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ABSTRACT

Background

Tuberculosis (TB) remains a significant public health problem in England despite control of tuberculosis being made a priority at government level. At local level, a report looking at the disease epidemiology and service provision of TB was produced for Bradford in 2004, with proposals for future planning, yet despite this, Bradford continues to have a high incidence of tuberculosis.

Aim

Improve prevention and treatment of TB in line with recommendations from key national guidance documents with the long-term aim of eliminating TB for the population of Bradford & Airedale (B&A)

Objectives

1. To identify the current burden of TB, including latent TB, within the population of Bradford & Airedale (B&A) compared with previous years and compared with regional and national levels.
2. To identify key guidance documents for management of TB disease and compare Bradford & Airedale's performance with the targets set within these documents.
3. To identify current service provision for TB disease and gaps in service provision within Bradford & Airedale
4. Prepare recommendations for change to be put forward to the Clinical Commissioning Groups (CCGs) in Bradford & Airedale.

Methods

An epidemiological needs assessment was carried for TB in Bradford & Airedale. The Enhanced Tuberculosis Surveillance (ETS) database was utilised to obtain epidemiological information for the burden of TB disease for this population. The database also enabled analysis of epidemiological information at sub-group level and analysis of effectiveness of services.

National guidelines containing standards for service provision were utilised to evaluate TB services in Bradford & Airedale as part of the epidemiological needs assessment.

A corporate needs assessment was also carried out. This was performed by undertaking interviews with key stakeholders to identify current service provision and gaps in service provision, as well as proposed ideas for change.

Results

The incidence of tuberculosis in Bradford & Airedale continues to remain high. Despite a fall in the incidence rate in 2011 compared with the previous year, Bradford & Airedale still has the highest rate of TB disease in the region, and one of the highest rates nationally.

Analysis at sub-group level reveals that the incidence of TB in Bradford & Airedale is highest in young adults and in those of Black-African and South Asian origin. In addition, non-UK born residents make up the highest proportion of TB cases in Bradford & Airedale with a TB rate that is 12 times higher than the TB rate among UK born individuals. Also, TB cases among the Indian ethnic group born in the UK is increasing in Bradford & Airedale which may indicate poor control of TB disease among those at increased risk.

Pulmonary TB remains the most common type of TB occurring in Bradford & Airedale. This type of TB is also the most infectious form therefore early diagnosis and treatment is essential, however, during the 3 years proceeding 2008, less than 1 in 5 pulmonary cases in Bradford & Airedale were diagnosed within the recommended 2 week target.

Non-compliance with treatment also continues to remain a problem for TB cases in Bradford & Airedale. Over 10% of cases had at least one risk factor for non-compliance with TB treatment and treatment completion rates were lower than the recommended national target.

BCG vaccination coverage among at-risk neonates is high but coverage in eligible older children is low.

The Bradford & Airedale TB service continues to remain understaffed as recognised in the report produced in 2004 which has resulted in the inability to provide key components of TB management, such as directly observed therapy (DOT). Also, the reporting mechanisms of TB cases, contacts and screened individuals are independent of each other which has the potential to lead to difficulties in linking cases together and in obtaining complete information for each patient. This could become more hazardous in the future, especially if the burden of TB in Bradford & Airedale rises.

Bradford & Airedale provides TB screening services for new arrivals and asylum seekers, to detect active and latent TB cases, however, very little is available for homeless individuals, who are an additional vulnerable group.

Conclusion

TB remains a significant public health problem in Bradford & Airedale. It is clear now more than ever that a multidisciplinary approach involving primary care, secondary care and third sector organisations is imperative in order to achieve the recommendations set out in this report, particularly in the context of the current NHS reforms, whereby TB service provision has the potential to become disjointed.

Recommendations

1. Provision of additional TB nurses in line with guideline requirements provided by the National Institute for Health and Clinical Excellence (NICE)
2. District wide commissioning of TB services to be undertaken by one CCG within Bradford district to prevent the development of disjointed services.
3. Commission TB services as a separate entity as opposed to within other services (e.g. respiratory services) to encourage transparency about the services being provided
4. Develop a multidisciplinary team involving ALL organisations that provide a TB service within B&A and encourage that all people involved in TB care should attend.
5. Continue to increase awareness of TB among primary care, secondary care and third sector professionals who are involved in managing patients with TB
6. Form an outpatient clinic within secondary care that is specific to TB along NICE guidelines
7. Bring together the existing TB databases onto one database to enable continuity of patient care
8. Provision of an active case finding service for vulnerable groups, including the homeless, as recommended by NICE.
9. Continue to encourage accurate reporting of TB notification information on the ETS database
10. Consideration of appointing a lead TB clinician

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Abbreviations

B&A	Bradford and Airedale
BCG	Bacillus Calmette-Guérin
BME	Black and Minority Ethnic
BTHFT	Bradford Teaching Hospitals NHS Foundation Trust
CCDC	Consultant in Communicable Disease Control
CCG	Clinical Commissioning Group
CMO	Chief Medical Officer
DOB	Date of Birth
DOT	Directly Observed Therapy
ETS	Enhanced Tuberculosis Surveillance
GP	General Practitioner
HIV	Human Immunodeficiency Virus
HNA	Health Needs Assessment
HPA	Health Protection Agency
IGRA	Interferon-Gamma Release Assay
MDR-TB	Multidrug-Resistant Tuberculosis
MDT	Multidisciplinary Team
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
ONS	Office for National Statistics
PbR	Payment by Results
PCT	Primary Care Trust
TB	Tuberculosis
UK	United Kingdom
WHO	World Health Organisation
WTE	Whole Time Equivalent
Y&H	Yorkshire and The Humber

SECTION 1

OVERVIEW OF THE REPORT

1.1 Purpose of the report

The aim of this report is to improve management of Tuberculosis (TB) for the population of Bradford & Airedale through effective prevention and treatment of TB in line with recommendations from key national guidance documents, with the long-term aim of eliminating TB in this area.

1.2 Structure of the report

The report will begin by describing the clinical components and public health impact of Tuberculosis disease including; risk factors, symptoms, diagnosis, treatment and prevention. It will then discuss the history of surveillance of TB disease and how it has changed over time, as well as the impact surveillance has had on TB control.

The next section of the report will discuss global and national guidance and targets that have been put into place, which have resulted in an increased awareness and heightened response in tackling the burden of TB disease.

The next chapter will be structured in the form of a health needs assessment. The first part will describe the components of a health needs assessment in a general context and how it will be used in this report for TB. This will be followed by a brief description of the global burden of TB disease and an in-depth analysis of the epidemiology of TB in Bradford & Airedale, including analysis at sub-group level. This will be placed in context by comparing the findings with those of previous years, and also comparing the findings with national and regional figures. An analysis of the effectiveness of TB services in Bradford & Airedale will also be included within this chapter by undertaking a brief service evaluation against national standards.

The next section will form the corporate component of the health needs assessment, which will include a description of the current provision of TB services in Bradford & Airedale, including identification of gaps in service provision.

Following on from this, all the information will be combined to identify areas of development for TB services in Bradford & Airedale and propose recommendations for change.

Throughout the report, the terms, ‘B&A’ and ‘Bradford district’ are used interchangeably to refer to the population of Bradford & Airedale.

SECTION TWO

INTRODUCTION

This section of the report describes the clinical components of Tuberculosis disease and its relevance to public health, followed by the history of surveillance of TB disease, as well as the impact surveillance has had on TB control.

2.1 Clinical Features of Tuberculosis

2.1.1 What is Tuberculosis?

Tuberculosis (TB) is caused by a bacterium called *Mycobacterium tuberculosis* and can affect any part of the body. In the UK, the most common form is pulmonary TB (affecting the lungs),[1,2] which is also the most infectious form of TB. TB infection is acquired by breathing in infected droplets from an infectious person with pulmonary TB, for example through coughing or sneezing.

2.1.2 Risk factors

The risk factors for TB infection include:

- Age; TB mostly affects young adults in their most productive years.[3] Young children are more susceptible to TB infection from someone who already has TB disease, and the elderly are at greatest risk of reactivation of TB disease.[4]
- Close contact of a TB patient. An individual with untreated pulmonary TB disease can infect 10-15 people each year.[3] This is highly dependent on the nature and duration of exposure; with household members being at greatest risk of contracting the infection (1 in 3).[5]
- Immunocompromised patients; For example, HIV suppresses the immune system which makes it difficult for the body to destroy TB bacteria when it becomes infected. As a result, people with HIV are more likely to develop TB than those who do not have HIV.[3]
- Ethnic minority groups; The majority of TB cases occur in those from ethnic minorities, predominantly those from South Asia and sub-Saharan Africa. In addition, those individuals born in, or arrived from, or returned from countries with a high incidence of TB within the last 5 years are at greater risk,[5] with a greater than average lifetime risk that extends to their children and close contacts born in the UK.[4]
- Lifestyle factors such as a history of drug misuse or alcohol misuse.[6] These individuals may have a weakened immune system, which makes it difficult to fight off TB infection. They are also less likely to access health services during the early stages of disease,[7] which increases their risk of experiencing greater morbidity as a result of TB infection and a greater risk of spreading disease to non-infected vulnerable individuals.
- Living in crowded or unsanitary accommodation. This includes those who are homeless and those who have been or are currently in prison. Poverty, malnutrition, overcrowding and poor housing encourage the spread of TB.[4]

- Smoking; More than 20% of TB cases worldwide are attributable to smoking.[3]

2.1.3 Symptoms

As TB can affect any part of the body, symptoms vary depending on the area affected. However, pulmonary TB is the most infectious form, and in the UK, it is the most common type of TB,[1,2] therefore its symptoms are discussed in detail in this section.

Symptoms of pulmonary TB include a productive cough, fever, night sweats, weight loss, loss of appetite, malaise (fatigue), chills and chest pains.[3] These symptoms are not specific to TB and they closely mimic those of other respiratory illnesses. This can result in misdiagnosis or delayed diagnosis which leads to delayed treatment for TB. This has the potential to increase the risk of infecting other individuals and also increase the risk of morbidity (ongoing ill health) and mortality (death) of the affected individual, particularly as TB is a progressive disease and can be fatal if left untreated.[2] In addition to this, there are stigmas attached to TB, particularly in communities where the disease is feared and considered to be linked to poverty.[8,9,10] This also results in delayed presentation, which can make prevention and control more difficult.

2.1.4 Diagnosis

Pulmonary TB is diagnosed by performing a chest x-ray and by microscopic examination of sputum for the presence of acid-fast bacilli. This is important as sputum smear positive cases of pulmonary TB are the most infectious and therefore the most likely cause of transmission of TB in the community. The gold standard is culture confirmation.

In addition to this, drug susceptibility tests are carried out to detect resistance to the antibiotics that are used to treat TB. Again, this is important because treatment regimes vary depending on drug susceptibility and treatment success rates are dependent on appropriate treatment being prescribed.

An important aspect of TB is that not all infected individuals go on to develop the disease. Some infected individuals may overcome the infection without clinical presentation. In others, the infection may remain *latent* where these individuals are infected with the bacteria, but they do not present with symptoms (asymptomatic) and cannot infect others, unless they go on to develop *active* disease which is when the symptoms occur and these individuals then have the potential to infect others.[2,12] Although latent cases are more difficult to identify as they are asymptomatic, early identification and treatment through coordinated screening programmes is key in preventing these individuals from progressing to active disease which could occur days, months or even years after the initial infection. Studies have shown that approximately 5% of individuals with latent infection (in the absence of other predisposing conditions) will develop active TB within 5 years of infection[12,13] and the lifetime risk of developing active disease is 10-12%.[6,14]

2.1.5 Treatment

In those who develop active disease, early diagnosis is essential to eliminate transmission. Mathematical modelling suggests that the incidence of TB will decline at 5-10% per year when 70% of infectious cases are detected and 85% of these cases are cured.[15,16] Early treatment with specific antibiotics (isoniazid, rifampicin, ethambutol and pyrazinamide are first line drugs[17]) is also essential as is monitoring of compliance in order to reduce morbidity and mortality, prevent transmission of infection to others, and prevent drug resistance. The World Health Organisation (WHO) state that by using first-line drugs to treat TB, 90% of people with drug susceptible TB can be cured in 6 months.[18] Although, there is very little research looking at the cost-effectiveness of TB interventions in European countries, studies undertaken in other parts of the world have shown that standard TB treatment (i.e. in the absence of drug resistance) is one of the most cost-effective of all health interventions at a cost of $5-$50 per year of healthy life gained.[19]. This shows that TB treatment is highly effective at curing disease and cost-effective if patients remain fully compliant with their treatment.

Infectious TB patients can become non-infectious in as early as 2 weeks after commencing treatment,[20] therefore indicating that TB can be prevented from spreading if diagnosis is made early, treatment is started promptly and compliance with treatment is maintained. However, TB patients are more susceptible to non-compliance of treatment because standard treatment is lengthy (6 months) but recovery is quick. Also, side effects can be intolerable especially if a person feels well without medication. In addition, individuals leading chaotic lifestyles e.g. those who are homeless, in prison, or those who misuse alcohol or drugs, are at increased risk of TB and increased risk of poor compliance with TB treatment.[4] This poses a public health risk as TB disease can be reactivated or drug resistance may develop which can prolong the current spell of illness or affect treatment in the future if the disease reoccurs. Drug resistant TB is also more costly to treat. Previous research has shown that treatment of drug resistance TB costs between £50,000 to £70,000 per case in the UK, compared to £5,000 for non-resistant cases[7]. This evidence provides a strong economic case for effective management of TB disease.

One way to help ensure compliance with TB treatment is through *Directly Observed Therapy* (DOT), where the ingestion of every drug dose is witnessed by a health professional. Studies have shown improved cure rates from TB disease, as well as reductions in TB rate, drug resistance and relapses of TB disease in areas where DOT was implemented.[21,22,23] However, a DOT programme can only operate effectively and efficiently if all health providers involved with the programme are fully engaged.[24]

Without treatment, TB can be fatal.[2] Untreated TB can also spread to other parts of the body such as the bones (leading to joint destruction), brain (leading to meningitis), liver & kidneys

(leading to impaired liver and kidney function), and the heart (leading to the inability of the heart to pump effectively).[25]

As well as treating cases of TB, contacts of cases of active pulmonary TB need to be identified promptly so that they can be assessed and managed accordingly. Individuals classed as contacts of a case include those living in the same household and frequent visitors to the individual's home.[26] These contacts can be screened using a skin test or blood test.[17] As with latent cases, it is important to screen contacts of cases to prevent development of active disease and to provide preventative treatment if required. Evidence has shown that an untreated infectious person infects on average 10-15 people per year.[5] In addition, studies looking at contacts of TB cases have shown that up to 10% of TB cases are diagnosed through contact tracing and that TB disease occurs in 1% of contacts.[26]

2.1.6 Prevention

A core focus of public health intervention is prevention. TB disease is entirely preventable[18] through prevention of infection, prevention of spread and prevention of complications. Evidence indicates that the best form of protection against TB disease for at-risk neonates and children is the BCG vaccination. Several studies have shown consistently high protective efficacy of BCG vaccine against serious forms of disease in children (73-77%), however, there is low efficacy against pulmonary TB in adults.[27,28] Other preventive strategies include; identifying and treating latent infection before these individuals develop active disease, early identification and treatment of active TB disease, and monitoring of compliance with TB treatment with measures in place to support those who are non-compliant.

One method of monitoring the effectiveness of TB prevention and control is through disease surveillance.

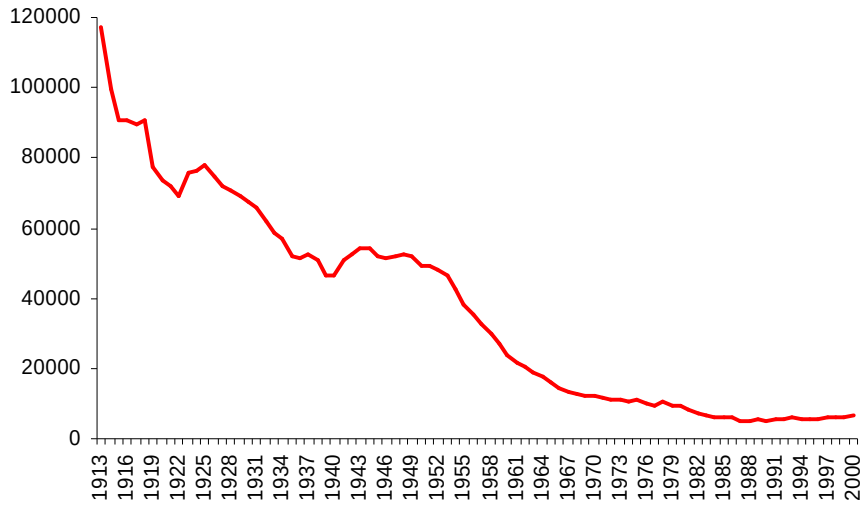
2.2 Surveillance of TB and its impact on TB control

Public health surveillance is defined as the ongoing, systematic collection, analysis and interpretation of health related data for the purpose of preventing or controlling disease, thus improving the public's health.[29] A public health surveillance system requires development of a system that can be used for collection and analysis of data that is relevant for the disease of interest. This data is then interpreted so that the information can be disseminated and acted upon to continue to improve the health of the population.[30] Any public health surveillance system should be robust enough to adapt to the changing environment. For example, rapidly changing technology allows most surveillance systems to be paperless. Also, time constraints mean that surveillance systems have to be easy to use when inputting, obtaining, analysing and interpreting data.

For diseases such as TB, surveillance forms the foundation blocks for prevention and control of disease within the population.

A clinical diagnosis of TB became statutory notifiable in 1913 in England which means that surveillance data on TB has been available for nearly 100 years. The data indicates that nearly 120,000 cases were reported in England and Wales in the early 1900s (figure 1). Improvements in public health e.g. improved sanitation and housing, led to a rapid decline in cases during the inter-war period.[31] However, notifications remained high right through to the 1950s (figure 1). Prior to this, some European countries had introduced programmes to vaccinate children with BCG, which had led to a reduction in TB infection rates.[32] As a result, a programme to vaccinate school children with BCG was introduced in the UK in 1953.[2] This was a contributory factor to the decline in TB cases that occurred during this period of time (figure 1).

Figure 1 Number of notifications for TB in England and Wales: 1913-2000



Source: Statutory Notifications to the Communicable Disease Surveillance Centre

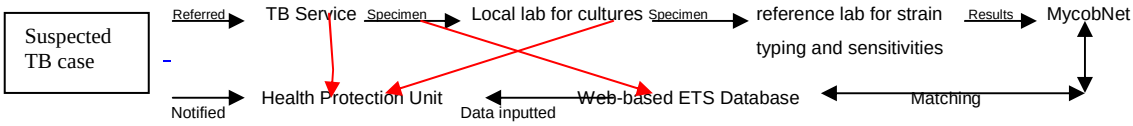
Despite successful collection of data from statutory notifications, it was difficult to monitor trends in sub-groups of the population therefore the data had limited use. This led to the formation of a national TB survey, which was introduced in 1965.[33] In later years, this survey collected additional data such as information on ethnicity. However, it was carried out on a sample of the population, which made it difficult to draw conclusions from the findings to apply to the whole population. In addition to this, the survey was carried out every 5 years therefore it became easily out of date and therefore could not reflect the effects of extensive changes in the population demographics during the 1960s and 1970s.

As well as changes in data collection for TB cases, the 1960s and 70s brought the pasteurisation of milk (raw milk was linked to a particular type of TB known as bovine TB),

introduction of effective drug treatments for TB, early detection of TB through mass chest x-ray programmes and contact tracing.[5] Since then, cases began to fall sharply with the lowest reported rates seen in 1987 (Figure 1). However, TB surveillance showed that the reduction was mainly within the indigenous population as opposed to the immigrants who had been arriving from high-incidence countries since the 1960s.[2] As a result, the BCG immunisation programme was adapted to include a selective neonatal BCG programme for infants born in the UK to parents from high TB incidence countries. This involved vaccinating the babies shortly after birth.[2]

The following 2 decades brought about further changes. Reported cases of TB began to increase again, with cases exceeding 9,000 in the UK in 2009 – almost double that from the 1980s.[34,35] In 1994, a system to monitor TB drug resistance in the UK was produced called *Mycobacterial Surveillance Network* (*MycobNet*) which was followed by the introduction of the *Enhanced Tuberculosis Surveillance* (ETS) database which was introduced in 1999 and required clinicians to provide detailed information on TB cases, on case report forms which were collated by the Health Protection Agency.[33] This provided more detailed information on the epidemiology of TB, particularly within at-risk subgroups at local, regional and national level, and was linked to MycobNet to provide more in-depth information on drug resistance. In 2008/09, the system became web-based to allow real-time reporting and therefore provide information that was as up-to-date, accurate and complete as possible[33] (figure 2).

Figure 2 **TB Surveillance Data Flow**



As a result of the new surveillance system, it became evident that the resurgence of TB in the UK was partly due to changes in the population demographics, namely migration and lifestyle factors e.g. alcohol misuse, drug misuse and homelessness. However, TB rates in the indigenous population remained stable which contributed to the decision to terminate the school BCG programme in 2005[2] and enhancement of the selective neonatal BCG programme, whereby BCG vaccination was offered to neonates falling under the at-risk group.[2]

Outcome surveillance information from the surveillance system has been available since 2000 meaning that information is available on the outcomes of TB cases to enable evaluation of TB services.

Although the surveillance system has multiple benefits as mentioned above, it does not collect data on contacts of TB cases. These are important components of TB management.

For example, without knowing the contacts of TB cases, it is difficult to identify the burden of contact tracing on the local TB service and it also makes it difficult to identify the number of contacts who later go on to develop TB disease. Changes are being proposed to include collect data on data through the contact tracing module of ETS

At present, local discussions are underway to introduce a new case management system (*TB First*) that will also include information on; clinical activity related to TB, screening of at-risk individuals and contacts of cases. It is hoped that this will help in improving the problems with the existing surveillance database by bringing all the information together onto one web-based database. TB First will provide a local cases management system and will have facility to record contact follow up information.

2.3 Summary

TB is a preventable infectious disease that can lead to significant morbidity and mortality if left untreated. Risk factors for TB indicate it is linked to increasing health inequalities, which is exacerbated by delayed presentation to health services by at-risk groups due to the stigma surrounding the disease, and due to a highly mobile at-risk population.

Despite availability of an effective vaccine to prevent TB in children and highly effective treatment with antibiotics for those with active disease, as well as a robust surveillance system that has clearly identified at-risk groups within the national population, TB control in the UK has not been maintained at the low levels that occurred during the 1980s.

The next chapter of this report explores how TB became a global public health priority and how it led to policies and strategies being implemented to try and tackle the burden of this disease.

SECTION THREE

BACKGROUND

3.1 Global Threat and Response

A report on TB control identified that globally, 3 million deaths and 8 million new cases of TB continued to occur during the late 1980s.[36] In addition, the report recognised that the existing strategy for tuberculosis control was beginning to lose its effectiveness in industrialised countries where the initial decline in TB incidence had either slowed or reversed. Also, the HIV/AIDS pandemic during this period led to a rapid increase in TB cases in developing countries, which needed urgent action.[36] As a result of these findings, global efforts to control TB were revitalised in 1991, when a World Health assembly resolution[36] recognised TB as a major global public health problem. This led to an international control strategy being launched in 1994,[37] which recognised the need for government commitment, improved case detection, standardised treatment under proper conditions, and the need for a monitoring and evaluation system. This strategy was adopted by a growing number of countries worldwide and helped to improve their TB control programmes and ultimately reduce incidence and mortality related to TB disease.

In 2001, the Stop TB partnership launched the *Global Plan to Stop TB*[38] which set out actions that were needed for TB control and was followed by two advanced plans launched in 2006 (*Global Plan to Stop TB 2006-2015*)[39] and 2010 (*Global Plan to Stop TB 2011-2015*)[18] to dramatically reduce the global burden of TB and support achievement of the Millennium Development Goals related to TB. The target was to halve TB rates by 2015 compared to 1990 levels and to eliminate TB by 2050 (<1 case of TB per 1 million population per year), however, despite a falling trend, current rates of progress are insufficient and therefore this target is unlikely to be achieved globally.[18] As a result, WHO launched the *Stop TB Strategy*[40] to enhance the global plans and support achievement of the Millennium Development goals with the overall vision of a world free of TB.

3.2 National Threat and Response

As well as being a global burden, TB was recognised as becoming a major concern in England. In 2004, the Chief Medical Officer (CMO) published an action plan to stop TB in England,[5] which set out steps to reverse the rise in TB through coordinated action of the Government, health services and local communities. The action plan also set out targets to reduce TB in the population (figure 3).

Figure 3 Targets from the CMO TB action plan

- A progressive decline of at least 2% per year in rates of TB in population groups born in England
- A reduction in the incidence of disease among people who entered the country and became resident within the previous 5 years
- No more than 7% of new cases resistant to isoniazid and 2% of new cases with MDR-TB
- All patients with suspected pulmonary TB to be seen by the TB team within 2 weeks of first presentation to healthcare
- At least 65% of patients with pulmonary TB have the diagnosis confirmed by laboratory culture
- All patients diagnosed with TB have the outcome of their treatment recorded, and at least 85% successfully complete their treatment.

Source: Stopping Tuberculosis in England: An Action Plan from the Chief Medical Officer, Department of Health (2004)

Following this, in 2006, the National Institute for Health and Clinical Excellence (NICE) published guidelines[41] with the aim of helping identify, prevent and treat people with TB. These were revised in 2011.[17] The guidelines included key priorities for implementation, which involved management of active TB as well as wider aspects of TB care, such as; improving adherence to treatment, new entrant screening and BCG vaccination (figure 4).

Figure 4 Key priorities from NICE guidance for TB

- All patients should have a risk assessment for adherence to treatment, and directly observed therapy should be considered for patients who have adverse risk factors in particular;
    - Street or shelter-dwelling homeless people
    - Patients with likely poor adherence or history of non-adherence
- All patients should be informed of who their named key worker is
- Healthcare professionals responsible for screening new entrants should maintain a coordinated programme to detect active and latent TB and commence treatment, and provide BCG vaccination to those who are eligible
- Active case finding should be carried out among street homeless people by chest x-ray screening on an opportunistic and/or symptomatic basis
- Primary care organisations with a high incidence of TB (≥ 40 cases per 100,000 people per year) should consider vaccinating all neonates soon after birth
- In all other primary care organisations, BCG vaccination should be offered to at-risk neonates:
    - Born in an area with a high incidence of TB
    - Have one or more parent or grandparent born in a high incidence country
    - Have a family history of TB in the past 5 years
- Healthcare professionals should opportunistically identify and vaccinate unvaccinated children older than 4 weeks and younger than 16 years, who would have qualified for neonatal BCG and are Mantoux negative

Source: NICE clinical guideline 117. Clinical Diagnosis and management of tuberculosis, and measures for its prevention and control (2011)

Although the guidelines covered several domains of TB care, it and the CMO TB action plan did not recommend how services should be configured, nor did they provide funding to implement any changes. So in 2007, the Department of Health developed a toolkit[7] that provided a framework for commissioners of TB services in assessing local needs and for commissioning high-quality services to help implement the recommendations from the TB action plan and NICE guidance. As with the TB action plan, the commissioning toolkit set standards (figure 5) with the overall aim of improving TB management.

Figure 5 Recommendations from the TB commissioning toolkit

- To secure high-quality services, commissioners need to consider their local TB incidence and population demography and potential changes to that demography, in order to plan TB services.
- Every PCT should have a named TB lead
- All TB services should have a lead clinician with overall responsibility for the diagnosis and possible treatment of TB
- TB should be diagnosed and managed by experienced specialists. While primary care clinicians may suspect a diagnosis of TB, a formal diagnosis (including treatment and care plans) is best made by specialist service providers.
- A named key worker for each patient should be appointed
- TB service providers should aim to improve awareness of TB among the public, the professions and local authority agencies.
- At least 95% of reported cases should include completed data for key variables (name, DOB, sex, ethnic group, born/not born in UK, postcode, date of notification, previous TB treatment, site of disease, sputum smear status (if pulmonary only))
- Outcome of treatment should be reported on at least 95% of all cases reported

Source: Tuberculosis prevention and treatment: a toolkit for planning, commissioning and delivering high-quality services in England. Department of Health (2007)

However, since the publication of these reports, plans for major reconfiguration of NHS services have been put into place by the Coalition Government, including the abolition of Primary Care Trusts and the movement of public health responsibilities to the Local Authority and Public Health England. The field of commissioning is also undergoing major changes as general practitioner groups are being given greater control over this area via the formation of Clinical Commissioning Groups (CCGs). The concerns surrounding these new changes are that TB management may not necessarily be deemed a priority and that TB services will become fragmented if different CCGs within one district attempt to tackle the burden of TB in different ways.[42] Also, it could lead to insufficient funding being allocated to management of outbreaks and drug resistant TB as these require cross boundary working. This indicates that extra efforts are necessary to ensure that the introduction of new healthcare providers strengthens, rather than inhibits joined up services for TB control.

In respect of TB, a key aspect of the reforms is that the Department of Health has published the *Public Health Outcomes Framework*[43] which sets out desired outcomes for public health in the new and reformed system, with the overall aim of increasing healthy life expectancy and reducing the differences in life expectancy and healthy life expectancy between communities. The outcomes framework recognises the importance of vaccination coverage in communicable disease prevention and has therefore included an indicator targeted at BCG

vaccination for at-risk children aged 1-16 years. The outcomes framework also recognises that timely treatment for tuberculosis is key to saving lives, preventing long-term ill health, reducing the number of new infections and preventing drug resistance. It has therefore included an indicator specifically on treatment completion for tuberculosis.

Although this is a step forward in prioritising the control of TB disease, the first indicator on vaccine coverage does not include neonates, and neither of the indicators (unlike the TB commissioning toolkit and the CMO TB action plan) includes a target level that is deemed as achieving the proposed indicator.

More recently, NICE has published guidance on improving the way tuberculosis is identified and managed among hard-to-reach-groups.[44] As the guidance was published this year, it incorporates the new NHS and public health structures, which makes it more applicable to the current situation. Also, although the main focus of this guidance is aimed at hard-to-reach groups, which includes, those who are homeless, substance misusers, prisoners and vulnerable migrants, the guidance also includes overarching recommendations for TB services. One of these is ensuring adequate numbers of specialised staff to manage TB cases. The guidance recommends one whole time equivalent (WTE) case manager (usually a TB nurse) for every 40 TB cases that require standard treatment.[44]

3.3 Summary

Over the decades, several strategies have been published to provide guidance to strengthen existing TB services with the aim of reducing the incidence of TB and with a long-term goal of creating a world free of TB.

This report explores whether Bradford & Airedale is meeting the specified targets and requirements set by these strategies, by undertaking a health needs assessment.

SECTION FOUR

HEALTH NEEDS ASSESSMENT

This element of the report describes what a health needs assessment is in a general context and how it will be used to analyse the burden of TB as well as in describing existing TB services for the population of Bradford & Airedale.

4.1 What is a health needs assessment?

Health needs assessment (HNA) is a systematic process, which reviews the health issues affecting a population. The process aims to improve health, and reduce health inequalities, by identifying local priorities for change and then planning the actions needed to make these changes happen.[45]

The aim of the government's health inequalities strategy is to narrow the gap between different social and economic groups and areas. HNA is a vital tool in helping meet this objective through targeting populations most in need of improved support and services.[47]

4.2 Types of health needs assessment

There are several types of health needs assessment that can be undertaken. The 3 most common types are described below.

The first type is an epidemiological needs assessment which incorporates 3 core elements known as the 'triangle of health needs assessment' (figure 6).[46]

The first element of an epidemiological needs assessment involves identifying the size of the problem and the pattern of the disease being studied in the population under investigation. This is done through analysis of data to obtain incidence, prevalence and distribution information. Incidence is the number of <u>new</u> cases of disease that have occurred in a particular time period (usually a year) divided by the total population at risk of developing the disease in that time period. Prevalence is the number of <u>existing</u> cases with the disease of interest during a particular time period (usually a year), divided by the total population at risk (figure 7). Distribution of disease describes the subgroups of the population who are affected the most, for example age groups, gender, ethnicity and deprivation.

Figure 6 The triangle of epidemiological needs assessment

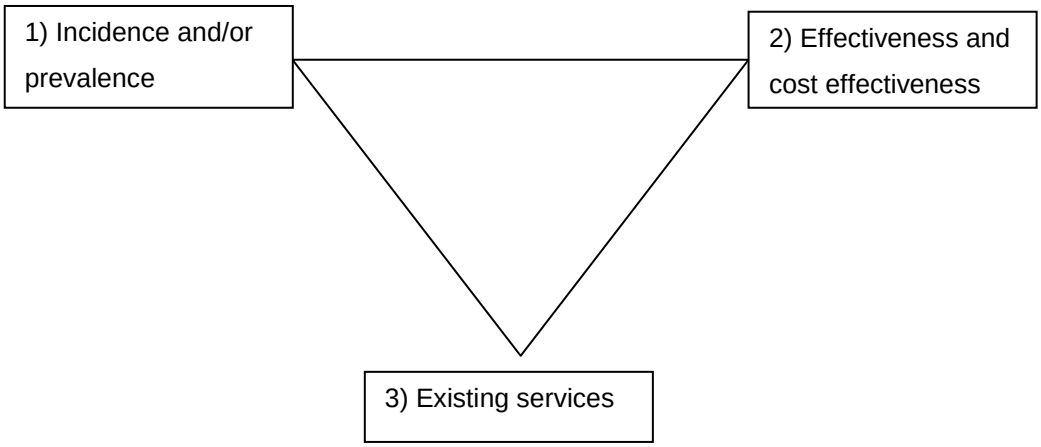


Figure 7 Calculation of incidence and prevalence

Incidence = $\frac{\text{number of new episodes of disease occurring}}{\text{Total population at risk}}$

Prevalence = $\frac{\text{number of people with the disease during a selected period of time}}{\text{Total population at risk}}$

The second element of an epidemiological needs assessment is the identification of effectiveness and cost effectiveness of interventions/services, in other words, identification of interventions/services that work, are affordable and would also address the local health situation. The final element of an epidemiological needs assessment is identification of all the current services available for the disease being investigated, which includes primary care, secondary care and voluntary sector services. In order to make changes for the better, knowledge of existing services is important to identify which services need to be changed and what resources are required to make the changes happen.

The second type of health needs assessment is a corporate needs assessment, which involves the systematic collection of knowledge and views of informants, on healthcare services and needs.[48] Informants can include; health professionals, commissioning managers, voluntary organisations, local authority colleagues, patients and the public, and information is obtained through surveys, interviews and focus groups. This type of needs assessment is extremely useful in obtaining detailed knowledge of parties who are involved with the disease/service of interest (stakeholders), particularly relating to local knowledge. This can also strengthen engagement of stakeholders through local ownership, when changes are

implemented. However, vested interests may bias the information provided by stakeholders, therefore this has to be borne in mind when interpreting responses.

The third type of health needs assessment is a comparative needs assessment, which compares the services available to a population in the area under investigation with those available in another area.[48] This highlights differences between services in both areas, which can be explored further to identify best or effective practices that can be utilised in the area under investigation. However, for this to work effectively, the areas being compared have to be similar in their population structure and size as this roughly equates to similar needs and demands.

4.3 Applying a health needs assessment approach to TB in Bradford district

The epidemiological approach to needs assessment was carried out for B&A using the Enhanced TB Surveillance database (ETS), which provides a wealth of information on incidence and distribution of TB disease amongst sub-groups, as well as information on effectiveness of TB services. In addition to this, knowledge of existing services was obtained through discussions with stakeholders.

The corporate approach to needs assessment was also carried out in Bradford district through interviews with key stakeholders. Although this was limited due to time constraints, there was still some opportunity to interview a variety of individuals which included; a Consultant in Public Health, a TB nurse, a Consultant in Infectious Diseases, 2 Consultants in Communicable Disease Control, a General Manager for Medicine within the acute trust, a member of the Finance and Procurement team within the PCT, a project manager for *TB First* and members of the Homeless and New Arrivals Team who undertake TB screening for new entrants.

The comparative approach to needs assessment was not carried out due to time constraints and limited resource availability.

By combining the findings from the types of health needs assessment carried out in Bradford district, it is hoped that this will identify the action that needs to be taken and the steps required to achieve the changes necessary.

The next two chapters in this report involve applying the two types of health needs assessment to TB care and services for the population of Bradford & Airedale.

SECTION 5

EPIDEMIOLOGICAL NEEDS ASSESSMENT FOR TB IN BRADFORD & AIREDALE

5.1 Introduction

Tuberculosis (TB) is the second most common cause of death from infectious disease worldwide, after HIV.[49]

WHO estimates that despite a falling trend in TB cases and deaths globally, more than 9 million people worldwide still develop active TB with almost 2 million deaths attributable to TB each year,[18] which makes it one of the greatest infectious disease challenges in the world. WHO also estimates that 1/3 of the world's population have latent TB infection.[18] These individuals have the potential to develop active disease which could be transmittable. Furthermore, 85% of global cases occur in Africa and Asia.[18] This is of importance to Bradford district as it receives a large number of new entrants from these continents, and its population consists of a large Black and Minority Ethnic (BME) population predominantly from South Asia who frequently travel to countries with a high incidence of TB.

In Europe, it is estimated that there are 49 TB cases diagnosed per hour and there are 7 TB related deaths every hour,[50] indicating that TB disease is far from under control and that it is not just a disease affecting developing countries.

It is also reported that parts of the UK are now experiencing TB rates above 40/100,000 population per year, which puts these areas on par with some developing countries.[7] This resurgence of TB in the UK is linked to changing epidemiology. TB disease once affected the whole population but now occurs predominantly in specific subgroups of the population, including; those with links to high incidence areas of the world such as sub-Saharan Africa and the Indian subcontinent, and those with social risk factors such as homelessness, alcohol misuse, drug misuse and history of imprisonment.[2] The population of Bradford district differs somewhat from the national population which could impact on the level of TB disease it experiences. The differences are explored later in this report.

5.2 Methods

5.2.1 Data Sources

The principle data source was the Enhanced Tuberculosis Surveillance Database (ETS), a national surveillance database. Every suspected case of TB in B&A is notified to the TB team by the responsible clinician. A member of the administrative staff within this team completes a paper notification form using the details provided by the clinician suspecting the diagnosis. The form is then sent to the local health protection unit who input the details onto the web based ETS database. When a suspected case is later confirmed through microbiological or pathological investigation, the results are also sent to the HPU. This provides extra assurance that all cases of TB are notified and placed on the database. In addition to this, if laboratory investigation reveals that a suspected case does not have TB, these cases are denotified.

The ETS database contains notification information as well as demographic, clinical, microbiological and outcome information, for all TB cases notified to the B&A TB service and therefore provides the most comprehensive, accurate and recent TB data that is available.

The B&A TB team also have handwritten notes regarding clinical follow-up of TB cases and contacts. However, these notes were not used as the majority of information that was required from the case notes was available on the ETS database which was more accessible. Although this limited collection of information on contacts, the average number of contacts per case was provided by the TB team which was sufficient for this report.

TB screening for new entrants and asylum seekers is recorded on the ETS database and the team who work with this group (Homeless and New Arrivals Health Team) have their own databases. Referrals for asylum seekers are received through the Home Office portal and the two main dispersal centres which are located in Barnsley and Huddersfield. This database does not hold data on outcomes of screening i.e. the number of screened individuals who were diagnosed with active or latent TB following entry into the UK, however, it is able to provide information on the number of individuals screened and the number of individuals who did not attend their appointment. The number of individuals referred to the hospital for further investigation for suspected TB Is collected by hand and kept as a paper file.

5.2.2 Analyses undertaken

The first aspect that was analysed was the demographic of the population of Bradford and Airedale. This was done to provide baseline information on the population and compare it with that of the region and of England. This was important as any differences in demographics may impact on TB incidence.

Following this, the ETS database was used to undertake the following analyses for Bradford district:

1. Overall numbers of TB cases and rate of TB per 100,000 population per year. This was undertaken to identify the trend over time. Also, NICE guidance[17] indicates that PCTs with a TB incidence ≥ 40/100,000 population per year should consider vaccinating all neonates with BCG shortly after birth. This analysis will help in determining whether NHS Bradford & Airedale falls under the category of a high incidence PCT and whether the guidance is being adhered to.

2. TB cases/rate by subgroups:
    A. TB rate by age-group. Evidence shows that TB mostly affects young adults in their most productive years[3] and that young children are more susceptible to TB infection from someone who already has TB disease, and the elderly are at greatest risk of reactivation of TB disease[4]. This analysis will help to identify the groups that are at greatest risk in Bradford district and subsequently support future decision making regarding TB service provision.
    B. TB rate by gender and age-group. The incidence of TB may differ between males and females within the same age group. This analysis will determine whether this is true for Bradford district and whether the results are significantly different to warrant changes in service delivery.
    C. TB cases by deprivation. TB has been classically associated with poverty[4,51], which also impacts on health inequalities. Bradford contains some of the most deprived areas in England and this may impact on TB incidence in the area.
    D. TB rate by ethnicity. The majority of TB cases occur in those from ethnic minorities, predominantly those from South Asia and sub-Saharan Africa.[5,6] As Bradford district is made up of an ethnically diverse population, this may impact on TB incidence in the area.
    E. TB cases by place of birth. TB is more common in those born outside of the UK, particularly those who have emigrated from countries with a high incidence of TB.[5,6] As Bradford district experiences a large influx of new entrants every year, this may impact on TB incidence. Also, the CMO TB action plan[5] states that there should be a decline of 2% per year in rates of

TB in population groups born in England, therefore it is important to ascertain whether B&A is achieving this target.

F. TB cases by time since entry into UK (for those not born in the UK). Traditionally, the focus of screening programmes for new entrants has been on detection of active TB, with very little emphasis placed on detecting latent TB. As a result, new entrants with latent infection are placed at risk of developing active TB months or years after being initially infected (infection is likely to have occurred in their country of origin)[11,12,13]. The CMO TB action plan[5] states that there should be a reduction in TB incidence among people entering and residing in the UK within the previous 5 years. This analysis will help determine whether Bradford district is achieving this target.

G. TB cases by social risk factors. Poverty, malnutrition, overcrowding and poor housing encourage the spread of TB.[4] NICE guidance[17] states that all patients with a suspected diagnosis of TB should have a risk assessment for adherence to treatment and that directly observed therapy (DOT) should be considered for patients who have adverse risk factors (homeless individuals and patients with likely poor adherence or history of non-adherence), in order to improve compliance and completion of treatment. Although the TB service in B&A does not offer DOT to its patients, it is important to ascertain the number of patients who may benefit from DOT to help shape future services.

H. TB cases by primary site of infection and microbiological confirmation. Pulmonary TB is the most common and most infectious type of TB,[1,2] therefore it is linked to increased risk of spread of disease. It is therefore imperative to undertake microbiological testing to confirm pulmonary TB to enable appropriate action to be taken to prevent spread of disease and to also detect drug resistance so that appropriate treatment can be prescribed. The CMO TB action plan[5] states that at least 65% of patients with pulmonary TB should have their diagnosis confirmed microbiologically. This analysis will identify whether Bradford district is achieving this target.

3. Measures of effectiveness of the B&A TB service

A. TB Notification rate

B. Time between first presentation to healthcare and being seen by a TB specialist. The CMO TB action plan[5] states that individuals with suspected pulmonary TB should be seen by a TB specialist within 2 weeks of presentation to healthcare. As pulmonary TB is the main type that leads to spread of disease, it is important that these individuals are diagnosed and treated early to prevent transmission of disease to others.

C. Proportion of cases with their outcome recorded and proportion of cases who successfully completed treatment. Individuals with TB disease have the

potential to spread infection if they are not fully compliant with medication. There is also a risk of drug resistance which is costly and more difficult to treat,[7] therefore it is imperative that all cases have their outcome recorded. Also, the CMO TB action plan[5] provides a target of at least 85% successfully completing treatment, therefore it is important to identify whether Bradford district is achieving this.

D. Number of contacts identified and screened per TB case.
E. Immigrant/new entrant/asylum seeker/university students screening, attendance and follow-up numbers.
F. Proportion of children/neonates eligible for BCG vaccine who actually receive the vaccine. Studies have shown that BCG vaccination is highly effective in protecting children against serious forms of TB disease.[27,28] In addition, NICE guidance[17] states that BCG should be offered to <u>at-risk</u> neonates and children in PCTs where the incidence of TB is below 40/100,000 population per year, and to <u>all</u> neonates in PCTs where the incidence is ≥ 40/100,000. It is therefore important to ascertain which category B&A falls under and whether high vaccination coverage for eligible individuals is being achieved.
G. Proportion of cases with data fields completed on ETS for key variables (name, DOB, gender, ethnic group, place of birth status, postcode, date of notification, previous TB treatment, site of disease and sputum smear status). Surveillance systems for TB have been in existence for decades with improvements that have led to the current database (ETS) being produced. This aims to provide up-to-date, accurate and complete information. However, a database is only as good as the data that is inputted on to it. If the data fields are incomplete, analysis is inaccurate and this could under- or over-estimate the burden of TB disease in sub-groups of the population which could make service delivery and resource allocation difficult. The TB commissioning toolkit[7] states that at least 95% of reported cases should have the key data fields (as mentioned above) completed on ETS. This analysis will determine whether Bradford district is achieving this target.
H. Time from onset of symptoms to first diagnosis
I. Onset to first presentation
J. First presentation to diagnosis
K. Outcome recorded
L. %Culture confirmed
M. Treatment completion- most important measure
N. Service quality

5.2.3 Time period of study

The previous TB report produced for Bradford & Airedale analysed data from 2001 to 2003, therefore, this data is already in existence and does not require repeat analysis. For this report, it was decided to use data on TB cases from 2005 to 2011. The reason for this was that analysis of subgroup level data for B&A for each year would produce small numbers which would be difficult to interpret, therefore for certain subgroups, data was grouped over several years to improve accuracy of the interpretation of the results. Also, part of this report was to look at TB trends over time therefore several years of data would be required to do this. However, it was recognised that sufficient epidemiological data could be obtained without having to go back too many years, and that resources and time were limited therefore 2005 was chosen as the earliest year. Also, 2011 was selected as the latest year as data for this year up to the end of the financial period was available. However, as data was not available for the remainder of 2011 at the time that this report was produced, 2010 was chosen as the cut-off year for analyses that required a full year's data.

5.2.4 Case selection

Cases were defined as a 'notified case of TB residing in a postcode that is covered by the B&A TB service and NHS Bradford & Airedale, and that was not subsequently denotified'

5.2.5 Denominator population

Population numbers were obtained from the West Yorkshire Observatory[52] and from the Office for National Statistics (ONS).[53] For calculations of proportions, the denominator figure was the total number of cases on the ETS database that had the information under investigation recorded.

For comparative analysis with Yorkshire and The Humber, TB data was obtained from the most recent Health Protection Agency (HPA) regional report[42] and for comparative analysis with England or the UK, TB data was obtained from the most recent national HPA reports.[1,35]

5.3 Results

5.3.1 Bradford & Airedale Demographic

Bradford district is composed of a population of approximately 515,000 people.[52] Table 1 shows the population breakdown by age group with regional and national comparisons.

Table 1 Comparison of population breakdown (%) by age-group for B&A, Y&H and England: 2010

	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
Bradford & Airedale	14.8%	13.0%	15.7%	13.3%	13.3%	11.1%	8.6%	6.3%	3.9%
Yorkshire & The Humber	11.5%	12.2%	15.1%	12.3%	14.4%	12.1%	10.7%	7.2%	4.5%
England	11.8%	12.0%	13.8%	13.2%	14.8%	12.0%	10.7%	7.1%	4.7%

Source: West Yorkshire Observatory

It is evident from the table that B&A has a younger age profile in comparison to the regional and national profiles, with almost 44% of B&A's population being under the age of 29, compared to 39% for Yorkshire and The Humber and 38% for England.

With respect to gender, Bradford & Airedale shares the same profile as Yorkshire and The Humber and England (table 2) in that it has a slightly higher proportion of females within its population compared to males.

Table 2 Comparison of gender proportions in the population for B&A, Y&H and England: 2010

	Males	Females
B&A	49.4%	50.7%
Yorkshire & The Humber	49.3%	50.7%
England	49.3%	50.6%

Source: West Yorkshire Observatory

Although the gender profile is similar to regional and national levels, there is a considerable difference in ethnic proportions when compared to regional and national levels (table 3). In 2001, about 20% (1 in 5) of B&A's population were from an ethnic minority group, compared with just under 10% (1 in 10) nationally and an even lower proportion regionally (7%). By 2009, B&A's ethnic minority population made up almost 25% of the whole population, compared to 12% for England and only 10% regionally. In addition to this, over half the ethnic population in Bradford & Airedale is made up of individuals from the Pakistani ethnic group who are known to be at greater risk of developing TB disease.

Table 3 – Comparison of ethnic group proportions (%) for B&A, Y&H and England: 2001 and 2009

Ethnic Categories*	2001			2009		
	B&A	Yorkshire and The Humber	England	B&A	Yorkshire and The Humber	England
White	78.3	93.5	90.9	74.7	89.6	87.5
Indian	2.7	1.0	2.1	3.1	1.8	2.7
Pakistani	14.5	2.9	1.4	13.4	3.3	1.9
Bangladeshi	1.1	0.2	0.6	2.4	0.6	0.7
Black-Caribbean	0.6	0.4	1.1	0.8	0.6	1.2
Black-African	0.2	0.2	1.0	1.1	0.8	1.5
Black-Other	0.1	0.1	0.2	0.1	0.1	0.2
Chinese	0.2	0.2	0.4	0.5	0.6	0.8
Mixed/Other	2.3	1.3	2.2	3.9	2.6	3.4

Source: West Yorkshire Observatory

* Ethnic categories have been grouped according to the categories used by the Enhanced TB Surveillance database

In addition to the above difference, Bradford & Airedale also has a higher proportion of people in its population who were born outside of the UK. In 2001, B&A's population was composed of almost 12% who were born outside the UK, compared to 9% of the national population and 5% of the regional population.[52] Again, evidence indicates that a larger proportion of TB cases

are born outside of the UK,[5] therefore placing Bradford & Airedale at a higher risk of having a higher TB burden if the condition isn't identified and treated early in this vulnerable group.

5.3.2 TB cases and incidence in Bradford & Airedale

. Despite this Bradford district continues to have the highest rate of TB in the region (table 4). In addition to this, the incidence of TB in B&A has increased by 20% over a period of 10 years (from 2000 to 2010) compared to only 8% for Yorkshire and the Humber. This suggests poor control of the disease for the population.

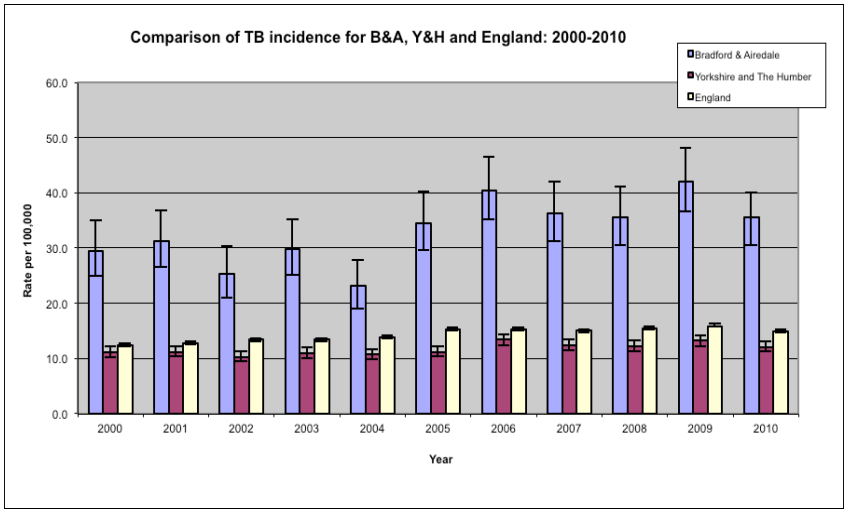
Table 4 TB incidence by PCTs within Yorkshire and The Humber: 2004 and 2010

PCT	Rate 2004 (per 100,000)	Rate 2010 (per 100,000)
Bradford and Airedale	23.1	35.5*
Kirklees	17.8	25.6
Sheffield	17.8	15.5
Leeds	15.6	14.9
Calderdale	9.7	12.4
Doncaster	6.2	7.9
Rotherham	11.1	7.9
Wakefield	8.5	7.1
Hull	5.5	6.9
North East Lincolnshire	0	4.5
North Lincolnshire	1.9	4.4
Barnsley	4.5	4.0
North Yorkshire and York	3.3	2.9
East Riding of Yorkshire	3.0	0.9

Source: Tuberculosis in Yorkshire and The Humber region 2010: Health Protection Agency (2011)
**Source: ETS Database*

Figure 8 shows that the rate of TB in Bradford & Airedale has remained significantly higher than regional and national rates since 2000. Another concerning factor is that the current incidence rate of TB in Bradford district (35.5 per 100,000) is nearly 3 times that of the regional rate (figure 8). Moreover, nearly 20% of TB cases notified in Yorkshire and the Humber were from Bradford district.[42]

Figure 8 Comparison of TB incidence for B&A, Y&H and England: 2000-2010



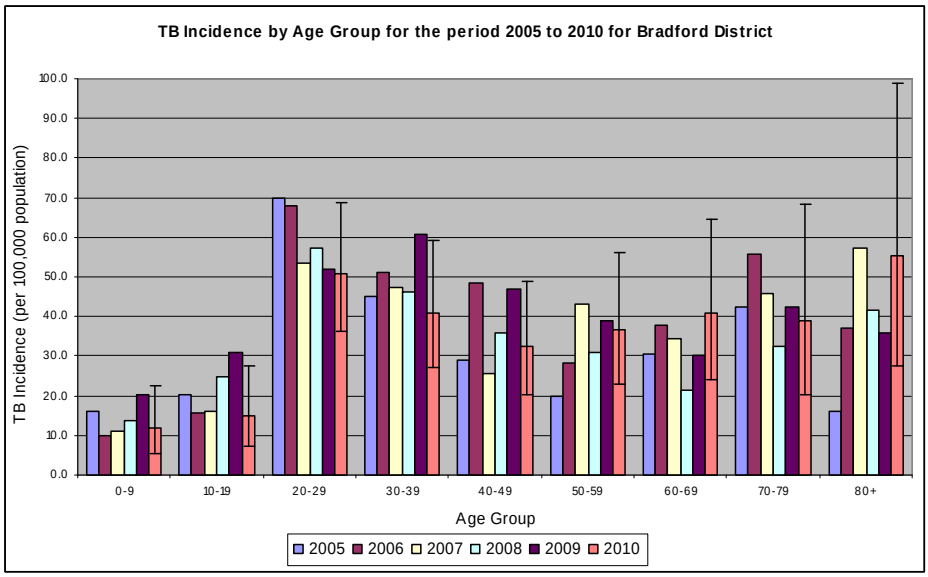
NICE guidance indicates that areas with a TB incidence ≥ 40/100,000 population per year should consider vaccinating all neonates with BCG shortly after birth. Figure 8 shows that B&A went above this threshold in 2006 and 2009. In addition to this, the 95% confidence intervals indicate that from 2005 onwards, the TB rate could have been higher than the threshold for consideration of universal BCG vaccination of neonates residing in B&A. At the time, it was decided not to introduce such a programme as after the peaks of 2006 and 2009, TB incidence fell sharply.

5.3.3 TB cases/incidence by sub-groups

5.3.3.1 AGE GROUP

National data indicates that TB incidence varies by age group.[1,35] Figure 9 displays TB incidence by age group for each year from 2005 to 2010 for Bradford District.

Figure 9 TB incidence by age-group: B&A, 2005-2010



Source: numerator - ETS, denominator - ONS Mid-year population estimates

It is clear from figure 9 that the highest incidence of TB in Bradford district is in the 20-39 age group. This is similar to national findings in that 40% of TB cases occurring in Bradford district in 2010 were aged between 20 to 39, and the proportion for the UK was almost 48% for the same age group in the same year (Figure 10). As a significant proportion of this age group are likely to be economically active or in higher education, they are generally a more active group of the population, therefore TB disease in this group is likely to lead to increased risk of transmission to non-infected individuals.

Another concern is that TB incidence in the 0-19 age group is increasing. This could be due to a failure in achieving adequate uptake of BCG vaccination among at-risk children,

Figure 10 **Comparison of the proportion of TB cases by age group for B&A and the UK: 2010**

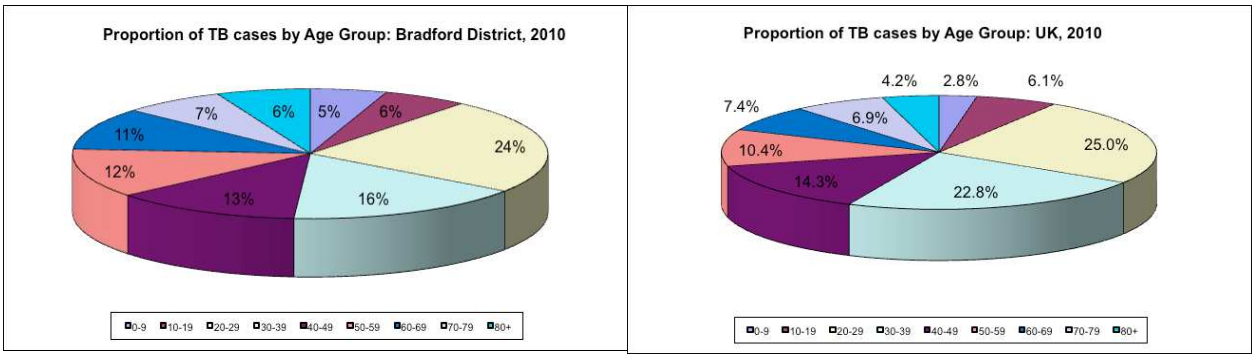
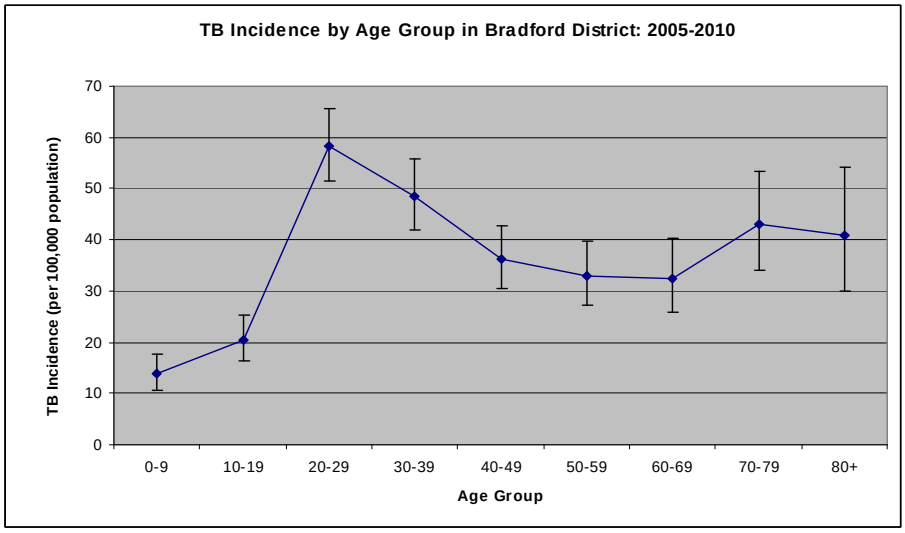


Figure 9 also shows that TB incidence is high in the 70+ age group. However, the confidence intervals are wide due to the small number of TB cases occurring in this subgroup of the population of Bradford district, therefore it is difficult to interpret this result based on individual years. Instead, by combining the number of TB cases for each age group from 2005 to 2010, a more accurate picture of TB incidence for each age group can be determined. This is displayed in figure 11, which confirms that the highest incidence of TB is in the 20-39 age group, and that the incidence of TB in the 70+ group is not significantly different from the other adult age groups.

Figure 11 **TB incidence by age-group: B&A, 2005-2010**



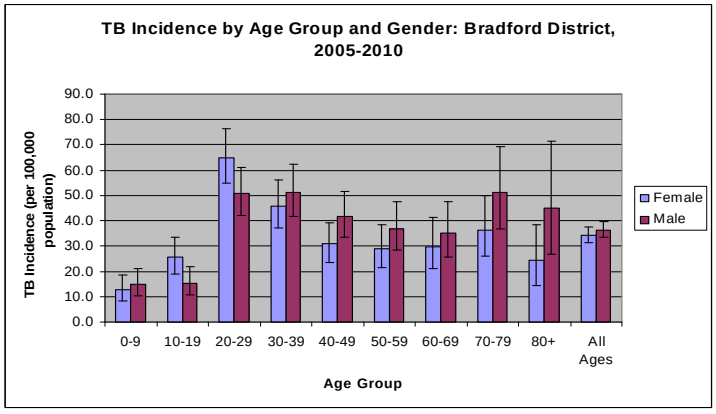
Source: numerator – ETS, denominator – West Yorkshire Observatory

5.3.3.2 GENDER AND AGE GROUP

National and regional data indicate that in 2010, males made up a higher proportion of TB cases than females (57% in the UK[35], 53% in Yorkshire and The Humber[42]). B&A shares a similar proportion to national levels in that 56% of TB cases in 2010 were male.

Figure 12 displays more detailed analysis of TB incidence by gender by exploring differences in TB incidence for each age group.

Figure 12 TB incidence by age-group and gender: B&A, 2005-2010



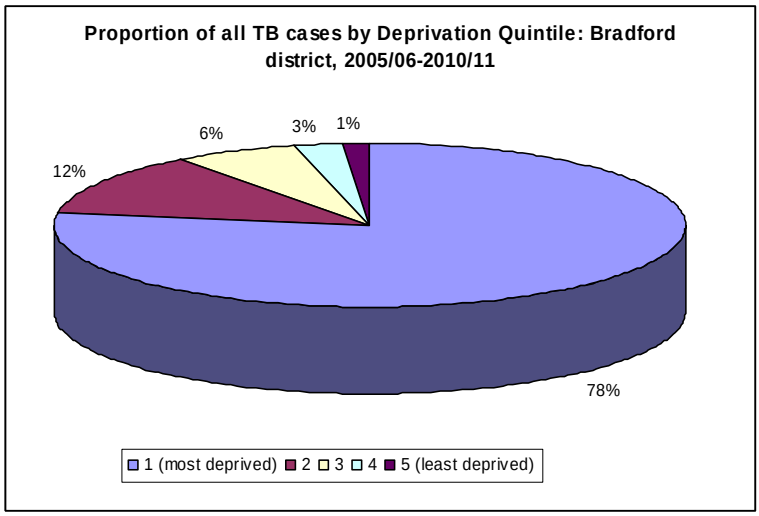
Source: numerator – ETS, denominator – West Yorkshire Observatory

This graph shows that TB incidence is higher in females compared to males for the younger age groups (10-29 years) but the reverse is true for the older age groups (30+).

5.3.3.3 DEPRIVATION

Spread of TB disease has been linked to poor housing, overcrowded accommodation, poor sanitation, and poor nutrition, which are all linked with deprivation. Also, the recently published *Public Health Outcomes Framework*[43] sets out a goal to reduce the differences in life expectancy and healthy life expectancy between communities. Figure 13 shows that 90% of TB cases notified between 2005/06 and 2010/11 for the population of B&A were from the two most deprived quintiles, compared to only 4% from the two least deprived areas. This is a significant difference and indicates a link between TB disease and deprivation. However, these results have to be interpreted with caution as it is well known that a greater proportion of ethnic minorities live in deprived areas and ethnicity is a risk factor for TB disease therefore it could be a confounder. In addition, a greater proportion of the population of B&A (over 60%) live in the 2 most deprived quintiles,[54] therefore one would expect a greater proportion of TB cases in this group too.

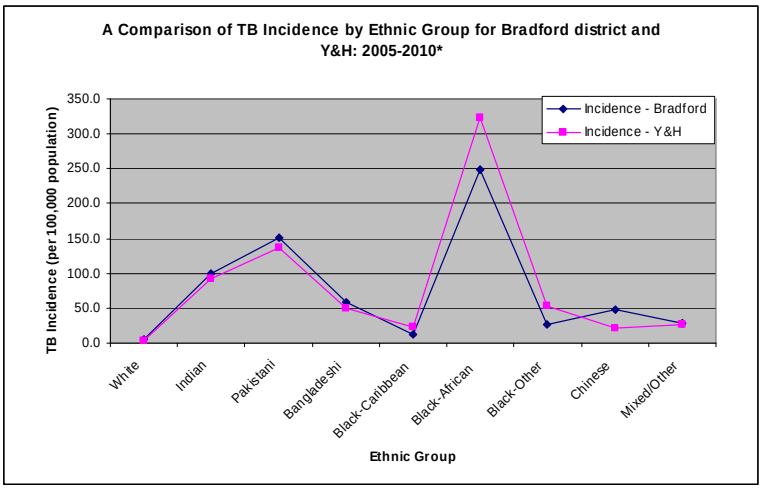
Figure 13 Proportion of TB cases by deprivation quintile: B&A, 2005/06-2010/11



5.3.3.4 ETHNICITY

Research has shown that certain ethnic groups have a higher incidence of TB[5,6]. Figure 14 shows that the highest TB incidence within Bradford district and the region is in the Black African ethnic group, followed by the Pakistani and Indian ethnic groups. In addition to this, the Pakistani ethnic group make up the largest proportion of TB cases for both B&A and the region, with nearly 2/3rds of all TB cases in B&A occurring in this ethnic group (figure 15). In Bradford district, more than half the ethnic population is composed of the Pakistani ethnic group with numbers predicting to rise further in the future. This could lead to an increase in TB cases if action is not taken to try and reduce the current levels.

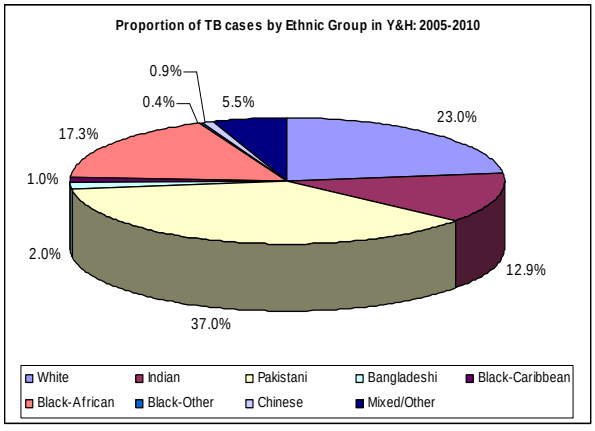
Figure 14 Comparison of TB incidence by ethnic group for B&A and Y&H: 2005-2010

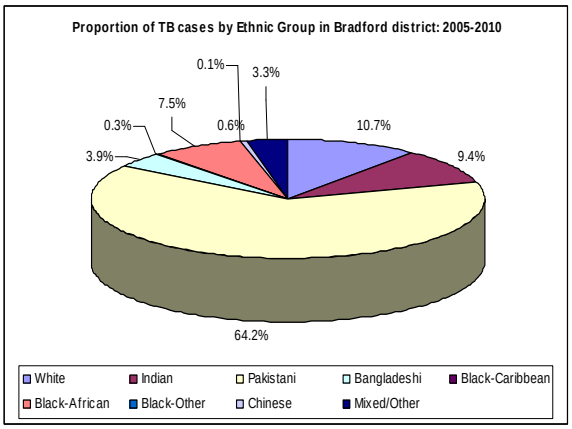


*2005-2009 for Y&H data

Source (denominator): ONS

Figure 15 Comparison of the proportion of TB cases by ethnic group for B&A and Y&H: 2005-2010





5.3.3.5 PLACE OF BIRTH

TB incidence varies profoundly between countries, with rates as high as 900-1,000/100,000 reported in countries such as South Africa and Swaziland.[55] Individuals entering the UK from countries such as these are more likely to have latent TB infection and therefore likely to develop TB months or years after the initial infection, by which time, these individuals are residing in the UK. Studies have shown that 5% of individuals with latent infection develop active TB disease within 5 years of infection.[12,13] As Bradford district experiences a large influx of immigrants into the district, this is likely to impact on its TB incidence.

Table 5 shows that Bradford district continues to have a significantly higher proportion of TB cases born outside the UK compared with those born in the UK, with the most recent figure being 72%. This is much higher than the regional proportion of 64%.[42]

Table 5 Proportion of TB cases occurring in B&A by place of birth (UK born/non-UK born): 2005-1010

Year	Place of Birth	
	UK born	Non-UK born
2005	28%	72%
2006	25%	75%
2007	27%	73%
2008	28%	72%
2009	29%	71%
2010	28%	72%

The CMO TB action plan[5] states that there should be a progressive decline of at least 2% per year in rates of TB in population groups born in England. ETS data regarding place of birth is categorised into two categories; UK born and non-UK born, therefore it is difficult to compare incidence rates per year for population groups in England alone. As a result, this report focused on utilising the CMO target for the UK born population group.

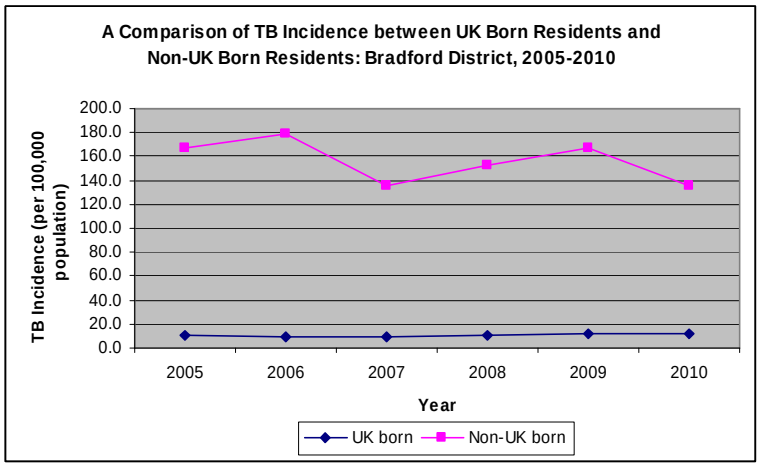
The incidence of TB among UK born residents in Bradford district fell from 12.1/100,000 in 2009 to 11.3/100,000 in 2010 (figure 16).

Figure 16 also shows that despite a previous increase in TB incidence among non-UK born residents within Bradford district from 135.6/100,000 in 2007 to 166.7/100,000 in 2009, the

rate fell to 135.0/100,000 in 2010. This decrease was much sharper (19.0%) than the decline of the UK born rate during the same period (figure 16).

National figures show that in 2010 the TB rate among the non-UK born population (82/100,000) was nearly 21 times higher than the rate in the UK born population (4/100,000).[35] For Yorkshire and the Humber, the difference in rate was greater with a rate of 88.8/100,000 among the non-UK born population compared with a rate of 4/100,000 in the UK born population within the region.[42] For Bradford district, the rate of TB among the non-UK born population was only 12 times higher than that of the UK born population (figure 16), which indicates a narrowing of the gap between the TB rates in both groups. This is not a good sign as the rate in non-UK born is not decreasing

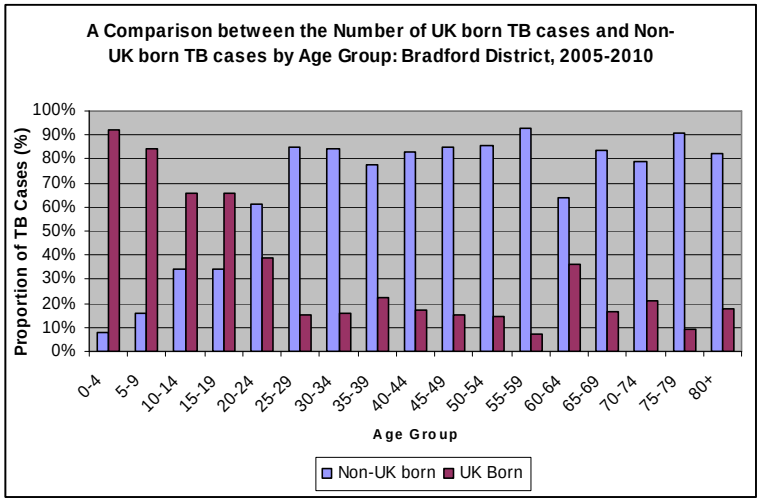
Figure 16 **Comparison of TB incidence between UK born residents and non-UK born residents: B&A, 2005-2010**



Source (denominator): ONS

Of concern is that there were more UK born TB cases than non-UK born TB cases in the 0-19 age group for Bradford district (figure 17). Children are more susceptible to active TB infection from someone who already has active TB disease[55] therefore TB disease in children suggests poor control of TB transmission. On the other hand, there were more non-UK born TB cases than UK born TB cases in those aged 20 and over (figure 17) which could reflect patterns of migration[42] and presence of latent TB infection.

Figure 17 **Comparison of UK born TB cases and non-UK born TB cases by age-group: B&A, 2005-2010.**



In addition to this, ETS also reveals that the proportion of TB cases from the Indian ethnic group who were born in the UK has increased from 18% in 2005 to 29% in 2010, whereas for the Pakistani and Black ethnic groups, the proportion has declined. This indicates that while TB in the Black and Pakistani ethnic groups continues to be associated with migration, TB in the Indian ethnic group is increasingly linked with acquisition of TB infection in the UK. As the majority of these individuals fall under the at-risk group for BCG vaccination, this finding is concerning and could indicate low uptake of BCG vaccine by at-risk groups in Bradford District.

5.3.3.6 TIME SINCE ENTRY INTO UK

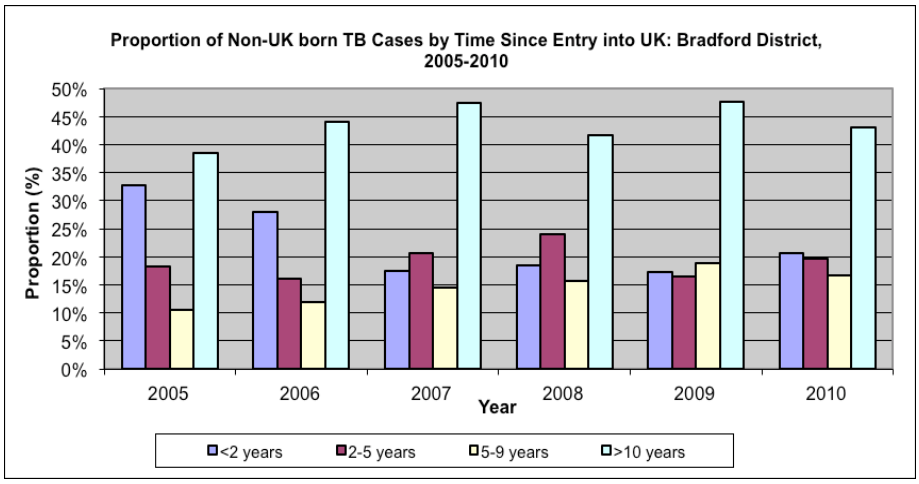
The CMO TB action plan[5] advises that there should be a reduction in the incidence of TB disease among those who entered the country and became resident within the previous 5 years. This calculation is outside the scope of this report, as the figures available from ONS do not identify how long each non-UK born individual has been residing in the UK, nor does it include those living in communal establishments, such as international students. Instead, this report focuses on the proportion of cases diagnosed within selected time periods that have been used in previous national[35] and regional[42] TB reports (within 2 years, within 5 years and greater than 5 years). For this analysis, an assumption has been made that a reduction in the proportion of cases diagnosed within 5 years translates to a reduction in incidence.

Immigrants entering the UK from high TB prevalence countries are at greater risk of developing active TB. In addition, evidence also indicates that these individuals are at greater risk of developing active TB disease in the immediate years after entry into a new country, such as the UK[57]

In Bradford district, the proportion of TB cases diagnosed within 2 years of entry into the UK fell from 33% in 2005 to 21% in 2010 and the proportion of TB cases diagnosed within 5 years of entry into the UK also fell from 51% in 2005 to 40% in 2010 (figure 18). However, the

proportion of cases diagnosed more than 5 years after entry into the UK has increased which suggests that one-off screening measures on initial entry into the UK may not be sufficient, particularly for those who frequently travel to countries with a high incidence of TB.

Figure 18 **Proportion of non-UK born cases by time since entry into the UK: Bradford District 2005-2010**



5.3.3.7 SOCIAL RISK FACTORS AND DIRECTLY OBSERVED THERAPY

NICE guidance states that all patients with a suspected diagnosis of TB should have a risk assessment for adherence to treatment and that directly observed therapy (DOT) should be considered for patients who have adverse risk factors, in order to improve compliance and completion of treatment.[17] The ETS database collects risk factor information, which includes:

- History of alcohol misuse
- History of drug misuse
- History of homelessness
- History of imprisonment
- Previous diagnosis of TB

At present, the Bradford & Airedale TB service does not offer DOT due to staff capacity (this is now being addressed), but risk assessments are still carried out on suspected TB cases. This helps to identify the number of TB cases that could benefit from DOT and will also help to shape future services.

Table 6 shows the proportion of TB cases with each risk factor compared to regional and national levels. In total, 6.9% of TB cases notified in 2010 in Bradford district had one or more social risk factor. This is lower than the regional[42] and national[35] levels of 10% (1 in 10 TB cases). Also, 7% of TB cases in 2010 in Bradford district had been previously diagnosed with TB more than 12 months earlier.

Table 6 Comparison of the proportion of TB cases with each risk factor for B&A, Y&H and the UK: 2010

Risk Factor	B&A 2010	Y&H 2010[23]	UK 2010[1]
Drug misuse	3.8%	2.3%	2.7%
Alcohol misuse	2.6%	3.2%	4.3%
Homeless	0.6%	2.3%	2.7%
Imprisonment	4.6%	3.7%	2.5%
Previous diagnosis of TB	7.0%	8.2%	10%

In total, 12% of TB cases occurring in Bradford district in 2010 had one or more risk factor for consideration of DOT. This indicates a large number of TB cases who may benefit if DOT was introduced in B&A. This could subsequently lead to improved outcomes, reduced risk of transmission of disease, reduced risk of reccurrence of disease and reduced risk of drug resistance.

In 2007, an evaluation of the efficacy of TB services using pharmacy based DOT was carried out in London.[58] It found that 93% of patients with active TB and latent TB infection successfully completed treatment. The benefits of pharmacy based DOT based on this evaluation included: reduced cost of providing DOT, reduced workload for nurses, improved access and convenience for patients and greater patient choice. This indicates that the model could be successfully replicated in areas where there is medium to high TB incidence and where there is difficulty in providing DOT by other means.

5.3.3.8 SITE OF DISEASE AND MICROBIOLOGICAL CONFIRMATION

TB can affect any part of the body and as a result symptoms vary depending on the area affected. This can make it difficult to diagnose the condition early. In addition to this, pulmonary TB is the most common and most infectious type of TB disease therefore it increases the risk of transmission to non-infected individuals.[1,2] Both of these factors mean that it is important to ascertain the most common type of TB disease occurring in Bradford district.

In 2010, nearly half of all TB cases in B&A were pulmonary TB. Although this is lower than the national and regional proportions (53% in the UK[35] and 60% in Yorkshire and The Humber[42]), it still indicates the presence of a large number of potentially infectious individuals in the population.

Further analysis reveals that in Bradford district, non-pulmonary TB disease is more common in non-UK born individuals compared to UK born individuals (table 7), and it is also higher in ethnic groups with a high incidence of TB (Bangladeshi, Black-African, Indian and Pakistani ethnic groups) (Table 8). The symptoms of non-pulmonary TB mimic those of many other more common diseases, which leads to delayed diagnosis and increased risk of morbidity and mortality for the affected individual. Also, non-pulmonary TB disease cannot be

diagnosed by chest x-ray, which is the method that most TB screening programmes used in the past. Since then, NICE has published guidance on screening new entrants from high-incidence (≥40/100,000) countries,[17] which includes the use of skin and/or blood tests to detect latent TB disease and to also detect latent TB infection.

Table 7 Proportion of pulmonary and non-pulmonary TB cases by place of birth: B&A, 2005-2010.

	Place of Birth	
	UK born	**Non-UK born**
Pulmonary	62%	43%
Non-pulmonary	38%	57%

Table 8 Proportion of pulmonary and non-pulmonary TB cases by ethnic group: B&A, 2005-2010

	Ethnic Group				
	Bangladeshi	**Black-African**	**Indian**	**Pakistani**	**White**
Pulmonary	42%	46%	40%	45%	78%
Non-pulmonary	58%	54%	60%	55%	22%

As pulmonary TB is the most common and most infectious type of TB,[2] it is imperative that microbiological testing is undertaken to confirm its diagnosis. This enables appropriate action to be taken to prevent spread of disease. It also allows assessment of drug sensitivities to detect drug resistance and therefore facilitate treatment decisions and actions to control transmission of TB disease. This also allows strain typing to detect clusters/chains of transmission.

The CMO TB action plan[5] states that at least 65% of patients with pulmonary TB should have their diagnosis confirmed microbiologically. In 2010, 74% of pulmonary cases in Bradford district were confirmed microbiologically. This is much higher than the national figure of 58%[35] and the regional figure of 65%.[42] More importantly, it is higher than the target set by the CMO TB action plan.

5.3.4 Measures of effectiveness of the B&A TB service

5.3.4.1 NOTIFICATION RATE

All forms of TB are compulsorily notifiable to the 'proper officer' by the physician suspecting the diagnosis. This falls under the Public Health (Control of Disease) Act 1984.[59]

A comparison of the figures provided by the B&A TB service and the figures from the ETS database indicate that 100% of TB cases in B&A were notified for each year under investigation. This is an excellent result and could be due to the multiple systems that are in place within the service to ensure 100% notification, for example, positive microbiology reports are sent to the local health protection unit as well as to the TB service.

5.3.4.2 TIME BETWEEN FIRST PRESENTATION TO HEALTHCARE AND BEING SEEN BY A TB SPECIALIST FOR SUSPECTED PULMONARY TB CASES

Pulmonary TB is the most infectious form of TB and therefore linked to spread of disease. It is therefore important that individuals with suspected pulmonary disease are identified, diagnosed and treated early to prevent transmission of disease to others.

The CMO TB action plan[5] states that individuals with suspected pulmonary TB should be seen by a TB specialist within 2 weeks of presentation to healthcare. The ETS database collects information on the date at which an individual first presented with symptoms and the date of diagnosis. The majority of individuals first present to their GP with symptoms and a definitive diagnosis can only be made by a TB specialist, therefore, for the purpose of this report, the date at which an individual first presented with symptoms was interpreted as first presentation to healthcare, and date of diagnosis was interpreted as being seen by a TB specialist. Also, as date of presentation information was collected from November 2008 onwards, only cases from this date forward have been included in the analysis.

Out of the 495 TB cases notified from November 2008 onwards, 226 (46%) had pulmonary TB. Out of these, 139 (62%) had information recorded on both the date of first presentation to healthcare and date of diagnosis and were therefore included in the analysis.

Figure 19 shows that the majority of pulmonary TB cases in Bradford district were diagnosed 2 or more months after first presentation to healthcare with less than 1 in 5 cases being diagnosed within the recommended 2 week target. This indicates that a large number of TB cases are not being diagnosed and commenced on treatment early enough and therefore increasing the risk of transmission of infection to others. Delayed diagnosis contributes to increased severity and transmission of disease. Delays of more than 2 months in diagnosing TB and commencing treatment has been shown to increase the risk of spread of TB to domestic contacts.[60]

Although the national target does not include non-pulmonary TB cases, it is important to explore whether these cases also experience a delayed diagnosis as this has the potential to

increase morbidity and affect recovery in these individuals. Table 9 shows that the proportion of non-pulmonary TB cases diagnosed within 2 weeks is lower than that for pulmonary TB. Although this is unlikely to affect transmission of disease, it does have an impact on recovery therefore more needs to be done to diagnose all TB cases early.

Figure 19 **Number of pulmonary TB cases by time between first presentation of symptoms and date of diagnosis: B&A, 2008-2011**

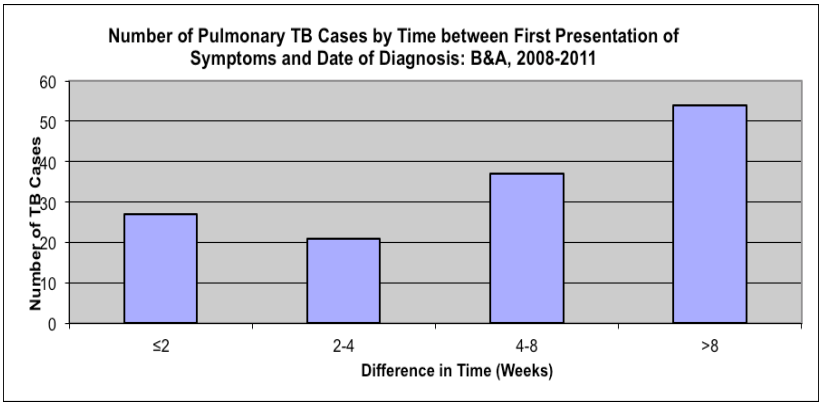


Table 9 **Comparison of the time between first presentation of symptoms and date of diagnosis for pulmonary and non-pulmonary TB cases: B&A, 2008-2011**

	≤2 weeks	2-4 weeks	4-8 weeks	>8 weeks
Pulmonary	19.4%	15.1%	26.6%	38.8%
Non-Pulmonary	12.8%	7.1%	25.0%	55.1%

The results also show that within the Pakistani ethnic group, 40% were diagnosed with TB more than 2 months after initial presentation. This could explain the high incidence within this group as delayed diagnosis results in increased risk of transmission of infection to others. The cause of a delayed diagnosis in this group could possibly be due to a greater proportion having non-pulmonary TB disease which is more difficult to diagnose than pulmonary TB, however this is theoretical. Further work in this area is necessary to explore the possible reasons for these results.

5.3.4.3 OUTCOME REPORTING AND TREATMENT COMPLETION

TB Surveillance provides an opportunity to identify the burden of TB disease in Bradford district. However, it is just as important to ascertain the outcomes of these cases in order to reduce morbidity of the individual and reduce transmission of TB disease to others. It is also important in preventing development of drug resistance which is more costly and difficult to treat.[7] Collection of outcome data on the ETS database was introduced nearly a decade ago to help highlight the effectiveness of services in successfully diagnosing and treating TB cases.

Out of all TB cases diagnosed in 2009 in Bradford district, 100% had their outcome recorded which was higher than the national proportion of 97%,[35] and the regional value of 99%,[42] and meets the CMO TB action plan[5] target of 100%. The need to look at longer trends is evident however.

In addition to this, 81% of TB cases diagnosed in 2009 in Bradford district completed their treatment within 12 months. This was higher than the regional proportion of 78%,[42] but lower than the CMO TB action plan[5] target of 85%. Individuals with TB disease have the potential to transmit infection to others if they are not fully compliant with medication. These individuals are also at greater risk of developing drug resistance which is more costly and time consuming to treat. Evidence suggests that drug resistant TB costs between £50,000 to £70,000 per case to treat compared to standard treatment which costs £5,000 per case.[7] All of this evidence provides a strong case that Bradford district needs to do more to increase the treatment completion rate.

5.3.4.4 CONTACT SCREENING

Contact tracing is an important component of TB management as it aids in:

- Detecting TB cases that are associated with the primary TB case
- Detecting latent cases who may benefit from chemoprophylaxis to prevent development of active TB disease
- Detecting non-infected individuals who may benefit from BCG vaccination

Information provided by the B&A TB service indicated that smear positive TB cases (these are the most infectious) are seen within 2 days and contacts of these cases are screened within 5 days. Also, during a 12 month period, the B&A TB service reported that there were on average, 7 cases screened for each TB case. In addition to this, 20% of TB cases were identified through contact screening. This indicates that contact screening of TB cases places a huge burden on the B&A TB service. Furthermore, evidence from Canada suggests that close contact investigation is highly cost effective and results in net savings.[61] This evidence provides a strong economic case for investing in a contact screening programme for TB.

5.3.4.5 SCREENING OF AT-RISK GROUPS (IMMIGRANTS, NEW ENTRANTS, ASYLUM SEEKERS)

Guidelines[62] state that all individuals from countries with a high TB incidence who are entering the UK for ≥ 6 months should be screened for active TB at the port of entry by having a chest x-ray. There are significant flaws with this existing system. Firstly, not all airports have the facilities to perform chest x-rays (including Leeds/Bradford airport).[63] Secondly, out of those airports that do carry out chest x-rays, only 2/3rds of those eligible for screening are actually

screened.[63] Thirdly, out of those screened and referred for further medical assessment, it is unclear what proportion have evidence of TB.[63] And fourthly, screening by chest x-ray only identifies *active* cases of *pulmonary* TB. Evidence suggests that in the majority of cases, TB disease develops within the first few years after arrival into a new country,[5] therefore one-off screening by means of a chest x-ray has limited value.

Since the inception of the above guidance, NICE has produced further guidance[17] that recognises the importance of screening for latent infection in addition to active TB disease to commence appropriate treatment or provide BCG. The guidance recommends that local tuberculosis services should screen at-risk subgroups of new entrants for latent infection. These subgroups include:

- Children <16 years coming from countries with an incidence of ≥40 TB cases per 100,000 population per year
- Adults aged 16-35 coming from countries with an incidence ≥500 TB cases per 100,000 population per year, or coming from sub-Saharan countries

However, a recent study[64] showed that screening adults as per the NICE guidelines results in over 70% of latent cases being missed, with the majority of missed cases coming from the Indian subcontinent. These cases are at risk of developing active TB disease in the future. The study suggests that screening for latent infection can be implemented cost-effectively at a threshold incidence level of ≥250/100,000 TB cases (ICER = £17,956 per prevented case of TB) or ≥150/100,000 TB cases (ICER = £20,819 per prevented case of TB). Both thresholds identify most immigrants with latent TB and the latter threshold level would pick up cases from the Indian subcontinent. This could prevent a substantial number of active TB cases in the future and also reduce the spread of infection to non-infected individuals.

In Bradford district, a multidisciplinary health team (Bradford District Care Trust Bevan House Homeless and New Arrivals Health Team), provide TB screening services to asylum seekers, refugees and other migrants who are new to Bradford and Airedale. In 2011, approximately 260 asylum seekers and 1,200 new entrants were screened for TB and approximately 60 (4.1%) of those screened using a screening questionnaire and Mantoux testing were referred to the Bradford & Airedale TB service for further investigation.

In addition to this, the Homeless and New Arrivals Team also undertake TB screening for international students attending the local university and colleges. On average, 400-500 students require new entrant TB screening every year. Before September 2011 there was a high non-attendance rate among these individuals, and screening could take up to 7 months to complete due to multiple attempts to contact the individuals. Since September 2011 the uptake of screening has improved, due to close collaboration with the university staff and

holding the screening sessions at the University GP Practice and University building, instead of inviting students to Horton park Centre..

5.3.4.6 UPTAKE OF BCG VACCINE AMONG ELIGIBLE INDIVIDUALS

Studies have shown that BCG vaccination is highly effective in protecting children against serious forms of TB disease.[27,28] In addition, NICE guidance[17] states that BCG should be offered to at-risk neonates and children in PCTs where the incidence of TB is below 40/100,000 population per year, and to all neonates in PCTs where the incidence is ≥ 40/100,000. As NHS Bradford & Airedale has an incidence below this threshold, it falls under the first group whereby BCG should be offered to at-risk neonates and children.

PCTs are required to complete a KC50 form which records information on the immunisation of children with BCG and is collated by the NHS Information Centre. However, the data obtained by each PCT varies considerably and for all the years prior to 2010/11, the data only provides numbers of individuals who were vaccinated as opposed to numbers of individuals who are eligible for the BCG vaccine, therefore it is difficult to assess vaccine coverage for Bradford district prior to 2010/11.

According to the data from 2010/11, Bradford district achieved 100% vaccine coverage for eligible neonates, 18% coverage for eligible 1-5 year olds, 67% coverage for eligible 6-15 year olds and 88% coverage for eligible >16 year olds. However it is unclear how the denominator population was obtained for neonates therefore the coverage rate could be an over-estimation. Also, the denominator population for the remaining age groups was based on the number of individuals in each group who had a Mantoux test performed to determine the need for BCG. There may be children in these age groups who are at-risk and have not been identified yet or there may be children who were invited for a Mantoux test but did not attend, therefore these individuals are not captured in the denominator figure. This again could lead to over-estimation of vaccine coverage in each age group.

It has already been identified that TB incidence in B&A is increasing in the 0-19 age group, therefore more needs to be done to improve vaccine coverage among eligible individuals within this age group. More needs to be done to treat latent TB in parents before acquiring active disease and infecting children and early diagnosis of each adult case.

5.3.4.7 DATA COMPLETENESS

TB surveillance systems have been in existence for nearly 100 years with continual improvements being made to adapt to the changing environment. However, a surveillance database is only as good as the data that is inputted on to it. If data fields are incomplete, analysis of data becomes inaccurate which could under- or over-estimate the burden of TB

disease in sub-groups of the population and lead to inappropriate allocation of TB resources. The TB commissioning toolkit[7] states that at least 95% of reported TB cases should include completed data for key demographic and clinical variables. Bradford district has achieved this target for the majority of variables, however, recording of ethnicity, place of birth and previous TB treatment is below the target (table 10).

Research has shown that certain ethnic groups have higher incidence of TB[65,66] therefore it is important that this information is recorded when notifying a case. In 2010, 93% of TB cases in B&A had their ethnicity recorded which is slightly lower than the regional level of 94%[42] and the national reporting level of 95%.[35] As Bradford & Airedale is composed of a more ethnically diverse community in comparison to national and regional proportions, it is imperative that the area aims for a 100% report rate for information on ethnicity.

It is also important that B&A aims for a 100% reporting rate for place of birth (UK born or non-UK born), as evidence shows that TB incidence is higher in non-UK born individuals compared with UK born individuals,[5] and B&A has a higher than average proportion of non-UK born individuals within its population. It is important to accurately identify the burden being placed on TB services by this subgroup of the population so that necessary improvements to services can be made in the future.

Table 10 Data completeness of key variables on the ETS database: B&A, 2010

	% Complete
(Name)*	(100%)
DOB	100%
Gender	100%
Ethnic Group	93%
UK or Non-UK born status	91%
Postcode	100%
Date of Notification	100%
Previous TB treatment	93%
Site of Disease	100%

*For patient confidentiality purposes, names of TB cases were omitted from the extracted data from ETS, however, a record can only be entered onto ETS if a name, date of notification and date of birth is entered therefore these will always be 100%

In addition to the above variables, it is also important to ascertain whether data completeness is being achieved for risk factors that affect adherence to TB treatment. As this variable was only introduced in 2009, reporting is lower than that of the original variables (table 11), however, Bradford & Airedale has higher reporting proportions than Y&H for every social risk factor.

Table 11 Comparison of data completeness of risk factor variables on the ETS database for B&A and Y&H: 2010

	Bradford & Airedale	Yorkshire and The Humber
Alcohol Use	89%	88%
Drug Use	92%	90%
Homelessness	90%	89%
Prison	88%	82%
Previous diagnosis of TB	93%	94%

If risk assessment for directly observed therapy is to be carried out effectively, collection of information on risk factors needs to be improved.

5.4 Summary of TB Epidemiology in Bradford and Airedale

Despite a fall in incidence of TB in 2010 compared to the previous year, Bradford & Airedale continues to have the highest rate of TB in the region, with a rate that is almost 3 times that of Yorkshire and The Humber and a rate that is close to the threshold for being classified as a high TB incidence PCT.

The highest incidence of TB is among the 20-39 age group, and the incidence among the 0-19 age group is slowly increasing which may be due to a combination of poor vaccine coverage and failure of TB control as TB in children indicates recently acquired infection.

There is a strong link between TB disease and deprivation, however, it is difficult to control for factors that could be contributing to the relationship such as poor housing, living in overcrowded accommodation, poor sanitation and poor nutrition, which are all risk factors for TB.[4,6] In addition a greater proportion of ethnic minority groups live in deprived areas and ethnicity is a risk factor for TB, particularly among the Black African, Pakistani and Indian ethnic groups,[65,66] therefore this could be confounding the relationship. Also, a greater proportion of the population of B&A live in the most deprived areas compared to the least deprived areas therefore one would expect a greater proportion of TB cases to also occur in the most deprived areas compared to the least deprived areas.

The proportion of TB cases occurring in non-UK born individuals is higher than UK born individuals but the difference in TB incidence between both groups is narrowing for the population of Bradford district. In addition to this, a greater proportion of the younger age group are UK born compared to non-UK born, which indicates recent transmission of infection, but the reverse is true for older age groups, which could reflect a combination of migration patterns and latent infection.

People born outside of the UK accounted for nearly 70% of all TB cases in 2010, but this is not due to a recent influx of infected new entrants as only a fifth of these have lived in the UK

for less than 2 years, whereas nearly 50% have lived in the UK for more than 10 years. This suggests that detection and treatment of active and latent TB disease has improved in B&A for non-UK born individuals, however, one off measures of screening may not be sufficient as the number of individuals diagnosed with active TB disease after 5 years of entering the UK has increased.

12% of TB cases in B&A in 2010 had one or more risk factor for consideration of DOT yet this service is not provided by the district due to staff capacity. In addition to this, 7% of cases in 2010 had a previous diagnosis of TB which could indicate a history of poor compliance with treatment and therefore an increased need for support for these individuals.

Pulmonary TB remains the most common type of TB disease diagnosed in B&A and the rate of microbiological confirmation of pulmonary disease in the district is higher than the national target. However, non-pulmonary TB is more common in non-UK born individuals and in ethnic groups with a high TB incidence, which indicates that the traditional TB screening methods using a chest x-ray are insufficient in identifying TB disease in this vulnerable group. This could lead to delayed diagnosis, which could impact on morbidity and mortality.

There are multiple measures in place to ensure 100% notification of TB cases in B&A, however, less than 1 in 5 cases of pulmonary TB in B&A are diagnosed within the 2 week recommended target which has the potential to increase the risk of transmission of infection to non-infected individuals and increase severity of disease. In addition to this, Bradford district has not achieved the treatment completion target of 85% which means that individuals are at risk of recurrence/worsening of TB disease or of developing drug resistance, and they also increase the risk of transmission of disease to non-infected individuals.

B&A has achieved an excellent BCG vaccination coverage rate among at-risk neonates, but coverage in eligible older children is poor. As TB incidence in the 0-19 age group is increasing, this requires substantial improvement.

5.5 Conclusion

Bradford district continues to have ongoing difficulties in managing TB disease in the area as identified by the epidemiological information. However, further work is required to explore the provision of TB services in B&A to identify areas of good practice and areas that require improvements. By combining these findings with the epidemiological findings, a clearer picture of where resources need to be targeted can be identified.

This is covered in the next section of this report by undertaking a corporate needs assessment.

SECTION 6

CORPORATE NEEDS ASSESSMENT FOR TB IN BRADFORD & AIREDALE

6.1 Introduction

This corporate needs assessment was carried out as a qualitative study with the purpose of adding to the epidemiological information described above. Qualitative methods are useful in the investigation of knowledge, attitudes and practices, and are complementary to quantitative methods which are limited in their analysis of structures, processes and means of improving services.[67]

This section explores the corporate component of a health needs assessment for TB in Bradford and Airedale.

6.2 Methods

Semi-structured interviews were undertaken with health professionals who contribute to the B&A TB service with the aim of representing several aspects of the service. Due to time restrictions and ethical issues, patients of the TB service were not interviewed.

The aspects of TB covered in the interviews included:

- The interviewees understanding of the existing TB service
- Issues in the health care of TB patients in B&A
- How the issues can be addressed

Each interview lasted approximately 1 hour and was held at a location selected by the interviewee. Each interviewee was informed about the purpose of the interview and was aware that handwritten notes were taken with the aim of including the findings in this report. The findings from the interviews were also compared with national guidance to identify whether the B&A TB service met the standards set on a national scale.

6.3 Results

Table 12 lists those who were interviewed as part of their contribution to the B&A TB service

Table 12 Interviewees and date of interview

Interviewee	Month/Year of Interview
Consultant in Public Health, NHS Bradford & Airedale	April 2011
CCDC, West Yorkshire Health Protection Unit	April 2011
CCDC, West Yorkshire Health Protection Unit	June 2011
BDCT Homeless and New Arrivals Team, Bevan House	July 2011
TB Nurse – B&A TB Service	October 2011
General Manager for Medicine, BTHFT	March 2012
Consultant in Infectious Diseases, BTHFT	March 2012
Finance and Procurement Team, NHS Bradford & Airedale	April 2012
Project Manager for ‘TB First’, NHS Bradford & Airedale	April 2012

6.3.1 Existing Setup of the B&A TB Service and Issues in the Healthcare of TB patients in B&A

The TB service within B&A has a nominated TB lead within the PCT who is a Consultant in Public Health. There is also a clinical TB lead for the trust. This helps to provide a point of contact for queries relating to the TB service or for developing pathways for management, and also meets the recommendations of the TB commissioning toolkit.[7]

There are 3 respiratory consultants, 2 infectious disease consultants and 1 paediatrician who share the TB caseload amongst each other within secondary care. This means that there isn't a specific outpatient clinic to diagnose, monitor and review suspected TB cases within B&A. However, the advantage of the existing system is that a clinic is available 4 days a week for suspected TB cases to be referred to for prompt assessment, and that consultants from different specialties are able to maintain the specialist skills required for management of TB. On the other hand, the current setup makes it difficult to capture data on the number of TB patients seen every month therefore monitoring of the burden of TB and clinical management is difficult to carry out.

The existing guidance from NICE[17] and the Department of Health[7] do not state that a specific TB outpatient clinic is required. Instead they indicate that all active TB cases should be seen by health professionals who specialise in TB management. Although, this is reported to be happening in Bradford & Airedale, there is some concern that repeat prescriptions for TB medications are being provided by primary care services that do not specialise in TB management. This is of concern as antibiotics used to treat TB have side effects and interactions that may be unfamiliar to a primary care health professional. Another issue is that TB medications are free for TB patients in Bradford district. TB drugs are free only when prescribed in the hospital, not in the community. This could dissuade individuals from obtaining their medication and therefore impact on treatment completion.

There are also 2 TB nurses (1.5 WTE) who cover the whole of Bradford district with regards to TB management. This includes home visits for Mantoux testing and interpretation, contact tracing and standard follow-up. Since the early 90s, the Joint Tuberculosis Committee has recommended a minimum of one full time TB nurse or health visitor for every 50 notifications per annum plus full clerical support.[68] More recently, NICE have published guidance[44] that recommends one whole time equivalent (WTE) case manager (usually a TB nurse) for every 40 TB cases that require standard treatment. In the last year, there were 172 cases of TB reported in Bradford & Airedale, which indicates that there should be 4.3 WTE TB nurses employed within the district, nearly three times the current amount. In addition to this, the TB service employs 2 administrative staff who work a total of 35 hours per week. Staff have reported that this is insufficient to meet the demands placed on the B&A TB service. The concerns identified by staff as a result of a reduced workforce is that patients cannot be

followed up as often as required and that the service does not have the capacity to provide DOT, which could lead to poor adherence with treatment and subsequent recurrence of disease or development of drug resistance. In addition, it was reported that staff have limited time to carry out audits of the TB service which is an integral component of service improvement.

Although there isn't a specific TB outpatient clinic, there is a weekly 'contact' clinic which takes place at St. Luke's Hospital where household members of TB cases are invited for screening. The TB nursing team also visits patients in the community, for example in their houses This is run by a respiratory/infectious disease physician, a TB nurse and a paediatrician and is reported to be well attended with an average of 7 contacts per case being screened. In addition to the contact clinic, there is a fortnightly Mantoux clinic where Mantoux tests are carried out or interpreted to make decisions on further management.

As well as clinical services, the Bradford & Airedale TB service is also involved in non-clinical services. For example, a TB MDT meeting takes place once a month. The purpose of this meeting is to discuss TB cases and agree ways forward for management. The meeting should ideally be attended by physicians (infectious diseases, respiratory and paediatricians), health protection staff and by a microbiologist, however, attendance to these meetings is reported to be inconsistent with poor attendance from respiratory physicians. As a result, only TB cases on the infectious disease team caseload are discussed.

In addition to the above, Bradford district also has a multidisciplinary health team (the Homeless and New Arrivals Health Team) that works with asylum seekers, refugees and other migrants who are new to Bradford and Airedale. They offer TB screening and facilitate access to further services if required. The service is commissioned by Bradford District Care Trust to provide several TB services including:

- BCG vaccine for children < 14 years who are deemed to require it
- BCG vaccine for children who are eligible and are over the age 14 years is given by the school nurses. They are identified as being eligible during the school risk check that takes place in Year 9.
- New entrant screening for asylum seekers and immigrants

Staff from this service run 2 BCG clinics a week with referrals mainly from health visitors, nursery nurses, midwives and practice nurses (approx 2-3 per week). The majority of children referred are under the age of 1 which indicates that early protection against the most serious forms of TB is being achieved.

For immigrants, referrals are received from the health protection unit (via Port Health forms) and from GPs (following recognition that they are newly registered patients), at a rate of 30-40

per week. The new entrant screening clinic takes place on a weekly basis with staff reporting a fairly good attendance rate of 20-25 new entrants per session and a good turnover rate with screening taking place within 2-3 weeks of receiving the initial referral. Referrals for asylum seekers are predominantly from the Home Office but this group is reported to have poor attendance rates for screening (27% failed to attend their appointment in 2011), despite women and children being offered home visits (men are invited to a clinic at Bevan House which runs approximately once a month). One of the issues raised by staff at Bevan House is that the dispersal centres (Barnsley and Huddersfield) carry out Mantoux testing but individuals fail to attend the follow-up appointment to read the result of the Mantoux. As this test cannot be repeated within a year and the service is not commissioned to carry out IGRA testing, testing for latent infection is restricted.

In addition to the above, the Homeless and New Arrivals Team also undertake TB screening for international students attending the local university and colleges. The University Health Centre provides a clinic room for staff to use for one session a week to screen eligible individuals (including those who are not registered with the University Health Service), and staff also utilise some time during 'Fresher's week' to encourage individuals to attend screening. Staff report that on average, there are 400-500 students that require new entrant screening every year and this can take up to 7 months to complete, predominantly due to high non-attendance rates. Since September 2011 the the uptake of screening has improved and by September 2012 there was no waiting list or backlog of students waiting to be seen.

Another issue raised by Bevan House staff is that the team is not commissioned to screen homeless individuals for TB, therefore active case finding cannot be carried out. Instead, the majority of individuals in this group come into contact with the TB service when they develop symptoms. NICE guidance clearly states that active case finding should be carried out among homeless people by chest x-ray screening on an opportunistic and/or symptomatic basis.

An issue that was mentioned by several interviewees was regarding the method of data collection. At present, when a clinician suspects a diagnosis of TB, a member of the TB service administrative team collects the relevant information from the reporting clinician and records it on a paper notification form. This form is then sent to the local health protection unit who transfer the information onto the electronic ETS system. Separately from this, clinical management and follow-up that takes place in the outpatient department is recorded in the patient's notes by the reviewing physician. And then separately from this, outcomes from community visits (e.g. follow-up visits and contact tracing) are recorded and stored on a separate paper based system which is stored in the TB office at St. Luke's Hospital. Also, the team at Bevan House have their own database for recording TB information for new arrivals and asylum seekers. All of these data sources are independent of each other and therefore

continuity of patient information regarding TB management is poor. Staff report that this has been an ongoing issue and that they were eagerly awaiting a new system that would join up all the information from several databases to form one database (TB First) to make information easily accessible while still maintaining patient confidentiality.

Concerns were also raised by several interviewees regarding lack of awareness of TB among primary care health professionals, however, one staff member attributed this to the relatively low numbers of TB cases seen by any primary care health professional in comparison to other more common illnesses with similar symptoms. Also, training focusing on TB disease is provided to GPs on an annual basis.[69] In addition to this, TB is also included in the teaching syllabus for medical students in their 3rd and 5th years.[69] Also, through multidisciplinary working and the use of existing guidance, The B&A TB service has produced a care pathway for primary care health professionals to provide guidance on the diagnosis and management of TB.

Another issue that was identified from the interviews was that under the NHS changes, NHS Bradford and Airedale will be split into several CCGs which could fragment the TB service and subsequently compromise patient care. The Department of Health has issued guidance surrounding this issue which recommends that TB services should be commissioned by one CCG for each district.

6.3.2 Addressing the Issues

At present, TB activity within secondary care is paid through 'Payment by Results' which is an activity based payment. For example, if a TB patient is seen in a respiratory clinic, the activity would fall under 'respiratory consultant service' This means that it is difficult to identify activity taking place in secondary care outpatients that is specific to TB. One suggestion made to address this issue is to commission TB services as a separate entity within Bradford and Airedale. This would allow monitoring of the burden of TB disease locally. It would also provide clarification on funding for IGRA testing as there has been some confusion over this matter in recent months.

A recurring and important issue raised by several staff was the need to increase staff capacity to meet the national guidance, which would also enable DOT to be carried out on those deemed to require it.

There was conflicting opinion on whether an outpatient clinic specifically for TB should be setup. The main concern was that this would lead to one clinic taking place per week and therefore patients would have to wait longer to be seen. In addition, past discussions have taken place to try and implement this proposal but there has been difficulty in achieving consensus regarding the day of the week on which the clinic should take place because of

prior commitments by the physicians involved. However, staff recognised the benefits of a TB clinic and felt that this could be a possibility for the future.

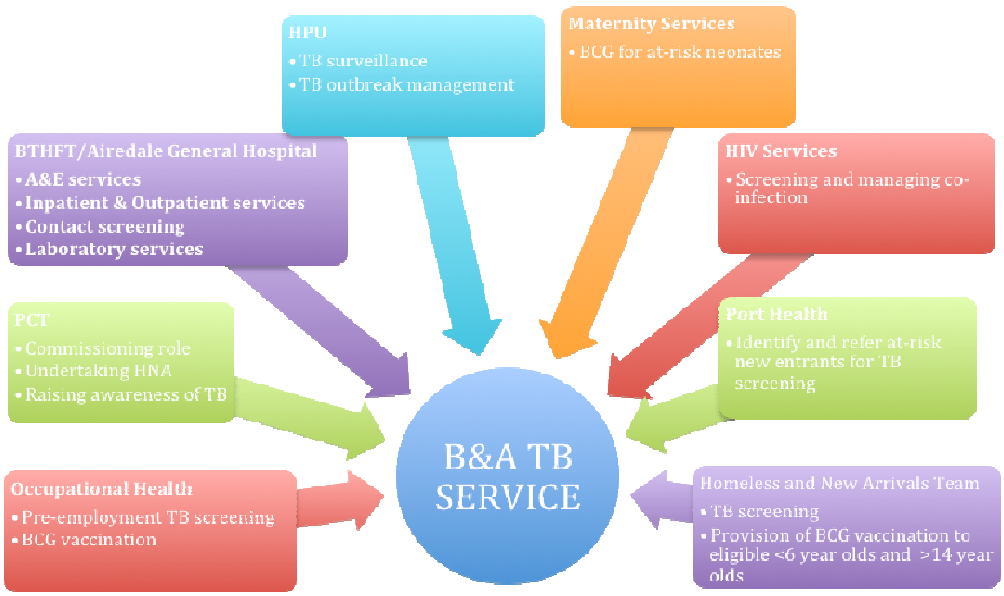
It was recognised that the presence of a robust data collection system that could be accessed and used by all health professionals involved with TB management would enable improved patient care through data linkage and availability of information on each case from start to finish. It was also recognised that this would be even more effective if an outpatient clinic specifically for TB management was setup as all the information would go on one database at one point in time. However, alternative suggestions were also provided such as the use of an existing system e.g. 'SystmOne' which would reduce costs and minimise the number of different healthcare databases that exist within the NHS.

Another important suggestion was the need for multidisciplinary meetings that are attended regularly and by all groups involved in the provision of TB services in B&A, including public health and the Homeless and New Arrivals Health Team.

6.4 Summary

The corporate needs assessment has identified that there are multiple services available that are tailored to the at-risk groups for TB disease in B&A (Figure 20). However, a reduced workforce, absence of an outpatient clinic specific to TB, poor attendance to MDT meetings, the existence of multiple data reporting databases and lack of awareness of TB disease among primary care professionals, have been reported to be issues existing within the B&A TB service. In addition, the NHS reforms have created a level of anxiety around how TB services will be commissioned in the future.

Figure 20 **Key relationships and stakeholders of the B&A TB Service**



6.5 Conclusion

The B&A TB service has taken great steps towards preventing and managing TB disease within its population. However, with an ever-changing population and the ongoing NHS reconfiguration, efforts need to be strengthened to ensure that the B&A TB service provides optimum outcomes for TB control.

SECTION 7
RECOMMENDATIONS

7.1 Introduction

The epidemiological health needs assessment combined with the corporate needs assessment carried out for TB in B&A have highlighted issues that are inter-related. For example, the B&A TB service is understaffed which has resulted in the inability to provide a DOT service, yet a large proportion of TB cases could benefit from this, and this could improve the treatment completion rates.

Also, it is unclear how many new entrants into the UK are screened and subsequently referred to the B&A TB service for further investigation and this appears to be caused by the lack of a coherent data reporting system.

Control of TB requires action across a complex mix of different interventions including increasing awareness, early diagnosis, screening, contact tracing, treatment, immunisation, chemoprophylaxis and prevention of drug resistance. All of these are important to reduce TB related morbidity, mortality and in tackling health inequalities.

The NHS reforms provide an opportunity to improve the valuable service that the B&A TB service provides. For example, closer working with the Local Authority could improve joint working with drug action teams and housing and homeless support units.

The aim of this report is to improve prevention and treatment of TB in line with recommendations from key national guidance documents with the long-term aim of eliminating TB for the population of Bradford & Airedale (B&A).

By undertaking a health needs assessment on TB in B&A, several issues have been highlighted and based on the findings, the following recommendations have been made, with the overall aim of improving prevention and treatment of TB and with the long-term aim of eliminating TB for the population of B&A

7.2 Recommendations

1. Provision of additional TB nurses in line with guideline requirements provided by the National Institute for Health and Clinical Excellence (NICE)

2. District wide commissioning of TB services to be undertaken by one CCG within Bradford district to prevent the development of disjointed services.

3. Commission TB services as a separate entity as opposed to within other services (e.g. respiratory services) to encourage transparency about the services being provided

4. Develop a multidisciplinary team involving ALL organisations that provide a TB service within B&A and encourage regular attendance by all parties involved.

5. Continue to increase awareness of TB among primary care health professionals.

6. Form an outpatient clinic within secondary care that is specific to TB

7. Bring together the existing TB databases onto one database to enable continuity of patient care

8. Provision of an active case finding service for vulnerable groups, including the homeless, as recommended by NICE

9. Improved surveillance

10. The use of Cohort Reviews to improve quality of care

Other useful resources available regionally are

1. Audit of TB cases lost to follow up
2. Audit of delayed diagnosis
3. Audit of BCG uptake

Also ongoing work by TB alert to raise awareness in at-risk groups.

Need to also mention proposed changes to port of entry screening

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