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# **Tuberculosis in Yorkshire and Humber: Annual review (2015 data)**

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The Field Epidemiology Service (FES) supports Public Health England Centres and partner organisations through the application of epidemiological methods to inform public health action.

FES does this in two main ways, firstly by providing a flexible expert resource, available, as and when needed, to undertake epidemiological investigations for key health protection work and secondly through the expert analysis, interpretation and dissemination of surveillance information to PHE Centres, local health partners, service providers and commissioners of services.

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Public Health England  
Wellington House  
133-155 Waterloo Road  
SE1 8UG  
Tel: 020 7654 8000

<http://www.gov.uk/phe>  
Twitter: @PHE\_uk  
Facebook: [www.facebook.com/PublicHealthEngland](http://www.facebook.com/PublicHealthEngland)

Prepared by: Field Epidemiology Services Yorkshire and Humber

For queries relating to this document, please contact: [yhfes@phe.gov.uk](mailto:yhfes@phe.gov.uk)

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The data presented in this report are correct as at August 2016.

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## Authors

This report was prepared and edited by Dr Louise Coole and Mary Cronin of the Field Epidemiology Service Leeds National Infection Service, PHE, with additional content contribution from Renu Bindra and Helen McAuslane of the Health Protection Team, Yorkshire and Humber PHE Centre.

## Suggested citation

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## Notes on the report

### Intended audience

This report is aimed at healthcare professionals involved in the diagnosis and/or treatment of TB patients, commissioners involved in planning and financing TB services, public health professionals working in the control of TB or health of at-risk populations, researchers with an interest in TB, and government and non-governmental organisations working in the field of TB. In particular we aim to update the Yorkshire and Humber and North East TB Control Board and clinical leadership groups across Yorkshire and Humber.

### Aim of report

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

### Data sources

This report presents detailed data on TB case notifications made to the Enhanced Tuberculosis Surveillance system (ETS) in England to the end of 2015. Data from notifications made to ETS from 2000 are updated annually to take into account denotifications, late notifications and other updates. The data presented in the current year's report supersedes data in previous reports.

### Other data displays

The national report presenting recent epidemiology of TB in England is available at:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/564656/TB\\_annual\\_report\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/564656/TB_annual_report_2016.pdf)

Additional high-level data on TB notifications in the UK to the end of 2015, and breakdowns by country, can be found in the Official Statistic for TB, 'Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: United Kingdom, 2000 to 2015'. This is available at:

<https://www.gov.uk/government/collections/tuberculosis-and-other-mycobacterial-diseases-diagnosis-screening-management-and-data>

As part of the Collaborative TB Strategy for England 2015-2020, a suite of TB Strategy Monitoring Indicators have been developed.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/403231/Collaborative\\_TB\\_Strategy\\_for\\_England\\_2015\\_2020\\_.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403231/Collaborative_TB_Strategy_for_England_2015_2020_.pdf)

Where data for these indicators are presented in this report, the indicator name is shown, and a summary table of TB strategy indicators is presented in Appendix D.

Data for indicators which are presented at Upper Tier Local Authority and Clinical Commissioning Group can be found at:

<http://fingertips.phe.org.uk/profile/tb-monitoring>

## Executive summary

In January 2015, Public Health England and NHS England jointly launched the *Collaborative Tuberculosis Strategy for England 2015-2020* [1]. The strategy aims to achieve a year-on-year decrease in TB incidence, a reduction in health inequalities, and ultimately the elimination of TB as a public health problem in England.

To achieve these aims and deliver significant improvements in TB control the strategy sets out 10 key areas for action:

1. Improve access and earlier diagnosis
2. Provide universal high-quality diagnostics
3. Improve treatment and care services
4. Ensure comprehensive contact tracing
5. Improve BCG vaccination uptake
6. Reduce drug resistant TB
7. Tackle TB in under-served populations
8. Implement new entrant latent TB (LTBI) screening
9. Strengthen surveillance and monitoring
10. Ensure an appropriate workforce to deliver TB control

Since the launch of the strategy, significant steps have been taken to deliver on the 10 areas for action including:

- the creation of a national TB programme, with a national TB office and seven multi-agency TB control boards (TBCBs)
- the development of a national TB service specification
- the provision of a new online resource of comprehensive TB data using the PHE Fingertips tool to support TB commissioning and monitoring
- the roll-out of 54 CCG new migrant LTBI programmes funded by NHS England (£10m in 2015/16 and £10m in 2016/17)
- the updating of TB awareness-raising material in collaboration with TB Alert and the launch of a toolkit to support LTBI programme delivery
- a review of the TB nursing workforce with work underway to take forward its recommendations and help support a more professionalised workforce
- the establishment of five national 'task and finish' groups to take forward work on the areas for action: high-quality diagnostics, LTBI testing and treatment, drug resistant TB, TB in under-served populations and workforce

## Key Points for Yorkshire and Humber

There were 440 cases of TB reported in Yorkshire and Humber during 2015, with an incidence rate of 8.2 per 100,000, which is not only a reduction on 2014 (9.6 per 100,000) but the lowest rate in the last 10 years. It is encouraging that TB incidence is declining both locally and nationally, however there are still areas of concern. There is considerable variation in TB rates across Yorkshire and Humber and the gap between the highest burden local authority and other areas is not reducing.

The reduction in numbers of TB cases in Yorkshire and Humber in the past year has occurred in both the non-UK born population and the UK born population, although the incidence rates of TB were nearly 23 times higher in those born outside the UK compared to the UK born population and 69% of all TB cases notified in the local population in 2015 were born abroad. The local non-UK born rate of TB exceeds the national average. Incidence in recent migrants is decreasing more quickly than the incidence in established migrants and 64% of non-UK born TB cases in Yorkshire and Humber have lived in the UK for more than six years.

Among UK born cases, the proportion of cases with Indian Sub-continent (ISC) ethnicities (Pakistani, Indian, Bangladeshi), increased from 18% in 2004 to 23% in 2015. For this group the acquisition of TB infection in the UK is an increasing concern (Figures 2.11).

The incidence rate of TB in UK born children under 15 years of age in Yorkshire and Humber (2.7 cases per 100,000), an indirect indicator of recent transmission, is higher than the England average (1.8 cases per 100,000) and has increased compared to 2014 (2.2 cases per 100,000). The incidence in pre-school children (0-4) has also increased to 3.6 per 100,000 from 1.8 per 100,000. Children aged 0 to 14 made up 6% (25) of all TB cases diagnosed in the region in 2015. Twenty of twenty-five (80%) of all these children diagnosed in the region<sup>1</sup> during 2015 were UK born, highlighting that potential missed opportunities for prevention remain.

The proportion of TB cases diagnosed with multi-drug resistant TB increased in 2015 from 2.5% in 2014 to 4% in 2015. Mono-resistance to Isoniazid increased from 8% in 2011 to 10% in 2015. The most frequent countries of birth of cases resistant to Isoniazid alone and MDR-TB were Eastern European countries in contrast to the national picture where the Indian subcontinent accounted for the country of birth of the majority of cases.

Where the information is completed, only 38% of cases with a previous history of TB infection received Directly Observed Therapy (DOT). Where other social risk factor information was known, – of those aged 15 or over and resistant to isoniazid (without MDR-TB), 13% had at least one known social risk factor. These risk factors were current or history of drug misuse (25%, 2/8), alcohol misuse (33.3%, 3/9), or imprisonment (11.1%, 1/9). Only one of the 10 cases of MDR-TB identified in Yorkshire and the Humber had an identified social risk factor.

Despite year on year improvements in the proportion of cases which are microbiologically confirmed, 28% of pulmonary cases are not confirmed and 40% of all cases (pulmonary and non-pulmonary) were not confirmed. Only half of pulmonary cases had a smear status recorded.

Early diagnosis and treatment is key to preventing further transmission of TB. It is therefore worth noting that in 2015 over half of TB cases commenced treatment more than two months after the onset of symptoms. Delayed diagnosis of potentially infectious patients within healthcare settings has considerable impact, particularly where the diagnosis was not suspected and staff and patients may

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<sup>1</sup> Country of birth for one child case is not recorded and is therefore not included in this figure

have been exposed. Investigation and clinical management of these incidents can be complex and resource intensive.

The proportion of TB cases completing treatment within 12 months of diagnosis in the region (84%) is similar to the 2013 cohort of cases which were reported last year (86%) and is also consistent with the England average. This does represent a considerable improvement on the 62% treatment completion for cases diagnosed in 2004. There is however, considerable variation in treatment completion rates across the region with lower treatment completion reported from both low and high burden areas. Encouragingly many of the highest burden areas in Yorkshire and Humber achieved or exceeded this level of treatment completion. The proportion of patients reported as still on treatment or lost to follow up at 12 months is now lower in the Yorkshire and Humber region than the national average.

Despite the overall reduction in TB cases, the number of cases with social risk factors (homelessness, drug or alcohol misuse or imprisonment) has not declined in keeping with national picture. In 2015 11.7% of cases in Yorkshire and Humber had at least one social risk factor recorded (11.8% nationally). TB cases with social risk factors are more likely to have pulmonary disease and drug resistance, and have worse outcomes. Only 43% of cases with a social risk factor in 2015 received DOT in Yorkshire and Humber compared to 55% nationally.

Cohort review, a system of quality assurance and accountability for the management of TB cases and their contacts has been successfully implemented across Yorkshire and Humber since 2014. A review of the first year led to developments and strengthening of the process to support the effective contribution to improvements in TB outcomes. All areas of Yorkshire and Humber are now participating. A separate report on the indicators included in the cohort review process is underway.

## Recommendations

To continue to achieve year-on-year reductions in TB incidence, and the eventual elimination of TB as a public health problem in England, sustained work is required to deliver all 10 key areas for action in the *Collaborative TB Strategy for England 2015-2020*.

### Recommendations for local agencies:

- Reduce the delay in TB diagnosis through improved awareness of TB in healthcare workers, allied professionals working with underserved populations and underserved populations themselves.
- Increase the proportion of cases that have a culture result to allow drug resistance detection and facilitate the identification of clusters.
- Commission and support highly-targeted case finding and prevention activities with a focus on underserved populations.
- TB clinical teams to continue to support cohort review as a tool to improve local TB control and as a measure of treatment outcomes and contact tracing activity.
- Healthcare staff should continue to offer and document universal HIV testing for all those diagnosed with tuberculosis in line with national guidance.
- Ensure relevant information is completed accurately on the PHE ETS system and improve reporting of important indicators such as social risk factors, offer of HIV test, sputum results and the use of directly observed therapy (DOT) as well as newer indicators such as travel to endemic areas and hosting visitors from endemic areas.



- Ensure appropriate access to services and treatment for underserved populations and provide support to enable patients to complete treatment.
- Sustain the roll out of new migrant LTBI screening programme within the high burden areas identified within Yorkshire and Humber CCGs.
- Investigate and reduce the incidence of TB in children in Yorkshire and Humber particularly where opportunities for prevention exist.
- Target efforts in local communities where there is evidence of continuing transmission of TB.

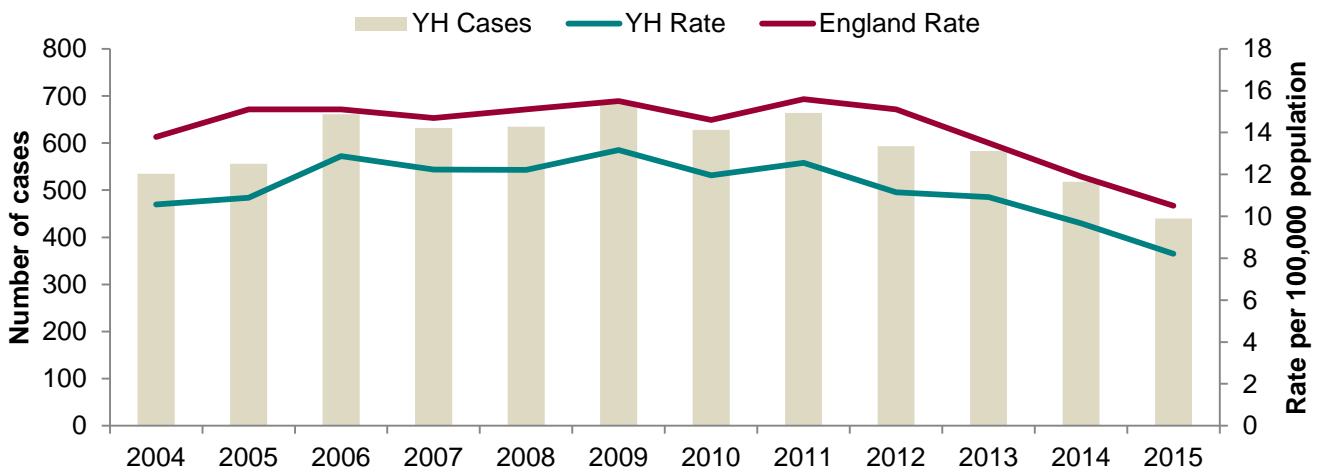
# 1. TB notifications and incidence

## Overall numbers, rates and geographical distribution

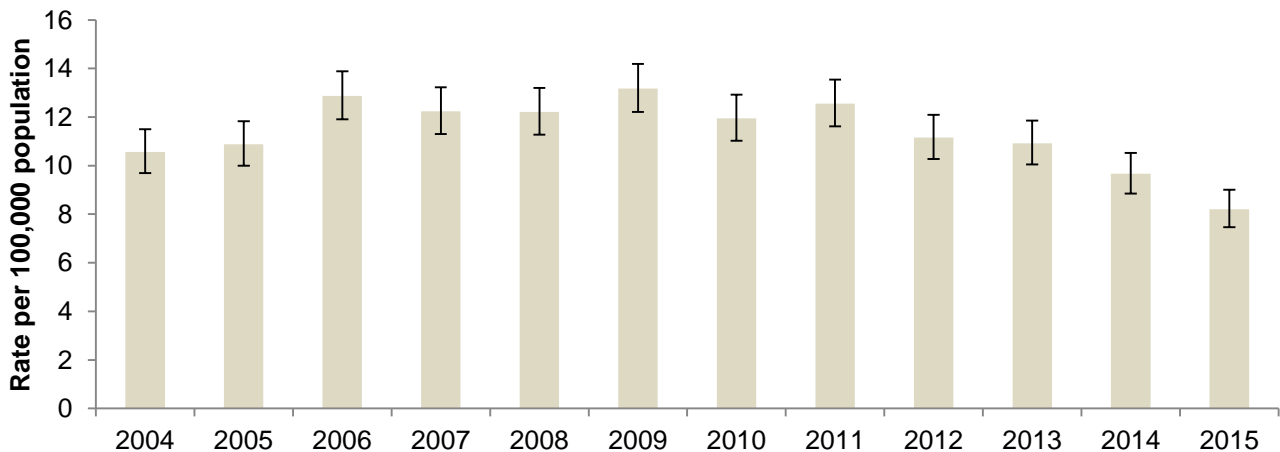
In 2015, a total of 440 cases of tuberculosis were reported in Yorkshire and Humber; a rate of 8.2 per 100,000 population (95%CI 7.5-9.0) which is an improvement on 2014 (518 cases; rate of 9.7/100,000, 95%CI 8.9-10.5) (Figures 1.1 and 1.2). This is the lowest incidence in Yorkshire and Humber in the last 10 years. This is consistent with a sustained reduction in TB incidence nationally. The TB incidence in Yorkshire and Humber is the second highest rate in Public Health England (PHE) Centres outside London (Figure 1.3).

While the Yorkshire and Humber TB incidence rate remains below the England rate in 2015 (10.5 per 100,000 population); four local authorities in the region have higher rates than the national average – Bradford and Airedale (19.5 per 100,000 population), Kirklees (15.1 per 100,000 population), Sheffield (12.6 per 100,000 population) and Leeds (12.0 per 100,000). These high rates persist in these areas but conceal reductions in incidence over time in these higher burden areas, particularly in Bradford and Airedale, Sheffield and Leeds (Figure 1.5).

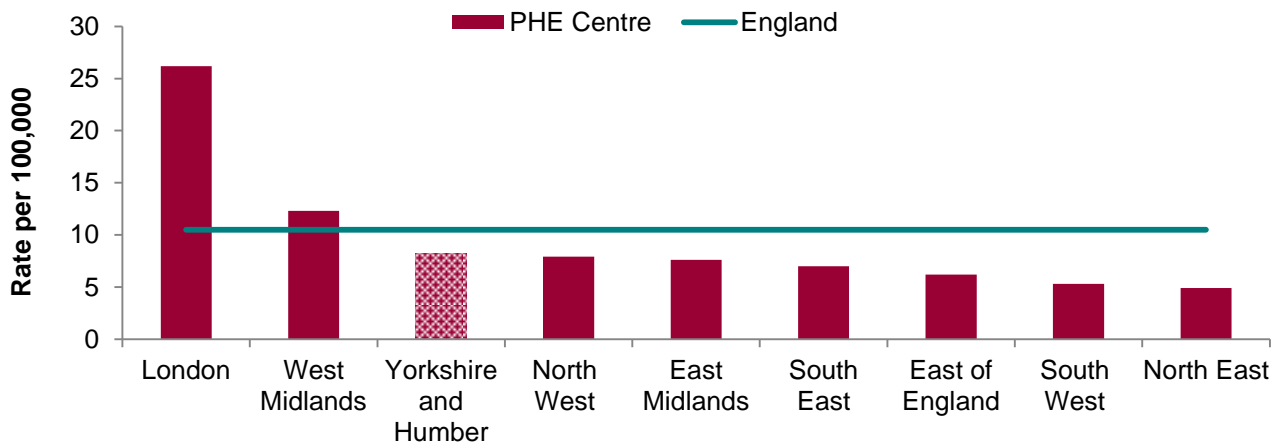
**Figure 1.1: Tuberculosis case reports and rates Yorkshire and Humber and England, 2004-2015**



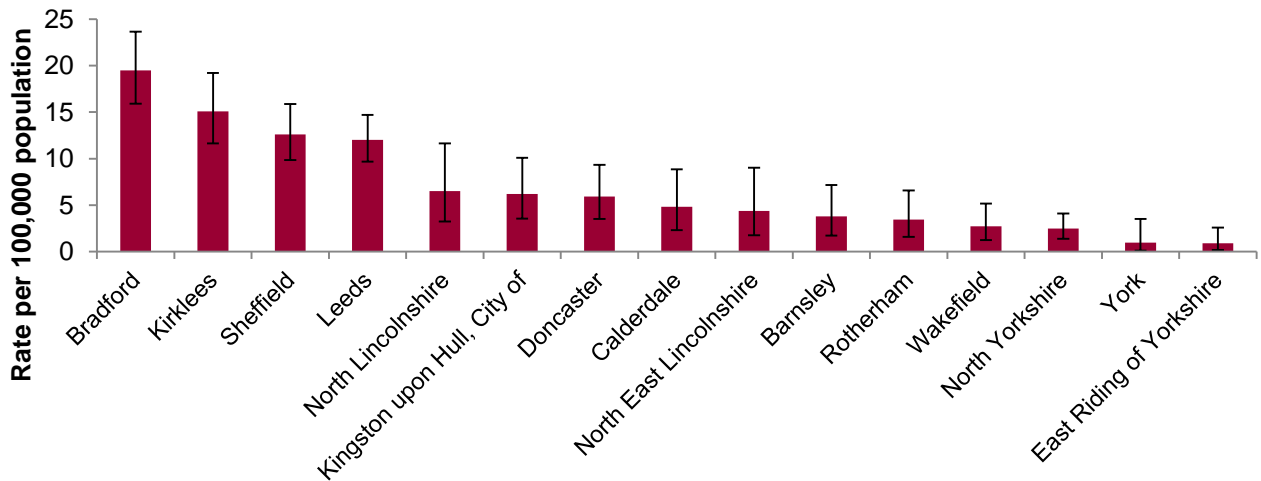
**Figure 1.2: Tuberculosis incidence rates in Yorkshire and Humber with 95% confidence intervals, 2004-2015**



**Figure 1.3: Tuberculosis rates by Public Health England Centre and England, 2015**



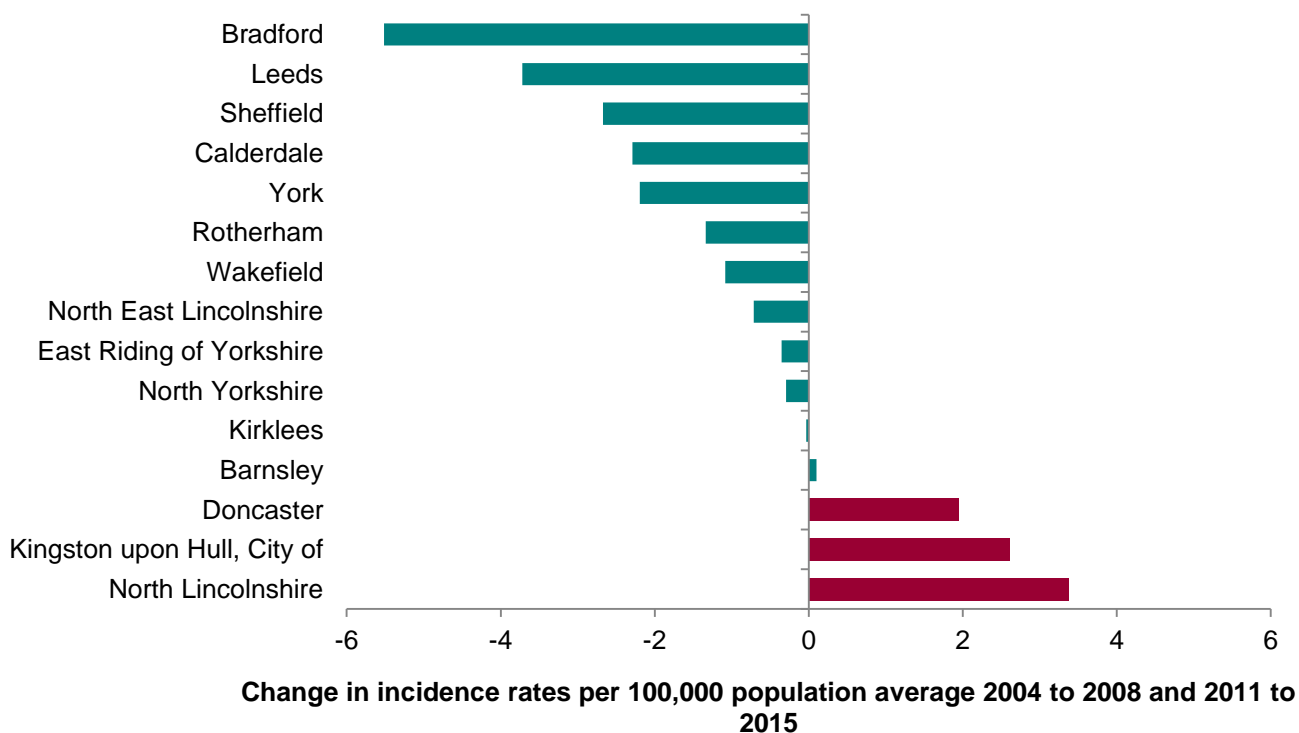
**Figure 1.4: Tuberculosis incidence rates with 95% confidence intervals by local authority, Yorkshire and Humber, 2015**



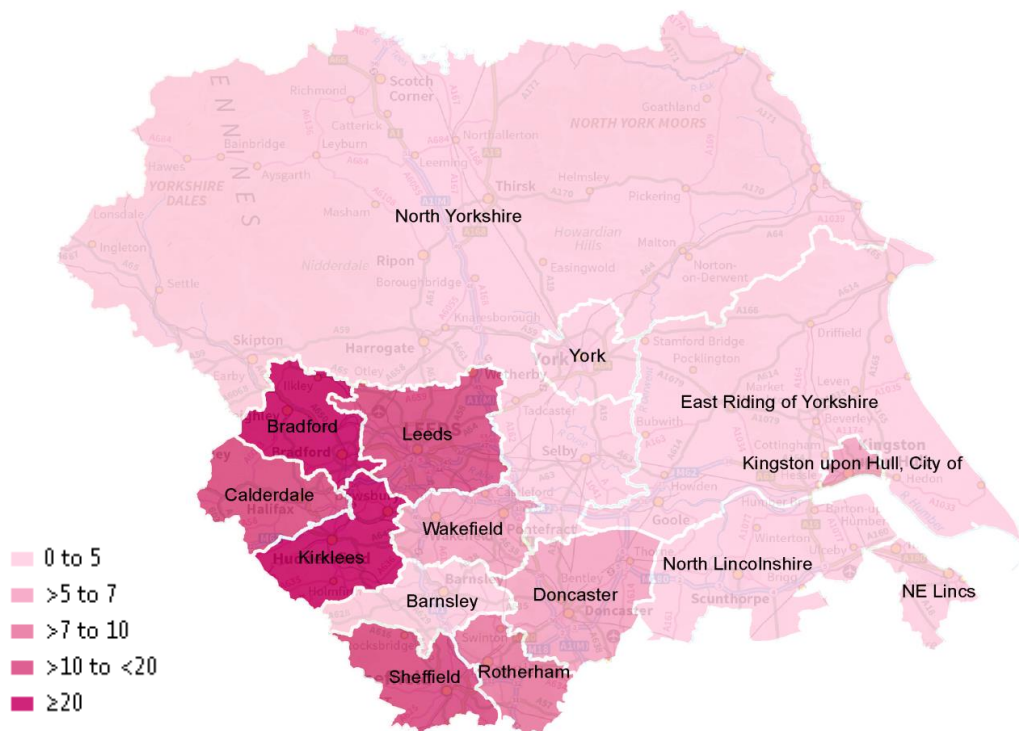
**Table 1.1: Number of cases of tuberculosis and regional ranking by local authority, Yorkshire and Humber, 2004-2008, 2011-2015, and 2015**

UTLA	Average no. of cases 2004 to 2008	Rank average 2004 to 2008	Average no. of cases 2011 to 2015	Rank average 2011 to 2015	No. of Cases 2015	Rank 2015
Bradford	158.8	1	139.4	1	103	1
Leeds	123.2	2	99.2	2	92	2
Sheffield	95	3	85.8	4	71	3
Kirklees	82.2	4	86.8	3	65	4
Doncaster	15.6	8	22	5	18	5
Kingston upon Hull, City of	13	10	19.8	6	16	6
North Yorkshire	15.6	9	14.2	10	15	7
North Lincolnshire	6.8	14	12.8	11	11	8
Calderdale	22	5	18.2	8	10	9
Barnsley	7.4	13	8	12	9	10
Rotherham	21.4	6	18.4	7	9	11
Wakefield	20.6	7	17.6	9	9	12
North East Lincolnshire	5.5	15	4.4	15	7	13
East Riding of Yorkshire	8.6	12	7.6	13	3	14
York	9.2	11	5.4	14	2	15

**Figure 1.5: Change in incidence rates of tuberculosis between 2004-2008 and 2011-2015, by local authority, Yorkshire and Humber**

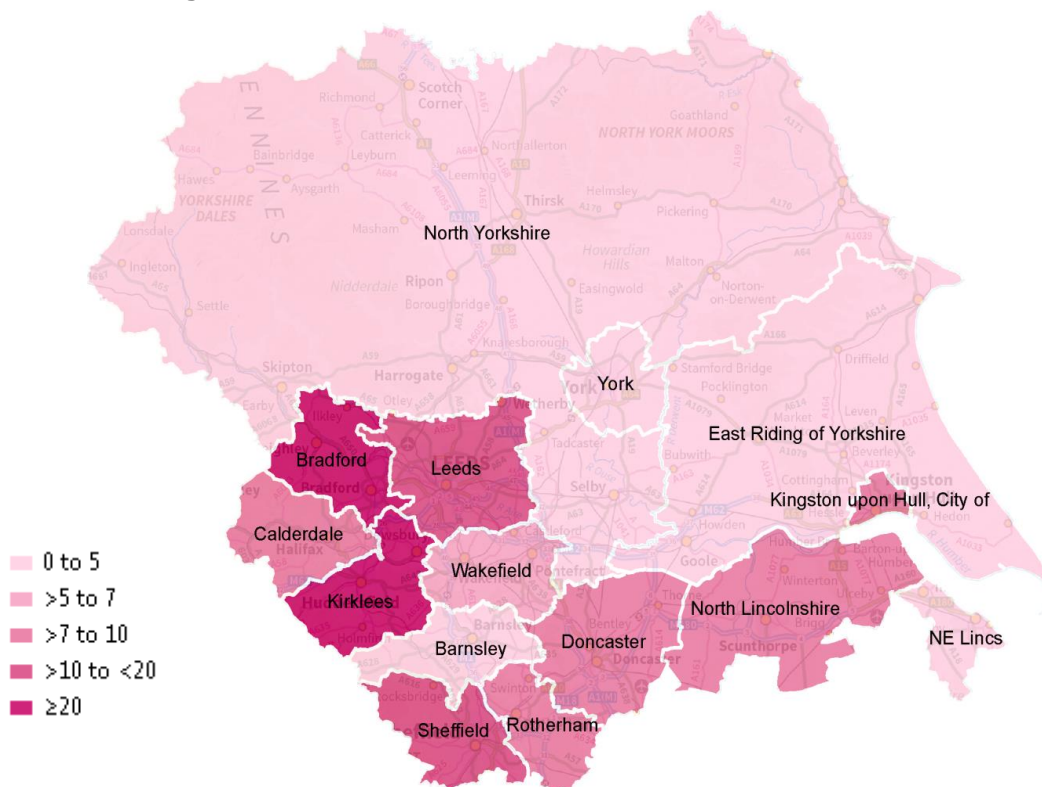


**Figure 1.6: Tuberculosis incidence per 100,000 populations for Yorkshire and Humber local authorities, average rate, 2004-2008**



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**Figure 1.7: Tuberculosis incidence per 100,000 population for Yorkshire and Humber local authorities, average rate, 2011-2015**



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## TB incidents in 2015

A TB incident is defined as a situation where potential transmission to non-household contacts is identified, warranting wider public health investigation beyond routine contact tracing. This includes potential, suspected or confirmed transmission in:

- An educational setting involving a child, student or member of staff
- A prison, reception centre or detention setting
- A healthcare setting involving a patient or a health care worker
- A workplace
- Other settings such as a place of worship, a club or pub, etc.
- Exposure on an aircraft

We also categorise as incidents, situations where legal public health action, such as applications made under the Health Protection 2010 Regulations (e.g. Part 2A orders) are considered necessary for the effective management of a TB patient and cases of multidrug resistant TB where there have been complex case management issues.

Table 1.2 contains a selection of TB incidents reported in Yorkshire and Humber in 2015. These incidents require a joint response from the NHS, Health Protection Teams in Public Health England, local authority public health and other services. Management of complex TB cases and incidents can be prolonged and resource intensive.

A recurring theme identified from these incidents is a failure to consider TB when patients with respiratory symptoms are admitted to hospital wards. Limited access to side rooms for patients with potentially infectious respiratory conditions remains a challenge. TB incidents in schools and workplaces also continue to be reported in Yorkshire and Humber and across the country. These are labour intensive investigations which can cause a lot of anxiety for those involved.

**Table 1.2: A selection of tuberculosis incidents in Yorkshire and Humber, 2015**

Area	Setting	Brief description	Number of potentially exposed individuals	Outcome
North Yorkshire and Humber	Community	Complex case of pre XDR TB	Close contacts only	Highlighted significant complexities in social care management.
	Hospital	Smear positive TB in a hospital inpatient	83 patients and staff	63 patients and staff screened. Five diagnosed with LTBI. Among those who did not attend for screening; the majority were staff members.
	Hospital	Smear positive TB in a healthcare worker	12	11 contacts were screened 2 cases identified, both from high incidence countries
	Hospital	Symptomatic TB in a patient who was an inpatient in several wards in the same hospital	Family contacts plus 7 patients required screening	One further positive case among exposed patients
	Hospital	Hospital staff member (non-public facing) worked for 4 weeks whilst symptomatic	Family and nine work colleagues screened	One further case identified through screening Occupational exposure of index case investigated but inconclusive
South Yorkshire	Hospital	Symptomatic smear positive case of pulmonary TB admitted through A&E to a 4 bedded ward.	16 family contacts, 4 patient contacts and one healthcare worker	One other family member with active TB and one other contact with LTBI Awareness raising undertaken with local NHS on TB presentation
	School	Pulmonary TB in a child attending a special needs school	7 children (aged between 7 and 11) and 8 adults identified for screening	One case of LTBI identified
West Yorkshire	Hospital	Long-stay Inpatient with smear negative culture positive TB	27 patients exposed	Patients were triaged for screening or inform and advice letters 80 staff members screened. No evidence of transmission identified.

## 2. Demographic characteristics

### Age and sex

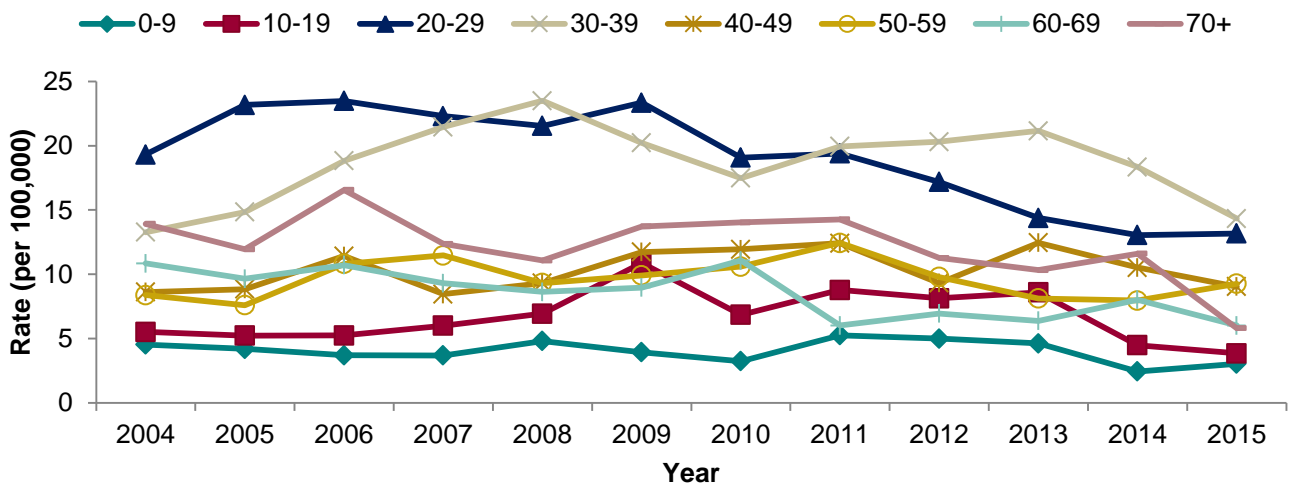
Fifty-eight per cent of the TB cases in the region in 2015 were aged between 20 and 49 years. The proportion of cases in the 70 year and over age-group has declined from 25% in 2000 to 8% in 2015 and is now in line with the national figure.

The proportion of TB cases in the region occurring in children aged 1 year and under in 2015 was 1.6% which is a small increase from 2014 (0.6%) but this only relates to a difference in four cases. In 2015 86% (6/7) cases in children aged one year and under were UK born. Similarly the incidence rate in those one year and under in Yorkshire and Humber increased from 2.3 per 100,000 (95%CI 0.5-6.7) in 2014 to 5.4 per 100,000 (95%CI 2.2-11.2) in 2015.

Of the TB cases in children <15 years old in the region, 80% were UK born. This is particularly a concern in Bradford where nine per cent of TB cases in the last five years has been a child aged 14 years or younger. The epidemiology of TB in children in Yorkshire and Humber indicates on-going TB transmission, indicating a failing TB control programme in some parts of the region.

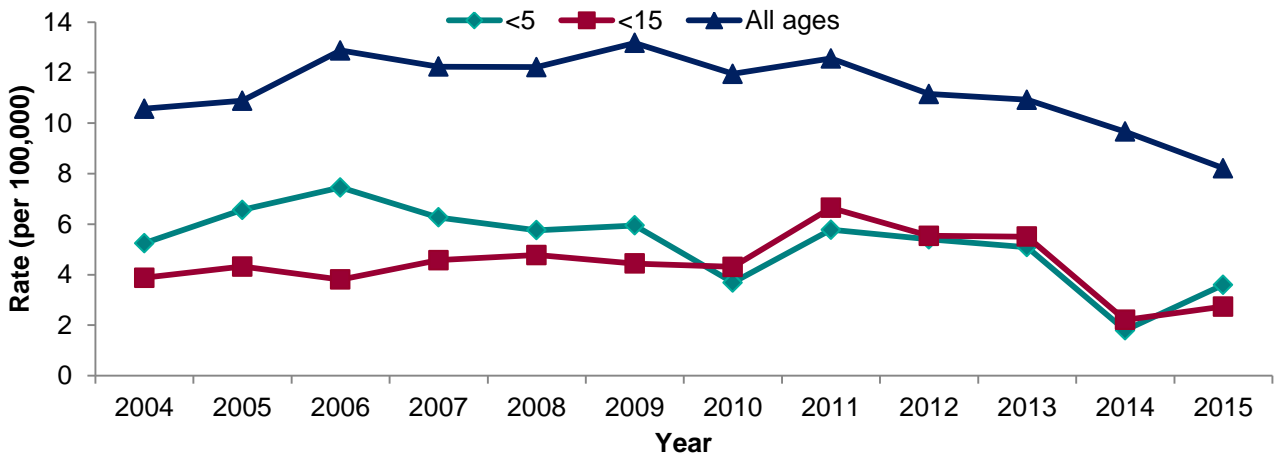
In keeping with the national pattern, TB incidence in the Yorkshire and Humber region remained slightly higher in males than females. In 2015, there were more male TB cases in every age group except the 0-9 year age group, where there were more female cases (Figure 2.3).

**Figure 2.1: All persons tuberculosis rates by age group, Yorkshire and Humber, 2004-2015**

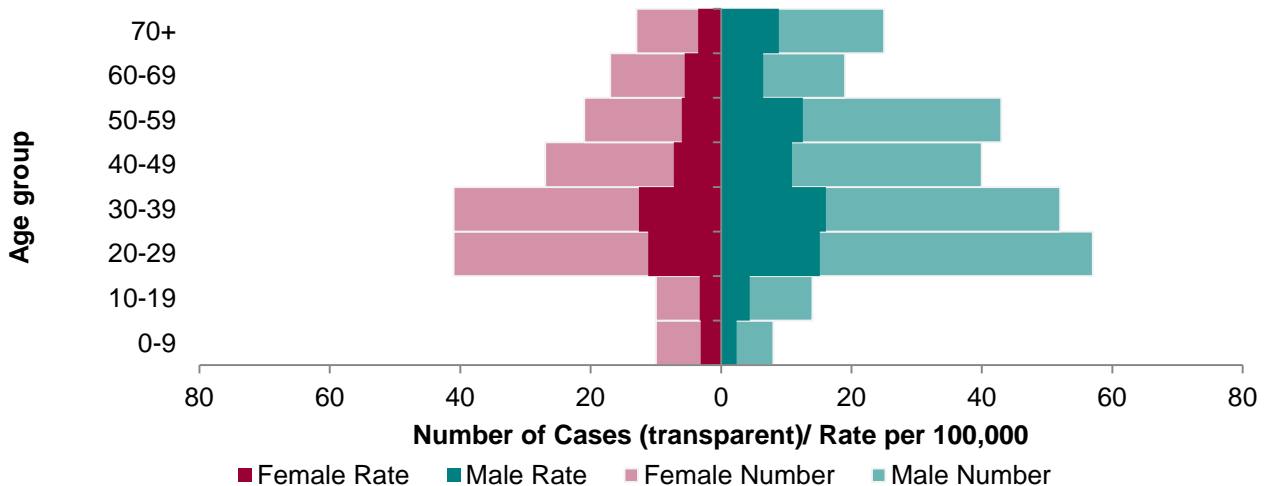




**Figure 2.2: Child and adult tuberculosis notifications rates, Yorkshire and Humber, 2004-2014**



**Figure 2.3: Tuberculosis reports & rates by age group and gender, Yorkshire and Humber, 2014**



### Place of birth and time since entry

Place of birth was recorded for 95.2% (419/440) of cases reported in 2015, similar to 95% in 2014.

#### UK born

Thirty per cent of TB cases in Yorkshire and Humber in 2015 were UK born. The incidence of TB in the UK born population in the region has improved modestly between 2004 and 2015; with a UK born TB incidence rate of 4.13/100,000 in 2004 declining to 2.6/100,000 in 2015 (Figure 2.4).

#### Non-UK born

Seventy per cent (292/419) of TB cases in the region in 2015 were born outside the UK. The incidence rate for TB in the non-UK born population in the region has declined year on year from the peak of 112.8 per 100,000 population in 2006, to 61.3 per 100,000 population in 2015 (Figure 2.5)<sup>2</sup>. However, the TB

<sup>2</sup> The population estimates used to calculate TB incidence rates by country of birth have been updated. This has resulted in an increase in the denominator population for non-UK born and thus a **decrease** in the TB incidence

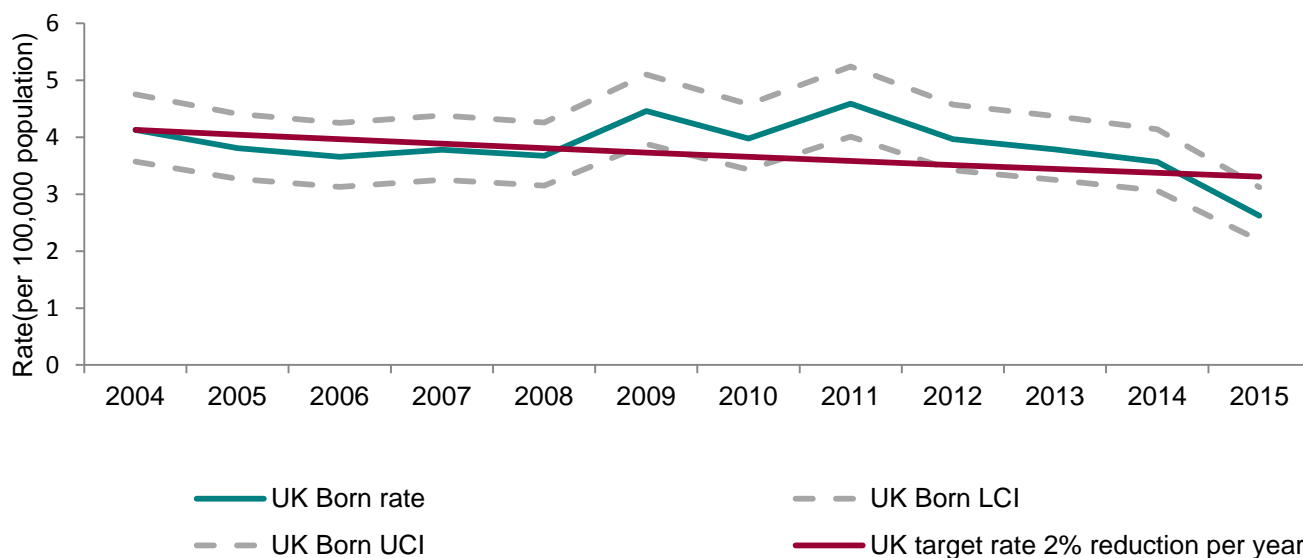
incidence rate in the non-UK born in the region remains higher than the national rate (51.2 per 100,000) and is 23 times higher than the rate for UK born residents of Yorkshire and Humber compared to 15 times higher nationally.

The trend in the last 10 years among non-UK born cases has been for a reduction in the proportion of TB cases, in individuals resident in the UK for less than five years, and an increase in the proportion of cases among individuals resident in the UK for greater than 10 years (Figure 2.8).

### Place of birth and age

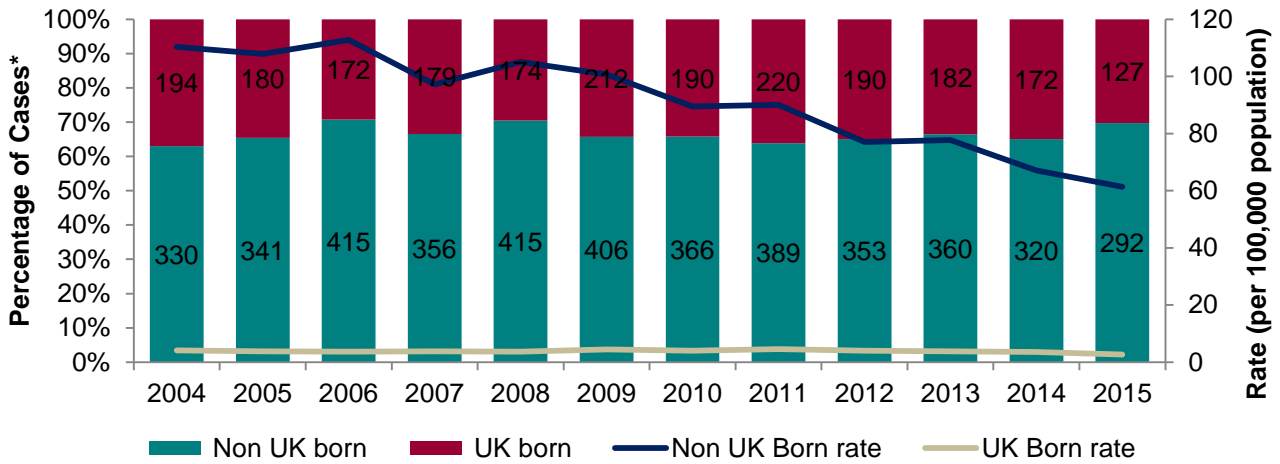
In 2015, the number of TB cases in non-UK-born exceeded that in the UK born TB cases in every age group except the 0-14 age groups where cases in UK born children outnumber cases in children born outside of the UK (Figure 2.6). While the concentration of non-UK born TB cases in the adult age groups reflects migration patterns, the high proportion of UK born TB cases in children under 15 years of age is of concern as it indicates recent TB transmission potentially occurring in the UK.

**Figure 2.4: Tuberculosis rate per 100,000 population for UK born cases, with 95% confidence intervals and 2% decline target from 2004, Yorkshire and Humber, 2004-2015**

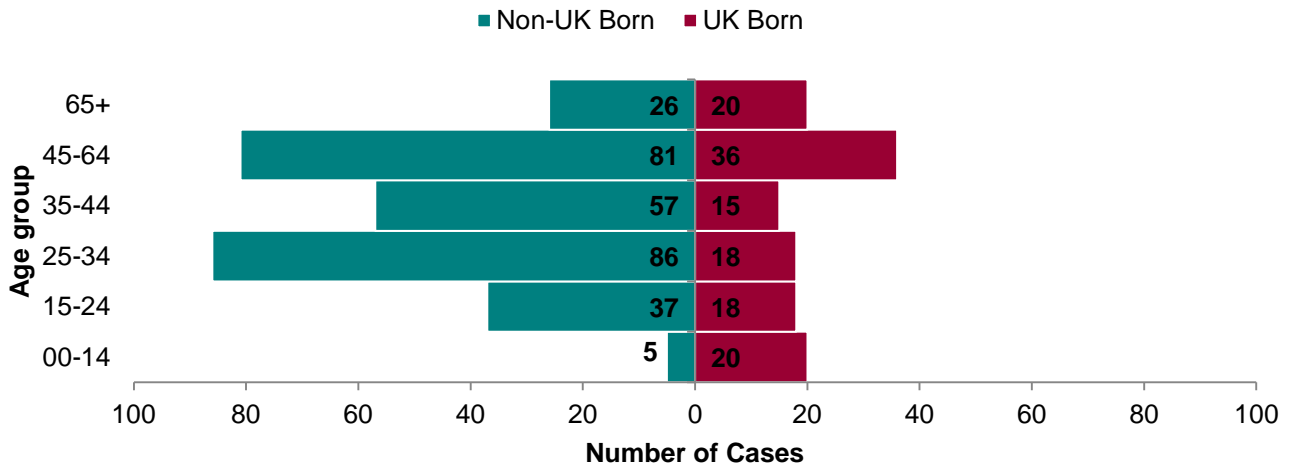


rate for non-UK born compared to the rates reported in the previous annual report. The incidence rates in the UK born remains mostly unchanged.

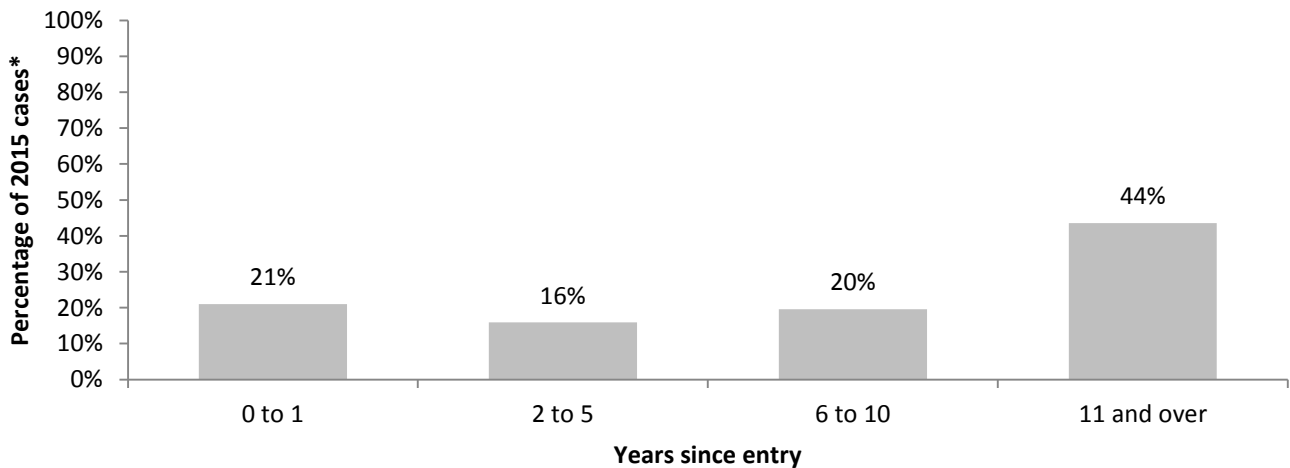
**Figure 2.5: Tuberculosis case reports by place of birth, proportion of cases and rate per 100,000 population, Yorkshire and Humber, 2004-2015**

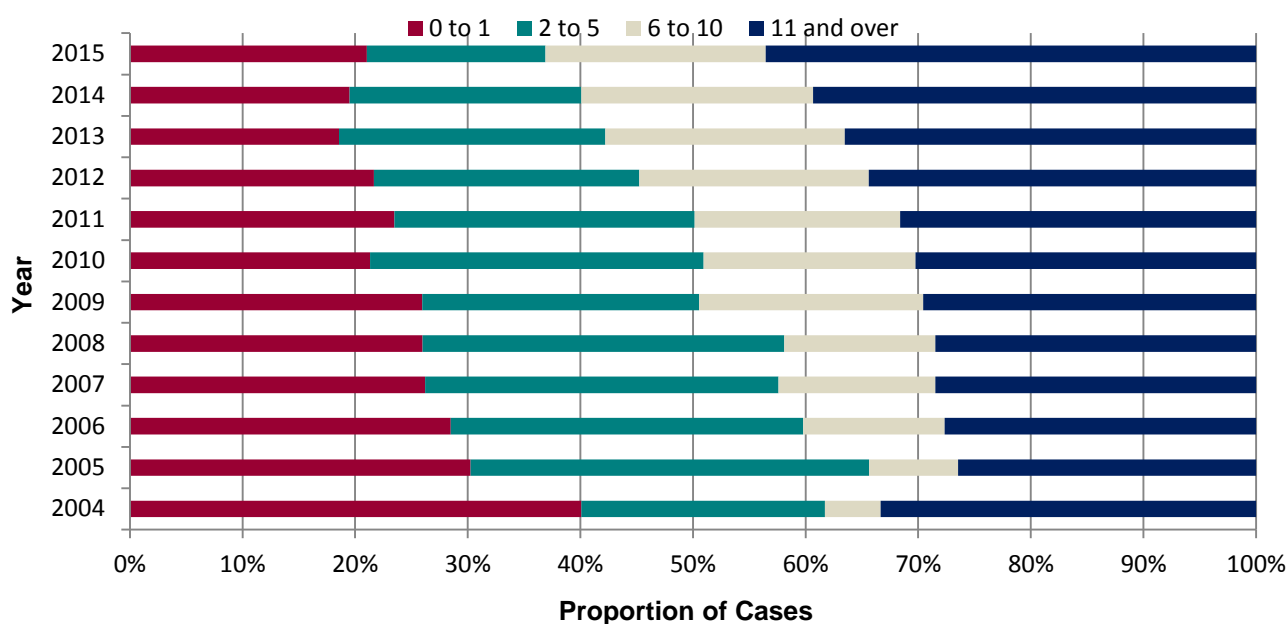


**Figure 2.6: Tuberculosis case reports by place of birth and age group, Yorkshire and Humber, 2015**



**Figure 2.7: Non-UK born tuberculosis cases by time since entry to the UK, Yorkshire and Humber, 2015**



**Figure 2.8: Time between entry to the UK and TB notification for non-UK born cases, Yorkshire and Humber 2004-2015**

## Country of birth

Amongst non-UK-born TB cases in the region, the most commonly reported country of birth was Pakistan, accounting for 35% of all non-UK born cases in 2015, followed by India (13%). Five sub-Saharan African countries – Eritrea, Somalia, Zimbabwe, Ethiopia and Sudan collectively accounted for 17% of cases in 2015 (Table 2.1). The proportion of TB cases from eastern European countries has increased with 9% of the TB cases notified in 2015 coming from Eastern European countries (Lithuania, Latvia, Poland and Romania).

**Table 2.1: Reported country of birth for non-UK born tuberculosis cases, Yorkshire and Humber, 2015**

Country of Birth	Number of cases	Percentage of Non-UK Born cases
Pakistan	103	35%
India	38	13%
Eritrea	15	5%
Somalia	13	4%
Zimbabwe	13	4%
Bangladesh	8	3%
Lithuania	8	3%
Ethiopia	7	2%
Latvia	6	2%
Poland	6	2%
Romania	6	2%
Sudan	6	2%
Kenya	5	2%
Other <= 1% each and unknown*	58	20%

## Ethnicity

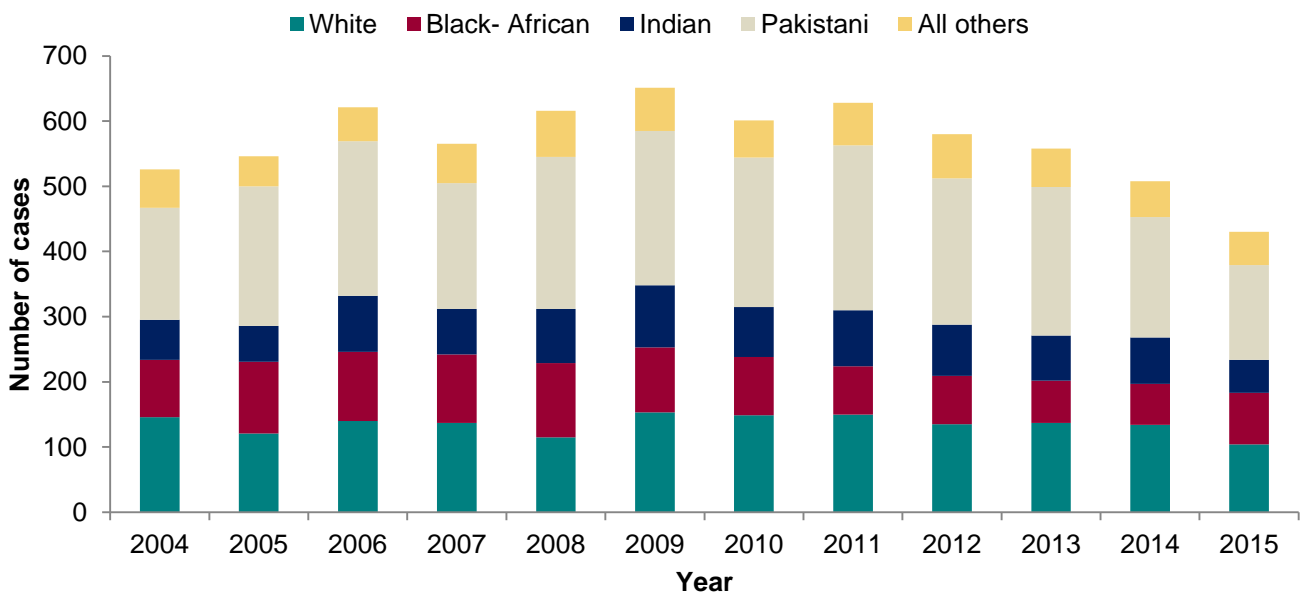
Ethnicity was recorded for 97.7% of TB cases notified in 2015. Thirty-five per cent of TB cases in the region in 2015 were from the Pakistani ethnic group. The next most frequent reported ethnicities were white (23.0%), Black African (18.6%) and Indian (11.8%) (Figure 2.9).

The TB incidence rate in the Pakistani ethnic group has decreased between 2010 and 2015 from 101 to 64 per 100,000 population. A less marked decline was observed for other ethnic groups. The incidence in the Indian ethnic group declined from a peak of 124 in 2011 to 73 per 100,000 population in 2015, and the Bangladeshi group declined from 80 in 2011 to 36 per 100,000 population in 2015.

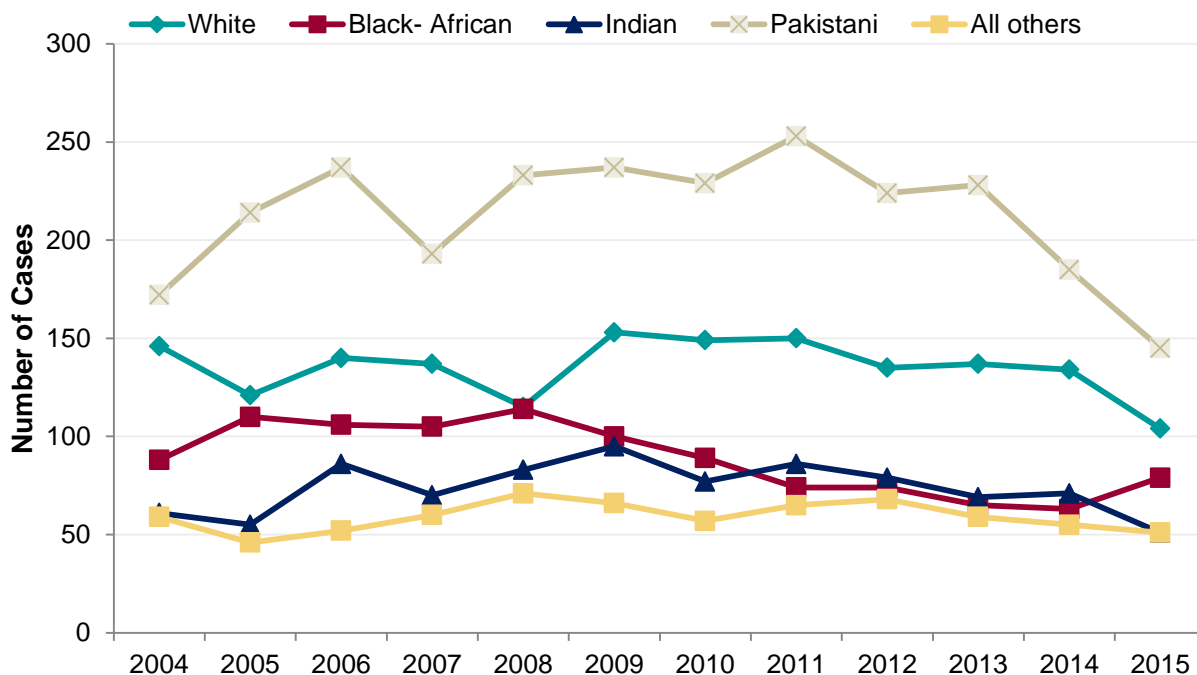
These rates are markedly higher than the rate for the white ethnic group which remained almost unchanged between 2010 (3.2 per 100,000 population) and 2015 (2.2 per 100,000 population). However the TB incidence rate for Black Africans in the region has declined from the peak of 193 per 100,000 population in 2010 to 171 per 100,000 population in 2015 in what appears to be a consistent trend (Figure 2.12). Nationally a reduction in cases from Somalia and Zimbabwe has been observed over the last decade but these trends need to be interpreted in the context of changing migration patterns with a reduction in long term migration from high and very high TB incidence countries, and more recently the introduction of pre-entry screening since autumn 2012, alongside progress in international TB control programmes.

The proportion of TB cases with Indian Sub-continent (ISC) ethnicities (Pakistani, Indian, Bangladeshi), who were UK-born increased from 18% in 2004 to 23% in 2015. For Black ethnic groups (Black African, Black Caribbean, Black Other), the proportion that were UK-born increased from 8.5% in 2004 to 10.9% in 2015. This suggests that while TB in the Black African ethnic groups in the region remains predominately associated with migration; for ISC ethnic groups, acquisition of TB infection in the UK is an increasing concern (Figure 2.11).

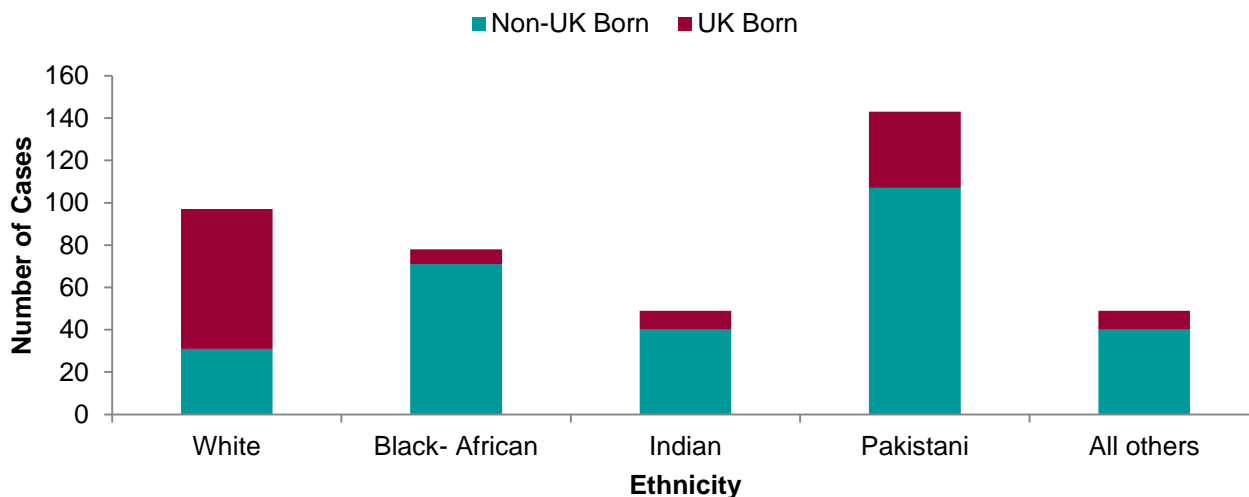
**Figure 2.9: Tuberculosis case numbers by ethnic group, Yorkshire and Humber, 2004-2015**



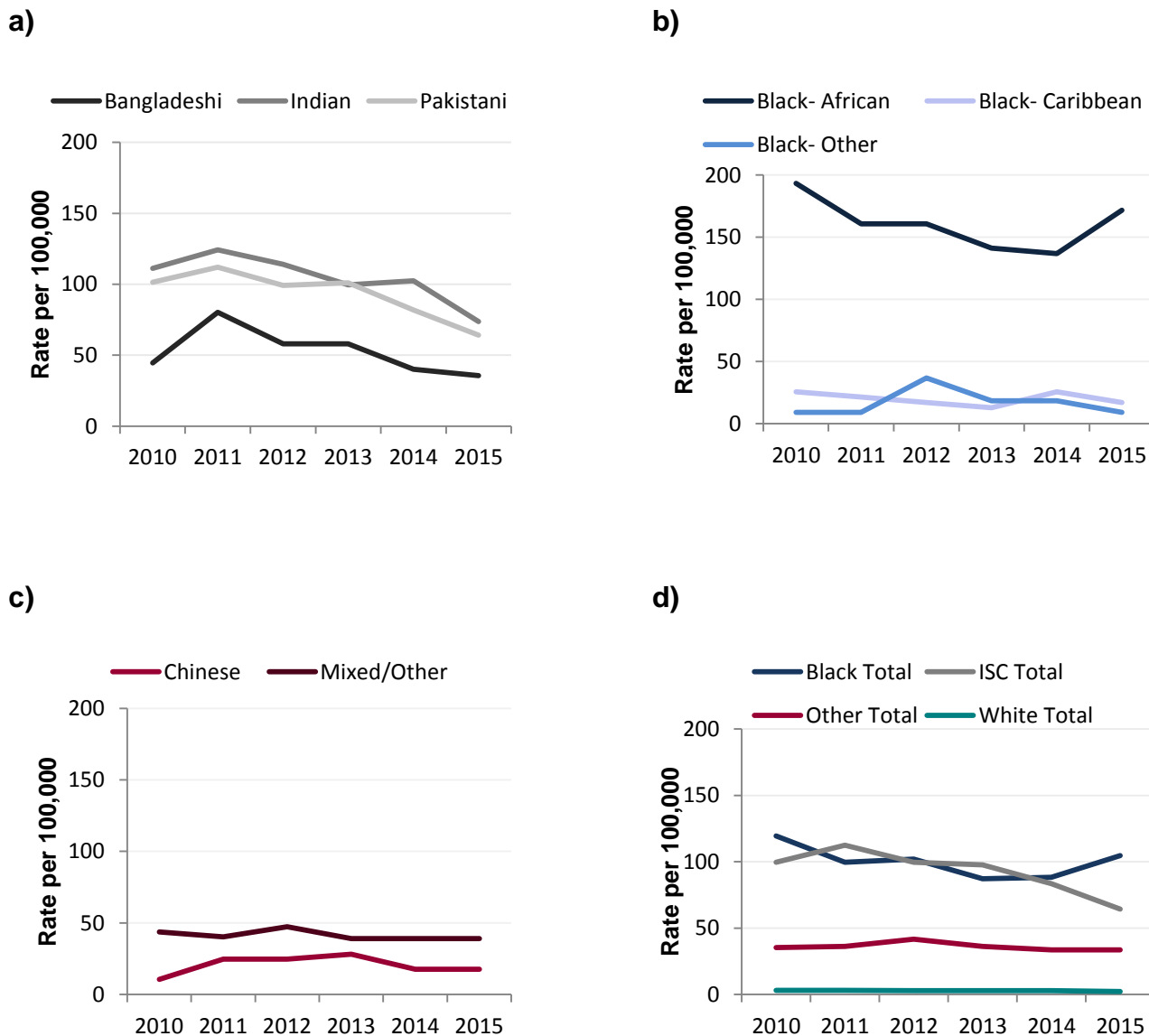
**Figure 2.10: Tuberculosis case numbers by ethnic group, Yorkshire and Humber, 2004-2015**



**Figure 2.11: Tuberculosis case numbers by ethnic group and place of birth, Yorkshire and Humber, 2015**



**Figure 2.12: Trend in tuberculosis rates per 100,000 population a) Indian sub-continent ethnic groups b) black ethnic groups c) mixed/other ethnic groups and d) white and all ethnic groups**



## Occupation

Twenty-two TB cases in Yorkshire and Humber in 2015 were known to be health care workers. Twenty-nine cases worked in education. TB cases in these occupations can indicate complexity in case management due to the nature of transmission chains. Forty-six per cent of cases between the ages of 18 and 65 were reported as unemployed; a factor with well-recognised associations with some of the life-style risk factors for TB in addition to the correlation between unemployment and deprivation.

**Table 2.2: Occupational category of TB patients aged 18 to 65, Yorkshire and Humber, 2014**

Occupation Category	No. of cases	%
Agricultural/animal care worker	2	1%
Education	29	9%
Health care worker	22	7%
None	148	46%
Other	116	36%
Social service/prison worker	3	1%

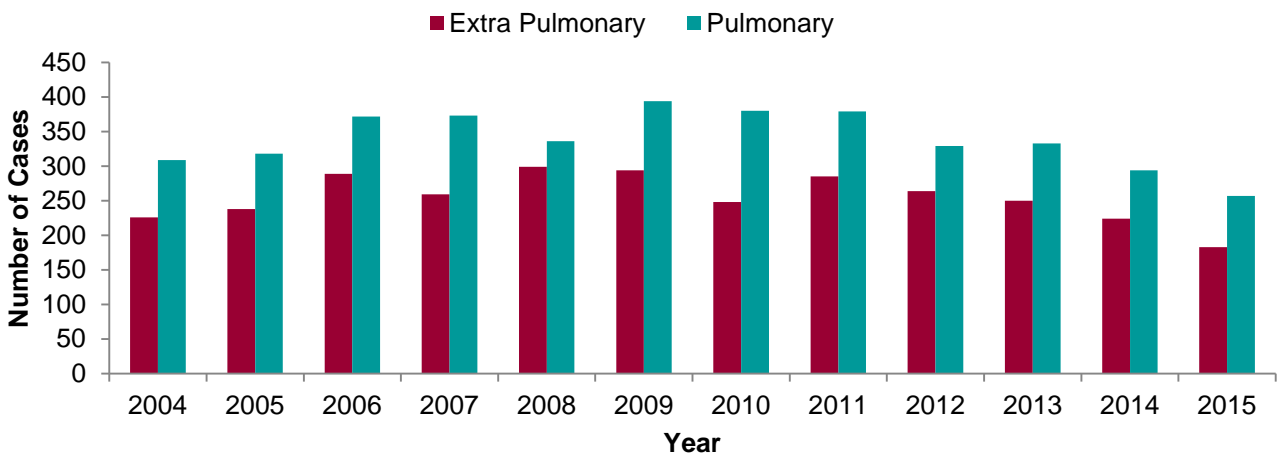


### 3. Clinical characteristics

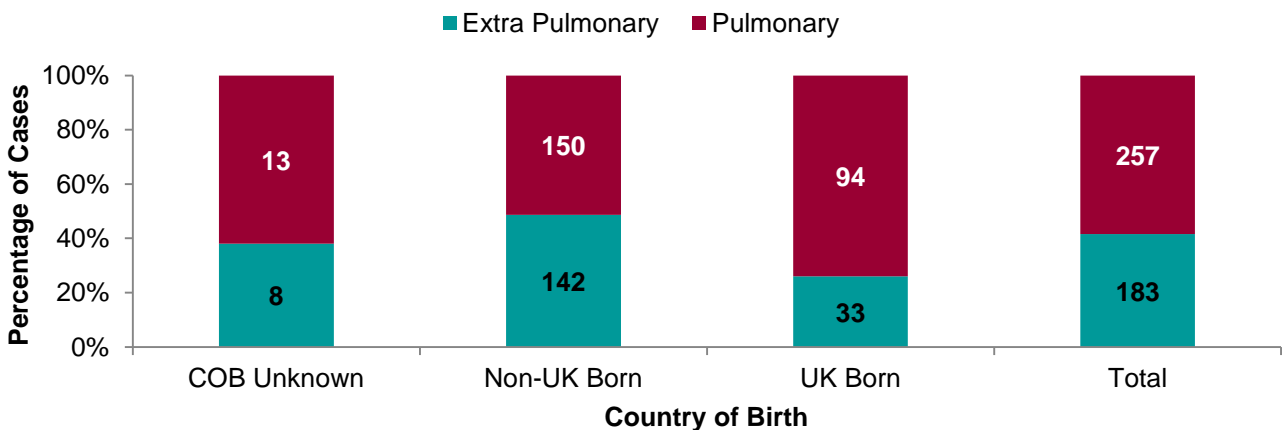
#### Site of disease

Fifty-eight per cent of TB cases reported in the region in 2015 had pulmonary disease, similar to the proportion nationally (53.4%). The ratio of pulmonary to extra-pulmonary TB cases has been relatively stable in the region in the past decade (Figure 3.1). In 2015 as in previous years, extra-pulmonary disease was more common in non-UK-born than in UK-born TB cases (Figure 3.2).

**Figure 3.1: Tuberculosis cases by site of disease, Yorkshire and Humber, 2004-2015**



**Figure 3.2: Tuberculosis cases by site of disease and place of birth, Yorkshire and Humber, 2015**



#### Previous history of tuberculosis

For Yorkshire and Humber cases notified in 2015, 33 of 416 (8%) cases (where past history is documented) had a previous diagnosis of TB more than 12 months before their current notification. Among those with a previous diagnosis of TB, 23 of 25 cases (92%) where treatment status was documented had previously been treated for TB and 11 of 29 (38%) cases where DOT status is recorded are known to have received DOT during their current notification of TB. Time since previous diagnosis was known for 90.1% (30/33) of cases with a past history of TB, with a median time since previous diagnosis of nine years (IQR 1-60 years). This is consistent with the national picture. Given

the recognised association between previous disease, treatment compliance and antimicrobial resistance this may be an area where increased assurance on treatment compliance through enhanced case management may be helpful. It is also the case that clinical assessment may appropriately downgrade the risk of non-compliance and the need for DOT and this may contribute to the low numbers of cases with a previous TB history with a report of receiving DOT in their current infection.

**Table 3.1: Previous TB history among cases diagnosed between 2004 and 2015, Yorkshire and Humber**

Year	Previous Diagnosis Unknown	No previous history of TB	Previous history of TB Yes	% of TB cases with a past history of TB (where status recorded)
2004	81	405	49	11%
2005	97	418	41	9%
2006	111	513	37	7%
2007	145	451	36	7%
2008	74	519	42	7%
2009	56	582	50	8%
2010	36	545	47	8%
2011	27	596	41	6%
2012	20	531	42	7%
2013	32	517	34	6%
2014	34	449	35	7%
2015	24	383	33	8%

## Smoking status

Information on current smoking status at onset of symptoms, presentation or during care was collected from 2 July 2015. Between 2 July 2015 and 31 December 2015 information on smoking status was known for 44% (195/440) of notified TB cases in Yorkshire and Humber. Where information was known, 21.5% (42/195) were current smokers, which is higher than the England average of 19.3%. However this may be the result of a bias towards completing this information in known smokers given the completion of the information on smoking history is better across the country (76%) than in Yorkshire and Humber (44%).

## Travel and visitor risk factors

History of travel to and visitors received from a country outside the UK (excluding Western Europe, US, Canada, New Zealand and Australia) in the last two years prior to TB diagnosis has been collected since 13 May 2015. Between 13 May 2015 and 31 December 2015, in Yorkshire and Humber, information on travel history and visitor history was known for 44.3% and 29.5% of notified TB cases, respectively. Where information was known, 26.2% (51/195) of TB cases had travelled outside the UK and 2.3% (3/130) had received a visitor from outside the UK. Where the country of travel or origin of visitor was known, 75.5% (37/49) of cases travelled to their country of birth and 33.3% of cases had received a visitor from their country of birth. Compared to the England averages Yorkshire and Humber cases were more likely to have travelled outside of UK and less likely to have received a visitor from outside of the UK. Data completion in Yorkshire and Humber cases is considerably lower than the UK average of 65% for travel history and 55% for visitor information.

## 4. Laboratory confirmation of TB

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### Laboratory tests data collection

Data for all culture confirmed TB isolates from the Mycobacterium Reference Laboratories, including speciation, drug susceptibility testing and Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR) typing were matched to TB case notifications and the results were used to report culture confirmation. Results for microscopy, PCR and histology were also collected in ETS.

### Culture confirmation and speciation

Microbiological confirmation through culture remains the gold-standard for TB diagnosis. It enables assessment of drug sensitivities to inform treatment and informs decisions and actions taken to control transmission. It is also essential for genotypic studies of TB in the UK. In 2015, 71% of pulmonary cases in Yorkshire and Humber were microbiologically confirmed, similar to the national figure (72%). Of all notified TB cases just 60% were culture confirmed.

Use of PCR confirmation has increased in recent years and has increased the proportion of microbiologically confirmed pulmonary TB cases in the region by about 2-3% each year (Figure 4.2). However, it remains significantly below the European Centre for Disease Prevention and Control target of 80%.

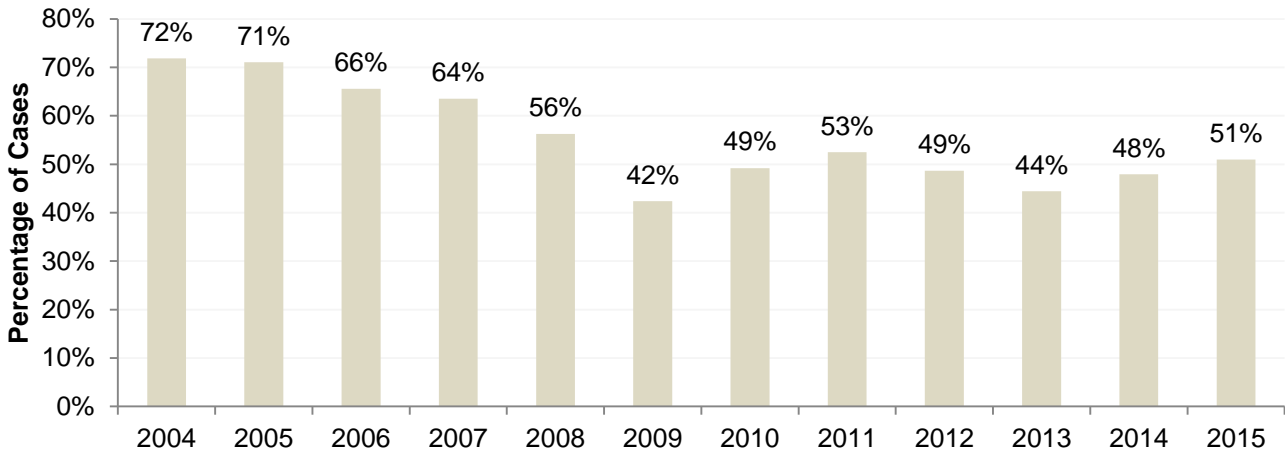
In 2015 the proportion of culture confirmation was lower among TB cases aged 0-14 years 42% (11/26) compared with those aged 15 to 44 years 63% (151/240), and 45 to 64 years 57% (69/121) and 65 years and older 62% (33/53).

### Sputum smear status

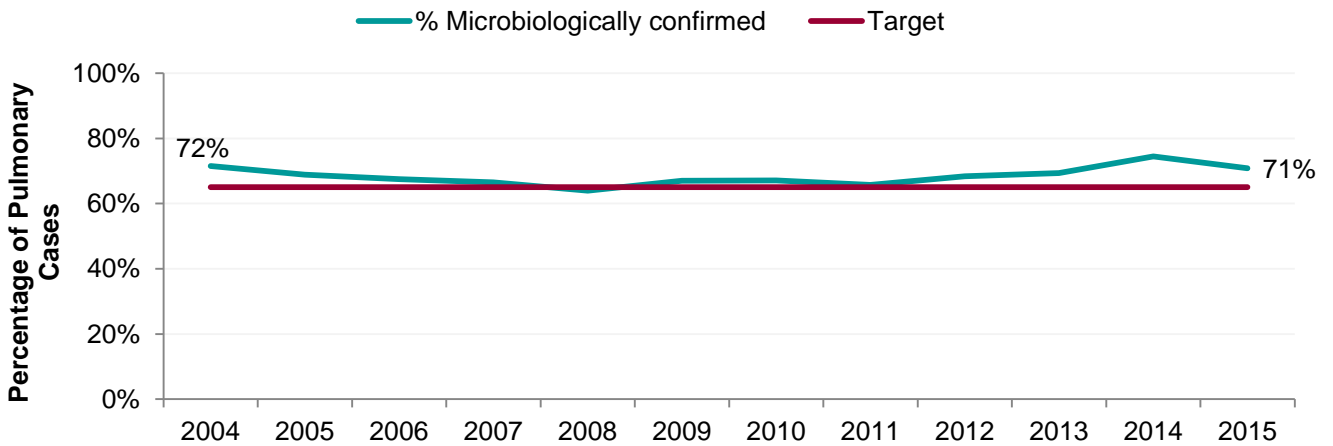
Sputum smear status is an indicator of TB infectivity and therefore, a marker for potential transmission. Sputum smear status was known for 131/257 (51%) of pulmonary TB cases diagnosed in the region in 2015 (Figure 20), compared to 61% nationally.

Where sputum smear status was known, 70/131 (53.4%) were sputum smear positive in 2015 compared to 101/222 (45%) in 2004 (Figure 4.3). Nationally 52.4% of cases with a reported sputum smear result were positive.

**Figure 4.1: Proportion of pulmonary tuberculosis cases where sputum smear status known Yorkshire and Humber, 2004-2015**

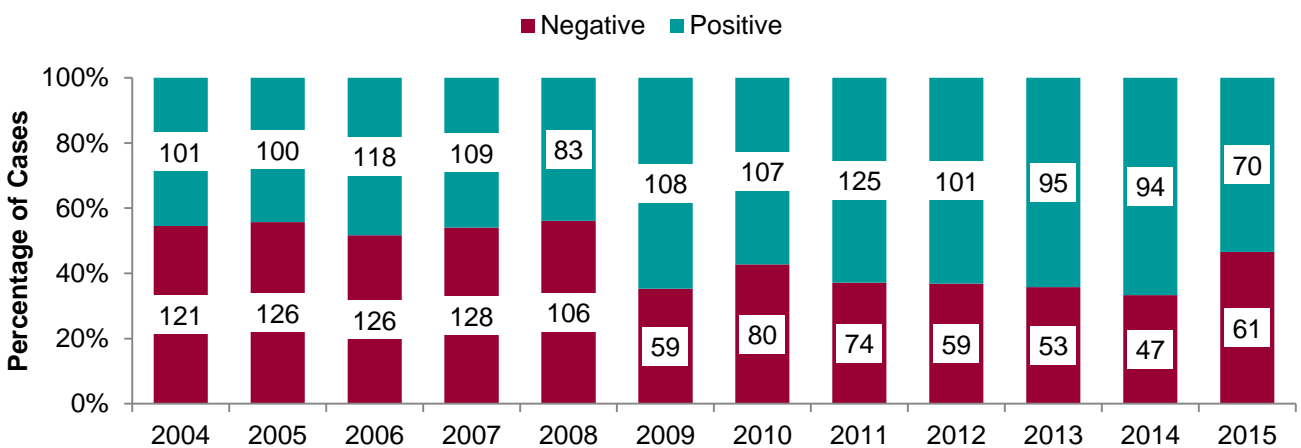


**Figure 4.2: Proportion of pulmonary tuberculosis cases microbiologically\* confirmed, Yorkshire and Humber, 2004-2015**



\* Culture or PCR

**Figure 4.3: Proportion of sputum positive Tuberculosis cases (where sputum status known), Yorkshire and Humber, 2004-2015**



## 5. TB transmission

The incidence rate of TB in children is widely accepted to be a good indicator of TB transmission in a community. Molecular genotyping of the organisms causing TB in a population can also provide insight into putative transmission chains.

### Rate of TB in UK born children

In 2015, the rate of TB in UK born children under 15 years of age, a proxy for recent transmission within England was 1.8 per 100,000 (95% CI 1.5-2.1) with a reduction over the last three years. However, in Yorkshire and Humber the rate of TB in UK born children under 15 increased to 2.2 per 100,000 from 1.6 per 100,000 although there are wide confidence limits on this.

**Figure 5.1: Rate of TB in UK born children (<15), Yorkshire and Humber, 2004-2015**



### Strain typing and clustering

The PHE National Strain Typing Service was established in January 2010 and since that time all TB isolates have been typed using 24 loci Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeats (MIRU-VNTR). Such strain typing identifies clusters of cases with indistinguishable strain types that may indicate that they are part of the same chain of transmission<sup>2</sup>. However, clustering could also reflect common endemic strains circulating within England or abroad and therefore the detection of a common strain type among cases does not confirm recent transmission. Additional epidemiological information is required to assess if a common strain type is likely to reflect recent transmission. MIRU-VNTR strain typing can be used to support or refute whether transmission has occurred between individuals.

Within the Field Epidemiology Service, there is a designated TB cluster investigator whose role is to review strain typing and identify clusters within and across PHE Centres. Cluster information is regularly provided including contextual information about strain types, which are routinely reviewed with the health protection team for epidemiological links and for decisions on appropriate monitoring or further investigation of the cluster.

## Whole genome sequencing

It is hoped that the higher level of resolution provided by whole genome sequencing (WGS) will improve our understanding of TB transmission in England. WGS sequencing began in Yorkshire and Humber at the end of 2016 and will be available throughout England in 2017.

## Proportion of cases clustered and geographical distribution

Between 2010 and 2015, there were 2,042 culture confirmed cases of TB in Yorkshire and Humber, of which 1,496 cases (73.5 %) had an isolate that was strain typed with at least 23 loci typed. Of these, 981 (65.6%) did not cluster with any other isolates within Yorkshire and Humber. The remaining 515 (34.4%) cases clustered with at least one other case in Yorkshire and Humber since 2010. This is less than the proportion of cases clustering in England (58.4%). Between 2010 and 2015, 130 different strain type clusters were reported in Yorkshire and Humber and 2,539 were reported in England.

**Table 5.1: Number and proportion of culture confirmed cases typed and number and proportion of cases in clusters, Yorkshire and Humber, 2010-2015**

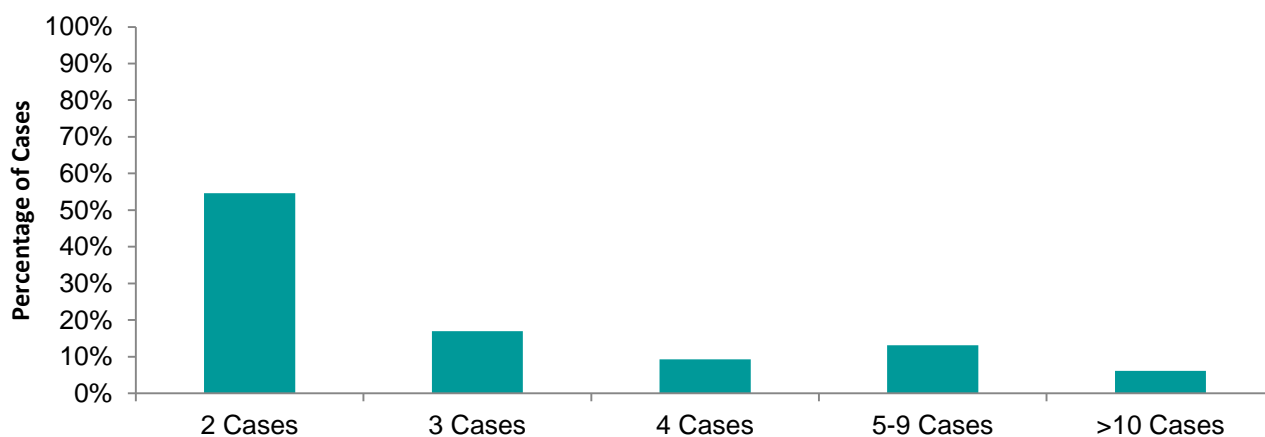
Years	Culture confirmed cases (%)	Strain – typed cases $\geq$ 23 loci	Cases clustered	Clusters
2010-2015	2,042 (59.6%)	1496 (73.5%)	515 (34.4%)	130

## Cluster size

Of the 130 clusters in Yorkshire and Humber identified between 2010 and 2015, the majority of clusters were small with just over half including only two cases and approximately one fifth including five or more cases.

Nationally, over the six year period 2010 to 2015, there were a total of 2,539 clusters with a median cluster size of three cases (range 2-226). The majority of clusters (75.1%; 1,906/2,539) were small in size (<5 cases), with 45.5% (1,154) having only two cases in the cluster.

**Figure 5.2: Proportion of clusters by size, Yorkshire and Humber, 2010-2015**



The reduction in the rate of TB among UK born children nationally, the decrease in the proportion of clustered cases and the reduction in the number of new clusters each year all suggest that there has been a decrease in TB transmission within England in recent years. However in Yorkshire and Humber it is a concern that cases in UK born children have not declined but increased.

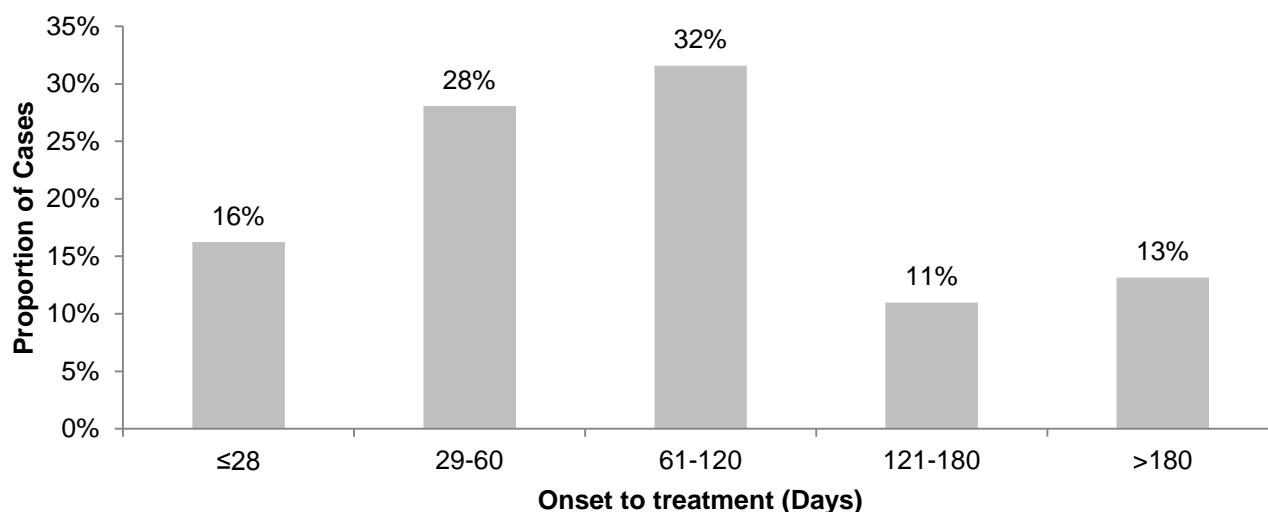
## 6. Delay from onset of symptoms to start of treatment

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

Dates of symptom onset and treatment start were available for 89% (228/257) of pulmonary TB cases diagnosed in 2015, an improvement on the previous year.

In 2015, among the 228 pulmonary TB patients where the interval between onset and treatment is known 44% started treatment within 60 days (two months) of symptom onset (Figure 6.1). Of concern is the significant proportion of pulmonary cases, 24% (55/228) commencing treatment over 121 days (four months) after onset of symptoms. However across England 28% of pulmonary cases were reported as commencing treatment over four months after onset of symptoms in cases.

**Figure 6.1: Pulmonary tuberculosis case reports by time of onset to treatment start date, Yorkshire and Humber, 2015**



\*excluding asymptomatic cases, and those with missing onset dates

There was no difference in time to treatment start date by country of birth. Proportions of UK-born and non-UK born cases were approximately equal for early and late diagnoses for pulmonary cases<sup>3</sup> (Figure 6.2). There was no clear pattern for delays in treatment by ethnic group, (Figure 6.4). Nationally consistently longer delays are experienced by UK born cases. The median delay for pulmonary TB cases is 67.5 days.

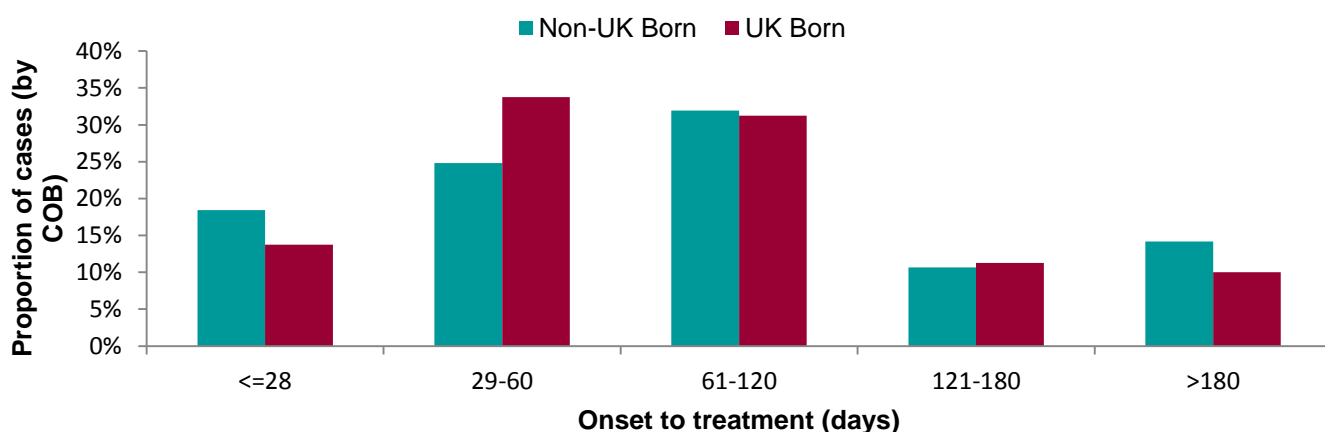
<sup>3</sup> Early diagnosis: diagnosis made within 28 days of onset of symptoms. Late diagnosis: diagnosis made more than 120 days after onset of symptoms.

### Characteristics of pulmonary TB cases with a delay between onset of symptoms and starting treatment

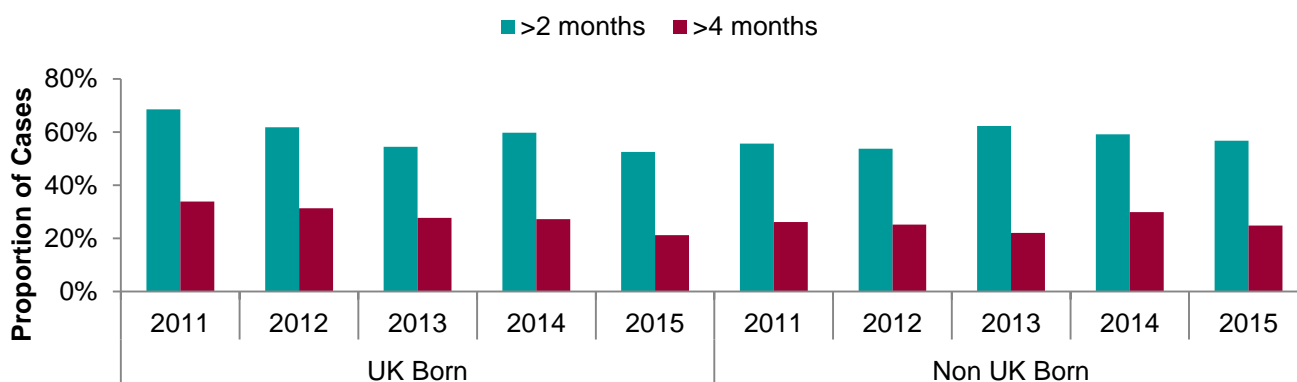
**Table 6.1: Number and proportion of pulmonary TB cases by time from symptom onset to treatment start by age group, Yorkshire and Humber, 2015**

Time from symptom onset to treatment start	Age group											
	<15		15-24		25-34		35-44		45-64		65+	
	n	%	n	%	n	%	n	%	n	%	n	%
0 to 2 months	5	63%	19	59%	21	41%	16	47%	27	39%	13	41%
between 2 and 4 months	3	38%	6	19%	19	37%	9	26%	26	38%	9	28%
more than 4 months	0	0%	7	22%	12	24%	10	29%	16	23%	10	31%
Total	8	100%	32	100%	51	102%	34	103%	69	100%	32	100%

**Figure 6.2: Proportion of pulmonary tuberculosis case reports by time from onset to treatment start date and country of birth, Yorkshire and Humber, 2015**

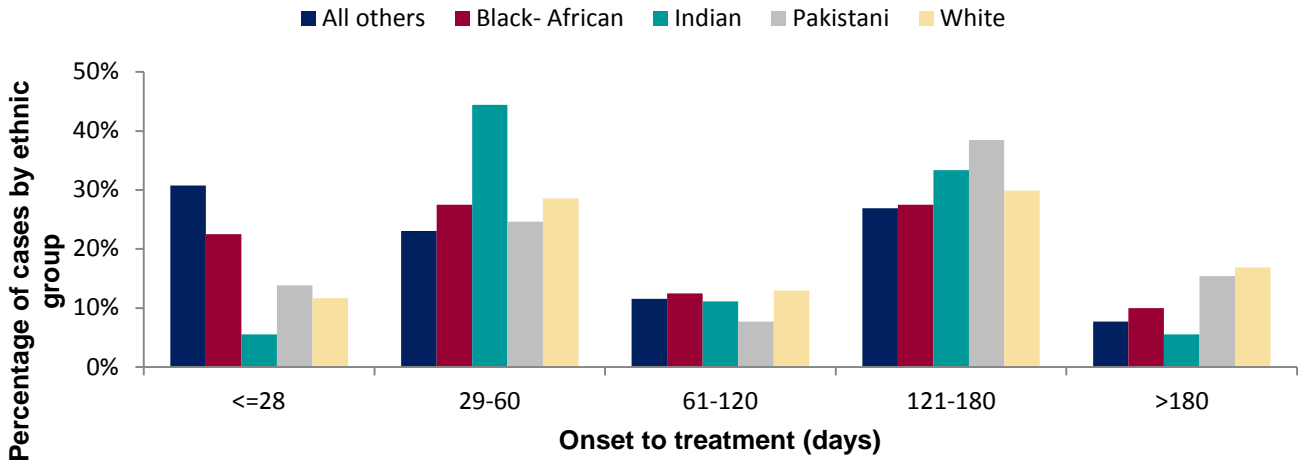


**Figure 6.3: Proportion of pulmonary TB cases with a delay from symptom onset to treatment start by place of birth, Yorkshire and Humber 2011-2015**

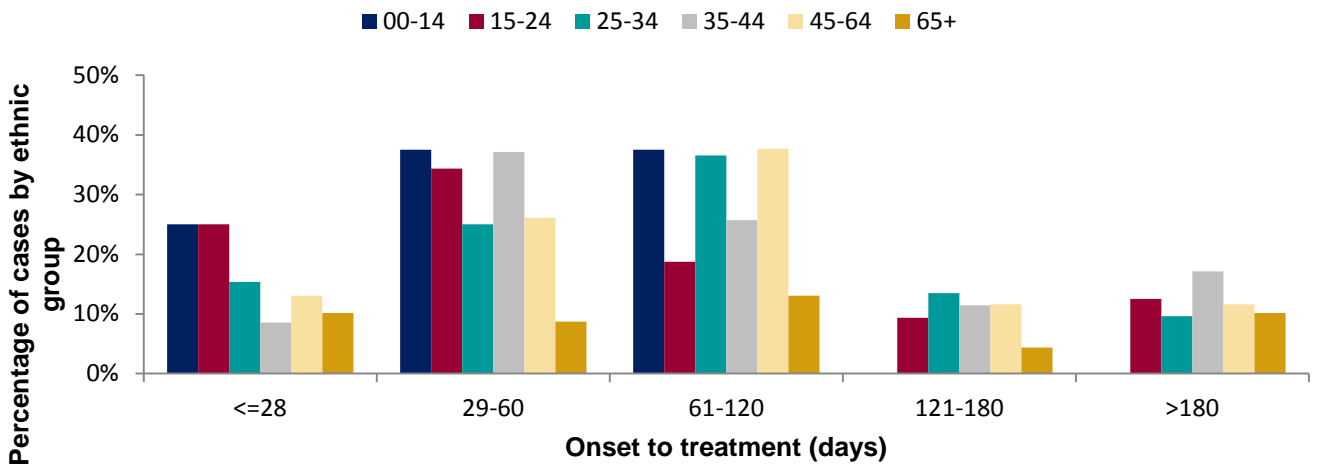




**Figure 6.4: Pulmonary tuberculosis case reports by time from onset to treatment start date and ethnic group, Yorkshire and Humber, 2015**

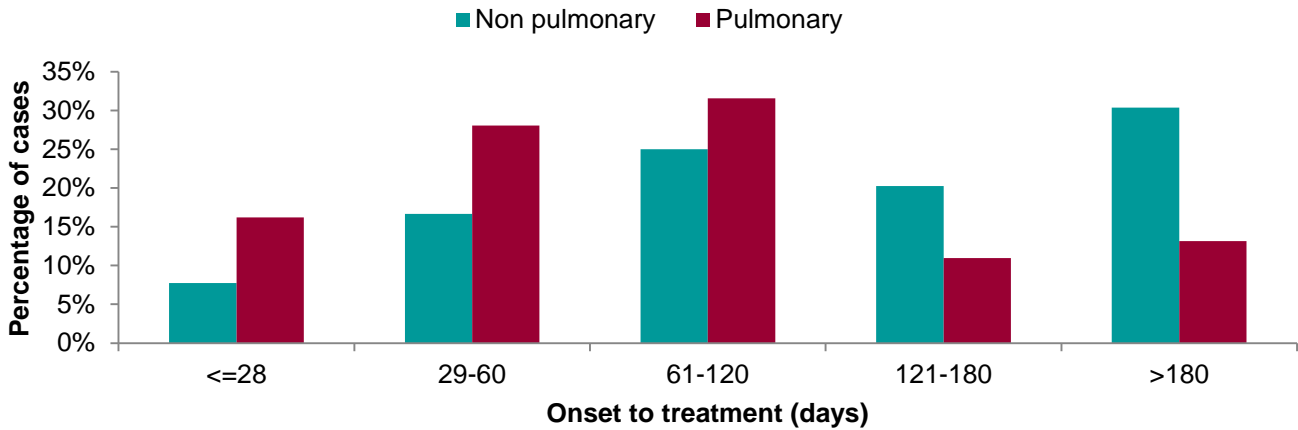


**Figure 6.5: Pulmonary tuberculosis case reports by time from onset to treatment start date and age group, Yorkshire and Humber, 2015 (pulmonary TB cases only)**



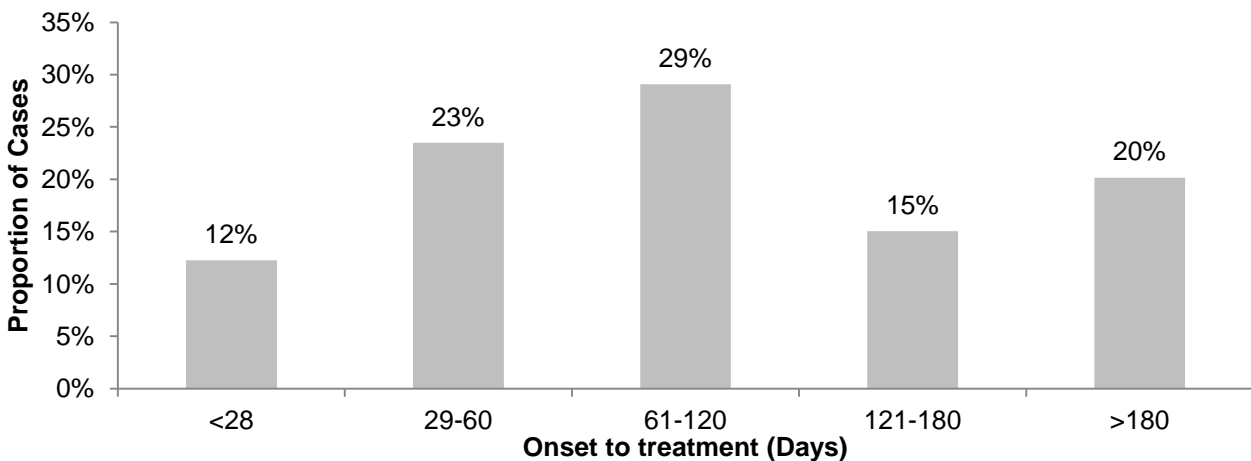
Time from symptom onset to treatment start for patients with pulmonary and non-pulmonary TB

Figure 6.6: Pulmonary and non-pulmonary tuberculosis case reports by time from onset to treatment start date and site of disease, Yorkshire and Humber, 2015



Dates of symptom onset and treatment were available for 90% (396/440) of all TB cases diagnosed in 2015, an improvement on the previous year. Thirty-six per cent (142/396) of all TB cases in 2015 started treatment within 60 days (two months) of onset of symptoms (Figure 6.7). As expected, delay in treatment was more common for extra-pulmonary than pulmonary disease – 35% of extra-pulmonary TB cases began treatment more than 120 days after onset of symptoms compared to 24% of pulmonary cases (Figure 6.6).

Figure 6.7: Tuberculosis (pulmonary and non-pulmonary) case reports by time of onset to treatment start date, Yorkshire and Humber, 2015



\*excluding asymptomatic cases, and those with missing onset dates

There was no difference in time to treatment start date by country of birth. Proportions of UK-born and non-UK born cases were approximately equal for early and late diagnoses<sup>4</sup> (Figure 6.9). There was no clear pattern for delays in treatment by ethnic group, (Figure 6.10). Nationally consistently longer delays are experienced by UK born cases. The median delay for all cases was 85.5 days.

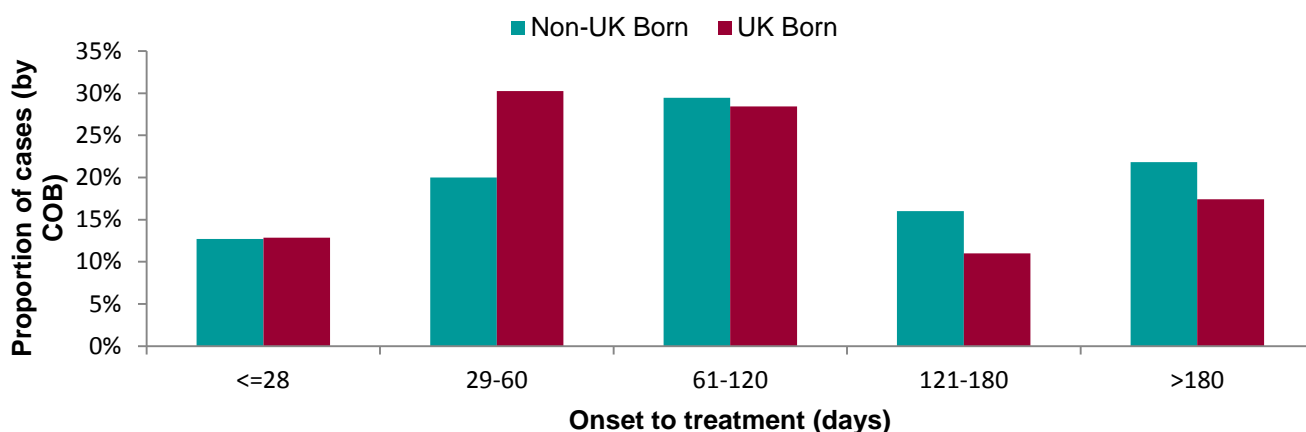
<sup>4</sup> Early diagnosis: diagnosis made within 28 days of onset of symptoms. Late diagnosis: diagnosis made more than 120 days after onset of symptoms.

**Table 6.2: Number and proportion of all TB cases (pulmonary and non-pulmonary) by time from symptom onset to treatment start by age group, Yorkshire and Humber, 2015**

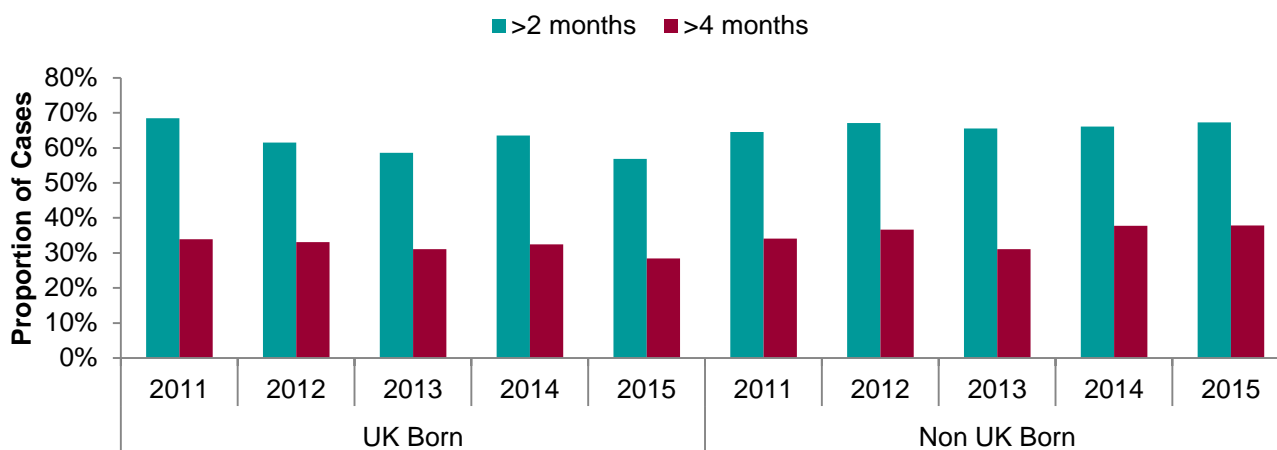
Time from symptom onset to treatment start	Age group											
	<15		15-24		25-34		35-44		45-64		65+	
	n	%	n	%	n	%	n	%	n	%	n	%
0 to 2 months	9	60%	23	43%	30	31%	22	31%	40	35%	18	39%
between 2 and 4 months	3	20%	13	25%	33	34%	17	24%	36	32%	12	26%
more than 4 months	3	20%	17	32%	35	36%	31	44%	38	33%	16	35%
Total	15	100%	53	100%	98	100%	70	100%	114	100%	46	100%

**Characteristics of all TB cases (pulmonary and non-pulmonary) with a delay from onset of symptoms to treatment**

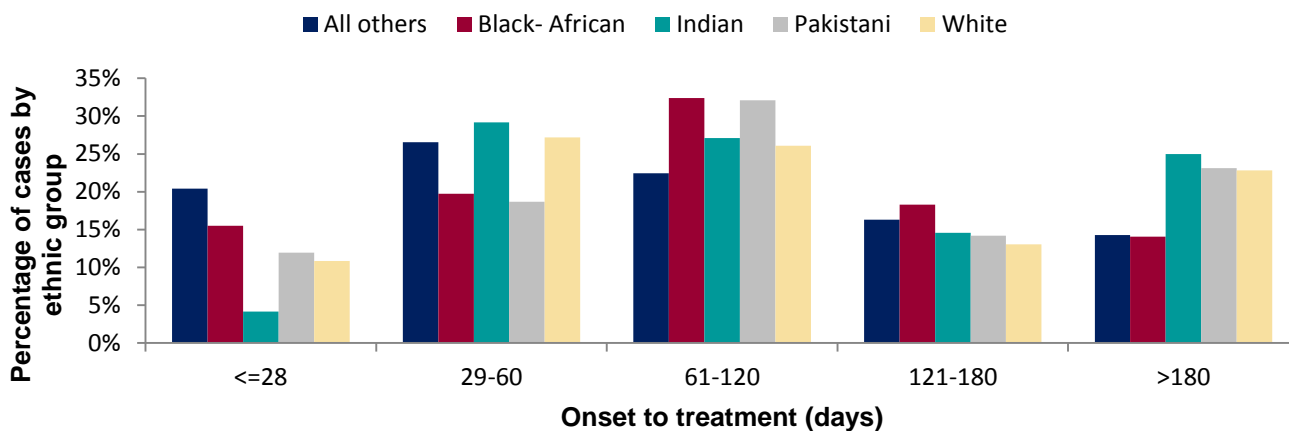
**Figure 6.8: Proportion of all tuberculosis (pulmonary and non-pulmonary) case reports by time from onset to treatment start date and country of birth, Yorkshire and Humber, 2015**



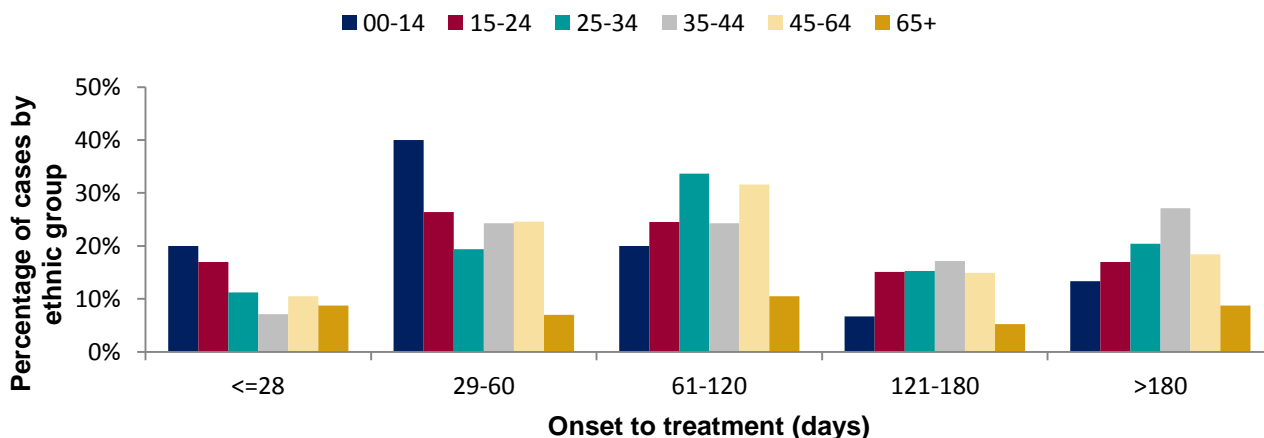
**Figure 6.9: Proportion of all TB cases (pulmonary and non-pulmonary) with a delay from symptom onset to treatment start by place of birth, England, 2011-2015**



**Figure 6.10 Tuberculosis (pulmonary and non-pulmonary) case reports by time from onset to treatment start date and ethnic group, Yorkshire and Humber, 2015**



**Figure 6.11: All Tuberculosis (pulmonary and non-pulmonary) case reports by time from onset to treatment start date and age group, Yorkshire and Humber, 2015**



## 7. TB outcome in drug sensitive cohort

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### Drug sensitive cohort

For the purposes of TB outcome reporting the drug sensitive cohort excludes all TB cases with rifampicin resistant TB (initial or amplified) including MDR-TB (initial or amplified), and non-culture confirmed cases treated as MDR-TB [5]. Under this definition, cases with resistance to isoniazid, ethambutol and/or pyrazinamide but *without* resistance to rifampicin are included in the drug sensitive cohort. For TB outcomes in the drug resistant cohort, see Chapter 6.

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

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

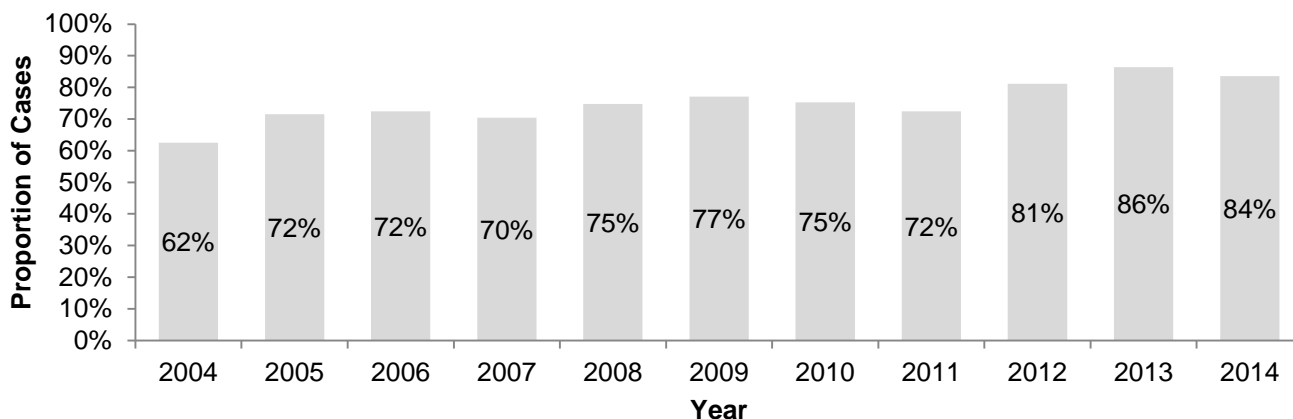
Treatment outcome reports were received for 98% of cases diagnosed in 2014, compared to 76% of cases diagnosed in 2004.

Definitions for the various treatment outcomes are contained in Appendix 4. Definitions have been updated in line with the revised 2013 World Health Organization (WHO) TB outcome definitions. Additional data validation has been conducted nationally this year, using data on the date of treatment start and the date of treatment completion to validate duration of treatment. It is important to note that TB outcomes reported using the updated 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.

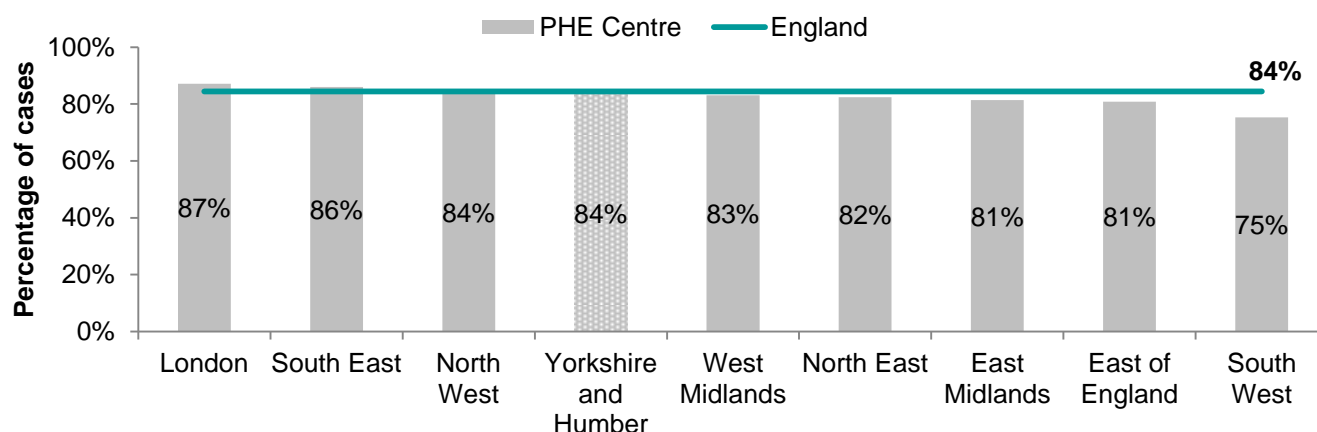
The proportion of TB cases completing treatment within 12 months of notification increased in the region from 62% for TB cases diagnosed in 2004 to 84% for cases diagnosed in 2014 (Figure 7.1). This is just below the national treatment completion rate of 84.4%.

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

**Figure 7.1: Proportion of tuberculosis cases that complete treatment by twelve months\*, Yorkshire and Humber, 2004-2014**



**Figure 7.2: Proportion of tuberculosis cases\* diagnosed in 2014 that complete treatment in twelve months, by Public Health England Centre, 2014**

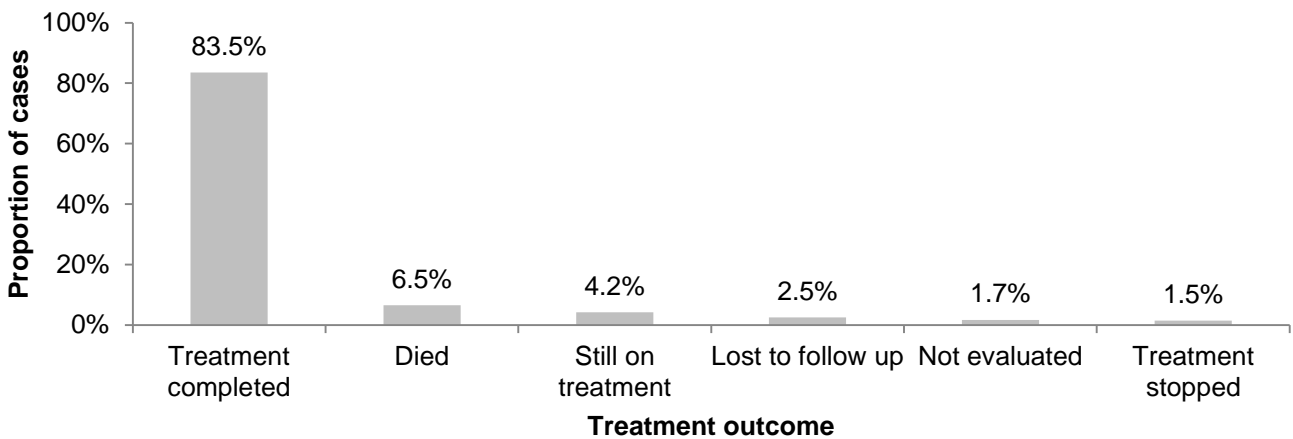


## TB treatment outcome

The proportion of patients reported as still on treatment or lost to follow up is now lower in the Yorkshire and Humber region than the national average. Of the TB cases diagnosed in 2014, 6.7% were reported as still on treatment or lost to follow up compared to the national proportion of 8.8%. Some patients still on treatment at 12 months had experienced interruption of treatment for various reasons leading to an extension of the treatment time. TB treatment was also stopped for a small number of patients due to clinical reasons such as intolerance of the treatment regimen. Those with complex disease and known resistance to anti-tuberculous drugs requiring longer treatment periods are excluded from this analysis.

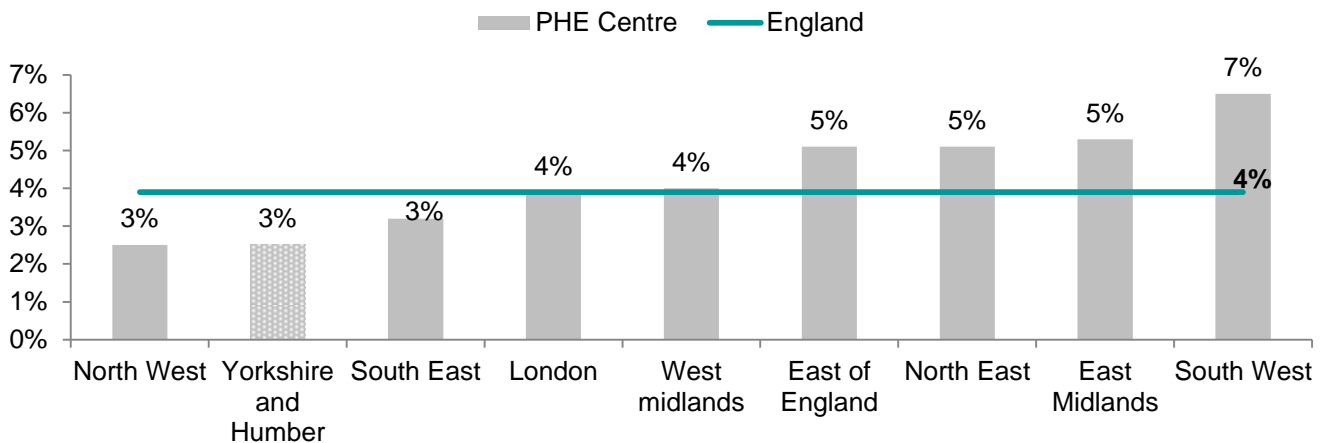
Of TB patients diagnosed in 2014 in the region, 2.6% were reported as lost to follow up 12 months later, a decrease from the previous year (5.1%) and below the England proportion of 3.9% (Figure 7.4).

**Figure 7.3: Tuberculosis cases by treatment outcome for cases diagnosed in 2014, Yorkshire and Humber**



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

**Figure 7.4: Proportion of tuberculosis cases diagnosed in 2014 that reported being lost to follow up as a treatment outcome by twelve months, by PHE Centre**



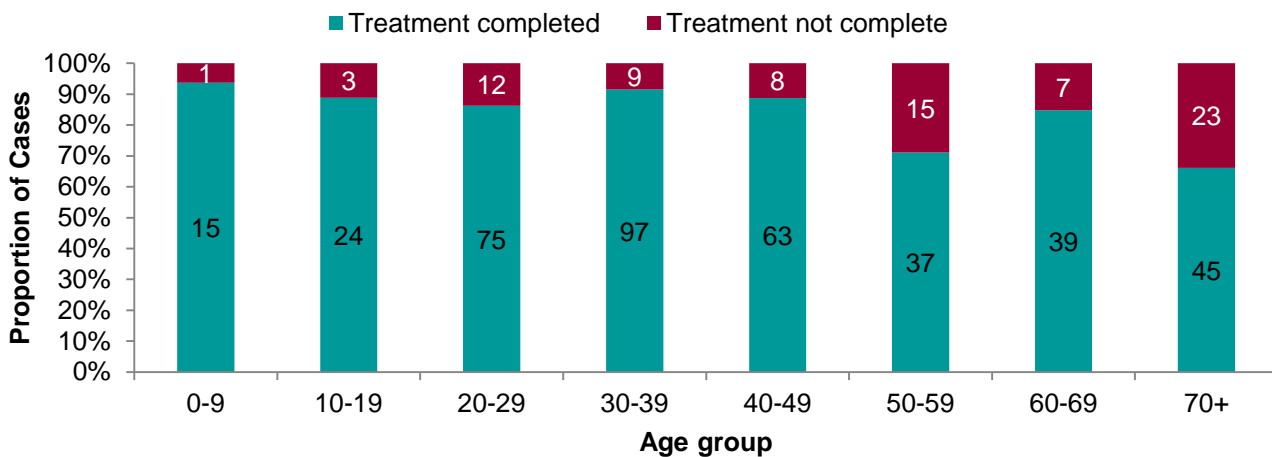
\*excludes rifampicin resistant TB, and patients with CNS, spinal, miliary or cryptic disseminated disease

The proportion of patients completing treatment within 12 months was lowest in the 70+ age group (Figure 7.6). Death was the most commonly reported reason for failing to complete treatment in the 70+ age groups while loss to follow up was most commonly reported in the 20-29 age group (Figure 7.7).

A higher proportion of non-UK born than UK born TB patients completed treatment within 12 months – 85% compared to 83% (Figure 7.8). An audit of TB treatment outcome in West Yorkshire suggested that a significant proportion of non-UK born TB patients reported as lost to follow up had left the country before treatment was completed<sup>4</sup>.

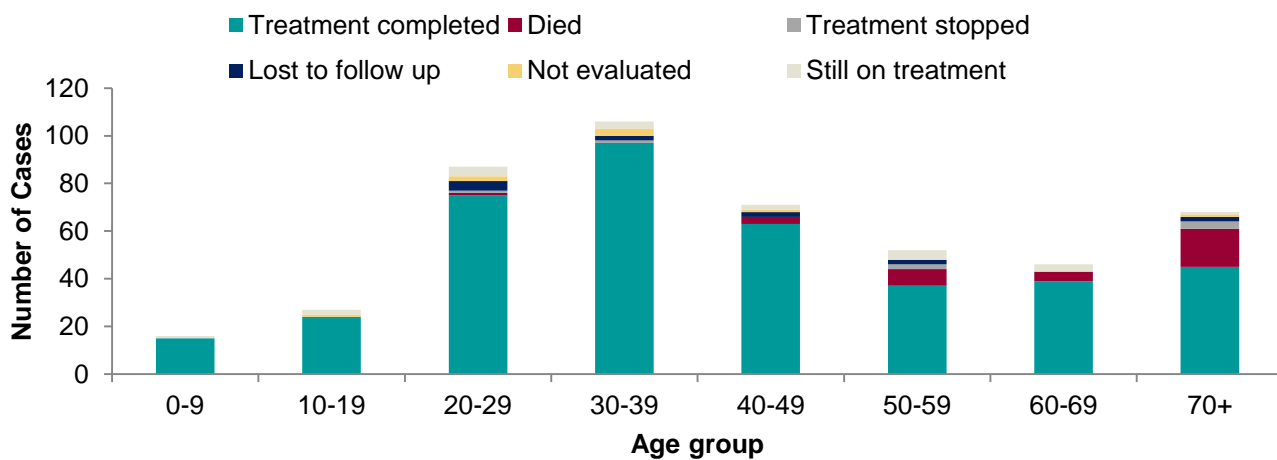
Treatment completion rates also varied by ethnicity of the TB patient with the lowest treatment completion rates reported in the white ethnic group – 74%, and highest completion rates in the Black-African ethnic group – 89% (Figure 7.9). This is partly explained by the age profile of the white TB patients who tend to be older and a higher chance of death from other causes before treatment is completed. This is also due to the slightly higher proportion of white TB patients with risk factors associated with poor treatment adherence such as substance misuse.

**Figure 7.5: Proportion of tuberculosis cases diagnosed in 2014 by treatment outcome and age group, Yorkshire and Humber**



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

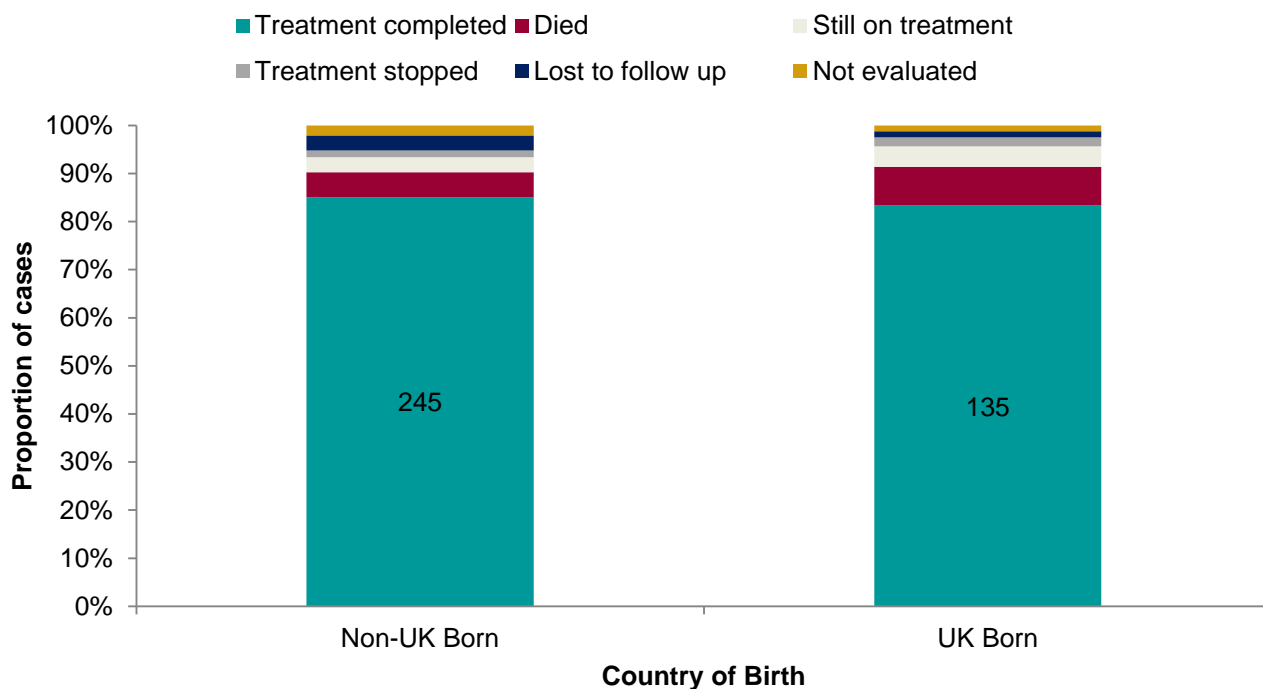
**Figure 7.6: Number of tuberculosis cases diagnosed in 2014 by age group and reason for not completing treatment, Yorkshire and Humber**



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

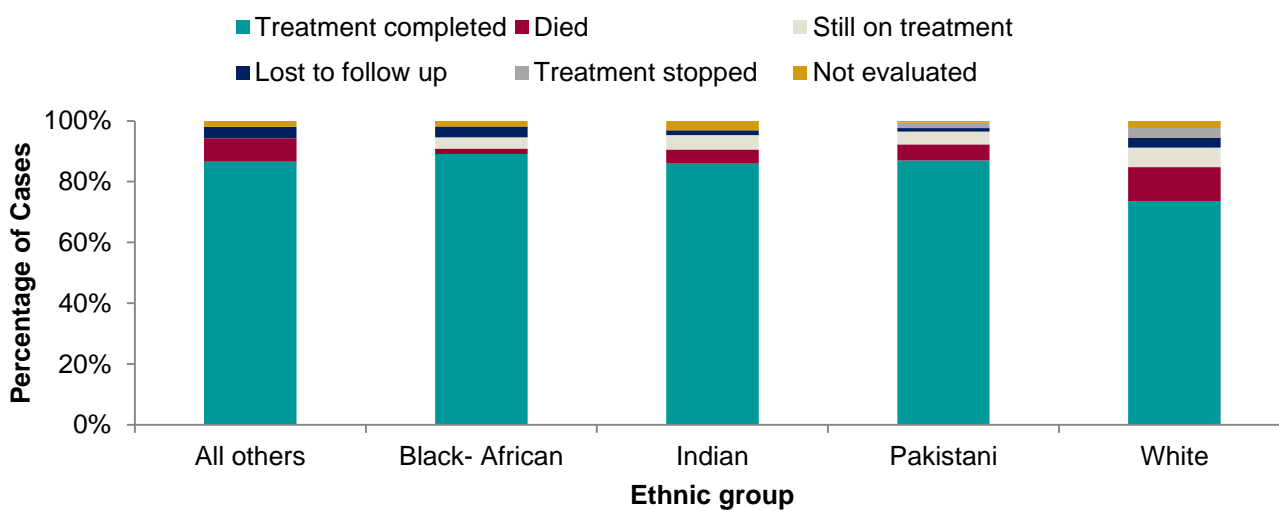


**Figure 7.7: Proportion of tuberculosis cases diagnosed in 2014 by treatment outcome and country of birth, Yorkshire and Humber**



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

**Figure 7.8: Proportion of tuberculosis cases diagnosed in 2014 by treatment outcome and ethnicity, Yorkshire and Humber**



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

## TB treatment outcome – death

Death was the most commonly reported reason for not completing treatment in the region (Figure 7.4). The median age of TB patients who were notified in 2014 and died before or whilst on treatment was 73 years.

TB was reported as a contributor or primary cause of death in 41.2% of TB cases who died. This has declined since 2004 when TB was reported as the cause or contributor to death in 58.3% of TB cases who died within 12 months of diagnosis. However, it should be noted that numbers are small and the proportion of deaths where the role of TB was reported as unknown was very high, 50% in 2014 (Table 7.1).

**Table 7.1: Number of deaths per year and proportion of total cases and relationship of death outcome to tuberculosis, Yorkshire and the Humber, 2004-2013 diagnoses**

Year	Number of Cases	Number of Deaths	Proportion of cases	Median age at death	TB caused death	TB contributed to death	TB incidental to death	Unknown
2004	535	36	7%	78	9	12	8	7
2005	556	38	7%	69	8	10	10	10
2006	661	43	7%	71	5	12	7	19
2007	632	41	6%	71	3	10	8	20
2008	635	41	6%	63	3	11	11	16
2009	688	44	6%	72	8	8	14	14
2010	628	46	7%	72	7	7	13	19
2011	664	48	7%	72	4	8	11	25
2012	593	32	5%	77	3	8	7	14
2013	583	30	5%	70	0	5	7	18
2014	518	34	7%	73	3	5	9	17

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

**Table 7.2: TB treatment last recorded outcome (August 2016) for the drug sensitive cohort with CNS spinal miliary or cryptic TB notified in 2014 TB, Yorkshire and Humber, 2014**

Last recorded outcome (August 2016)	n	%
Treatment completed	24	67%
Still on treatment	2	6%
Lost to follow up	4	11%
Not evaluated	3	8%
Died	2	6%
Treatment stopped	1	3%
<b>Total</b>	<b>36</b>	<b>100%</b>

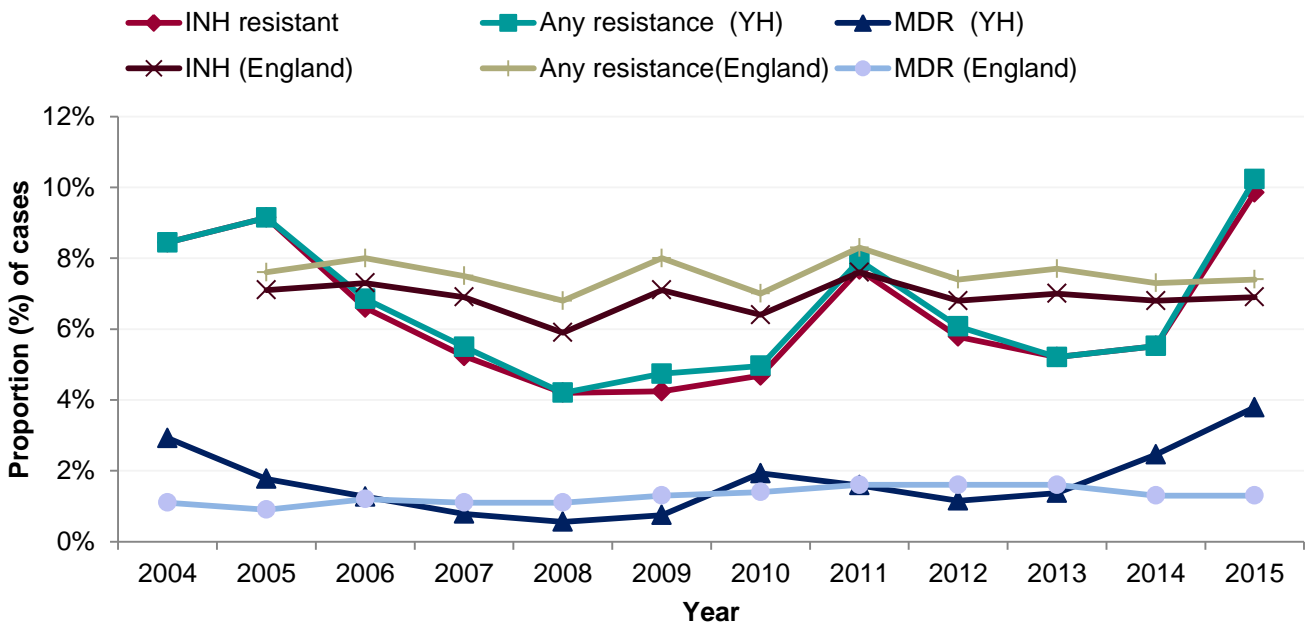
## 8. Drug resistant TB

### Overall initial drug resistance and geographical distribution

The proportion of TB cases with initial resistance to Isoniazid without MDR-TB has remained fairly stable nationally at around 6% and in previous years this was true for Yorkshire and Humber cases, however among cases reported in 2015 Isoniazid resistance increased to 10%. The number of cases with MDR-TB has also increased in 2015 to 4% and is higher than the national average (1.3%) and is higher than at any point in the last decade.

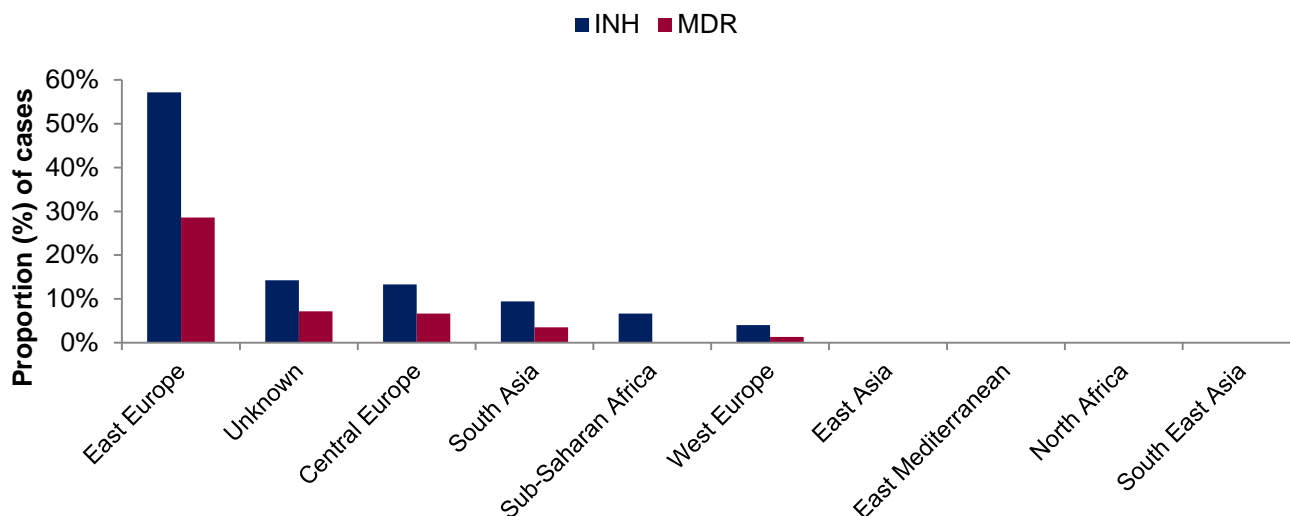
The most frequent countries of birth of cases resistant to Isoniazid alone and MDR-TB were Eastern European countries in contrast to the national picture where the Indian subcontinent accounted for the country of birth of the majority of cases. Where social risk factor information was known for those 15 and over, a high proportion (13%, 3/29) of cases resistant to isoniazid without MDR-TB had at least one known social risk factor (current or history of drug misuse (25%, 2/8), alcohol misuse (33.3%, 3/9), or imprisonment (11.1%, 1/9). Among the 10 patients with MDR-TB in Yorkshire and Humber one was known to have a social risk factor.

**Figure 8.1: Proportion of culture confirmed tuberculosis cases with first-line drug resistance, Yorkshire and Humber 2004-2014\***

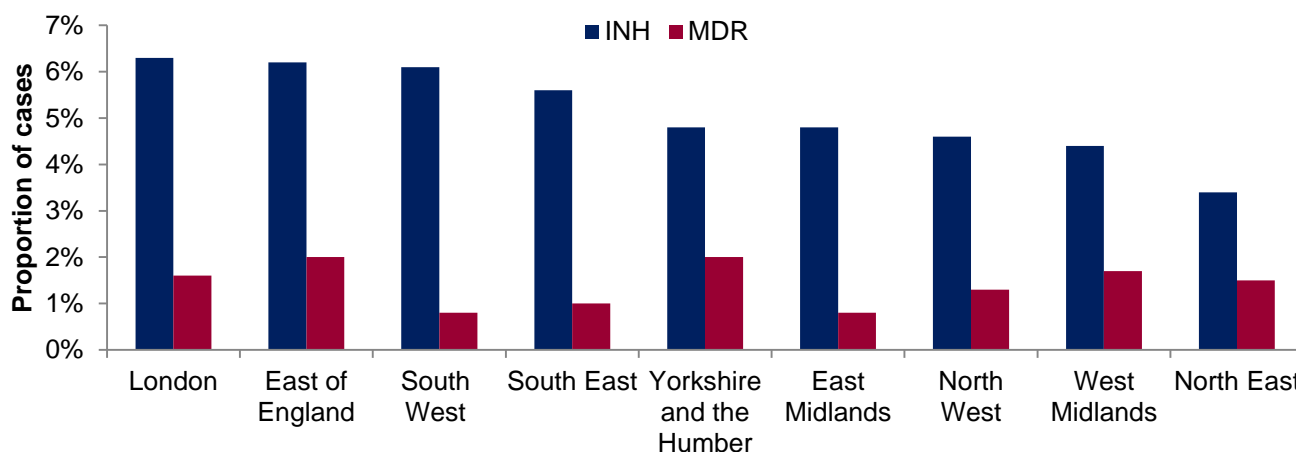


\*England data retrieved from national report. Information on INH AND MDR not available for 2004 in the national report

**Figure 8.2: Proportion of tuberculosis cases with drug resistance by world region of birth, Yorkshire and Humber, 2015**



**Figure 8.3: Proportion of tuberculosis cases with drug resistance by PHE centre, Yorkshire and Humber, 2011-2015**



### TB outcome at 24 months for patients with multi drug resistant disease

Due to the length of time of treatment for cases with MDR-TB, the most current treatment outcome data is reported for cases notified in 2013. There were five cases with MDR-TB in 2013 60% of which had completed treatment at 24 months.

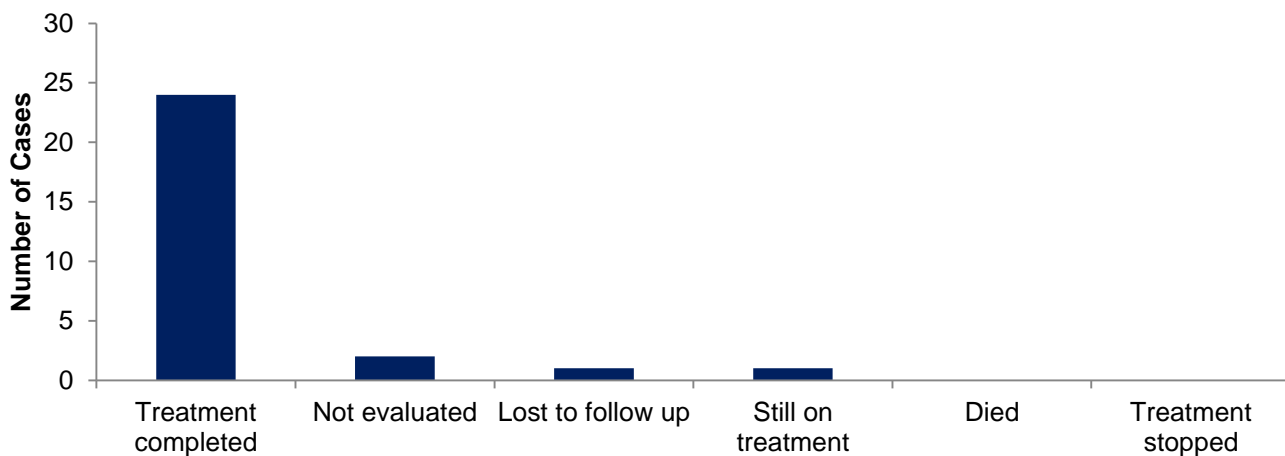
### TB outcome at 24 months for patients with isoniazid resistant disease

Due to the length of time of treatment for cases with isoniazid resistant TB, the most current treatment outcome data is also reported for cases notified in 2013. In 2013, there were nineteen cases of isoniazid resistant TB, 15% of which were known to have completed treatment at 24 months.

### TB outcome at 24 months for all patients still on treatment at 12 months

Of the 28 cases notified in 2013 that reported still being on treatment at 12 months, 38 (86%) had completed treatment 24 months after diagnosis. Two (7.1%) were not evaluated, one case (3.6%) was still receiving treatment, and one case (3.6%) was lost to follow up.

**Figure 8.4: TB outcome at 24 months for all patients still on treatment at 12 months, TB cases diagnosed in 2013**



## 9. TB in under-served populations

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### Under-served populations

The Collaborative Tuberculosis Strategy for England (2) 2015 to 2020 defines Underserved Populations (USPs) as individuals whose social circumstances, language, culture or lifestyle (or those of their parents or carers) make it difficult to recognise the clinical onset of TB, access diagnostic and treatment services; self-administer treatment (or, in the case of children and young people, have treatment administered by a parent or carer); or attend regular appointments for clinical follow up.

### Social risk factors

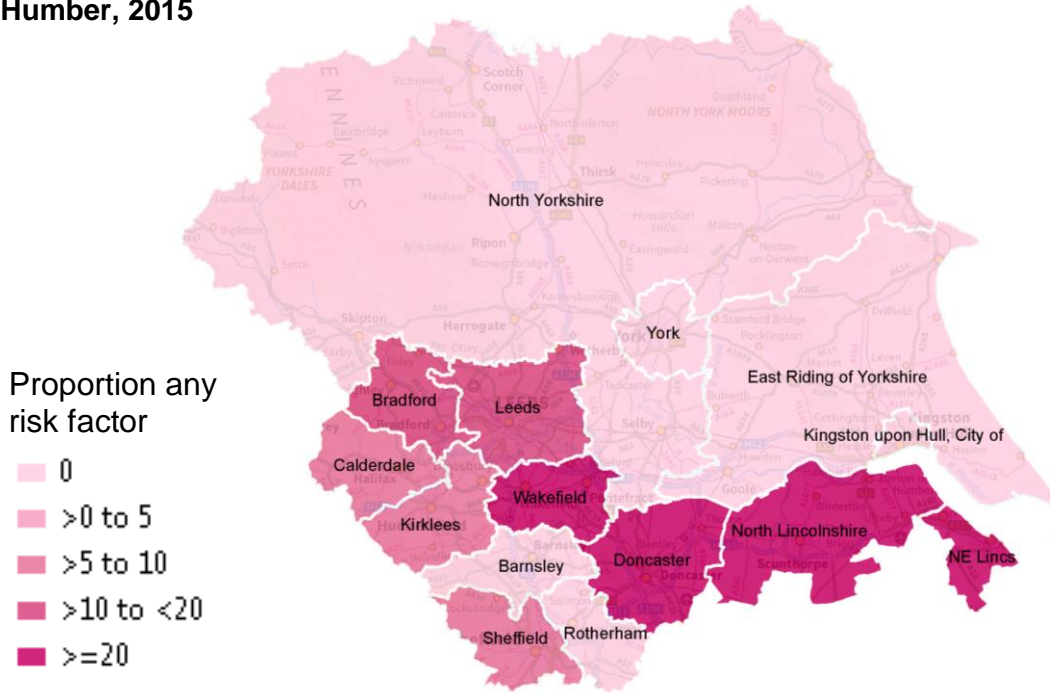
Information on factors associated with increased risk of TB is collected for all TB cases. The risk factors collected include:

- Previous diagnosis of TB
- Substance misuse – alcohol or drug misuse
- Current or recent history (5years) of homelessness
- Current or recent history (5 years) of imprisonment

Reporting of risk factors associated with TB has improved since their addition to ETS in 2008. A response was recorded for 83% of TB cases reported in the region in 2015. 33/391 (8.4%) of the reported TB cases over 15 years of age had a previous diagnosis of TB; 11/409 (2.7%) reported alcohol misuse; 11/387 (2.8%) reported drug misuse; 15/379 (4.0%) reported homelessness; and 18/361 (5.0%) reported imprisonment.

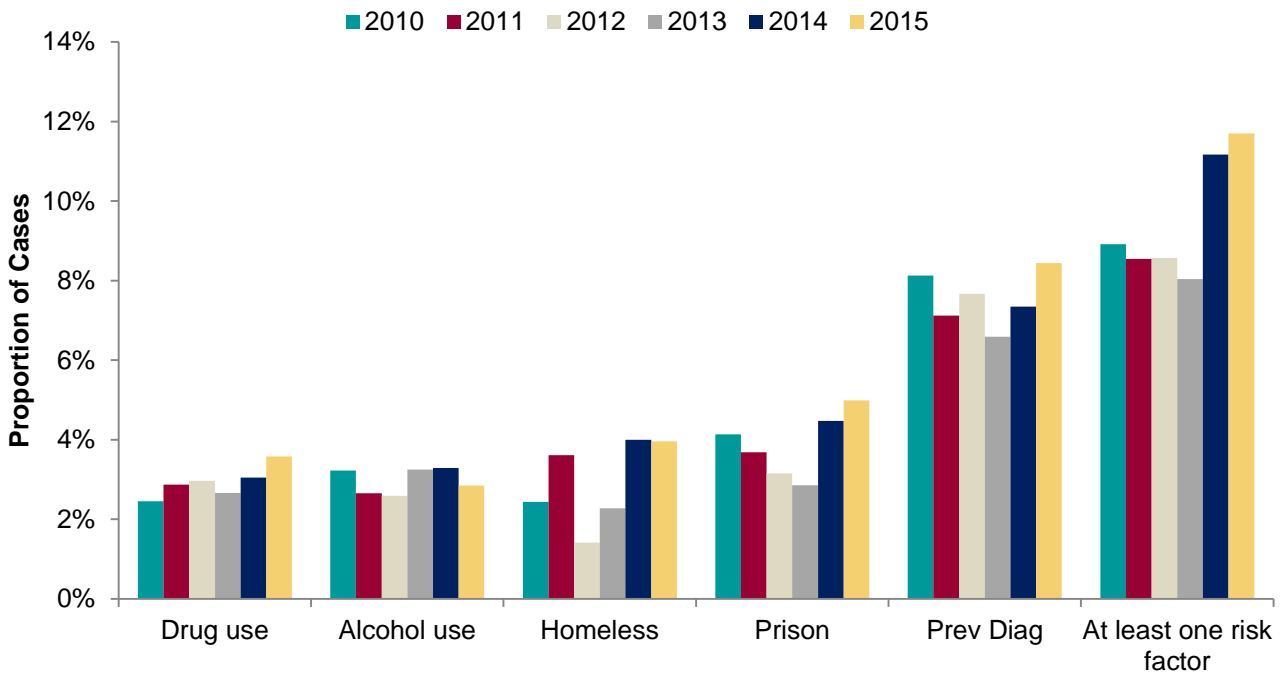
In total, 40/342 (11.7%) of TB cases notified in Yorkshire and Humber in 2015 were reported as having at least one social risk factor for TB, consistent with the national epidemiology (12%). Cases reporting social risk factors are distributed across the region (Figure 9.1) which indicates that even in areas with low incidence, TB cases may still present a management challenge as they are still likely to have factors that increase the complexity of case management.

**Figure 9.1: Proportion of tuberculosis cases reporting any risk factor aged >14, Yorkshire and Humber, 2015**



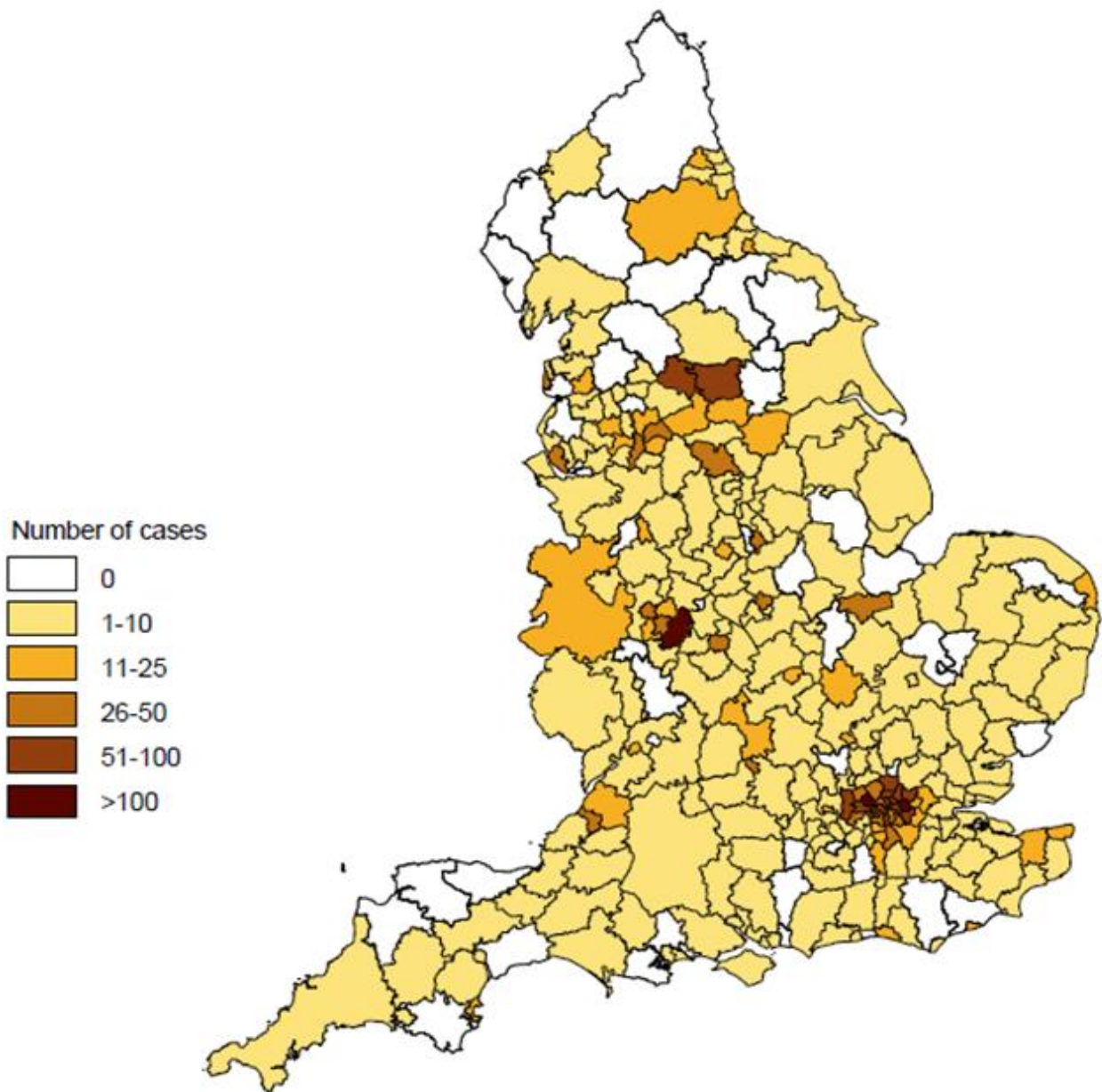
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**Figure 9.2: Proportion of TB cases with at least one social risk factor\*, Yorkshire and Humber. 2010-2015**



\* Includes those aged 15 years and older

**Figure 9.3: Number of TB cases with at least one SRF\*, drug misuse, homelessness, imprisonment and alcohol misuse by local authority, England, 2010-2015**

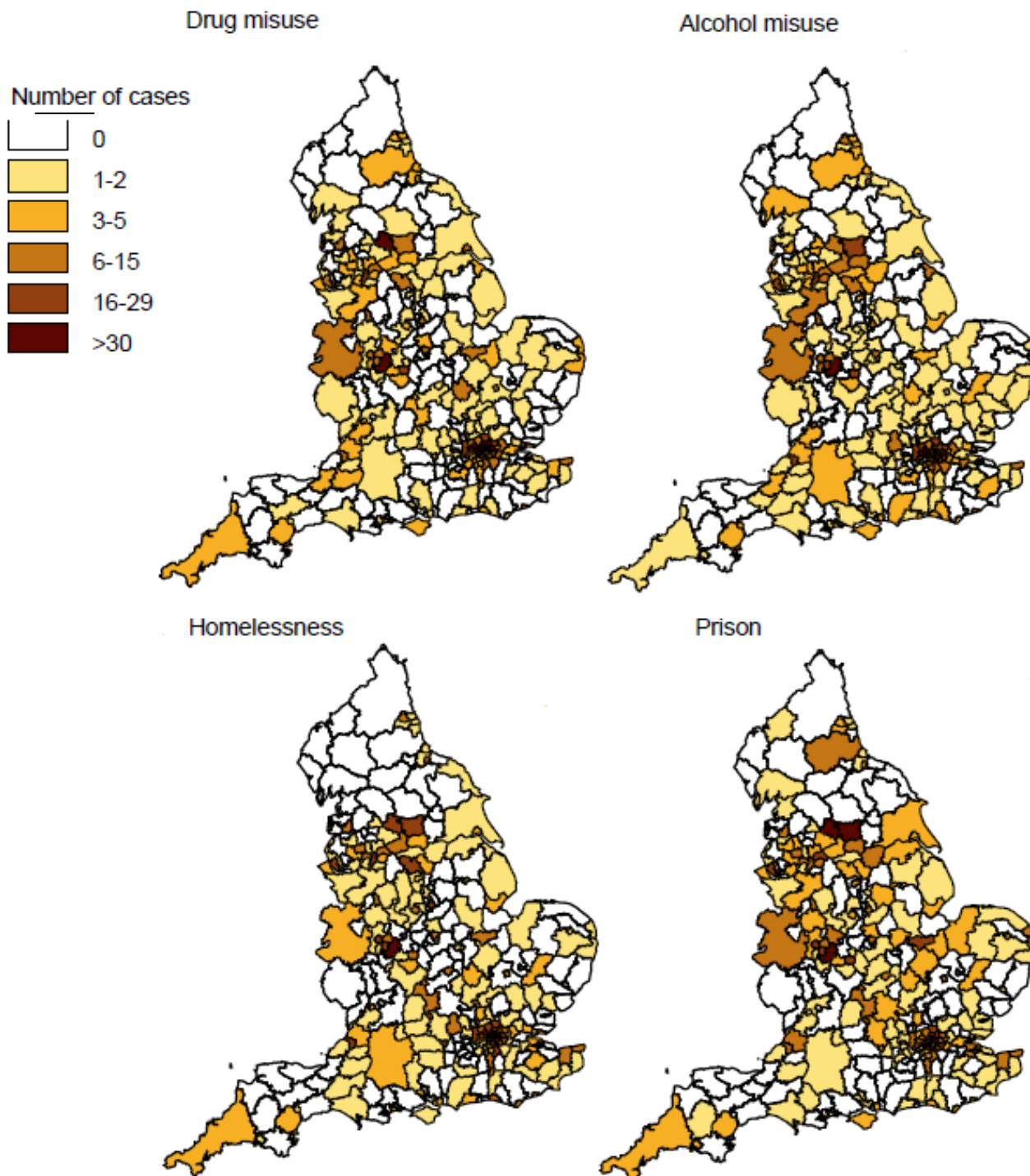


\* Includes those aged 15 years and older

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**Figure 9.4: Number of TB cases with at least one SRF\*, drug misuse, homelessness, imprisonment and alcohol misuse by local authority, England, 2010-2015**



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### Social risk factors: Use of Directly Observed Therapy (DOT)

After drug-sensitivity, the most important factor affecting TB treatment outcome is treatment adherence. Non-adherence to TB treatment results in onward transmission, increased morbidity and mortality and the emergence of drug resistant strains. Directly Observed Therapy (DOT) is a well-recognised option for improving treatment adherence and is recommended by the World Health Organisation and NICE.

DOT should be considered for TB patients with active disease who have a past history of poor adherence to treatment, a past history of active TB, a history of homelessness or substance misuse, major psychiatric, memory or cognitive disorders, or have multi-drug-resistant TB.

DOT is resource intensive and figures below suggest that DOT is not being applied in many situations where national guidance recommends it should be used. Only 43% of TB patients across the region in 2015 with risk factors indicating the need for DOT received this treatment (Table 9.1). Whilst these risk factors for poor adherence may be more nuanced and require local clinical assessment the use of DOT remains low across the region and has declined from 2012. This disparity between those with adherence risk factors and the use of DOT is observed in both low and high burden areas although the underlying reasons may differ. Nationally 55% of cases with a social risk factor received DOT but this was highest among those with current alcohol or drug misuse.

**Table 9.1: Tuberculosis cases reporting at least one social risk factor and DOT Status, by local authority, Yorkshire and Humber, 2015**

Local authority	Total Cases with at least one risk factor	DOT status reported (for cases with a risk factor)	Cases with a risk factor on DOT
Barnsley	0	0	0
Bradford	10	7	4
Calderdale	1	1	1
Doncaster	6	1	0
East Riding of Yorkshire	0	0	0
Kingston upon Hull, City of	0	0	0
Kirklees	4	3	2
Leeds	8	7	0
North East Lincolnshire	2	2	2
North Lincolnshire	2	2	0
North Yorkshire	0	0	0
Rotherham	0	0	0
Sheffield	4	3	2
Wakefield	3	2	1
York	0	0	0

## Deprivation

The association between TB and deprivation is well established. Using the Index of Multiple Deprivation (IMD)<sup>5</sup>, Figure 9.5 and Table 9.2 shows the association between TB incidence rates in 2015 and IMD scores in 2015.

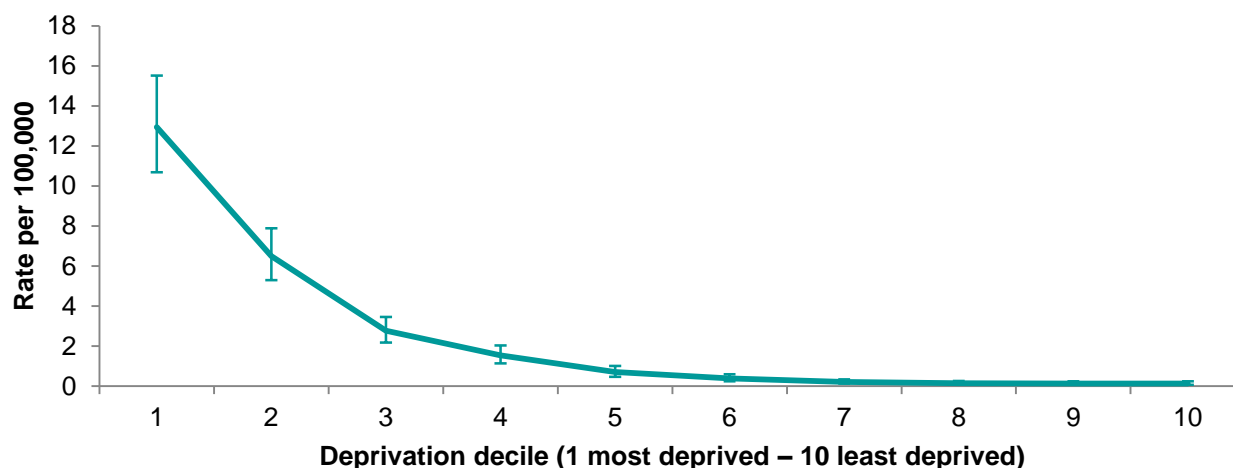
The IMD provides a summary measure of relative deprivation at Lower-layer Super Output Area (LSOA) level in England and aims to provide a nationally consistent measure of how deprived an area is, by identifying the degree to which people are disadvantaged based on factors such as low income,

<sup>5</sup> The IMD provides a summary measure of relative deprivation at Lower-layer Super Output Area (LSOA) level in England and aims to provide a nationally consistent measure of how deprived an area is, by identifying the degree to which people are disadvantaged based on factors such as low income, unemployment, lack of education, poor health, and crime. Each of the 32,844 LSOAs in England is assigned a score and rank.

unemployment, lack of education, poor health, and crime. Each of the 32,844 LSOAs in England is assigned a score and rank. 602/3317 (18.1%) of the LSOAs in our region were categorised amongst the most deprived 10% of LSOAs in England in 2015<sup>6</sup>.

Of the region's population, 18.2% live in these most deprived areas. Much of the region's significant deprivation is concentrated within towns and cities but also around the former coalfields of the region.

**Figure 9.5: TB case rate by deprivation, 2015**



**Table 9.2: Tuberculosis rates by local authority and corresponding local authority deprivation ranking, Yorkshire and Humber, 2014**

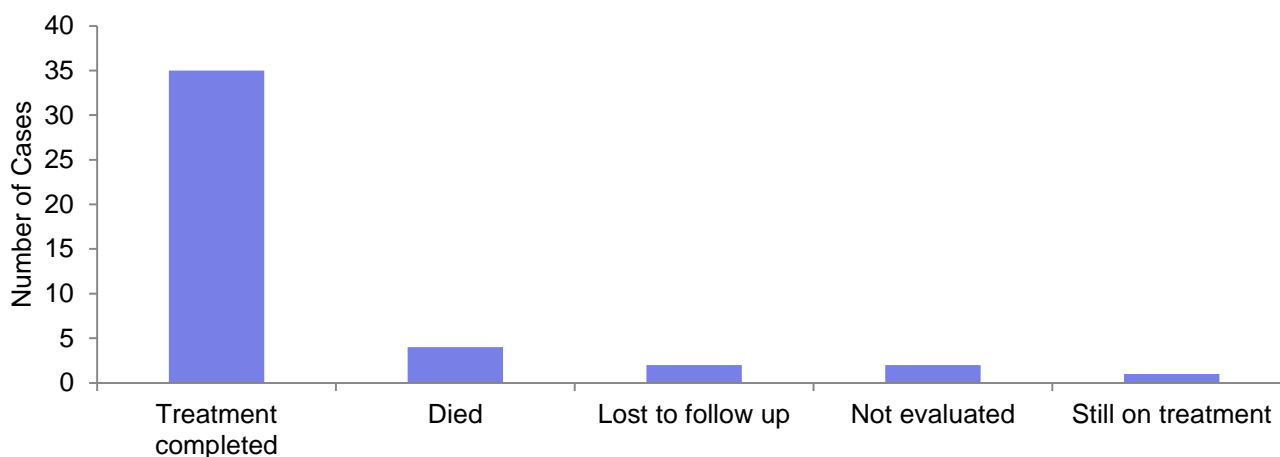
Upper tier local authority	Rate per 100,000- 2015	Deprivation Rank in Y&H
Bradford	19.5	2
Kirklees	15.1	11
Sheffield	12.6	7
Leeds	12.0	9
North Lincolnshire	6.5	12
Kingston upon Hull, City of	6.2	1
Doncaster	5.9	5
Calderdale	4.8	10
North East Lincolnshire	4.4	3
Barnsley	3.8	4
Rotherham	3.5	6
Wakefield	2.7	8
North Yorkshire	2.5	14
York	1.0	15
East Riding of Yorkshire	0.9	13

<sup>6</sup> Indices of Deprivation 2015. <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015>  
Accessed 08/01/2015

## Social risk factors: Outcome

Of the 44 TB cases with one or more risk factors reported in 2014 who were expected to complete treatment within 12 months, outcome was known for 95.5% (42/44). Treatment completion within 12 months of diagnosis was lower among cases with a social risk factor, 83.3% (35/42) compared to the overall treatment completion rate of 84%. The most common reasons for not completing treatment in this group were death, 10% (4/42) and patient being lost to follow up 4.7% (2/42) (Figure 9.6).

**Figure 9.6: Treatment outcome at 12 months for tuberculosis cases diagnosed in 2014 with at least one social risk factor, Yorkshire and Humber**

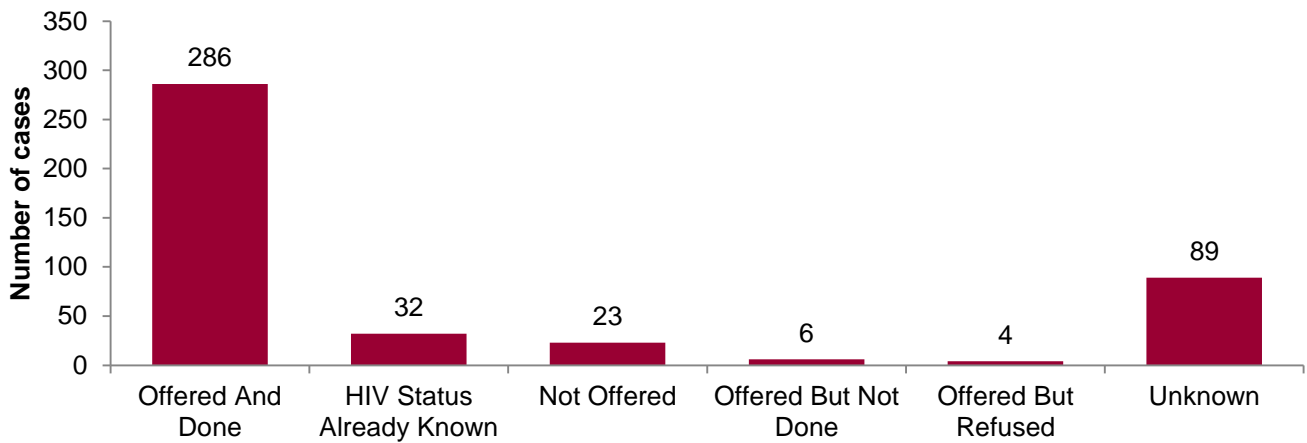


## 10. TB-HIV co-infection and HIV testing among TB cases

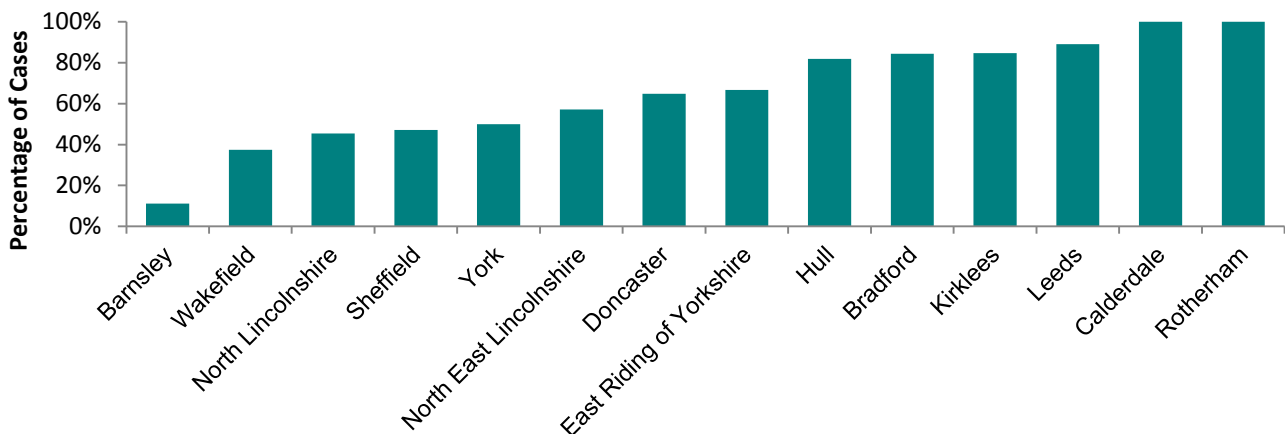
### HIV testing

The majority of TB patients in 2015 (67%) were being offered and having an HIV test. There appears to be some geographical variation in the offer of HIV testing among TB patients but this may partly reflect the variation in the documentation of the offer. Twenty-three patients were reported as not having been offered a HIV test although some of these will have been children under 6 years of age. Refusal of the offer is uncommon, although some patients accept the offer but the test does not get done which may be caused by a combination of factors. The proportion of cases where an HIV test has been offered and done has increased year on year.

**Figure 10.1: HIV testing status of notified TB cases, Yorkshire and Humber, 2015**

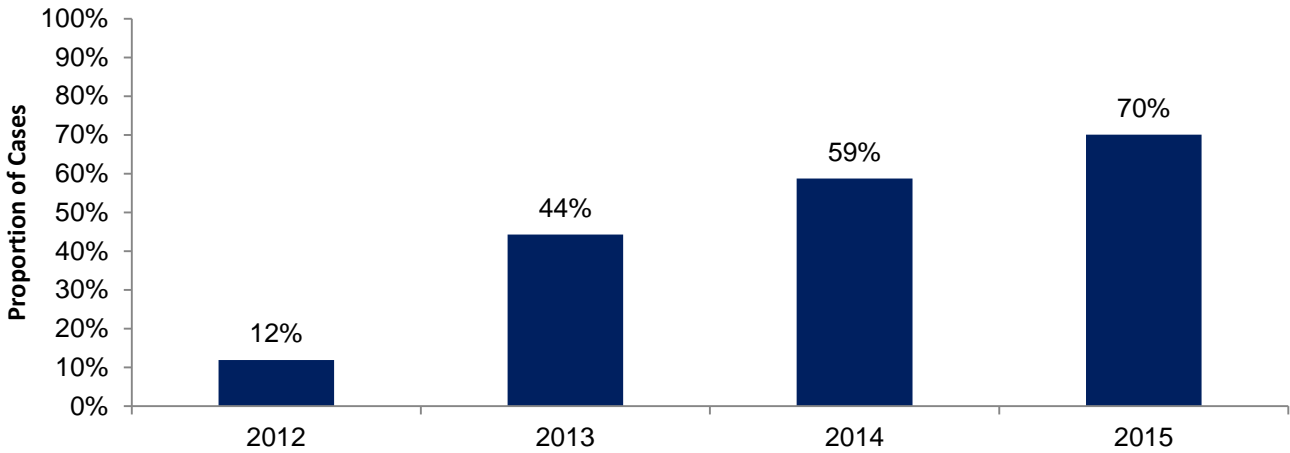


**Figure 10.2: Proportion of notified TB cases offered an HIV test by Local Authority, Yorkshire and Humber, 2015\***



\*Excludes cases where HIV status is known. Where HIV test offer is not recorded, these have been counted as not offered.

**Figure 10.3: Proportion of notified TB cases where a HIV test was offered and done HIV test by year, Yorkshire and Humber, 2015\***

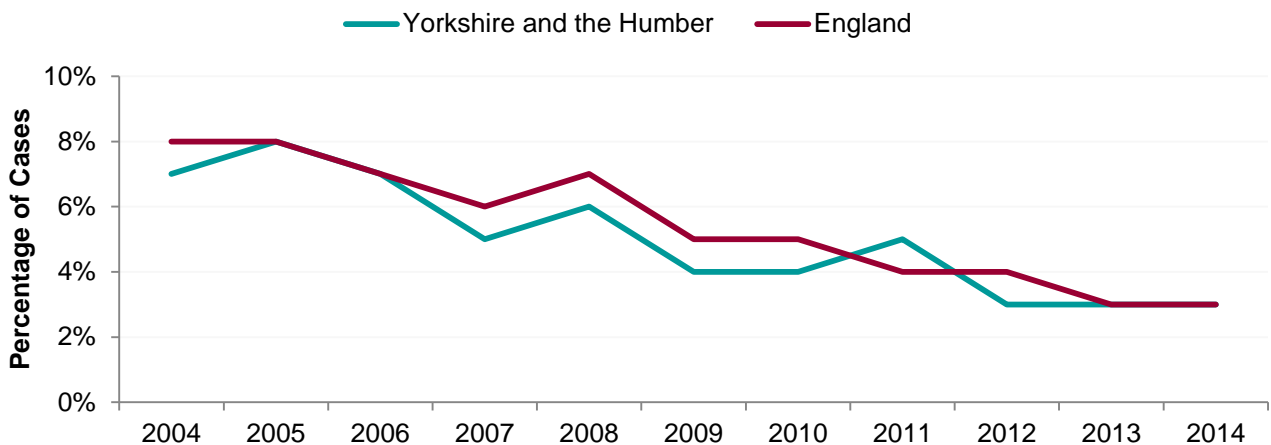


\*Excludes cases where HIV status is known. Where HIV test offer is not recorded, these have been counted as not offered.

### HIV co-infection rates

The most recent year for which TB-HIV co-infection data is currently available for the region and nationally is 2014. Information on TB and HIV co-infection is obtained by matching TB case reports for ages 15 and above, to HIV case reports from the national surveillance system SOPHID (Survey of Prevalent HIV Infections Diagnosed), combined with reports of new AIDS diagnoses where TB was reported as the AIDS defining illness.

**Figure 10.4: Proportion of tuberculosis cases aged 15 and over co-infected with HIV, Yorkshire and Humber, 2004-2014**



## 11.BCG Vaccination

The BCG vaccination programme in Yorkshire and Humber is a risk based programme. The vaccine is recommended for individuals deemed to be at higher risk of exposure to TB, particularly to protect against serious forms of disease in infants. In areas with an incidence greater than 40 per 100,000 universal vaccination of infants is recommended. Across Yorkshire and Humber BCG is offered to neonates as a risk based selective programme.

In 2012 an audit was undertaken on the arrangements for delivery of BCG to selected neonates and the results taken forward by a Centre-wide multi agency group to develop a risk assessment tool and service pathway for all maternity units in Yorkshire and Humber. A re-audit has recently been undertaken to complete the audit cycle and help inform further service quality improvements for Yorkshire and Humber.

It is not possible to calculate vaccine coverage for areas with a selective programme as the denominator is not defined within Child Health Information Systems.

Information on BCG vaccination history is collected for TB cases and this information is available for 54% of cases in Yorkshire and Humber in 2015, compared to 69% nationally. Among those cases where vaccination was recorded 63.5% were vaccinated compared to 71% nationally. Among the eighteen cases in children under 10 years of age, vaccination history was not available for three cases with 93% of the remaining children having received BCG vaccine.

### BCG vaccination status of cases

**Table 11.1 Vaccination status of TB cases in Yorkshire and Humber in 2015 and UK born/non-UK born status**

UK Born	Unknown	Not vaccinated	Yes vaccinated	Total known vaccination status	Proportion vaccinated (where known)
Unknown UK Born	19	1	1	2	50%
Non-UK Born	137	59	96	155	62%
UK Born	45	27	55	82	67%
total	201	87	152	239	64%

**Table 11.2: Number and proportion of TB patients with BCG vaccination, Yorkshire and Humber, 2008-2015**

Year	Total Known Vaccination	No BCG	Yes BCG	Proportions with a BCG vaccination *	Unknown Vaccination Status
2008	102	57	45	44%	533
2009	402	157	245	61%	286
2010	374	154	220	59%	254
2011	435	179	256	59%	229
2012	383	148	235	61%	210
2013	364	163	201	55%	219
2014	302	106	196	65%	216
2015	239	87	152	64%	201

**Table 11.3 Vaccination status of TB cases in Yorkshire and Humber in 2015 by age group**

Age grp	Unknown vaccinated	Not vaccinated	Yes vaccinated	Vaccination status recorded	Proportion vaccinated
Unknown age grp		1	1	2	50%
0-9	3	1	14	15	93%
10-19	8	4	12	16	75%
20-29	40	20	38	58	66%
30-39	44	20	29	49	59%
40-49	27	12	28	40	70%
50-59	34	10	20	30	67%
60-69	23	7	6	13	46%
70+	22	12	4	16	25%



## 12. New Migrant Latent TB infection testing and treatment

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### Key messages

- The national roll-out of the NHSE England funded latent TB infection (LTBI) testing and treatment for eligible new migrants started in April 2015, prioritising 59 high TB burden clinical commissioning groups (CCGs) in England.
- In Yorkshire and Humber six CCGs covering four local authorities were identified as eligible for funding.
- Local programmes were implemented from February 2016. Provisional data suggests that to December 2016 1420 samples have been taken of which 201 have been positive (14%).

### Implementing new migrant LTBI testing and treatment in Yorkshire and Humber and England

The Collaborative TB Strategy for England 2015-2020 recommends latent TB infection (LTBI) testing and treatment for individuals aged 16 to 35 years, who entered the UK from a high incidence country ( $\geq 150/100,000$  or sub-Saharan Africa) within the last five years. NHS England (NHSE) funding was made available to support implementation in 59 CCG areas with high TB incidence (defined as areas with incidence  $> 20/100,000$  population or a 0.5% of TB case burden or more in England). The funding covers the costs of the screening programme, LTBI treatment and any awareness raising activities.

Six CCGs in Yorkshire and Humber were eligible to apply for NHSE funding: Sheffield, Leeds South and East, Greater Huddersfield, North Kirklees, Bradford City and Bradford District.

Eligible CCGs were asked to submit plans to the Yorkshire and Humber and North East TB Control Board (YHNE TBCB) describing how they would use this additional funding. Greater Huddersfield and North Kirklees and the Bradford CCGs opted to submit joint proposals; All areas in Yorkshire and Humber had started testing by February 2016 and were some of the earliest in the country to implement the programme.

### LTBI Programme Models

NHSE/PHE guidelines for commissioners proposed that eligible new migrants were identified and tested in primary care (2). Bradford, Kirklees and Leeds already had existing new migrant LTBI testing programmes therefore in these areas eligible patients are identified at GP registration and referred into existing TB services. Sheffield did not have an existing programme therefore testing is done at the GP practice after new patient registration. As programmes have been implemented some models have been adapted to improve outcomes, for example Leeds are now planning to roll out testing in primary care.

### LTBI testing

The NHSE funded programme uses an interferon gamma release assay (IGRA) alone to test for LTBI. Five out of six local programmes test using T-Spot.TB® (Oxford Immunotec) from the nationally procured laboratory provider. The remaining CCG uses a Quantiferon test provided by the local lab. As

per national programme clinical guidelines, persons with a positive IGRA test result are referred to secondary care to rule out active TB disease and to initiate treatment for LTBI.

## LTBI data collection and information governance

The data presented in this section is preliminary, further detail on data collection and information governance of the programme is available in the TB in England report, available at:

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/564656/TB\\_annual\\_report\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/564656/TB_annual_report_2016.pdf)

There are seven proposed LTBI programme indicators, which are:

1. LTBI testing and treatment programme coverage
2. LTBI testing acceptance
3. IGRA test performance and LTBI positivity
4. LTBI treatment uptake
5. LTBI treatment completion
6. Adverse events from LTBI treatment

There is a further proposed indicator which is time between positive test and appointment in secondary care.

There are several limitations to the data available nationally due to difficulties returning data to national team and variations in data entry systems used. For example; recording of key variables, such as eligible population and laboratory test results in GP clinical systems, and treatment uptake and completion in secondary care systems. This means that we are not yet able to report on all the indicators described above.

Due to these data collection issues a local data collection template has been implemented which CCGs will return to the TBCB quarterly. There is also data from the nationally procured test provider for five out of six CCGs; both of these are described below.

## Number of tests and positivity

Data from the national test provider shows that between February and December 2016, 1,046 people were tested in Bradford and Kirklees. Sheffield only started using the national test provider in April and up to December had tested 374 people (Table 12.3). Of all those tested 14% were positive for LTBI and approximately 2% of local test results were recorded as indeterminate<sup>1</sup>.

**Table 12.3: LTBI test results February to December 2016<sup>2</sup>**

CCG*	Total tests n	Positive n (%)	Negative n (%)	Indeterminate n (%)**
Bradford Districts and City	576	90 (16)	440 (76)	14 (3)
Greater Huddersfield	313	54 (17)	244 (78)	4 (1)
North Kirklees	157	19 (12)	135(86)	1(1)
Sheffield <sup>3</sup>	374	43 (11)	294 (79)	6 (2)
Total	1420	201 (14)	1112 (78)	25 (2)

1. An indeterminate result indicates an uncertain likelihood of M. tuberculosis infection, the test is repeated.
2. Data from test provider showing 5 out of 6 CCGs; Leeds South and East CCG data not included
3. Sheffield data from April to December 2016

## Local reporting for year 2 Quarter 3 (October to December 2016)

Due to issues with national data collection each CCG was asked to complete a template to report on local activity. This was trialled in quarter three 2016 and feedback was mostly positive; this system will continue until the national system is reporting regularly to the TBCB.

This data is provisional and should be treated with caution, however it shows that in quarter three test uptake ranged between 40%-85.4% and treatment uptake ranged between 41.2% and 100% (Table 12.4).

**Table 12.4 New Migrant LTBI programme Q3 2016/17, provisional data all CCGS.**

CCG	Eligible	% test uptake	% positive test	% treatment uptake
Bradford: City & Districts	288	43.8	19.8	100
Greater Huddersfield	70	72.1	12.2	100
Leeds South and East	Not reported	40	30	100
North Kirklees	198	68.7	10.9	72.7
Sheffield	Not reported	85.4	14.3	41.2

Feedback to the LTBI Task and Finish Group has identified common themes across all six CCG areas, which are:

1. Improving data collection
2. Improving uptake of testing and/
3. or referrals of eligible patients from primary care
4. Delays in starting treatment due to pressures in secondary care

There is currently an interim evaluation underway which will help to understand these issues further and identify priorities for the upcoming year.

## 13. Standards for Tuberculosis Surveillance

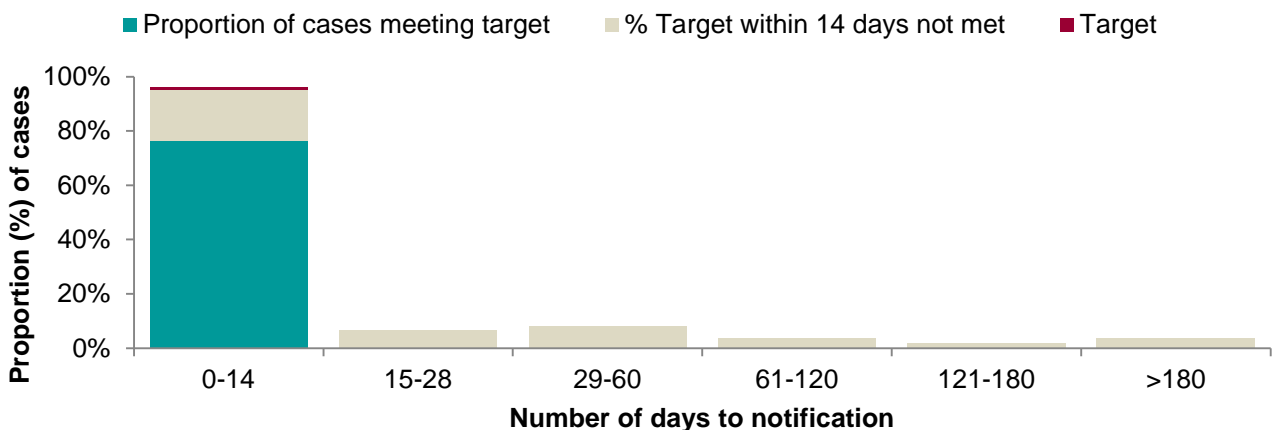
### Time from diagnosis to notification

Standards for TB surveillances are set out in Department of Health guidance for England<sup>7</sup>. The guidance identifies key surveillance variables and reporting times and includes the following surveillance standards:

- At least 95% of cases should be reported within two weeks of diagnosis or decision to treat with a full course of anti-TB drugs.
- At least 95% of reported cases should include complete data for the key variables. The key variables are: name, date of birth, sex, ethnic group, born/not born in the UK, postcode, date of notification, previous TB treatment, site of disease (pulmonary/extra-pulmonary); and for pulmonary cases, sputum smear status.

The time from diagnosis to notification could be calculated for 425/440 (97%) of TB cases notified in 2015. Seventy-six per cent of the cases in 2015 were reported within two weeks of diagnosis, below the target of 95% but showing a continuing improvement on previous years. There were very long delays in reporting some cases with 4% of cases reported more than six months after diagnosis.

**Figure 13.1: Days from tuberculosis diagnosis to notification, Yorkshire and Humber, 2014**



### Completeness of ETS data

Across the region, completeness of reporting of the key variables listed below was not as good as in previous years. Many variables failed to reach the 95% completeness target (Table 13.1).

The reporting of postcode, ethnicity and country of birth achieved the target. The region also achieved a 98.3% return for the treatment outcome forms, with 83.5% of cases reported as completing their treatment. Overall data completion is consistent with last year although the reporting of the presence or absence of a prison history has reduced. Reporting of BCG status and culture confirmation status is poor.

<sup>7</sup> Department of Health. Tuberculosis prevention and treatment: a toolkit for planning, commissioning and delivering high-quality services in England. 2007. London, Department of Health.

**Table 13.1: Completeness of key information in TB Notifications, Yorkshire and Humber 2014 and 2015**

Variable	2015 Essential Data	2015 % Complete	2014 % Complete
Total Cases	440	N/A	518
Postcode	440	100.00%	100.00%
ethnic group	430	97.73%	98.07%
UK or Non-UK Born	419	95.23%	94.98%
*COB where Non-UK Born	290	99.32%	97.10%
*Year of Entry where Non-UK Born	271	92.81%	86.56%
BCG Yes/No	239	54.32%	58.30%
Previously Diagnosis yes/no	416	94.55%	93.44%
Alcohol Yes/No	409	92.95%	92.08%
Drug Yes/No	416	94.55%	92.66%
Homelessness Yes/No	404	91.82%	90.93%
Prison Yes/No	386	87.73%	86.10%
DOT	358	81.40%	80.00%
Travel outside UK	195	44.32%	4.63%
Visitor outside UK	130	29.55%	1.93%
HIV Test	351	79.77%	68.53%
**<28 days Diagnosis to Notification	352	80.00%	78.40%
***Pulmonary Cases Culture Confirmed	182	70.82%	74.49%
***Smear test result	131	50.93%	47.96%
****TOM Submitted	466	98.31%	99.43%
****Treatment Complete	396	83.54%	86.39%

\*292 Non-UK Born Cases

\*\*of 425 where date of onset and case report date known

\*\*\*of 257 Pulmonary Cases 2015 and 294 2014

\*\*\*\* of 474 2014 cases, 529 cases 2013

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## Appendix A: Description of data sources and definitions

### Data sources

Data on TB cases in 2015 comes from the national Enhanced TB surveillance (ETS) system. Data collected includes notification details, and demographic, clinical and microbiological information, including drug resistance and strain type, provided by the Reference Laboratory.

### Definitions

#### Treatment outcome

Information on outcomes were reported for all cases reported in the previous year, excluding those with known rifampicin resistant disease: outcomes for these cases were reported at 24 months. Definitions for outcome are based on World Health Organization (WHO) and European definitions, but adapted to the UK context. In this report, all data was obtained from the ETS matched dataset provided in August 2016.

#### Proportions

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

#### Confidence intervals

A 95% confidence interval for incidence was obtained assuming a Poisson distribution.

#### Population denominator

Tuberculosis rates by geographical area (Centre, local authority, MSOA and LSOA), age, sex and place of birth were calculated using ONS mid-year population estimates, 2014 mid-year population estimates were also used for 2015 data. Tuberculosis rates by ethnicity were calculated using 2011 census data [\[link to online source\]](#)

#### Cluster definitions

Strain typing was performed at the TB reference laboratories using 24 MIRU-VNTR profiling. Analysis was undertaken on strain type clusters defined as two or more people with TB caused by indistinguishable strains, with at least 23 complete VNTR loci. Analysis of clustering in Yorkshire and Humber was carried out on cases that were notified between 2010 and 2015.

## Appendix B: TB among Yorkshire and Humber Local Authority residents

**Table B1: Tuberculosis numbers and rates per 100,000 by local authority of residence, Yorkshire and Humber, 2004-2015**

Local authority	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2004-2015
Barnsley	10	4	11	6	6	3	8	12	3	5	11	9	
	4.5	1.8	4.9	2.7	2.6	1.3	3.5	5.2	1.3	2.1	4.6	3.8	
Bradford	110	158	185	170	171	205	172	173	171	155	95	103	
	22.7	32.2	37.3	33.9	33.7	40.0	33.2	33.1	32.6	29.4	18.0	19.5	
Calderdale	18	24	23	23	22	30	25	20	20	22	19	10	
	9.2	12.2	11.6	11.5	10.9	14.8	12.3	9.8	9.7	10.7	9.2	4.8	
Doncaster	18	15	16	20	9	11	22	22	21	19	30	18	
	6.2	5.1	5.4	6.8	3.0	3.7	7.3	7.3	6.9	6.3	9.9	5.9	
East Riding of Yorkshire	10	5	13	5	10	7	2	15	6	4	10	3	
	3.1	1.5	4.0	1.5	3.0	2.1	0.6	4.5	1.8	1.2	3.0	0.9	
Kingston upon Hull, City of	14	7	17	15	12	9	19	24	25	16	18	16	
	5.5	2.7	6.7	5.9	4.7	3.5	7.4	9.4	9.7	6.2	7.0	6.2	
Kirklees	69	80	76	85	101	104	103	123	87	74	85	65	
	17.36	19.96	18.80	20.83	24.53	25.07	24.62	29.08	20.45	17.28	19.72	15.08	
Leeds	113	104	147	101	151	125	117	113	84	114	93	92	
	15.6	14.1	20.0	13.7	20.4	16.8	15.7	15.1	11.1	15.0	12.1	12.0	
North East Lincolnshire	0	3	4	8	7	3	7	7	1	2	5	7	
	0.0	1.9	2.5	5.0	4.4	1.9	4.4	4.4	0.6	1.3	3.1	4.4	
North Lincolnshire	3	1	7	6	17	35	7	13	19	15	6	11	
	1.9	0.6	4.3	3.7	10.3	21.1	4.2	7.8	11.3	8.9	3.5	6.5	
North Yorkshire	20	13	18	17	10	20	18	13	13	17	13	15	
	3.4	2.2	3.1	2.9	1.7	3.4	3.0	2.2	2.2	2.8	2.2	2.5	
Rotherham	28	26	18	21	14	26	20	19	30	13	21	9	
	11.1	10.3	7.1	8.3	5.5	10.1	7.8	7.4	11.6	5.0	8.1	3.5	
Sheffield	90	85	97	129	74	77	84	89	91	94	84	71	
	17.3	16.2	18.4	24.3	13.9	14.3	15.4	16.1	16.3	16.8	14.9	12.6	
Wakefield	27	23	20	15	18	23	20	15	17	22	25	9	
	8.5	7.2	6.2	4.7	5.6	7.1	6.1	4.6	5.2	6.7	7.5	2.7	
York	5	8	9	11	13	10	4	6	5	11	3	2	
	2.7	4.3	4.8	5.8	6.8	5.2	2.1	3.0	2.5	5.4	1.5	1.0	



**Table B2: Tuberculosis cases by age group, gender, ethnic group and site of disease Yorkshire and Humber, 2004-2015**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Age group</b>												
≥0-14	36	40	35	42	44	41	40	62	52	52	21	26
15-24	75	95	93	93	91	134	93	85	89	76	64	55
25-34	141	145	170	175	193	166	131	161	147	135	123	109
35-44	69	85	100	106	98	109	101	111	92	114	92	76
45-64	105	95	129	109	119	129	154	140	122	119	117	121
65+	109	96	133	107	89	109	109	105	91	87	101	53
<b>Sex</b>												
Female	232	262	301	282	305	314	277	303	266	235	224	181
Male	302	292	356	348	330	364	341	355	327	348	294	259
<b>Ethnic group</b>												
Pakistani	172	214	237	193	233	237	229	253	224	228	185	145
Black-African	88	110	106	105	114	100	89	74	74	65	63	79
Indian	61	55	86	70	83	95	77	86	79	69	71	51
White	146	121	140	137	115	153	149	150	135	137	134	104
All others	59	46	52	60	71	66	57	65	68	59	55	51
<b>Site</b>												
Not pulmonary	226	238	289	259	299	294	248	285	264	250	224	183
Pulmonary	309	318	372	373	336	394	380	379	329	333	294	257

**\*Table B3: Tuberculosis cases by detailed site of disease, Yorkshire and Humber, 2004-2015**

Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Pulmonary	309	318	372	373	336	394	380	379	329	333	294	257
Bone/Spine	13	22	30	24	22	31	19	33	27	23	18	19
Bone/Other	4	14	17	19	15	17	13	18	13	13	7	9
CNS Meningitis	5	12	11	13	12	14	10	10	4	7	6	9
CNS Other	7	9	10	9	7	20	9	13	10	15	7	7
Cryptic	9	5	9	3	3	1	3	4	1	2	2	1
Gastrointestinal	31	33	44	39	35	35	36	44	37	34	30	23
Genitourinary	21	14	8	19	24	16	21	14	16	11	9	11
Intra-Thoracic Lymph Nodes	68	56	68	66	95	109	101	105	111	89	66	85
Lymph Node	99	116	136	118	156	151	135	142	129	136	103	101
Laryngeal	1	1	2	1	4	2			2	2		
Miliary	15	12	27	16	21	24	21	16	19	11	11	15
Pleural	52	43	60	57	56	46	36	57	49	42	51	34
Extra pulmonary other	44	45	53	48	48	49	39	47	43	32	44	35
Extra Pulmonary Unknown	49	65	44	76	87	95	60	72	67	52	45	37
Unknown	0	0	9	15	2	4	3	6	0	9	8	4

**Table B4: Outcomes returned by local authority, Yorkshire and Humber, cases diagnosed in 2004 and 2014**

Local Authority	Total Cases 2004*	Outcomes returned	% Outcomes Returned	Target	Total Cases 2014	Outcomes returned	% Outcomes Returned	Target
Barnsley	10	10	100%	●	9	8	89%	●
Bradford	101	99	98%	●	85	85	100%	●
Calderdale	15	15	100%	●	16	16	100%	●
Doncaster	18	18	100%	●	30	30	100%	●
East Riding of Yorkshire	10	9	90%	●	10	9	90%	●
Kingston upon Hull, City of	14	13	93%	●	16	16	100%	●
Kirklees	64	43	67%	●	77	77	100%	●
Leeds	95	90	95%	●	84	82	98%	●
North East Lincolnshire	0	0	n/a	n/a	4	4	100%	●
North Lincolnshire	3	2	67%	●	5	5	100%	●
North Yorkshire	19	19	100%	●	12	12	100%	●
Rotherham	27	22	81%	●	20	20	100%	●
Sheffield	81	21	26%	●	79	77	97%	●
Wakefield	23	2	9%	●	24	22	92%	●
York	5	4	80%	●	3	3	100%	●
Yorkshire and the Humber	485	367	76%	●	474	466	98%	●

**Table B5: Treatment completion by local authority, Yorkshire and Humber, cases diagnosed in 2004 and 2014**

Local Authority	Total Cases 2004*	Treatment completed	% Complete	Target	Total Cases 2014*	Treatment completed	% Complete	Target
Barnsley	10	8	80%	●	8	6	●	75%
Bradford	99	85	86%	●	85	76	●	89%
Calderdale	15	13	87%	●	16	14	●	88%
Doncaster	18	14	78%	●	30	23	●	77%
East Riding of Yorkshire	9	5	56%	●	9	7	●	78%
Kingston upon Hull, City of	13	10	77%	●	16	14	●	88%
Kirklees	43	36	84%	●	77	66	●	86%
Leeds	90	78	87%	●	82	75	●	91%
North East Lincolnshire	0	0	n/a	n/a	4	4	●	100%
North Lincolnshire	2	2	100%	●	5	4	●	80%
North Yorkshire	19	12	63%	●	12	11	●	92%
Rotherham	22	15	68%	●	20	17	●	85%
Sheffield	21	20	95%	●	77	59	●	77%
Wakefield	2	1	50%	●	22	18	●	82%
York	4	4	100%	●	3	2	●	67%
Yorkshire and the Humber	367	303	83%	●	466	396	●	85%

\*where treatment completion was known

**Table B6: Treatment outcomes by local authority, Yorkshire and Humber, cases diagnosed in 2014**

Local Authority	Total Cases 2014*	Treatment completed	% Complete	Died	Lost to follow up	Not evaluated	Still on treatment	Treatment Stopped
Barnsley	8	6	80%	2	0	1	0	0
Bradford	85	76	89%	2	5	0	2	0
Calderdale	16	14	89%	1	0	0	1	0
Doncaster	30	23	94%	1	1	0	5	0
East Riding of Yorkshire	9	7	100%	1	0	1	0	1
Kingston upon Hull, City of	16	14	100%	1	0	0	0	1
Kirklees	77	66	92%	8	0	0	2	1
Leeds	82	75	84%	5	0	2	2	0
North East Lincolnshire	4	4	100%	0	0	0	0	0
North Lincolnshire	5	4	93%	1	0	0	0	0
North Yorkshire	12	11	88%	1	0	0	0	0
Rotherham	20	17	83%	1	0	0	1	1
Sheffield	77	59	78%	3	5	2	7	3
Wakefield	22	18	84%	3	1	2	0	0
York	3	2	91%	1	0	0	0	0

\*where treatment outcome was known

## Appendix C: TB Cohort

Yorkshire and Humber has been taking part in Cohort Review since March 2013. There are four areas covered by separate cohorts – LBA (Leeds, Bradford and Airedale), CKW (Calderdale, Kirklees and Wakefield), SY (Barnsley, Doncaster, Rotherham and Sheffield), and finally NYH (North Yorkshire and Humber). Not all areas started the process straight away, but since November 2016 all areas are represented. There have been 29 cohort meetings held, and 1203 cases covered. The cohort review process collects extra information regarding the cohort of cases, in order to measure against the following standards:

<b>Case Management</b>
1) 100% of TB patients will be assessed for need for enhanced case management (ECM)
2) 100% of TB patients will be offered HIV testing (adults and children >6)
3) At least 95% of fully sensitive pulmonary TB cases will successfully complete a recommended treatment regime within 365 days (12 months).
4) 100% of MDR-TB cases are discussed with BTS MDR-TB group.
5) Treatment outcomes:
a) 100% of fully sensitive TB patients receiving enhanced case management from treatment outset will complete treatment within a recommended treatment regime within 365 days (12 months).
b) 85% of patients who have had smear positive pulmonary TB will complete treatment within a recommended treatment regime within 365 days (12 months).
c) 70% of patients with any first line drug resistance will complete treatment within a recommended treatment regime within 365 days (12 months).
d) Less than 5% of TB cases will be LFU at time of cohort review.
<b>Contact Investigation</b>
1) Among pulmonary sputum smear positive cases:
a) 95% will have one or more contacts identified.
b) 80% will have five or more contacts identified.
c) 90% of all contacts will receive a clinical evaluation.

2) 85% of all contacts with Latent TB Infection (LTBI), who are started on preventative treatment, will successfully complete the course.

## Appendix D: Yorkshire and Humber level data for TB strategy monitoring indicators, 2000-2015

Year	Indicator 1				Indicator 2						Indicator 5			
	Overall TB incidence per 100,000 population				TB incidence in UK born and non-UK born populations						Incidence of TB in UK born children aged under fifteen years			
	YH Cases	YH Rate	95% CI		Non-UK Born	Non-UK Born rate	UK Born	UK Born rate	95% CI		UK Born	Rate	95% CI	
LCI			UCI	LCI					UCI	LCI			UCI	
2004	535	10.6	9.69	11.5	330	110.4	194	4.1	3.57	4.75	26	2.72	1.78	3.99
2005	556	10.9	10	11.83	341	107.9	180	3.8	3.27	4.41	39	4.08	2.9	5.58
2006	661	12.9	11.91	13.89	415	112.8	172	3.7	3.13	4.25	22	2.30	1.44	3.49
2007	632	12.2	11.3	13.23	356	97.3	179	3.8	3.25	4.38	27	2.83	1.86	4.11
2008	635	12.2	11.28	13.2	415	105.1	174	3.7	3.15	4.26	34	3.56	2.46	4.97
2009	688	13.2	12.21	14.19	406	100.7	212	4.5	3.88	5.1	29	3.04	2.03	4.36
2010	628	12.0	11.03	12.92	366	89.5	190	4.0	3.43	4.58	27	2.83	1.86	4.11
2011	664	12.6	11.62	13.55	389	90	220	4.6	4.01	5.24	39	4.08	2.9	5.58
2012	593	11.2	10.27	12.09	353	77.1	190	4.0	3.42	4.57	29	3.04	2.03	4.36
2013	583	10.9	10.05	11.85	360	77.8	182	3.8	3.25	4.37	27	2.83	1.86	4.11
2014	518	9.7	8.85	10.53	320	67.1	172	3.6	3.06	4.14	15	1.57	0.88	2.59
2015	440	8.2	7.46	9.01	292	61.3	127	2.6	2.19	3.12	21	2.20	1.36	3.36

Year	Indicator 6				Indicator 7				Indicator 8				Indicator 9			
	Number and proportion of pulmonary TB cases starting treatment within two months of symptom onset				Number and proportion of pulmonary TB cases starting treatment within four months of symptom onset				Number and proportion of pulmonary TB cases that were culture confirmed				Number and proportion of microbiologically confirmed cases with drug susceptibility testing reported for the four first line agents			
	Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI	
LCI			UCI	LCI			UCI	LCI			UCI	LCI			UCI	
2004	79	34.50	28.34	40.65	161	70.31	64.39	76.22	221	71.5	66.3	76.3	307	99.68	98.18	99.94
2005	103	40.39	34.37	46.41	179	70.20	64.58	75.81	218	68.6	63.3	73.4	338	99.71	98.35	99.95
2006	138	48.76	42.94	54.59	215	75.97	70.99	80.95	250	67.2	62.3	71.8	391	99.24	97.79	99.74
2007	121	47.08	40.98	53.18	184	71.60	66.08	77.11	245	65.7	60.7	70.3	372	97.38	95.25	98.57
2008	95	39.09	32.96	45.23	182	74.90	69.45	80.35	213	63.4	58.1	68.4	344	96.36	93.87	97.86
2009	120	43.48	37.63	49.33	203	73.55	68.35	78.75	264	67.0	62.2	71.5	391	97.51	95.47	98.64
2010	117	42.09	36.28	47.89	206	74.10	68.95	79.25	255	67.1	62.2	71.6	357	98.35	96.44	99.24
2011	112	39.02	33.38	44.67	201	70.03	64.73	75.33	247	65.2	60.2	69.8	376	99.47	98.09	99.85
2012	116	43.77	37.80	49.75	191	72.08	66.67	77.48	222	67.5	62.2	72.3	334	96.53	94.04	98.01
2013	107	40.68	34.75	46.62	197	74.90	69.67	80.14	229	68.8	63.6	73.5	353	96.71	94.34	98.11
2014	99	39.76	33.68	45.84	174	69.88	64.18	75.58	219	74.5	69.2	79.1	317	97.24	94.84	98.54
2015	100	44.25	37.77	50.72	171	75.66	70.07	81.26	182	70.8	65.0	76.0	257	97.35	94.63	98.71



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Year	Indicator 10				Indicator 11				Indicator 12			
	Number and proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months * Excludes CNS Miliary and cryptic TB				Number and proportion of drug sensitive TB cases who were lost to follow-up at last reported outcome *Includes CNS Miliary and cryptic TB				Number and proportion of drug sensitive TB cases who had died at last reported outcome			
	Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI	
LCI			UCI	LCI			UCI	LCI			UCI	
2004	303.00	62.47	58.08	66.67	17.00	3.23	2.03	5.11	36.00	6.84	4.98	9.33
2005	354.00	71.52	67.39	75.31	31.00	5.66	4.01	7.92	38.00	6.93	5.09	9.37
2006	420.00	72.41	68.64	75.89	39.00	5.95	4.38	8.02	43.00	6.55	4.90	8.71
2007	402.00	70.40	66.53	74.00	45.00	7.17	5.40	9.45	41.00	6.53	4.85	8.74
2008	427.00	74.78	71.06	78.17	44.00	6.96	5.23	9.22	41.00	6.49	4.82	8.68
2009	467.00	77.06	73.55	80.23	48.00	7.02	5.33	9.18	43.00	6.29	4.70	8.36
2010	425.00	75.22	71.50	78.60	40.00	6.44	4.77	8.65	46.00	7.41	5.60	9.74
2011	428.00	72.42	68.68	75.87	52.00	7.91	6.09	10.23	47.00	7.15	5.42	9.38
2012	435.00	81.16	77.63	84.24	28.00	4.78	3.33	6.82	31.00	5.29	3.75	7.41
2013	457.00	86.39	83.20	89.05	28.00	4.84	3.37	6.91	29.00	5.02	3.52	7.11
2014	396.00	83.54	79.94	86.61	16.00	3.14	1.94	5.04	33.00	6.47	4.64	8.95
2015	-	-	-	-	-	-	-	-	-	-	-	-

Year	Indicator 13				Indicator 14				Indicator 15			
	Number and proportion of TB cases with rifampicin resistance or MDR-TB who had completed treatment at 24 months				Number and proportion of TB cases with rifampicin resistance or MDR-TB who were lost to follow-up at last reported outcome				Number and proportion of TB cases with rifampicin resistance or MDR-TB who had died at last reported outcome			
	Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI	
LCI			UCI	LCI			UCI	LCI			UCI	
2004	3.00	33.33	12.06	64.58	1.00	11.11	1.99	43.50	0.00	0.00	0.00	29.91
2005	3.00	50.00	18.76	81.24	1.00	16.67	3.01	56.35	0.00	0.00	0.00	39.03
2006	4.00	80.00	37.55	96.38	0.00	0.00	0.00	43.45	0.00	0.00	0.00	43.45
2007	2.00	50.00	15.00	85.00	0.00	0.00	0.00	48.99	0.00	0.00	0.00	48.99
2008	2.00	100.00	34.24	100.00	0.00	0.00	0.00	65.76	0.00	0.00	0.00	65.76
2009	1.00	25.00	4.56	69.94	1.00	25.00	4.56	69.94	1.00	25.00	4.56	69.94
2010	5.00	71.43	35.89	91.78	0.00	0.00	0.00	35.43	0.00	0.00	0.00	35.43
2011	2.00	28.57	8.22	64.11	3.00	42.86	15.82	74.95	1.00	14.29	2.57	51.31
2012	4.00	66.67	30.00	90.32	0.00	0.00	0.00	43.45	1.00	20.00	3.62	62.45
2013	3.00	60.00	23.07	88.24	1.00	20.00	3.62	62.45	1.00	20.00	3.62	62.45
2014	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-

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Year	Indicator 16				Indicator 17				Indicator 18				Indicator 19			
	Number and proportion of TB cases offered an HIV test*where HIV status not known,				Number and proportion of drug sensitive TB cases with at least one social risk factor who completed treatment within 12 months				Number and proportion of culture confirmed TB cases with any first line drug resistance				Number and proportion of culture confirmed TB cases with multi-drug resistance TB			
	Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI		Number of Cases	Proportion	95% CI	
LCI			UCI	LCI			UCI	LCI			UCI	LCI			UCI	
2004	-	-	-	-	-	-	-	-	26	8.44	5.83	12.08	9	2.92	1.54	5.46
2005	-	-	-	-	-	-	-	-	31	9.14	6.52	12.69	6	1.77	0.8136	3.807
2006	-	-	-	-	-	-	-	-	27	6.87	4.76	9.81	5	1.27	0.5432	2.9359
2007	-	-	-	-	-	-	-	-	21	5.57	3.67	8.37	3	0.79	0.2674	2.2832
2008	-	-	-	-	-	-	-	-	15.0	4.30	2.6	7.0	2.0	0.56	0.1538	2.0193
2009	-	-	-	-	-	-	-	-	19.0	4.76	3.1	7.3	3.0	0.75	0.2548	2.1762
2010	-	-	-	-	24.00	61.54	45.9	75.1	18.0	5.00	3.2	7.8	7.0	1.93	0.9372	3.9264
2011	-	-	-	-	22.00	61.11	44.86	75.22	30.00	7.94	5.62	11.10	6.00	1.59	0.73	3.42
2012	75	12.78	10.32	15.72	26.00	74.29	57.93	85.84	21.00	6.19	4.09	9.28	4.00	1.16	0.45	2.93
2013	265	47.50	43.40	51.64	23.00	65.71	49.15	79.17	19.00	5.29	3.41	8.12	5.00	1.37	0.59	3.17
2014	302	61.38	57.01	65.58	33.00	78.57	64.06	88.29	18.00	5.61	3.58	8.69	8.00	2.45	1.25	4.77
2015	296	72.55	68.02	76.65	-	-	-	-	27.00	10.23	7.12	14.47	10.00	3.79	2.07	6.83

\*\*Where it is not recorded whether a case was offered a HIV test or not these have been included in the denominator as not offered.

