

Worcestershire

Tuberculosis Needs Assessment

2024



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Glossary

| | |
|-----------------|---|
| AAFB | Acid Alcohol Fast Bacilli |
| ACF | Active Case Finding |
| ARAP | Afghan Relocation and Assistance Policy |
| ETS | Enhanced Tuberculosis Surveillance |
| BCG | Bacillus Calmette Guerin |
| COVID_19 | Corona Virus Disease of 2019 |
| DNA | Deoxyribonucleic Acid |
| DNAs | Did Not Attend's |
| DOT | Directly observed therapy |
| DR-TB | Drug Resistant TB |
| ECDC | European Centre for Disease Control |
| HIV | Human Immune Deficiency Virus |
| ICB | Integrated Care Board |
| IGRAs | Interferon gamma release assays |
| LES | Locally Employed Staff |
| LTBI | Latent Tuberculosis Infection |
| MTBC | Mycobacterium Tuberculosis Complex |
| MDR-TB | Multidrug Resistant TB |
| NHS | National Health Service |
| HMP | His Majesty's Prison |
| NICE | National Institute for Health and Care Excellence |
| OHID | Office for Health Improvement and Disparities |
| ONS | Office for National Statistics |
| PCR | Polymerase Chain Reaction |
| PPG | Practice Plus Group |
| RCM | Regional Center for Mycobacteria |
| RR-TB | Rifampicin-Resistant TB |
| SRF | Social Risk Factor |
| TB | Tuberculosis |
| TST | Tuberculin Skin Test |
| UKHSA | United Kingdom Health Security Agency |
| USP | Underserved population |
| VOTS | Video observed therapy |
| WHO | World Health Organization |
| WGS | Whole Genome Sequencing |
| ZN Stain | Ziehl Neilson stain |

Executive Summary

Tuberculosis (TB) is an airborne disease that is treatable, but if left untreated leads to important health deficits and may be fatal. It can be latent in people exposed to TB and emerge as an active disease later in life.

Cases of TB in England increased by 7% in the first half of 2023 compared to the same timeframe in 2022 [\(59\)](#). The rates of TB in Worcestershire are lower than the England average and considered a low incidence area therefore services are funded accordingly. Delivering TB services in low incidence area brings challenges which may include smaller TB services, less surge capacity and less TB knowledge in health care workers. However, evidence indicates that investing in TB prevention and control could result in substantial savings to the whole health and social care system [\(1\)](#).

Comprehensive TB management delivered by well organised and integrated services is a very cost-effective intervention. There is a clear financial incentive to ensure TB services across the county are effective in detecting disease early, treating cases curatively, and preventing disease not only in contacts at risk of disease but also in other at-risk groups such as recently arrived migrants from TB high prevalence countries.

This needs assessment highlights gaps in the current service provision in the county which could lead to undetected and untreated TB cases. Also highlighted are delays in commencing treatment in patients with active TB. Delays increase the risk of transmission in the community, reduce patient outcomes, and increase costs. The report recommends that increased funding and resources are required to expand the service within the county to proactively identify, support and treat people with an increased risk of TB as recommended in NICE guidance. Investing in TB prevention and control in Worcestershire would also contribute to the global and National targets for disease elimination and would result in substantial savings to the whole health and social care system.

Introduction

What is Tuberculosis?

Tuberculosis (TB) is a communicable disease and is caused by the bacterium mycobacterium tuberculosis. The bacteria usually affect the lungs; however, TB bacteria can affect any part of the body such as the kidney, spine, and brain.

Not everyone infected with TB bacteria becomes unwell. There are two TB related conditions, Latent TB infection (LTBI) and active TB disease.

Infected individuals are classified as either having:

- Latent tuberculosis infection (LTBI), an asymptomatic clinical state that is not transmissible.
- Active TB disease, characterized by the presence of clinical symptoms arising from infection that can occur in multiple organs [\(2\)](#)

How is it spread?

TB is spread when a person with active TB disease in their lung's coughs or sneezes and someone else inhales the expelled droplets containing TB bacteria. The highest risk period for the development of disease is soon after infection but it usually takes several months for symptoms to appear. It can, however, remain latent for many years before developing into active disease. This means that non-UK born people from high incidence countries may continue to be at risk of developing disease for many years after initial arrival in the UK [\(3\)](#).

Signs and Symptoms of TB

TB develops slowly in the body and can take several months for symptoms to appear. Symptoms are extremely varied; however, the most common symptoms include:

- A persistent cough that lasts more than 3 weeks and usually brings up phlegm, which may be bloody
- Breathlessness that gradually gets worse.
- Lack of appetite and weight loss
- A high temperature
- Night sweats
- Extreme tiredness or fatigue [\(4\)](#)

People with LTBI are infected with mycobacterium tuberculosis but do not have active TB. People with LTBI do not have symptoms and are not infectious [\(5\)](#). Live TB bacilli remain inactive without causing disease, however the bacilli can at some point become active, multiply, and cause TB disease [\(6\)](#). The risk of progressing from LTBI to active TB disease is related to the virulence of the M. tuberculosis strain and the susceptibility of the host (e.g., malnutrition, immunocompromised status) [\(7\)](#).

Risk factors for TB.

The most at risk of developing TB include those who live in, come from, or have spent time in a country or area with high levels of TB. Around three in every four TB cases in the UK affect people born outside of the UK [\(8\)](#).

Other at-risk groups are:

- Those in close contact with someone who's infected, for example living in the same household or working in close proximity.
- Those with a condition that weakens their immune system, such as diabetes, renal conditions and HIV.
- Those having treatments that weaken the immune system.
- Those who are very young or very old.
- Those in poor health or with a poor diet because of lifestyle and social risk factors, such as drug misuse, alcohol misuse, or homelessness

Treatment and drug resistance

Tuberculosis (TB) requires at least 6 months of treatment. If treatment is incomplete, patients may not be cured, and drug resistance may develop [\(9\)](#). The standard treatment of active TB is completed in two phases. This includes an initial phase using four drugs (*Isoniazid, Rifampicin, Pyrazinamide and Ethambutol*) and a continuation phase using two drugs, in fully sensitive cases. The management of TB should be under specialist care by clinicians with training in, and experience of, the specialised care of individuals with TB [\(10\)](#).

Treatment for latent TB generally involves:

- Either taking a combination of an antibiotic and an antituberculosis agent for 3 months.
- An antituberculosis agent on its own for 6 months [\(11\)](#).

Overall, without treatment, about 5 to 10% of people with LTBI will develop TB disease at some time in their lives. About half of those people who develop TB will do so within the first two years of infection [\(12\)](#).

Drug-resistant tuberculosis (DR-TB) is a form of antimicrobial resistance that is difficult and costly to treat. It is caused by TB bacteria that are resistant to at least one of the first-line existing TB medications. This results in fewer treatment options and increasing mortality rates. Drug-resistant TB can occur when the drugs used to treat TB are misused or mismanaged.

Examples of misuse or mismanagement include:

- Not complete a full course of TB treatment.
- Health care providers prescribe the wrong treatment (the wrong dose or length of time)
- Drugs for proper treatment are not available.
- Drugs are of poor quality.

Drug-resistant TB is more common in people who:

- Do not take their TB drugs regularly, or do not complete their treatment.
- Develop TB disease again, after being treated for TB disease in the past.
- Come from areas of the world where drug-resistant TB is common.
- Have spent time with someone known to have drug-resistant TB disease.

Drug-resistant TB (DR TB) is spread the same way as drug-susceptible TB [\(13\)](#). Numbers and rates of cases with drug resistance increased in both 2019 and 2020. There were more cases of drug-resistant TB in 2020 than any year since enhanced surveillance began. 11.6% of cases were resistant to any drug and 2.4% were multidrug resistant (compared to 1.8% in 2019).

Of cases with laboratory-confirmed TB, 11.6% had resistance to at least one first-line drug, and 2.4% of cases were multi-drug resistant (MDR) or rifampicin-resistant (RR). This represents the highest recorded percentage of drug resistant cases since the current enhanced surveillance scheme started in 2000 [\(4\)](#). The incidence of multidrug-resistant or rifampicin-resistant TB was almost two times higher in people with a social risk factor (2.7%) compared with those without (1.5%). In addition, outcomes in people with drug-susceptible TB who had a social risk factor were worse (6.3% died and 6.5% were lost to follow-up) compared with those without [\(14\)](#).

National Drivers and Guidance

1. TB Action Plan for England 2021 to 2026

The aim of the TB Action Plan, 2021 to 2026 [\(15\)](#) is to improve the prevention, detection and control of TB in England. The Action Plan focuses on the needs of those affected by TB and TB services whilst recognising the impact and learning of the coronavirus (COVID-19) pandemic.

The TB Action Plan supports a year-on-year reduction in TB incidence and in-UK TB transmission and enable the UK to meet its commitment to the World Health Organization (WHO) elimination targets by 2035. The TB Action Plan includes actions linked to the outcomes of the Collaborative TB Strategy for England, 2015 to 2020 [\(1\)](#) particularly the challenges and recommendations outlined in the TB Strategy End of Programme report.

The 5 key priorities of the TB Action Plan are:

- Priority 1 – Recovery from COVID-19
- Priority 2 – Prevent TB
- Priority 3 – Detect TB
- Priority 4 – Control TB disease
- Priority 5 – Workforce

2. End of TB Strategy – WHO

WHO developed the End TB Strategy [\(16\)](#), which was endorsed by the Sixty-seventh World Health Assembly in 2014. The strategy envisions a world free of TB, with zero deaths, disease and suffering due to the disease. Furthermore, the strategy ambitiously proposes to “end the global TB epidemic” by 2035. The strategy targets a 90% reduction in patients suffering from TB, and a 95% reduction in deaths from TB by 2035.

3. Tuberculosis NICE guidance

The Tuberculosis NICE guidance [\(17\)](#) covers preventing, identifying, and managing latent and active TB in children, young people and adults. It aims to improve ways of finding people who have TB in the community and recommends that everyone under 65 with latent TB should be treated. It describes how services should be organized, including TB control board.

4. Collection - Tuberculosis (TB): diagnosis, screening, management and data – UKHSA

The UKHSA collection of TB guidance [\(18\)](#) provides information on the diagnosis, screening, epidemiology and public health strategy for tuberculosis and other mycobacterial diseases.

5. Tuberculosis (TB): Migrant health guide

Tuberculosis (TB): migrant health guide [\(19\)](#) provides advice and guidance on the health needs of migrant patients for healthcare practitioners.

Aims and Objectives

Aims

This TB needs assessment has been conducted in Worcestershire to:

- Provide a comprehensive report on the epidemiology of TB.
- Establish a baseline for current TB services.
- Look at the unmet health needs and gaps in current service provision.
- Make recommendations on:
 1. How to meet the current and future needs of the Worcestershire population.
 2. How to improve detection, treatment, and control of TB in Worcestershire.

Objectives

1. To describe the epidemiology of TB in Worcestershire including differential needs in geographical and ethnic population groups.
2. To describe the current TB service provision and performance in Worcestershire, establish whether existing services are meeting the health needs of the population affected, and identify areas of unmet needs and gaps in terms of service provision and capacity to deliver.
3. To outline TB policies and strategies and provide examples of best practice in service delivery based on evidence (local/national/international) and opportunities for service development/re-design.

Methods

Quantitative

The main data sources used in this report were the National TB surveillance database (NTBS), [\(20\)](#) and the [\(21\)](#). Some data was received from the local TB service. Statutory notifications of active TB cases are recorded through the NTBS system. It is a legal requirement for a Registered Medical Practitioner in both the NHS and private sector to notify when they suspect a case of TB. The NTBS system contains demographic and occupation and risk factor data as well as clinical, microbiological, treatment and outcome information. A request for data from the NTBS was granted by UKHSA field epidemiology service.

OHID fingertips data was used to provide crude rates per 100,000 population. This is calculated by using the numbers of the required indicator, dividing by the denominator (the sum of the mid-year population estimates provided by ONS) and multiplying by 100,000. The trend data used in this report refers to the period 2000 - 2021.

Qualitative

Information regarding the provision of TB services was provided by TB Specialist Lead Nurse. Information on microbiology services was obtained by meeting with the pathology manager from Worcester Royal Hospital Trust. Information on neonatal BCG commissioning was sought from the TB team. Information on prison healthcare was provided by the Infectious Disease Lead Nurse at HMP Hewell.

Limitations

In terms of the quantitative methods, the NTBS dataset was the main data source used and does not contain data on certain variables: The NTBS system only records data on notified cases of TB, therefore any cases that were not notified would not be included in the analysis. Some Local Authority data is suppressed within the NTBS and on the fingertips database to avoid presenting proportions based on small denominators. This is applied when an indicator is 5 or less and could be misleading and vary considerably from year to year. In these situations, suppression is applied to the count, proportion and confidence interval data.

Some data was received from the TB service in Worcestershire. Unfortunately, this was at times inaccurate and inconsistent and so has been included in this report.

Epidemiology

Global

Whilst TB is present worldwide its prevalence varies between countries and populations. Eight countries accounted for more than two thirds of the global total in 2022 (22) which were: India, Indonesia, China, Philippines, Pakistan, Nigeria, Bangladesh, and the Democratic Republic of Congo. Mortality from TB decreased between 2005-2019, however it is now increasing. In 2021, a total of 1.6 million people died from TB making it the second leading infectious killer after COVID-19 and the 13th leading cause of death worldwide. It is also the leading killer of people with HIV and a major cause of deaths related to antimicrobial resistance (22)

Europe

Distribution of epidemic patterns varies between the countries of the WHO European Region (Figure 1). Most countries are approaching the low incidence level of below 10 per 100,000 population, however, there are some particularly in Eastern Europe that report high incidence of up to 80 per 100,000. The European Region overall also has nine of the 30 countries in the world with the highest multidrug-resistant tuberculosis (MDR-TB) burden (23).

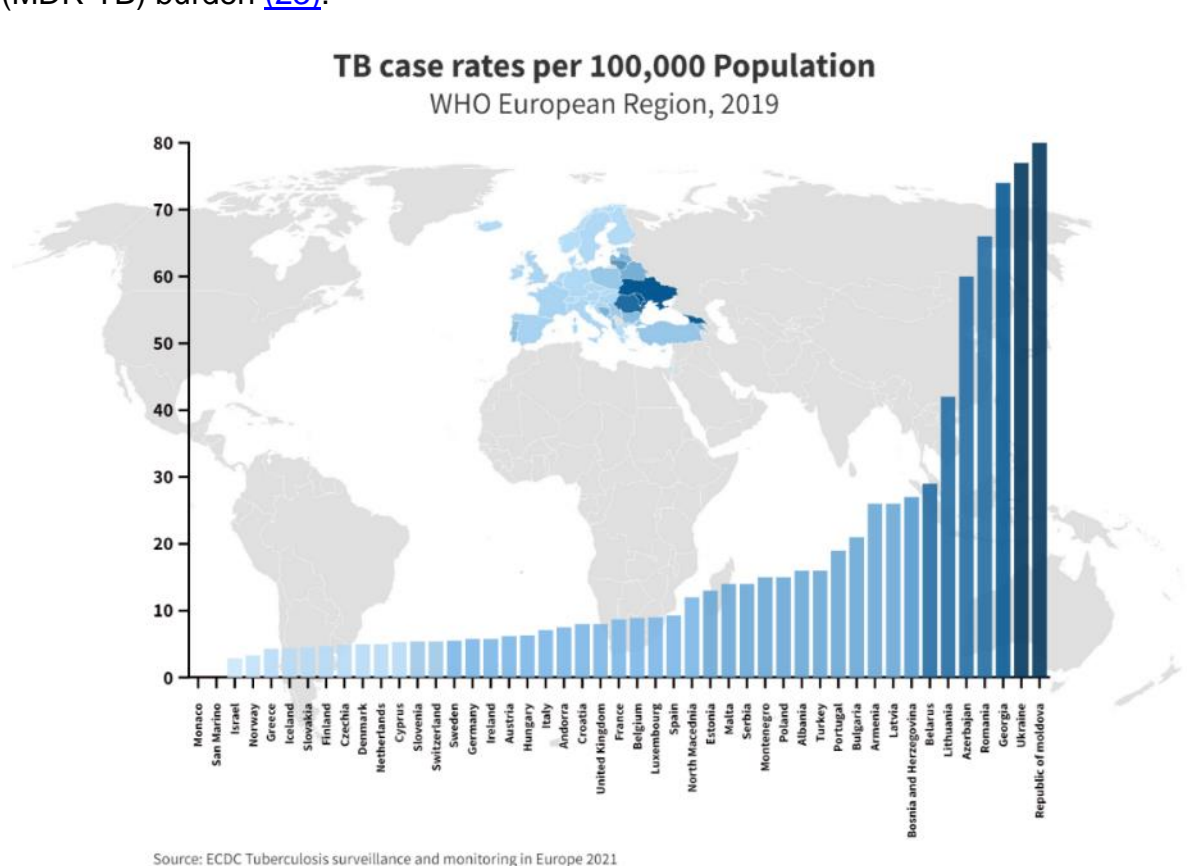


Figure 1. TB case rates per 100,000 Population

England

England meets the World Health Organization (WHO) definition of a low incidence country. Despite this England has higher rates than many other countries in Europe and the proportion of people with one or more social risk factors (SRF) has remained constant highlighting the social inequality in the burden of TB infection in England (Figure 2) ([24](#)).

Relationship between TB incidence (three year average) rate in England and % proportion of TB cases with at least one social risk factor

Crude rate - per 100,000

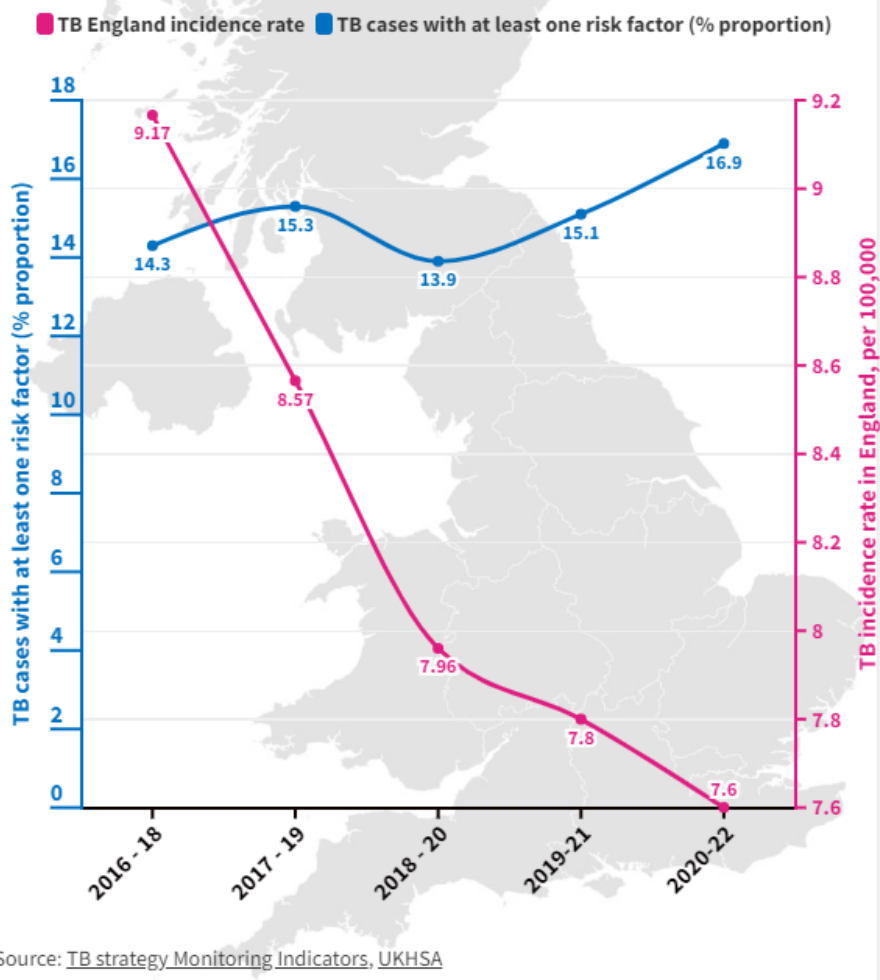
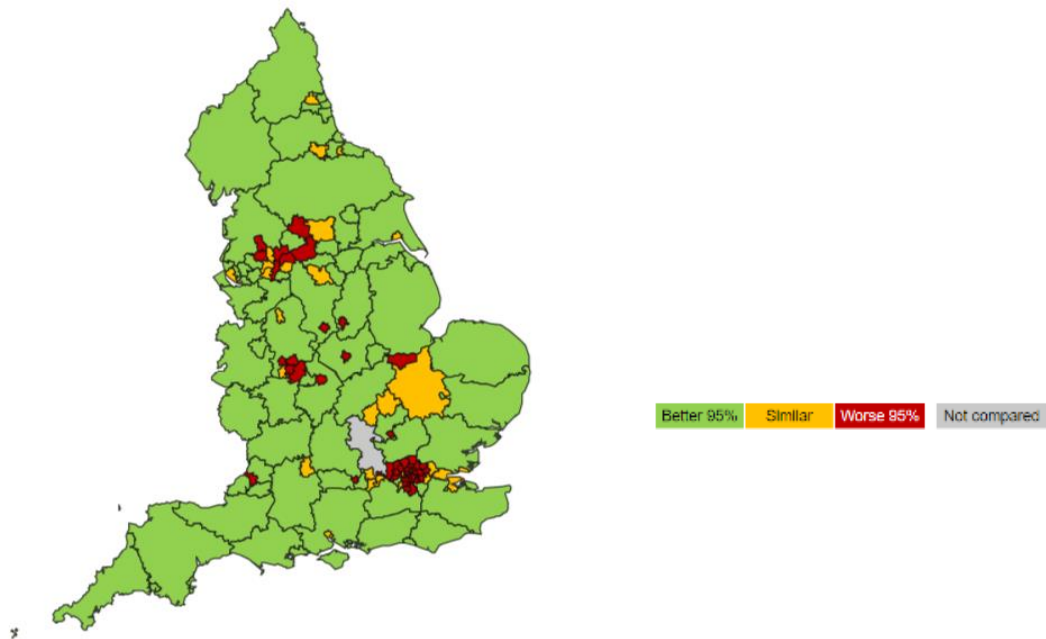


Figure 2. Relationship between TB incidence in England and TB cases with at least one risk factor

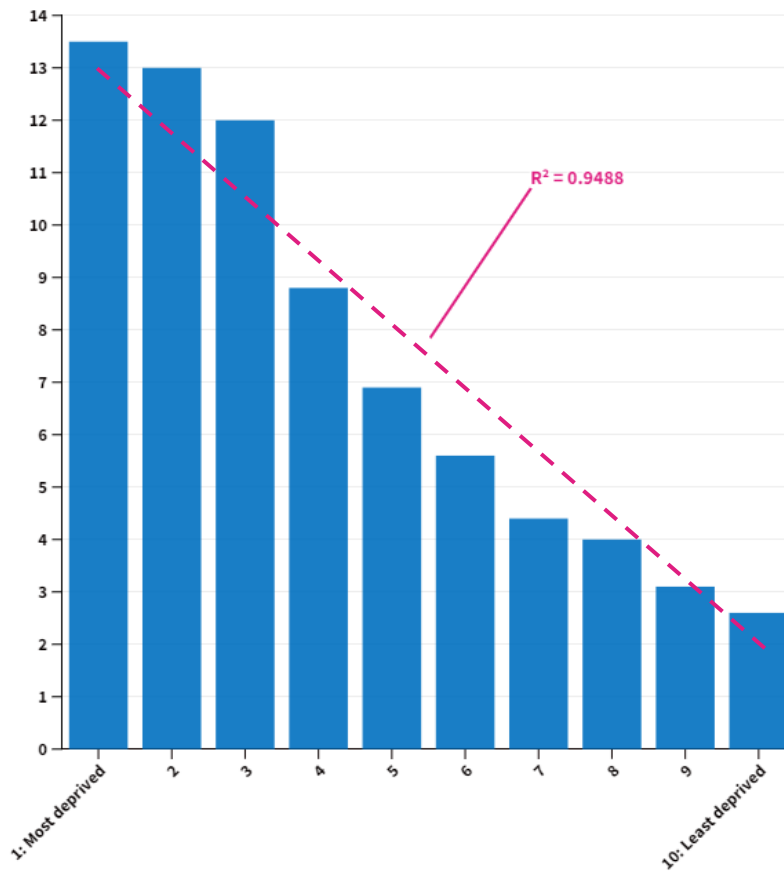
The burden of TB is also unequally distributed across England (Figure 3. ([25](#))). The main burden of disease in 2020 is seen in largely urban areas such as London and the West midlands and in people born outside of the UK (73%). High cases of TB are positively correlated with high deprivation ($R^2 = 0.9488$). Figure 4. Shows the relationship between deprivation and TB notifications in England, 2022 ([61](#)), Figure 5 shows the increase in confirmed TB cases with any drug resistance within England from 2016 to 2020 ([26](#)).

Figure 3. TB Incidence rate (Three-year average) 2018-2020 England.



TB notification rates by Index of Deprivation

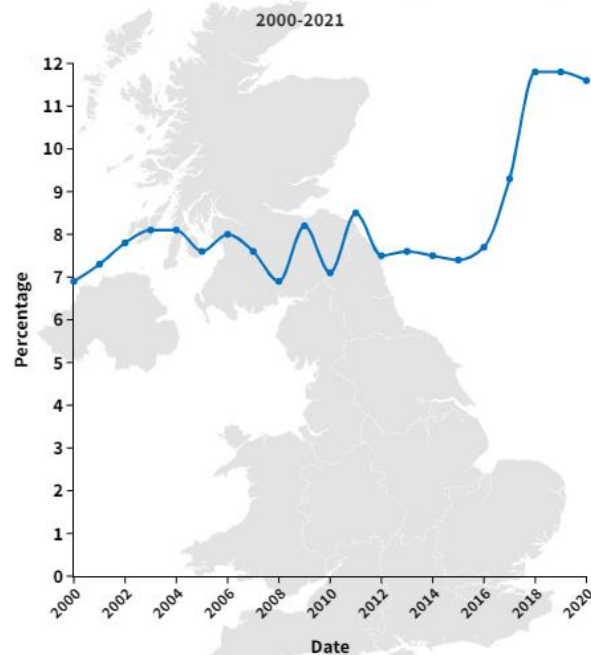
England, 2022



Source: UKHSA

Figure 4 TB notifications by Index of Deprivation, 2022

Proportion of culture confirmed TB cases with any first line drug resistance



Source: [TB Strategy Monitoring Indicators](#)

Figure 5. Proportion of culture confirmed TB cases with first line drug resistance.

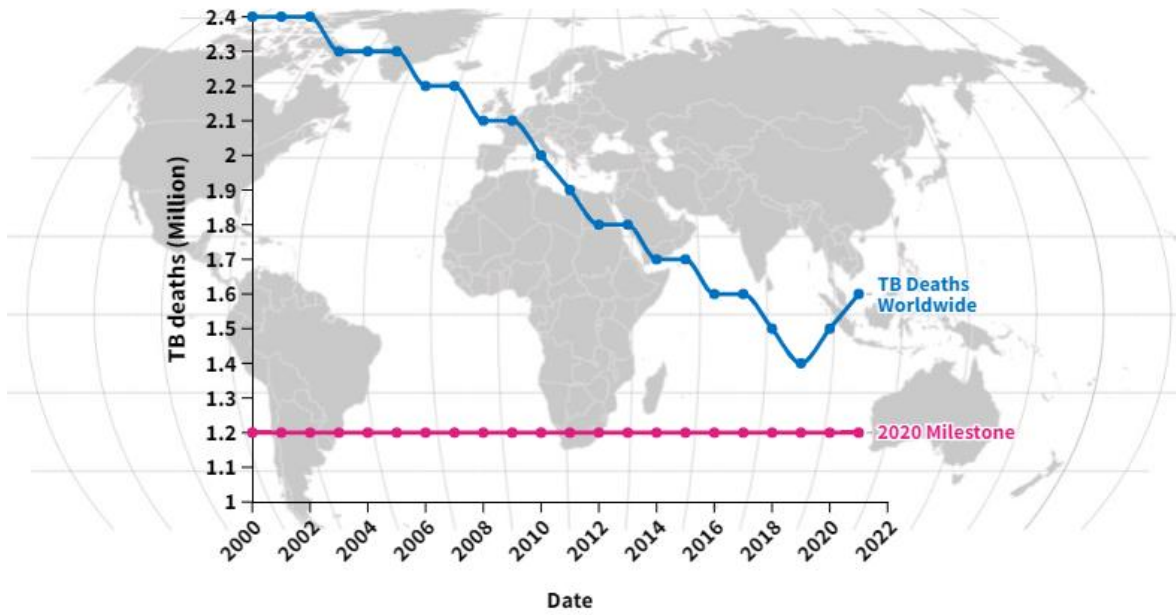
West Midlands

The West Midlands has higher rates of TB than England as a whole. The three-year average TB incidence rate 2019-21 in the West Midlands was 9.5 cases per 100,000 population, compared to 7.8 per 100,000 in England. There is much variation between the local authorities within the West Midlands. The highest rates of TB in the West Midlands were seen in Wolverhampton (20.8 per 100,000), Sandwell (19.8 per 100,000), Birmingham (18.0 per 100,000) and Coventry (15.8 per 100,000). The [\(27\)](#) report describes how rates of TB in the West Midlands are influenced by migration from countries with high rates of TB. The report also demonstrates that the burden of TB falls on more socio-economically challenged groups, with 43% of people with TB being resident in the most deprived areas of the West Midlands.

COVID-19 Impact

During the COVID-19 pandemic there was a 24% drop in notifications seen in Europe [\(23\)](#). More locally the number of cases and rate of TB decreased in the West Midlands by 5% in 2020 compared to 2019. The decline is likely to be due to the COVID-19 pandemic affecting health seeking behaviour [\(27\)](#). The impact of delaying, or lack of diagnosis due to the disruptions to services can be seen in the number of TB deaths increasing in 2020 for the first time in over two decades (Figure 6). Other major global events such as the war in the Ukraine and the displacement of millions in Europe continue to disrupt TB services and increase risk of disease [\(28\)](#) UKHSA, 2022 highlight the potential for variation in TB rates at local level and emphasize the importance of having sufficiently resilient, resourced services in place to deal with higher than expected numbers of cases locally [\(27\)](#).

Global trends in the estimated number of TB deaths 2000-2021

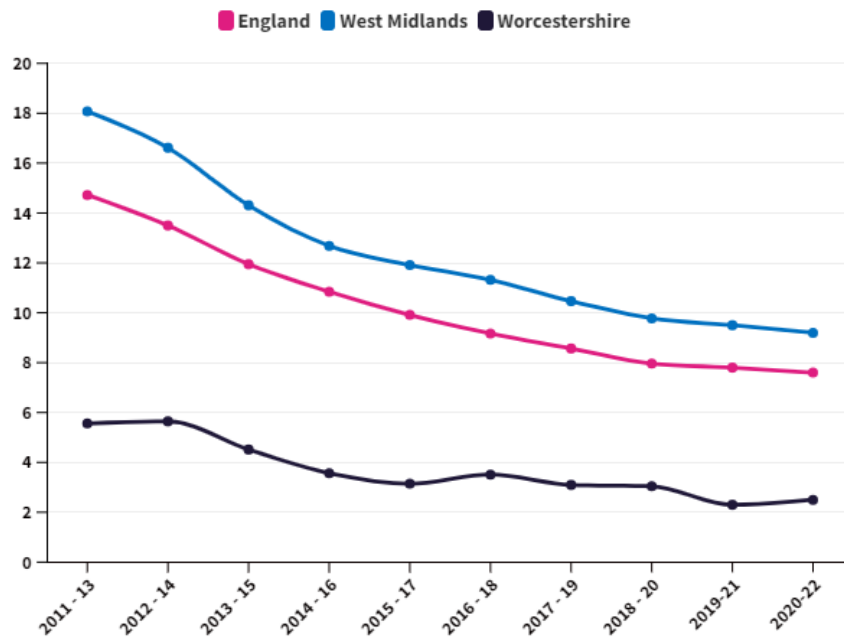


Source: WHO: Global TB report 2022

Figure 6. Global Trends in the estimated number of TB deaths

Worcestershire

Three-year average incidence of TB per 100,000 population (2011 to 2021)



Source: TB strategy Monitoring Indicators

Figure 7 Three-year average incidence of TB per 100,000 population (2011-2022)

The rates in Worcestershire are consistently significantly lower than England and the West Midlands and were largely constant during 2011-2022 (Figure 7). Over the last three years the number of cases has remained stable between 13-14 per calendar year equaling 40 in total.

Of the 40 cases between 2020- 2022 the largest percentage was seen in the 30-44 age group. Overall, 60% were men 40% female, 70% were pulmonary, 62.5% were born non-UK (Figure 8) 10% of cases were in prisons, 5% in asylum seekers 5% HIV patients and 5% Drug/alcohol misuse (Figure 9).

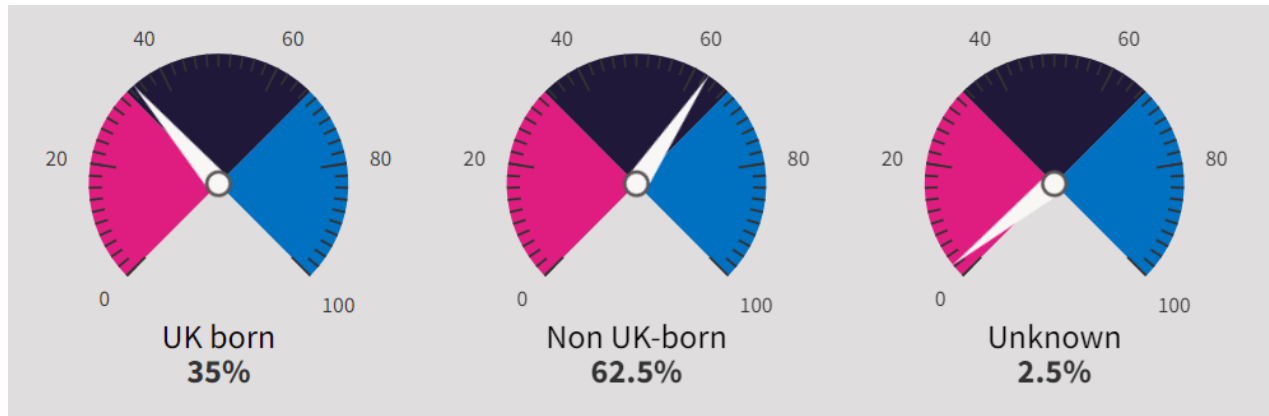


Figure 8 UK born versus non-UK born TB cases, Worcestershire, 2020-2022

TB cases in Worcestershire with Risk factor (2020 to 2022)

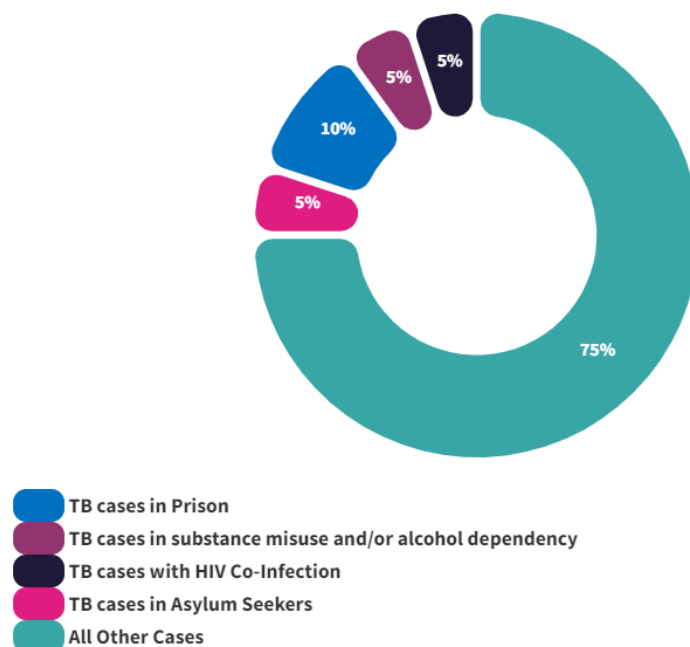


Figure 9 TB Cases in Worcestershire with Risk Factor 2020-2022

Number of HIV/Tb co-infection by year

There have been less than 10 people identified with HIV/TB co-infection within the past 5 years.

Number of people diagnosed with TB with substance misuse and /or alcohol dependency.

There have been less than 10 people diagnosed with TB in the last 5 years with substance misuse/alcohol dependency. These individuals were not identified through screening programmes but may have been screened for other reasons other than active case finding.

Number of cases within prison services.

There are 2 prisons within Worcestershire. HMP Hewell is a Category B establishment holding adult male and located in Bromsgrove. HMP Long Lartin is a High Security A men’s prison and located in Wychavon. There have been less than 10 cases of TB in prisons in the last 5 years.

Number of deaths due to TB.

There have been less than 10 deaths due to TB. It has not been possible to establish the demographics and detailed circumstances behind each death.

Hospital Admissions [\(20\)](#)

Figure 10. shows how the number of hospital admissions for TB in the county in the last ten years has varied. Particularly obvious is the drop from 2018/19 of 12 admissions down to 4 admissions in 2019/2020 during the COVID-19 pandemic.

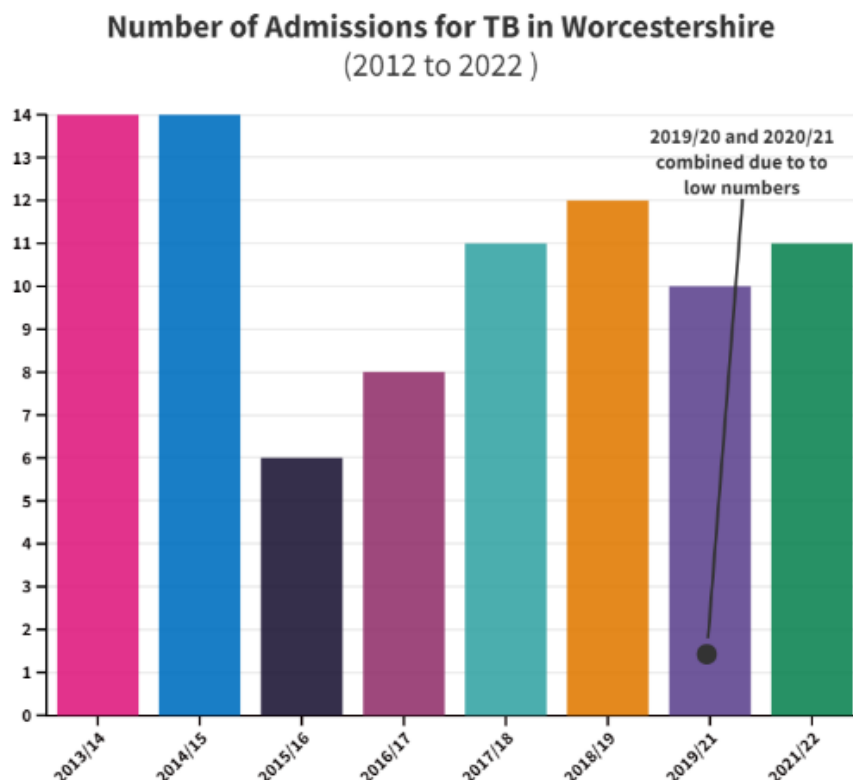


Figure 10 Number of admissions for TB in Worcestershire 2012-2020

Figure 11. demonstrates how hospital admissions in the county in the last ten years are varied between the districts, with Redditch and Worcester City having the highest number and Malvern Hills having the lowest number of admissions.

Total Number of Admissions for TB in Worcestershire Districts
(2012 and 2022)

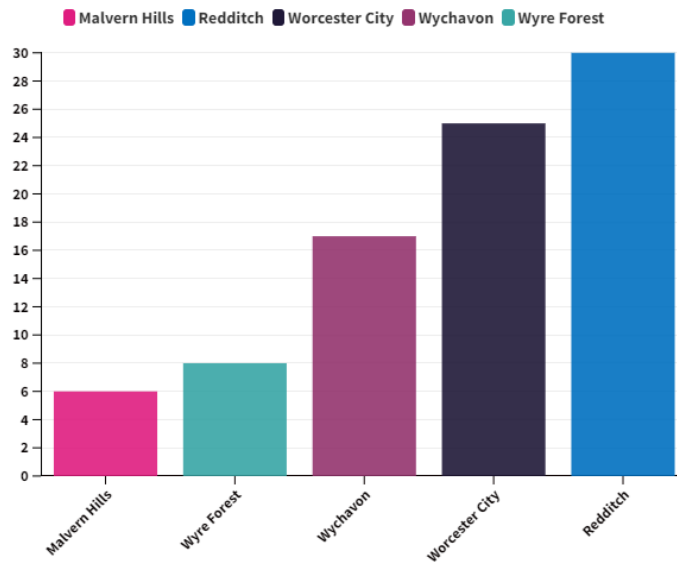


Figure 11. Total Number of Hospital Admissions in Worcestershire by District 2012-2022

This highlights the the potential for variation in TB rates at local level. UKHSA emphasize the importance of having sufficiently resilient, resourced services in place to deal with higher than expected numbers of cases locally (27). Figure 12. shows the proportion of those TB admissions between 2012-2022 by age range. The highest proportions are seen in the middle age categories.

Total TB Admissions for TB in Worcestershire by Age Range
2012-2022



Figure 12 Total TB admissions in Worcestershire by age range 2012-2022.

Figure 13 shows the breakdown of TB admissions by ethnicity for each year in Worcestershire between 2012-2020. More recently an increase in ‘Other ethnic group’ can be seen. We were unable at this time to establish the reason for hospital admission.

Number of Admissions for TB in Worcestershire (2012 to 2022)

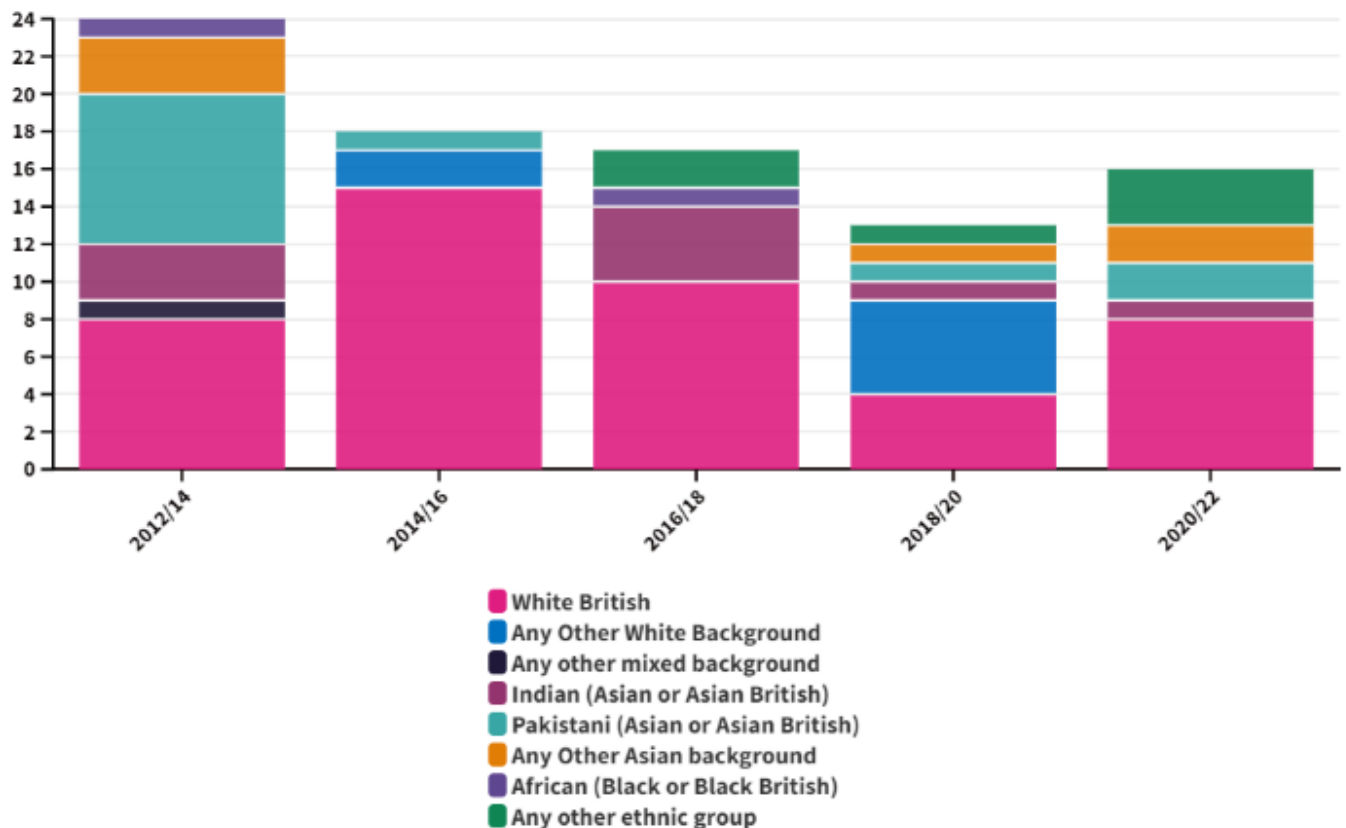


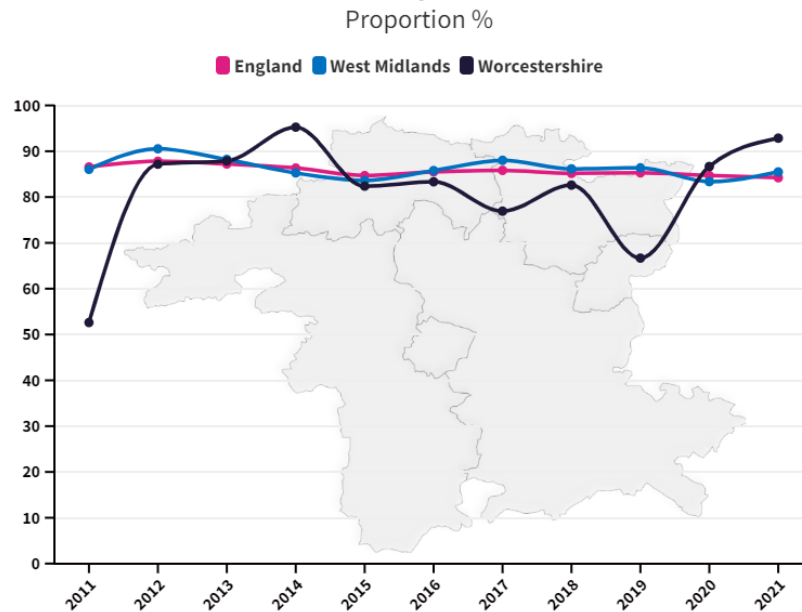
Figure 13 Number of TB admissions for TB in Worcestershire by ethnicity 2012-22.

Treatment Outcomes

Drug sensitive TB has an expected treatment duration of less than 12 months. The % proportion of TB cases who had completed a full course of treatment within 12 months is used as a key indicator in the treatment and care of TB cases in the UK.

In Worcestershire between 2011 and 2013 the percentage of people who completed treatment within 12 months increased from 52.6% to 87.8%. From 2013 to 2016 the rate was in line with the West Midlands and England. Most recently, there has been an increase since 2019, to 92.9% which is higher than both West Midlands and England (Figure 14).

Proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months

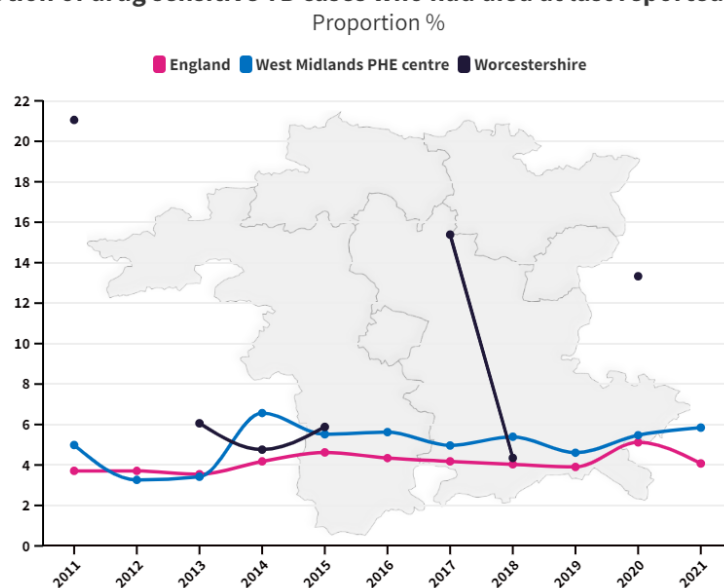


Source: [TB strategy Monitoring Indicators](#)

Figure 14. The proportion of drug sensitive TB cases who had completed a full course of treatment by 12 months.

Figure 15 shows the proportion of drug sensitive TB cases who had died at last reported outcome which is also used as a key indicator in the treatment and care of TB cases in the UK. Similarly, the rates in Worcestershire show hugely variable trends compared to the rates in England and in the West Midlands. Worcestershire's data is also incomplete and difficult to interpret. Figure 15. Shows a sharp decrease in percentage from 15% in 2017 down to 4% in 2019 should be interpreted with caution as low numbers may not reflect actual trends, could be misleading and vary considerably from year to year.

Proportion of drug sensitive TB cases who had died at last reported outcome



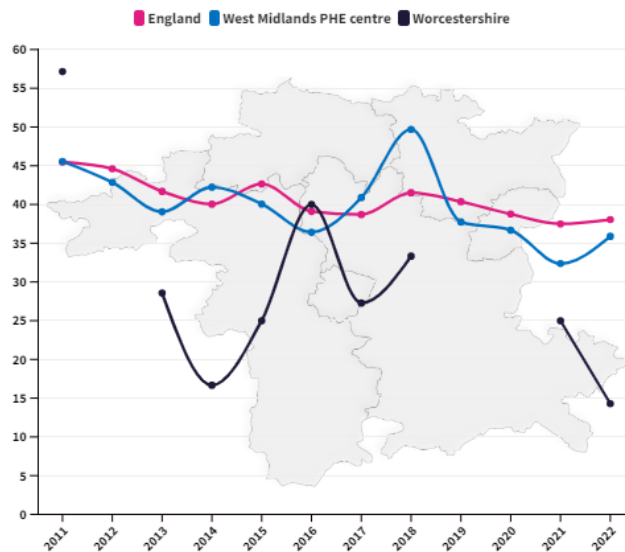
Source: [TB strategy Monitoring Indicators](#)

Figure 15. Proportion of drug sensitive TB cases who had died at last reported outcome.

Delays in Patient Pathway

The prompt diagnosis and treatment of active TB can improve patient outcomes and reduce the period of infectiousness and thus TB transmission. Early diagnosis and improved access to services is the essential first step onto the patient pathway, and into the system to prevent, control and treat TB. In patients with symptomatic pulmonary TB, a delay of days or weeks can put their health at risk and can also risk the spread of infection to close contacts.

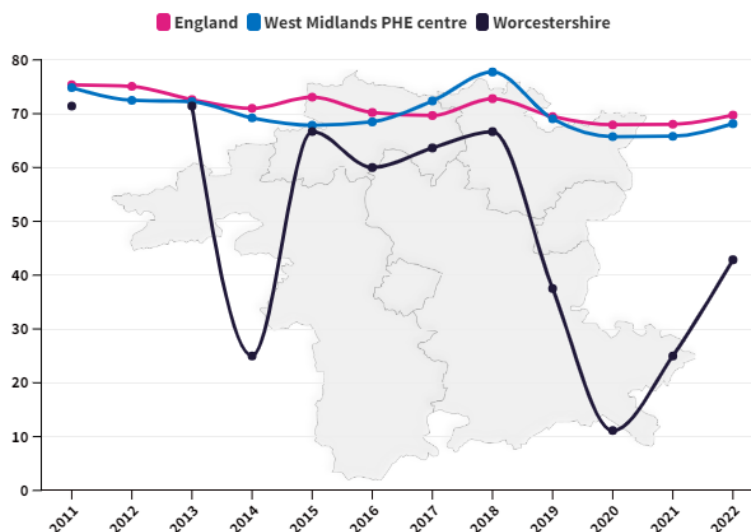
Proportion of pulmonary TB cases starting treatment within two months of symptom onset
 Proportion %



Source: [TB strategy Monitoring Indicators](#)

Figure 16. Proportion of pulmonary TB cases starting treatment within 2 months of symptom.

Proportion of pulmonary TB cases starting treatment within four months of symptom onset
 Proportion %



Source: [TB strategy Monitoring Indicators](#)

Figure 17 Proportion of pulmonary TB cases starting treatment within 4 months of symptom onset.

The proportion of pulmonary TB cases starting treatment at either 2 or 4 months is consistently lower in Worcestershire than the rates within England and West Midlands (Figures 16 and 17). There is a significant drop in 4-month rates in Worcestershire from 2018 to 2020. This resulted in only 11% of patients starting treatment within four months of symptom onset in 2020.

Since 2020, rates have improved (Figure 17), but are still much lower than rates for England and the West Midlands. Worcestershire's data is incomplete for 2 months (Figure 16.) and should be interpreted with caution as low numbers may not reflect actual trends and could be misleading and vary considerably from year to year.

Qualitative data was requested from the TB service in Worcestershire to gain insight into the potential delays in starting treatment. Unfortunately, the data provided was incomplete and inconsistent and so has not been included in this report. Influences that may be considered as potential factors in delaying treatment fall into three categories:

1. Delay in Access:

- A delay between the onset of symptoms and seeking medical help.
- Low awareness of TB/LTBI in community
- Low availability of appointments/clinics
- A delay in identifying at risk groups for screening for LTBI.
- Low uptake of screening programmes/Opportunistic screening.

2. Delay in Test:

- A delay between the time of seeking medical help to getting the diagnosis.
- Low availability of appointments/clinics
- Prolonged travel to appointments/clinics
- Low awareness of TB/LTBI within primary care
- Delays associated with lab diagnosis.

3. Delay in Treatment:

- A delay between diagnosis and the start of TB treatment
- Incomplete treatment adherence or treatment refusal

Screening data for LTBI in Worcestershire

Number of other people identified and treated for LTBI.

Within the last 5 years, 17 – 43 cases per year of LTBI have been identified.

Directly observed therapy & Video observed therapy.

All persons starting treatment for suspected or confirmed active TB should be evaluated for their risk of non-adherence to therapy at the time treatment is initiated.

Directly Observed Therapy (DOT) is a very effective way to ensure that patients complete adequate TB therapy in a timely manner. DOT means that a trained health care worker or other designated individual (excluding a family member) provides the prescribed TB drugs and watches the patient swallow every dose in order to maximize patient adherence to treatment. The World Health Organization recommends that TB treatment should, if required, be delivered by DOT in order to maximize patient adherence to treatment.

DOT has been the standard of care for TB since the early 1990s, however it can be inconvenient for patients and service providers (29). Video Observed Therapy (VOT), where treatment observation is conducted remotely by asking patients to submit video clips of themselves taking their treatment via smartphones, has emerged as a potential solution to this problem (30).

There has been a total of 16 people who have required VOT. The data shows a slight increase in the last 2 years. In 2020 1 person required DOT. This was due to the individual having issues with mental capacity.

It has not been possible to obtain details of why there has been an increase in VOT. However, it is possible that this is due to an increase in cases in individuals who have lived in or visited a high incidence country and may have difficulty due to language barriers and misunderstanding of requirement to take medication as prescribed.

Service Provision for TB

Worcestershire is considered a low incidence area for TB. Providing a TB Service within a low incident area can present some challenges.

The current model of TB commissioning in England requires each ICB to commission TB services for their population, however ICBs may not have the resources to dedicate to the commissioning of a specialist service in areas where there are small number of TB patients. PHE (now UKHSA) and NHS England and NHS Improvement (NHSE and NHSEI) has developed a nationally recommended TB service specification, however there is insufficient resource to implement or monitor this specification in most parts of the country given the small cohort of patients treated under it.

In addition, TB teams in low incidence areas often take on tasks which those in high incidence areas do not. For example, in many low incidence areas, all TB testing is undertaken by the TB team. In higher incidence areas, TB testing is often more widely available, and not undertaken by the TB team alone. This further stretches resources in low incidence areas.

Small teams may also not have enough capacity to manage the response to TB incidents where large numbers of people need to be screened. There may also be less community awareness and less resources to undertake awareness-raising activities in lower incident TB areas. This may result in both healthcare workers and members of the public not recognising the risks and symptoms of TB. Low community awareness may also contribute to greater diagnostic delay in low incidence areas. Programmatic TB screening has been introduced in areas with higher incidence of TB but has not been funded in areas of low incidence. In practice this means that screening of new entrants for latent TB can be under resourced and challenging. Other challenges to TB control in low incidence areas can include:

- Smaller TB workforce therefore impacted by leave, sickness and TB incidents.
- Less cross cover/surge capacity
- Less resources for incident management
- Provision of Directly Observed Therapy (DOT) can be difficult, also obtaining funding for Video Observed Therapy (VOT) can be difficult.
- Diagnostic delay is more likely due to a lack of awareness of the disease in patients and clinicians and due to the geography/distances to services.
- Healthcare delays are more common and there is a greater likelihood of fragmented diagnostic pathways.
- Less exposure to cases, so GPs and others are less aware ([31](#)).

Worcestershire TB Service

The Worcestershire TB service is provided by Worcestershire Acute Hospital NHS Trust and commissioned by Herefordshire and Worcestershire Integrated Care Board. At the time of undertaking this needs assessment there were:

- 1 Respiratory Consultant for Pulmonary TB
- 2 Infectious Diseases Consultants for extra pulmonary TB and TB Nurses
- 1 Lead TB Nurse
- 3 part time TB Clinical Nurses Specialist.

In addition, if someone is already under the care of a Respiratory Consultant and subsequently diagnosed with TB, they will generally remain under that Respiratory Consultant to ensure there is continuity of care. TB Nurses undertake screening as well as providing enhanced case management.

In patient Treatment

In-patient treatment can be initiated in either Alexandra Hospital, Redditch or Worcestershire Royal Hospital, Worcester.

Outpatients Clinic

A TB clinic is held by a Respiratory Consultant one a month. Appointments for the active cases generally involve a consultation, x-ray and bloods if required. There is also a Nurse led clinic for people with LTBI. Nurse led outpatient LTBI clinics can be held at Community Hospitals so more convenient for the patient according to where

they live. TB Nurses also provide home visits if required. Frequency of this depends on the needs of the patients.

Delivery of Bacillus Calmette-Guérin (BCG) vaccination

The Bacillus Calmette-Guérin (BCG) vaccine is a live attenuated vaccine which protects against TB. BCG is not given as part of the routine NHS vaccination schedule. However, it is offered to children or adults who have an increased risk of meeting TB.

BCG for babies

BCG vaccination is recommended for babies up to 1 year old who:

- are born in areas of the UK where TB rates are high.
- have a parent or grandparent who was born in a country where there's a high rate of TB.
- live with, or are close contacts of, someone with infectious TB.

If it will usually be offered at about 28 days old. In Worcestershire babies below the age of 12 months old are seen within the Paediatric Clinic if they require the BCG vaccination.

BCG for children aged 16 and under

BCG vaccination may also be recommended for older children who have an increased risk of developing TB, such as:

- children who have a parent or grandparent who was born in a country where there's a high rate of TB.
- children who have recently arrived from countries with high levels of TB, including those in Africa, the Indian subcontinent, parts of southeast Asia, parts of South and Central America, and parts of the Middle East
- children who will be living with local people for 3 months or longer in countries with high rates of TB
- children who live with, or are close contacts of, someone with infectious TB.

In Worcestershire the TB nurses administer BCG vaccinations to eligible children over the age of 12 months old.

BCG for adults

BCG vaccination is rarely given to anyone over the age of 16 because there is little evidence it works very well in adults. However, it is given to adults aged 16 to 35 who are at risk of TB through their work, such as some healthcare workers, veterinary staff and abattoir workers. The TB incidence rate in Worcestershire is 3 per 100,000 therefore there is no universal TB vaccination programme in this area. However, for the year 2021/22 169 BCG vaccinations were given to infants under 1 year in Worcestershire. The TB service does not current deliver a BCG vaccination programme for adults.

Referral pathway

Referral to the TB service can be made via a dedicated respiratory advice and guidance email address. Patients can also self-refer if they are concerned about TB. Details are available on the Worcestershire Acute Hospitals website.

Screening for TB in Worcestershire

Screening a population for TB involves identifying otherwise healthy people who are at an increased risk of developing TB. It can focus on detecting active TB disease or LTBI. Screening for active TB disease of the lungs usually involves chest X-rays. Sputum samples may also be taken for smear and culture analysis [\(34\)](#).

Active case finding of underserved groups.

Active case finding (ACF) is a strategy used to identify and treat people with TB who would otherwise not seek prompt medical care. It usually focuses on detecting pulmonary TB using chest X-rays or performing a symptom enquiry. Interventions using active finding of TB cases can reduce the prevalence of the disease. In low incidence countries, ACF is most commonly targeted at the below high-risk groups [\(32\)](#); [\(33\)](#):

- Professionals at risk of TB (for example healthcare workers)
- Close contacts of patients with TB (if active TB is suspected)
- People with social risk factors such as:
 - Homeless people
 - People who misuse substance or are alcohol dependent.
 - Prisoners
 - Immigrants from countries where TB is common [\(34\)](#)

In Worcestershire active case finding is not undertaken for people who:

- Are homeless.
- Misuse substances or are alcohol dependent.

Active case finding for the above group is also not included in the current Worcestershire TB service specification.

LTBI screening

It is likely that LTBI reactivation causes most of the active cases in the UK. Treatment of LTBI is essential to controlling TB because it substantially reduces the risk of progression to active TB disease. It is not feasible or cost-effective to screen an entire population, however, NICE recommends LTBI screening for specific high-risk groups in the UK. These groups include:

- Close contacts of patients with TB.
- Healthcare workers.
- Immunosuppressed patients (for example those with HIV).
- Migrants from countries where TB is common.

Screening tests for LTBI include the:

- Tuberculin skin test (TST) [\(35\)](#)
- Interferon gamma release assay (IGRA) [\(36\)](#).

People with LTBI have no symptoms of disease but are at risk of reactivation to active TB, sometimes for decades. LTBI can be detected using tuberculin skin tests (TST) or interferon gamma release assays (IGRAs).

As Worcestershire is a low incident rate area latent TB screening is not routinely undertaken for:

- Rough sleepers and people who are homeless.
- People who misuse substances or are alcohol dependent.
- Asylum seekers
- New entrants to the UK from high incidence countries – this includes people who have lived or visited high incidence countries and may include people who live in contingency hotels, are studying in Worcestershire or employed within Worcestershire.

However, it is offered and undertaken for:

- Contacts of active cases
- Those who have lived in a high incident country for TB and are applying for an NHS clinical post at Worcestershire Acute Hospital or Worcestershire Health and Care Trust
- People who have arrived in Worcestershire as part of the Afghan Relocation and Assistance Policy (ARAP)
- Those who have been referred from health care professional i.e. Dermatology
- 0 – 5-year-olds who have recently arrived to the UK via the homes for Ukraine scheme.

Close contacts of patients with TB (if active TB is suspected)

When someone is diagnosed with TB, contact tracing will be undertaken to identify those who should be offered LTBI screening. High-risk contacts include:

- All household members
- Close contacts (such as partner, house visitors, and close workplace contacts) if the person with TB has a positive sputum smear result.
- Casual contacts (such as work colleagues) if the index person with TB is particularly infectious (known transmission to close contacts), *or* if casual contacts are at increased risk of infection (such as immunocompromised people) [\(37\)](#).

The TB service currently screens people who are identified as contacts of people with active TB.

LTBI Screening for Health Care professionals at risk of TB

Work-based screening is intended to identify staff who may have active or LTBI. This is usually undertaken for employees who are born or had a prolonged stay in an area where TB is common. The risk for developing TB is highest during the first five years after arrival in the UK. Screening is usually undertaken by the Occupational Health service [\(38\)](#).

LTBI screening is undertaken for individuals who are employed by the NHS and have lived in a high incidence area. However, there is no data to suggest that people from

high incidence countries who work within private health sector or social care sector are screened for LTBI. LTBI screening is also not undertaken for university students who have placements at NHS Trusts.

Screening people with social factors risk for LTBI.

TB disproportionately affects vulnerable and disadvantaged populations [\(39\)](#). The most deprived 10% of the UK population have a TB rate more than 7 times higher than the least deprived 10% of the population [\(14\)](#). In 2020 12.7% of people notified with TB had a social risk factor, broadly comparable with previous years. 22% of UK born cases had at least 1 social risk factor recorded, compared with 9.1% of non-UK born cases. Cases with social risk factors are also less likely to complete treatment and are more likely to be lost to follow up [\(40\)](#).

People using homeless hostels, shelters and care centers are particularly at risk. People who are in prison and detention centers are also at higher risk than the general population. People who are alcohol dependent [\(41\)](#), smoke [\(42\)](#) or are underweight or malnourished [\(43\)](#) also have a slightly increased risk for LBTI reactivation. LTBI Screening for people with social factors risk is not currently offered in Worcestershire.

People experiencing homelessness.

People experiencing homelessness are at an increased risk of becoming infected with TB compared to the general population. This is due to factors such as substance misuse, HIV infection and the environment they live in. Homeless shelter environments can be overcrowded and have insufficient ventilation. In addition, people experiencing homelessness often lack access to the medical care required to make an early diagnosis of TB disease. Homeless people may also think the symptoms are due to their lifestyle so may delay seeking help.

The immune stresses associated with homelessness, such as rough sleeping, cold, poor nutrition and alcohol and substance misuse can also make it more likely that someone exposed to TB will go on to develop the illness. Active case finding or LTBI screening is not routinely undertaken in Worcestershire for people who are homeless [\(44\)](#) [\(45\)](#).

People with substance misuse issues and/or alcohol dependency.

People who misuse drugs or alcohol have a greater risk of catching TB. This is because:

- Alcohol and drugs damage a person's body and weaken their defenses against illnesses such as TB.
- They may not eat a diet that provides all the nutrients they need to stay healthy.
- They may spend time in places where it's easier for TB to spread, such as crowded or poorly ventilated homes or social venues.
- They may be around other people who have infectious TB but don't know it.

The symptoms of TB can be masked by alcohol and drugs and someone with a substance misuse problem may also find it difficult or be reluctant to access healthcare

or take their medication regularly if they do. This means they then pose an increased risk of passing infectious TB on to others and/or developing drug-resistant TB.

TB treatment can also be complicated in people with drug and alcohol issues because:

- TB medication can lead to side effects such as liver toxicity, which is particularly dangerous for people who drink too much alcohol. Injecting drug users are at risk of co-infection with viral hepatitis and/or HIV, which require careful monitoring and alternative drug-regimens [\(46\)](#).

Active case finding or LTBI screening is not routinely undertaken in Worcestershire for people who are drug or alcohol dependent.

HIV

People living with HIV are at a higher risk of developing active TB [\(47\)](#). HIV weakens people's immune systems, increasing the risk of opportunistic infections such as TB. Screening for and treatment of LTBI in HIV patients is also effective and cost-effective. People diagnosed with HIV are screened for TB in Worcestershire [\(48\)](#).

New entrant screening in Worcestershire

Pre-entry screening for active pulmonary TB

Since 2014, the UK has screened for active pulmonary TB in all long-term visa applicants from high incidence countries prior to arrival in the UK (pre-entry TB screening). The screening includes a chest x-ray and symptom assessment. Individuals who are found to have active pulmonary TB must complete treatment before their visa is granted [\(49\)](#).

National LTBI testing and treatment programme.

The National Latent TB Infection testing, and treatment programme has been in place since 2015. ICBs with high numbers of TB notifications and rates were identified as high priority for the LTBI programme. Guidance indicates that LTBI screening for new entrants should be undertaken for people who:

- Are born or spent more than 6 months in a high TB incidence country ($\geq 150/100,000$ or Sub-Saharan Africa)
- Entered the UK within the last 5 years (including entry via other countries)
- Aged between 16 – 35 years.
- Have no previous history of TB or LTBI
- Have not previously screened for LTBI in the UK

The Tuberculosis (TB): migrant health guide [\(50\)](#) indicates that LTBI screening for people arriving from areas with a TB incidence of 150/100,000 or more is cost effective [\(58\)](#) for the NHS. However, NICE guidance indicates that risk factors for TB is higher for people who are born in high prevalence areas defined as more than 40 cases per 100,000 population per year.

In 2023, TB notification rates in England remain highest in people who are originally from parts of the world where TB is more common and those in large urban areas in England which are associated with higher levels of deprivation, and in 'under-served populations' [\(60\)](#). Some people who move to the UK are at increased risk of infectious

diseases whilst living in the UK and continue to remain at a higher risk for TB many years after their arrival. This can be due to high TB infection risk in the country of origin and during their journey to the host country or higher prevalence of risk factors for TB such as malnutrition and HIV.

Groups including asylum seekers and refugees, unskilled workers or undocumented migrants may also be economically disadvantaged and live in over-crowded conditions. They are also at increased risk due to living and meeting socially with other at-risk groups.

Health care utilisation among migrants to the UK is up to 40% lower than amongst the UK-born population. This highlights that people with clinical onset of TB may delay accessing diagnostic and treatment services and attending regular appointments for clinical follow up.

Over the past 2 years people have arrived in Worcestershire under new schemes that support refugees and asylum seekers. This includes:

- ARAP (Afghan relocation and assistance policy)
- Bridging/contingency hotels for those seeking asylum.
- Homes for Ukraine scheme.

The majority of people who are living in Worcestershire from the above groups have lived in high incidence countries.

The county also has:

- Seasonal workers who often live in countries with higher rates of TB.
- People who study in Worcestershire from high incidence countries.
- People employed in Worcestershire from high incidence countries.

Current Screening programme delivered in Worcestershire for people living in Afghan Relocations and Assistance Policy (ARAP) accommodation and contingency hotels ([62](#))

In Worcestershire TB screening for those who reside in ARAP accommodation consist of:

- Symptom checks.
- Chest x-rays offered to those over 11 years old.
- LTBI screening using IGRA for adults and Mantoux skin test for children.

LTBI screening is not currently delivered to people residing in contingency hotels. However, a health questionnaire aimed at identifying active TB is completed. This is either undertaken by GPs or the TB Nursing Team. The health questionnaire is a tool used to identify people who are symptomatic and therefore potentially have active TB.

Ideally a chest x-ray would be performed alongside the health questionnaire, however this has not been implemented in Worcestershire. Anyone identified as having symptoms of TB should be referred to the TB Service.

Homes for Ukraine

In response to the displacement of millions of people due to the war in the Ukraine, the UK government has produced guidelines that recommend screening for all new entrants (including children) from Ukraine for TB [\(51\)](#).

The UK Health Security Agency (UKHSA) recommends that those arriving from Ukraine should be screened for active TB in line with the pre-entry specifications. This enables early identification of those with active TB, including those with MDR-TB and initiation of early treatment, preventing onward transmission and averting new cases.

For people aged over 15 (who are not pregnant), this would include a:

- Symptom check
- Chest X-ray
- Sputum assessment, where appropriate (person is coughing and able to produce sputum)

The LTBI screening for children 0 – 5 years old arriving to Worcestershire under the Homes for Ukraine scheme should consist of:

- Asymptomatic children with immunodeficiencies or other complex medical conditions referred to local paediatric services for an assessment of TB disease and infection.
- Asymptomatic healthy children aged 0 to 5 years offered an interferon gamma release assay (IGRA) test, or a tuberculin skin test (TST) for latent TB infection. Integrated care boards (ICBs) should work with local paediatric services and local TB services to agree a local pathway.

In Worcestershire LTBI screening is offered to children under 5 who have arrived under the Homes for Ukraine scheme [\(52\)](#).

Other considerations

Horticulture is a key sector in Worcestershire and local businesses rely on seasonal workers. A large number of seasonal workers within Worcestershire travel from high incidence countries on short term work visas. In recent years, there has also been an increase in students travelling to Worcestershire to study who are from high incidence countries. Worcester University also welcome overseas students.

There is also the risk of people living in Worcestershire who have travelled from high incidence areas and have no recourse to public funding. People with no recourse to public funding cannot access a range of services including welfare benefits and housing because of that lack of status. There is currently no LTBI screening programme in place for people who have travelled to the UK due to being a seasonal worker or student. There is also no current pathway to support people who are diagnosed with TB and have no recourse to public funding.

Screening for TB in prisons

TB in prisons is a major challenge to TB control. Higher levels of TB in prison populations are likely to be attributable to the fact that a disproportionate number of prisoners are from population groups already at high risk of TB infection and TB disease, for example, people who are alcohol and drug dependent, homeless people and people who struggle with mental health issues.

The prison setting can also increase the risk of transmission. Overcrowding, late case detection, inadequate treatment, high turnover of prisoners and poor implementation of TB infection control measures are all known factors contributing to transmission of TB in prisons.

Prisoners may also be at risk of rapid progression of LTBI to TB disease following recent infection or reactivation of latent infection through coexisting pathology, particularly HIV infection, intravenous drug use and poor nutritional status [\(53\)](#). The management of TB among UK prisoners is further complicated by high rates of lost to follow-up care and poor treatment outcomes [\(54\)](#). All new prisoners should be assessed for their TB risk by symptom screening and, if facilities are available in the prison for this, digital chest x-ray.

Any prisoner with a productive cough for more than three weeks who also has any other TB symptom (fever, night sweats, coughing blood, weight loss or generally feeling unwell) should be isolated in a single cell as soon as possible (preferably in the healthcare unit if available) and should have a medical assessment as soon as possible. If the prison doctor/GP suspects TB, they should urgently refer the patient to the local NHS TB service for further investigations [\(55\)](#).

Within Worcestershire there are 2 prisons, HMP Hewell and HMP Long Lartin. HMP Hewell is a category B adult male local prison, situated in the village of Tardebigge, near Redditch in Worcestershire. HMP Prison Long Lartin is a high security men's prison. It is located in the village of South Littleton (near Evesham) in the Wychavon district in Worcestershire. Practice Plus Group (PPG) provides the healthcare provision for both prisons. HMP Hewell has a TB Local Operating Procedure in place which main principles are:

- Screening for suspected TB
- Ensure patients are managed in line with best practice.
- Cross infection risk to staff and peers is minimised within PPG.
- To signpost Practice Plus Group staff and supporting partner organisations to up to date guidance on managing suspected/confirmed TB.

All prisoners are screened for TB at reception by the health care team. Whilst detained, if prisoners present with unexplained weight loss, night sweats, and or Haemoptysis/persistent cough they are treated as suspected TB until proven otherwise. The local operating procedure indicates that if someone is suspected to have TB then within the first 24 hours the follow is to be undertaken:

- First sputum sample collected.
- Prison staff made aware and informed.

- Isolate and place on medical hold. If in a shared cell moved to be single cell with immediate effect. (Pad mate should be monitored but not screened unless they present with symptoms)
- NEWS2 completed and prisoner informed of management plan.
- Inform duty Dr/H1 who will refer for an urgent chest x-ray.
- Patients with suspected TB attend the medication hatch to collect their prescribed meds wearing full PPE (Apron, mask and gloves)
- Datix to be completed.
- Head of Healthcare to be informed.

Within 48 hours the following procedures are undertaken:

- 2nd sputum to be collected.
- Care plan created.
- TB Team informed.
- NEWS2 completed.
- IGRA requested.

Within 72 hours the following procedure are undertaken:

- 3rd Sputum collected.
- NEWS2 completed.
- Discuss with TB team regarding isolation duration – this is usually after x 3 negative sputum's, a chest x-ray and IGRA result.
- Ensure BBV screen has been completed.
- Daily monitoring of patient whilst in isolation by HCA/Nurse.
- If identified as positive/latent TB – patient to remain in isolation until instructed by PHE and or TB Team. There is a TB register (TB Folder in H1 office), or on PPG intranet if confirmed positive.

Discharge planning is agreed with the TB Team, primary care and prison. If a prisoner is found to be negative for TB, further management plan on presenting symptoms is discussed with GP.

Although there is a robust pathway in place at HMP Hewell some issues have been identified. Prisoners are required to isolate whilst waiting for a chest X ray and results. Isolation periods can be prolonged due to difficulties in obtaining a chest x ray. This can have an effect on prisoners' mental health and wellbeing. The main reasons for delay in chest x rays

- Mobile X ray provision is only available only once a month and for 6 appointments.
- Issues with transport
- Prison staff capacity – each prisoner will usually need at least 2 escorts if attending an appointment out of the prison.

There is no detail available regarding the pathways for screening for TB at Long Lartin Prison.

Overview of Screening delivered in Worcestershire.

| Population Group | Screening conducted | Screening not conducted |
|---|---|---|
| Contacts of active cases | Yes | |
| Immunocompromised patients | Conducted in HIV Patients | Not conducted in other immunocompromised patients |
| Entrants from high-incidence countries | Conducted in: ARAP 0-5 Homes for Ukraine NHS health professional from high incidence country | Not conducted in any other new entrant screening: Contingency Hotels Asylum seekers/Refugees Students Seasonal Workers |
| Underserved populations | Conducted in Prisoners | Not conducted in: People experiencing homelessness. People experiencing drugs and/or alcohol misuse. People experiencing mental health problems. |

Table 1 Overview of screening delivered in Worcestershire.

Active case finding and LTBI screening is undertaken for those who are healthcare professionals employed by NHS Trusts and are at risk of TB due to living or recently lived in a high incident TB area. Screening of close contacts of active TB cases is also undertaken. However active case finding or LBTI screening is not undertaken for people with social risk factors such as being homeless or at risk due to drug and alcohol dependencies. TB screening is offered to people who live in ARAP hotels and is undertaken by the TB Team. LTBI screening is not routinely undertaken for those residing in contingency hotels. However, a health questionnaire aimed at identifying active TB is completed. Ideally a chest x-ray would be performed alongside the health questionnaire, this has not been implemented in Worcestershire.

Screening at ARAP and contingency hotels requires the TB service to attend on-site. The majority of service users do not speak English therefore conversations over the telephone have proven difficult. Translator services are required for each appointment and on occasion the requirement to arrange several translators per site has been required due to the mix of languages spoken. LTBI screening is also not offered to individuals who were born or spend considerable time in a country where TB is very common are more likely to have LTBI.

Fundamentally TB is disproportionately distributed within geographical areas, and it is the disadvantaged populations that are at increased risk of disease. Therefore, even within low incidence areas like Worcestershire, there are populations that experience higher prevalence of disease. Consequently, individuals with high personal risk of TB are not screened. This raises questions of equity as screening is based on the area you live rather than individual risk [\(56\)](#).

Due to the lack of LTBI screening:

- The true number of those with LTBI in Worcestershire is unknown.
- Combined with current living arrangements there is a risk of a TB outbreak in certain settings. This would have a significant impact on the capacity of TB service.
- There is a risk of people with undetected LBTI developing active TB disease. It is likely that latent TB reactivation causes most of the active cases in the UK. Identifying and treating latent TB can prevent future active cases and potential transmission of infection.

Opportunities for improving the detection of LTBI and Active TB in Worcestershire

Currently there is a policy-practice mismatch for the screening of LTBI in Worcestershire. This is most likely due to the current funding for Worcestershire services.

Increase funding and resources will allow Worcestershire TB services to expand current screening to including both opportunistic and active case finding in many more at risk groups. Funding is also required to enable treatment and medical overview for those who are identified.

Diagnosing TB

The Microbiology lab within Worcester Royal Hospital provides the current mycobacterium service for Worcestershire. Microscopy of samples provides an initial auramine fluorescent stain to screen for Acid Alcohol Fast Bacteria (AAFB), this is confirmed with a ZN overlay stain. This is reported as smear positive. The Microbiology laboratory based within the Worcester Royal's pathology department provide this service on a daily basis, results are available within 1 working day. Positive smear samples are then sent to the Regional Centre for Mycobacteriology (RCM) Laboratory at Birmingham Heartlands Hospital for full identification (Whole Genome Sequencing (WGS) and sensitivities.

Mycobacteria are slow-growing organisms that can take approximately 2 to 6 weeks to grow under laboratory culture conditions after the sample has been taken. Negative samples are reported after 8 weeks incubation. This can result in substantial time-lag between diagnostic confirmation of the presence of TB and further tests such as genomic sequencing and antimicrobial susceptibility [\(57\)](#).

The Microbiology department at Worcester also offer a rapid molecular test (Cepheid PCR), which can detect Mycobacterium tuberculosis DNA in samples, and can flag patients with TB on the same day their sample is taken. This PCR can also detect resistance to rifampicin. This test is performed on Sputum samples for in-patients or on request from respiratory Consultants. The Worcester laboratory also offers daily (Monday – Thursday) QuantiFERON® for identification of LTBI. Microbiology services within the county are summarised below in Table 2. Consideration needs to be given to local laboratory capacity. If Screening is increased this may have an effect on lab capacity.

Table 2 The current arrangement for TB microbiology services in Worcestershire

| Hospital Trust | Processing Laboratory | Microscopy and Culture | Susceptibility Testing | Direct Molecular Testing (PCR) | Immunodiagnostic Tests |
|-----------------------------|-------------------------------|---|---|---|---|
| Worcester Royal Hospital | Worcestershire Acute Hospital | <p>Microscopy: Auramine (Acid Alcohol Fast Bacilli - AAFB) and ZN stain available onsite with daily reporting apart from Sunday.</p> <p>Culture: Specimens are cultured using liquid and solid automated methods onsite with daily reporting.</p> | Positive cultures referred to RCM for ID and sensitivity testing. | <p>PCR available on demand using Cepheid (Sputum samples for in-patients or on request from respiratory Consultants)</p> <p>Tissue, other samples referred to RCM</p> | <p>QuantiFERON® - TB for latent TB daily.</p> <p>Samples must be received in the laboratory between 09:00-17:00 Monday- Thursday.</p> |
| Alexander Hospital Redditch | | <p>Identification and Sensitivities: Any positive AAFB/ ZN samples are sent to for the Regional Centre for Mycobacteriology (RCM) Laboratory at Birmingham Heartlands Hospital for full identification and sensitivities.</p> | | | |
| Kidderminster Hospital | | <p>Bone samples and specimens requiring low temperature culture are referred to the RCM.</p> | | | |

Opportunities for improved Microbiology in Worcestershire

Worcester Royal Microbiology lab has the potential to provide identification and sensitives of smear positive samples in-house. This would reduce time that samples spent in transit between laboratories.

The rapid PCR test could be utilised more with increased funding allowing same day diagnosis of TB and rifampicin

Promotion and Awareness

The Tuberculosis (TB): a resource to support TB guidance indicates that community awareness of TB in low incidence areas is often lower than areas that are high incidence. It is suggested that this applies to both health care professionals and members of the public. Smaller TB workforces in low incident areas may also not have the necessary resources to undertake awareness raising activities [\(56\)](#).

NICE guidance indicates that education programmes should be delivered to raise awareness and reduce stigma associated with TB. Stigmatisation of TB means that many people are fearful of seeking a diagnosis even when they become very unwell. Guidance also suggests that statutory, community and voluntary organisations and advocates who work with the general public, in particularly underserved and high-risk groups, should be supported with raising awareness and sharing share information about TB.

The National TB Service Specification also indicates that services should increase awareness of TB across statutory and non-statutory health and non-health care providers and communities.

Within Worcestershire the TB service provides teaching sessions to settings such as hostels and prisons. They have also visited settings that support asylum seekers. However, due to the capacity within the TB service, time restraints affect the amount of awareness and proactive campaigns and educational sessions that can be undertaken.

The ICS TB network meet regularly to discuss how the profile of TB can be raised within Worcestershire. The TB network is currently considering the recommendations within the National TB action plan.

Key Issues and Recommendations

Key Issues

Funding

Currently TB service funding is based on the number of people treated for TB. Screening of contacts, awareness raising activity, and pro-active screening of high-risk populations are not captured or considered. This means Worcestershire along with other low incidence areas receive the least funding for TB services. This highlights a gap in current funding as reaching eradication in any infectious disease in any population takes disproportionate effort and cost particularly when prevalence remains in isolated pockets. (56). Due to being funded as a low incidence area there is:

- A lack of capacity to screen for LTBI. Therefore, the number of people in Worcestershire with LTBI is unknown.
- A lack of capacity for treating those identified with LTBI.
- A lack of capacity to undertake active TB screening for all populations at risk. less opportunity to deliver awareness campaigns, therefore, may increase the risk of health care professionals and those supporting the most vulnerable not recognising the signs and symptoms of TB which may result in delayed referrals to the TB service.

Access to Services.

TB teams in Worcestershire cover a large geographical area that can require large distances of prolonged travel. Equally patients may be required to travel a large distance to attend clinics. This can result in a delay to treatment as a separate appointment with a nurse (potentially with prolonged travel) may be required to initiate treatment, particularly where Video Observed Therapy is required.

Delays in starting treatment.

The proportion of pulmonary TB cases starting treatment at either 2 or 4 months is consistently lower in Worcestershire than the rates within England and West Midlands (Figures 21 and 22). There is a significant drop in both rates in Worcestershire from 2018 onwards, resulting in 0% starting treatment within two months in 2019 and 2020, and 0% starting treatment within 4 months in 2020.

Lack of understanding of why people have been admitted to hospital for TB or died due to TB.

Although data is available to inform the number of people who have been admitted to hospital with TB or died due to TB the detail behind each case is not available. Therefore, it is difficult to provide recommendations which may reduce hospital admission and reduce the risk of death.

Collation of data.

The current method of collating data for LTBI is not robust. It is therefore difficult to ascertain the number of people who have been identified and treated for LTBI. Robust data collation will allow evaluation of the service and its needs.

Recommendations

1. ICB and public health to seek increase in funding and resources to allow Worcestershire TB services to expand current screening practice in line with national guidance.
2. Increase awareness programmes to at-risk communities by developing partnership with relevant voluntary or third sector organisations.
3. System partners to increase uptake of screening programmes/Oppportunistic screening by positive promotion among relevant communities.
4. Increase partnership working with relevant voluntary or third sector organisations who work with at risk groups.
5. Consider attaching LTBI screening to already established programmes/interactions such as Blood Borne Virus (BBV) or new admission screening.
6. Consider joint commissioning across a wider footprint e.g., with a neighboring ICS
7. Consider surge capacity arrangements with larger services in higher incidence areas to provide capacity during incidents in low incidence areas by cross-charging to cover.
8. Continue partnership working with the University to prevent the risk of spread of TB, including international students.
9. Improve data collection of LTBI screening.
10. Undertake a cohort review.
11. Ensure there are robust screening pathways within Worcestershire Prisons
12. Agree a processes and funding for people who have active TB and no recourse to public funding.
13. Consider 'Car in the community' model – TB nurse runs their patient follow-up from a car.

NHS England will need to be engaged for some of the key recommendations above, particularly with regard to funding. Herefordshire and Worcestershire ICB will need additional funding to enable sustainable screening and treatment of increasing numbers of cases.

Conclusion

TB rates in Worcestershire are currently stable and are classed at a low incidence level. However, it is recognized that there are populations within Worcestershire who are at higher risk of developing active TB.

As Worcestershire is a low incidence area it receives the least funding for TB services. Due to lack of funding proactive screening for active TB and LTBI screening cannot be undertaken for people who are at higher risk of TB due to social risk factors and deprivation and/or have lived in a high incidence area. There is also a lack of capacity within the TB service to treat and manage LTBI cases if all at risk were screened and identified. This could lead to undetected and untreated TB cases. Lack of funding also reduces the opportunity for TB services to work collaboratively with organisations who support those who are at higher risk of TB.

There are also delays in commencing treatment in patients with active TB. This delay increases the risk of transmission in the community, reduces patient outcomes, and increases costs.

To address the above increased funding and resources are required to expand the service within the county to serve those with active TB and those with an increased risk of TB as recommended in NICE guidance. Investing in TB prevention and control in Worcestershire would contribute to the global and National targets for disease elimination and would result in substantial savings to the whole health and social care system.

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