Public Health England

Protecting and improving the nation's health

Tuberculosis in the UK
2014 report

Health Protection Scotland

GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales

HSC Public Health Agency

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through advocacy, partnerships, world-class science, knowledge and intelligence, and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

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Contents

This report is accompanied by a slide set, available at https://www.gov.uk/government/publications/tuberculosis-tb-in-the-uk and the official statistics “Reports of cases of tuberculosis to the national Enhanced Tuberculosis Surveillance System, 2004-2013, Official statistics”, available at www.gov.uk/government/collections/tuberculosis-and-other-mycobacterial-diseases-diagnosis-screening-management-and-data

Further tables, such as those containing breakdown by local geography, are also available at https://www.gov.uk/government/statistics/uk-tuberculosis-tb-surveillance-data

Data for Scotland in this report may differ slightly to data presented by Scotland in their own reports. In this UK report, cases that have transferred from England to Scotland are not counted in the Scottish figures to avoid duplication at the UK level.

The data presented in this report is correct as at May 2014.

Foreword

I am pleased to introduce the Tuberculosis in the UK 2014 report, based on surveillance data provided by frontline TB staff from across the UK. This year's report presents detailed data for the 10 year period 2004-2013, providing a valuable picture of the trends in TB epidemiology in the UK over the past decade.

While TB rates in the UK continue to be unacceptably high compared to other comparable countries, it is encouraging that we have seen a small decrease in case numbers and incidence in the past two years. However, it is too early to tell whether this is the beginning of a downward trend, and certainly no time for complacency.

Tackling TB is one of the key priorities for Public Health England, and we have been working closely with NHS England and a coalition of key stakeholders to develop a collaborative TB strategy for England. With the public health, clinical and social care arrangements in England since April 2013, and with the strengthened accountability arrangements for TB control set out in the strategy, we have a real opportunity to bring about a step change in TB control in England.

We are committed to working together with our key stakeholders to ensure that our vision of a sustained year-on-year reduction in TB, a reduction in health inequalities, and eventual elimination of the disease as a public health problem is achieved.

Dr Paul Cosford

Director for Health Protection and Medical Director
Public Health England

Acknowledgements

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We gratefully acknowledge all those who contributed information on TB cases in the UK, including physicians, nurses, microbiologists, scientists and administrative staff. Special thanks are extended to those who co-ordinate and oversee TB surveillance at regional/country level for their essential collaboration in the ongoing improvements to TB surveillance.

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1. Tuberculosis case reports, 2004-2013

Key messages

- a total of 7,892 cases of TB were notified in the UK in 2013, an incidence of 12.3/100,000
- overall numbers of TB cases in the UK have declined 11.6% in the past two years, due to a small decline in numbers and rates in the non-UK born population
- overall numbers and rates in the UK born population have not declined in the past decade, although rates in the UK born population under 15 years have reduced in the past five years
- as in previous years, almost three quarters of TB cases (73%) occurred among people born outside the UK; only 15% of these were recent migrants (diagnosed within two years of entering the UK)
- TB remains concentrated in the most deprived populations; in 2013, 70% of cases were resident in the 40% most deprived areas, nearly half (44%) of cases were not in employment and 10% had at least one social risk factor (history of alcohol or drug misuse, homelessness or imprisonment)
- more than a quarter (28%) of patients with pulmonary TB started treatment more than four months after symptom onset, and the proportion of cases with a delay of more than four months has increased slightly in the past 3 years

Overall numbers, rates and geographical distribution

In 2013 in the UK, a total of 7,892 cases of TB were notified, a rate of 12.3 cases per 100,000 population (95% confidence interval (CI) 12.0 -12.6) (Figure 1.1, Table A1.1). The rate of TB in the UK has remained high and relatively stable over the past decade. In the past two years, there has been a small decline in the numbers and rates each year, with a reduction in rates of 2.5% in 2012 and 10.4% in 2013.

Compared to 2012, TB cases and rates declined in England, Northern Ireland and Scotland, while they remained stable in Wales (Figure 1.2). The largest decline in rates was in England and Northern Ireland (10.6% and 16.4% respectively) (Table A1.2).

Figure 1.1: Tuberculosis case reports and rates, UK, 2004-2013

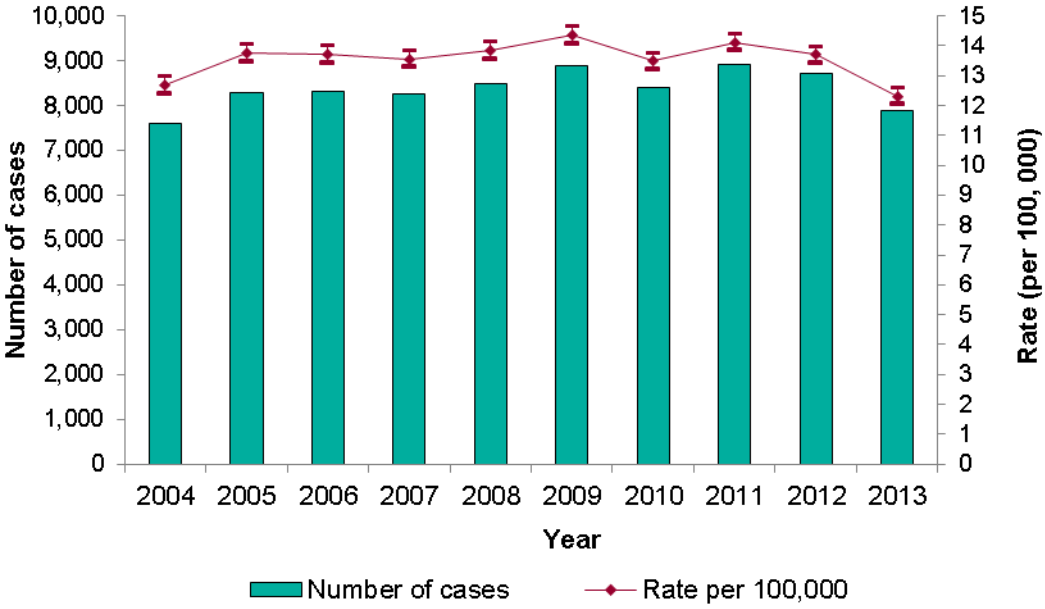
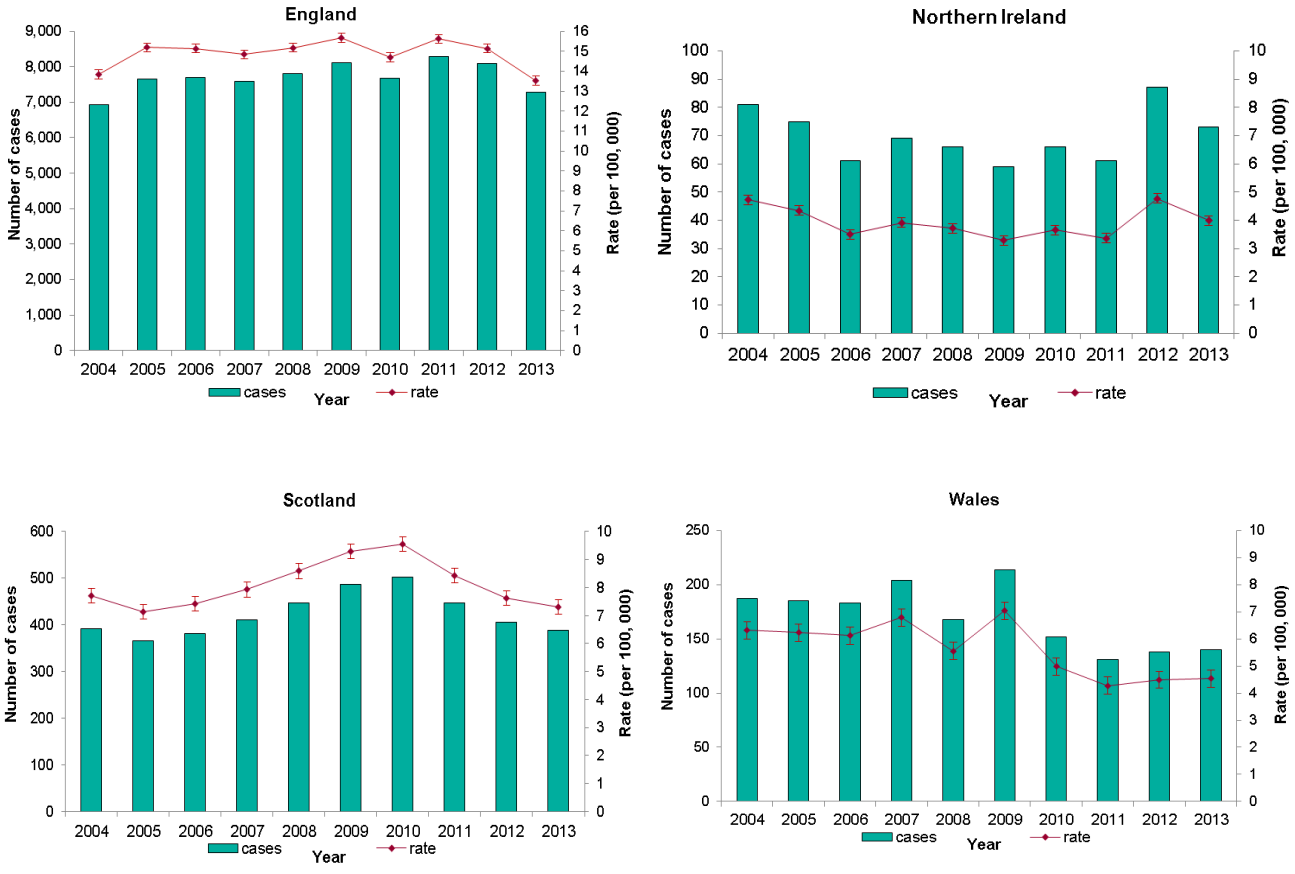
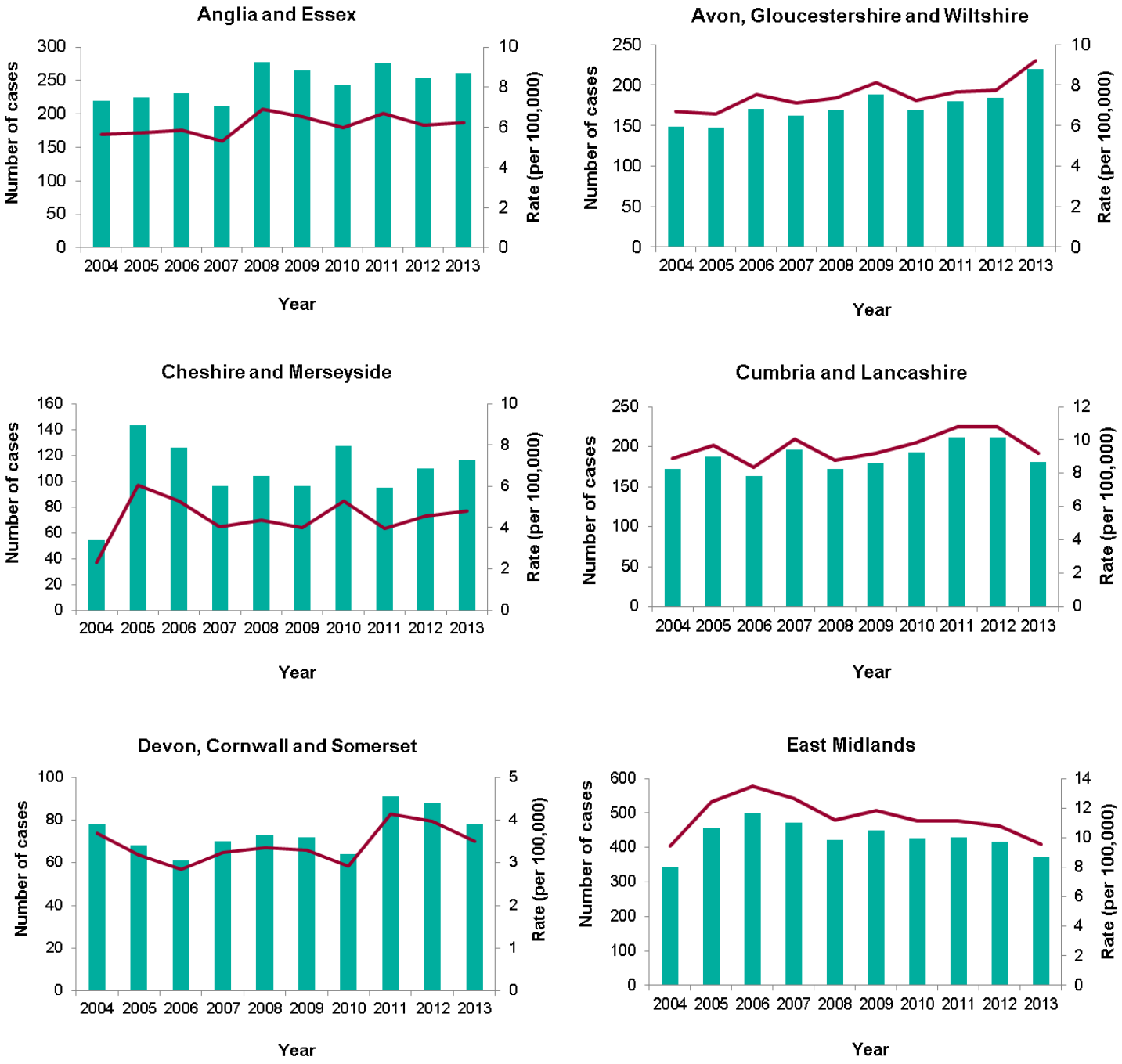


Figure 1.2: Tuberculosis case reports and rates by country, UK, 2004-2013

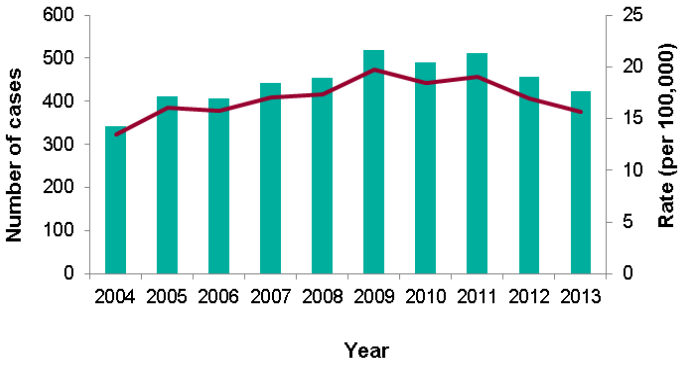


As in previous years, London accounted for the highest proportion of cases in the UK (37.8%, 2,985/7,892), with a rate of 35.5 cases per 100,000 (95% CI 34.2-36.8), followed by the West Midlands PHE Centre (PHEC) area (12.4%, 981; 17.3 per 100,000; CI 16.2-18.4). TB rates have shown a small decline in most PHEC areas in the past year or two, with the exception of Avon, Gloucestershire and Wiltshire and Cheshire and Merseyside PHE Centres (Figure 1.3, Table A1.3). The main burden of disease remained concentrated in large urban areas (Figure 1.4).

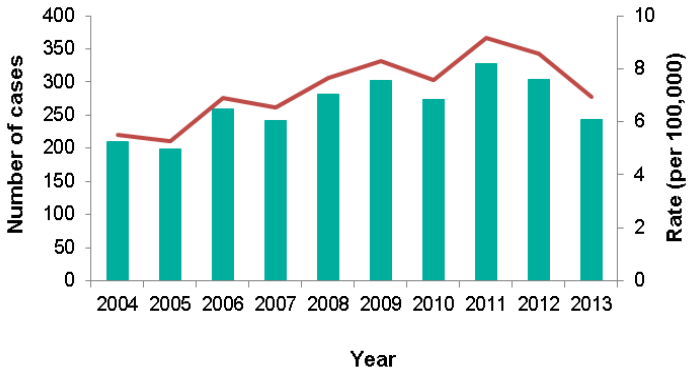
Figure 1.3: TB rates by Public Health England centre, 2004-2013



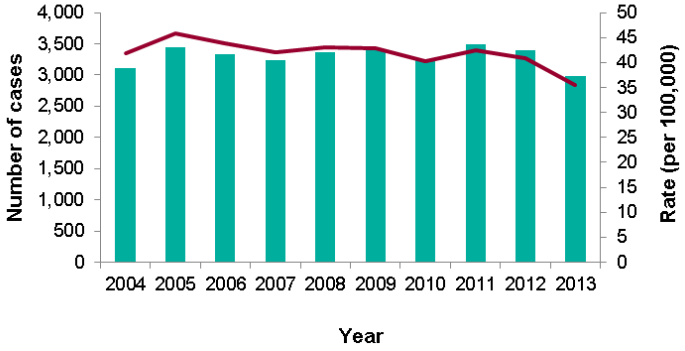
Greater Manchester



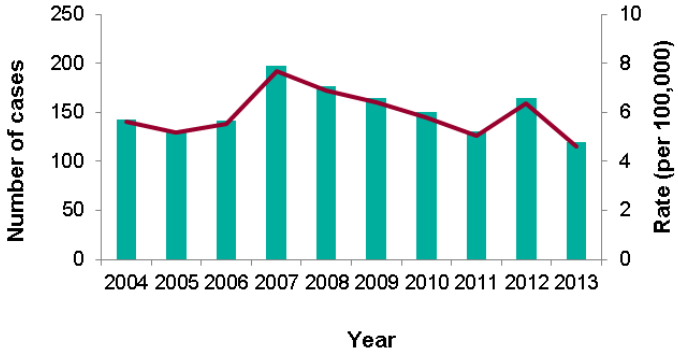
Kent, Surrey and Sussex



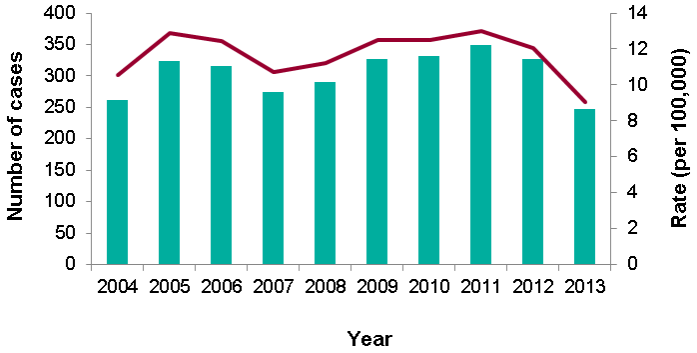
London



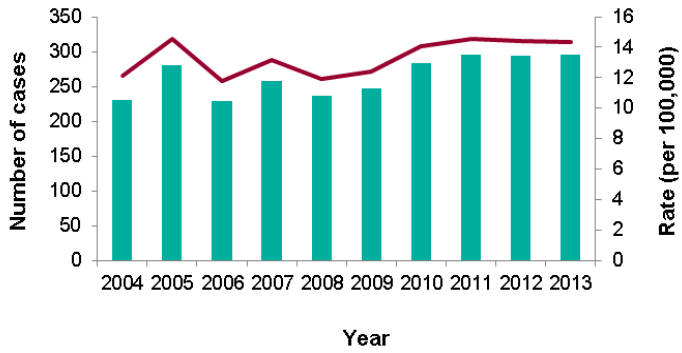
North East



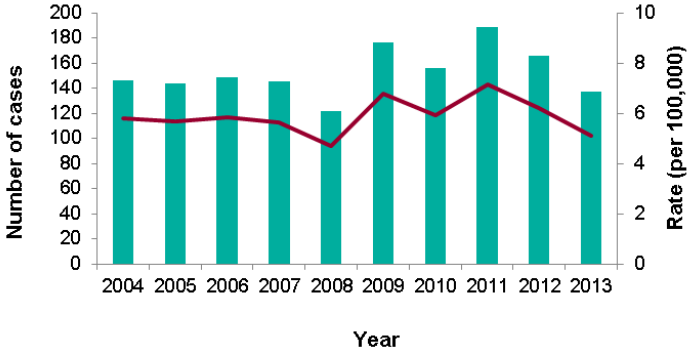
South Midlands and Hertfordshire



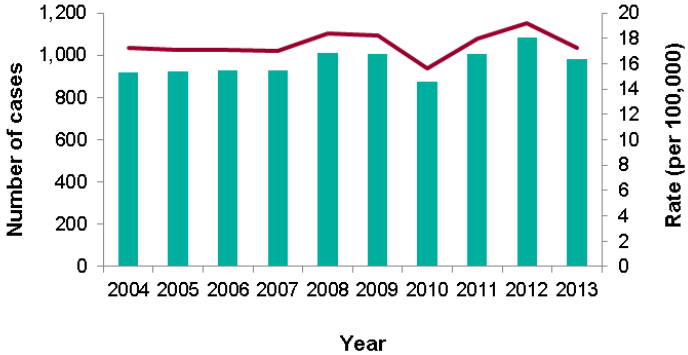
Thames Valley



Wessex



West Midlands



Yorkshire and the Humber

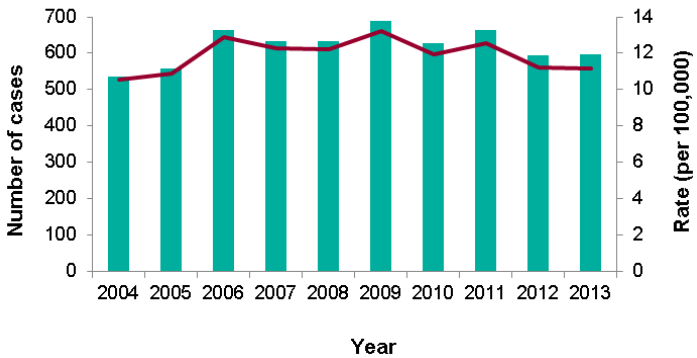
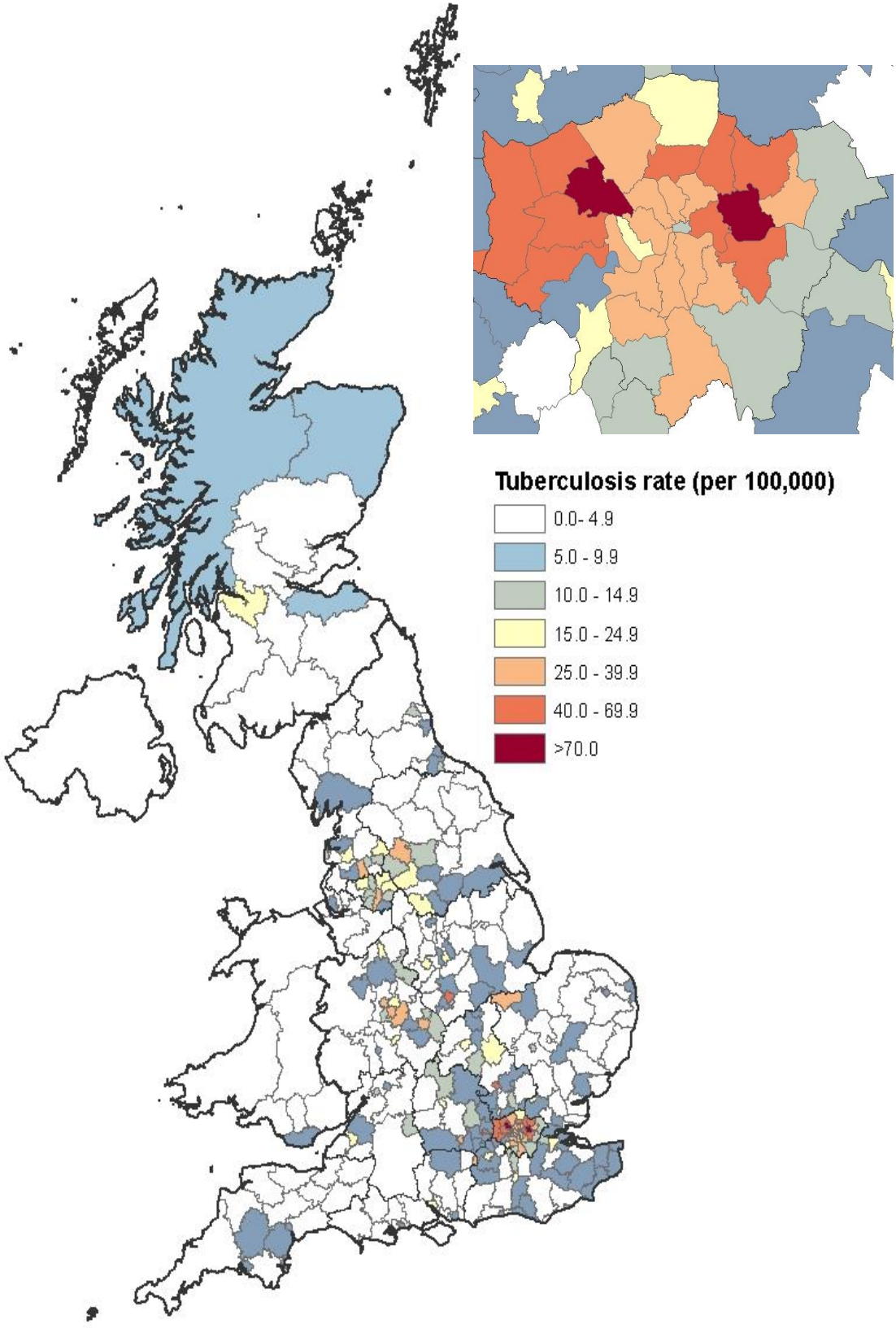


Figure 1.4: Three-year average tuberculosis rates by local authority (England), health board (Scotland and Wales) and country (Northern Ireland), UK, 2011-2013. Box shows enlarged map of London area.



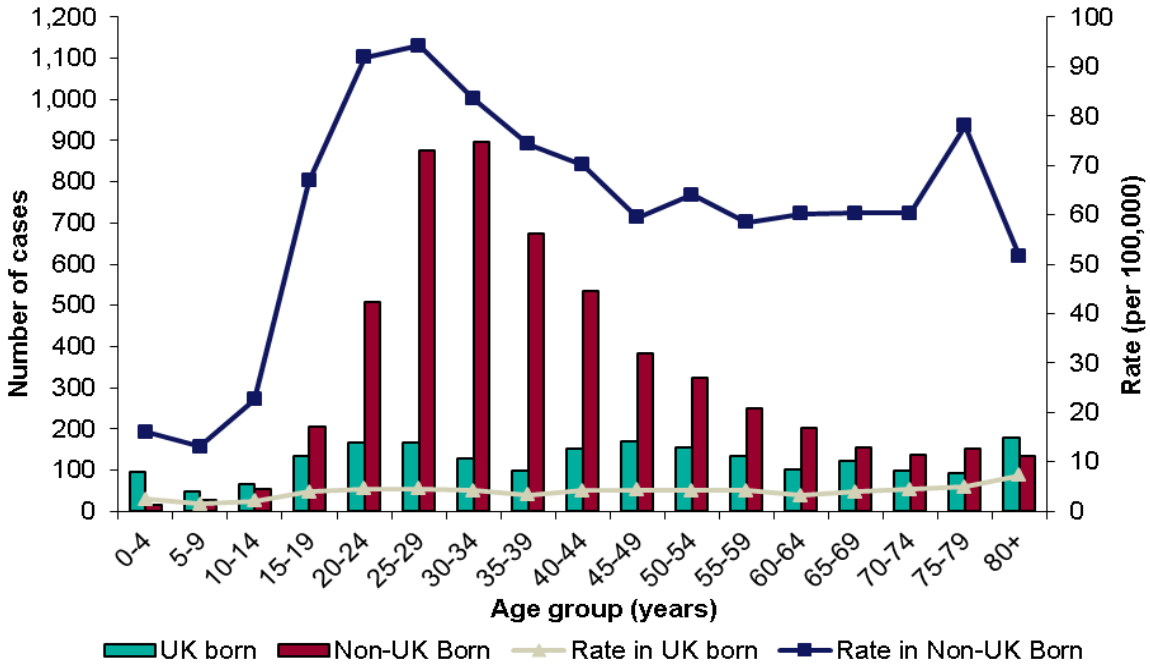
Demographic characteristics

Age and sex

In 2013, just over half of all cases were male (58%, 4,560/7,892). Nearly 60% of all cases were aged 15 to 44 years old (4,654/7,892). Patients aged 45 to 64 years accounted for 23%, and those 65 years and over for 14% of all cases. Three percent of patients were aged 5 to 14 years and 1.4% were aged less than five years. Similar to previous years, in 2013 TB rates were highest in patients aged 25 to 34 years (24.4 per 100,000, CI 23.4-25.5) (Table A1.4)).

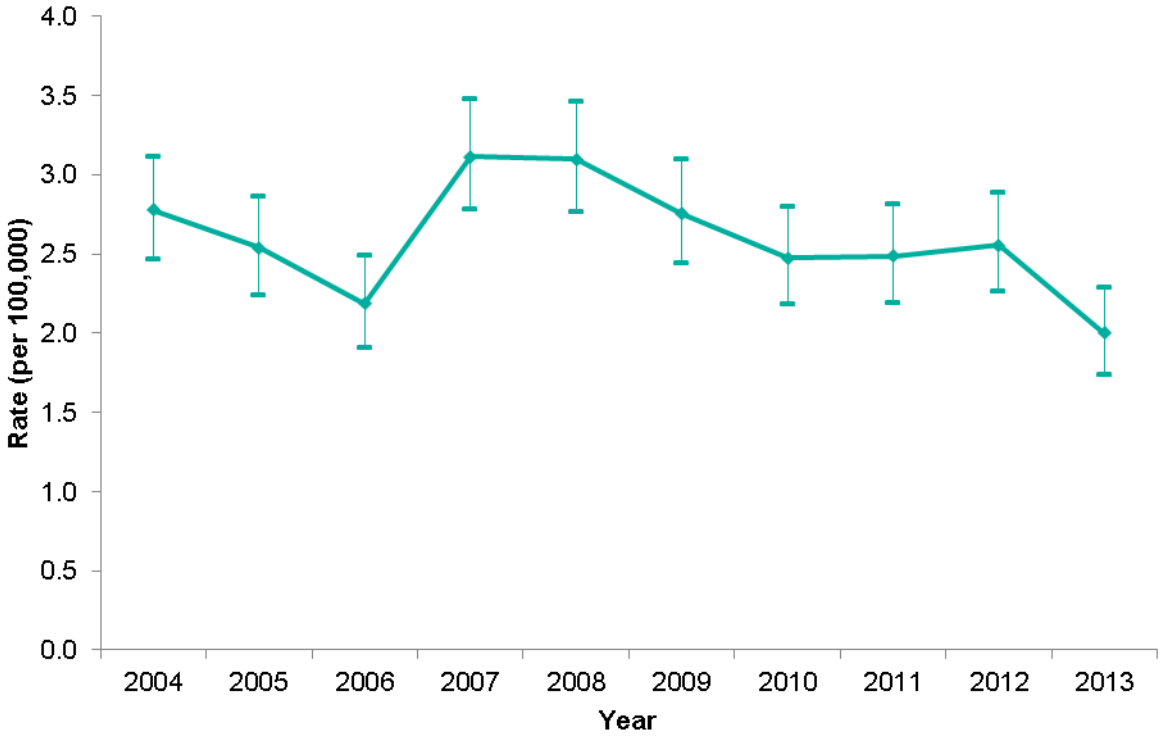
In 2013, the highest rate in the non-UK born population was in those aged 25 to 29 years (94.3 per 100,000). In contrast, in the UK born population, the highest rate was in those aged 75 years and older (6.6 per 100,000) (Figure 1.5).

Figure 1.5 Tuberculosis case reports and rates by age group and place of birth, UK, 2013



In 2013, the rate of TB in UK born children under 15 years of age, an indicator of recent transmission within the UK, was 2.0 per 100,000, a decrease since the peak of 3.1 per 100,000 in 2007 and 2008 (Figure 1.6). Similarly, the child-to-adult ratio in notification rate, another proxy for on-going transmission in a community, has declined over the past five years, down from 0.29 in 2008 to 0.20 in 2013 (Table A1.5).

Figure 1.6: Tuberculosis rate in UK born children (0 to 14 years old), UK, 2004-2013



Place of birth

Place of birth (UK born/non-UK born) was known for 97% (7,632/7,892) of cases notified in the UK in 2013. Similar to 2012, 72% (5,529/7,632) of these were born outside the UK.

In 2013, the rate of TB among the non-UK born population was 18 times higher than the rate in the UK born, at 70 per 100,000 (Figure 1.7, Table A1.1), a decline since the peak of 98 per 100,000 in 2005. The rate in the non-UK born population showed a 13.5% decline between 2012 and 2013, with a decline in the number of cases to 6,174 in 2012 and 5,529 in 2013. In contrast, the number and rate in the UK born population have not shown a decline in the past decade, with just over 2,000 cases a year, a rate of 4 per 100,000.

As in previous years, India, Pakistan and Somalia were the most common countries of origin of non-UK born cases (30%, 1,615/5,415; 20%, 1,103/5,415 and 5%, 292/5,415 respectively) (Table 1.1).

Figure 1.7: Tuberculosis case reports and rates by place of birth, UK, 2004-2013

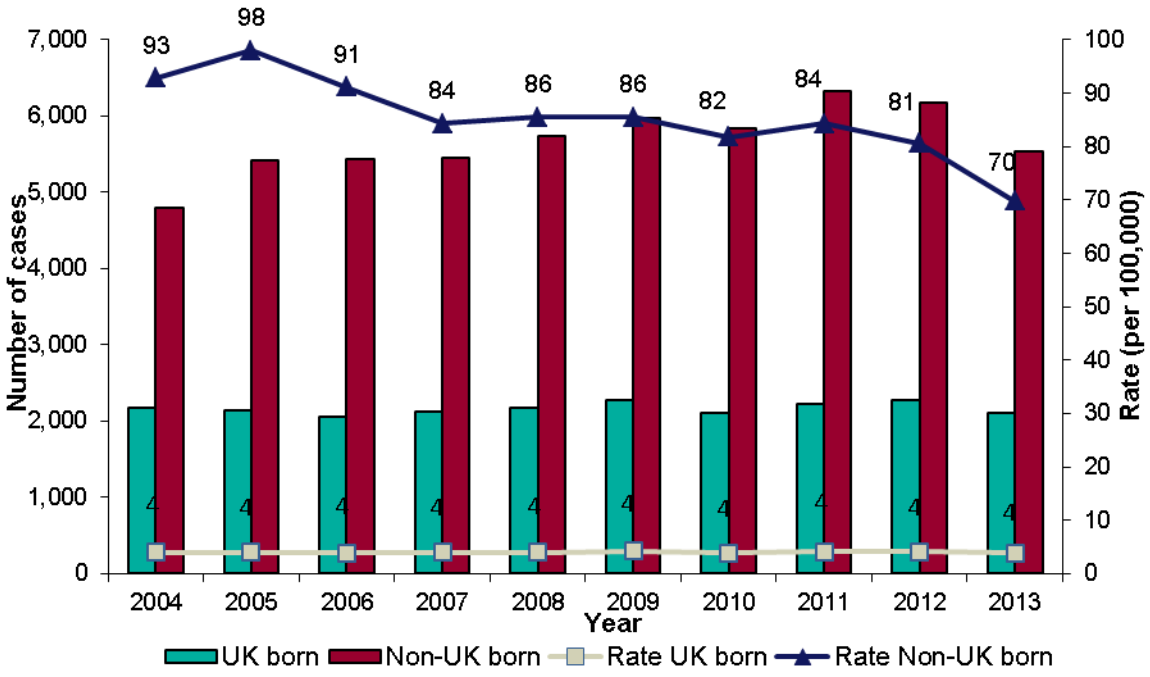


Table 1.1 Most frequent countries of birth for non-UK born tuberculosis cases and time since entry to the UK to tuberculosis diagnosis, UK, 2013

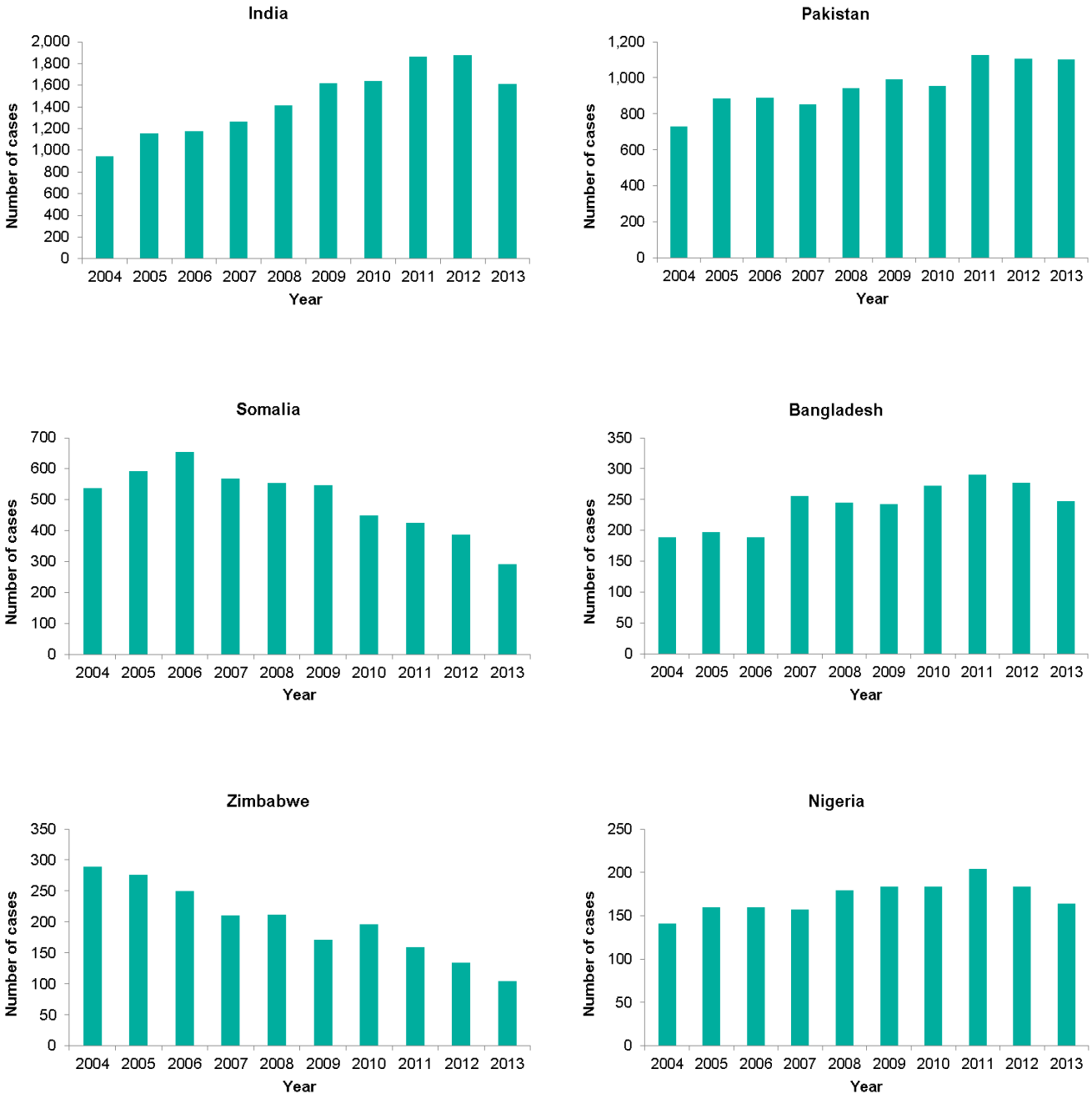
Country of birth	Number of cases	Percentage of cases*	Median time since entry to UK (IQR)**
India	1,615	29.8	5 (2 -13)
Pakistan	1,103	20.4	7 (2 -22)
Somalia	292	5.4	9 (4 -13)
Bangladesh	248	4.6	7 (3 -18)
Nepal	170	3.1	3 (2 -6)
Nigeria	164	3.0	7 (3 -11)
Philippines	136	2.5	8 (5 -12)
Zimbabwe	105	1.9	11 (7 -12)
Sri Lanka	95	1.8	7 (3 -13)
Kenya	84	1.6	22 (8 -37)
Romania	70	1.3	2 (0 -4)
Afghanistan	67	1.2	6 (2 -11)
Poland	66	1.2	5 (2 -7.5)
Eritrea	62	1.1	4 (2 -7)
China	56	1.0	7 (4 -11)
Others (each <1%)	1,082	20.0	5 (1 -13)
Total*	**5,415**	**100**	**7 (3 -14)**

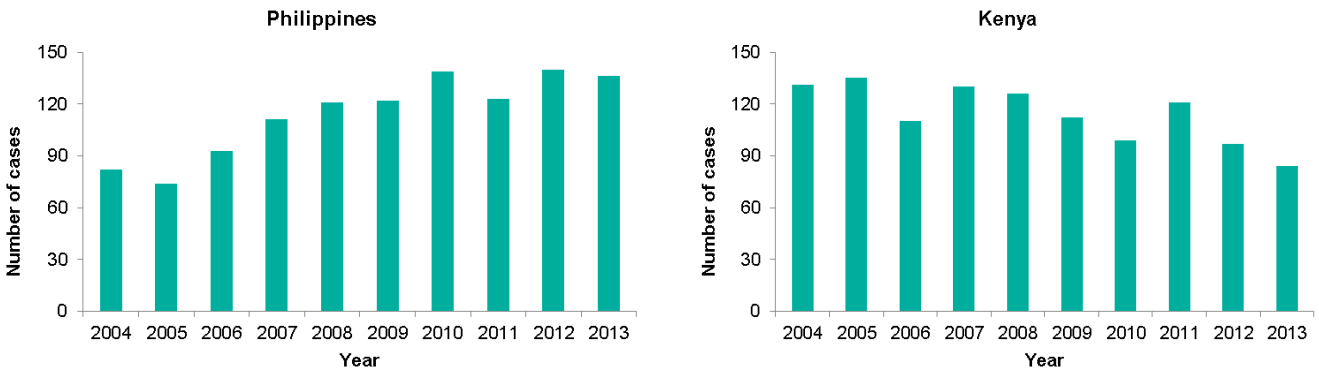
*Where country of birth was known
**Years, IQR refers to interquartile range

Trends in number of TB cases by country of birth

Figure 1.8 shows the trends in TB cases reports by the top eight countries of birth of non-UK born cases over the past decade. The number of cases born in Indian, Pakistan, Bangladesh and Nigeria increased between 2004-2011, but has shown a small decline in the past year (India) or two years (Bangladesh, Pakistan, Nigeria). The number of cases born in Zimbabwe has shown a marked decline over the past decade, and the number of cases born in Somalia has shown a marked decline since a peak in 2006.

Figure 1.8 Trend in tuberculosis case reports by country of birth of non-UK born cases, UK, 2004-2013

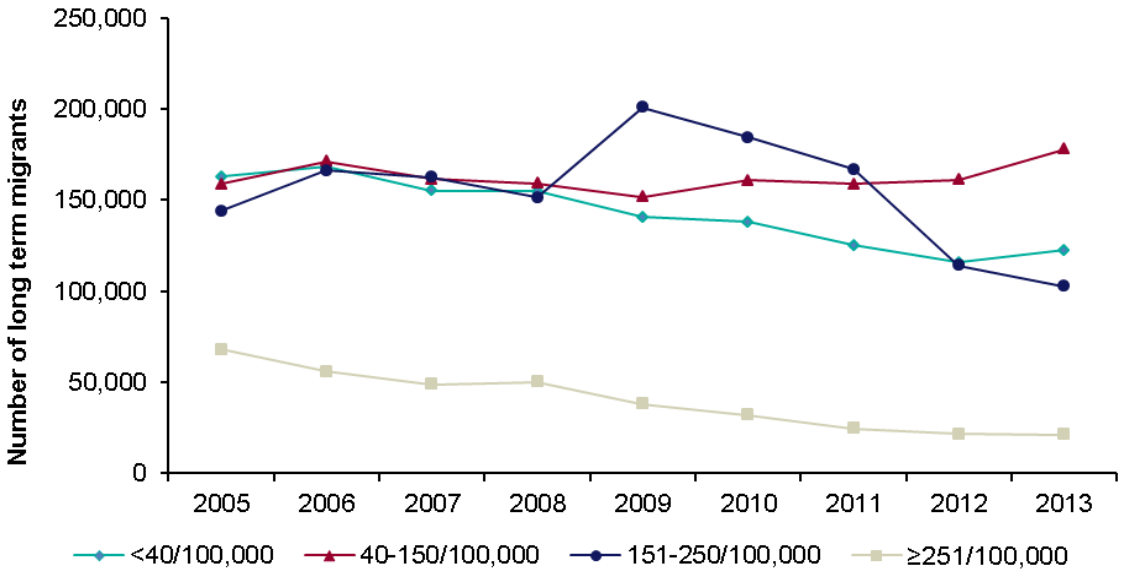




Trends in migration from high TB burden countries

Trends in the number of TB cases in the non-UK born population should be interpreted in the context of trends in migration. Figure 1.9 shows the number of long-term migrants requiring a visa to enter the UK[1] between 2005 and 2013, stratified by TB incidence in their country of birth. In the past decade, the number of long term migrants from countries with a very high TB incidence (>250 per 100,000) has decreased by 68%, and since 2009 the number of long term migrants from countries with a high TB incidence (151-250 per 100,000) has decreased by almost half (49%). Since 2009, numbers of migrants from medium TB incidence countries (40-150 per 100,000) has shown a small increase (11%).

Figure 1.9: Number of long term migrants (>6 months) to the UK, stratified by 2012 WHO TB incidence estimates in their country of birth, 2005 to 2013



[1] Person issued with an entry clearance visa to stay in the UK for longer than 6 months. Does not include migrants from EU countries that do not require a visa to enter the UK, (source: Home Office Statistics).

Pre-entry screening for active tuberculosis

Trends in numbers of TB in the non-UK born population should be also be interpreted in the context of changes to pre-entry screening policies. Since 2005, the UK has collaborated with the International Organisation of Migration to pilot pre-entry screening of long term migrants to the UK for active pulmonary TB in 15 high TB incidence countries[2], and from autumn 2012, pre-entry screening was rolled out to all high incidence countries (>40/100,000) [1]. Figure 1.10 shows the number and rate of TB detected in high incidence countries through pre-entry screening by year. The number of cases of TB detected by pre-entry screening increased in 2013, to 130 cases, and rates have increased from 45 per 100,000 in 2006 to 188 per 100,000 in 2013.

Figure 1.10: Number and rate of TB cases detected in high incidence countries through the UK pre-entry screening programme, 2006 to 2013[3]

Time since entry to the UK

In 2013, the time between entry to the UK and TB diagnosis was known for 91% (5,012/5,529) of non-UK born cases. Of these, 15% (738) were diagnosed within two years and 44% (2,213) within five years of entering the UK (Figure 1.11).

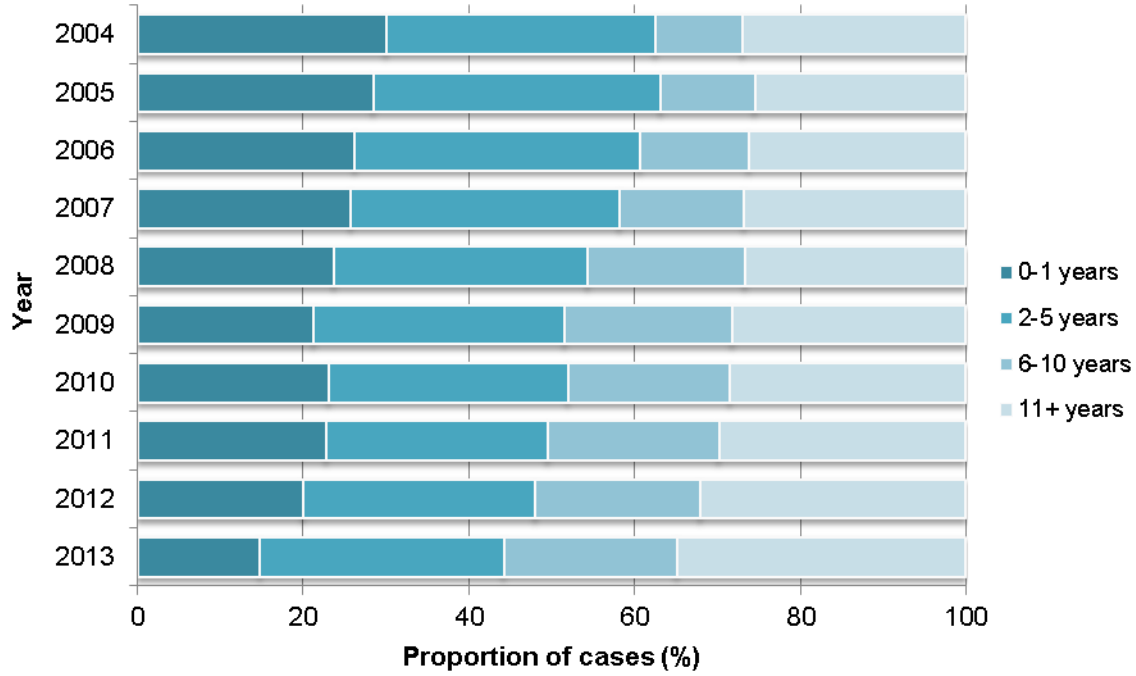
[2] The 15 high incidence countries were Bangladesh, Burkina Faso, Cambodia, Cote d'Ivoire, Eritrea, Ghana, Kenya, Laos, Niger, Pakistan, Somalia, Sudan, Tanzania, Thailand and Togo.

[3] For countries that only became part of pre-entry screening during the global roll-out in 2012-13, there is a possibility of under-ascertainment, as clinics were establishing reporting systems during this transition phase

In recent years a smaller proportion of cases have been diagnosed within two years of entering the UK, while an increasingly larger proportion of patients have been diagnosed after six years, and after ten years of entering the UK (Figure 1.11).

Cases born in Kenya had the longest median time between entry to the UK and TB diagnosis (22 years; interquartile range (IQR): 8-37 years), followed by cases born in Zimbabwe (11 years; IQR: 7-12 years); cases born in Romania had the lowest time since entry to the UK and TB diagnosis (2 years; IQR: 0-4 years) (Table 1.1).

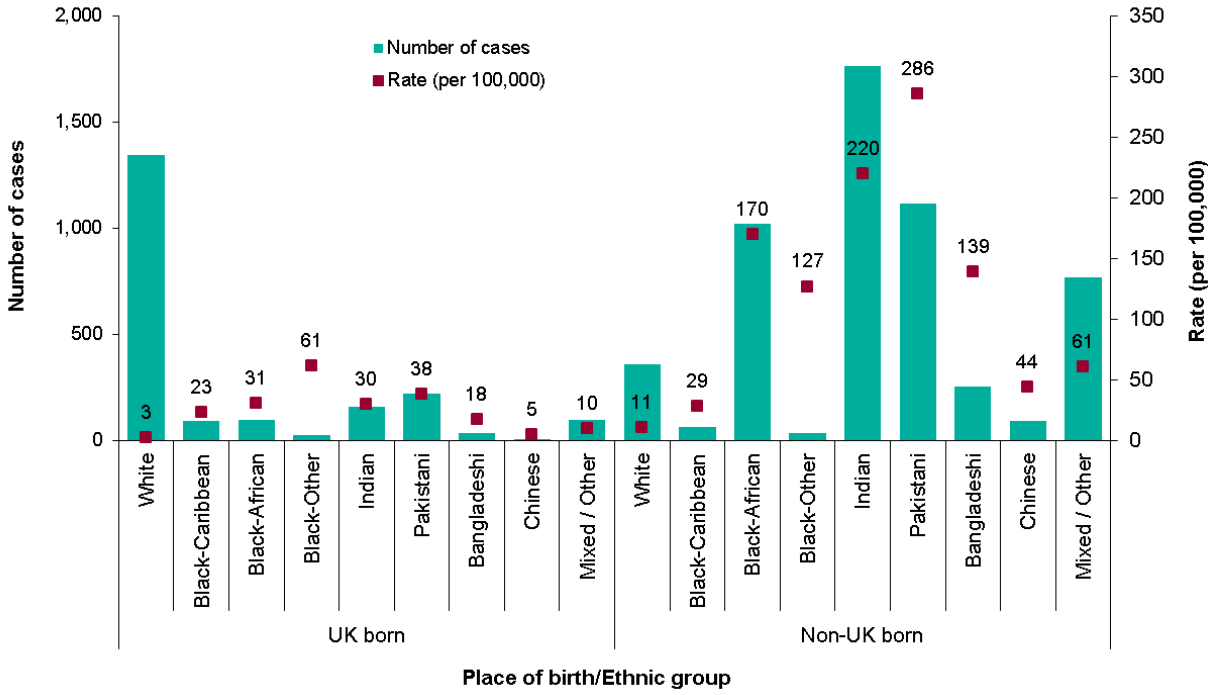
Figure 1.11: Time between entry to the UK and TB diagnosis for non-UK born tuberculosis cases by year, UK, 2004-2013



Ethnic group

Information on ethnic group was available for 98% of cases notified in 2013 (7,714/7,892). The largest proportions of cases were from the Indian (25% 1,959/7,714), White (23%, 1,770) and Pakistani (18%, 1,372) ethnic groups. The highest rates were in the Indian, Black-African and Pakistani ethnic groups (132, 123 and 114 per 100,000 respectively), although rates in all three of these ethnic groups declined compared to 2012 (156, 147 and 132 respectively). In the Black-African ethnic group, the rates have been in sustained decline over the past decade. In 2013, the highest rates among the non-UK born were in the Pakistani, Indian and Black-African ethnic groups (286, 220 and 170 per 100,000 respectively) (Figure 1.12).

Figure 1.12: Tuberculosis case reports and rates by place of birth and ethnic group, UK 2013[4]



In 2013, the majority of cases aged 0 to 14 years were born in the UK (69%, 209/305), with little change over the past ten years. The largest proportions of children in this age group were from the Black-African (23%, 72/312), White (21%, 65) and Pakistani (17%, 52) ethnic groups. Among UK born children the highest rates were in the Black-African and Indian ethnic groups (12 and 11 per 100,000 respectively).

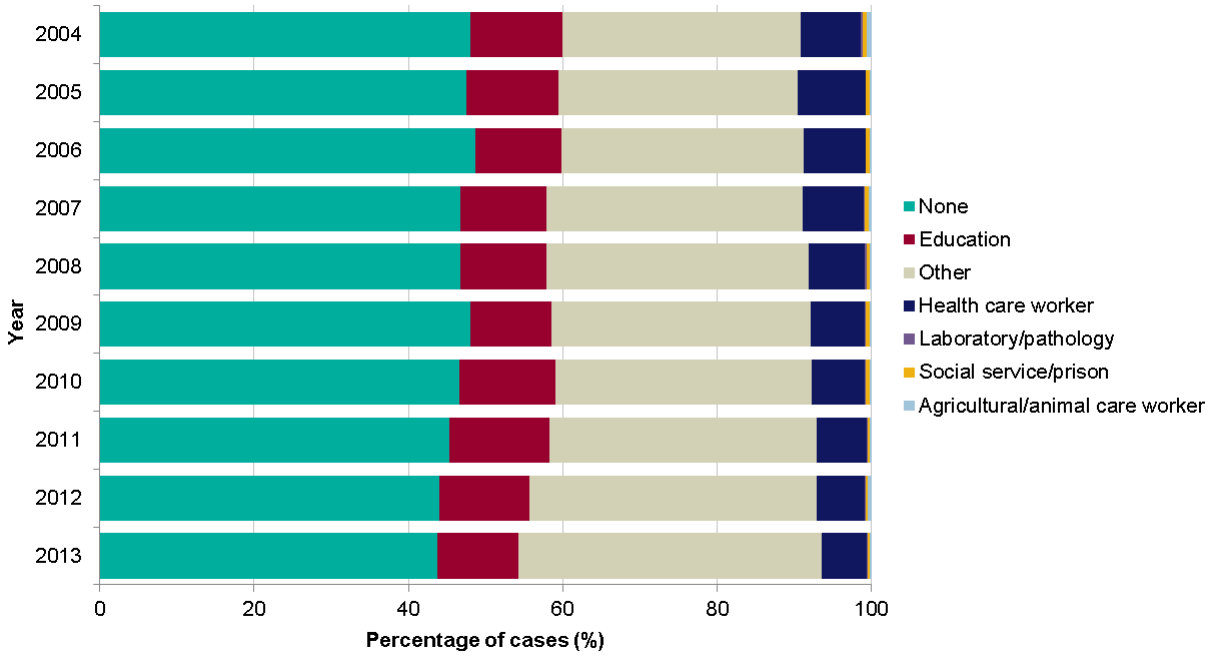
Socioeconomic characteristics

Occupation

Nearly half (44%, 3,004/6,869) of TB cases aged 16 years and over in 2013 with known occupational status were not in employment; 11% (726) were either studying or working in education, 6% (398) were health-care workers, and the remaining cases (40%, 2,741) had other occupations. The distribution of TB cases across these occupational categories has remained fairly stable over the last decade, with a slight drop in the proportion of those not in employment (Figure 1.13).

[4] Rates calculated using 2010 LFS data.

Figure 1.13: Proportion of cases by occupational category, UK, 2004-2013



Social risk factors

Among cases with known information, 3.2% (227/7,007) had a current or history of problem drug misuse, 3.9% (272/6,987) of alcohol misuse/abuse, 3.3% (231/7,067) of homelessness and 2.9% (200/6,885) of imprisonment. Eighty one percent of cases (162/200) who had a current or history of imprisonment were reported to be in prison in the UK at diagnosis or previously. A total of 9.6% of cases (642/6,682) had at least one of these social risk factors, a third of whom (203/642) had more than one risk factor.

Similarly to previous years, in 2013 a higher proportion of UK born cases had at least one social risk factor compared to non-UK born cases (17% versus 7%). Nearly half of cases with at least one social risk factor were from the White ethnic group (47%, 301/635), and 16% (101) were Black-African. Among UK born cases, the highest proportions of cases with at least one social risk factors were among Black-Caribbean (34%, 27/80) and White (20%, 220/1,080) patients.

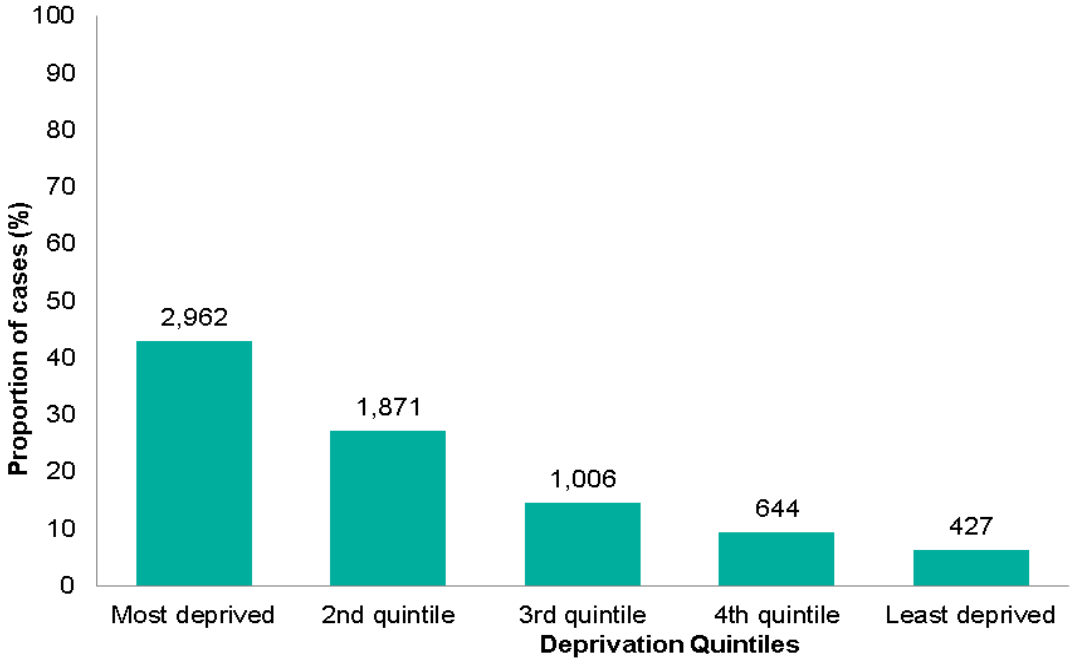
Among those born abroad, the most common countries of birth of patients with at least one social risk factor were India (11.9%, 39/328), Pakistan (11.0%, 36/328), Somalia (10.1%, 33/328) and Poland (6.1%, 20/328).

Nearly 60% (373/642) of cases with at least one social risk factor were aged 15 to 44 years, and the majority were male (81.2%, 521/642).

Area-level deprivation

Based on the Index of Multiple Deprivation (IMD 2010), over 70% of TB cases were resident in areas in the two most deprived quintiles in England (Figure 1.14)[5].

Figure 1.14: Proportion of tuberculosis cases by deprivation quintile, England, 2013



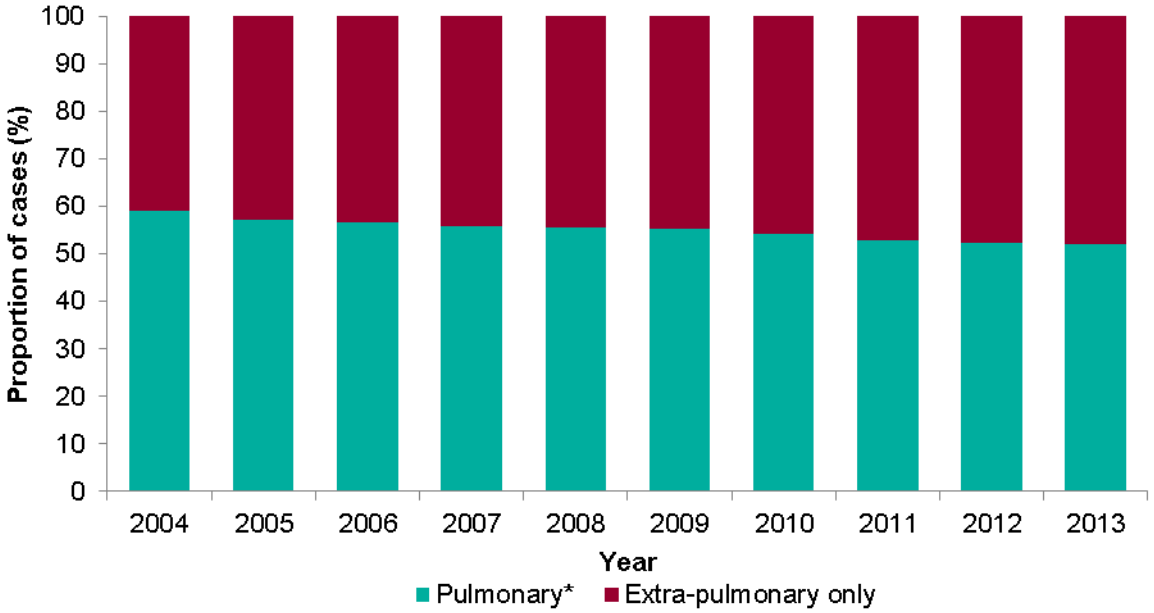
Clinical characteristics

Site of disease

Just over half of TB cases notified in 2013 where site of disease was known had pulmonary disease (52%, 4,096/7,855) (Table 1.2). Over one in five cases (959) with pulmonary disease were also reported to have extra-pulmonary disease in at least one additional site. Pulmonary disease was also the most common clinical presentation for cases aged 0 to 14 years (60%, 192/319). The proportion of cases with extra-pulmonary disease has increased slightly over the last decade from 40.9% to 47.9% (Figure 1.15, Table A1.6).

[5] The IMD 2010, part of the English Indices of Deprivation, is an overall measure of multiple deprivation experienced by people living in an area. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf]

Figure 1.15: Proportion of pulmonary/extra-pulmonary tuberculosis cases, UK, 2004-2013



* With or without extra-pulmonary disease

Table 1.2: Tuberculosis case reports by site of disease, UK, 2013

Site of disease*	Number of cases	Percentage**
Pulmonary	4,096	52.1
Extra-thoracic lymph nodes	1,874	23.9
Unknown extra-pulmonary	931	11.9
Intra-thoracic lymph nodes	916	11.7
Pleural	673	8.6
Other extra-pulmonary	689	8.8
Gastrointestinal	432	5.5
Bone – spine	353	4.5
Bone – other	220	0.5
Miliary±	211	2.8
CNS – meningitis	172	2.7
Genitourinary	145	2.2
CNS – other	129	1.8
Cryptic	39	1.6
Laryngeal	19	0.2

*With or without disease at another site
**Percentage of cases with known sites of disease (7,855)
± For Scotland cases, this includes both cryptic and miliary site
CNS - Central Nervous System
Total percentage exceeds 100% due to disease at more than one site

Of cases with at least one social risk factor, the majority had pulmonary disease (78%, 500/642); of these 58% (237/412) for whom a sputum smear result was available were sputum smear positive.

Planned course of treatment and directly observed therapy

Data on the planned course of treatment were known for 53% of cases (4,167/7,892) notified in 2013; 92% (3,839) of these were planned to start on a standard six month course of treatment.

Information on whether a patient received directly observed therapy (DOT)6 was known for 93% of cases (7,325/7,892); of these 10% (734) were reported to have received DOT treatment. Twenty four percent (71/293) of children aged 0 to 14 years received DOT. Only 48% (295/611) of cases with at least one social risk factor received DOT, compared to 93% (28/30) of cases who were in prison at diagnosis.

Previous diagnosis of tuberculosis

Information on previous history of TB was available for 95% (7,509/7,892) of cases recorded in 2013; of these 7% (508) had a previous diagnosis of TB more than 12 months previously. Among cases known to have a previous diagnosis of TB, 24% (117/479) received DOT. Just above 10% (64/615) of cases with at least one social risk factor were reported to have a previous history of TB.

Hospital inpatient

Information on whether cases were hospital inpatients at diagnosis was available for 96% of cases (7,568/7,892); of these 28% (2,115/7,568) were hospital inpatients at diagnosis, half the proportion reported to be hospital inpatients in 2004.

BCG vaccination

In 2013, data on BCG vaccination status were available for 70% of cases (5,552/7,892); 71% (3,941) of these had previously received BCG vaccination. Almost three-quarters of cases aged 0 to 14 years had received BCG vaccination (74%, 211/284); the proportion of children who had received BCG vaccination was higher in non-UK born children (80%, 63/79) than in UK born children (72%,141/195). A similar pattern could be observed among children less than 5 years of age, where the proportion of children who had received BCG vaccination was 85% in non-UK born (11/13) compared with 74% for UK born children (64/86).

[6] In the Enhanced TB Surveillance system (ETS), the relevant variable is "Patient to begin a course of treatment under direct observation"; in the London TB Register (LTBR) the relevant variable is "Patient was taking Directly Observed Therapy at any time during the episode of care".

HIV testing

In 2013, information on HIV testing was known for 81% of cases whose HIV status was not previously known (6,205/7,616). Of these, 88.5% of cases (5,490) were offered and received HIV testing, 6.8% of cases (424) were not offered testing, and 4.7% (291) were offered HIV testing but did not receive it, of which 1.7% (106) declined. A high proportion of children aged 0 to 14 years old were not offered HIV testing (35%, 78/221. Data on HIV status is not collected in the surveillance system. Information on the proportion of TB cases aged 15 years and older with HIV is obtained by record linkage between the national TB and HIV datasets. For 2012 data, this information will be available later in the year after record linkage has been completed.

Time from symptom onset to TB treatment start for pulmonary TB cases

In 2013, information on time from symptom onset to TB treatment start was available for 73% of pulmonary patients (3,009/4,096), with a median time between onset of symptoms to TB treatment start of 72 days (interquartile range (IQR) 36-132). Forty one percent (1,235/3,009) of patients started treatment within two months and 72% (2,153) within four months of symptom onset. Data on the time from symptom onset to TB treatment start has been available for more than two thirds of patients since 2011 only. The proportion of patients who started treatment within two months (2011: 48.1%, 2013: 41.0%) and four months (2011: 75.5%, 2013: 71.6%) of symptom onset has decreased over the last three years, with a greater proportion of patients experiencing longer delays.

The proportion of cases who experienced a delay from onset of symptoms to start of treatment of at least four months increased with age (0-14: 15.4%, 15-44: 24.9%, 45-64: 33.2%, over 65: 38.6%).

The proportion of cases who had a delay of greater than four months was similar for those with at least one social risk factor (28%, 106/374) and for those without social risk factors (29%, 693/2,375).

2. Microscopy, culture confirmation, speciation and drug susceptibility, 2004-2013

Key messages

- the proportion of cases resistant to isoniazid has fluctuated over the past decade, and remains at the same level in 2013 as in 2004
- isoniazid resistance was most common in those with a previous history of TB or social risk factors, in particular those reporting drug misuse or imprisonment
- the proportion of cases with MDR-TB has remained stable at 1.6% over the past 3 years
- the majority of cases with MDR-TB (87.3%) were born outside the UK; the highest number of cases were from India, Pakistan and Somalia, and the highest proportions were in those from the Ukraine, Lithuania, Latvia and Sierra Leone
- the majority of MDR-TB cases with resistance to an injectable agent were born in EU/EEA countries (58.3%)
- the majority of MDR-TB cases with resistance to a fluoroquinolone were born in countries outside the EU/EEA (72.7%)

Culture and species identification

Of all TB cases notified in 2013, 59.3% (4,680/7,892) were culture confirmed. In the UK, the proportion of culture confirmed cases was highest in Northern Ireland (61.6%, 45/73) and Scotland (61.2%, 238/389). In England culture confirmation was highest in the North East of England (74.2%, 89/120) and lowest in Avon, Gloucestershire and Wiltshire (50.5%, 111/220) (Table A2.1).

A higher proportion of pulmonary cases were culture confirmed compared to extra-pulmonary cases (71.3%, 2,920/4,096 versus 46.8%, 1,759/3,759) (Table A2.2).

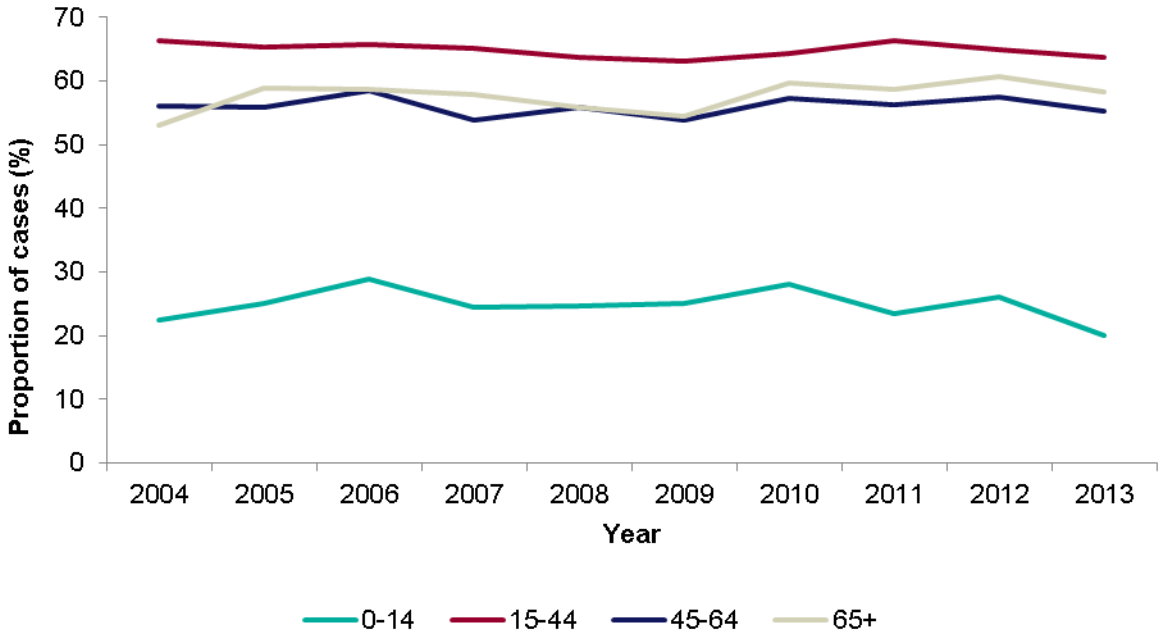
Over the last decade, the proportion of TB cases that were culture confirmed in the UK remained relatively stable, although there was a decline in Scotland from 77.0% (302/392) in 2004 to 61.2% (238/389) in 2013. The proportion of culture confirmed cases in 0-14 year olds was consistently two to three times lower (range 20-29%) than in 15-44 year olds (range 63-66%) (Figure 2.1).

Among all culture confirmed cases notified in 2013, 97.5% (4,563/4,680) were identified with *Mycobacterium tuberculosis* (*M.tuberculosis*) infection, 0.6% (29/4,680) with *Mycobacterium bovis* (*M.bovis*), 1.4% (63/4,680) with *Mycobacterium africanum* (*M.africanum*) and 0.5% (25/4,680) with *Mycobacterium tuberculosis* complex (MTBC) bacteria which were not further differentiated. There were no cases of *Mycobacterium microti*. The apparent decrease in the

proportion of cases with *M. tuberculosis*, and parallel increase in those with with MTBC between 2009 and 2013 (Table A2.3) reflects the fact that prior to 2009 the majority of MTBC cases were reclassified as *M. tuberculosis*.

The increase in the proportion of *M. africanum* cases from 0.1% in 2004 to 0.3% in 2006 and a further increase to 1.4% in 2011 can be explained by improvements in speciation techniques such as the introduction of molecular probes in 2006 and Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR) in 2010. The proportion of *M. bovis* cases remained relatively stable over time. There were only 4 cases of confirmed *M. microti* in the last 10 years.

Figure 2.1 Culture confirmation by age group, UK, 2004-2013



Drug resistance

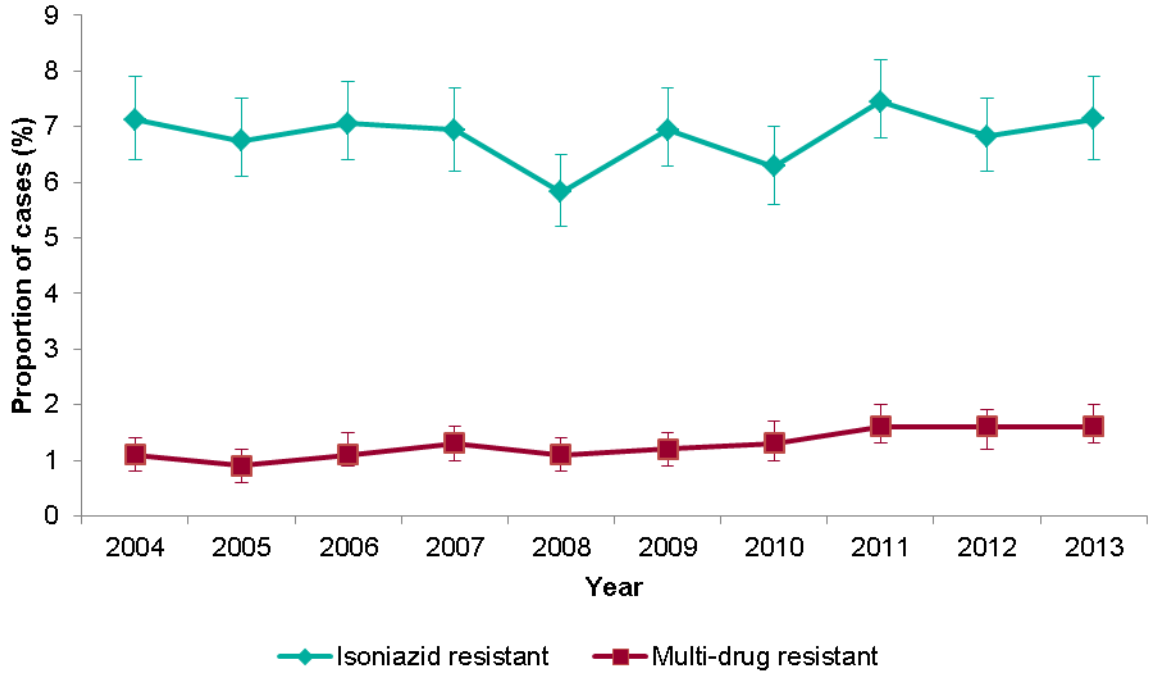
Drug susceptibility test results for at least isoniazid and rifampicin were available from the earliest TB isolate for 98.4% (4,606/4,680) of the 2013 culture-confirmed cases, similar to previous years. Of these, 7.1 % (329/4,606) were resistant to isoniazid, 1.9% (86/4,606) were resistant to rifampicin, 0.9% (43/4,606) were resistant to pyrazinamide, 0.9% (41/4,897) were resistant to ethambutol, 7.8% (360/4,606) were resistant to at least one first line antibiotic and 1.6% (74/4,606) were MDR-TB cases, with resistance to at least isoniazid and rifampicin (Table A2.4).

Isoniazid resistance

Over the past 10 years, the proportion of TB cases resistant to isoniazid fluctuated between 5.8 and 7.5% (Figure 2.2). In 2013, the proportion of cases resistant to isoniazid was slightly higher in males compared to females (7.3%, 202/2,764 versus 6.9%, 127/1,842) and in those

15-44 years old (8.1%, 238/2,931) compared to other age groups (Table 2.1). The proportion of cases resistant to isoniazid was lowest in 0-14 year olds, and decreased in this age group from 11 cases in 2012 to 1 case in 2013.

Figure 2.2: Proportion of tuberculosis cases with isoniazid resistance or MDR-TB, UK, 2004-2013



The proportion of cases with isoniazid resistance was higher in the non-UK born compared to those born in the UK (8.0%, 267/3,332 versus 4.6%, 52/1,127). Among the 10 most common countries of birth for non-UK born cases with isoniazid resistance, the highest number of cases with isoniazid resistance were in those born in India, Pakistan and Somalia, but the highest proportions of TB cases with isoniazid resistance, were in those born in Ireland, Lithuania, the Ukraine and Eritrea (Table 2.2). Half of the cases with isoniazid resistance that were born in Ireland were part of a known isoniazid resistant outbreak in London (cluster E1244: strain type 424332431515321236423-52), which predominantly involves White or Black-Caribbean UK born cases with social risk factors. In 2013, 7.3% (20/274) of all isoniazid resistant cases with a strain type were part of this cluster.

Table 2.1: Number and proportion of tuberculosis cases with drug resistance by age group, UK, 2013

Age Group	Isoniazid resistant		Multi-drug resistant		Total*
	n	%	n	%	n
0-14	1	1.6	0	0.0	62
15-44	238	8.1	61	2.1	2,931
45-65	66	6.9	11	1.1	964
65+	24	3.7	2	0.3	649

*Culture confirmed cases with DST results for at least isoniazid and rifampicin

In both UK and non-UK born cases the proportion of cases resistant to isoniazid was higher in those with a previous history of TB (UK born: 5.3%, 4/75 versus 4.7%, 47/1,008; non-UK born: 10.7%, 18/169 versus 7.9%, 241/3,052). The proportion of cases with isoniazid resistance was also higher in those with a social risk factor (current or history of drug or alcohol use, imprisonment or homelessness) compared to those known to have none of these risk factors (UK born: 7.5%, 17/227 versus 4.1%, 30/729; non-UK born: 12.8, 31/242 versus 7.4%, 195/2,629). In particular, the proportion of cases with isoniazid resistance was highest in those reporting drug misuse (15.3%, 28/183) or imprisonment (15.4%, 23/149), of which 20/23 cases had been in prison in the UK.

Table 2.2: Most frequent countries of birth of non-UK born tuberculosis cases with drug resistance, UK, 2013

Country*	Total cases**	Isoniazid resistant		Multi-drug resistant	
	n	n	%	n	%
India	966	76	7.9	23	2.4
Pakistan	631	39	6.2	5	0.8
Somalia	179	21	11.7	6	3.4
Nigeria	97	8	8.2	2	2.1
Lithuania	31	8	25.8	4	12.9
Eritrea	39	7	17.9	3	7.7
Bangladesh	140	12	8.6	1	0.7
Philippines	87	12	13.8	1	1.1
Ireland	22	6	27.3	0	0
Nepal	111	5	4.5	1	0.9
Latvia	15	4	26.7	2	13.3
Sierra Leone	15	3	20.0	2	13.3
Sudan	28	3	10.7	2	7.1
Ukraine	4	3	75.0	2	50.0

* The table shows the top ten countries of birth for the **number** of isoniazid resistant cases and MDR-TB cases in 2013. For these countries, the total number of cases and proportions with resistance are shown.
**Culture confirmed cases with DST results for at least isoniazid and rifampicin

Most frequent countries of birth for non-UK born cases with MDR-TB or isoniazid resistance

- Multi-drug and isoniazid resistant
- Isoniazid resistant only
- Multi-drug resistant only

Multi-drug resistant (MDR) TB

Between 2004 and 2011, the proportion of cases with MDR-TB increased from 1.1% (49/4,504) to 1.6% (86/5,397 cases). Since 2011 the number of cases decreased to 82 cases in 2012 and to 74 cases in 2013, but the proportion remained stable at 1.6%.

In 2013, the proportion of cases with MDR-TB was slightly higher in males compared to females (1.7%, 48/ 2,764 versus 1.4%, 26/ 1,842), and in 15 to 44 year olds (2.1%, 61/2,931) compared to other age groups (Table 2.1). There were no laboratory confirmed cases of MDR-TB in children aged 0-14 years in 2013, compared to seven cases in 2012.

The vast majority of MDR-TB cases were non-UK born (87.3%; 62/71) and had entered the UK within the past five years (61.7%, 37/60). The most frequent countries of birth of MDR-TB cases were India, Somalia and Pakistan, but the highest proportions were in the small number of cases born in Ukraine, Latvia, Lithuania and Sierra Leone (Table 2.2). The proportion of cases with MDR-TB was higher in those with a previous history of TB compared to those without (4.0%, 10/250 versus 1.4%, 59/ 4,128).

In addition to the culture confirmed MDR-TB cases, two TB cases who were not culture confirmed in the UK received MDR-TB treatment. One case was a contact of a culture confirmed MDR-TB case, and one entered the UK having been culture confirmed abroad.

Second line drug resistance and Extensively Drug Resistant (XDR) TB

Of those MDR-TB cases that were tested for all first line drugs (isoniazid, rifampicin, ethambutol and pyrazinamide), 17.4% were resistant to all four (12/69). Fifty percent (37/74) of MDR-TB cases were resistant to at least one second line drug. A high proportion (98.6%, 73/74) of MDR-TB cases were tested for at least one injectable agent (amikacin, capreomycin or kanamycin); a lower proportion (93.2%, 69/74) were tested for at least one fluoroquinolone (either ofloxacin or moxifloxacin). Of these, similar proportions were resistant to an injectable agent (16.4%, 12/73) or a fluoroquinolone (15.9%, 11/69). There were 17 MDR-TB cases resistant to at least one injectable agent OR one fluoroquinolone (pre-XDR). The majority of MDR-TB cases with resistance to an injectable agent were from countries in the EU/EEA (58.3%, 7/12) whereas the majority with fluoroquinolone resistance were from outside the EU/EEA (72.7%, 8/11).

Between 2004 and 2009, the proportion of MDR-TB cases resistant to an injectable agent increased from 2.1% to 8.6%. In 2010, there was a substantial increase to 15.9% and this higher proportion has been sustained for the past 4 years (Table 2.3). This increase was mainly due to a rise in the number and proportion of MDR-TB cases with resistance to an injectable agent born in Lithuania, from 25.0% (3/12) between 2004 and 2009 to 78.3% (18/23) between 2010 and 2013 (Table 2.4).Between 2010 and 2013, at least half of the MDR-TB cases born in Latvia or China also had resistance to an injectable agent. All MDR-TB cases from the Russian Federation in this time period were resistant to an injectable agent. Despite an increase in the number of MDR-TB cases from Romania in the past four years, the proportion with resistance to an injectable agent (20%) has not increased.

Table 2.3: MDR-TB cases with resistance to an injectable agent or a fluoroquinolone, UK, 2004-2013

Year	MDR-TB cases	Tested for at least one injectable		Resistant to an injectable		Tested for at least one fluoroquinolone		Resistant to a fluoroquinolone	
	n	n	%	n	%	n	%	n	%
2004	49	48	98.0	1	2.1	0	0.0	0	0.0
2005	43	42	97.7	0	0.0	1	2.3	0	0.0
2006	58	58	100.0	3	5.2	1	1.7	0	0.0
2007	62	56	90.3	3	5.4	25	40.3	3	12.0
2008	55	52	94.5	4	7.7	45	81.8	10	22.2
2009	61	58	95.1	5	8.6	53	86.9	7	13.2
2010	67	63	94.0	10	15.9	61	91.0	10	16.4
2011	86	85	98.8	16	18.8	83	96.5	20	24.1
2012	82	81	98.8	16	19.8	79	96.3	4	5.1
2013	74	73	98.6	12	16.4	69	93.2	11	15.9

Testing for fluoroquinolone resistance in MDR-TB cases did not exceed 90% until 2010, so it is unclear whether there has been an increase in fluoroquinolone resistance over time (Table 2.3). Between 2010 and 2013, the number and proportion of cases with fluoroquinolone resistance have fluctuated; the majority of all MDR-TB cases with fluoroquinolone resistance over this time period were born in India (45.5%, 20/44).

There were three cases of XDR-TB in 2013, similar to the two to three cases notified each year between 2008 and 2012, with the exception of 2011 when there were six cases. Prior to 2008, there were no notified cases of XDR-TB in the UK. The majority of XDR-TB cases between 2008 and 2013 were born in Lithuania (47.4%, 9/19).

Table 2.4: The number and proportion of MDR-TB cases resistant to at least one injectable agent by most frequent country of birth, 2010-2013

Country of birth*	MDR-TB Cases	Injectable resistance	
	n	n	%
Lithuania	23	18	78.3
United Kingdom	34	6	17.6
India	92	6	6.5
Latvia	8	5	62.5
Russian Federation	4	4	100.0
Romania	10	2	20.0
China	4	2	50.0

*Countries of birth for MDR-TB cases are included if more than one MDR-TB case was notified

Amplification of drug resistance on repeat culture

In 2013, 0.2% (9/4,606) of culture confirmed cases with initial drug susceptibility test results for at least isoniazid and rifampicin were identified as having amplified resistance on repeat culture. There were no amplified MDR-TB or rifampicin resistant TB cases, although since many cases diagnosed in 2013 are still on treatment some of these may amplify resistance in the future.

Between 2004 and 2013 there were 121 cases of amplified resistance, of which 31.4% (38 cases) amplified rifampicin resistance and of these the majority (34 cases) amplified to MDR-TB (Table 2.5). The average number of cases amplifying MDR-TB per year decreased over time from five cases between 2004-2008 compared to two cases between 2009 and 2013. For those with a treatment start date recorded (31 cases), the median time for MDR amplification after starting treatment was 249 days (range 19-1092).

Six percent (36/637) of MDR-TB cases notified between 2004 and 2013 amplified further resistance in subsequent cultures taken during treatment. Further resistance most commonly developed to Ethionamide (12 cases), Ethambutol (11 cases) and Pyrazinamide (10 cases). Over the past decade, only one case has amplified to XDR-TB.

Table 2.5: Number of TB cases with initial and amplified rifampicin resistance and MDR-TB, UK, 2004-2013

	Rifampicin resistance			MDR-TB			
Year	Initial resistance	Amplified resistance*	Total	Initial resistance	Amplified resistance*	Treated as an MDR-TB case*^	Total
2004	66	7	73	49	6	0	55
2005	59	3	62	43	2	0	45
2006	79	5	84	58	5	1	64
2007	76	7	83	62	5	1	68
2008	74	4	78	55	6	0	61
2009	73	3	76	61	2	0	63
2010	77	3	80	67	2	0	69
2011	95	3	98	86	3	0	89
2012	92	3	95	82	3	4	89
2013	86	0	86	74	0	2	76

*Excludes Scotland
^ Not culture confirmed

TB isolates not matched to notified cases

The PHE Tuberculosis Surveillance Unit receives data from the mycobacterial reference laboratories in England, Wales and Northern Ireland on all laboratory confirmed TB isolates, including speciation, drug resistance and MIRU-VNTR strain type, and matches this data with

notified cases. The number and proportion of isolates that failed to match to a notified cases in the same calendar year, or the preceding or subsequent year, have decreased over the last decade from 550 isolates (12.7%) in 2004 to 185 isolates (3.7%) in 2012 (Table 2.6). In 2013, isolates from 420 individuals could not be matched to a case notified in 2012 or 2013. In 2010-2012, 48-58% of isolates which did not match to a notified case in the calendar year or preceding year went on to match with a case notified in the subsequent year; the number of isolates in 2013 that remain unmatched by the end of 2014 is likely to decrease by a similar proportion.

Unmatched isolates may be from TB cases that were not notified to the surveillance system or isolates may have failed to match to a notified case if personal identifiers were incomplete or inaccurate; a small number may represent contaminants.

The majority of unmatched isolates in 2013 were were *M. tuberculosis* (93.3%; 392/420), 5.2% (22/420) were MTBC, 0.7% (3/420) were *M. bovis*, 0.5% (2/420) were *M. africanum* and 0.2% (1/420) was *M. microti*. A higher proportion of unmatched isolates were not speciated (MTBC) compared with matched isolates.

Table 2.6: Unmatched isolates by specimen year, 2004-2013

Specimen date year	All isolates	Unmatched to a case within calendar year		Unmatched to a case within previous year, calendar year or subsequent year	
	n	n	%	n	%
2004	4,325	756	17.5	550	12.7
2005	4,727	771	16.3	563	11.9
2006	4,823	674	14.0	478	9.9
2007	4,664	633	13.6	431	9.2
2008	4,748	728	15.3	469	9.9
2009	4,836	610	12.6	373	7.7
2010	4,784	501	10.5	259	5.4
2011	5,257	509	9.7	214	4.1
2012	5,000	442	8.8	185	3.7
2013	4,198	420	10.0		

3. Strain typing, 2010-2013

Key messages

- in 2013, 82% of culture confirmed cases had their strains typed at 23 loci or more
- between 2010-2013, the proportion of strain typed TB cases that clustered was 53.5%
- the proportion UK born cases that clustered was higher than the proportion of non-UK born cases that clustered
- there was considerable variation in lineage by country of birth

Background

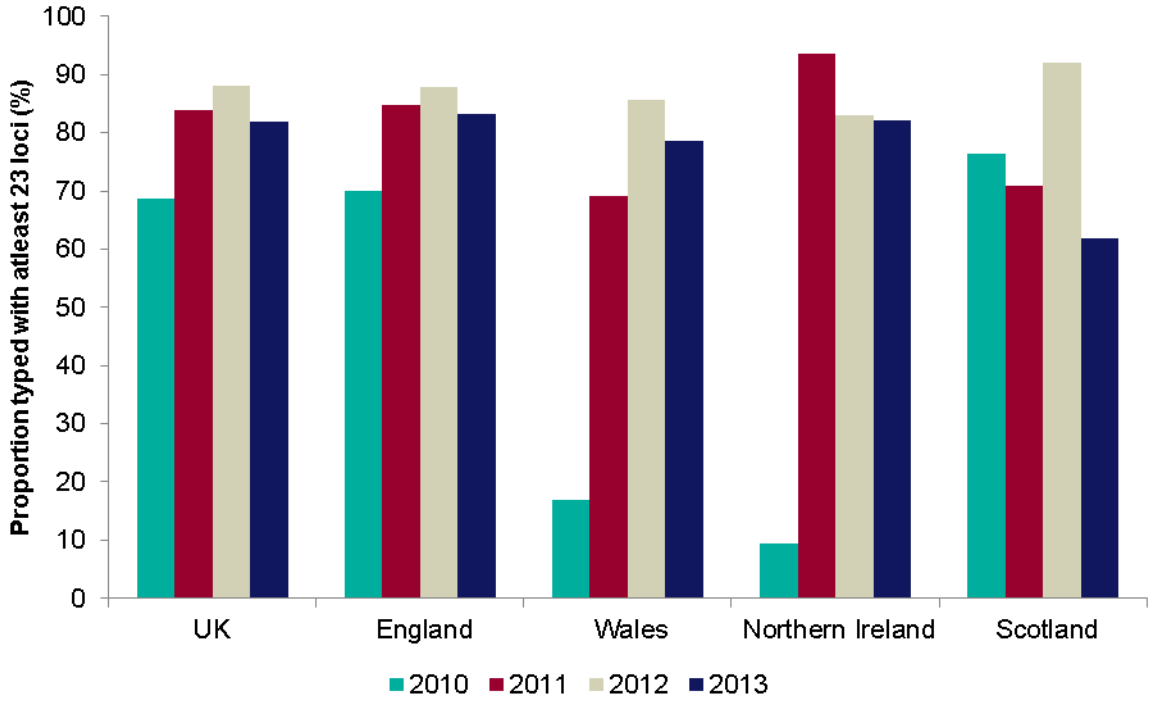
The National Strain Typing Service, which was established in 2010, involves prospectively typing TB isolates using 24 loci MIRU-VNTR. Molecular clusters of patients with indistinguishable 24 loci MIRU-VNTR profiles which fulfil certain criteria are investigated to try to identify epidemiological links and transmission settings and inform public health action [2].

Proportion of culture confirmed cases strain typed and clustered

In 2013, 98.4% (4,607/4,680) of culture confirmed cases in the UK had an isolate strain typed. Eighty two percent (3,838) of the culture confirmed cases had at least 23 loci typed, a lower proportion than in 2012. This is in part due to a decrease in Scotland, where the DNA extraction methodology was changed in 2013 (Table A3.1, Figure 3.1). Between January 2010 and December 2013, there were a total of 80.7% (16,602/20,560) isolates from culture confirmed cases on which strain typing was completed for at least 23 loci; of these 53.5% (8,890) cases were in 1,854 molecular clusters and 46.5% (7,712) cases had a unique strain type (Table 3.1).

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 the UK or abroad. In previous years, the n-1 method was used to estimate the proportion of cases likely to be due to recent transmission on the basis of the proportion of cases clustered and the number of clusters [3]. This method has some limitations and is unlikely to provide a reliable estimate of recent transmission in the UK, particularly as such a high proportion of UK TB cases are born abroad. To obtain reliable estimates of the proportion of cases due to recent transmission in the UK requires strain typing data to be combined with detailed epidemiological data on links between cases derived from cluster investigation, which is the subject of on-going work. For this reason, in this report we present data on the proportion of cases that cluster, without attempting to derive estimates of the proportion of cases due to recent transmission.

Figure 3.1 Proportion of culture confirmed cases with at least 23 loci typed by country 2010-2013



The proportion of culture confirmed cases which clustered varied by country, with lower proportions in Wales (15.9%), Northern Ireland (24.6%) and Scotland (30.8%). In England, the proportion of clustered cases was 53.3% and varied by PHEC area, with the highest proportions in London (47.6%) and the West Midlands (45.9%), and the lowest in Cheshire and Merseyside (16.2%) (Table 3.1).

Table 3.1: Number of tuberculosis clusters and proportion clustered by country and Public Health England Centre, 2010-2013

	Notified cases	Culture confirmed cases		Culture confirmed cases with a strain type*		Number of cases with a unique strain		Number of cases clustered**		Number of clusters	Number and proportion of clusters by cluster size									
											2		3		4		5-9		≥10	
	n	n	%	n	%	n	%	n	%	n	n	%	n	%	n	%	n	%	n	%
UK‡	**33,942**	**20,560**	**60.6**	**16,602**	**80.7**	**7,712**	**46.5**	**8,890**	**53.5**	**1,854**	**858**	**46.3**	**365**	**19.7**	**188**	**10.1**	**306**	**16.5**	**137**	**7.4**
Country																				
England§	31,350	18,838	60.1	15,375	81.6	7,182	46.7	8,193	53.3	1,733	813	46.9	336	19.4	183	10.6	278	16.0	123	7.1
Wales	561	390	69.5	239	61.3	201	84.1	38	15.9	16	12	75.0	3	18.8	0	0.0	1	6.3	0	0.0
Northern Ireland	287	198	69.0	130	65.7	98	75.4	32	24.6	14	11	78.6	2	14.3	1	7.1	0	0.0	0	0.0
Scotland	1,744	1,134	65.0	858	75.7	594	69.2	264	30.8	62	33	53.2	8	12.9	3	4.8	13	21.0	5	8.1
PHE Region/Centre																				
North of England	**6,177**	**3,739**	**60.5**	**2,680**	**71.7**	**1,767**	**65.9**	**913**	**34.1**	**240**	**133**	**55.4**	**47**	**19.6**	**15**	**6.3**	**33**	**13.8**	**12**	**5.0**
North East	566	401	70.8	284	70.8	218	76.8	66	23.2	22	11	50.0	6	27.3	3	13.6	2	9.1	0	0.0
Cumbria and Lancashire	798	458	57.4	309	67.5	205	66.3	104	33.7	29	13	44.8	9	31.0	2	6.9	3	10.3	2	6.9
Yorkshire and Humber	2,483	1,445	58.2	1,067	73.8	750	70.3	317	29.7	85	49	57.6	17	20.0	5	5.9	9	10.6	5	5.9
Greater Manchester	1,882	1,138	60.5	798	70.1	602	75.4	196	24.6	57	36	63.2	10	17.5	3	5.3	5	8.8	3	5.3
Cheshire and Merseyside	448	297	66.3	222	74.7	186	83.8	36	16.2	15	11	73.3	3	20.0	0	0.0	1	6.7	0	0.0
Midlands and East of England	**7,873**	**4,665**	**59.3**	**3,879**	**83.2**	**2,162**	**55.7**	**1,717**	**44.3**	**418**	**211**	**50.5**	**73**	**17.5**	**47**	**11.2**	**62**	**14.8**	**25**	**6.0**
East Midlands	1,641	964	58.7	808	83.8	548	67.8	260	32.2	77	43	55.8	15	19.5	4	5.2	11	14.3	4	5.2
West Midlands	3,943	2,279	57.8	1,898	83.3	1,026	54.1	872	45.9	202	101	50.0	37	18.3	29	14.4	22	10.9	13	6.4
Anglia and Essex	1,034	628	60.7	528	84.1	423	80.1	105	19.9	41	27	65.9	10	24.4	2	4.9	2	4.9	0	0.0
South Midlands and Hertfordshire	1,255	794	63.3	645	81.2	486	75.3	159	24.7	51	29	56.9	11	21.6	5	9.8	5	9.8	1	2.0
London	**13,118**	**7,881**	**60.1**	**6,704**	**85.1**	**3,510**	**52.4**	**3,194**	**47.6**	**767**	**389**	**50.7**	**168**	**21.9**	**65**	**8.5**	**98**	**12.8**	**47**	**6.1**
South of England	**4,179**	**2,550**	**61.0**	**2,109**	**82.7**	**1,408**	**66.8**	**701**	**33.2**	**219**	**124**	**56.6**	**46**	**21.0**	**19**	**8.7**	**23**	**10.5**	**7**	**3.2**
Sussex, Surrey and Kent	1,290	830	64.3	692	83.4	502	72.5	190	27.5	68	42	61.8	15	22.1	2	2.9	9	13.2	0	0.0
Thames Valley	1,167	704	60.3	594	84.4	458	77.1	136	22.9	52	36	69.2	9	17.3	4	7.7	3	5.8	0	0.0
Wessex	648	387	59.7	327	84.5	258	78.9	69	21.1	23	16	69.6	4	17.4	1	4.3	1	4.3	1	4.3
Devon, Cornwall and Somerset	321	206	64.2	169	82.0	125	74.0	44	26.0	12	7	58.3	2	16.7	1	8.3	1	8.3	1	8.3
Avon, Gloucestershire and Wiltshire	753	423	56.2	327	77.3	249	76.1	78	23.9	25	12	48.0	7	28.0	1	4.0	5	20.0	0	0.0

* Culture confirmed cases with a MIRU-VNTR profile with at least 23 complete loci
** Clustered cases are clustered with each other within the same geographical area
‡ The number of cases clustered in the UK is lower than the sum of all clustered cases in the four countries because it includes clusters that span more than one country. The number of clusters in the UK is higher than the sum of all clusters in the four countries because it includes clusters that span more than one country.
§ The number of clusters in England is higher than the sum of all PHEC clusters because it includes clusters that span more than PHEC

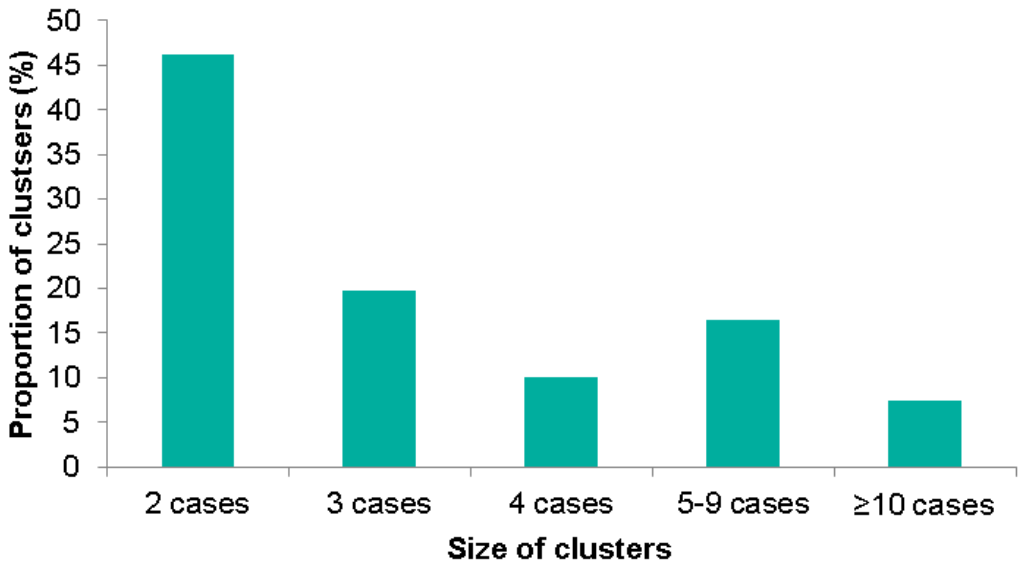
Clustering by year, 2010-2013

The proportion of cases that clustered with at least one other case within the four year period 2010-2013 was relatively stable between 2010 and 2013 (range 52.5 to 55.1) (Table A3.2). The number of new clusters that formed each year[7] was 395 in 2010, 523 in 2011, 557 in 2011 and 379 in 2013. It is difficult to interpret changes in the proportion of cases that cluster and the number of new clusters that form each year when only four year's data are available. Cases within the first year of the time period do not have the opportunity to cluster with cases in previous years, and cases in the final year do not have the opportunity to cluster with cases in future years.

Cluster size

Over the four year period of 2010 to 2013, there were a total of 1,854 clusters, with a median cluster size of three cases (range 2-166). The majority of clusters (76.1%, 1,411/1,854) were small in size (<5 cases), with 46.3% (858/1854) of clusters having only two cases in the cluster. A further 16.5% (306) of clusters were medium sized (5-9 cases), and 7.4% (137) were large (>10 cases), of which twelve clusters (0.6%) were very large (>50 cases) (Table 3.1, Figure 3.2).

Figure 3.2 Proportion of clusters by size, 2010-2013



[7] A new cluster forms at the point when a second case is notified with the same MIRU-VNTR strain type as an existing case

Descriptive epidemiology of clusters

The proportion of cases that clustered within the four year time period 2010-2013 varied considerably by country of birth. The proportion of UK born cases that clustered was 65.6% (2,683/4,088) compared to 49.5% in non-UK born cases (Table 3.2).

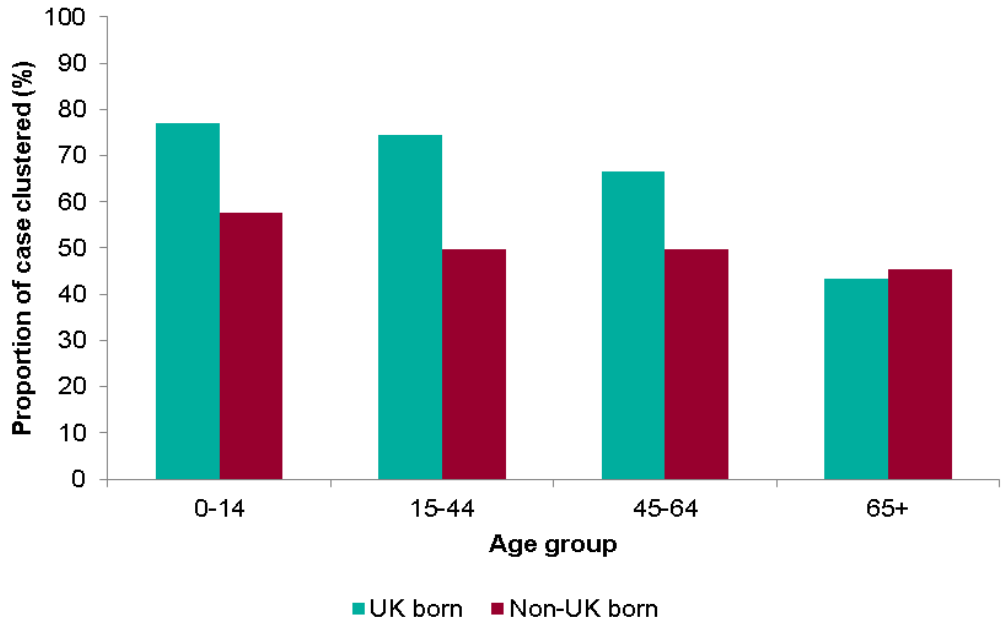
Table 3.2: Number of tuberculosis cases and proportion of clustering stratified by place of birth, 2010-2013

	Notified cases	Culture confirmed cases		Strain typed cases*		Unique cases		Clustered cases		Number of clusters**
	n	n	%	n	%	n	%	n	%	n
Total ‡	**33,942**	**20,560**	**60.6**	**16,602**	**80.7**	**7,712**	**46.5**	**8,890**	**53.5**	**1,854**
UK born §	8,713	4,896	56.2	4,088	83.5	1,405	34.4	2,683	65.6	909
Non-UK born ◊	23,875	14,844	62.2	11,909	80.2	6,016	50.5	5,893	49.5	1,625

* Culture confirmed cases with a MIRU-VNTR profile with at least 23 complete loci
**The number of clusters in the UK born plus the non-UK born is greater than the total number of clusters as some clusters contain both UK born and non-UK born cases
‡ The number of cases in the UK is higher than the sum UK born and non-UK born as 605 strain type cases have unknown place of birth
§Number of clusters with at least one UK born person in the cluster
◊ Number of clusters with at least one non-UK born person in the cluster

The proportion of cases that clustered varied by age in UK born cases; 85% (49/58) of children under five years of age clustered, while only 43% (391/903) of those over 65 years of age clustered, consistent with a greater proportion of cases being due to recent transmission in the UK in the younger age group (Table A3.3). The proportion of cases that clustered did not vary as much with age in the non-UK born cases (Figure 3.3).

Figure 3.3: Proportion clustering by age and place of birth, UK, 2010-2013



Out of the 1,854 clusters, 9% (167) of clusters contained only UK born cases, 51% (945) of clusters contained only non-UK born cases, and 40% (742) had a mix of UK born and non-UK born cases (Table 3.3). More than a quarter of clusters (495/1,854) had at least one case with a social risk factor, and 9.9% (184/1,854) of clusters had at least 50% of cases with at least one social risk factor. Having more than 50% of cases with at least one social risk factor occurred in one quarter of clusters consisting of exclusively UK born cases (41/167), compared to only 7.0% of clusters of exclusively non-UK born cases (66/945).

Thirty four percent (628) of clusters consisted of exclusively pulmonary cases, and 8.5% (157) of exclusively extra-pulmonary cases, with the remainder having both pulmonary and extra-pulmonary cases. Clusters consisting of exclusively UK born cases were more likely to be exclusively pulmonary (72.5%, 121/167) and almost all included at least one pulmonary case (97.6%, 163/167). A higher proportion of clusters containing only non-UK born cases had extra-pulmonary disease only (131/945, 13.9%).

Five percent (97) of clusters had two or more isoniazid resistant cases, and 1% (19) had two or more MDR-TB cases.

Table 3.3: Descriptive epidemiology of clusters, stratified by clusters with only UK born cases, clusters with only non-UK born cases, and clusters with both UK and non-UK born cases

		All clusters		Clusters with only UK born cases		Clusters with only non-UK born cases		Clusters with both UK born and non-UK born clusters	
		n	%	n	%	n	%	n	%
Number of cases clustered	n	8,890		502		2823		5565	
Number of clusters	n	1,854		167		945		742	
Cluster size	median (range)	3 (2-166)		2 (2-13)		2 (2-16)		4 (2-166)	
Social Risk factors*	Clusters with at least 50% of cases with at least one risk factor	184	9.9	41	24.6	66	7.0	77	10.4
Site of disease*	Clusters where all cases have pulmonary disease (with or without extrapulmonary)	628	33.9	121	72.5	268	28.4	239	32.2
	Clusters where all cases have extrapulmonary disease	157	8.5	4	2.4	131	13.9	22	3.0
	Clusters with a mix of cases with pulmonary and extrapulmonary disease	1,069	57.7	42	25.1	546	57.8	481	64.8

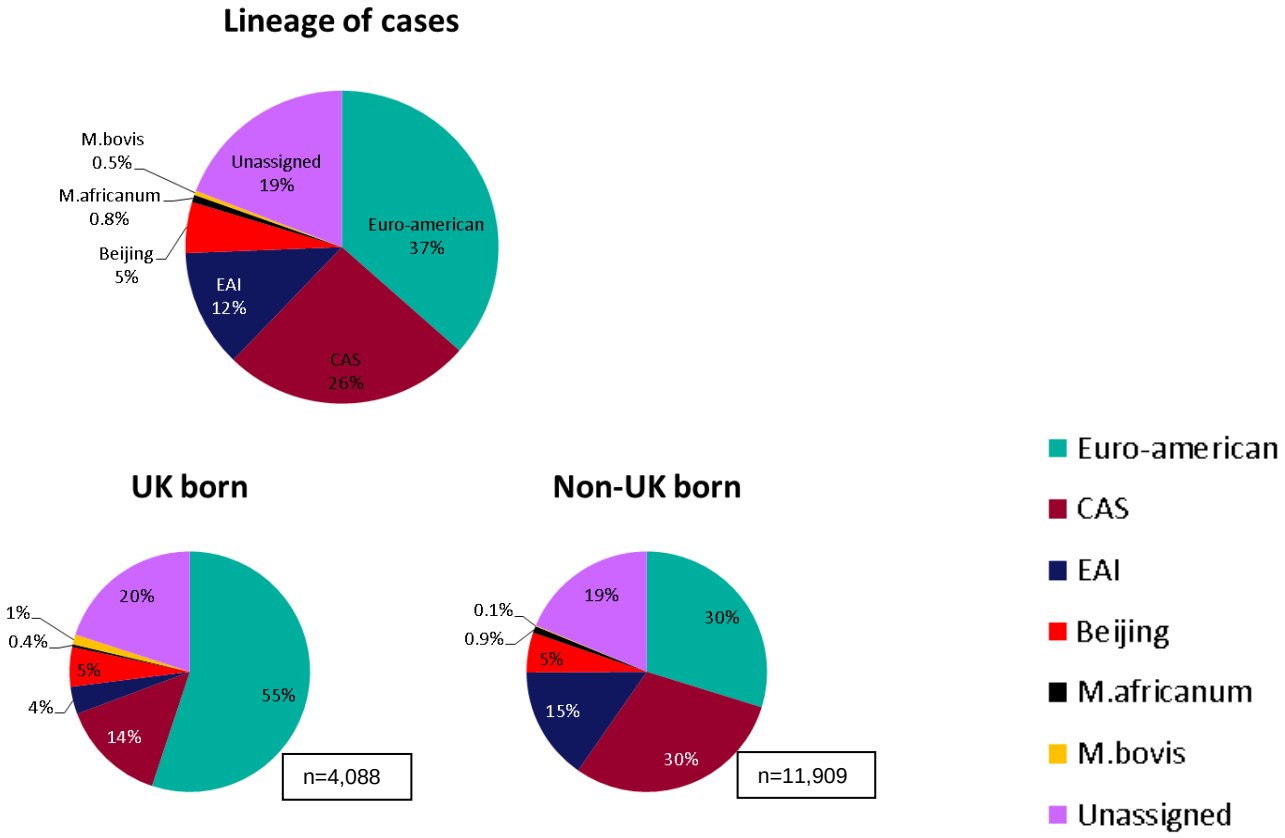
*proportions are out of the number of clusters

Lineage of strains

Lineage was derived from the MIRU-VNTR for cases with strain types; 36.5% of cases (6,059) were of Euro-American lineage, followed by 25.7% (4,267) Central Asian strain (CAS), 12.2% (2,024) East African Indian (EAI), 5.3% (875) Beijing, 0.8% (125) *M.africanum*, 0.5% (74) *M.bovis*, and 19.1% (3,178) had no lineage assigned (Figure 3.4).

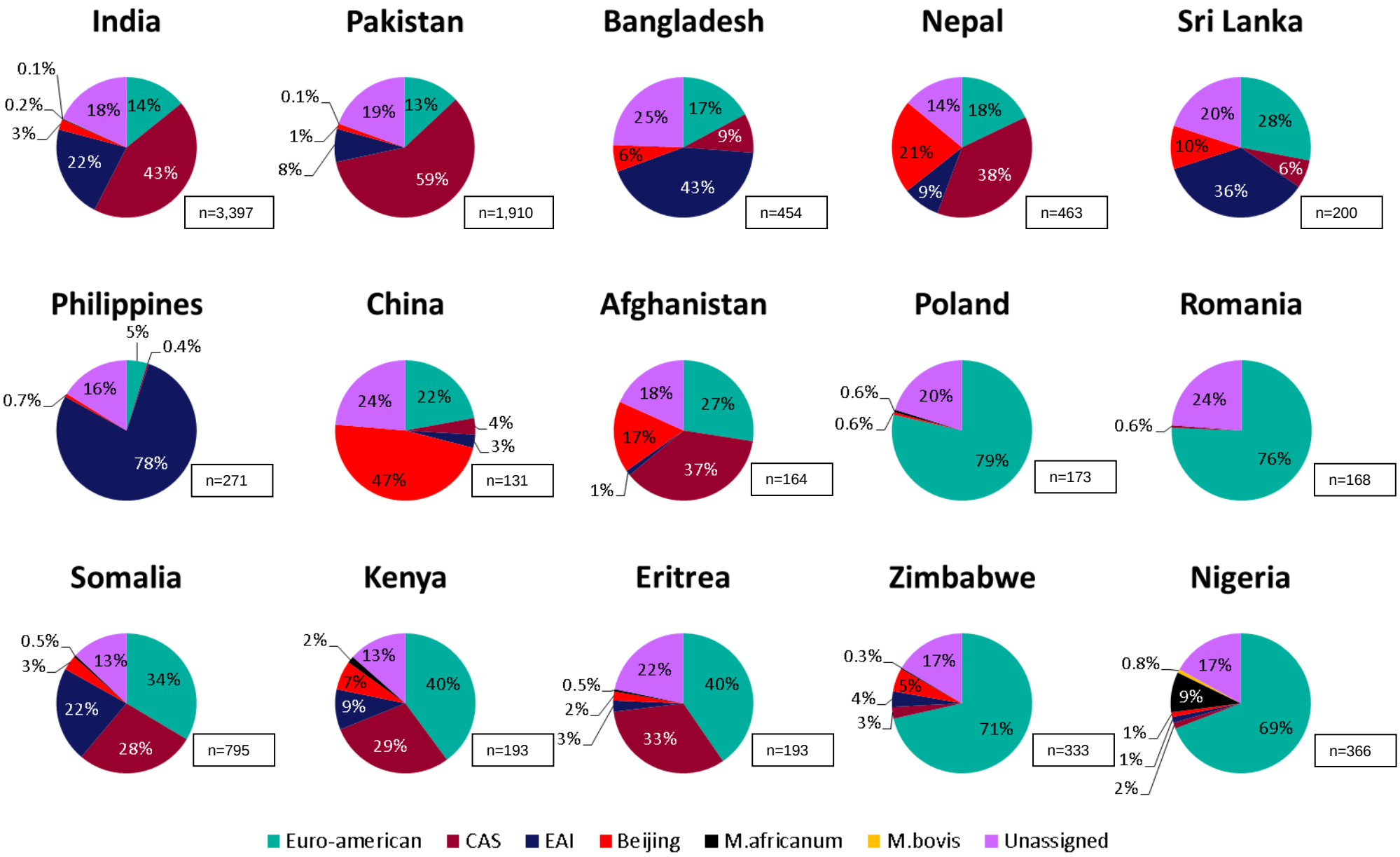
The distribution of different lineages varied considerably by place of birth (Figure 3.4 and 3.5).

Figure 3.4: Lineage of cases with MIRU-VNTR strain types 2010-2013*



*as determined by MIRU-VNTR

Figure 3.5: Lineage of cases with MIRU-VNTR strain types as determined by MIRU-VNTR by country of birth for the top 15 countries of birth by burden of TB in the, UK, 2010-2013



4. Tuberculosis case outcomes

Key messages

- the proportion of drug sensitive cases with an expected treatment duration of less than 12 months who had completed treatment by 12 months has improved gradually over the past decade, reaching 82.8% of those notified in 2013
- the proportion of drug sensitive cases who died has decreased over the last 10 years, to stabilise at 5.0% in 2011 and 2012
- drug sensitive cases with at least one social risk factor have worse treatment outcomes than those without; 6.1% of those notified in 2012 died and 7.1% were lost to follow up
- the proportion of drug resistant TB cases who completed treatment by 24 months was low (48.0%), with many still on treatment (22.5%) or lost to follow up (19.4%)

Drug sensitive cohort, 2003-2012

In line with the revised 2013 World Health Organization (WHO) TB outcome definitions, for the purposes of TB outcome reporting the drug sensitive cohort is defined as all TB cases, excluding those with rifampicin resistant TB or MDR-TB (initial or amplified), or non-culture confirmed cases treated as MDR-TB [4].

In this report, treatment outcomes for drug sensitive TB cases are reported separately for the following groups:

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

Data on deaths and loss to follow up at last recorded outcome are presented for the entire drug sensitive cohort.

Additional data validation has been conducted this year, using data on the date of treatment start and the date of treatment completion to validate duration of treatment (see Appendix II-Methods for further details).

TB outcomes reported using these new cohort definitions and validation methods will not be directly comparable with outcome data presented in previous reports. Within this report, treatment outcomes for all cases notified from 20 03-2012 have been calculated using these new definitions, so that trends can be monitored.

TB outcomes for drug sensitive cohort with expected duration of treatment less than 12 months

Information on TB outcome 12 months after starting treatment was available for 97.9% (7,615/7,774) of cases in this cohort notified in 2012 (Table 4.1).

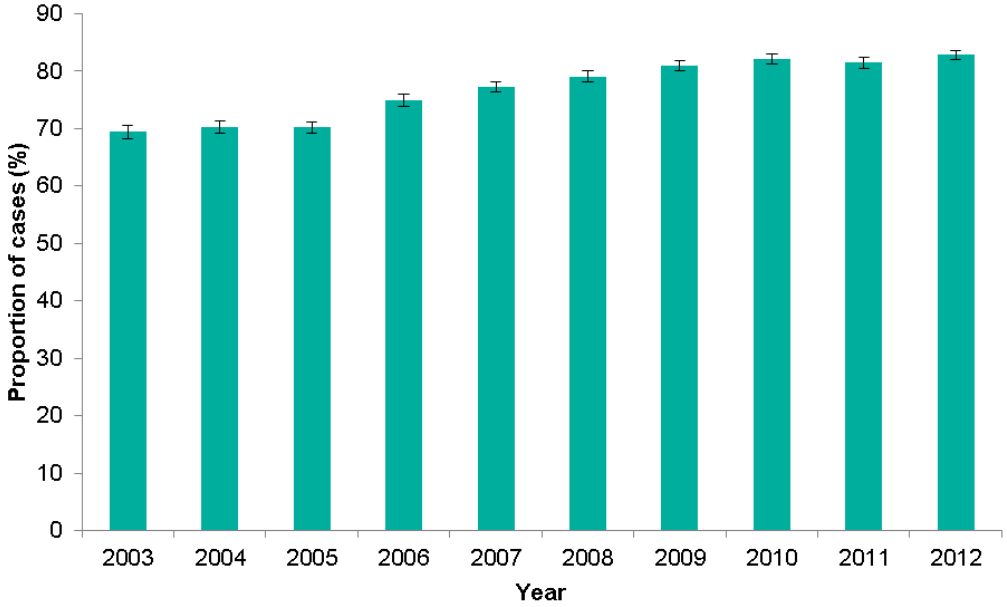
Table 4.1: TB outcome at 12 months for drug sensitive cases with expected treatment duration < 12 months*, UK, 2012

Treatment outcome	n	%
Completed	6,438	82.8
Died	345	4.4
Lost to follow up	307	4.0
Still on treatment	446	5.7
Stopped	79	1.0
Not evaluated**	159	2.1
Total	7,774	

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

The proportion of cases in this cohort notified in 2012 who completed treatment within 12 months was 82.8% (6,438/7,774), compared to 81.4% (6,459/7,933) in 2011 (Figure 4.1, Table A4.1). A further 4.0% (313) of cases are known to have completed treatment after 12 months bringing overall treatment completion for 2012 cases to 86.8% (6,751/7,774) (Table A4.2). Treatment duration was recorded for 71.4% (4,819/6,751) of the 2012 cases who completed treatment, with a median time to complete treatment of 191 days (Table A4.3); 73.7% (3,552/4,819) completed treatment between 6 and 7 months after treatment start (Figure 4.2).

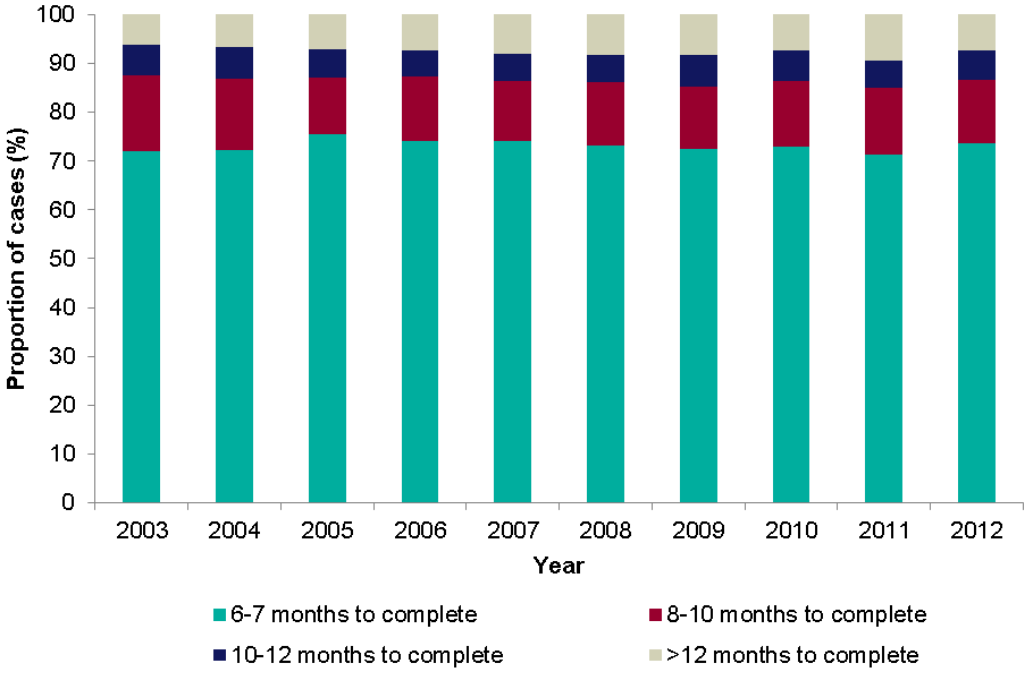
Figure 4.1: Treatment completion at 12 months for drug sensitive cases with expected treatment duration < 12 months*, UK, 2003-2012



* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

Between 2003 and 2012, there was an increase in the proportion of cases reported to have completed treatment within 12 months (Figure 4.1,Table A4.1), and a decrease in the proportion of outcomes not evaluated. In the same time period, there was no change in the time in which treatment was completed (Figure 4.2, Table A4.3). For the cohort of cases notified in 2012, 92.7% (4,466/4,819) of those with a known time to completion completed treatment within 12 months (Figure 4.2).

Figure 4.2: Time to complete treatment for drug sensitive cases with expected treatment duration < 12 months*, UK, 2003-2012



* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

The proportion of cases who completed treatment at 12 months decreased with age (Table A4.4); in 2012 treatment completion was 90.3% (345/382) in 0-14 year olds compared to 67.7% (722/1,067) in those aged 65 years and over. The proportion of cases that completed treatment was higher for females (85.5%, 2,842/3,324) than males (80.8%, 3,596/4,450) (Table A4.5). Treatment completion at 12 months was higher in those with extra-pulmonary disease only compared to pulmonary disease only (85.8%, 3,072/3,581 compared to 81.2%, 2,727/3,358, respectively). Specifically, completion was highest in those with lymph node TB (intra-thoracic lymph node 87.5%, 795/909 and extra-thoracic lymph node 86.0%, 1,650/1,919) (Table A4.6).

Treatment completion at 12 months varied by PHEC; from 67.9% (114/168) in Avon, Gloucestershire and Wiltshire to 87.9% (233/265) in Thames Valley (Table A4.7 and Table A4.8).

Nearly six percent (5.7%, 446/7,774) of cases were still on treatment at 12 months (Table 4.1, Table A4.1). While it is known from the last reported outcome that the majority of these

(70.2%, 313/446) eventually completed treatment, the reason for still being on treatment 12 months after starting was not recorded for the majority of cases (60.3%, 269/446). Where the reason was recorded, 49.7% (88/177) were known to be on a regimen exceeding 12 months, although initial drug resistance was only reported for 28.4% (25/88) of these cases. Fifteen percent (27/177) were still on treatment due to intolerance or side effects, and 9.6% (17/177) had been non-compliant with treatment.

TB outcomes for drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated TB

The proportion of cases in this cohort notified in 2012 who had completed treatment at last recorded outcome was 71.5% (612/856) (Table 4.2, Table A4.9). Treatment duration was recorded for 87.6% (536/612) of those who completed treatment, with a median time to complete treatment of 363 days (Table A4.10).

Table 4.2: Last recorded TB outcome for drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated*, UK, 2012

Treatment outcome	n	%
Completed	612	71.5
Died	82	9.6
Lost to follow up	55	6.4
Still on treatment	81	9.5
Stopped	7	0.8
Not evaluated**	19	2.2
Total	856	

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases
** Not evaluated includes missing, unknown and transferred out

There was 9.5% (81/856) of cases notified in 2012 still on treatment at last reported outcome (Table 4.2, Table A4.9); a further proportion of these cases will be expected to have completed treatment by next year's report.

TB outcomes in entire drug sensitive cohort

Table 4.3: Last recorded TB outcome for entire drug sensitive cohort*, UK, 2012

Treatment outcome	n	%
Completed	7,363	85.3
Died	432	5.0
Lost to follow up	370	4.3
Still on treatment	199	2.3
Stopped	88	1.0
Not evaluated**	178	2.1
Total	8,630	

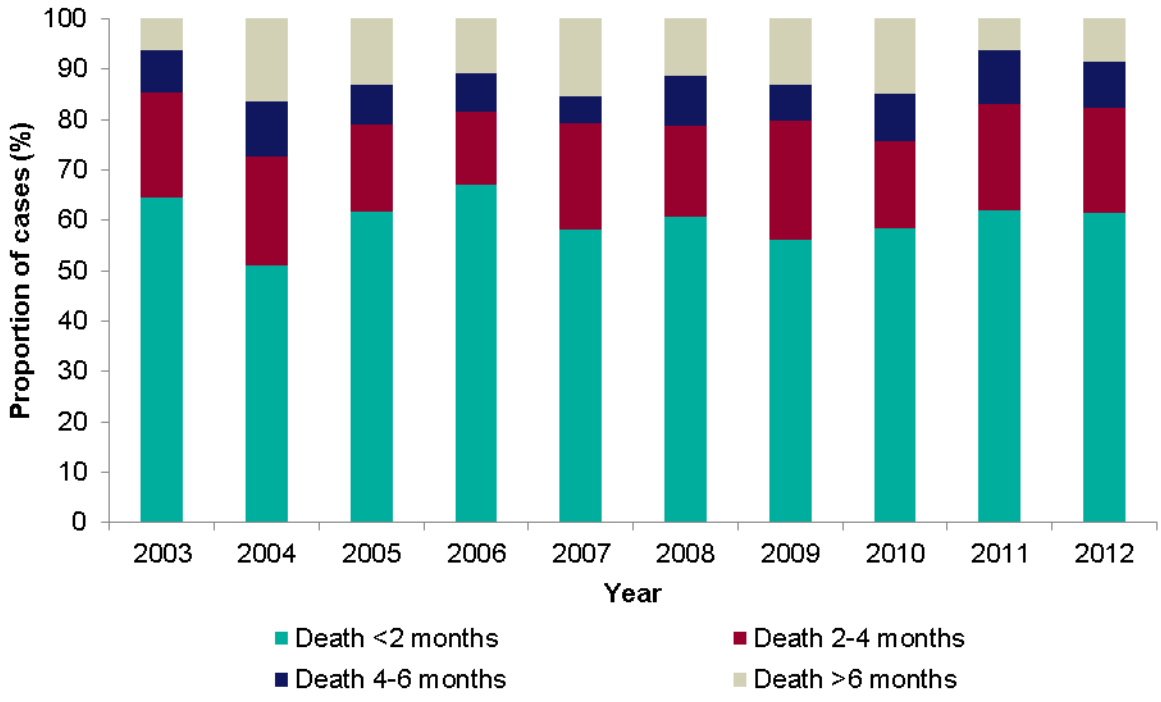
* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases
** Not evaluated includes missing, unknown and transferred out

Deaths in drug sensitive cohort

Between 2003 and 2011, the proportion of cases who were reported to have died at the last reported outcome among all drug sensitive TB cases (including those with CNS, spinal, miliary or cryptic disseminated TB) decreased year on year, from 6.5% to 5.0% (Table A4.11). In 2012 the proportion remained stable at 5.0% (432/8,630 respectively) (Table 4.3). In 2012, TB caused or contributed to 32.4% (140/432) of deaths, was incidental to death in 22.7% (98/432), and the relationship between TB and death was unknown in 44.9% (194/432). Among those reported to have died, 17.4% (75/432) were diagnosed post mortem. The majority of those who died were 65 years or older (64.6%, 279). More than two thirds of those who died were male (69.4%, 300). By site of disease, death occurred most frequently in those with miliary TB (18.4%, 39/212), and CNS TB (CNS meningitis 15.3%, 29/189 and CNS other 11.5, 16/139) (Table A4.12). Excluding those diagnosed post mortem, the median time to death after starting treatment was 36 days (range 0-504 days); 61.4% of these cases (135/220) died within two months of starting treatment (Figure 4.3). In 2012, 8.2% (41/501) of those with a previous diagnosis of TB died compared to 3.9% (301/7,665) without a previous diagnosis of TB. A higher proportion of cases with a social risk factor died compared to those without a social risk factor (6.1%, 39/638 compared to 3.7%, 240/6,533).

In 2012, the highest proportion of deaths occurred in Wales (11.7%, 16/137), East Midlands (9.7%, 40/414) and Devon, Cornwall and Somerset (10.5%, 9/86) (Table A4.13).

Figure 4.3: Time between start of treatment and death for drug sensitive cohort*, UK, 2003-2012



* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases

Loss to follow up in entire drug sensitive cohort

In 2012, 4.3% (370/8,630) of all drug sensitive TB cases (including those with CNS, spinal, miliary or cryptic disseminated TB) were lost to follow up at the last reported outcome, 85.9% (318/370), of which were born abroad (Table 4.3). Where the reason for loss to follow up was recorded, 67.6% (198/293) of those born abroad had left the UK (Table A4.14). Eighty four percent (311/370) of lost to follow up cases occurred in the 15-44 age group, a total of 6.0% (311/5,222) of this age group were lost to follow up (Table A4.15). Overall, 7.1% (45/638) of those with at least one social risk factor were lost to follow up, compared to on 3.7% (239/6,533) in those without a social risk factor. Seven cases were known to have been lost to follow up before any treatment commenced. Fifty three percent (196/370) of cases lost to follow up had pulmonary disease.

TB outcome for drug resistant cohort, 2004-2011[8]

The drug resistant cohort included any cases with rifampicin resistant TB or MDR-TB (initial or amplified) as well as those without culture confirmation treated for MDR-TB. Information on 24 month outcome was available for 98.0% (96/98) of the cases reported in the drug resistant cohort in 2011 (Table 4.4, Table A4.16). Eighty nine of the 98 were MDR-TB cases (86 with initial resistance and 3 amplified to resistant), six of which had XDR-TB, and nine had rifampicin resistance only (all initially resistant). For the cohort notified in 2011, there were no cases known to be treated for MDR-TB without culture confirmation.

Table 4.4: TB outcome at 24 months after treatment start for drug resistant cohort, UK, 2011*

Treatment outcome	n	%
Completed	47	48.0
Died	4	4.1
Lost to follow up	19	19.4
Still on treatment	22	22.4
Stopped	4	4.1
Not evaluated**	2	2.0
Total	98	

* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only
** Not evaluated includes missing, unknown and transferred out

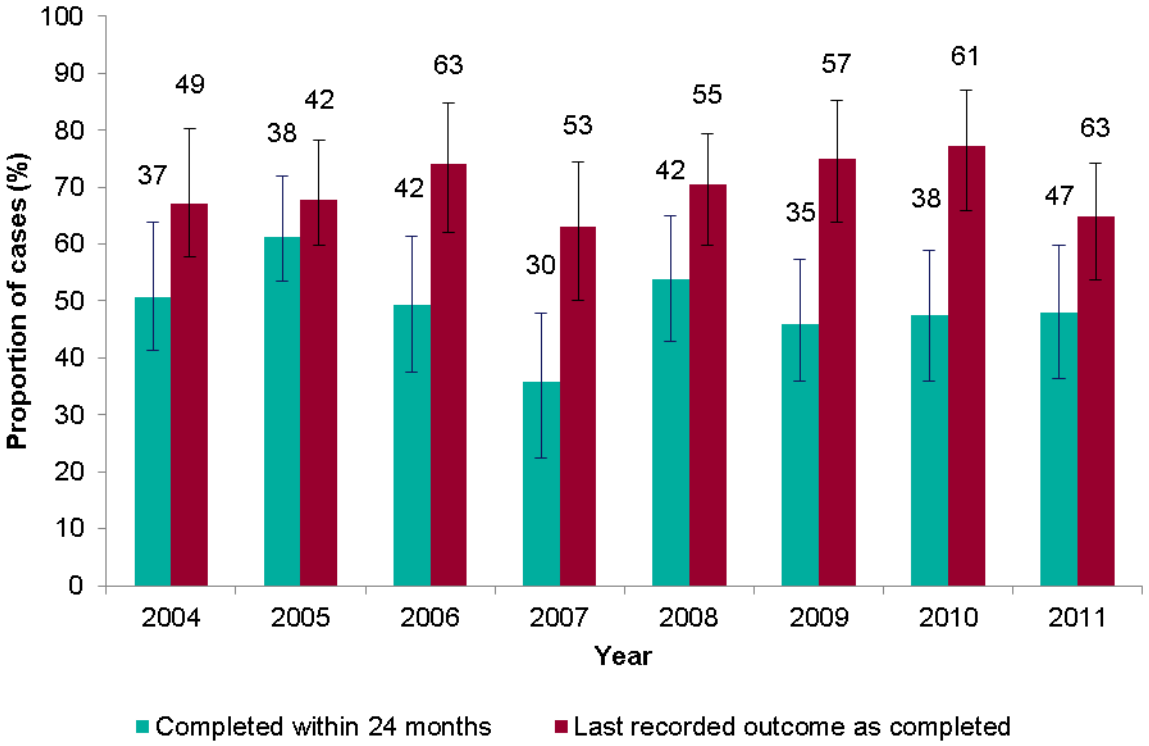
Treatment completion in drug resistant cohort

Less than half (48.0%, 47/98) of the cases in the drug resistant cohort notified in 2011 had completed treatment within 24 months of starting treatment (Figure 4.4, Table A4.16). A further

[8] 24 month outcomes are only available as far back as 2004

16 cases are known to have completed treatment after 24 months, bringing overall treatment completion for cases notified in 2011 to 64.3% (63/98). This is lower than in previous years, although six cases were still on treatment when outcome was last measured (Table A4.17).

Figure 4.4: Treatment completion for drug resistant TB cases, UK, 2004-2011*



* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only
Data labels display the number of cases completing treatment

Treatment duration was recorded for 90.5% (57/63) of the drug resistant cohort notified in 2011 known to have completed treatment, with a median time to complete treatment of 698 days (23 months) (Table A4.18). Of the six XDR-TB cases notified in 2011, two had completed treatment, two were still on treatment, one had died and one was lost to follow up at the last recorded outcome.

Twenty two percent (22/98) of cases were still on treatment at 24 months, with a planned course of treatment exceeding 24 months for 45.5% (10/22) of cases. The last recorded outcome shows that the majority (72.7%, 16/22) of those still on treatment at 24 months went on to complete treatment.

Deaths in drug resistant cohort

Four of the drug resistant cases notified in 2011 died by their last recorded outcome, one of whom was a case diagnosed post mortem. All four had pulmonary TB. The case diagnosed post mortem was aged 45-64 and the relationship between TB and death was unknown. The other three deaths were all aged 15-44, and TB caused or contributed to their deaths. All four

cases were born abroad. For two of the cases who died, the time between treatment start and death was recorded; both died more than a year after starting treatment. One case had a history of homelessness and alcohol use and a second had a history of drug misuse. Although the proportion of drug resistant cases who died has fluctuated over time, in the past three years the proportion was lower than for cases notified in 2007 and 2008, and similar to the proportion recorded in the drug sensitive cohort.

Loss to follow up in the drug resistant cohort

The most common reason for drug resistant cases not completing treatment (based on last recorded outcome) was loss to follow up. In 2011, 19.4% (19/98) of drug resistant TB cases were lost to follow up; all were born abroad and 78.9% (15/19) were documented to have been lost to follow up abroad. Twenty percent (17/85) of cases aged 15-44 were lost to follow up, with this age group accounting for 89.5% (17/19) of all cases lost to follow up. The majority (73.7%, 14/19) of cases lost to follow up had pulmonary disease. The proportion of cases lost to follow up in 2011 was higher than in previous years (Table A4.19).

5. Conclusions

The incidence of TB in the UK in 2013 continues to be high compared to most other Western European countries [5]. TB continues to disproportionately affect the most deprived communities, with 70% of all TB cases coming from the 40% most deprived areas. TB is concentrated in large urban centres, with rates in London, Leicester, Birmingham, Luton, Manchester and Coventry more than three times the national average. Nearly three quarters of all TB cases occur in those born abroad, mainly in high TB burden countries, and 10% of all TB cases had at least one social risk factor (a history of alcohol or drug misuse, homelessness or imprisonment).

Following a decline in TB incidence throughout most of the twentieth century, TB rates in the UK increased from the early 1980s until the mid-2000s, and have been at a high but relatively stable level ever since [6]. The overall incidence of TB in 2013, of 12.3 per 100,000 population, has shown a small decline over the past two years, and is currently at a similar level to 2003.

The small drop in TB rates in the past two years is due to a decline in TB in the non-UK born population, and is likely to be influenced by a number of factors, including changes in migration patterns, and the impact of interventions to improve the control of TB, both in the UK and abroad.

The decline in the number of TB cases born in countries in sub-Saharan Africa and, more recently, the Indian subcontinent, is likely to in part reflect changes in the countries of origin of migrants to the UK, with reductions in the numbers of migrants from high and very high TB burden countries. In addition, the risk of TB in new migrants from such countries may have decreased, as WHO estimates a reduction in TB incidence in the majority of these countries in the past decade [7]. The introduction of pre-entry screening for active TB is likely to have led to a reduction in the small proportion of pulmonary TB cases diagnosed shortly after arrival in long term migrants from high TB incidence countries. While this decline is welcome, it is important to recognise that the vast majority of TB cases in the non-UK born population (85%) occur among settled migrants rather than new entrants. Tackling the reactivation of latent TB in such migrants will require systematic implementation of screening and treatment of latent TB infection.

In contrast to the decline in TB incidence in the non-UK born population, the rates of TB in the UK born population have been stable over the past decade. However, it is encouraging to see that the incidence in UK born children aged under 15 years has shown a small decline in the past five years, which suggests some reduction in recent acquisition of TB in the UK.

The proportion of cases with first line drug resistance has remained relatively stable over the past decade at around 7%. The proportion of cases with MDR-TB increased from 2005-2011, and has been stable over the past three years at 1.6%. While the largest number of MDR-TB

cases were born in India, Pakistan and Somalia, a particularly high proportion of the small numbers of TB cases born in the Ukraine, Lithuania and Latvia were found to have MDR-TB. This reflects the high proportion of cases with MDR-TB in many countries of the former Soviet Union [7]. Clinicians should take into account the risk of MDR-TB in different countries of origin when making initial infection control and treatment decisions.

The proportion of pulmonary TB cases that had a delay of more than four months between symptom onset and treatment start has shown a small increase over the past three years, with more than a quarter of patients having a delay of greater than four months in 2013. This highlights the need to improve awareness of TB and to tackle obstacles to accessing services, especially for vulnerable groups. With current levels of data completeness on the date of first presentation to health services, it is not yet possible to determine what proportion of this delay is due to late presentation to health services, and what proportion due to a delay in making the diagnosis within the health sector. Improvements in data completeness in the future should enable a better understanding of this delay, and help inform better targeting of awareness raising activities.

It is encouraging that the proportion of drug sensitive TB cases that completed treatment by 12 months, an indicator of the quality of TB services, has continued to gradually improve over the past decade, and the proportion of patients who died has decreased. The proportion of cases who died or were lost to follow up is higher in those with social risk factors, highlighting the need for extra support for vulnerable patients with complex needs. In contrast to the improvements in treatment outcomes in the drug sensitive cohort, the proportion of drug resistant cases that completed treatment at 24 months has not improved, for the cohort notified in 2011, nearly a quarter were still on treatment and 20% were lost to follow up at 24 months. This highlights the complexity of treating patients with MDR-TB, and the need to ensure access to specialist advice and comprehensive support services to meet the social as well as clinical needs of such patients.

Public Health England and NHS England will shortly publish the Collaborative TB Strategy for England 2015-2020, which sets out the improvements that need to be achieved across 10 key areas to bring about a sustained decline in TB in England, and the mechanisms by which these should be achieved. Improvements in TB control across the country, particularly among the most vulnerable groups, will require the social and economic determinants of the disease to be addressed, in addition to the provision of strong and effective public health and clinical services. Following implementation of the Strategy, we look forward to monitoring the improvements that we hope will be achieved over the next decade.

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Appendix I. Supplementary tables

Table A1.1: Tuberculosis case reports, rates and annual percentage change, UK, 2004-2013

Year	Total		Annual change in case numbers (%)	Annual change in rate (%)	Place of birth			
					UK born		Non-UK born	
	Number of cases	Rate per 100,000 (95% CI)			Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2004	7,594	12.7 (12.4 -13.0)	-	-	2171	4.0 (3.9 -4.2)	4789	92.8 (90.2 -95.5)
2005	8,290	13.8 (13.5 -14.1)	9.2%	13.0%	2142	4.0 (3.8 -4.1)	5411	98.0 (95.4 -100.6)
2006	8,314	13.7 (13.4 -14.0)	0.3%	0.3%	2049	3.8 (3.6 -4.0)	5429	91.2 (88.7 -93.6)
2007	8,268	13.6 (13.3 -13.9)	-0.6%	0.3%	2118	3.9 (3.8 -4.1)	5445	84.4 (82.1 -86.6)
2008	8,495	13.8 (13.5 -14.1)	2.7%	5.5%	2175	4.0 (3.9 -4.2)	5742	85.5 (83.3 -87.8)
2009	8,878	14.4 (14.1 -14.7)	4.5%	4.2%	2282	4.2 (4.1 -4.4)	5982	85.6 (83.4 -87.8)
2010	8,398	13.5 (13.2 -13.8)	-5.4%	-2.4%	2115	3.9 (3.7 -4.1)	5837	81.8 (79.8 -84.0)
2011	8,923	14.1 (13.8 -14.4)	6.3%	8.5%	2224	4.1 (3.9 -4.3)	6335	84.3 (82.2 -86.4)
2012	8,729	13.7 (13.4 -14.0)	-2.2%	-2.5%	2271	4.2 (4.0 -4.3)	6174	80.6 (78.6 -82.6)
2013	7,892	12.3 (12.0 -12.6)	-9.6%	-10.4%	2103	3.8 (3.7 -4.0)	5529	69.7 (67.9 -71.6)

CI- confidence intervals

Table A1.2: TB case reports and rates by country, UK, 2004-2013

Year	Country									
	England		Northern Ireland		Scotland		Wales		Total	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2004	6,934	13.8 (13.5 -14.2)	81	4.7 (3.8 -5.9)	392	7.7 (7.0 -8.5)	187	6.3 (5.4 -7.3)	7,594	12.7 (12.4 -13.0)
2005	7,665	15.2 (14.9 -15.5)	75	4.3 (3.4 -5.4)	365	7.1 (6.4 -7.9)	185	6.2 (5.4 -7.2)	8,290	13.8 (13.5 -14.1)
2006	7,689	15.1 (14.8 -15.5)	61	3.5 (2.7 -4.5)	381	7.4 (6.7 -8.2)	183	6.1 (5.3 -7.1)	8,314	13.7 (13.4 -14.0)
2007	7,585	14.8 (14.5 -15.2)	69	3.9 (3.0 -5.0)	410	7.9 (7.2 -8.7)	204	6.8 (5.9 -7.8)	8,268	13.6 (13.3 -13.9)
2008	7,814	15.2 (14.8 -15.5)	66	3.7 (2.9 -4.7)	447	8.6 (7.8 -9.4)	168	5.6 (4.7 -6.5)	8,495	13.8 (13.5 -14.1)
2009	8,119	15.7 (15.3 -16.0)	59	3.3 (2.5 -4.2)	486	9.3 (8.5 -10.2)	214	7.0 (6.1 -8.1)	8,878	14.4 (14.1 -14.7)
2010	7,677	14.7 (14.4 -15.0)	66	3.7 (2.8 -4.7)	503	9.6 (8.7 -10.4)	152	5.0 (4.2 -5.8)	8,398	13.5 (13.2 -13.8)
2011	8,284	15.6 (15.3 -16.0)	61	3.4 (2.6 -4.3)	447	8.4 (7.7 -9.3)	131	4.3 (3.6 -5.1)	8,923	14.1 (13.8 -14.4)
2012	8,099	15.1 (14.8 -15.5)	87	4.8 (3.8 -5.9)	405	7.6 (6.9 -8.4)	138	4.5 (3.8 -5.3)	8,729	13.7 (13.4 -14.0)
2013	7,290	13.5 (13.2 -13.8)	73	4.0 (3.1 -5.0)	389	7.3 (6.6 -8.1)	140	4.5 (3.8 -5.4)	7,892	12.3 (12.0 -12.6)

CI - confidence interval

Table A1.3: TB case reports and rates by PHE region and centre, England, 2004-2013

PHE Area	2004		2005		2006		2007		2008	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
North Of England	1,247	8.6 (8.2 -9.1)	1,432	9.9 (9.4 -10.4)	1,500	10.3 (9.8 -10.8)	1,564	10.7 (10.2 -11.2)	1,542	10.5 (10.0 -11.0)
North East	143	5.6 (4.7 -6.6)	132	5.2 (4.3 -6.1)	141	5.5 (4.6 -6.5)	197	7.7 (6.7 -8.8)	177	6.9 (5.9 -8.0)
Cumbria and Lancashire	172	8.9 (7.6 -10.4)	188	9.7 (8.4 -11.2)	163	8.4 (7.1 -9.8)	196	10.1 (8.7 -11.6)	172	8.8 (7.5 -10.2)
Yorkshire and the Humber	535	10.6 (9.7 -11.5)	557	10.9 (10.0 -11.8)	663	12.9 (11.9 -13.9)	633	12.3 (11.3 -13.3)	634	12.2 (11.3 -13.2)
Greater Manchester	343	13.5 (12.1 -15.0)	412	16.1 (14.6 -17.7)	407	15.8 (14.3 -17.4)	442	17.0 (15.5 -18.7)	455	17.4 (15.8 -19)
Cheshire and Merseyside	54	2.4 (1.8 -3.2)	143	6.4 (5.4 -7.5)	126	5.6 (4.6 -6.6)	96	4.2 (3.4 -5.1)	104	4.5 (3.7 -5.5)
Midlands and East of England	1,745	11.4 (10.8 -11.9)	1,927	12.4 (11.9 -13.0)	1,974	12.6 (12.1 -13.2)	1,888	12 (11.5 -12.6)	2,000	12.6 (12.1 -13.2)
East Midlands	344	9.4 (8.5 -10.5)	457	12.4 (11.3 -13.6)	500	13.5 (12.3 -14.7)	472	12.6 (11.5 -13.8)	421	11.2 (10.1 -12.3)
West Midlands	920	17.2 (16.1 -18.4)	921	17.1 (16 -18.3)	927	17.1 (16.0 -18.3)	929	17.0 (16.0 -18.2)	1,010	18.4 (17.3 -19.5)
Anglia and Essex	219	5.6 (4.9 -6.4)	225	5.7 (5.0 -6.5)	231	5.8 (5.1 -6.6)	212	5.3 (4.6 -6.1)	278	6.9 (6.1 -7.8)
South Midlands and Hertfordshire	262	10.5 (9.3 -11.9)	324	12.9 (11.5 -14.4)	316	12.5 (11.1 -13.9)	275	10.7 (9.5 -12.1)	291	11.2 (10.0 -12.6)
London	3,111	41.9 (40.4 -43.4)	3,449	45.9 (44.4 -47.4)	3,328	43.8 (42.3 -45.3)	3,234	42 (40.6 -43.5)	3,363	43 (41.6 -44.5)
South of England	823	6.4 (5.9 -6.8)	850	6.5 (6.1 -7.0)	885	6.7 (6.3 -7.2)	896	6.7 (6.3 -7.2)	906	6.8 (6.3 -7.2)
Kent, Surrey and Sussex	220	5.2 (4.6 -6.0)	211	5.0 (4.3 -5.7)	276	6.5 (5.7 -7.3)	261	6.0 (5.3 -6.8)	306	7.0 (6.3 -7.9)
Thames Valley	231	12.1 (10.6 -13.8)	280	14.5 (12.9 -16.4)	229	11.8 (10.3 -13.4)	258	13.2 (11.6 -14.9)	236	11.9 (10.5 -13.6)
Wessex	146	5.8 (4.9 -6.8)	144	5.7 (4.8 -6.7)	149	5.9 (4.9 -6.9)	145	5.6 (4.8 -6.6)	122	4.7 (3.9 -5.6)
Devon, Cornwall and Somerset	78	3.7 (2.9 -4.6)	68	3.2 (2.5 -4.0)	61	2.8 (2.2 -3.6)	70	3.2 (2.5 -4.1)	73	3.4 (2.6 -4.2)
Avon, Gloucestershire and Wiltshire	148	6.7 (5.6 -7.8)	147	6.6 (5.5 -7.7)	170	7.5 (6.4 -8.7)	162	7.1 (6.0 -8.3)	169	7.3 (6.3 -8.5)

CI - confidence interval

Table A1.3: TB case reports and rates by PHE region and centre, England, 2004-2013 cont.

PHE Area	2009		2010		2011		2012		2013	
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
North Of England	1,652	11.2 (10.6 -11.7)	1,588	10.7 (10.2 -11.2)	1,613	10.8 (10.3 -11.3)	1,539	10.3 (9.8 -10.8)	1,437	9.5 (9.1 -10.1)
North East	165	6.4 (5.5 -7.5)	150	5.8 (4.9 -6.8)	131	5.0 (4.2 -6.0)	165	6.3 (5.4 -7.4)	120	4.6 (3.8 -5.5)
Cumbria and Lancashire	180	9.2 (7.9 -10.7)	193	9.9 (8.5 -11.4)	212	10.8 (9.4 -12.4)	212	10.8 (9.4 -12.3)	181	9.2 (7.9 -10.6)
Yorkshire and the Humber	690	13.2 (12.2 -14.2)	628	12.0 (11.0 -12.9)	664	12.6 (11.6 -13.5)	595	11.2 (10.3 -12.1)	596	11.2 (10.3 -12.1)
Greater Manchester	520	19.7 (18 -21.5)	490	18.4 (16.8 -20.1)	511	19 (17.4 -20.8)	457	16.9 (15.4 -18.5)	424	15.6 (14.2 -17.2)
Cheshire and Merseyside	96	4.1 (3.4 -5.1)	127	5.4 (4.5 -6.5)	95	4.0 (3.3 -4.9)	110	4.6 (3.8 -5.6)	116	4.8 (4.0 -5.8)
Midlands and East of England	2,049	12.8 (12.3 -13.4)	1,873	11.6 (11.1 -12.2)	2,059	12.7 (12.1 -13.2)	2,080	12.7 (12.2 -13.3)	1,861	11.3 (10.8 -11.8)
East Midlands	449	11.9 (10.8 -13)	426	11.2 (10.1 -12.3)	428	11.1 (10.1 -12.2)	416	10.8 (9.7 -11.8)	371	9.5 (8.6 -10.6)
West Midlands	1,008	18.2 (17.1 -19.4)	872	15.7 (14.6 -16.7)	1,006	17.9 (16.8 -19.1)	1,084	19.2 (18.1 -20.4)	981	17.3 (16.2 -18.4)
Anglia and Essex	265	6.5 (5.8 -7.4)	244	6.0 (5.2 -6.8)	276	6.7 (5.9 -7.5)	253	6.1 (5.4 -6.9)	261	6.2 (5.5 -7.1)
South Midlands and Hertfordshire	327	12.5 (11.2 -13.9)	331	12.5 (11.2 -13.9)	349	13.0 (11.7 -14.5)	327	12.1 (10.8 -13.5)	248	9.1 (8.0 -10.3)
London	3,404	42.9 (41.4 -44.3)	3,241	40.2 (38.8 -41.6)	3,489	42.5 (41.1 -44)	3,403	41 (39.6 -42.4)	2,985	35.5 (34.2 -36.8)
South of England	1,014	7.5 (7.1 -8.0)	975	7.2 (6.7 -7.6)	1,122	8.2 (7.7 -8.7)	1,075	7.8 (7.3 -8.3)	1,007	7.2 (6.8 -7.7)
Kent, Surrey and Sussex	331	7.5 (6.7 -8.4)	303	6.8 (6.1 -7.6)	367	8.2 (7.4 -9.1)	343	7.6 (6.8 -8.4)	277	6.1 (5.4 -6.8)
Thames Valley	247	12.4 (10.9 -14.1)	283	14.1 (12.5 -15.8)	295	14.6 (13 -16.3)	294	14.4 (12.8 -16.1)	295	14.3 (12.7 -16.0)
Wessex	176	6.8 (5.8 -7.8)	156	5.9 (5.0 -7.0)	189	7.1 (6.2 -8.2)	166	6.2 (5.3 -7.3)	137	5.1 (4.3 -6.0)
Devon, Cornwall and Somerset	72	3.3 (2.6 -4.2)	64	2.9 (2.3 -3.7)	91	4.1 (3.3 -5.1)	88	4.0 (3.2 -4.9)	78	3.5 (2.8 -4.4)
Avon, Gloucestershire and Wiltshire	188	8.1 (7.0 -9.4)	169	7.2 (6.2 -8.4)	180	7.7 (6.6 -8.9)	184	7.8 (6.7 -9)	220	9.2 (8.0 -10.5)

CI - confidence interval

Table A1.4 Tuberculosis rates by age group, UK, 2004-2013

	Age groups									
	0-14 years		5-14 years		15-24 years		25-34 years		35-44 years	
Year	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2004	155	4.5 (3.9 -5.3)	283	3.8 (3.3 -4.2)	1,151	14.9 (14.8 -15.8)	2,126	26.5 (25.4 -27.7)	1,278	13.9 (13.2 -14.7)
2005	161	4.7 (4.0 -5.5)	283	3.8 (3.4 -4.3)	1,285	16.4 (15.5 -17.3)	2,338	29.1 (27.9 -30.3)	1,476	15.9 (15.1 -16.8)
2006	123	3.5 (2.9 -4.2)	260	3.5 (3.1 -4.0)	1,341	16.9 (16.0 -17.8)	2,291	28.5 (27.4 -29.7)	1,482	16.0 (15.2 -16.8)
2007	168	4.7 (4.0 -5.4)	318	4.4 (3.9 -4.9)	1,230	15.2 (14.4 -16.1)	2,381	29.6 (28.4 -30.8)	1,447	15.6 (14.8 -16.4)
2008	182	4.9 (4.2 -5.7)	305	4.2 (3.8 -4.7)	1,267	15.6 (14.7 -16.5)	2,371	29.2 (28.0 -30.4)	1,579	17.1 (16.3 -18.0)
2009	168	4.4 (3.8 -5.2)	256	3.6 (3.1 -4.0)	1,334	16.3 (15.5 -17.2)	2,374	28.9 (27.8 -30.1)	1,646	18.1 (17.2 -19.0)
2010	125	3.2 (2.7 -3.9)	255	3.6 (3.1 -4.0)	1,267	15.4 (14.6 -16.3)	2,284	27.4 (26.3 -28.6)	1,513	16.9 (16.1 -17.8)
2011	140	3.6 (3.0 -4.2)	268	3.7 (3.3 -4.2)	1,352	16.3 (15.5 -17.2)	2,456	29.0 (27.9 -30.2)	1,612	18.4 (17.5 -19.3)
2012	159	4.0 (3.4 -4.7)	254	3.5 (3.1 -4.0)	1,285	15.6 (14.7 -16.4)	2,428	28.4 (27.3 -29.5)	1,588	18.5 (17.6 -19.4)
2013	113	2.8 (2.3 -3.4)	206	2.8 (2.5 -3.2)	1,040	12.7 (11.9 -13.5)	2,120	24.4 (23.4 -25.5)	1,494	17.7 (16.8 -18.6)

	Age groups							
	45-54 years		55-64 years		65 and older		Total	
Year	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)
2004	847	11.1 (10.4 -11.9)	604	8.7 (8.1 -9.5)	1,149	12.0 (11.4 -12.8)	7,593	12.7 (12.4 -13.0)
2005	867	11.2 (10.5 -12.0)	644	9.2 (8.5 -9.9)	1,234	12.8 (12.1 -13.6)	8,288	13.7 (13.4 -14.0)
2006	943	12.0 (11.7 -13.3)	661	9.2 (8.5 -10.0)	1,213	12.6 (11.9 -13.3)	8,314	13.7 (13.4 -14.0)
2007	899	11.2 (10.5 -12.0)	665	9.2 (8.5 -9.9)	1,160	11.9 (11.2 -12.6)	8,268	13.5 (13.2 -13.8)
2008	1,006	12.3 (11.5 -13.0)	641	8.8 (8.1 -9.5)	1,140	11.5 (10.9 -12.2)	8,491	13.7 (13.4 -14.0)
2009	1,060	12.6 (11.9 -13.4)	751	10.2 (9.5 -11.0)	1,289	12.8 (12.1 -13.5)	8,878	14.3 (14.0 -14.6)
2010	1,027	11.9 (11.2 -12.7)	725	9.8 (9.1 -10.6)	1,201	11.7 (11.1 -12.4)	8,397	13.4 (13.1 -13.7)
2011	1,089	12.4 (11.7 -13.2)	783	10.6 (9.8 -11.3)	1,223	11.7 (11.1 -12.4)	8,923	14.1 (13.8 -14.4)
2012	1,058	11.9 (11.2 -12.6)	757	10.4 (9.6 -11.1)	1,200	11.1 (10.5 -11.7)	8,729	13.7 (13.4 -14.0)
2013	1,066	11.8 (11.1 -12.5)	719	9.9 (9.2 -10.6)	1,134	10.2 (9.6 -10.8)	7,892	12.3 (12.0 -12.6)

CI - confidence interval

Table A1.5 Child to adult ratio in notification rate, UK, 2004-2013

Year	Age Group				Child to Adult Ratio
	0-14 years old		15+ years old		
	Number of cases	Rate per 100,000 (95% CI)	Number of cases	Rate per 100,000 (95% CI)	
2004	438	4.0 (3.7-4.4)	7,155	14.6 (14.3-15.0)	0.28
2005	444	4.1 (3.7-4.5)	7,844	15.9 (15.5-16.2)	0.26
2006	383	3.6 (3.2-3.9)	7,931	15.9 (15.6-16.3)	0.22
2007	486	4.5 (4.1-5.0)	7,782	15.5 (15.1-15.8)	0.29
2008	487	4.5 (4.1-5.0)	8,004	15.8 (15.5-16.2)	0.29
2009	424	3.9 (3.6-4.3)	8,454	16.6 (16.2-16.9)	0.24
2010	380	3.5 (3.2-3.9)	8,017	15.6 (15.3-16.0)	0.22
2011	408	3.8 (3.4-4.1)	8,515	16.6 (16.2-16.9)	0.23
2012	413	3.7 (3.4-4.1)	8,316	16.0 (15.6-16.3)	0.23
2013	319	2.9 (2.6-3.2)	7,753	14.7 (14.4-15.0)	0.20

CI - confidence interval

Table A1.6: Number and proportion of tuberculosis case reports by site of disease and place of birth, UK, 2004-2013

Year	Pulmonary*		Extra-pulmonary		Total	UK born**					Non-UK born**				
						Pulmonary*		Extra-pulmonary		Total	Pulmonary*		Extra-pulmonary		Total
	Number of cases	%	Number of cases	%		Number of cases	%	Number of cases	%		Number of cases	%	Number of cases	%	
2004	4,480	59.1	3,095	40.9	7,575	1,587	73.3	578	26.7	2,165	2,524	52.8	2,257	47.2	4,781
2005	4,718	57.1	3,548	42.9	8,266	1,536	71.9	601	28.1	2,137	2,795	51.8	2,605	48.2	5,400
2006	4,689	56.6	3,599	43.4	8,288	1,474	72.2	567	27.8	2,041	2,761	51.0	2,658	49.0	5,419
2007	4,608	55.9	3,633	44.1	8,241	1,473	69.8	636	30.2	2,109	2,705	49.8	2,732	50.2	5,437
2008	4,686	55.6	3,749	44.4	8,435	1,546	71.4	618	28.6	2,164	2,810	49.2	2,897	50.8	5,707
2009	4,871	55.2	3,949	44.8	8,820	1,625	71.7	641	28.3	2,266	2,882	48.4	3,078	51.6	5,960
2010	4,524	54.1	3,842	45.9	8,366	1,477	70.1	630	29.9	2,107	2,748	47.2	3,071	52.8	5,819
2011	4,687	52.8	4,194	47.2	8,881	1,576	71.7	622	28.3	2,198	2,902	45.9	3,421	54.1	6,323
2012	4,538	52.3	4,142	47.7	8,680	1,549	68.7	706	31.3	2,255	2,836	46.1	3,321	53.9	6,157
2013	4,096	52.1	3,759	47.9	7,855	1,434	68.7	654	31.3	2,088	2,513	45.5	3,005	54.5	5,518

* With or without extra-pulmonary disease
** Where place of birth was known

Table A2.1: Number and proportion of culture confirmed TB cases by country, PHE region and PHE centre, 2004-2013

	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
Country	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
UK	4,547	59.9	5,016	60.5	5,124	61.6	4,923	59.5	5,005	58.9	5,162	58.1	5,091	60.6	5,463	61.2	5,326	61.0	4,680	59.3
England	4,079	58.8	4,581	59.8	4,666	60.7	4,449	58.7	4,536	58.1	4,669	57.5	4,606	60.0	5,027	60.7	4,892	60.4	4,313	59.2
Wales	102	54.6	121	65.4	128	70.0	128	62.8	102	60.7	119	55.6	107	70.4	94	71.8	105	76.1	84	60.0
Northern Ireland	64	79.0	45	60.0	47	77.1	57	82.6	50	75.8	49	83.1	53	80.3	47	77.1	53	60.9	45	61.6
Scotland	302	77.0	269	73.7	283	74.3	289	70.5	317	70.9	325	66.9	325	64.6	295	66.0	276	68.2	238	61.2
PHE Region/Centre																				
North of England	**716**	**57.4**	**848**	**59.2**	**909**	**60.6**	**940**	**60.1**	**899**	**58.3**	**990**	**59.9**	**950**	**59.8**	**988**	**61.3**	**926**	**60.2**	**875**	**60.9**
North East	90	62.9	95	72.0	101	71.6	127	64.5	115	65.0	108	65.5	97	64.7	104	79.4	111	67.3	89	74.2
Cumbria and Lancashire	84	48.8	91	48.4	82	50.3	124	63.3	100	58.1	102	56.7	119	61.7	130	61.3	104	49.1	105	58.0
Yorkshire and the Humber	308	57.6	339	60.9	393	59.3	383	60.5	357	56.3	402	58.2	363	57.8	378	56.9	347	58.3	357	59.9
Greater Manchester	195	56.9	232	56.3	250	61.4	249	56.3	267	58.7	313	60.2	291	59.4	319	62.4	282	61.7	246	58.0
Cheshire and Merseyside	39	72.2	91	63.6	83	65.9	57	59.4	60	57.7	65	67.7	80	63.0	57	60.0	82	74.6	78	67.2
Midlands and East of England	**1,064**	**61.0**	**1,133**	**58.8**	**1,157**	**58.6**	**1,118**	**59.2**	**1,131**	**56.6**	**1,158**	**56.5**	**1,129**	**60.3**	**1,262**	**61.3**	**1,201**	**57.7**	**1,073**	**57.7**
East Midlands	214	62.2	244	53.4	260	52.0	269	57.0	248	58.9	232	51.7	250	58.7	254	59.4	251	60.3	209	56.3
West Midlands	537	58.4	525	57.0	539	58.1	555	59.7	542	53.7	584	57.9	524	60.1	614	61.0	595	54.9	546	55.7
Anglia and Essex	150	68.5	145	64.4	162	70.1	144	67.9	190	68.4	159	60.0	158	64.8	169	61.2	147	58.1	154	59.0
South Midlands and Hertfordshire	163	62.2	219	67.6	196	62.0	150	54.6	151	51.9	183	56.0	197	59.5	225	64.5	208	63.6	164	66.1
London	**1,812**	**58.2**	**2,041**	**59.2**	**2,016**	**60.6**	**1,833**	**56.7**	**1,934**	**57.5**	**1,908**	**56.1**	**1,951**	**60.2**	**2,088**	**59.9**	**2,090**	**61.4**	**1,752**	**58.7**
South of England	**485**	**58.9**	**556**	**65.4**	**582**	**65.8**	**555**	**61.9**	**571**	**63.0**	**614**	**60.6**	**576**	**59.1**	**688**	**61.3**	**673**	**62.6**	**613**	**60.9**
Kent Surrey and Sussex	139	63.2	154	73.0	188	68.1	173	66.3	187	61.1	199	60.1	195	64.4	220	60.0	228	66.5	187	67.5
Thames Valley	129	55.8	166	59.3	150	65.5	167	64.7	142	60.2	138	55.9	167	59.0	181	61.4	175	59.5	181	61.4
Wessex	89	61.0	87	60.4	95	63.8	70	48.3	71	58.2	111	63.1	90	57.7	109	57.7	101	60.8	87	63.5
Devon, Cornwall and Somerset	40	51.3	45	66.2	35	57.4	42	60.0	59	80.8	47	65.3	36	56.3	63	69.2	60	68.2	47	60.3
Avon, Gloucestershire and Wiltshire	88	59.5	104	70.8	114	67.1	103	63.6	112	66.3	119	63.3	88	52.1	115	63.9	109	59.2	111	50.5

Table A2.2: Number and proportion of pulmonary culture confirmed TB cases by country and PHEC, 2004-2013

Country	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
UK	3,102	69.2	3,298	69.9	3,292	70.2	3,198	69.4	3,214	68.6	3,337	68.5	3,199	70.7	3,358	71.6	3,209	70.7	2,920	71.3
England	2,741	68.4	2,986	69.1	2,978	69.3	2,851	68.7	2,899	67.7	3,004	68.1	2,864	70.4	3,069	71.6	2,945	70.3	2,673	71.3
Wales	72	56.7	81	69.2	89	79.5	93	68.9	73	72.3	80	63.0	72	78.3	56	78.9	63	79.8	61	73.5
Northern Ireland	56	82.4	36	80.0	36	83.7	42	93.3	30	81.1	38	86.4	35	94.6	38	80.9	36	76.6	29	67.4
Scotland	233	83.5	195	82.3	189	80.4	212	76.3	212	79.7	215	74.4	228	70.2	195	69.2	165	75.0	157	70.7
PHE Region/Centre																				
North of England	**502**	**69.8**	**552**	**68.2**	**581**	**69.9**	**625**	**69.5**	**564**	**70.1**	**651**	**70.2**	**627**	**70.8**	**603**	**69.9**	**575**	**70.5**	**547**	**70.8**
North East	68	70.8	63	75.9	68	73.9	85	69.7	74	74.0	69	70.4	60	73.2	59	81.9	69	71.9	65	85.5
Cumbria and Lancashire	50	61.0	62	68.9	55	63.2	79	75.2	67	73.6	76	72.4	79	79.0	89	74.8	78	69.6	67	68.4
Yorkshire and the Humber	221	71.5	218	68.6	249	66.9	247	65.9	213	63.8	265	67.1	255	67.1	247	65.2	222	67.5	225	66.4
Greater Manchester	139	69.2	140	62.2	147	72.4	168	70.0	164	74.9	196	71.3	180	72.6	178	71.5	151	70.9	138	69.7
Cheshire and Merseyside	24	77.4	69	73.4	62	80.5	46	80.7	46	75.4	45	81.8	53	69.7	30	68.2	55	83.3	52	83.9
Midlands and East of England	**757**	**70.9**	**731**	**67.1**	**752**	**65.5**	**733**	**69.2**	**765**	**65.4**	**777**	**68.0**	**731**	**71.6**	**827**	**72.2**	**740**	**66.1**	**697**	68.8
East Midlands	132	72.9	145	64.4	159	57.2	190	69.3	173	70.6	157	68.0	161	78.2	173	72.7	159	66.5	149	69.0
West Midlands	393	67.5	339	65.3	359	65.2	357	69.1	365	64.2	383	68.0	332	70.5	406	72.0	372	65.0	348	65.7
Anglia and Essex	113	79.6	105	69.1	113	79.0	96	72.2	135	73.0	109	73.2	106	71.6	110	70.5	94	63.1	98	71.0
South Midlands and Hertfordshire	119	73.0	142	73.2	121	68.8	90	66.2	92	54.1	128	64.3	132	67.4	138	73.4	115	71.9	102	79.1
London	**1,151**	**67.6**	**1,313**	**70.1**	**1,287**	**71.1**	**1,119**	**67.2**	**1,176**	**67.1**	**1,175**	**66.8**	**1,149**	**71.5**	**1,189**	**72.6**	**1,183**	**72.6**	**1,039**	**73.3**
South of England	**330**	**64.2**	**387**	**71.5**	**356**	**70.2**	**372**	**71.0**	**393**	**71.1**	**402**	**69.1**	**357**	**64.2**	**449**	**70.2**	**446**	**71.3**	**390**	**71.6**
Kent, Surrey and Sussex	92	65.7	113	78.5	125	73.5	122	74.9	136	67.0	132	68.8	124	70.9	138	71.5	152	73.4	122	77.7
Thames Valley	90	71.4	110	73.8	82	73.2	105	82.0	90	74.4	83	70.3	87	64.9	103	70.1	91	71.1	103	83.7
Wessex	62	60.8	55	59.1	53	66.3	49	54.4	44	63.8	78	70.9	61	63.5	82	67.8	78	71.6	55	70.5
Devon, Cornwall and Somerset	31	55.4	34	61.8	27	58.7	33	63.5	44	80.0	37	74.0	27	57.5	49	72.1	47	71.2	32	61.5
Avon, Gloucestershire and Wiltshire	55	61.1	75	75.0	69	69.7	63	69.2	79	75.2	72	64.3	58	55.8	77	69.4	78	67.2	78	57.8

Table A2.3: Species identification for notified TB cases, UK, 2004-2013

year	*M. tuberculosis*		*M. bovis*		*M. africanum*		*M. microti*		MTBC		Total
	n	%	n	%	n	%	n	%	n	%	n
2004	4,523	99.5	17	0.4	5	0.1	0	0.0	2	< 0.1	4,547
2005	4,983	99.3	26	0.5	6	0.1	0	0.0	1	< 0.1	5,016
2006	5,080	99.1	29	0.6	15	0.3	0	0.0	0	0.0	5,124
2007	4,880	99.1	24	0.5	18	0.4	0	0.0	1	< 0.1	4,923
2008	4,958	99.1	22	0.4	25	0.5	0	0.0	0	0.0	5,005
2009	5,092	98.6	29	0.6	36	0.7	0	0.0	5	0.1	5,162
2010	4,978	97.8	37	0.7	39	0.8	2	< 0.1	35	0.7	5,091
2011	5,320	97.4	39	0.7	75	1.4	0	0.0	29	0.5	5,463
2012	5,188	97.4	39	0.7	77	1.5	2	< 0.1	20	0.4	5,326
2013	4,563	97.5	29	0.6	63	1.4	0	0.0	25	0.5	4,680

Table A2.4: Number and proportion of tuberculosis cases with first line drug resistance, UK, 2004-2013

Year	Isoniazid resistant		Rifampicin resistant		Ethambutol resistant		Pyrazinamide resistant*		Multi-drug resistant		Resistant to any first line drug		Total**
	n	%	n	%	n	%	n	%	n	%	n	%	
2004	321	7.1	66	1.5	19	0.4	30	0.7	49	1.1	356	7.9	4,504
2005	336	6.8	59	1.2	18	0.4	15	0.3	43	0.9	362	7.3	4,981
2006	359	7.1	79	1.6	29	0.6	29	0.6	58	1.1	397	7.8	5,085
2007	338	6.9	76	1.6	32	0.7	35	0.7	62	1.3	369	7.6	4,872
2008	288	5.8	74	1.5	39	0.8	36	0.7	55	1.1	329	6.7	4,945
2009	353	6.9	73	1.4	29	0.6	54	1.1	61	1.2	399	7.8	5,088
2010	316	6.3	77	1.5	37	0.7	43	0.9	67	1.3	347	6.9	5,035
2011	402	7.5	95	1.8	60	1.1	59	1.1	86	1.6	449	8.3	5,397
2012	360	6.8	92	1.7	51	1.0	47	0.9	82	1.6	389	7.4	5,278
2013	329	7.1	86	1.9	41	0.9	43	0.9	74	1.6	360	7.8	4,606
Total	3,402	6.8	777	1.6	355	0.7	391	0.8	637	1.3	3,757	7.5	49,791

* Excluding *M. bovis* cases
**Culture confirmed cases with DST results for at least isoniazid and rifampicin

Table A3.1: Number and proportion of culture confirmed cases typed, or with 23 or 24 loci typed by year and country, 2010-2013

	Year	Notified cases	Culture confirmed		Typed*		≥23 loci**		24 loci$	
		n	n	%	n	%	n	%	n	%
UK	2010	8,398	5,091	60.6	4,588	90.1	3,494	68.6	2,319	45.6
	2011	8,923	5,463	61.2	5,434	99.5	4,582	83.9	3,169	58.0
	2012	8,729	5,326	61.0	5,295	99.4	4,688	88.0	3,441	64.6
	2013	7,892	4,680	59.3	4,607	98.4	3,838	82.0	2,719	58.1
	Total	**33,942**	**20,560**	**60.6**	**19,924**	**96.9**	**16,602**	**80.7**	**11,648**	**56.7**
England	2010	7,677	4,606	60.0	4,160	90.3	3,223	70.0	2,166	47.0
	2011	8,284	5,027	60.7	5,000	99.5	4,264	84.8	3,003	59.7
	2012	8,099	4,892	60.4	4,862	99.4	4,300	87.9	3,167	64.7
	2013	7,290	4,313	59.2	4,255	98.7	3,588	83.2	2,563	59.4
	Total	**31,350**	**18,838**	**60.1**	**18,277**	**97.0**	**15,375**	**81.6**	**10,899**	**57.9**
Wales	2010	152	107	70.4	102	95.3	18	16.8	10	9.3
	2011	131	94	71.8	94	100.0	65	69.1	45	47.9
	2012	138	105	76.1	104	99.0	90	85.7	59	56.2
	2013	140	84	60.0	75	89.3	66	78.6	46	54.8
	Total	**561**	**390**	**69.5**	**375**	**96.2**	**239**	**61.3**	**160**	**41.0**
Northern Ireland	2010	66	53	80.3	5	9.4	5	9.4	4	7.5
	2011	61	47	77.0	47	100.0	44	93.6	21	44.7
	2012	87	53	60.9	53	100.0	44	83.0	21	39.6
	2013	73	45	61.6	43	95.6	37	82.2	23	51.1
	Total	**287**	**198**	**69.0**	**148**	**74.7**	**130**	**65.7**	**69**	**34.8**
Scotland	2010	503	325	64.6	321	98.8	248	76.3	139	42.8
	2011	447	295	66.0	293	99.3	209	70.8	100	33.9
	2012	405	276	68.1	276	100.0	254	92.0	194	70.3
	2013	389	238	61.2	234	98.3	147	61.8	87	36.6
	Total	**1,744**	**1,134**	**65.0**	**1,124**	**99.1**	**858**	**75.7**	**520**	**45.9**

* % 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 all 24 loci typed

Table A3.2: Number and proportion of unique cases, clustered cases and new clusters by year, 2010-2013

	Notified cases	Culture confirmed cases		Strain typed cases (≥23 loci)		Unique cases		Clustered cases*		New clusters (per year)**
	n	n	%	n	%	n	%	n	%	n
2010	8,398	5,091	60.6	3,494	68.6	1,630	46.7	1,864	53.3	395
2011	8,923	5,463	61.2	4,582	83.9	2,154	47.0	2,428	53.0	523
2012	8,729	5,326	61.0	4,688	88.0	2,106	44.9	2,582	55.1	557
2013	7,892	4,680	59.3	3,838	82.0	1,822	47.5	2,016	52.5	379
Total (2010-2013)	**33,942**	**20,560**	**60.6**	**16,602**	**80.7**	**7,712**	**46.5**	**8,890**	**53.5**	**1,854**

* i.e. clustered in time period (2010-2013), 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

Table A3.3: Number and proportion of unique and clustered cases by place of birth and age, 2010-2013

		Notified cases	Culture confirmed cases		Strain typed cases (≥23 loci)*		Unique cases		Clustered cases**	
		n	n	%	n	%	n	%	n	%
UK born	0-14	984	211	21.4	170	80.6	39	22.9	131	77.1
	15-44	3,608	2,335	64.7	1,958	83.9	501	25.6	1,457	74.4
	45-64	2,126	1,236	58.1	1,057	85.5	353	33.4	704	66.6
	65+	1,995	1,114	55.8	903	81.1	512	56.7	391	43.3
	Total§	**8,713**	**4,896**	**56.2**	**4,088**	**83.5**	**1,405**	**34.4**	**2,683**	**65.6**
Non-UK born	0-14	461	148	32.1	125	84.5	53	42.4	72	57.6
	15-44	16,242	10,543	64.9	8,530	80.9	4,277	50.1	4,253	49.9
	45-64	4,744	2,657	56.0	2,101	79.1	1,057	50.3	1,044	49.7
	65+	2,427	1,495	61.6	1,152	77.1	628	54.5	524	45.5
	Total◊	**23,874**	**14,843**	**62.2**	**11,908**	**80.2**	**6,015**	**50.5**	**5,893**	**49.5**

* Culture confirmed cases with a MIRU-VNTR profile with at least 23 complete loci
‡ The number of cases in the UK is higher than the sum UK born and non-UK born as 605 strain type cases have unknown UK born information
§Number of clusters with at least one UK born person in the cluster where age is known
◊ Number of clusters with at least one non-UK born person in the cluster where age is known

Table A4.1: TB outcome at 12 months after treatment start for drug sensitive cases with expected treatment duration < 12months*, UK, 2003-2012

Year	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2003	4,561	69.4	404	6.1	285	4.3	253	3.9	64	1.0	1,008	15.3	6,575
2004	4,876	70.3	390	5.6	337	4.9	315	4.5	80	1.2	940	13.6	6,938
2005	5,287	70.2	431	5.7	371	4.9	416	5.5	88	1.2	937	12.4	7,530
2006	5,622	74.9	409	5.5	401	5.4	483	6.4	91	1.2	496	6.6	7,502
2007	5,724	77.3	409	5.5	335	4.5	510	6.9	83	1.1	344	4.7	7,405
2008	6,019	79.1	397	5.2	344	4.5	468	6.2	74	1.0	309	4.1	7,611
2009	6,420	81.0	382	4.8	328	4.1	474	6.0	88	1.1	236	3.0	7,928
2010	6,133	82.1	366	4.9	317	4.2	428	5.7	67	0.9	158	2.1	7,469
2011	6,459	81.4	361	4.6	388	4.9	505	6.4	77	1.0	143	1.8	7,933
2012	6,438	82.8	345	4.4	307	4.0	446	5.7	79	1.0	159	2.1	7,774

* Excludes initial and amplified to rifampcin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

Table A4.2: Last recorded TB outcome for drug sensitive cases with expected treatment duration < 12months*, UK, 2003-2012

Year	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2003	4,675	71.1	406	6.2	285	4.3	137	2.1	64	1.0	1,008	15.3	6,575
2004	5,031	72.5	391	5.6	338	4.9	158	2.3	80	1.2	940	13.6	6,938
2005	5,495	73.0	434	5.8	371	4.9	205	2.7	88	1.2	937	12.4	7,530
2006	5,877	78.3	415	5.5	404	5.4	218	2.9	92	1.2	496	6.6	7,502
2007	6,050	81.7	415	5.6	340	4.6	172	2.3	84	1.1	344	4.7	7,405
2008	6,355	83.5	403	5.3	351	4.6	116	1.5	77	1.0	309	4.1	7,611
2009	6,758	85.2	397	5.0	329	4.2	119	1.5	89	1.1	236	3.0	7,928
2010	6,441	86.2	371	5.0	323	4.3	107	1.4	69	0.9	158	2.1	7,469
2011	6,925	87.3	366	4.6	390	4.9	29	0.4	80	1.0	143	1.8	7,933
2012	6,751	86.8	350	4.5	315	4.1	118	1.5	81	1.0	159	2.1	7,774

* Excludes initial and amplified to RMP-resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out

Table A4.3: Median time to treatment completion for drug sensitive cases with expected treatment duration < 12months*, UK, 2003-2012

Year	Cases reported	Completed**		95% confidence interval			Median	Range		
		n	%							
2003	6,575	4,675	71.1	70.0	-	72.2	196	180	-	915
2004	6,938	5,031	72.5	71.4	-	73.6	196	180	-	3,411
2005	7,530	5,495	73.0	72.0	-	74.0	192	180	-	1,363
2006	7,502	5,877	78.3	77.4	-	79.3	194	180	-	1,326
2007	7,405	6,050	81.7	80.0	-	82.6	193	180	-	986
2008	7,611	6,355	83.5	82.6	-	84.3	193	180	-	1,927
2009	7,928	6,758	85.2	84.4	-	86.0	192	180	-	993
2010	7,469	6,441	86.2	85.4	-	87.0	191	180	-	1,252
2011	7,933	6,925	87.3	86.5	-	88.0	191	180	-	1,115
2012	7,774	6,751	86.8	86.1	-	87.6	191	180	-	1,729
Total	**74,665**	**60,358**	**80.8**	**80.6**	**-**	**81.1**	**193**	**180**	**-**	**3,411**

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB
** Completed refers to last recorded outcome

Table A4.4: Treatment completion at 12 months by age group for drug sensitive cases with expected treatment duration < 12months*, UK, 2003-2012

Year	0-14		15-44		45-64		65+	
	n	%	n	%	n	%	n	%
2003	259	79.0	2,856	73.0	854	67.0	591	56.0
2004	327	80.5	3,042	73.5	940	70.1	567	54.0
2005	325	79.7	3,438	74.1	901	65.8	622	55.9
2006	301	84.8	3,592	78.1	1,088	75.9	641	57.6
2007	380	83.9	3,610	80.3	1,096	77.9	638	60.8
2008	402	88.9	3,821	81.7	1,168	80.1	625	61.3
2009	372	91.6	3,993	83.8	1,292	80.3	763	66.3
2010	320	91.7	3,816	85.1	1,275	82.3	722	66.7
2011	329	85.9	4,031	84.1	1,391	82.7	708	65.7
2012	345	90.3	4,020	85.5	1,351	83.2	722	67.7

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

Table A4.5: Treatment completion at 12 months by sex for drug sensitive cases with expected treatment duration < 12months*, UK, 2003-2012

Year	Male		Female	
	n	%	n	%
2003	2,485	67.5	2,076	71.9
2004	2,671	69.6	2,203	71.2
2005	2,856	68.4	2,428	72.6
2006	2,980	72.7	2,633	77.7
2007	3,090	75.7	2,622	79.2
2008	3,194	77.5	2,806	81.1
2009	3,452	79.3	2,932	83.2
2010	3,403	81.0	2,702	83.7
2011	3,562	79.2	2,877	84.4
2012	3,596	80.8	2,842	85.5

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

Table A4.6: TB outcome at 12 months by site of disease for drug sensitive cases with expected treatment duration < 12months, 2012*

Site of disease	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total#
	n	%	n	%	n	%	n	%	n	%	n	%	n
Pulmonary only	2,727	81.2	204	6.1	132	3.9	192	5.7	31	0.9	72	2.1	3,358
Pulmonary, with or without EP	3,333	80.4	250	6.0	175	4.2	266	6.4	36	0.9	84	2.0	4,144
Extrapulmonary only	3,072	85.8	92	2.6	128	3.6	175	4.9	41	1.1	73	2.0	3,581
Extra-thoracic lymph nodes	1,650	86.0	31	1.6	79	4.1	94	4.9	22	1.2	43	2.2	1,919
Intra-thoracic lymph nodes	795	87.5	14	1.5	34	3.7	46	5.1	5	0.6	15	1.7	909
Pleural	581	82.1	44	6.2	31	4.4	32	4.5	5	0.7	15	2.1	708
Bone Other	141	69.1	7	3.4	9	4.4	37	18.1	4	2.0	6	2.9	204
All other EP sites‡	1,538	82.4	71	3.8	76	4.1	124	6.6	22	1.2	36	1.9	1,867
Unknown site	55	64.7	5	5.8	4	4.7	6	7.1	2	2.4	13	15.3	85
Total	6,438	82.8	345	4.4	307	4.0	446	5.7	79	1.0	159	2.1	7,774

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB
** Not evaluated includes missing, unknown and transferred out
# Multiple sites of disease can be reported so does not add up to the total number of cases
‡ All other EP sites - includes gastrointestinal, genitourinary, laryngeal, other and unknown extra pulmonary (EP) disease

Table A4.7: TB outcome at 12 months for drug sensitive cases with expected treatment duration <12 months by country, PHE region and PHE centre, 2012

	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
Country	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
England	5,998	83.3	305	4.2	282	3.9	417	5.8	76	1.1	120	1.7	7,198
Wales	88	72.1	12	9.8	6	4.9	10	8.2	2	1.6	4	3.3	122
Northern Ireland	53	67.9	3	3.8	7	9.0	13	16.7	1	1.3	1	1.3	78
Scotland	299	79.5	25	6.6	12	3.2	6	1.6	0	0.0	34	9.0	376
PHE Centre/Region													
North of England	**1,125**	**81.7**	**74**	**5.4**	**45**	**3.3**	**89**	**6.5**	**16**	**1.2**	**28**	**2.0**	**1,377**
North East	117	77.5	11	7.3	4	2.6	10	6.6	3	2.0	6	4.0	151
Cumbria and Lancashire	163	82.7	8	4.1	2	1.0	13	6.6	2	1.0	9	4.6	197
Yorkshire and the Humber	436	81.2	26	4.8	22	4.1	46	8.6	5	0.9	2	0.4	537
Greater Manchester	325	82.3	21	5.3	16	4.1	18	4.6	5	1.3	10	2.5	395
Cheshire and Merseyside	84	86.6	8	8.2	1	1.0	2	2.1	1	1.0	1	1.0	97
Midlands and East of England	**1,528**	**82.5**	**100**	**5.4**	**76**	**4.1**	**104**	**5.6**	**22**	**1.2**	**22**	**1.2**	**1,852**
East Midlands	295	81.5	27	7.5	14	3.9	13	3.6	5	1.4	8	2.2	362
West Midlands	828	85.4	43	4.4	33	3.4	53	5.5	9	0.9	3	0.3	969
Anglia and Essex	180	76.3	16	6.8	15	6.4	21	8.9	0	0.0	4	1.7	236
South Midlands and Hertfordshire	225	78.9	14	4.9	14	4.9	17	6.0	8	2.8	7	2.5	285
London	**2,572**	**85.9**	**81**	**2.7**	**122**	**4.1**	**168**	**5.6**	**30**	**1.0**	**20**	**0.7**	**2,993**
South of England	**773**	**79.3**	**50**	**5.1**	**38**	**3.9**	**56**	**5.7**	**8**	**0.8**	**50**	**5.1**	**975**
Kent, Surrey and Sussex	241	78.2	17	5.5	13	4.2	11	3.6	1	0.3	25	8.1	308
Thames Valley	233	87.9	11	4.2	6	2.3	11	4.2	3	1.1	1	0.4	265
Wessex	124	81.6	4	2.6	9	5.9	10	6.6	1	0.7	4	2.6	152
Devon, Cornwall and Somerset	61	74.4	6	7.3	2	2.4	10	12.2	1	1.2	2	2.4	82
Avon, Gloucestershire and Wiltshire	114	67.9	12	7.1	8	4.8	14	8.3	2	1.2	18	10.7	168

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

** Not evaluated includes missing, unknown and transferred out

Table A4.8: Treatment completion at 12 months for drug sensitive cases with expected treatment duration < 12months* by country, PHE region and PHE centre, 2003-2012

	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
Country	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
England	4,195	69.6	4,431	70.1	4,879	70.3	5,220	75.5	5,288	78.1	5,586	79.9	5,918	81.8	5,633	82.6	6,008	81.8	5,998	83.3
Wales	102	67.1	112	65.1	116	67.4	115	66.9	113	60.8	115	76.7	146	76.0	107	77.5	90	76.3	88	72.1
Northern Ireland	28	53.8	53	74.6	35	52.2	46	82.1	46	73.0	36	61.0	41	75.9	39	67.2	42	79.2	53	67.9
Scotland	236	68.8	280	74.7	257	74.3	260	72.2	277	72.7	282	68.9	315	70.3	354	77.5	319	76.3	299	79.5
PHE Centre/Region																				
North of England	**867**	**74.9**	**720**	**63.4**	**901**	**68.9**	**997**	**73.9**	**1,030**	**73.3**	**1,055**	**75.4**	**1,167**	**78.5**	**1,136**	**80.2**	**1,108**	**76.6**	**1,125**	**81.7**
North East	88	65.2	96	75.0	77	61.1	98	71.0	139	77.7	121	72.5	111	72.5	111	79.3	89	73.6	117	77.5
Cumbria and Lancashire	102	77.9	121	74.7	114	67.5	115	79.9	143	83.1	138	88.5	142	86.6	140	80.9	147	77.8	163	82.7
Yorkshire and the Humber	394	79.3	305	62.8	354	71.1	422	72.5	401	70.2	426	74.6	468	77.0	424	75.0	429	72.6	436	81.2
Greater Manchester	241	73.0	164	53.1	253	66.2	277	74.7	298	73.9	309	75.0	381	79.9	374	88.2	380	82.3	325	82.3
Cheshire and Merseyside	42	64.6	34	68.0	103	77.4	85	73.9	49	60.5	61	64.9	65	76.5	87	76.3	63	75.0	84	86.6
Midlands and East of England	**862**	**59.1**	**1,050**	**64.3**	**1,018**	**58.1**	**1,283**	**71.6**	**1,348**	**78.2**	**1,416**	**78.5**	**1,490**	**80.5**	**1,372**	**81.3**	**1,486**	**81.3**	**1,528**	**82.5**
East Midlands	88	23.3	89	28.0	81	19.3	346	706.1	333	79.7	289	77.3	342	82.0	323	86.1	312	81.9	295	81.5
West Midlands	516	70.4	633	73.3	570	68.7	565	67.7	674	77.3	759	82.3	745	81.9	632	79.9	725	81.1	828	85.4
Anglia and Essex	106	73.6	148	72.2	142	68.3	152	72.0	136	73.1	178	71.5	175	75.1	172	77.5	190	80.2	180	76.3
South Midlands and Hertfordshire	152	74.9	180	72.9	225	76.5	220	76.9	205	83.0	190	73.4	228	78.6	245	81.7	259	82.0	225	78.9
London	**2,076**	**76.4**	**2,182**	**78.3**	**2,441**	**78.8**	**2,429**	**81.8**	**2,338**	**82.8**	**2,539**	**85.3**	**2,581**	**86.3**	**2,436**	**86.0**	**2,617**	**85.6**	**2,572**	**85.9**
South of England	**390**	**56.2**	**479**	**63.2**	**517**	**66.0**	**511**	**63.6**	**572**	**69.8**	**575**	**70.9**	**680**	**74.9**	**689**	**78.3**	**796**	**78.9**	**773**	**79.3**
Kent, Surrey and Sussex	84	43.5	94	47.0	108	56.5	136	55.7	143	61.1	180	67.2	211	73.8	186	69.4	263	80.7	241	78.2
Thames Valley	177	78.7	168	78.1	207	78.7	180	86.5	200	81.6	184	87.6	200	88.1	235	90.7	222	85.7	233	87.9
Wessex	32	26.9	100	71.9	96	71.6	103	74.6	88	68.8	76	68.5	119	74.8	116	81.7	147	83.5	124	81.6
Devon, Cornwall and Somerset	17	39.5	41	53.2	33	52.4	29	50.9	41	67.2	44	65.7	53	74.6	44	75.9	63	74.1	61	74.4
Avon, Gloucestershire and Wiltshire	80	70.2	76	59.8	73	55.3	63	40.1	100	66.2	91	58.7	97	58.8	108	70.6	101	62.0	114	67.9

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treated cases and those with CNS, spinal, miliary or cryptic disseminated TB

Table A4.9: Last recorded TB outcome by end of follow up period for drug sensitive cases with CNS, spinal, miliary or cryptic disseminated TB TB cases*, UK, 2003-2012

Year	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2003	348	60.8	60	10.5	25	4.4	35	6.1	5	0.9	99	17.3	572
2004	318	54.6	83	14.2	33	5.7	38	6.5	8	1.4	103	17.7	583
2005	402	57.6	80	11.5	37	5.3	47	6.7	8	1.2	124	17.8	698
2006	480	66.0	75	10.3	40	5.5	59	8.1	10	1.4	63	8.7	727
2007	549	70.5	69	8.9	46	5.9	64	8.2	8	1.0	43	5.5	779
2008	561	69.6	88	10.9	48	6.0	53	6.6	7	0.9	49	6.1	806
2009	641	73.3	83	9.5	49	5.6	59	6.8	9	1.0	33	3.8	874
2010	625	73.6	75	8.8	52	6.1	63	7.4	11	1.3	23	2.7	849
2011	720	80.7	73	8.2	59	6.6	8	0.9	10	1.1	22	2.5	892
2012[#]	612	71.5	82	9.6	55	6.4	81	9.5	7	0.8	19	2.2	856

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases and only includes drug sensitive TB cases with CNS, spinal, miliary or cryptic disseminated TB

** Not evaluated includes missing, unknown and transferred out

[#] Reduced follow up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

Table A4.10: Median time to treatment completion for drug sensitive cases with CNS, spinal, miliary or cryptic disseminated TB cases*, UK, 2003-2012

Year	Cases reported	Completed		95% confidence interval	Median	Range
		n	%			
2003	572	348	60.8	56.7 - 64.9	315	180 - 406
2004	583	318	54.6	50.4 - 58.6	282	180 - 785
2005	698	402	57.6	53.8 - 61.3	334	180 - 1,183
2006	727	480	66.0	62.5 - 69.5	303	180 - 883
2007	779	549	70.5	67.1 - 73.7	351	180 - 831
2008	806	561	69.6	66.3 - 72.8	358	180 - 976
2009	874	641	73.3	70.3 - 76.2	360	180 - 1,402
2010	849	625	73.6	70.5 - 76.6	362	180 - 1,058
2011	892	720	80.7	78.0 - 83.3	365	180 - 1,029
2012	856	612	71.5	68.3 - 74.5	363	180 - 743
Total	**7,636**	**5,256**	**68.8**	**67.8 - 69.9**	**359**	**180 - 1,402**

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases and only includes drug sensitive TB cases with CNS, spinal, miliary or cryptic disseminated TB

Table A4.11: Drug sensitive* TB cases reported to have died at last recorded outcome, UK, 2003-2012

Year	Cases reported	Total deaths		TB caused or contributed to death		TB incidental to death		Unknown	
		n	%	n	%	n	%	n	%
2003	7,147	466	6.5	173	37.1	96	20.6	197	42.3
2004	7,521	474	6.3	182	38.4	122	25.7	170	35.9
2005	8,228	514	6.2	172	33.5	125	24.3	217	42.2
2006	8,229	490	6.0	165	33.7	106	21.6	219	44.7
2007	8,184	484	5.9	164	33.9	97	20.0	223	46.1
2008	8,417	491	5.8	175	35.6	117	23.8	199	40.5
2009	8,802	480	5.5	175	36.5	102	21.3	203	42.3
2010	8,318	446	5.4	131	29.4	122	27.4	193	43.3
2011	8,825	439	5.0	131	29.8	110	25.1	198	45.1
2012	8,630	432	5.0	140	32.4	98	22.7	194	44.9

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases

Table A4.12: Last recorded TB outcome for drug sensitive TB cases by site of disease*, 2012

Site of disease	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total[#]
	n	%	n	%	n	%	n	%	n	%	n	%	n
Expected treatment duration of <12 months													
Pulmonary only	2,857	85.1	209	6.2	136	4.1	52	1.5	32	1.0	72	2.1	3,358
Pulmonary, with or without EP	3,513	84.8	255	6.2	179	4.3	75	1.8	38	0.9	84	2.0	4,144
Extrapulmonary only	3,202	89.4	92	2.6	132	3.7	41	1.1	41	1.1	73	2.0	3,581
Extra-thoracic lymph nodes	1,712	89.2	31	1.6	82	4.3	28	1.5	23	1.2	43	2.2	1,919
Intra-thoracic lymph nodes	829	91.2	14	1.5	34	3.7	12	1.3	5	0.6	15	1.7	909
Pleural	600	84.7	44	6.2	32	4.5	11	1.6	6	0.8	15	2.1	708
Bone Other	168	82.4	7	3.4	9	4.4	10	4.9	4	2.0	6	2.9	204
All other EP sites[‡]	1,638	87.7	71	3.8	76	4.1	23	1.2	23	1.2	36	1.9	1,867
Unknown site	59	69.4	5	5.9	4	4.7	2	2.4	2	2.4	13	15.3	85
Total	6,751	86.8	350	4.5	315	4.1	118	1.5	81	1.0	159	2.1	7,774
Cases of CNS, spinal, miliary or cryptic disseminated TB[$]													
Bone Spine	301	77.4	14	3.6	29	7.5	32	8.2	2	0.5	11	2.8	389
CNS Meningitis	114	60.3	29	15.3	12	6.3	28	14.8	3	1.6	3	1.6	189
CNS Other	88	63.3	16	11.5	13	9.4	17	12.2	2	1.4	3	2.2	139
Miliary	147	69.3	39	18.4	9	4.2	15	7.1	1	0.5	1	0.5	212
Cryptic disseminated	34	87.2	2	5.1	1	2.6	1	2.6	0	0.0	1	2.6	39
Total	612	71.5	82	9.6	55	6.4	81	9.5	7	0.8	19	2.2	856

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases
** Not evaluated includes missing, unknown and transferred out
# Multiple sites of disease can be reported so does not add up to the total number of cases
‡ All other EP sites - includes gastrointestinal, genitourinary, laryngeal, other and unknown extra pulmonary (EP) disease
$ Cases may have an additional site of disease not shown (i.e. pulmonary, lymph node, pleural, bone other or other EP sites)

Table: A4.13: Last recorded TB outcome for drug sensitive cases* by country, PHE region and PHE centre, 2012

	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
Country	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
England	6,878	85.9	383	4.8	344	4.3	182	2.3	82	1.0	134	1.7	8,003
Wales	101	73.7	16	11.7	6	4.4	5	3.6	4	2.9	5	3.6	137
Northern Ireland	67	77.0	6	6.9	7	8.0	5	5.7	1	1.1	1	1.1	87
Scotland	317	78.7	27	6.7	13	3.2	7	1.7	1	0.2	38	9.4	403
PHE Centre/Region													
North of England	**1,294**	**85.0**	**88**	**5.8**	**58**	**3.8**	**32**	**2.1**	**16**	**1.1**	**35**	**2.3**	**1,523**
North East	132	80.5	14	8.5	4	2.4	4	2.4	3	1.8	7	4.3	164
Cumbria and Lancashire	178	84.4	11	5.2	3	1.4	7	3.3	2	0.9	10	4.7	211
Yorkshire and the Humber	506	86.2	30	5.1	27	4.6	16	2.7	5	0.9	3	0.5	587
Greater Manchester	385	85.2	25	5.5	20	4.4	5	1.1	5	1.1	12	2.7	452
Cheshire and Merseyside	93	85.3	8	7.3	4	3.7	0	0.0	1	0.9	3	2.8	109
Midlands and East of England	**1,755**	**85.4**	**132**	**6.4**	**91**	**4.4**	**31**	**1.5**	**23**	**1.1**	**24**	**1.2**	**2,056**
East Midlands	338	81.6	40	9.7	17	4.1	4	1.0	5	1.2	10	2.4	414
West Midlands	948	88.6	52	4.9	40	3.7	17	1.6	10	0.9	3	0.3	1070
Anglia and Essex	206	82.4	18	7.2	17	6.8	5	2.0	0	0.0	4	1.6	250
South Midlands and Hertfordshire	263	81.7	22	6.8	17	5.3	5	1.6	8	2.5	7	2.2	322
London	**2,950**	**87.8**	**101**	**3.0**	**153**	**4.6**	**98**	**2.9**	**34**	**1.0**	**23**	**0.7**	**3,359**
South of England	**879**	**82.7**	**61**	**5.7**	**41**	**3.9**	**21**	**2.0**	**9**	**0.8**	**52**	**4.9**	**1,063**
Kent, Surrey and Sussex	270	79.6	20	5.9	13	3.8	9	2.7	1	0.3	26	7.7	339
Thames Valley	266	91.4	12	4.1	6	2.1	3	1.0	3	1.0	1	0.3	291
Wessex	142	86.6	5	3.0	10	6.1	2	1.2	1	0.6	4	2.4	164
Devon, Cornwall and Somerset	71	82.6	9	10.5	2	2.3	1	1.2	1	1.2	2	2.3	86
Avon, Gloucestershire and Wiltshire	130	71.0	15	8.2	10	5.5	6	3.3	3	1.6	19	10.4	183

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases
** Not evaluated includes missing, unknown and transferred out

Table: A4.14: Drug sensitive* TB cases reported as lost to follow up at last recorded outcome, UK, 2003-2012

Year	Cases reported	Lost to follow up		UK born		Non-UK born		Lost to follow up abroad	
		n	%	n	%	n	%	n	%
2003	7,147	310	4.3	52	16.8	241	77.7	67	51.5
2004	7,521	371	4.9	48	12.9	295	79.5	63	43.8
2005	8,228	408	5.0	52	12.7	320	78.4	67	44.1
2006	8,229	444	5.4	56	12.6	351	79.1	100	55.9
2007	8,184	386	4.7	54	14.0	296	76.7	93	50.5
2008	8,417	399	4.7	43	10.8	325	81.5	171	56.4
2009	8,802	378	4.3	43	11.4	306	81.0	156	53.8
2010	8,318	375	4.5	35	9.3	323	86.1	183	58.7
2011	8,825	449	5.1	42	9.4	385	85.7	233	61.5
2012	8,630	370	4.3	29	7.8	318	85.9	198	67.6
Total	**82,301**	**3,890**	**4.7**	**454**	**11.7**	**3,160**	**81.2**	**1,331**	**42.1**

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases
** Non-UK born cases with a known reason of lost to follow up

Table A4.15: Lost to follow up at last recorded outcome by age group in drug sensitive* TB cases, UK, 2003-2012

Year	0-14		15-44		45-64		65+	
	n	%	n	%	n	%	n	%
2003	8	2.3	240	5.6	42	3.1	20	1.7
2004	11	2.5	297	6.6	38	2.6	25	2.2
2005	14	3.2	321	6.4	54	3.6	19	1.5
2006	6	1.6	350	6.9	60	3.8	28	2.3
2007	5	1.0	299	6.0	58	3.7	24	2.1
2008	4	0.8	333	6.5	43	2.6	19	1.7
2009	3	0.7	298	5.6	56	3.1	21	1.6
2010	3	0.8	300	6.0	49	2.8	21	1.8
2011	10	2.5	364	6.8	54	2.9	21	1.7
2012	1	0.2	311	6.0	41	2.3	17	1.4

* Excludes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases

Table A4.16: TB outcome at 24 months after treatment start for drug resistant* TB cases, UK, 2004-2011

Year	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2004	37	50.7	5	6.9	8	11.0	15	20.6	4	5.5	4	5.5	73
2005	38	61.3	4	6.5	7	11.3	6	9.7	5	8.1	2	3.2	62
2006	42	49.4	3	3.5	9	10.6	27	31.8	3	3.5	1	1.2	85
2007	30	35.7	13	15.5	6	7.1	27	32.1	6	7.1	2	2.4	84
2008	42	53.9	7	9.0	10	12.8	15	19.2	3	3.9	1	1.3	78
2009	35	46.1	4	5.3	12	15.8	22	29.0	1	1.3	2	2.6	76
2010	38	47.5	0	0.0	9	11.3	28	35.0	4	5.0	1	1.3	80
2011	47	48.0	4	4.1	19	19.4	22	22.5	4	4.1	2	2.0	98

* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only
** Not evaluated includes missing, unknown and transferred out

Table A4.17: Last recorded TB outcome for drug resistant* TB cases, 2004-2011

Year	Completed		Died		Lost to follow up		Still on treatment		Stopped		Not evaluated**		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n
2004	49	67.1	5	6.8	8	11.0	3	4.1	4	5.5	4	5.5	73
2005	42	67.7	4	6.5	8	12.9	1	1.6	5	8.1	2	3.2	62
2006	63	74.1	4	4.7	9	10.6	5	5.9	3	3.5	1	1.2	85
2007	53	63.1	13	15.5	6	7.1	2	2.4	6	7.1	4	4.8	84
2008	55	70.5	8	10.3	10	12.8	1	1.3	3	3.8	1	1.3	78
2009	57	75.0	4	5.3	12	15.8	0	0.0	1	1.3	2	2.6	76
2010	61	76.3	1	1.3	9	11.3	4	5.0	5	6.3	0	0.0	80
2011[#]	63	64.3	4	4.1	19	19.4	6	6.1	4	4.1	2	2.0	98

* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only
** Not evaluated includes missing, unknown and transferred out
[#] Reduced follow up period for this group, therefore proportion completed expected to increase and proportion still on treatment expected to decrease in future reporting

Table A4.18: Median time to treatment completion for drug resistant* TB cases, UK, 2003-2012

Year	Cases reported	Completed		95% confidence interval			Median	Range		
		n	%							
2004	73	49	67.1	55.1	-	77.7	585	201	-	1,955
2005	62	42	67.7	54.7	-	79.1	581	216	-	810
2006	85	63	74.1	63.5	-	83.0	622	362	-	1,099
2007	84	53	63.1	51.9	-	73.4	731	180	-	1,116
2008	78	55	70.5	59.1	-	80.3	634	361	-	985
2009	76	57	75.0	63.7	-	84.2	695	190	-	1,188
2010	80	61	76.3	65.4	-	85.1	648	271	-	1,103
2011	98	63	64.3	54.0	-	73.7	698	340	-	922
Total	**761**	**465**	**61.1**	**57.5**	**-**	**64.6**	**624**	**180**	**-**	**1955**

* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only

Table A4.19: Lost to follow up at last recorded outcome in drug resistant* TB cases by country of birth, UK, 2004-2011

Year	Cases reported	Lost to follow up		UK born		Non-UK born		Lost to follow up abroad**	
		n	%	n	%	n	%	n	%
2004	73	8	11.0	0	0.0	7	87.5	4	57.1
2005	62	8	11.3	1	12.5	7	87.5	5	83.3
2006	85	9	10.6	1	11.1	8	88.9	5	71.4
2007	84	6	7.1	0	0.0	6	100.0	5	100.0
2008	78	10	12.8	0	0.0	10	100.0	8	80.0
2009	76	12	15.8	0	0.0	11	91.7	8	72.7
2010	80	9	11.3	0	0.0	9	100.0	8	88.9
2011	98	19	19.4	0	0.0	19	100.0	15	78.9
Total	**761**	**86**	**11.3**	**2**	**2.3**	**80**	**93.0**	**58**	**72.5**

* Includes initial and amplified to rifampicin resistant TB and MDR-TB cases and MDR-TB treatment cases only
** Non-UK born cases with a known reason of lost to follow up

Appendix II. Methods

Data Production

Case notifications

Cases in England, Wales and Northern Ireland are notified to the Enhanced Tuberculosis Surveillance system (ETS). Cases in London region are currently notified to the London TB Register (LTBR). Data from the LTBR is routinely imported to ETS. Cases in Scotland are notified to the Enhanced Surveillance of Mycobacterial Infections (ESMI). Data from ETS and ESMI are compiled for the purpose of UK reporting.

Matching laboratory isolates to case notifications

Data from all TB isolates identified in the four UK mycobacterium reference laboratories between January 2003 and March 2014 were deduplicated and a summary record was generated from all the isolates from the same individual within a 12 month period. MDR-TB cases that received treatment for longer than 12 months were reviewed and summarised outwith the 12-month period. These data were then matched to TB case notifications from 2003-2013, through a probabilistic matching process based on patient identifiers common to both the laboratory isolate and the case notification [8]. Matches were also subject to manual review to identify any false positive or false negative matches.

In addition, isolates and cases are matched in ETS; automatically where patient identifiers are identical or manually by frontline users where differences in patient identifiers occur. These matches were included in the production of the full dataset.

Data cleaning to improve data quality

In addition to validation checks at data entry and routine cleaning queries that identify missing or inconsistent data within ETS, the following cleaning was subsequently carried out to produce the dataset used in reporting.

Cases of BCGosis, patients with latent TB on chemoprophylaxis or cases of non-tuberculosis mycobacteria who had been notified in error were identified using comments fields, queried with clinics and denotified. Cases with culture confirmed results who were denotified were also queried with clinics, and lab contaminations were removed or cases were renotified if they were found to have been denotified in error.

The site of disease was reclassified to pulmonary if a positive sputum sample was recorded at any time during treatment or, for culture confirmed cases, a positive culture was grown from a

pulmonary laboratory specimen. Site of disease for cases with extra-pulmonary disease was reclassified for culture confirmed cases based on the site in the body where the specimen was taken.

Occupation was categorised into the main occupation groups using the free text field, where occupation was recorded as unknown or other.

The presence or absence of the social risk factors drug or alcohol misuse, homelessness and prison were updated based on information in the comments fields. Drug misuse was updated to yes if recorded as unknown but current or past drug misuse was mentioned in the comments fields.

Alcohol use was updated if alcohol use was mentioned in the comments along with evidence that the patient was non-compliant or on DOT, in line with the definition that alcohol affects the ability to self administer treatment.

Homelessness was updated to yes if mentioned in the comments fields or if the address given was “no fixed abode” or a shelter/hostel was named. Named homeless shelters/hostels were confirmed to be for homeless residents.

Prison was updated to yes if mentioned in the comments fields or if HMP or a prison was recorded as the address.

Children under 16 with drug or alcohol use recorded had data queried with the clinic and corrected as appropriate.

Data cleaning of TB outcomes

Where ‘date of death’ and ‘post mortem date of death’ differed, the date of death was validated using ONS mortality data and updated. Deaths were classified as post mortem deaths if the date of death was earlier than the date of diagnosis, where date of diagnosis was available.

For cases who died and treatment start date was available, cases were reclassified as died at 12, 24 or 36 months based on the time between the date of starting treatment and the date of death. Where the date of treatment start was not available, the case report date was used. Outliers were queried with the clinic.

For cases who completed treatment and treatment start date was available, cases were reclassified as completed at 12, 24 or 36 months based on the time between the date of treatment start and the date of treatment completion. Where treatment start date was not available ‘case report date’ was used. Outliers were queried with the clinic.

For cases with no known treatment outcome, data was updated based on comments fields. For cases who were transferred to another clinic but a duplicate was entered in error the treatment outcome was used from the record where it was recorded and the duplicate was removed.

Reporting methodology

Tuberculosis rates

Overall tuberculosis rates per 100,000 population, as well as those by age, sex and area of reporting, were calculated for the UK using the mid-year population estimates provided by the Office for National Statistics (ONS).

Rates by place of birth and by ethnic group were calculated using population estimates from the Labour Force Survey (LFS). 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.

Rates for the most frequent countries of birth of non-UK born cases were calculated using population estimates from the Annual Population Survey (APS).

Numbers of recent migrants were calculated using data on the number of people issued with a UK entry clearance visa to stay for longer than 6 months, obtained from Home Office UK Visas and Immigration Proviso-Central Reference System (CRS) visa case working system published by ONS. Countries of birth for migrants were divided into 4 categories using the World Health Organisation (WHO) estimated incidence rates for 2012. The categories were <40, 40-150, 150-250 and ≥251 cases per 100,000 population.

TB rates detected during pre-entry TB screening were calculated by taking the cases detected as the numerator and the number of applicants screened in the same year as the denominator.

Three-year average rates

The three-year rolling average rates for TB incidence have been calculated by first calculating a three-year average figure for the number of new TB cases (the numerator), and then the denominator used is the mid-year population data for the middle year of the three year period.

DOT interpretation

The variables for collecting information on DOT are slightly different in ETS and LTBR. In ETS, the relevant variable is “Is the patient to begin a course of treatment under direct

observation?". In LTBR the relevant variable is "Patient was taking Directly Observed Therapy at any time during the episode of care". For the purposes of this report, a report of 'yes' for either variable was taken as an indication that the patient had received DOT.

Reporting of *Mycobacterium* species

The species field was reclassified based on MIRU-VNTR phylotypic lineage (see below); those reported as MTBC with a phylotypic lineage of EAI, Beijing, CAS, or Euro-american were reclassified as *M. tuberculosis. T*hose reported as *M. tuberculosis* or MTBC with phylotypic lineage of *M. bovis* or *M. africanum* were reclassified as *M. bovis* or *M. africanum* respectively.

Reporting drug resistance

Initial resistance is classed as resistance identified within three months of the first specimen date. However, if there was evidence of amplification of resistance within this three month period, based on a change from a sensitive to resistant result following start of treatment, then these were reclassified as amplified resistance. Any result which changed from sensitive to resistant after the three month period was automatically counted as amplification. If no drug susceptibility results were available for isolates cultured in the first three months, any subsequent susceptibility results were not used, unless MDR-TB was identified. To ensure that all MDR-TB cases were counted, where the first drug susceptibility test available was positive for MDR-TB after the three month cut off, with no evidence of amplification, this MDR-TB result was classified as initial resistance.

MDR-TB Treatment

Additional cases treated for MDR-TB, but not culture confirmed, were identified using key word searches on the comment fields on the ETS case reports.

Strain typing

Strain types were assigned cluster numbers and phylogenetic lineage (based on MIRU-VNTR) using data from the "UK TB Cluster Naming Resource" (http://bioinformatics.phe.org.uk/TBCluster/tbhome.php) for those with a strain type with at least 23 loci.

A cluster was defined as two or more cases with indistinguishable 24 MIRU-VNTR strain types with at least one case with a complete 24 loci profile [2]. Additional cases in the cluster may each have one missing loci. In addition there are clusters identified by the Mycobacteria Reference Laboratories where all cases in the cluster have one untypable locus at the same locus which are designated as u clusters. The year a cluster was assigned to being a new cluster was the year of notification of the second case in the cluster.

Cases that are part of a cluster are referred to as clustered cases. Clustered cases were presented nationally, and stratified by geographical area. Clustered cases within a geographical area were only defined as clustered if they were in a cluster with other cases within the same the area.

TB outcome cohorts

For the purposes of TB outcome reporting, the drug sensitive cohort is defined as all TB cases, excluding those with rifampicin resistant TB or MDR-TB (initial or amplified), or non-culture confirmed cases treated as MDR-TB [4]. In this report, treatment outcomes for drug sensitive TB cases are reported separately for the following groups:

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

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

A TB outcome is assigned to each member of these cohorts; those that have an unknown treatment outcome, or recorded as transferred to another clinic are assigned the outcome “not evaluated”.

As well as reporting outcomes at defined time periods (at 12 and 24 months for drug sensitive and drug resistant cohorts respectively), a last recorded outcome was collected and reported for those still on treatment beyond the 12 and 24 month time periods.

Specifically, for this report the following groups have been presented:

- drug sensitive cohort with expected course of treatment less than 12 months TB outcomes were reported at 12 months, with analysis of treatment completion at 12 months
- drug sensitive cohort with CNS, spinal, miliary or cryptic disseminated TB had outcomes reported for the last recorded outcome
- analysis of deaths in the entire drug sensitive cohort (including CNS, spinal, miliary or cryptic disseminated TB) were presented for the last recorded outcome
- analysis of loss to follow up in the entire drug sensitive cohort was presented for the last recorded outcome

- drug resistant cohort had TB outcomes reported at 24 months, with analysis of treatment completion at 24 months
- Deaths and loss to follow up of the drug resistant cohort were reported at last recorded outcome

Confidence intervals

A 95% confidence interval for incidence rates were calculated using a Poisson distribution. For proportions a binomial distribution was used.

Appendix III. Surveillance data quality

Data Completeness

Audits of records are undertaken annually based on the criteria suggested in the 2007 Department of Health TB Toolkit for Commissioners [9] which outlines the minimum quality standards for surveillance. Table 5.1 shows the level of completeness of the information for the Toolkit fields with have a 95% target. To further categorise completeness <95%, 95-98% and 99-100% completeness are colour coded in the table. The fields “Name”, “Postcode”, “Date of birth” and “Date of notification” are mandatory fields in Enhanced TB Surveillance system (ETS) (100% completeness), thus these fields are not included in Table 5.1.

Demographic Variables

The recording of place of birth (UK, non-UK born or unknown) was high and met the target of 99% in all areas, with the exception of Scotland (it should be noted that this was introduced as a mandatory field in ETS during 2013). A lower proportion of cases (97%) had a known place of birth (i.e. when those reported as unknown were excluded). An improvement in “known” information is required to provide useful data outputs. Data completeness for known place of birth was particularly low for: North East (87% known), Yorkshire and the Humber (92% known) and Devon, Cornwall and Somerset (88% known). Place of birth was known for 100% of cases in Thames Valley and Wessex.

The proportion of cases with known ethnic group was >95% in all areas apart from Yorkshire and Humber and Avon, Gloucestershire and Wiltshire.

NHS number, which is used for matching TB isolates to notified cases, and for identifying duplicate cases, was very poorly completed. 25% of cases in England, 39% of cases in Wales and 26% of cases in Northern Ireland did not have an NHS number reported. Forty four percent of cases in London did not have an NHS number reported.

Clinical Variables

Data reported for previous TB diagnosis was high in all UK countries (99-100% with the exception of Scotland) but the proportion of those that had a known previous TB diagnosis (yes or no) was lower, particularly in Wales (93%). This was also a problem in the following PHECs: Cheshire and Merseyside (91% known), Devon, Cornwall and Somerset (92% known), Cumbria and Lancashire (93% known), West Midlands (93% known) and South Midlands and Hertfordshire (93% known).

Data reported for previous TB treatment (for those with a previous TB diagnosis) was low across the UK (overall 80%); with the lowest proportion of 50% in Avon, Gloucestershire and Wiltshire PHEC; only one PHEC area had completeness of over 95% (Anglia and Essex at 100%).

Similarly, recording of HIV testing across England, Wales and Northern Ireland was low (with majority ranging 45-89%) with the exception of Thames Valley PHEC, Cheshire and Merseyside PHEC and London PHEC and (96%, 97%, and 99% respectively).

Social Risk Factor Variables

In England, Wales and Northern Ireland, the proportion of cases with information reported on social risk factors (prison, drug misuse, alcohol abuse and homelessness) was high (all risk factors 98%) but a lower proportion of cases (92, 93, 93, 94% respectively) had a known history reported (i.e. not reported as ‘unknown’).

Diagnosis and treatment

The recording of sputum smear status was low (60% overall in the UK), with less than 65% in all areas in England other than London (76%) (Table 5.2). In contrast, the recording of site of disease was very high ranging from 98-100% in all areas in England.

Date Variables

In general, the recording of date of symptom onset and date presented was low in the UK, and the date diagnosed and start of treatment could be improved. All areas in England had less than 95% reported for date of symptom onset and date presented, with the exception of Thames Valley (96, 97% respectively). For date of symptom onset and date presented, data completion was particularly low for: Cumbria and Lancashire (73% and 76% reported), Greater Manchester (68% and 72% reported) and East Midlands (72% and 65% reported).

The recording of date that treatment was completed was higher than other dates in the system, perhaps as case managers are prompted to fill in these outcomes and there is active follow up of this information.

For cases notified in 2012 with a reported outcome of died, the reporting of date of death was 100% in some areas (North East, Yorkshire and the Humber, Cheshire and Merseyside, East Midlands, Thames Valley and Devon, Cornwall and Somerset PHECs), but was below 95% in all other PHECs. London only reported the date of death for 28% of those that had died. By country, Wales had the highest percentage of date of death recorded for those that had died (94%) and England had the lowest (76%), excluding Scotland which did not report the date of death for any of those that had died.

Treatment Outcome Variables

For cases notified in 2012, treatment outcome was known for more than 95% of cases at 12 months in all PHEC areas except for Kent, Surrey and Sussex (92%), Avon Gloucestershire and Wiltshire (90%) and Scotland (90%). Known treatment outcome at 24 months for those that were still on treatment at 12 months was generally good across the UK except for Cheshire and Merseyside PHEC, West Midlands PHEC and Wessex PHEC (75%, 88% and 50% respectively). However, only small numbers of cases were still on treatment after 12 months in these areas (4 cases in Cheshire and Merseyside and 2 cases in Wessex).

Additional cleaning and validation of treatment outcomes

Data cleaning was conducted as described in appendix II (Methods).

Treatment Outcomes 2004-2013*

Treatment outcomes at 12 months

Fifty two percent (3,439/6,626) of cases with recorded dates on treatment start date and treatment end date that were recorded as having completed treatment by 12 months, were found to still be on treatment after data validation. Sixty two cases were reported to have died by 12 months and were identified to still be on treatment and had died later than 12 months.

For those cases that were initially listed as ‘Unknown’ outcome, 14 had died and 38 were lost to follow up.

Eighty cases that were initially recorded as having transferred out and 11 cases that were initially recorded as treatment not completed were actually lost to follow up.

Treatment outcomes at 24 months

Sixty three cases were recorded as having completed treatment at 24 months, but after date validation were found to still be on treatment at 24 months (in total this is 7% of those initially recorded as ‘treatment completed’).

Treatment outcomes at 36 months

Only six cases that were initially recorded as treatment completed at 36 months were found to still be on treatment following data validation. Of those that were previously recorded as ‘died’ two were found to still be on treatment (2/5 cases) at 36 months.

Table 5.1 Completeness of key data fields, 2013

	Demographic					Clinical				Risk Factor							
	NHS Number	Ethnic group		UK Born/Non-UK born		HIV Testing[$]	Previous TB diagnosis		Previous TB treatment[^]	History of drug abuse		History of alcohol abuse		History of homelessness		History of prison	
Country	Reported	Known*	Reported**	Known	Reported	Reported	Known	Reported	Reported	Known	Reported	Known	Reported	Known	Reported	Known	Reported
England	75	98	99	97	100	87	96	99	79	93	98	93	98	94	98	92	98
Wales	61	97	99	99	100	76	93	99	88	85	93	91	95	93	98	86	98
Northern Ireland	74	96	100	95	100	79	99	100	88	95	100	93	97	96	100	92	100
Scotland	-	-	88	-	82	-	-	86	91	-	-	-	-	-	-	-	-
PHE Region/Centre																	
North of England	92	97	98	94	99	67	94	98	78	90	97	91	97	91	97	85	97
North East	98	96	100	87	100	66	96	98	78	89	98	93	96	93	98	90	98
Cumbria and Lancashire	94	96	98	97	99	82	93	96	75	93	96	92	94	94	96	89	96
Yorkshire and the Humber	95	95	98	92	99	45	94	99	76	92	98	93	98	91	98	86	98
Greater Manchester	84	98	99	97	100	85	94	97	79	86	97	89	97	88	97	79	97
Cheshire and Merseyside	97	99	100	97	100	97	91	99	88	91	98	91	98	92	97	89	99
Midlands and East of England	86	98	99	97	100	84	94	99	83	90	98	91	98	91	98	89	99
East Midlands	77	99	100	99	100	85	94	99	80	85	99	89	99	82	99	76	99
West Midlands	86	98	99	97	100	82	93	99	83	92	98	91	97	93	98	92	99
Anglia and Essex	96	98	99	97	100	87	95	98	100	91	98	93	98	92	99	90	98
South Midlands and Hertfordshire	89	98	100	95	100	86	93	98	67	92	96	93	97	93	98	92	98
London	56	99	100	99	99	99	97	99	81	97	99	94	98	98	99	97	99
South of England	91	97	98	98	100	84	97	99	65	94	98	96	99	95	99	92	99
Kent, Surrey and Sussex	81	97	97	98	100	89	96	99	65	94	98	95	97	96	98	95	98
Thames Valley	94	100	100	100	100	96	99	100	77	97	99	97	99	97	99	97	100
Wessex	94	98	99	100	100	84	99	100	80	94	97	97	100	98	99	95	99
Devon, Cornwall and Somerset	95	97	99	88	100	71	92	100	67	86	99	91	100	85	100	71	99
Avon, Gloucestershire and Wiltshire	95	94	96	96	100	65	96	99	50	92	98	96	98	92	98	90	97
England, Wales and Northern Ireland	75	98	99	97	100	82	96	99	79	93	98	93	98	94	98	92	98
UK	-	-	99	-	99	-	-	98	80	-		-		-		-	

* Data are reported and has a known value
** Data are reported but may be reported as unknown
[$] Excluding cases diagnosed post mortem
[^]Cases with previous TB diagnosis only
For Scotland, "-" data collection is not consistent with data from other countries for inclusion

Key:

99-100% complete	95-98% complete	<95% complete

Table 5.2 Completeness of data fields for diagnosis and treatment, 2013

	Diagnosis and Treatment												
	Sputum smear status*	Site of Disease	Symptom Onset	Date Presented	Date Diagnosed[μ]	Start of treatment[μ]	Date Completed[~]	Date of Death[§]	Treatment Outcome reported at 12 months[†]		Treatment Outcome reported at 24 months[‡]		Treatment Outcome reported at 36 months[¥]
Country	**Known****	**Known[$]**	**Reported[^]**	**Reported**	**Reported**	**Reported**	**Reported**	**Reported**	**Known**	**Reported**	**Known**	**Reported**	**Reported**
England	60	100	80	49	85	95	99	76	98	99	97	98	94
Wales	51	99	84	82	98	96	93	94	95	96	100	100	-
Northern Ireland	63	100	85	84	96	96	88	83	99	99	100	100	-
Scotland	70	99	73	-	-	-	-	0	90	100	100	100	100
PHE Region/Centre													
North of England	46	99	79	80	94	94	98	96	97	99	95	98	75
North East	47	99	88	92	91	97	97	100	96	98	100	100	100
Cumbria and Lancashire	44	98	73	76	97	94	100	82	95	98	100	100	-
Yorkshire and the Humber	44	100	84	83	96	91	98	100	99	100	95	100	67
Greater Manchester	44	100	68	72	91	96	97	92	97	98	100	100	-
Cheshire and Merseyside	65	99	91	91	98	97	97	100	97	99	75	75	-
Midlands and East of England	49	99	83	81	91	94	98	95	98	99	94	94	100
East Midlands	50	99	72	65	81	99	99	100	97	99	100	100	100
West Midlands	48	99	86	89	95	92	98	94	100	100	88	88	100
Anglia and Essex	55	100	89	80	94	96	99	84	96	98	100	100	-
South Midlands and Hertfordshire	47	98	81	75	88	94	97	95	97	99	100	100	100
London	76	100	75	-	73	96	99	28	99	100	99	99	100
South of England	55	100	92	91	97	94	98	87	94	96	93	97	100
Kent, Surrey and Sussex	58	100	94	86	94	96	99	75	92	93	94	100	100
Thames Valley	61	100	96	97	100	98	97	100	99	100	100	100	-
Wessex	64	100	93	91	99	88	100	80	96	97	50	50	-
Devon, Cornwall and Somerset	52	99	86	90	97	95	92	100	98	99	100	100	-
Avon, Gloucestershire and Wiltshire	43	99	86	88	97	90	99	88	90	90	100	100	-
England, Wales and Northern Ireland	60	100	80	50	86	95	98	77	98	99	97	98	-
UK	60	100	80	-	-	-	-	72	97	99	97	98	-

*Pulmonary cases only **Data are reported and has a known value [$]Site of disease is a mandatory field so 100% are reported
[^]Data are reported but may reported as unknown [μ]Excluding cases diagnosed post-mortem [~]Only those that had completed treatment
[§]Includes only those who have died
[†]For cases notified in 2012 (unknown and not reported also includes those that were not completed and transferred out).
[‡]For cases notified in 2011 and were still on treatment at 12 months [¥]For cases notified in 2010 and were still on treatment at 24 months

Glossary

Amplified resistance
A cultured isolate was drug sensitive to a particular drug, with a subsequent isolate for the same case found to have resistance to the same drug.

BCG
Bacillus Calmette-Guérin

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.

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

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

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.