB that are sensitive to treatment with rifampicin.

In 2014, there were 21 (6.9%) cases of TB with CNS dissemination and sensitive to treatment with rifampicin. All of these notifications were evaluated for treatment completion. The largest proportion was found to be still on treatment (9, 42.9%) and only five (23.8%) cases had completed treatment, see Table 11. This is a large reduction in the proportion of cases completing treatment when compared to 2013, when 57.9% of cases completed treatment. It is similar to 2011 and 2012, when 23.8% and 21.1% of people completed treatment, respectively. This increase when compared to 2013 is mainly due to a higher proportion of persons still on treatment after 12 months or who had died during their treatment.

Table 11: TB outcome at 12 months for patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, South West, cases diagnosed in 2014*

Outcome at 12 months	n	%
Completed	5	23.81%
Died	5	23.81%
Lost to follow up	2	9.52%
Still on treatment	9	42.86%
Treatment stopped	0	0.00%
Not evaluated	0	0.00%
Total	21	100.00%

*excludes rifampicin resistant TB

In 2014, the two people with drug sensitive CNS disseminated disease who were lost to follow up either left the UK or had other reasons for disengaging for treatment. The five people who died had an unknown relationship between death and TB infection and one of these persons was diagnosed via post-mortem. People who died whilst on TB treatment had a median age of 77 (IQR: 71 to 81) years. The majority of people (8, 88.9%) who were still on treatment had their treatment extended and one had their treatment changed. Treatment was extended due to either initial drug resistance (2 cases) or for other reasons (6 cases).

A higher proportion of men with rifampicin sensitive CNS disseminated disease completed treatment (28.6%) than women and also a higher proportion that were lost to follow up (14.3%). Males and females had the same proportion of persons still on treatment (42.9%). This is accounted for by a large proportion of female cases (42.9%) dying during their treatment. No people from the 65+ age group completed treatment; the majority of these people (57.1%) died during their care and the others (42.9%) were still on treatment.

The highest proportion of people completing treatment were aged 45 to 64 (50.0%) whereas 15 to 44 year olds had half this proportion (25.0%) completing treatment. This was accounted for by a higher proportion of 15 to 44 year olds either still being on treatment (50.0%) or lost to follow up (25.0%).

UK born people had a higher proportion completing treatment (30.0%) than their non-UK born counterparts (20.0%). The majority (60.0%) of non-UK persons were still on treatment and one (10.0%) was lost to follow up. UK born cases that did not complete treatment either died during their treatment (40.0%) or were still on treatment (30.0%).

Two drug sensitive CNS TB cases reported at least one social risk factor. Neither of these cases had completed treatment; one had died during treatment and the other was still on treatment after 12 months.

The City of Bristol had the largest number of cases (8) and the majority of these (6, 75.0%) were still on treatment. Devon had two cases, both of who had completed their treatment within 12 months. South Gloucestershire had five cases, four of which had died during their treatment. Wiltshire had three cases; these had either completed treatment, died, or were still on treatment after 12 months. The two South West cases that were lost to follow up lived in Gloucestershire and Swindon and these were their only sensitive CNS TB cases.

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

Drug resistance

The number and distribution of drug resistant cases notified in 2015 has been analysed. Outcomes related to drug resistance is presented for cases notified in 2013 due to the 24-month follow-up period associated with these cases.

Overall drug resistance and geographical distribution

In 2015, there were 171 culture confirmed cases. Nine cases (5.3%) exhibited resistance to at least one first-line drug. This was the lowest proportion of resistant isolates since 2005 and is part of a three-year consecutive decrease. In 2015, there were nine (5.3%) isolates with isoniazid resistance, one with rifampicin resistance and one with pyrazinamide resistance (excluding *M. bovis* cases).

One case of *M. tuberculosis* was found to be multi-drug resistant (MDR) and this was resistant to isoniazid, rifampicin, and pyrazinamide. This was one fewer than in 2014 when two cases of MDR-TB were identified. In the past six years, there has been either one or two cases of MDR-TB reported each year, see Figure 16. No isolates were found to be resistant to ethambutol in 2015. As there was only one case with MDR-TB, the demographic details of this case have been suppressed due to the potential for deductive disclosure.

TB Monitoring Indicator 9: Number and proportion of culture confirmed TB cases with drug susceptibility testing reported for the four 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).

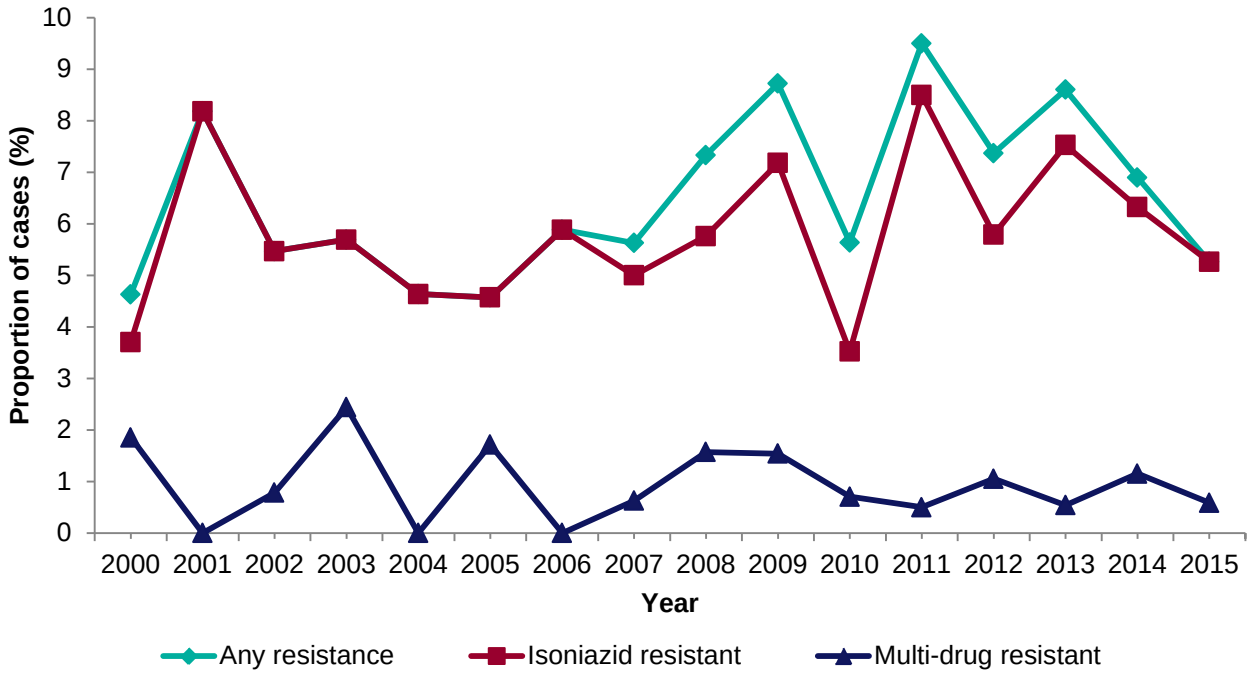
Characteristics of patients with drug resistant TB

Non-UK born persons who were culture confirmed had a higher proportion of isolates that were resistant to any first-line drug (8, 8.7%) when compared to UK born persons (1, 1.4%). All the non-UK born notifications with drug resistance were found to be resistant to isoniazid. The UK born case was classified as MDR and was resistant to isoniazid, rifampicin, and pyrazinamide.

The proportion of resistant isolates did not vary by sex (males and females both 5%). The highest proportion of resistant isolates were identified in cases with Black African (4, 12.5%) ethnicity followed by Indian (2, 10.5%) and mixed/other (1, 8.3%) ethnicities. None of the notifications with a drug resistant isolate had a previous diagnosis of TB recorded.

People reporting at least one social risk factor had a higher proportion of isolates that were resistant to at least one first-line drug (2, 8.3%) compared to those not reporting social risk factors (7, 5.9%). Pulmonary cases (5, 4.1%) had a lower proportion of drug resistant notifications than non-pulmonary cases (4, 8.0%).

Figure 16: Proportion of TB cases with first-line drug resistance, South West, 2000–2014



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

There were two (1.2%) notifications in 2015 with an infection resistant to second-line anti-TB drugs. This is a similar number to what was observed in the five years prior to 2014. During 2014, five cases (2.9%) experienced infections with an isolate resistant to second-line therapy. This is more than two times the number observed 2015. None of the cases in 2015 were found to be either pre- or extensively- drug resistant (XDR). This contrasts with 2014 when there was a single case with XDR TB in the South West.

There had been no cases of XDR TB prior to the 2014 case. The cases with resistance to second-line drugs were non-UK born, had no previous diagnosis, one was female and the other was male, neither reported social risk factors, and both had extra-pulmonary disease.

Outcomes: 24 months for patients with rifampicin resistant TB

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, 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.

In 2013, there were no rifampicin resistant cases with treatment completion data available. This is similar to previous years (2003, 2005, 2007, 2008, 2009, and 2010) when there were either one or two cases with missing data. As there was only one case in this section, demographic details have been suppressed due to the potential for deductive disclosure.

TB Monitoring Indicator 13: Number and proportion of drug resistant TB cases who 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 who 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 who had died at last reported outcome (England, PHEC and UTLA data shown on Fingertips).

TB in those with social risk factors and health inequalities associated with TB

Social risk factors

In 2015, data on social risk factors were available for 81.4% of notifications. During this year, 13.6% (32) of cases reported at least one social risk factor (alcohol abuse, drug use, homelessness and/or imprisonment). This is the second highest proportion of cases reporting social risk factors in the past five years and is 5% higher when compared to 2014, see Table 12. The majority reported one risk factor (18, 56.3%), followed by two (9, 28.1%), three (4, 12.5%) or four (1, 3.1%), respectively.

A higher proportion of people with at least one social risk factor had pulmonary disease (27, 84.4%) compared to non-pulmonary disease (5, 15.6%). A higher proportion of UK born people reported at least one social risk factor (19, 17.4%) compared to non-UK born people (12, 10.3%). The UK born ethnicity with the highest proportion of people reporting

social risk factors was white (18, 17.8%) with the only other case being black Caribbean (1, 100.0%).

The non-UK born ethnic group with the highest proportion of people with at least one social risk factor were mixed/other (3, 17.7%), black African (6, 16.2%) and white (3, 15.0%). There were 12 different countries of birth reported and the majority of non-UK born notifications reporting at least one social risk factor were from Somalia (3, 25.0%) or South Africa (2, 16.7%).

Table 12: Social risk factors among TB patients, South West, 2010–2015

Year	Any risk factor		Total
	n	%	
2010	21	11.9	177
2011	23	10.9	211
2012	32	13.5	238
2013	37	13.7	271
2014	23	8.6	268
2015	32	13.6	236

Among people reporting social risk factors, the most prevalent risk factor was homelessness (17, 53.1%) followed by alcohol misuse (14, 43.8%), drug use (13, 40.6%), and imprisonment (8, 25.0%), see Table 13.

Table 13: Individual social risk factors among TB patients, South West, 2015

Risk factor	n	%	Total
Homelessness	17	7.2	236
Imprisonment	8	3.4	236
Drug misuse	13	5.5	236
Alcohol misuse	14	5.9	236

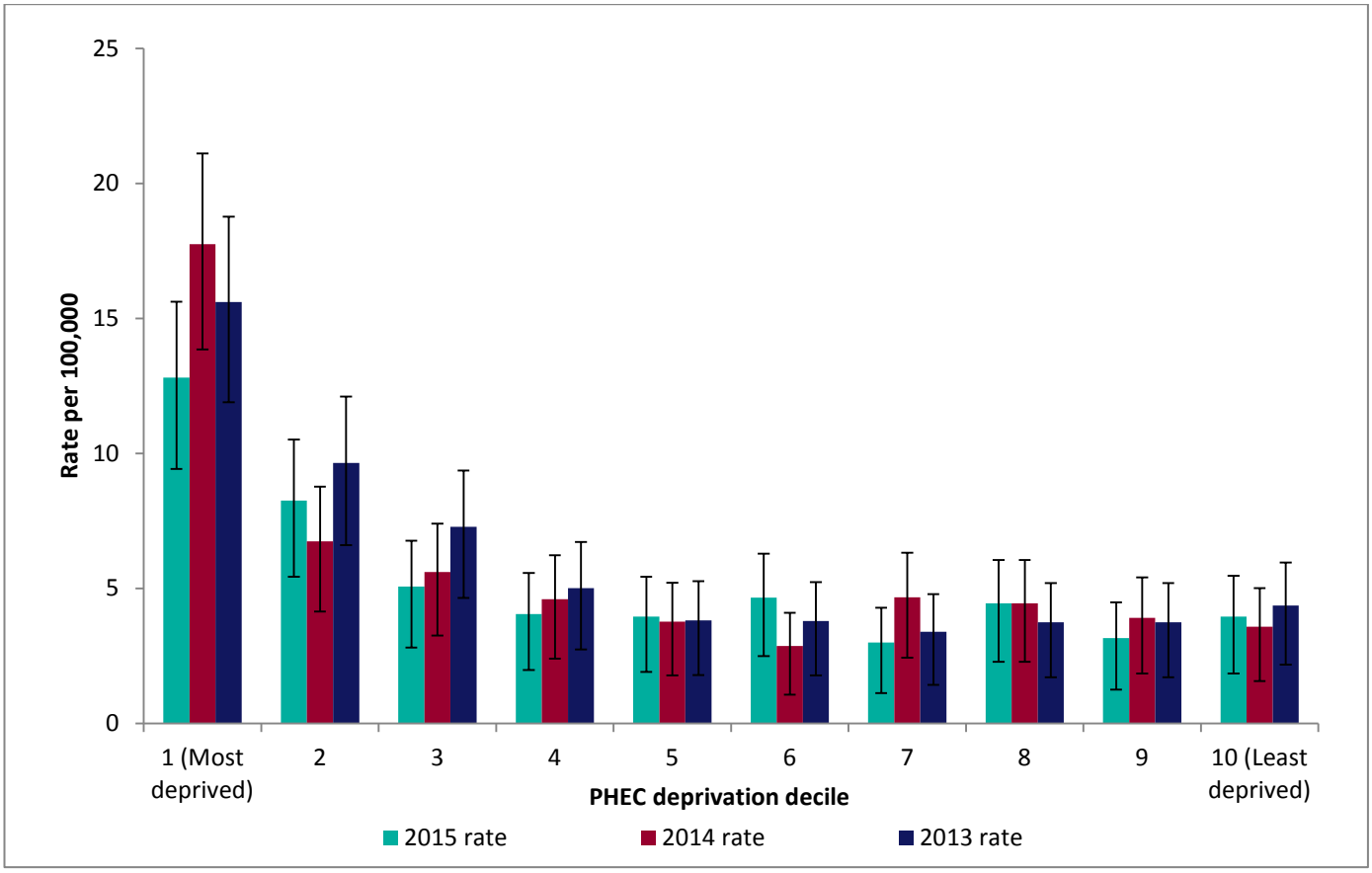
Deprivation

The Index of Multiple Deprivation (IMD) 2010, part of the English Indices of Deprivation, is an overall measure of multiple deprivation experienced by people living in an area and is measured at Lower Super Output (LSOA) level. This report uses IMD score categorised into five groups (deprivation quintiles) for each PHEC based on IMD score variable (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf).

In 2015, data on IMD were available for all notifications. During this year, the majority of cases were from the most deprived quintile (70, 24.1%). The rates by IMD decile for the past three years can be seen in Figure 17. In 2015, 2014 and 2013, the highest rate was observed in the most deprived decile. In 2015, the rate in the most deprived decile is lower than in both 2014 and 2013 although the 95% CIs overlap.

There is a clear trend towards lower rates of TB with decreasing social deprivation. In 2015, we see large reductions in the rate of TB disease between deciles one, two, three, and four, however, the rate is comparable between deciles four to ten. This pattern was also seen in 2014 and 2013. In 2015 and 2013, the 95% CI around the TB incidence rate in the most deprived decile overlaps with that around the second decile. In 2015, 2014 and 2013, the 95% CI around the TB incidence rate in the most deprived decile does not overlap with those for deciles three to ten. This indicates a significant difference between the rates of infection for social deprivation decile one compared to deciles three to ten.

Figure 17: TB case rate and 95% confidence intervals by IMD decile, South West, 2013, 2014 and 2015



HIV testing, DOT, and hospital admissions

HIV testing

In 2015, data on HIV status and testing were available for 84.8% of people. During this year, most people (89.3%) were offered an HIV test and this was similar to the proportion offered a test in 2014 (85.9%). The majority of cases had an HIV test performed (85.3%), while for 8.2% the HIV status was already known. Nine people (4.0%) were offered an HIV test but it was either refused (4) or not done (5) see Table 14.

Table 14: HIV testing, South West, 2015

Outcome	n	%
HIV test offered	201	89.3
HIV test not offered	24	10.7
HIV test offered and done	192	85.3
HIV test offered but refused or not done	9	4.0
All cases with data available	225	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

In 2015, data on inpatient treatment for TB were available for 95.2% of cases. A total of 71 patients (25.7%) were treated as an inpatient at some point during their care. This was an increase from 2014 when 58 cases were treated as inpatients (19.5%), see Table 15. In 2015, data on directly observed treatment (DOT) were available for 92.1% of cases. Twenty-seven cases (10.1%) received DOT as part of their care in 2015. This was a slight increase on 2014 when 26 cases (9.5%) of cases were provided with DOT, see Table 15.

Table 15: Hospital inpatient and DOT use, South West, 2015

	n	%	Total
DOT given*	27	10.1	267
Hospital inpatient*	71	25.7	276

* At any time during treatment

Comparison between South West and England

In order to put the South West findings in a wider epidemiological context, we will make comparisons with key findings from the national TB report.

In 2015, the rate of TB in the South West (5.3/100,000) was almost half that observed nationally (10/100,000). The South West rate was the second lowest regional rate, with only the North East experiencing a lower rate. The South West region had the lowest rate of disease in non-UK born population (31.9/100,000), however, it had the fourth highest UK born rate (2.6/100,000). These rates were both lower than the national rate for UK born (3.4/100,000) and non-UK born (51.2/100,000). The South West had the lowest proportion of pulmonary notifications culture confirmed (63.0%) in England, the national proportion was 72.7%.

The proportion of notifications with a greater than four-month delay between symptom onset to treatment start date in the South West was 31.7%. This was the third highest proportion out of the regions in England, with only the West Midlands (32.8%) and the South East (37.4%) regions experiencing a higher proportion of notifications delayed greater than four months. The region had the second lowest proportion of pulmonary cases starting treatment within two months of symptom onset (36.1%); lowest was South East (35.4%).

The South West region had the highest proportion of cases reporting at least one social risk factor (13.9%) compared to a national figure of 11.8%. When looking at individual risk factors, a high proportion of cases reported drug misuse (5.1%, highest West Midlands 5.3%), alcohol misuse (5.3%, joint highest with North West), homelessness (6.7%, highest in England). In contrast, the proportion of cases reporting imprisonment was low (3.3%, lowest London 2.5%). The South West had the second lowest proportion of persons offered and receiving a HIV test (85.3%). The highest was in London (97.3%) and the lowest in the North East (83.8%).

In 2014, the South West was the only region in England with a drug sensitive treatment completion rate less than 80.0%, with 75.3% of cases completing treatment. This was due to a higher proportion of cases being lost to follow up, still on treatment, or dying before treatment completion. The region had the highest mortality rate for drug sensitive cases at 12 months at 7.6% (22/291) and the highest lost to follow-up rate for drug sensitive cases at 12 months at 6.5% (19/291).

In 2015, the South West region had several ETS fields that were poorly completed compared to the rest of England. Out of 15 key fields, nine were less than 95.0% complete. There is further room to improve key field completeness on ETS.

Latent TB infection testing and treatment

In January 2015, the 'Collaborative Tuberculosis Strategy for England' identified £10 million of funding to establish new migrant LTBI testing and treatment services in areas with high incidence (>20 per 100,000). The only CCG to meet this threshold in the South West was Bristol.

The Bristol latent TB infection testing and treatment service will be 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 >6 months in high TB incidence country (>150/100,000 or Sub-Saharan Africa).
2. Entered the UK within the last 5 years.
3. Aged 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 who would be eligible for LTBI screening (defined above). Based on an average of the last three 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]) who meet the eligibility criteria are offered a latent TB screening test, which comprises a single blood sample. A positive result leads to a referral to the TB secondary care providers for treatment and support.

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

The service has been delivered in two phases. Phase one commenced in February/March 2016 and saw the service delivered across five GP practices that had the highest need and The Haven; phase two saw the service delivered to the next cohort of GP practices in Bristol CCG identified with high need. Phase three is due to be launch in 2017 when the pilot will be rolled out to the remaining Bristol practices.

For phase one, three 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 into the appropriate treatment.

Phase two was launched on 27 September and offered to an additional five practices in Bristol. Two of these practices have agreed to sign up to the service and interest has been gauged from the other three.

Discussion

This report provides an epidemiological overview of TB in the South West. It uses notification data from 2015 and outcome data from 2014 and 2013. There has been a year-on-year decrease in the incidence of TB in the South West over the past three years and the rate in 2015 was the lowest since 2010. The decrease has been seen in both UK and non-UK born populations; however, a more marked decrease was observed in the latter especially in the proportion of TB cases that had newly arrived in the UK. In the past three years, the majority of non-UK born cases have been diagnosed six years after entering the UK. In 2015, the rate in the non-UK born population was 12 times higher than in the UK born population and this group makes up the majority of notified cases. The reduction attributed to the non-UK born population appears to be a significant driver towards lower TB incidence in the South West and 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. Finally, the implementation of cohort review in a number of different areas in the South West will help to increase the quality of care and service delivery through shared multi-agency learning and increased awareness of issues operating at a population level.

For the first time since 2003, the rate of TB in the UK born population has decreased for two consecutive years (2014 and 2015). This decrease was despite a large cluster of cases associated with a school in the South West South area. This contributed an additional nine UK born cases to the total observed in 2015. The decrease in the

incidence of TB in the UK born population indicates an improvement in local TB control. However, it should be noted that the incidence of TB in UK born children under the age of 15 increased and this could indicate an increase in transmission within the community. There was a large degree of uncertainty associated with these rates; however, it will be important to monitor this indicator and ensure local transmission does not threaten current improvements in TB control.

The geographical distribution of TB in the South West shows a concentration of cases within urban upper tier local authorities. This is in line with the picture seen nationally. The highest rates of infection were observed in the City of Bristol and Swindon and these areas contain some of the largest urban areas in the South West. A number of urban areas have a higher incidence in 2015 when compared to 2014; however, the City of Bristol has seen a decrease.

Resistance to any first-line drug has seen a decrease in the past three years and there were only eight cases with drug resistance in 2015. There was decrease in the proportion of cases with resistance to second-line drugs when compared to 2014 and this brought levels back in line with what had been seen prior to 2014. There was only one case with MDR TB and there were no cases of XDR TB. This is in line with the trend observed over the past six years. The majority of resistant cases were non-UK born and this supports that notion that the majority of patients are prescribed appropriate treatment regimens and these are well adhered to.

The proportion of cases in 2015 with a delay of more than four months between symptom onset and treatment start date was higher than in 2014. We are yet to see consistent improvements in shortening this delay in the South West. Groups experiencing a particular high proportion of cases with a delay of greater than four months were non-UK born cases and persons without social risk factors. Shortening treatment delays should become a priority for South West TB services as this is key to reducing transmission and ensuring better treatment outcomes.

In 2014, a decrease in the proportion of cases reporting social risk factors was observed. However, in 2015 levels have returned to those observed in 2012 and 2013. This is 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 second consecutive decrease, 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 includes:

- large number of cases experiencing delays, greater than four months, from symptom onset to treatment start date
- the proportion of cases with drug sensitive TB completing treatment after 12 months is 10% lower than the national completion rate
- the South West is not experiencing the same magnitude of decrease in incidence when compared to what is occurring nationally
- while the rate of disease in the UK born population has decreased, the number of cases occurring in certain groups, in particular those with social risk factors and UK born cases under the age of 15, has increased
- a significantly higher rate of TB was observed in the lowest social deprivation quintile

It is expected that cohort review (which has been rolled out in several areas across the South West) will facilitate services to improve TB detection, reduce healthcare associated delays and improve treatment outcomes. TB remains concentrated within vulnerable societal groups who 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/464914/TB_Annual_Report_2015.pdf

Data sources
Data on TB cases in South West comes from the national Enhanced TB surveillance (ETS) system. Data collected includes notification details, and demographic, clinical and microbiological information, including drug resistance and strain type, provided by the Reference Laboratory (Cardiff and NMRL).

Definitions

Amplified resistance: Amplified resistance is classed as resistance identified on repeat culture after three months of the first specimen date. Cases with a change from a sensitive to resistant result following treatment start are reclassified as amplified resistance, even if this is within the three-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 who are infected with a strain of *Mycobacterium tuberculosis* complex with indistinguishable MIRU-VNTR profiles. Each cluster must have at least one person with a full 24 MIRU-VNTR profile, and other members of the cluster may have a maximum of one missing loci.

Drug resistant cohort: The drug resistant cohort includes any cases with rifampicin resistant TB (initial or 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 class as resistance identified within three 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 = $Q_3 - Q_1$

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.

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

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

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 outcome are based on World Health Organization (WHO) and European definitions, but adapted to the UK context. In this report, all data was obtained from the ETS matched dataset provided in August 2015.

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

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

Population denominator: Tuberculosis rates by geographical area (Centre, local authority, MSOA and LSOA), age, sex and place of birth were calculated using ONS mid-year population estimates. 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 (LFS) http://www.esds.ac.uk/findingData/qlfs.asp. The LFS is based on a population sample, so estimates are liable to sampling errors, particularly for small population subgroups, and should be interpreted with caution.

Cluster definitions: Strain typing was performed at the TB reference laboratories using 24 MIRU-VNTR profiling. Analysis was undertaken on strain type clusters defined as two or more people with TB caused by indistinguishable strains, with at least 23 complete VNTR loci. Analysis of clustering in South West was carried out on cases that clustered in 2014 and notified between 2010 and 2014.

Appendix B: TB among South West residents

Table Bi: TB cases numbers by local authority of residence, South West, 2000 – 2015

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bath and North East Somerset	6	11	11	12	9	18	4	5	8	12	12	4	11	9	19	13
Bournemouth	17	12	17	13	14	24	23	13	18	14	15	24	16	12	13	15
Bristol, City of	48	40	63	51	76	66	81	81	71	84	81	82	88	97	98	79
Cheltenham	8	7	10	6	8	6	14	8	13	8	5	7	5	13	7	5
Christchurch	4	4	1	2	2	3	3	4	0	3	1	2	2	0	0	1
Cornwall & Isles of Scilly	13	10	13	12	20	13	10	21	11	13	7	23	18	13	17	10
Cotswold	2	3	0	0	1	1	2	1	2	2	1	3	5	3	1	1
East Devon	8	2	5	1	6	5	1	3	2	5	4	3	1	0	1	4
East Dorset	3	6	2	2	3	1	1	2	2	5	1	1	2	3	3	1
Exeter	3	6	2	1	7	7	6	8	7	9	1	8	14	7	5	5
Forest of Dean	3	3	2	2	1	2	3	3	1	1	0	1	1	0	1	2
Gloucester	7	1	7	7	8	6	12	13	11	8	7	13	11	21	8	12
Mendip	2	2	5	2	10	9	3	3	4	1	4	2	2	6	5	3
Mid Devon	2	0	0	1	0	2	1	0	4	0	2	2	3	1	3	2
North Devon	3	0	0	0	1	0	0	1	0	1	0	0	1	3	3	4
North Dorset	1	2	2	3	2	3	4	0	1	4	3	2	4	1	0	3
North Somerset	3	7	4	3	5	10	6	5	10	13	10	6	9	7	8	10
Plymouth	11	15	12	9	12	5	16	12	13	13	11	16	20	12	11	19
Poole	12	8	10	5	10	11	6	8	11	5	7	2	1	5	1	9
Purbeck	0	2	1	2	2	1	3	2	1	3	3	2	1	2	1	0
Sedgemoor	1	0	5	0	2	0	0	3	2	1	2	7	3	2	4	2
South Gloucestershire	8	11	5	12	11	10	9	8	16	25	13	18	13	17	21	16
South Hams	2	6	0	0	1	1	2	2	2	1	6	3	1	2	4	3
South Somerset	2	2	4	2	2	9	5	5	2	3	5	2	5	5	9	0
Stroud	6	3	0	6	3	4	4	3	7	4	2	2	5	7	5	5
Swindon	11	9	8	12	11	10	21	24	13	18	21	23	18	29	18	22
Taunton Deane	4	2	4	1	3	2	0	1	4	2	1	6	6	3	2	0
Teignbridge	11	12	5	8	2	2	5	4	8	8	5	9	4	9	7	13
Tewkesbury	5	1	1	2	3	4	2	2	1	1	2	4	2	4	4	4
Torbay	9	8	6	3	8	12	10	4	11	14	12	11	5	10	6	8
Torridge	1	1	0	0	1	0	0	1	0	0	0	1	1	0	2	0
West Devon	1	1	1	2	3	0	2	1	2	1	2	0	5	5	4	1

Local Authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
West Dorset	3	1	2	3	2	5	3	2	4	2	2	2	2	2	3	0
West Somerset	0	0	1	1	0	1	0	1	1	0	2	0	0	0	0	0
Weymouth and Portland	4	2	0	1	3	4	4	6	0	6	0	1	1	3	5	1
Wiltshire	6	11	11	14	12	9	12	9	16	13	15	15	14	12	17	17

Table Bii: TB rate per 100,000 by local authority of residence, South West, 2000 – 2015

Local authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bath and North East Somerset	3.56	6.50	6.48	7.04	5.28	10.51	2.34	2.90	4.61	6.92	6.89	2.28	6.19	5.00	10.44	7.03
Bournemouth	10.45	7.34	10.33	7.92	8.54	14.46	13.80	7.64	10.47	8.03	8.37	13.08	8.57	6.36	6.79	7.71
Bristol, City of	12.29	10.26	16.16	13.03	19.20	16.28	19.83	19.66	17.12	20.05	19.15	19.16	20.35	22.17	22.15	17.58
Cheltenham	7.31	6.36	9.11	5.49	7.29	5.41	12.54	7.11	11.51	7.02	4.35	6.05	4.31	11.22	6.01	4.28
Christchurch	8.93	8.91	2.22	4.41	4.40	6.56	6.51	8.61	0.00	6.35	2.10	4.17	4.17	0.00	0.00	2.04
Cornwall & Isles of Scilly	2.61	1.99	2.57	2.35	3.89	2.51	1.92	4.01	2.09	2.46	1.32	4.29	3.33	2.39	3.10	1.81
Cotswold	2.47	3.73	0.00	0.00	1.22	1.22	2.42	1.20	2.41	2.42	1.21	3.61	5.98	3.57	1.18	1.17
East Devon	6.40	1.59	3.95	0.79	4.67	3.85	0.77	2.27	1.51	3.78	3.02	2.25	0.74	0.00	0.73	2.90
East Dorset	3.59	7.15	2.36	2.34	3.49	1.16	1.16	2.30	2.29	5.75	1.15	1.15	2.28	3.41	3.40	1.13
Exeter	2.71	5.40	1.81	0.90	6.32	6.20	5.30	7.01	6.13	7.87	0.86	6.83	11.73	5.75	4.02	3.93
Forest of Dean	3.76	3.75	2.50	2.48	1.23	2.45	3.67	3.66	1.22	1.22	0.00	1.22	1.21	0.00	1.20	2.37
Gloucester	6.35	0.91	6.33	6.28	7.11	5.27	10.41	11.09	9.29	6.70	5.80	10.66	8.91	16.86	6.37	9.44
Mendip	1.94	1.92	4.78	1.90	9.45	8.46	2.81	2.78	3.68	0.92	3.67	1.83	1.82	5.45	4.51	2.69
Mid Devon	2.89	0.00	0.00	1.40	0.00	2.73	1.35	0.00	5.24	0.00	2.58	2.57	3.83	1.27	3.79	2.52
North Devon	3.44	0.00	0.00	0.00	1.11	0.00	0.00	1.08	0.00	1.07	0.00	0.00	1.07	3.20	3.19	4.25
North Dorset	1.62	3.23	3.18	4.69	3.08	4.55	5.97	0.00	1.47	5.90	4.42	2.90	5.77	1.43	0.00	4.24
North Somerset	1.60	3.71	2.11	1.57	2.59	5.13	3.05	2.51	4.98	6.44	4.93	2.95	4.40	3.40	3.84	4.76
Plymouth	4.55	6.23	4.95	3.70	4.92	2.02	6.42	4.78	5.15	5.14	4.33	6.24	7.75	4.63	4.21	7.23
Poole	8.68	5.78	7.19	3.60	7.19	7.87	4.25	5.60	7.63	3.44	4.77	1.35	0.67	3.36	0.67	5.98
Purbeck	0.00	4.50	2.24	4.51	4.51	2.24	6.69	4.44	2.21	6.65	6.64	4.43	2.21	4.40	2.19	0.00
Sedgemoor	0.95	0.00	4.67	0.00	1.84	0.00	0.00	2.68	1.77	0.89	1.76	6.09	2.58	1.70	3.36	1.66
South Gloucestershire	3.27	4.47	2.02	4.82	4.38	3.95	3.53	3.12	6.20	9.63	4.97	6.83	4.88	6.32	7.73	5.83
South Hams	2.44	7.32	0.00	0.00	1.22	1.21	2.41	2.40	2.39	1.20	7.18	3.59	1.20	2.39	4.76	3.55
South Somerset	1.33	1.32	2.63	1.30	1.29	5.75	3.18	3.15	1.25	1.87	3.11	1.23	3.07	3.05	5.47	0.00
Stroud	5.56	2.78	0.00	5.51	2.74	3.63	3.62	2.70	6.29	3.58	1.78	1.77	4.41	6.14	4.34	4.29
Swindon	6.12	5.00	4.39	6.51	5.90	5.27	10.92	12.19	6.45	8.81	10.15	10.97	8.49	13.55	8.34	10.13
Taunton Deane	3.99	1.95	3.84	0.95	2.83	1.87	0.00	0.92	3.68	1.83	0.91	5.43	5.39	2.68	1.77	0.00
Teignbridge	9.14	9.90	4.10	6.53	1.63	1.62	4.05	3.22	6.43	6.43	4.02	7.24	3.20	7.14	5.50	10.09
Tewkesbury	6.54	1.31	1.29	2.57	3.85	5.11	2.53	2.52	1.25	1.24	2.45	4.86	2.41	4.75	4.66	4.60
Torbay	7.01	6.16	4.60	2.29	6.06	9.08	7.58	3.03	8.33	10.63	9.13	8.38	3.80	7.57	4.51	6.00
Torridge	1.72	1.69	0.00	0.00	1.63	0.00	0.00	1.58	0.00	0.00	0.00	1.56	1.54	0.00	3.05	0.00
West Devon	2.05	2.05	2.00	4.02	5.99	0.00	3.93	1.93	3.80	1.89	3.75	0.00	9.28	9.27	7.37	1.84
West Dorset	3.27	1.08	2.13	3.16	2.09	5.19	3.09	2.04	4.06	2.03	2.02	2.01	2.01	2.00	2.99	0.00
West Somerset	0.00	0.00	2.84	2.84	0.00	2.86	0.00	2.85	2.84	0.00	5.71	0.00	0.00	0.00	0.00	0.00

Local authority	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Weymouth and Portland	6.32	3.14	0.00	1.55	4.65	6.17	6.17	9.23	0.00	9.22	0.00	1.54	1.54	4.61	7.69	1.53
Wiltshire	1.40	2.54	2.51	3.16	2.69	2.01	2.65	1.96	3.45	2.79	3.19	3.16	2.94	2.50	3.52	3.50

Table Biii: TB case numbers and rate by age and sex, South West, 2015

Age Group		Male	Female
Age 0 to 9	Count	3	2
	Rate	0.95	0.67
Age 10 to 19	Count	11	12
	Rate	3.57	4.09
Age 20 to 29	Count	19	23
	Rate	5.52	7.08
Age 30 to 39	Count	43	31
	Rate	13.93	9.94
Age 40 to 49	Count	28	21
	Rate	7.80	5.66
Age 50 to 59	Count	22	12
	Rate	6.06	3.19
Age 60 to 69	Count	14	10
	Rate	4.22	2.84
Age 70+	Count	16	23
	Rate	4.47	5.08

Table Biv: Drug resistance among TB patients with culture confirmed disease*, South West, 2000 – 2014

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	4.63	4	3.70	2	1.85	0	0.00	2	1.85	108	0	0.00	104
2001	9	8.18	9	8.18	0	0.00	0	0.00	0	0.00	110	0	0.00	108
2002	7	5.56	7	5.56	1	0.79	0	0.00	1	0.79	126	0	0.00	124
2003	7	5.69	7	5.69	3	2.44	0	0.00	3	2.44	123	0	0.00	121
2004	7	4.73	7	4.73	0	0.00	0	0.00	0	0.00	148	0	0.00	148
2005	8	4.62	8	4.62	3	1.73	1	0.58	3	1.73	173	0	0.00	171
2006	10	5.92	10	5.92	0	0.00	0	0.00	0	0.00	169	0	0.00	165
2007	9	5.63	8	5.00	1	0.63	1	0.63	1	0.63	160	2	1.25	155
2008	14	7.37	11	5.79	3	1.58	2	1.05	4	2.11	190	3	1.58	188
2009	17	8.85	14	7.29	3	1.56	2	1.04	4	2.08	192	4	2.08	189
2010	8	5.93	5	3.70	1	0.74	1	0.74	2	1.48	135	2	1.48	132
2011	19	9.84	17	8.81	1	0.52	2	1.04	1	0.52	193	1	0.52	190
2012	14	7.41	11	5.82	2	1.06	1	0.53	3	1.59	189	3	1.59	182
2013	16	8.84	14	7.73	1	0.55	1	0.55	1	0.55	181	2	1.10	177
2014	12	6.90	11	6.32	2	1.15	2	1.15	2	1.15	174	0	0.00	165
2015	9	5.26	9	5.26	1	0.58	0	0.00	1	0.58	171	1	0.58	160

*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 three years. These will be published online shortly by your local FES team.