Public Health England

Protecting and improving the nation's health

Tuberculosis in North East England Annual review

Data from 2000 to 2016

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

Public Health England, Wellington House, 133-155 Waterloo Road, London SE1 8UG
Tel: 020 7654 8000 | www.gov.uk/phe | Twitter: @PHE_uk
Facebook: www.facebook.com/PublicHealthEngland

Prepared by: Field Epidemiology Services (North East)
For queries relating to this document, please contact: Angela.Cox@phe.gov.uk

About the Field Epidemiology Service

The Field Epidemiology Service (FES) supports Public Health England (PHE) Centres and partner organisations through the application of epidemiological methods to inform public health action. FES does this in 2 main ways, firstly by providing a flexible expert resource, available, as and when needed, to undertake epidemiological investigations for key health protection work and secondly through the expert analysis, interpretation and dissemination of surveillance information to PHE Centres, local health partners, service providers and commissioners of services. Within the FES network, excellence and innovation is encouraged, we foster academic collaborations and take active part and lead in research, development and training.

Published January 2018
PHE publications
gateway number: 2017699

PHE supports the UN
Sustainable Development Goals

Contents

Acknowledgements

We are grateful to all those who contribute information on tuberculosis cases in the North East, including nurses, physicians, microbiologists, scientists, outreach and social care and administrative staff. We also acknowledge colleagues at the National Mycobacterium Reference Service (North) for information on culture confirmation and drug susceptibility testing. Further thanks are due to the national Centre for Infectious Disease Surveillance and Control for matching the clinical and laboratory information, the North East Centre Health Protection team and the Field Epidemiology North East team for their work supporting Enhanced Tuberculosis Surveillance.

Authors

This report was prepared by Angela Cox of the Field Epidemiology Service North East, National Infection Service, PHE.

Suggested citation

Public Health England. (January 2018) Tuberculosis in North East: Annual review (2016 data), 2018. Public Health England: (North East)

Foreword

The North East remains one of the lowest incidence regions in England, with 4.7 cases per 100,000 population (compared with an incidence in England of 10.2 cases per 100,000 population). However, this figure masks considerable in-region variation: for example, Newcastle has 15.7 cases per 100,000 population, and Middlesbrough 9.3 per 100,000. The North East incidence of TB in UK-born children, which is used as a proxy for recent UK transmission of TB, is 0.9 per 100,000 – half the comparable figure for England (1.8 per 100,000). However, TB incidence in the North East has remained relatively static (subject to expected year-to-year variation) for many years.

This report highlights a number of very positive aspects to the treatment of TB in the North East. The cohort of TB patients in the North East has its specific challenges, 16% have identified social risk factors (vs 11% in England as a whole); and 4.9% have HIV co-infection (vs 3.8% in England as a whole). Despite this, compared to the figures for England , the median time from onset of symptoms to starting treatment is shorter, and a smaller proportion of TB patients in the North East are lost to follow-up. Most North East pulmonary TB cases complete their treatment within 12 months. This is testament to the hard work undertaken and effective therapeutic relationships built by TB teams across the North East. Successful treatment on the first attempt contributes to the low incidence of antibiotic resistant TB in the North East (3% of cases).

However, there is much more to do, especially given the national and international ambition to eradicate TB. In the North East, TB incidence in the most deprived quintile of the population is almost 4 times the incidence in the least deprived quintile. Similarly, those born outside the UK are more likely to be diagnosed with TB, and also more likely to be lost to follow up during treatment. Under-diagnosis in under-served groups may further exacerbate the disparity.

Over half of North East cases were born outside of the UK, and the vast majority (88%) of these had been living here for more than 2 years at the point of diagnosis. In the coming year, we need to do more to ensure that this group – which we know from other data sets are typically underserved by healthcare services – are aware of the symptoms of TB and the need to access services if these develop.

In September 2016 we re-established the North East TB Network to provide a forum to discuss how we can reduce the incidence of TB in the North East and to improve treatment outcomes for those diagnosed with the disease. We have developed an action plan to tackle local challenges. This can be found in Appendix B.

Paul Davison, Deputy Director of Health Protection
PHE North East Centre

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 the North East TB Control Board.

Aim of report

This report describes the recent epidemiology of TB in the North East of England, 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 2016. 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/publications/tuberculosis-in-england-annual-report
Additional high-level data on TB notifications in the UK to the end of 2016, 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 2016'. 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. Where data for these indicators are presented in this report, the indicator name is shown.

Data for indicators which are presented at Upper Tier Local Authority and Clinical Commissioning Group can be found at http://fingertips.phe.org.uk/profile/tb-monitoring and was updated with data for 2016 on 7th November 2017. Specific indicators are also shown throughout the report.

Executive summary

National

A total of 5,664 cases of TB were reported in England in 20161, the lowest number since 2000. The TB incidence rate remained approximately stable between 2015 (10.5 per 100,000 population 95% CI 10.2-10.7) and 2016 (10.2 per 100,000, 95% CI 10.0-10.5).

Regional

A total of 124 TB cases were reported in the North East of England in 2016 with a rate of 4.7 per 100,000 population. This represents no real change compared to the previous year (128 cases, incidence of 4.9 per 100,000 in 2015).
Local

Newcastle continued to have the highest incidence of TB, at 12.1 per 100,000 population in 2016. This was a decrease from the previous year (15.7 per 100,000 population in 2015). Northumberland and Durham had the lowest rates in 2016 (1.3 and 1.5 per 100,000 population respectively).

Age groups

In 2016, the age specific TB rates were highest in the 25-29 year age group at 7.5 per 100,000 population. The rate in UK born children aged under 15 years was 0.9 per 100,000, this was similar to the previous year.

Ethnic groups

As in recent years, the most common ethnic group of TB cases in the North East was White, followed by Black African. Numbers of cases among the Black African, Bangladeshi and Black other populations increased where as other groups remained stable or saw a decrease in 2016 from previous year.

In 2016, a greater number of TB cases were born outside of the UK. TB rates in UK born population remain very low at 2.1 per 100,000 while the rate in non UK born population was 42.2 per 100,000.

Clinical characteristics

In 2016, 58% (72/124) of TB cases reported in the North East had pulmonary disease, which is comparable with the figure for England (53.9%). Of those pulmonary cases, 49% (35/72) had a sputum smear result of which 80% were sputum smear positive. In 2016, 69% of all TB cases were confirmed by culture, 81% among pulmonary cases, compared to 63% and 76% respectively among all cases in England.

Treatment outcome

80% (102/128) of TB cases reported in the North East in 2015 in the entire drug sensitive cohort (excludes cases in the drug resistant cohort) had recorded as having completed treatment at the last recorded TB outcome. The most common reason for non-completion was due to death. 3% (4/128) of North East patients in the entire drug sensitive cohort were lost to follow up.

Among drug sensitive TB cases with non-CNS/spinal/miliary or cryptic disseminated disease, 79% of those notified in 2015 completed treatment within 12 months (compared with 82% in 2014). The most common reason for non-completion was due to death (11%). Half of the number of deaths were seen in the 65+ category. In most cases the relationship between TB and death was unknown. Loss to follow up accounted for 3% (3/117) of non-completion.

Among drug sensitive TB cases with CNS, spinal, miliary or cryptic disseminated disease, 82% of those reported in 2015 completed treatment within 12 months; the reasons for non-completion were due to death (1 case) and loss to follow up (1 case).
Drug resistance

Drug resistance remained low among TB cases reported in the North East in 2016, with 5% of cases with isoniazid resistance and 1% of cases with multi-drug resistance. The majority of resistant TB cases had extra-pulmonary disease and 50% had previous history of TB treatment.

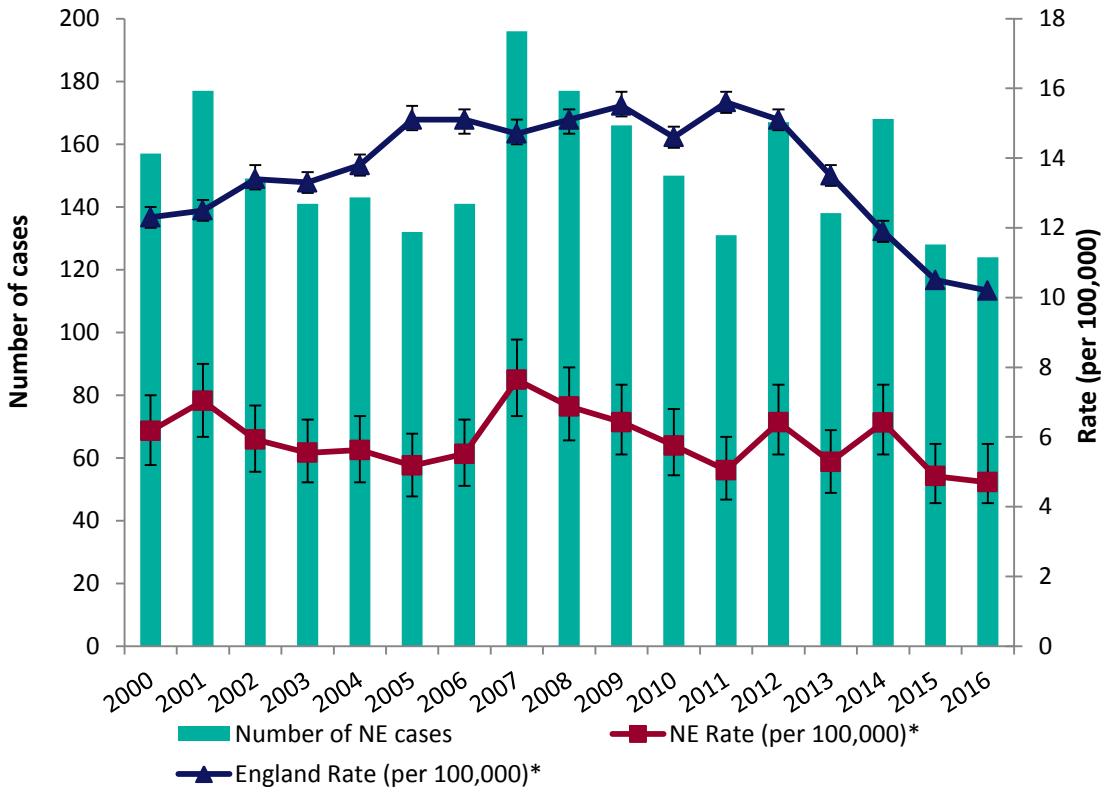
Complete and accurate surveillance data provide the evidence to review case management standards, and identify if opportunities for prevention have been missed. Recommendations for local NHS and PHE staff include (i) ensuring that accurate and complete information is provided on the PHE enhanced TB surveillance system in a timely manner, and (ii) that best practice case management is followed for all patients, including universal HIV testing and obtaining smear results. Reviewing of cases through cohort reviews ensures opportunities for prevention, early detection and successful treatment are not missed.

1. TB notifications and incidence

Overall numbers, rates and geographical distribution

In 2016, 124 TB cases were reported among North East residents, a rate of 4.7 per 100,000 population. This was a decrease of 3% compared to 2015 (Figure 1). The TB rate in the North East remained well below the national figure of 10.2 per 100,000 population.[1]

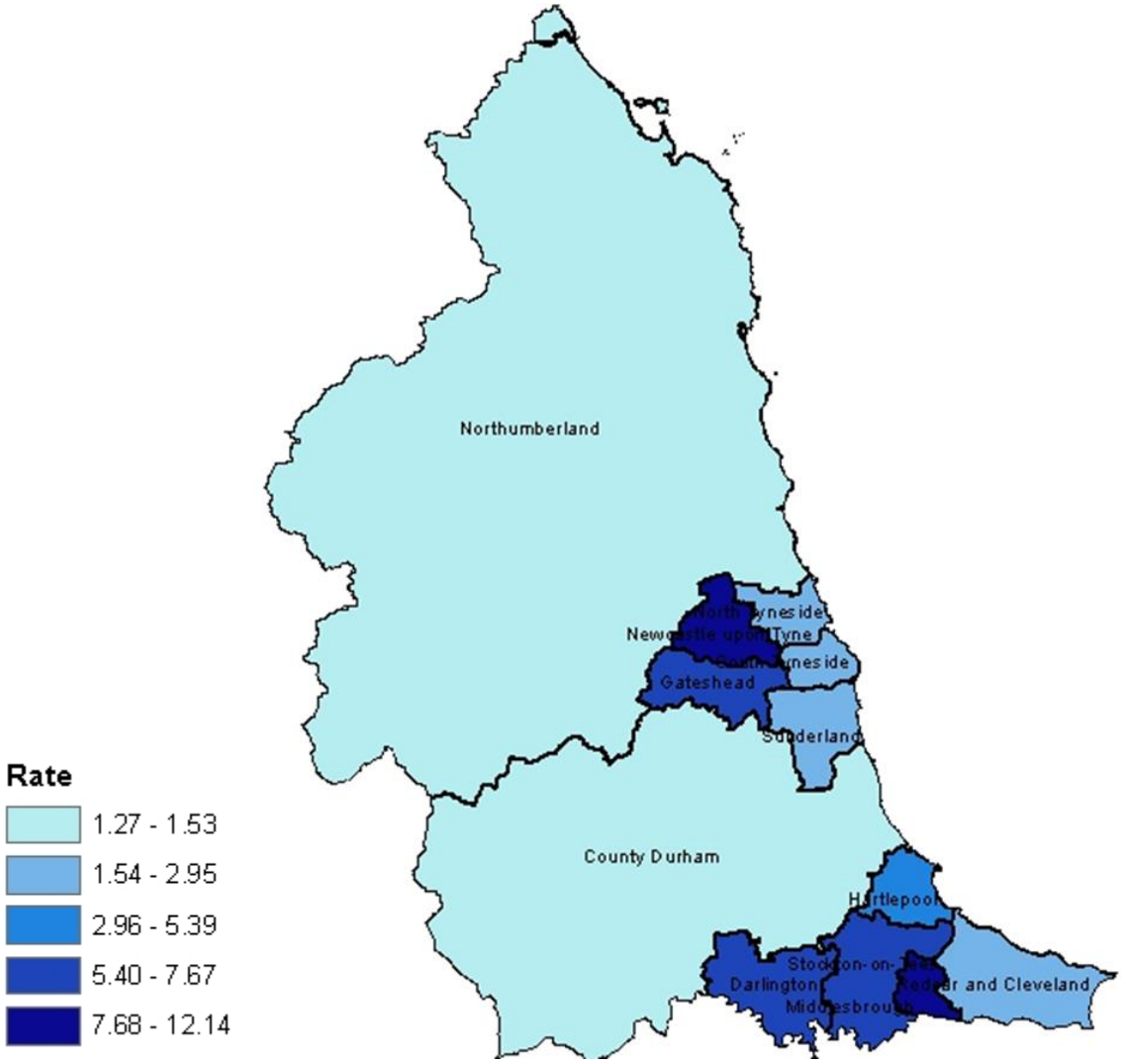
Figure 1: TB case reports and rates, North East and England rate, 2000 to 2016



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

The TB rates across North East upper tier local authorities in 2016 varied between 1.3 and 12.1 per 100,000 (Figure 2). The highest rates could be seen in Newcastle upon Tyne and Middlesbrough and the lowest in County Durham and Northumberland.

Figure 2: TB case rate* by upper tier local authority of residence, North East, 2016



*Rate per 100,000 population

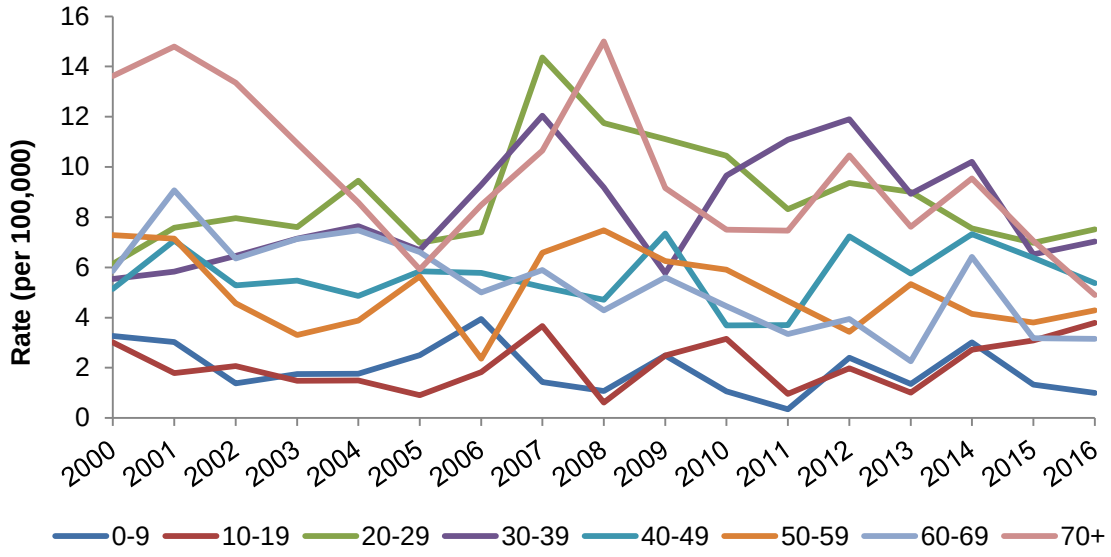
Demographic characteristics

Age and sex

In 2016, 51% (63/124) of North East TB cases were female and 49% (61/124) male, with rates of 4.71 per 100,000 in females and 4.69 per 100,000 in males. The greatest number of cases (27; 22%) were aged 20 to 29 years and the highest TB rate of 7.5 per 100,000 was also in those aged 20 to 29.
In 2016, 6 TB cases were reported among children aged under 15 years, no change on the previous year. This equates to a rate of 1.4 per 100,000 children. Of those children cases, the majority were UK born, with a rate of 0.9 per 100,000 UK born children. Of the children diagnosed with TB aged under 5 years, all were UK born.

Figure 3: TB case reports and rate by age and sex, North East, 2016

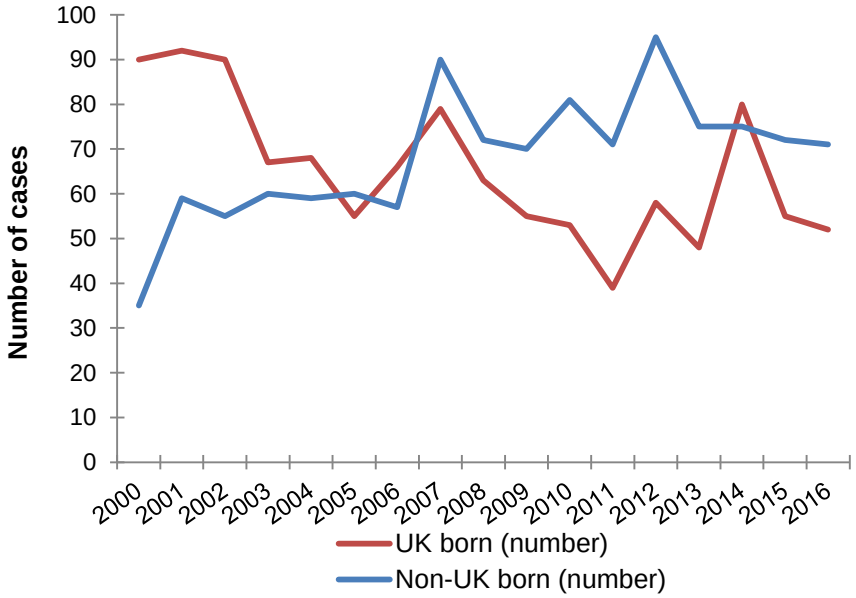
Figure 4: TB case rates by age group, North East, 2000 to 2016



Place of birth and time since entry

In 2016, place of birth was known for 99% of North East TB cases. Of these, 42% (52/123) of cases were born in the UK. Rates in the UK born remain very low at 2.1 per 100,000 population while the rate in non UK born was 42.2 per 100,000. Numbers of UK born decreased slightly from 55 in 2015 to 52 in 2016 (Figure 5).

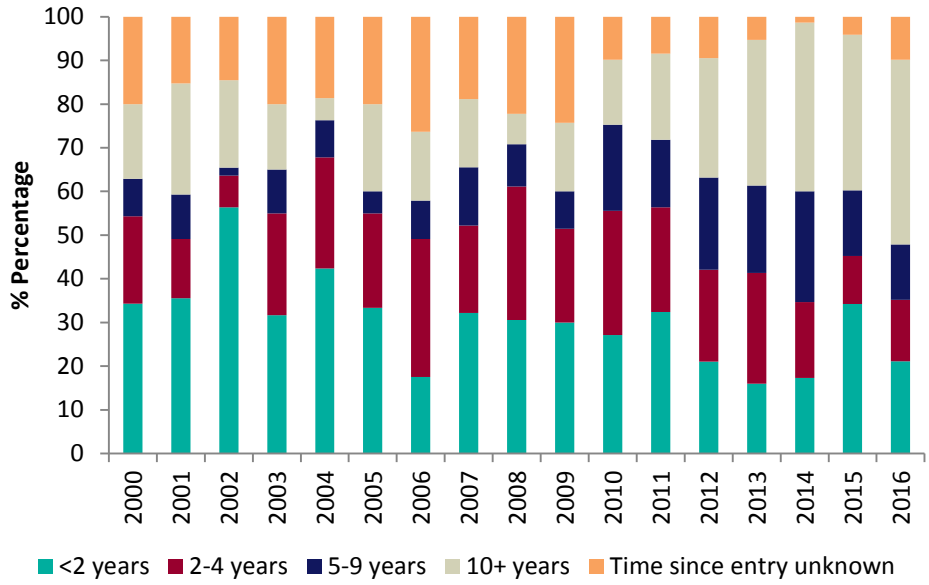
Figure 5: TB case reports by place of birth, North East, 2010 to 2016



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

Among those born outside the UK, the proportion of TB cases who had been in the UK for less than 2 years has decreased from 34% in 2015 to 21% in 2016.

Figure 6: Time between entry to the UK and TB notification for non-UK born cases by year, North East, 2000 to 2016



In 2016, the majority of non-UK born TB cases reported in the North East were born in India (13%) and Eritrea (13%), followed by Pakistan (11%) (Table 1). Nationally the most frequent countries of birth were India and Pakistan accounting for 40% of non-UK born cases.

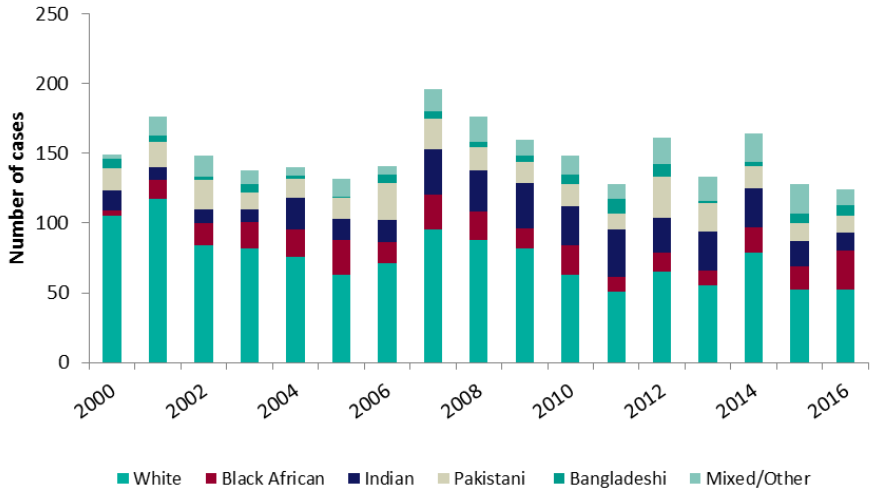
Table 1: 5 most common countries of birth of non-UK born TB patients, North East, 2016

Country of birth	n	% of non-UK born patients
India	9	13
Eritrea	9	13
Pakistan	8	11
Bangladesh	6	8
Romania	5	7
Others <5	32	45
Unknown	2	3
Total non-UK born	**71**	**100**

Ethnicity

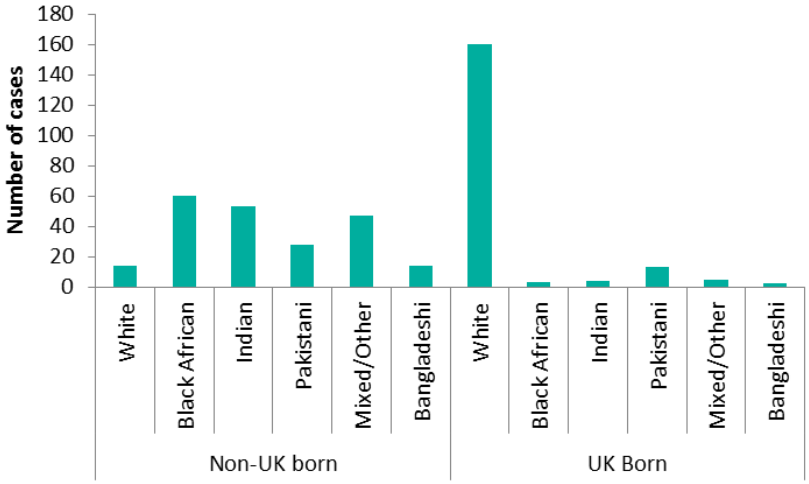
As in recent years, the most common ethnic group of TB cases in the North East was White, accounting for 42% of cases (52/124). However due to the predominantly White population of the North East, this equates to a rate of 2.1 per 100,000 white population, where as the TB rates in the Black African and Indian population were much higher (255.0 and 82.2 per 100,000 respectively).

Figure 7: TB case numbers by ethnic group, North East, 2000 to 2016



Of the UK born TB cases reported in 2014 to 16 (3 year data due to small numbers), the vast majority (86%, 160/187) were in the White ethnic group. Among the non-UK born reported in 2014-16, 28% (60/216) were in the Black African group; 25% (53/126) were in the Indian group and 22% (47/126) were in the Mixed/Other population.

Figure 8: TB case numbers by ethnic group and place of birth, North East, 2014 to 2016*



*3 year data due to small numbers

Occupation

Table 2: Occupational category of TB patients aged 18 to 65 years, North East, 2016

Occupation	n	%
Health care worker	7	8
Student/education	9	10
Other	35	38
No occupation	40	44
Total	**91**	**100**

In 2016, occupation was known for 97% (91/94) of North East TB cases aged between 18 and 65 years. Of these, 43% (40/91) of cases were not in education or employment; 10% (9/91) were either studying or working in education; 8% (7/91) were healthcare workers; and the remaining 38% (34/91) were working in other occupations including prison setting and social services.

Clinical characteristics

Site of disease

In 2016, the majority (58%) of TB cases had pulmonary disease (Table 3). The most common extra-pulmonary site was extra-thoracic lymph nodes (15%). Pulmonary disease was more common among UK born than non-UK born TB cases (71%, 37/52 vs 49%, 35/71) and those with social risk factors: (76%, 13/17).

Table 3: Site of disease of TB patients, North East, 2016

Site of disease	2016	
	n	%
Pulmonary	72	58
Lymph Node (extra thoracic)	19	15
Pleural	10	8
IT Lymph Nodes	7	6
Gastrointestinal/Peritoneal	7	6
CNS (Other - not meningitis)	6	5
Other	5	4
Miliary	4	3
Bone/Joint (spine)	4	3
Genitourinary	3	2
Bone/Joint (other - not spine)	2	2
Cryptic Disseminated	1	1
CNS (meningitis)	1	1
Laryngeal	0	0

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

Directly observed therapy (DOT)

Information on whether a case received DOT was known for 93% of North East TB cases (115/124) notified in 2016. Of these, only 9% (10/115) of cases were reported to have received DOT.

BCG Vaccination

BCG status was available for 84% (104/124) of North East TB cases in 2016. Where data was available, 70% (73/104) of cases had received the BCG vaccination.

Table 4: Number and proportion of TB patients with BCG vaccination, North East, 2016

	<5 years old BCG vaccination			<16 years old BCG vaccination			All ages BCG vaccination		
	n	%	N	n	%	N	n	%	N
UK born	0	0	3	1	25	4	25	58	43
Non-UK born	0	0	0	2	67	3	48	79	61
All cases	**0**	**0**	**3**	**3**	**43**	**7**	**73**	**70**	**104**

Previous history of tuberculosis

In 2016, 4% (5/120) of TB cases in the North East where information was available had a previous diagnosis of TB more than 12 months before their current notification, this figure remained static compared to 2015 4% (5/126). Among those with a previous diagnosis of TB, 80% (4/5) were known to have previously been treated for TB and 60% (3/5) received DOT during their current notification. Time since previous diagnosis was known for all of these cases, with a median time since previous diagnosis of 9 years (IQR 1-68 years).

2. Laboratory confirmation of TB

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

In 2016 in the North East, 69% (86/124) of all TB cases were confirmed by culture. This increased to 81% (58/72) among pulmonary cases and was lower (56%, 28/50) for cases with extra pulmonary disease (no information was available for 2 cases with unknown site of disease).

Among the culture confirmed TB cases notified in the North East in 2016, 98% (85/86) were identified as Mycobacterium tuberculosis (M.tuberculosis) infection, 1.2% (1/86) were identified with M.bovis. There were no cases of M.microti or M. africanum.

Sputum smear

Of the 72 North East pulmonary cases in 2016, 35 (49) had a sputum smear result. Of these, 80% (28/35) were sputum smear positive.

3. TB transmission

Rate of TB in UK born children

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

As stated previously, there were 6 children aged under 15 years reported with TB disease in the North East in 2016, similar to the previous year. Of these, the majority were UK born with a rate of 0.9 per 100,000. The rate in UK born children aged under 15 years is nationally used as a proxy for recent transmission of TB within the UK.

Strain typing and clustering

The National TB Strain Typing Service in England, established in 2010, prospectively types TB isolates using MIRU-VNTR. In December 2016, this service was terminated in North and Central England and replaced by whole gemnome sequencing (WGS). This service will be fully terminated throughout England by the end of 2017 (see WGS section for more details).

Clusters of TB cases with indistinguishable MIRU-VNTR strain types (clustered cases) may reflect cases that are part of the same chain of transmission, but could also reflect common endemic strains circulating either within England or abroad. MIRU-VNTR strain typing can be used to refute transmission between individuals, who have different strain types, but a common strain type does not confirm transmission; additional epidemiological information is required to assess whether a common strain type is likely to reflect recent transmission.

Proportion of cases clustered

In 2016 in the North East, there were 86 culture confirmed cases, of which 80% (69/86) had an isolate that was strain typed. This is lower than in previous years due to the transition from the use of strain typing to WGS in the North East of England in 2016. Of those which had at least 23 loci typed, 29 (71%) did not cluster with any other strain type within the North East. The remaining 12 (29%) cases clustered with at least one other case in the North East.

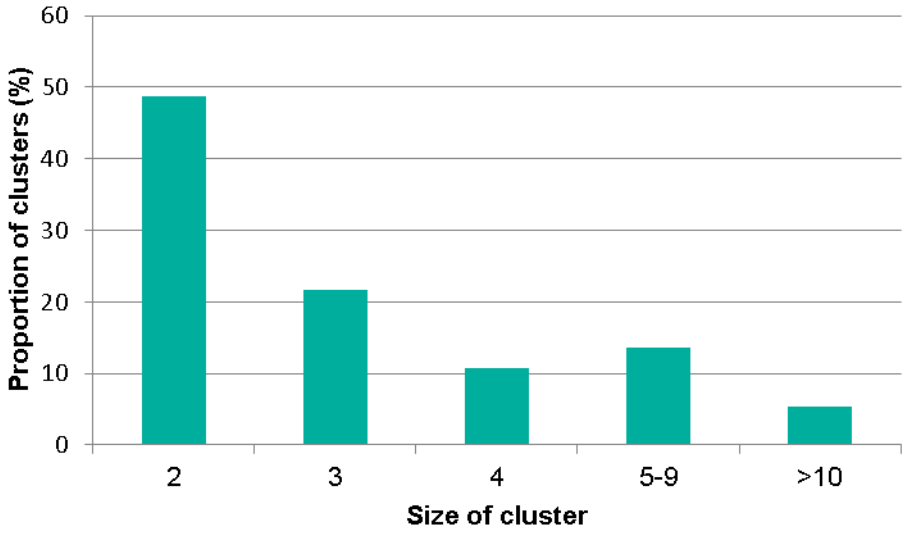
Table 5: Number and proportion of culture confirmed cases typed and number and proportion of cases in clusters, North East, 2010 to 2016

	Culture confirmed cases	Strain typed cases		Strain typed >=23 loci		Cases clustered		Clusters
Years	N	n	%	n	%	n	%	n
2010	97	91	94	57	59	16	28	3
2011	104	103	99	85	82	18	21	6
2012	114	114	100	88	77	23	26	9
2013	106	105	99	69	65	28	41	6
2014	115	115	100	69	60	21	30	8
2015	85	85	100	63	74	10	16	2
2016	86	69	80	41	59	12	29	3
	707	**682**	**96**	**472**	**69**	**128**	**27**	**37**

Size of clusters

Of the 37 clusters identified in the North East from 2010-2016, the majority of clusters (47%) consisted of 2 cases (Figure 10).

Figure 10: Proportion of TB clusters by size, North East 2010 to 2016



WGS

Whole genome sequencing (WGS) of Mycobacterium tuberculosis complex (MTBC) isolates provides information on single nucleotide polymorphism (SNP) differences between isolates, which provides more information than MIRU-VNTR strain typing on how isolates are related to each other. WGS may therefore provide greater understanding of whether isolates are likely to be part of the same transmission chain, and may also help determine the timing and direction of transmission.
PHE is close to deploying the routine prospective WGS for TB for the NHS throughout England. It has been already in place in areas served by the National Mycobacterium Reference Service (NMRS) Central and North, and will be deployed in areas covered by the NMRS South by the end of 2017. It is hoped that this new technology will continue to add to the learning of TB transmission by providing robust genomic information to be used in conjunction with epidemiological and surveillance information.

4. Delay from onset of symptoms to start of treatment

Time symptomatic

The time between onset of symptoms and starting treatment was available for 90% (112/124) of all TB cases and for 89% (64/72) of pulmonary TB cases, notified in the North East in 2016 (Table 6). The remaining patients were either asymptomatic at diagnosis, did not have a date of onset recorded or did not have a start or treatment date recorded.

The median number of days between symptom onset and treatment start was 85 days. This was lower among those with pulmonary disease at 73 days.
In 2016, 41% (26/64) of pulmonary cases started treatment within 2 months, and further 31% (21/64) between 2 and 4 months from symptom onset. The remaining 27% (17/64) of pulmonary cases had a delay from symptom onset to treatment start of more than 4 months; of which 76% of were born in the UK and all were in the White ethnic group.

Table 6: Time between symptom onset and start of treatment*, North East, 2016

	0-2 months		2-4 months		>4 months		Total
	n	%	n	%	n	%	N
Extra-pulmonary	13	27	14	29	21	44	48
Pulmonary	26	41	21	33	17	27	64
Pulmonary smear positive	9	33	10	37	8	30	27
All cases	**39**	**35**	**35**	**31**	**38**	**34**	**112**

*excluding asymptomatic cases, and those with missing onset dates

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

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

5. TB outcome in drug sensitive cohort

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. 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:

1. 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.
2. For cases with CNS, spinal, cryptic disseminated or miliary disease, the last recorded treatment outcome is reported.

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

In the North East, 79% (92/117) of TB cases notified in 2015 (excluding CNS, spinal, miliary or cryptic disseminated TB) completed treatment within 12 months, slight decrease than in previous years (Table 7) .

Table 7: Number and proportion completing treatment at 12 months, North East, 2002 to 2015

	TB patients		
	n	%	Total
2001	128	77	167
2002	103	71	145
2003	87	65	134
2004	96	75	128
2005	77	61	126
2006	98	71	138
2007	139	78	178
2008	121	73	165
2009	113	73	154
2010	114	81	140
2011	90	74	121
2012	119	78	152
2013	99	81	122
2014	112	82	136
2015	92	79	117

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

The most common reason for not completing treatment was due to death on or before starting treatment (13 of 25 cases who did not complete within 12 months; 52%) (Table 8). Of the 13 deaths recorded, the relationship between TB and death was unknown for 8 cases. Of the 5 where this was reported, TB contributed to death in 2 cases and was incidental to death in 2 cases.

Table 8: TB outcome at 12 months, North East, cases diagnosed in 2015*

Outcome at 12 months	n	%
Completed	92	79
Died	13	11
Lost to follow up	3	3
Still on treatment	7	6
Treatment stopped	2	2
Not evaluated	0	0
Total	**117**	**100**

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

Older patients were less likely to complete treatment: just 48% (12/25) of TB cases aged 65 years and over notified in 2015 completed treatment in the North East, with higher rates of death before or whilst on treatment (44%, 11/25).

Treatment completion was similar in females (79%, 31/39) and males (78%, 61/78), but lower among the UK born than non-UK born TB cases (73% vs 83%). Those born

outside the UK when compared to UK born cases were more often lost to follow up (5% vs 0%) or have treatment stopped (3% vs 0%) and less likely to die (3% vs 22%).

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

In the North East, over 80% of the 11 patients notified in 2015 with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, completed treatment within 12 months (Table 9). The remaining cases did not complete treatment within 12 months due to either death or being lost to follow up.

Table 9: TB outcome at 12 months for patients with rifampicin sensitive, CNS, spinal, miliary or cryptic disseminated disease, North East, cases diagnosed in 2015*

Outcome at 12 months	n	%
Completed	9	82
Died	1	9
Lost to follow up	1	9
Still on treatment	0	0
Treatment stopped	0	0
Not evaluated	0	0
Total	**11**	**100**

*excludes rifampicin resistant TB

Deaths and “lost to follow up” in the entire drug sensitive cohort

The proportion of cases in the entire drug sensitive cohort who had died at the last recorded outcome has remained fairly stable in the North East since 2004. Of the 128 cases notified in 2015, 14 (11%) died. Of these, the relationship between TB and death was unknown for the majority of cases (57%, 8/14) of cases. TB caused, contributed to or was incidental to a total of 6 deaths.

The proportion of drug sensitive North East cases that were lost to follow up at the last recorded outcome has ranged from 1% to 9% overall since 2004. Of TB cases notified in 2015, 3% (4/128) were lost to follow up, all among non-UK born cases, equally represented by males and females.

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

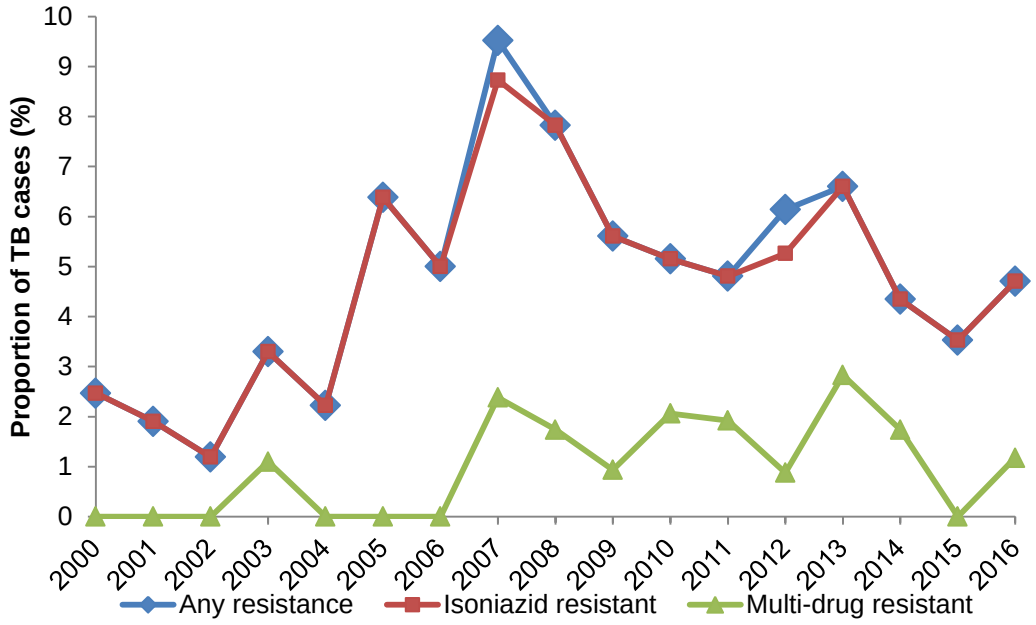
Drug resistance cohort

Please note that this chapter has been re-aligned to include reporting on cases in the **drug resistant cohort**. This includes cases that are culture confirmed with initial and acquired multi-drug resistant/rifampicin resistant TB (MDR/RR-TB), as well as those treated with a second line regimen for MDR/RR-TB without resistant phenotypic DST results, as defined by WHO2. This differs from previous reporting, where characteristics were only described for those with culture confirmed drug resistance, and outcomes were presented for the **drug resistant cohort**.

Initial first line drug resistance

In 2016, 4.7% (4/85) of the culture-confirmed TB cases in the North East were resistant to one or more first line drugs: all of which had isoniazid resistance and one had MDR-TB. Most of the resistant cases had extra pulmonary disease and 2 had a previous diagnosis of TB.

Figure 11: Proportion of TB cases with initial first line drug resistance, North East, 2000 to 2016



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

TB outcome at 24 months for patients with rifampicin resistant disease

In 2014, 2 cases had rifampicin resistant TB and each of these also had MDR-TB. Both cases were male, in the 46-64 age group and born in the UK.

At 12 months, both cases were still on treatment. At 24 months both cases still remained on treatment, but have since completed treatment.

7. TB in under-served populations

Social risk factors

In the ETS, data is collected on the presence or absence of 4 social risk factors (SRF) known to increase the risk of TB: current or history of homelessness, imprisonment, and drug misuse, and current alcohol misuse. Data in this chapter, with the exception of area level deprivation, is presented for TB cases aged 15 years and older.

In the North East in 2016, 16% (17/106) of TB cases aged 15 years and older had at least one SRF (Table 11), a slight increase from 2015 (13%, 14/108). Of the cases in 2016 with at least one SRF, 24%, (4/17) had 2 or more SRFs.

Table 11: Social risk factors among TB patients*, North East, 2009 to 2016

	Any risk factor		Total
	n	%	
2009	14	14	98
2010	12	9	126
2011	15	13	112
2012	15	10	136
2013	12	10	119
2014	13	9	138
2015	14	13	108
2016	17	16	106

* Includes those aged 15 years and older. Total refers to cases where risk factor information has been recorded.

Table 12: Individual social risk factors among TB patients*, North East, 2016

	n	%	Total
Homelessness	5	4	115
Imprisonment	9	8	115
Drug misuse	5	4	118
Alcohol misuse	3	3	114

* Includes those aged 15 years and older. Total refers to cases where risk factor information has been recorded.

Geographical characteristics

In 2016 in the North East, the proportion of UK born cases with at least one SRF was 53% (9/17), similar to that of 2015 (50%, 7/14) .

Clinical characteristics

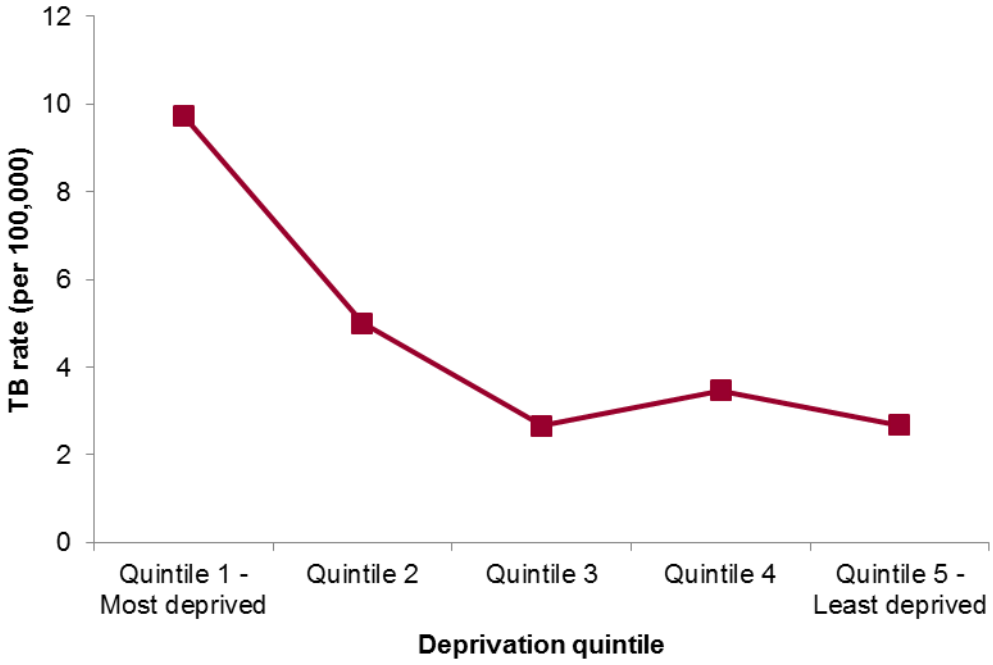
In 2016, the majority (77%, 13/17) of cases with at least one SRF had pulmonary TB and were male (71%, 12/17).

Over a third (35%, 6/17) of cases with at least one SRF received DOT in 2016 compared with 3% (3/89) of cases without a SRF. The proportion of those with at least one SRF receiving DOT was lower in 2016 than in 2015 (43%, 6/14).

Deprivation

In 2016, the rate of TB was 9.7 per 100,000 in the 20% of the population living in the most deprived areas of the North East compared to a rate of 2.7 per 100,000 in the 20% of the population living in the least deprived areas (Figure 12).

Figure 12: TB case rate by deprivation, North East, 2016



8. TB co-infection and HIV testing among TB cases

TB-HIV co-infection

HIV status is not collected in the ETS system. To estimate TB-HIV co-infection, TB and HIV surveillance data are matched annually for cases aged 15 years and older.

Table 13: Number and proportion of TB cases with HIV co-infection, North East*, 2001 to 2015

Year	n	%**
2001	8	4.9
2002	9	6.3
2003	8	5.9
2004	8	5.9
2005	6	4.8
2006	8	6.3
2007	15	8.0
2008	6	3.4
2009	8	5.1
2010	4	2.8
2011	2	1.5
2012	1	0.6
2013	2	1.5
2014	6	3.8
2015	6	4.9

Includes TB and HIV co-infected cases aged 15 years and older
** Proportion is calculated using the number of notified TB cases with HIV co-infection plus the number of un-notified TB isolates with HIV co-infection as the numerator, and the number of all notified TB cases (with or without HIV co-infection) plus the number of un-notified TB isolates with HIV co-infection as the denominator.

In the North East in 2016, information on HIV testing was available on 91% of TB cases* (111/122). Of those, 89% (94/106) were offered** an HIV test and 11% (15/106) were not offered a test. Among those offered testing, the uptake was high (96%, 90/94). Offer of an HIV test was lower among UK born TB cases compared to non-UK born cases (80%, 37/46 vs. 95%, 57/60).
*Excludes cases identified at post mortem **excludes cases identified at post mortem and those where HIV status is already known

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

Discussion

In January 2015, PHE and NHS England published the Collaborative TB Strategy for England 2015 to 2026, which sets out the actions required to achieve a year on year reduction in TB incidence and a reduction in the health inequalities associated with the disease. This report of TB surveillance data for North East England up until the end of 2016 provides a comprehensive overview of the epidemiology of TB in the North East England following the implementation of the strategy.

Numbers and rates of TB in the North East remain low and below the national average. However the rates and TB burden are higher in particular areas and subgroups such as urban and deprived populations.

In 2016, a small decrease was seen in the TB cases born in the UK from the previous year. A greater number of TB patients were born outside the UK than in the UK. Rates of TB in the UK born remain very low compared to the non-UK born population. The most common ethnic group of TB cases remains White, followed by Black African. HIV testing was not offered, or not recorded as offered to 19% of TB cases. UK guidelines recommend all TB patients should be offered a test, regardless of age or ethnicity or where they are resident[3]. Information on symptom onset was well completed and identified longer delays in extra pulmonary cases.

Less than a half of pulmonary cases had a sputum smear results. This is an important indication of infectiousness, and should be done on all patients where possible. Treatment completion at 12 months among patients with rifampicin sensitive and non-CNS/spinal/miliary or cryptic disseminated disease in the North East was below the national figure. The most commonly reported reason for not completing was due to death. The relationship between TB and death was poorly completed. The next most common reason was due to cases still being on treatment. Drug resistance among the North East TB cases remains low.

Conclusion and recommendations

This report updates the latest epidemiology of TB in the North East, describing those populations at increased risk of disease. This evidence can help services implement the basic elements of TB control, namely prompt identification of active cases of disease, supporting patients to successfully complete treatment, and preventing new cases of disease occurring, through effective case management and robust contact tracing. The information will also be useful to target resources effectively.

Key recommendations for the NHS and PHE derived from the data presented in this report include:

1. Ensure that accurate and complete information is provided on the PHE Enhanced TB Surveillance system in a timely manner.
2. Offer and encourage HIV testing for all those diagnosed with TB and ensure where possible tests are done, in line with national guidance.[3]
3. Increase proportion of pulmonary TB cases with a sputum smear result to better inform local infection control and prevention activity.
4. Report treatment outcome for all patients, and review reasons why completion is low in some areas.
5. Refer to NICE guidance[4] and the Royal College of Nursing guidance on TB case management as best practice.[5]

References

1. Tuberculosis in the England: 2017 Report (presenting data to end of 2016). Public Health England, October 2016. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/654152/TB_Annual_Report_2017.pdf

2. World Health Organization. Definitions and reporting framework for tuberculosis – 2013 revision. WHO 2013. http://apps.who.int/iris/bitstream/10665/79199/1/9789241505345_eng.pdf

3. British HIV Association. UK National Guidelines for HIV Testing. September 2008. https://www.bhiva.org.uk/documents/guidelines/testing/glinehivtest08.pdf

4. National Institute of Health and Clinical Excellence. Tuberculosis – full guideline [Internet] 2011. http://www.nice.org.uk/cg117/resources/cg117-tuberculosis-full-guideline3

5. Royal College of Nursing. Tuberculosis case management and cohort review. RCN 2012. http://rcn.org.uk/_data/assets/pdf_file/010/439129/004204.pdf

6. Collaborative tuberculosis strategy for England: 2015-2020 https://www.gov.uk/government/publications/collaborative-tuberculosis-strategy-for-england

Appendix A: Description of data sources and definitions

Data sources
Data on TB cases in North East England 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 National Mycobacterium Reference Service (North).

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 September 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 using the relevant procedure in Stata, assuming a Poisson distribution.

Population denominator
Tuberculosis rates by geographical area (Centre, local authority, MSOA and LSOA), age, sex and place of birth were calculated using ONS mid-year population estimates.

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 2 or more people with TB caused by indistinguishable strains, with at least 23 complete VNTR loci. Analysis of clustering was carried out on cases that clustered in North East England and notified between 2010 and 2016.

Appendix B: Priorities for TB in the North East 2018 to 2020

Our overarching goal: 'To support the WHO goal of TB eradication by reducing the incidence of TB in the population of the North East with particular emphasis on those with social risk factors'

	Priority	Aspiration for 2020	Actions	Time	Lead
1	**Commission effective TB Nursing services for the population of the North East.**	By 2020 there will be a network of consistently commissioned TB Nursing Teams across the North East based on national specification and local needs. These teams will be working to an agreed 'model of care' and staff in these teams will have access to training/CPD to enable them to maintain their specialist expertise and develop new interventions. They will play a leading role in tackling health inequalities by routinely providing testing for BBV/HIV in addition to TB testing and control. This will be recognised and supported by all CCGs. The TB teams will provide mutual support in times of surge or capacity issues.	1.1 Conduct a service review of the capacity and workload of local TB Teams.	March 2018	Paul Davison Simon Howard TB Teams
			1.2 Conduct a review of CCG commissioning arrangements for TB using the national specification.	January 2018	Michelle Henderson
			1.3 Evaluate the output of both reviews and produce a report with recommendations to NE TB Network.	July 2018	Paul Davison Simon Howard
2	**Target at-risk communities to reduce the likelihood of developing active TB**	By 2020 we will have seen a reduction in TB incidence among people with social risk factors through an integrated approach between statutory and Third Sector organisations. It will be routine practice that everyone known to Drug and alcohol services will have been offered screening for TB	2.1 HPT and TB Nursing teams to identify high risk populations (e.g. through clusters of cases) and work with local services to develop opportunistic interventions.	Ongoing	Health Protection and TB Teams
			2.2 Pilot and evaluate TB testing in 1 drug and alcohol service to identify prevalence in this community – linked to under-served populations, and consider if this could be extended to other services.	March 2019	Change, Grow, Live.
			2.3 Secure agreement with commissioners to conduct opportunistic testing for active/latent TB (and BBVs) when conducting screening in high risk setting such as hostels etc.	September 2018	To be confirmed when 1.1/1.2 are completed.

			2.4 Integrate whole genome sequence cluster detection into clinical and health protection practice.	Ongoing	Paul Davison Simon Howard Andy Burkitt
3	**Support and improve clinical and social care for TB patients.**	By 2020 all clinical services will have a definable single approach to TB treatment across all Trusts/Nursing Team for adults and children informed by NICE and local epidemiology.	3.1 Establish a secure clinical forum to discuss management of TB cases and seek advice from clinicians across the North East.	March 2018	Jim McFarlane
			3.2 National ID Service Specifications for MDR TB under review presently (Dr Ong working ID CRG member group) and the output will include specifications for MDRTB centres.	Ongoing	Ed Ong
			3.3 Establish a North East approach to the clinical care of adults and children with TB informed by NICE and local epidemiology.	March 2018	Simon Howard Jim McFarlane
			3.4 Review NE TB Network's approach to cohort review and make recommendations.	December 2018	Paul Davison Simon Howard TB Teams
4	**Support the National TB Strategy**	By 2020 there will be a reduction in the incidence of TB in the North East to 4/100,000 through the co-ordinated efforts of statutory and Third Sector organisations.	4.1 Exploit the opportunities presented by the national strategy to raise the profile of addressing TB as a public health threat	March 2020	Paul Davison Simon Howard
			4.2 Support the TB Control Board effectively and proportionally	Ongoing	Paul Davison Simon Howard