RNOH/GIRFT Review of Tuberculosis

Scotland National Report

September 2025

Scottish Government
Riaghaltas na h-Alba

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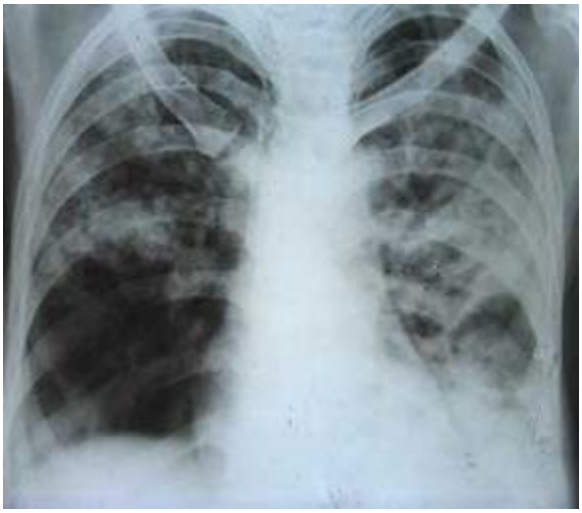

This report has been produced by the Getting It Right First Time Projects Team at the Royal National Orthopaedic Hospital (RNOH/GIRFT). It aims to reduce unwarranted variation to ensure best outcomes for patients and to maximise the use of existing resources and assets.

Written by: Dr Martin Allen - Consultant physician at University Hospitals of North Midlands NHS Trust, GIRFT Respiratory Lead and the National Specialty Adviser for Physiological Science NHS England.

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1 Foreword

Tuberculosis (TB) remains a major global health problem, despite being both preventable and curable. The World Health Organisation (WHO) ranks TB as the leading cause of death from an infectious disease worldwide. In recent years Scotland too has seen a worrying increase in the number of TB cases, resulting in increased patient morbidity and additional pressure on TB-specific and wider health services. Despite having made significant previous progress on reducing TB incidence in Scotland, the sustained increase in case numbers since 2022 mean that we are no longer on-track towards TB elimination.

Through a collaborative approach involving NHS Health Boards, Public Health Scotland, TB clinicians and other healthcare professionals, we have sought to better understand the current situation in Scotland. This includes identifying the ongoing challenges faced by Health Boards and highlighting areas where we can improve clinical practice. In this way we seek to reduce unwarranted variation in care and ensure that all patients receive the highest standard of treatment.

As part of this process, we commissioned a “Getting It Right First Time” review of TB services across Scotland, the findings of which are contained within this report. In addition to the important recommendations from the GIRFT team which aim to further improve services, there are also numerous examples of excellent clinical care and innovation, highlighting the dedication and diligence of our Scottish TB and wider health workforce. I extend my personal thanks to this workforce, and particularly to those who participated in this important review.

It is also clear, however, that there are areas of variation in TB service provision within Scotland and the review highlights the actions we need to take to deliver a more consistent, effective, and patient-centred approach to TB diagnosis and treatment, with an ever-present focus on reducing such health inequalities in Scotland.

As we move forward, I encourage all those involved in the commissioning and delivery of TB services in Scotland to play their part in considering and implementing the recommendations within this review. By continuing to strive to improve our care, and by working together, we can combat this important threat to population health with the ultimate goal of TB elimination in Scotland.

Professor Nicola Steedman
Deputy Chief Medical Officer

2 Executive Summary

Tuberculosis (TB) continues to be the major infectious disease accounting for loss of life worldwide. Although the number of notifications (a diagnosed case of TB reported to the relevant health authorities) has fallen over previous decades, TB in the UK continues to be a major burden and the WHO (World Health Organisation) eradication target is unlikely to be met by 2035. For a variety of reasons, there has more recently been a year-on-year increase in the number of post pandemic notifications, leading to the Scottish Government commissioning the GIRFT Projects Team at the Royal National Orthopaedic Hospital (RNOH/GIRFT) to deliver this review of TB, with the aim of identifying improvements to sustain care for patients with TB and highlight any good practice.

This report is very timely with the increase of 40.8 % in notifications between 2022 and 2023, an increase not seen since 2017. While Scotland remains a low incidence country at 5.2 cases per 100,000 population the increase in case numbers is very concerning, especially in the 25 to 34-year-old populations, where there is a rate of 13.5 notifications per 100,000, and increasing numbers of cases in children, consistent with recent TB transmission. Overall, there was a death rate due to tuberculosis of 4% in 2023, which, while similar to that in England, is still unacceptably high.

This report sets out how RNOH/GIRFT delivered against the objectives of the review, which used the GIRFT methodology of data-driven peer reviews of services. Although the methodology is similar to that used for the review of TB Services that RNOH/GIRFT undertook in England in 2024, the process was different, allowing a greater number of services to be reviewed. Furthermore, the report is constructed in a different way to the England report, with the themes based around the data pack chapters. As such, the recommendations are based upon the findings from the visits and the data and are thus bespoke to Scotland. As expected, there are some findings and recommendations that are common to both reports, but there are also differences.

While the geography and models of care in Scotland are different, it would be worth colleagues in Scotland reviewing the recommendations in the NHS England report on suggested staffing levels, especially if a preventative program is to be developed. The aim of this RNOH/GIRFT TB review was to instigate a step change in care, reducing the burden of TB on patients, their carers, on providers of TB services and on the local and national health systems. Whether we can redress the trajectory of elimination is unknown, but completing these recommendations will be a significant and positive step towards that goal.

Following the GIRFT methodology, a comprehensive data set was developed based upon the Scottish Morbidity Records Inpatient Dataset (SMR01) activity returns, the Enhanced Surveillance of Mycobacterial Infections (ESMI) dataset and an in-depth survey. The latter was based on the England survey developed by a ‘Delphi’ type process with several iterations. This formed the template for engagement with

colleagues in Scotland, after which the survey was improved and increased in size. There was an excellent response from colleagues as shown in Annex A**,** which lists those who completed the survey.

This resulted in the development of a bespoke data pack for each participating provider where the provider was anonymously benchmarked against their peers. This data pack then formed the basis of the ‘deep dive’ meetings with selected health boards, lasting 2 to 4 hours, at which the TB services were explored in detail. From these deep dives, both good practice and service issues were identified to form the basis of this report. To facilitate service development for each participant, a report was produced after each deep dive meeting, which included specific recommendations for that service provider.

To make the data pack easier to follow, some 102 ‘core graphs’ were selected and used as a focus for the deep dive meeting. The full data pack included these core graphs and was shared with the identified TB coordinator for the service, who then shared this pack with relevant colleagues. They also ensured that colleagues such as clinicians, TB nurses, Executive and Management leads and the TB Service Public Health representatives were invited to attend the deep dive meeting.

This report has been constructed using the information from the data sources listed and the deep dive visits. The narrative of each section is supported by a selection of graphs from the data pack which, for ease, are embedded within the report. The latter graphs usually show the Scotland average and the findings from several anonymised providers. This allows us to benchmark services as well as showing variation, some of which (from the visits) appear to be unwarranted.

The report contains 65 recommendations, many of which are relatively straightforward, in that they require a focus on providers to modify and standardise their services, supported by appropriate resources. Some recommendations propose action at national level.

The report recognises that financial resources are limited at present; however, many of these changes can be implemented with little additional funding and are likely to improve outcomes for patients, their carers, those individuals on preventative programs and, importantly, reduce the clinical and financial burden of TB in Scotland.

3 Acknowledgements

This report is the outcome of the close working of a small team comprising; RNOH/GIRFT team and the Clinical Lead, Martin Allen. Martin would like to thank the RNOH/GIRFT Project Manager, Gill Salter, for her organisation and coordination of the project, and Allison Beal, RNOH/GIRFT Programme Manager, for overseeing the delivery of the review.

The detailed analysis of a multiplicity of data items and data pack development was performed by Edge Health's Yammi Yip and Emily Zhai and overseen by Jon Bruce. The development of the survey was hugely supported by clinical colleagues from the Scottish Health Protection TB Multi-disciplinary Network whom we thank for their input. Last but by no means least, I want to thank colleagues within the Scottish Government's Population Health team, Graeme Hunter and Charles Laing and colleagues within the Public Health Scotland Bacterial respiratory Team, Eisin McDonald.

Martin Allen,
September 2025

4 Structure of this Report

This report is displayed in sections as they appeared in the data packs and generally follows the structure of the deep dive visits. Each section has a commentary, based upon the data and information from the visits and includes the relevant graph or reference to it within the complete data pack which can be found via the link in Annex E. Following this, there are recommendations made for each section which can be considered at the TB service, Health Board or national level.

Services are not specifically named or highlighted apart from those that appear in the good practice section where we have received permission to do so.

The report has relevant sections aligned to the data pack structure. After a brief section of the 'epidemiology' there is an overview of 'workforce' considered as medical, nursing, administrative and clerical. This is followed by a review of 'policies and procedures' for service providers and a section about 'data management'.

Following a section on 'diagnostics', the bulk of the report is considered as 'management' and, for ease, is broken down into several sub-sections, each with their own recommendations, again broadly following the information of the core data pack and the deep dive visits. The final section on 'preventative therapy' includes: 'occupational health', 'biological screening' and the 'Bacillus Calmette–Guérin vaccine (BCG)'. There is a large section on 'contact tracing' which the graphs highlight has considerable variation in practice. While there is not a formal commissioned 'latent TB' infection initiative in Scotland, several Health Boards are attempting to make a difference with excellent results. These are mentioned in the 'asylum and migrant' section of 'prevention' but more detail is included in the 'good practice' section.

The good practice section has many examples which are found via the link in Annex E.

There are many documents and much information referred to in this report; some of these are attached as Annexes, as per the list below, and the remaining larger documents are stored centrally for access.

The Annex documents referenced within this report include:

A: TB service survey participants

B: Martin Allen Biography

C: A list of deep dive meetings

D: Glossary of the common abbreviations used.

E: Link to the Good Practice resources and other useful links (Includes documents referenced within the report and other links which may be useful:

- Good practice documents
- The guidance for the survey questions
- Full anonymised data pack
- Key lines of enquiry – slide question prompts

5 Background and Approach

Getting It Right First Time (GIRFT) is a national programme in England developed by the GIRFT national team under the chairmanship of Professor Tim Briggs. GIRFT has been designed to improve patient care, by reducing unwarranted variations in clinical practice. GIRFT helps identify clinical outliers and best practice amongst providers, highlights changes that will improve patient care and outcomes and delivers efficiencies (such as the reduction of unnecessary procedures) and cost savings.

Working to the principle that a patient should expect to receive equally timely and effective investigations, treatment and outcomes wherever care is delivered, irrespective of who delivers that care, GIRFT aims to identify approaches from across the NHS that improve outcomes and patient experience.

RNOH/GIRFT was asked by the Scottish Government to conduct a review of Tuberculosis (TB) services in Scotland. Dr Martin Allen, the GIRFT Respiratory Clinical Lead, led this review. (See biography in Annex B). Martin is a Respiratory consultant at University Hospitals of North Midlands NHS Trust and is the National Specialty Adviser for Physiological Science and Respiratory Medicine for NHS England.

Martin has also provided the Clinical Leadership for the TB review in England and is leading on the TB Implementation Framework for England, which has been commissioned by NHS England following the recent publication of the England National Report.

5.1 Objectives of the Review

The review had the following objectives:

- Identify how different services are providing TB care and reflect this back to each provider
- Help to reduce diagnostic and patient delays
- Gain a better understanding of TB workforce models
- Improve and future proof TB services through appropriate rationalisation and service transformation
- Review and comment on the TB infrastructure in Scotland.

5.2 Methodology

Our approach was based on the methodology developed by GIRFT which uses data to identify the impactful and high priority opportunities for transformation. This includes opportunities to generate re-investment savings, improve service quality and address unwarranted variation in practice and/or spending.

The scope of the review was to look at TB service providers and to look at the engagement within TB systems and Public Health Scotland.

5.3 Data Collection

The first phase of the review was the identification of available data sources and how to gain access to them for the key areas we wished to review. For many areas there were gaps in knowledge and information, especially around the process of care and workforce numbers in relation to levels of service activity.

To fill this information gap, we developed a questionnaire which had been used for the England workstream and which we further enhanced for the Scotland review. The initial England questions were based upon the key deliverables of the TB action plan and developed using the 'Delphi' methodology, involving key opinion leaders from medical and TB nursing backgrounds. These questions were shared with colleagues in Scotland, who further developed them to answer specific issues thought to be important in Scotland and filled in data gaps which had been identified during the England work. The aim was to give a more comprehensive overview of TB services in Scotland. The questions were structured into the following themes:

- Staffing/workforce
- Bacillus Calmette–Guérin Vaccine (BCG)
- Preventative Treatment
- Organisational Support and Infrastructure
- Screening Services
- Diagnostics
- Contact Tracing
- Inclusion Health
- Management of TB

There were 186 questions in the survey and these questions were shared with the following key stakeholders to gain agreement:

- Representatives of the Specialty Advisory Group (SAG) of the British Thoracic Society (BTS)
- The Scottish Health Protection TB Network (SHPN)
- Scottish Government Population Health and Protection Division
- Several TB providers
- TB specialist nursing leads

Once the survey questions were agreed, they were developed into a 'webform' which was shared with the main contact(s) within each TB service. To provide more information and to encourage participation, we held a webinar to launch the TB Survey on 17 September 2024.

We also set up a dedicated mailbox to ensure effective communication and engagement during the review.

The full set of survey questions can be found via the link in Annex E.

5.4 Results of the Returns

The duration of the review was from March 2024 through to April 2025. The review used the full dataset from 2022 for TB data returns, with the survey responses aligned to this period. Over this period there were 201 TB notifications in Scotland.

5.5 Data pack production

To develop information and intelligence to support the report and visits, data was identified from different sources. The national surveillance returns for each service ESMI (Enhanced Surveillance of Mycobacterial Infections) data was collated as were the admission data from SMR01 (Scottish Morbidity Records Inpatient Dataset) where tuberculosis was the main code on discharge.

The data was then collated by the RNOH/GIRFT analytics team and reviewed to ensure the correct fields were captured. Graphs were produced for each TB Service, and a further webinar held to explain to services how to interpret the data. To facilitate interpretation a 'core' set of 102 graphs was produced, with all the collected data and information in the data pack 'Appendix', totalling some 348 graphs including the repeated 'core' graphs.

Surveys were sent out to 16 TB services, with responses received from all 16. Of these we received complete data from 15 services, and 1 service only partially completing 4 out of 9 of the survey sections. From these 16 services, 4 services had no notifications and therefore there is limited information in ESMI, and another 4 services had zero admissions, producing some variability in aggregated results. However, data was used as if the survey was totally or partially completed, recognising in some services the lack of notifications (ESMI data) or no admissions. This provided a very comprehensive overview of TB services in Scotland at this point in time.

The table in Annex A shows the TB service providers who participated in the survey.

5.6 Clinical Lead 'Virtual Deep Dive' Meetings

To validate and explore the data, the RNOH/GIRFT clinical lead led 11 virtual 'deep dive' reviews with TB providers. These were selected based on the details in the data packs, including the geography of the provider (rural versus urban) and the number of TB notifications. We asked for a broad attendance at the virtual deep dive reviews by all staff delivering TB services including: the service lead consultant, the lead TB nurse, Infectious Disease (ID) leads, CYP (Children and Young People) consultants, microbiology staff, pharmacy staff, administrative staff, Public Health colleagues, acute provider managers and service leads.

MS Teams' virtual deep dive meetings were conducted in 11 services, including one provider, as an example of a service with 0 notifications or admissions. Prior to each deep dive, the RNOH/GIRFT clinical lead reviewed the graphs and selected those most pertinent for discussion and explanation.

Each virtual deep dive meeting was of 3 to 4 hours' duration and engagement was excellent. There was a set process for each meeting in which the service leads were invited to present 'what worked well' and' what their issues were' before exploring the data pack in detail. The clinical lead focused on any unwarranted variation, as well as identifying and recognising areas of good practice.

For each service reviewed a local report was produced highlighting areas of good practice, some of which fed into the national good practice**,** and we made recommendations to improve the service. We were unable to conduct a deep dive visit one service due to time constraints for the service and so we provided a verified paper-based review (so in fact 12 reviews were undertaken).

The schedule of deep dive meetings in Annex D and the link to the Key Lines of Enquiry (KLOEs) we used are found via the link in Annex E.

5.7 Communication and Engagement

We delivered a series of communication and engagement activities throughout the lifecycle of the review including:

- An information leaflet to all stakeholders providing information about the review
- A fortnightly Project Team Meeting which included colleagues from RNOH/GIRFT and the Scottish Government
- A national webinar on 24th September 2024 to launch the survey
- Regular TB Review Updates which provided progress on the review at each key stage
- A second national webinar to explain and aid understanding of the data pack on 21st November 2025
- A stakeholder workshop to develop and agree the content for this report
- A third and final webinar is being scheduled to outline the key findings from the review.

6 Summary of Recommendations

Please note that all the recommendations in this report are listed in this section for your reference. We have identified who we think should have responsibility for implementation of each recommendation using the key below.

Key

P	Provider (TB Service)
HB	Health Boards (Territorial)
N	National (This applies to the various national organisations involved in supporting TB services, including the Scottish Government, Public Health Scotland, and other Special Health Boards. Bodies responsible for implementing these recommendations will be identified during the implementation process).

Table 1: All Recommendations by Section

Recommendations: Epidemiology

1.	Continued entry of information into surveillance systems is important to support planning for future services and understand local and national epidemiology. Administrative support is required to enable timely and complete data entry.	P, HB

Recommendations: Workforce Issues in the Management of Tuberculosis

2.	TB clinicians and teams should be encouraged and supported to participate in research and other academic activities which include teaching (as in workforce specific sections) production of guidelines etc.	P, HB, N

Recommendations: Medical Workforce

3.	Each TB service should have a recognised lead who is named, with responsibility for maintaining policies and overseeing Health Board education. This is dedicated lead SPA time and is generally the same for most services as even those with few notifications still need to deliver these general aspects of the TB service.	P, HB
4.	The clinical lead should deliver all, or the bulk of TB medical care and should have sufficient DCC time in their job plan for this to take place.	P, HB
5.	Depending on the size of the service, time for a clinical deputy and/or support needs to be included. There are advantages of this being from a different speciality, especially in managing co-infection with HIV.	P, HB

6.	In all job plans, appropriate SPA time for providing education and self-continuing professional development (CPD) should be included together with DCC time for service delivery. This should include, not only clinic activity, but time for regular local and Health Board or National MDTs and clinical administration.	P, HB
7.	Cohort reviews should be re-established with time in job plans to attend, with the lead clinician acting as a reviewer for other Health Boards. To support data collection for such reviews, there needs to be administrative time, and such reviews should be a feature of job plans for all individuals i.e. medical, nursing, pharmacist. A formal report with actions should be generated, hence the need for administrative time.	P, HB
8.	For some services such as CYP, non-tuberculous mycobacteria, where there may be a Health Board or National lead role, time needs to be allocated in the individual Lead's job plan for this work. Such networks need to be agreed and funded at Health Board or at National level.	P, HB

Recommendations: Nursing Workforce

9.	Services should review their nursing workforce to ensure they are not doing tasks which could be done by lower banded staff i.e. ensuring senior qualified staff are working at 'top of licence'.	P, HB
10.	There are excellent examples of nurses where they run their own clinics and prescribe and request radiographs. These nursing options should be explored in each TB service.	P, HB
11.	There should be sufficient senior nursing time to manage the TB service.	P, HB
12.	All nurses, as part of their re-validation process, should ensure they are up to date with current TB practices and where training is required should have access to funds for such education, at whatever level is appropriate.	P, HB

Recommendations: Admin and clerical workforce

13.	On a pro rata basis, Admin & Clerical support at Band 3 or Band 4 should be available in a dedicated role to support the TB service, acting as the focus for the service. This role would develop reports, collate information for MDTs and cohort reviews and facilitate data entry and general communication, informing all parties involved in TB care of decisions and outcomes.	P, HB

Recommendations: Policy

14.	Regular meetings between management in acute providers, which would also include Health Protection, Public Health and the Health Board, are an important way of maintaining the profile and supporting funding. Based upon the number of notifications and	P, HB

	preventative therapy, these meetings should take place at least on a quarterly basis.	
15.	TB services should meet internally with their management team to discuss practical service delivery issues, the frequency dictated by activity. This time should be built into job plans.	P, HB

Recommendations: Data Management

16.	National Services Scotland should consider the development of other data platforms, which would be helpful for in patient management and communication and would feed into national surveillance databases.	N
17.	Inputting data into such databases is an essential part of surveillance work and this needs to be appropriately resourced with administrative staff, of which there seems to be few in Scotland, as noted in the workforce section 7. This needs to be reviewed and properly resourced for each service, noting the benefits of accurate data entry and freeing up clinical staff.	P, HB
18.	Development of TB Service Analysis Reports, which can influence and support TB development at Health Board level, should be considered and developed by all TB services for Health Board level use.	P, HB

Recommendations: Diagnostics

19.	Services should have both protocols and the option for negative pressure facilities if they feel induced sputum is a technique they wish to use for obtaining respiratory samples.	P, HB
20.	All IGRA results (or just positives, depending on the service) should be notified to the TB lead, with the opportunity to ensure no positives are missed. This also gives an opportunity, working with pathology, to ensure there are not excessive and inappropriate requests from some speciality services.	P, HB
21.	Discussion between speciality services requesting IGRA and pathology departments should take place to ensure appropriate funding.	P, HB

Recommendations: Outpatient settings

22.	Ideally nurses and medical staff should run joint clinics, with nurses also having their own nurse-led clinics. For CYP services, nursing time should be made available.	P, HB
23.	Infrastructure needs to be in place for efficient running of clinics which includes ready access to clinic rooms when needed, supported by clinic booking staff or ideally TB administration staff to contact the patient.	P, HB
24.	Phlebotomy services in clinics should be available without the need for qualified nursing staff to be involved.	P, HB

25.	For patients living at a distance from the TB service, alternative models of Liver Function Tests (LFT) surveillance should be explored.	P, HB
26.	Infection prevention issues should be explored for Outpatient Departments (OPDs) in all TB services to minimise the risk to all parties. This should include a clear understanding of clinic air exchanges per hour and mitigation of potential risks, documented in a formal protocol or SOP. The output from the review above will help inform discussion.	P, HB
27.	To understand clinic activity and the procedures undertaken, data collection should be considered at a national level, possibly linked to a payment process.	P, HB, N

Recommendations: Inpatient activity

28.	Clinical teams should review the patient discharge letters to ensure they are accurate and where relevant discuss with the coding team to ensure that patients are correctly coded.	P, HB
29.	Clinical teams and Health Boards should review the reasons why some patients have a long length of stay, defined as beyond 28 days, to address remediable factors. Such patients should be discussed at cohort reviews.	P, HB
30.	All patients with tuberculosis need to be under a named TB physician if either outpatient or in patient, recognising TB patients may be admitted for other reasons. On such occasions the TB physician should be informed the patient is admitted, review them as an inpatient and provide ongoing advice.	P, HB
31.	Patients admitted with proven TB should be reviewed by a TB nurse during their inpatient stay and ideally an interested pharmacist should review medication during the patients stay and /or prior to discharge.	P, HB

Recommendations: Delays in management

32.	For individuals, where there are significant delays in both symptom onset to clinical review, and to treatment, a detailed review of the reasons should be undertaken and modifications to the service made to address the issues. These notifications should also be included in cohort reviews.	P, HB
33.	Clear policies for managing TB should exist within the Health Board and acute providers, supported by regular multi-professional managerial meetings.	P, HB
34.	There should be regular updates for primary care staff, at least bi-annually to general practitioners and primary care staff as part of their formal CPD program.	P, HB
35.	The updates to Health Protection staff, as part of their training, as noted in the good practice should continue.	P, HB
36.	Awareness of TB in the acute provider is essential in identifying patients promptly and therefore there should be at least an annual	P, HB,

	grand-round, or equivalent, in the acute provider with specific bi-annual education to staff in the acute portals.	

Recommendations: DOT and VOT

37.	A standardised tool to assess who would benefit from ECM should be used. This will allow consistency if patients move to different Health Boards' TB services.	P, HB
38.	DOT: Where DOT is required, appropriate staffing needs to be available i.e. using potentially lower banded staff. A risk assessment should always be performed to determine the number of staff required.	P, HB
39.	DOT: Community pharmacists, who are appropriately reimbursed are an alternative source of staff, where staffing or travel times limit nurse delivered DOT.	P, HB, N
40.	VOT: A platform should be available throughout Scotland to allow VOT to be delivered. This needs appropriate governance, and must be effective and easy to use for both patients and clinical staff.	N
41.	VOT: VOT seems to have a low use despite its potential advantages in rural areas of minimising staff travel. This may relate to the patient case-mix, lack of staff or availability of infrastructure or a platform. Each service should consider the benefits of VOTs when appropriately supported.	P, HB

Recommendations: Treatment

42.	All services should strive to achieve 12-month treatment outcomes of 'Treatment Success' for over 85% of culture-confirmed pulmonary tuberculosis cases and where they fail to do so, a root cause analysis as part of a cohort review, should take place.	P, HB
43.	Patients on treatment for TB (and those receiving preventative therapy) require ongoing support that is tailored to them. This should include information in different formats (written, spoken) and different languages.	P, HB,N

Recommendations: Medicines Management

44.	All services should have a robust prescribing system to minimise drug errors, especially if prescribing is devolved to primary care.	P, HB
45.	Pharmacist and pharmacy technician time is essential in TB services, providing advice, support to clinicians and patients, tracking medication use and advising around drug shortages. Attendance at TB MDTs and cohort reviews should be part of their job plan. Staff of appropriate seniority and experience / knowledge should support the service on a pro rata basis, depending upon the size of the service. All services should review their pharmacy infrastructure and support as needed.	P, HB

46.	Consider the setting up of a 'Scottish pharmacy network' to support TB, including CYP, and NTM, providing advice and support for the use of less commonly prescribed drugs, potential interactions when patients are taking anti TB drugs for long periods and to help manage TB drug shortages.	P, HB, N

Recommendations: NTM

47.	Infrastructure should be developed to comply with the national NTM guidelines.	P, HB
48.	Services should be developing a business case, as noted above, to support these patients.	P, HB
49.	A funded national NTM advice service which is multi-professional and includes pharmacist and administration time should be developed with a fortnightly MDT that individuals can refer into along the lines of the BTS MDR service.	N

Recommendation: Inclusion health

50.	It is important to acknowledge the changing epidemiology and patient groups who will have issues of inclusion health, especially around substance misuse and homelessness. Services need to be in place to address these social risk factors.	P, HB

Recommendations: CYP

51.	Health Boards should recognise the need for appropriate staff numbers, with time in their job plans, and access to training for managing CYP TB and any associated preventative treatments that occur after contact tracing.	P, HB
52.	A multi-professional Scotland CYP TB network needs to be established and funded.	P, HB, N
53.	If Scottish Government decides to develop a preventive strategy for latent TB, a specific infrastructure needs to be in place for CYP and unaccompanied adults.	N

Recommendations: Preventative strategies

54.	A formal preventative strategy needs to be developed for Scotland, encompassing all groups who may be eligible, but also recognising that some populations may have more numbers identified from a screening exercise and some may have a greater benefit from preventative therapy.	N
55.	There is wide variation in the practice of initiating and reviewing treatment for latent TB, including checking liver function and the nature of any follow up. NHS Health Board TB Services should develop a more uniform practice based on best evidence.	N

Recommendations: Contact Tracing

56.	There is an element of inconsistency regarding who is screened in pulmonary and extra-pulmonary disease, which reflects a lack of current guidance. A standardised approach, based on best practice, may be helpful in maximising the use of resources.	P, N
57.	Services should look to identify 5 or more contacts per index case with active disease, which most services appear to be doing already. However, there is wide variation in the number of individuals screened, which merits a review by the service and a discussion during cohort reviews.	P, HB
58.	The reasons for variation in self-reported attendance of individuals for screening needs to be explored by each service. To address low attendance rates. Services should seek to learn from colleagues who have better attendances.	P, HB
59.	Services should explore why there is variation between the identification of individuals who should start preventative treatment, and those who appear not to do so, or fail to complete treatment. Some of this may relate to contact tracing procedures and support during therapy, as noted previously. Cohort reviews have a role here.	P, HB

Recommendations: BCG

60.	BCG vaccination for neonates is an effective way of reducing the risk of developing TB, so a model that works for each service provider and Health Board is essential. With the potential for more babies to receive BCG, due to the evolving population, sufficient infrastructure needs to be in place. Health Boards need to keep the workload and delivery model under review.	P, HB

Recommendations: Occupational health screening

61.	A robust screening process needs to be in place due to staff from high prevalence areas being recruited into delivering health care.	P, HB
62.	There appears to be an increasing volume of work for occupational health services, for pathology services who perform the IGRA, and for TB services involved in delivering preventative therapies. This activity should be reviewed by Health Boards to ensure there is sufficient capacity to deliver a prompt service.	P, HB
63.	Consideration needs to be given to screening for TB in other workers involved in health care beyond acute providers' e.g. social care.	P, HB

Recommendations: Screening for biological therapies

64.	There should be discussion between pathology departments and specialist services regarding the increasing cost burden of IGRA tests (As in the diagnostics section 8.3,) so this is managed appropriately within the Board/service.	P
65.	TB services and pathology departments should be aware of the volume of requests for IGRA before biological therapies and to ensure current guidelines are followed, for example, that there are not unnecessary repeat tests requested.	P

7 Epidemiology

There was a wide variation and number of notifications during the review, with the bulk of notifications being in two sectors of Glasgow, especially the South, and the Lothian Health Board. In these two higher incidence services we were told that there is an evolution from older UK- born individuals to those individuals who were born outside of the UK.

This is not a uniform change, as we noted in some deep dive meetings that there continued to be significant disease burden in UK-born individuals, especially where there were social risk factors, leading to the need for enhanced case management and more resources. Undoubtedly this variation will relate to where migrants and asylum seekers are residing. Generally, during the deep dives, we did not comment on the local epidemiology (as the numbers were relatively small) to draw conclusions apart from the South Glasgow sector and Lothian Health Board. As such we have not included specific graphs on epidemiology, though these are available in the data pack found via the link in Annex E).

With the evolving epidemiology of tuberculosis, we noted several providers who had seen a significant increase in notifications but had little infrastructure to deal with the increased volumes of work, thus creating strain on resource within services who already have limited capacity.

It is worth noting that increased notifications generate substantially more work with the need for contact tracing and subsequent management. Additionally with more active cases who may be identified late, the risk of outbreaks increases, adding to the workload.

Furthermore, there is the markedly expanding aspect of preventative treatments needed for different populations, as outlined in the Preventative Strategies section 11.

Recommendation: Epidemiology

1.	Continued entry of notification information into the National TB surveillance system is important to support planning for future services and to understand local and national epidemiology. Administrative support is required to enable timely and complete data entry.	P, HB

8 Workforce Issues in the Management of Tuberculosis

The efficient and safe running of TB services is dependent upon its staff and infrastructure. To deliver against the requirements of a variable, but increasing workload, acute providers and Health Boards need to ensure there are sufficient staff to not only deliver the service, but also to ensure policies are up to date and provide education. These responsibilities are covered in the 'workforce' sections for medical, nursing and administrative and clerical resources. Pharmacist input is also essential and covered in the 'medicines management' section.

TB colleagues should be encouraged to participate in academic activities related to TB and this should be recognised in job plans. This activity should include an audit of the service provided, with presentations at either local or national meetings. Where possible, more formal research should be undertaken which may be either commercial, multi-centre trials or 'in house'. Supporting staff, from all disciplines to apply for grants in TB research is to be encouraged. Other academic activities beyond teaching such as contributing to and authoring guidelines should also be recognised and supported.

Recommendation: Workforce Issues in the Management of Tuberculosis

2.	TB clinicians and teams should be encouraged and supported to participate in research and other academic activities which include teaching (as in workforce specific sections) production of guidelines etc.	P, HB

8.1 Medical Workforce

From the survey returns, and data validated during the deep dives, there was marked variation in the medical support for TB services. Only two services had any 'supporting professional activity' (SPA) time for 'running the service' and for these two it was 1x 'programmed activity' (PA) or less (see graph 15 in the data pack in Annex E).

It is essential that the clinical lead has sufficient time for developing policies and protocols that are up to date and compliant with national advice. Meeting with the Health Board Directorate management team and infection prevention teams is an essential way of raising and maintaining the profile of TB management. As noted in **Table 3,** in the Delays in Management section 10.3, education is a consistent theme and the clinical lead should have responsibility for developing education programs across the Health Board in conjunction with colleagues from Public Health and Health Protection. This is especially important in low incidence Health Boards to maintain the knowledge and profile of tuberculosis with the positive benefit of reducing delays to diagnosis.

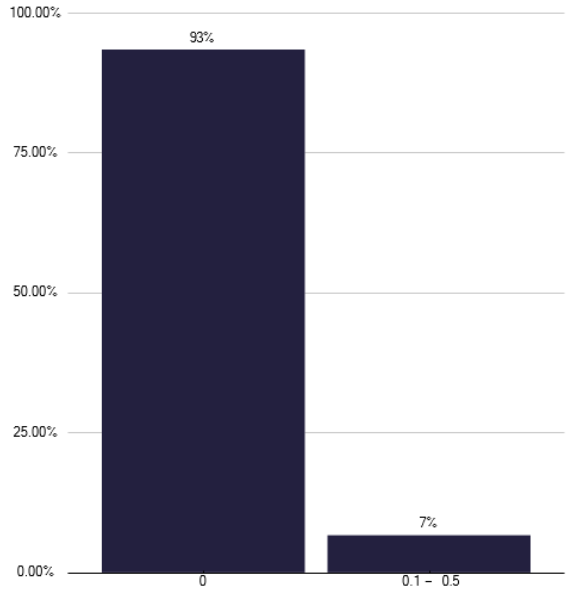
The overall service lead responsibility was split between infectious disease and respiratory doctors but in some services there was no recognised 'lead', which is a serious concern if there is no named clinician to take responsibility.

With regards to respiratory medicine, shown in **Figure 1,** the absence of general SPA time was marked. Direct clinical care (DCC) varied with the size of the service but there was generally insufficient DCC time and it appeared to be counted only as clinic time.

For both infectious diseases, **Figure 2** and paediatricians, **Figure 3,** there were similar findings as for respiratory medicine, with no general SPA time and limited DCC time. These are issues that need to be addressed for all three speciality teams dealing with TB.

Figure 1: SPA & DCC sessions: respiratory medicine

How many other SPA Respiratory Medicine consultant sessions are available for the TB Service?



How many other DCC Respiratory Medicine consultant sessions are available for the TB Service?

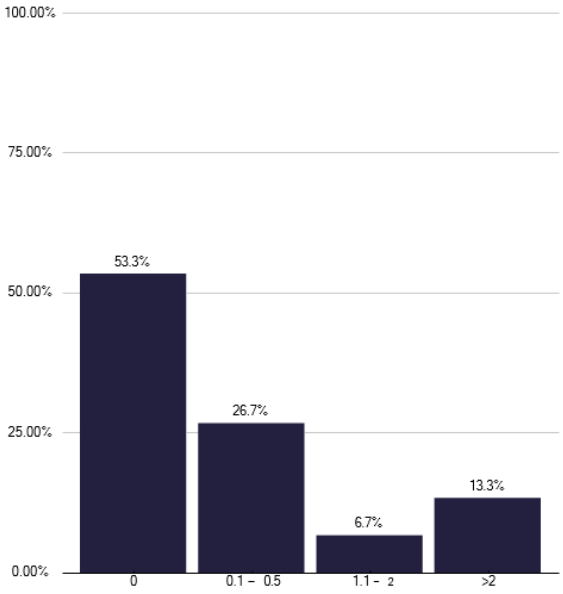
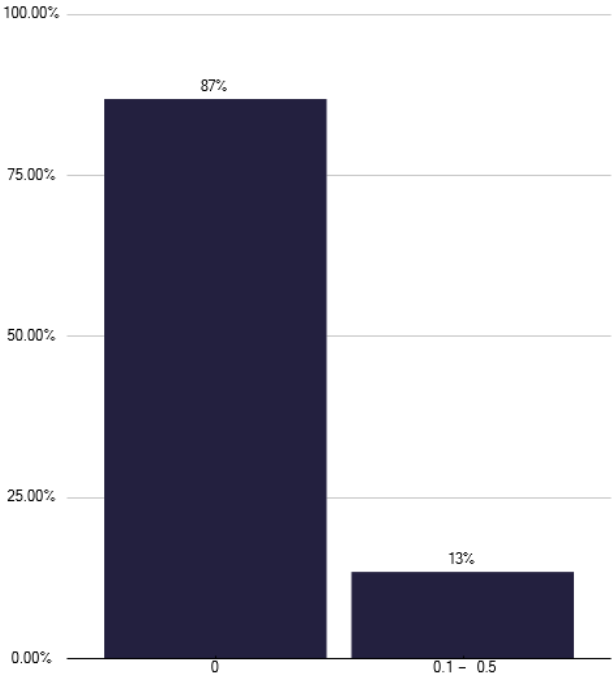


Figure 2: SPA & DCC sessions: infectious diseases

How many other SPA Infectious Disease consultant sessions are available for the TB Service?



How many other DCC Infectious Disease consultant sessions are available for the TB Service?

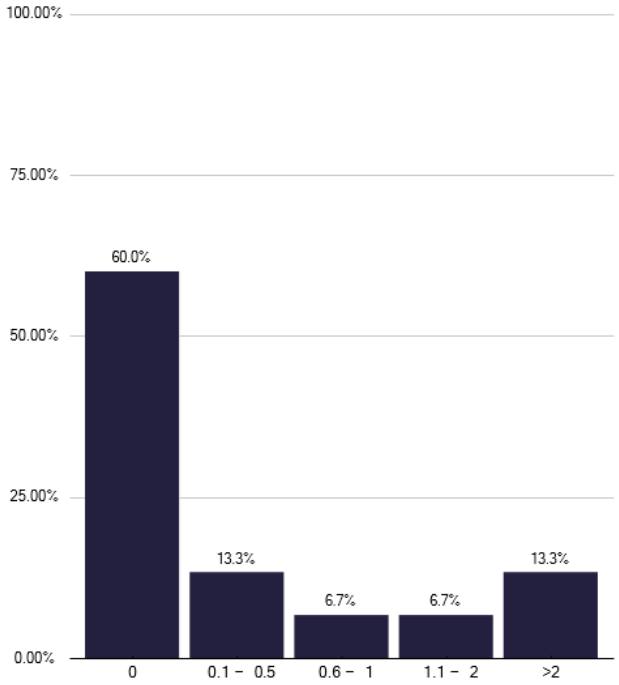
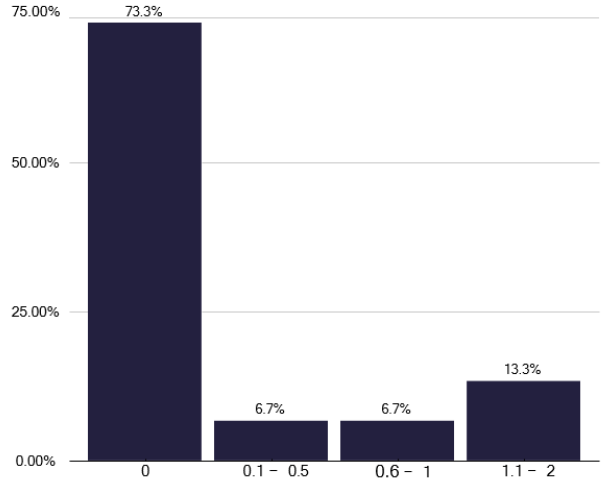
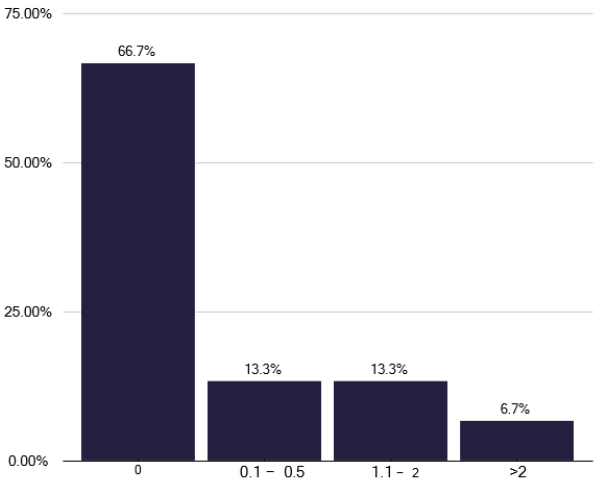


Figure 3: SPA & DCC sessions: paediatric consultant

How many other SPA paediatric consultant sessions are available for the TB Service?



How many other DCC paediatric consultant sessions are available for the TB Service?



We also noted during some of the deep dives, where patients with TB were managed by non-dedicated respiratory or ID physicians. In one provider, the random distribution of patients meant that some clinicians could potentially go several years without managing a patient with TB, a practice that is unacceptable.

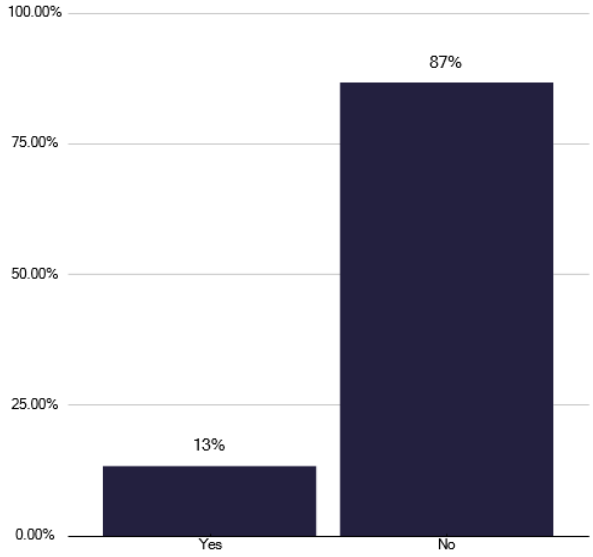
Furthermore, this lack of co-horting patients led to patients with TB being managed in general clinics, with the potential for cross infection. We also noted some services where the bulk of care was delivered by a named respiratory physician, but where some patients were randomly managed by one of several ID physicians. The recommended practice should ideally be for care to be shared, with a named ID and named respiratory physician for adult care where the clinicians' skillsets complement each other, especially around the management of Human Immunodeficiency Virus (HIV) and TB co-infected patients.

Delivering care to patients with TB doesn't only include the face-to-face activity of clinics but also general TB administration. This is a poorly-recognised issue, and missed results can lead to delays in management. Communicating with colleagues together with attending regular service meetings is essential for managing TB patients (depending on the size of the service).

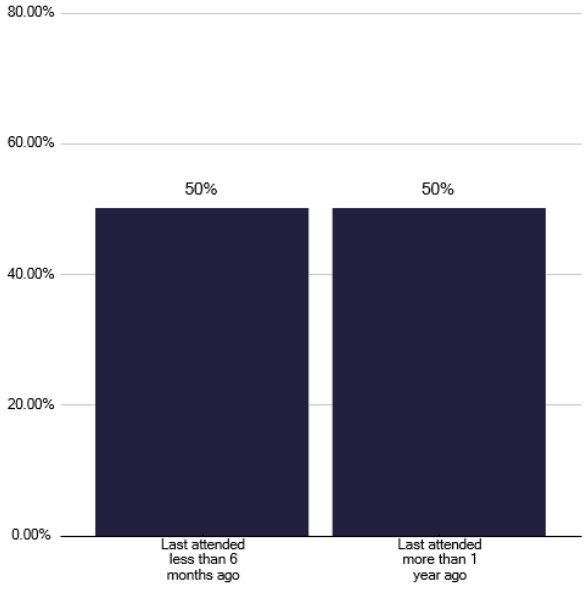
Embedded within this DCC activity is time for undertaking cohort reviews. These are an important aspect of improving services with independent external scrutiny, so time is required for both attending and preparing for cohort reviews, together with TB leads acting as 'external service reviewers'. Regrettably we found very few services that were undertaking cohort reviews, one of which had only done so on the basis of a recent surge in notifications **Figure 4.**

Figure 4: Cohort reviews

Do you participate in cohort reviews of your service?



If you participate in cohort reviews, please indicate frequencies as appropriate



For lower volume services, such as those for children and young people (CYP), it is difficult to maintain a skill set within all Health Boards and so more national support needs to be established. This is discussed in the CYP section.

Recommendations: Medical Workforce

3.	Each TB service should have a recognised lead who is named, with responsibility for maintaining policies and overseeing Health Board education. This is dedicated lead SPA time and is generally the same for most services as even those with few notifications still need to deliver these general aspects of the TB service.	P, HB
4.	The clinical lead should deliver all, or the bulk of TB medical care and should have sufficient DCC time in their job plan for this to take place.	P, HB
5.	Depending on the size of the service, time for a clinical deputy and/or support needs to be included. There are advantages of this being from a different speciality, especially in managing co-infection with HIV.	P, HB
6.	In all job plans, appropriate SPA time for providing education and self-continuing professional development (CPD) should be included together with DCC time for service delivery. This should include, not only clinic activity, but time for regular local and Health Board or National MDTs and clinical administration.	P, HB
7.	Cohort reviews should be re-established with time in job plans to attend, with the lead clinician acting as a reviewer for other Health Boards. To support data collection for such reviews, there needs to be administrative time, and such reviews should be a feature of job plans for all individuals i.e. medical, nursing, pharmacist. A formal report with actions should be generated, hence the need for administrative time.	P, HB
8.	For some services such as CYP, non-tuberculous mycobacteria, where there may be a Health Board or National lead role, time needs to be allocated in the individual Lead's job plan for this work. Such networks need to be agreed and funded at Health Board or at National level.	P, HB

8.2 Nursing Workforce

The nursing workforce has a variable model, with some services having embedded TB nurses, others having a combination of a dedicated TB nurse with support from Health Protection, whilst others have a Health Protection service that 'in reaches' into the acute provider, and finally where Health Protection run the TB service.

This variability in TB nurse service provision does not fully relate to the number of notifications, contacts traced or use of preventative therapies. CYP TB services are often small and have no dedicated workforce. In some services, the TB nurses also administer Bacillus Calmette-Guérin (BCG) as part of a neonatal programme, while other services had a well-established process for neonatal BCG vaccination, as described the BCG section of prevention 11.2.

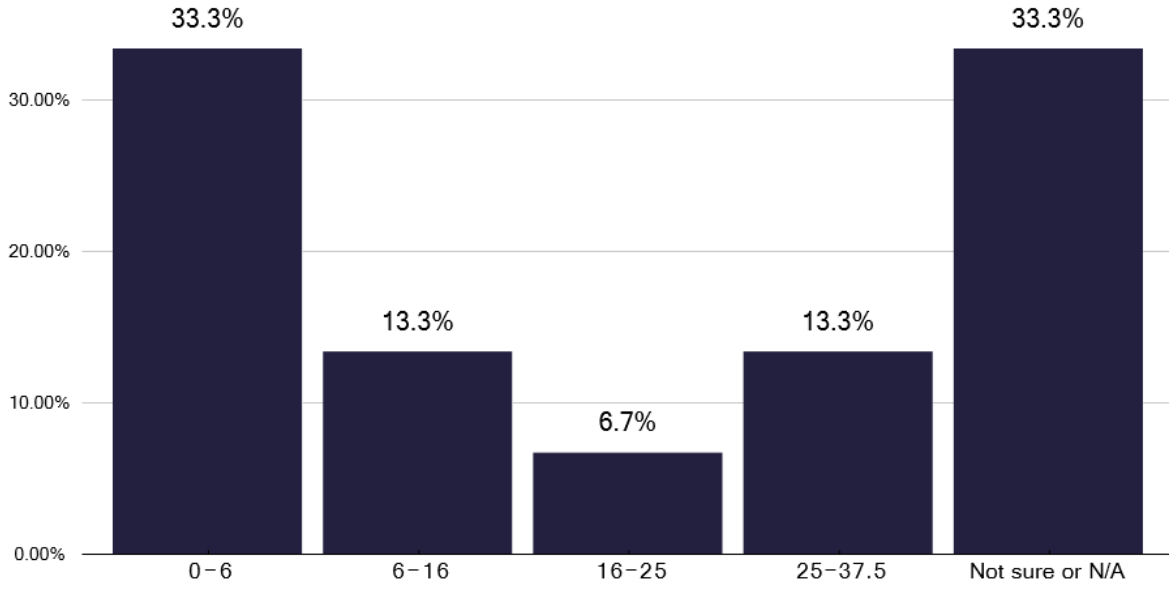
Most nurses were graded at Band 7 and we found fewer lower banded or unqualified nurses (Healthcare Assistants), meaning that the higher qualified staff were often doing routine tasks that could be delegated. This is in sharp contrast to England where Band 3 and 4 staff play a major role in TB services. Staffing of services in general needs to be considered in light of **The Health and Care (Staffing) (Scotland) Act 2019**.

We did hear different views about the benefits of unqualified staff. In several deep dives we heard that these staff played a useful role, while in other visits we heard the view that Band 3 and 4 nurses would have a minimal role. This was based upon the changing epidemiology, such that most notifications were born outside of the UK and were adherent to therapy and so there was little need for enhanced case management (ECM), where Directly Observed Therapy (DOTs) and Video Observed Therapy (VOTs) would be needed. This was in sharp contrast to other areas in Scotland where both geography and ECM generated a significant workload and DOTs and VOTs were important aspects of therapy that could be fulfilled by lower banded nursing staff. Depending upon the service and local need, the indicative workforce developed in the England report could form the basis for staffing discussions.

Whatever the model, senior nursing management to support the service is important, but limited, as shown in **Figure 5.**

Figure 5: Nursing workforce: Management time

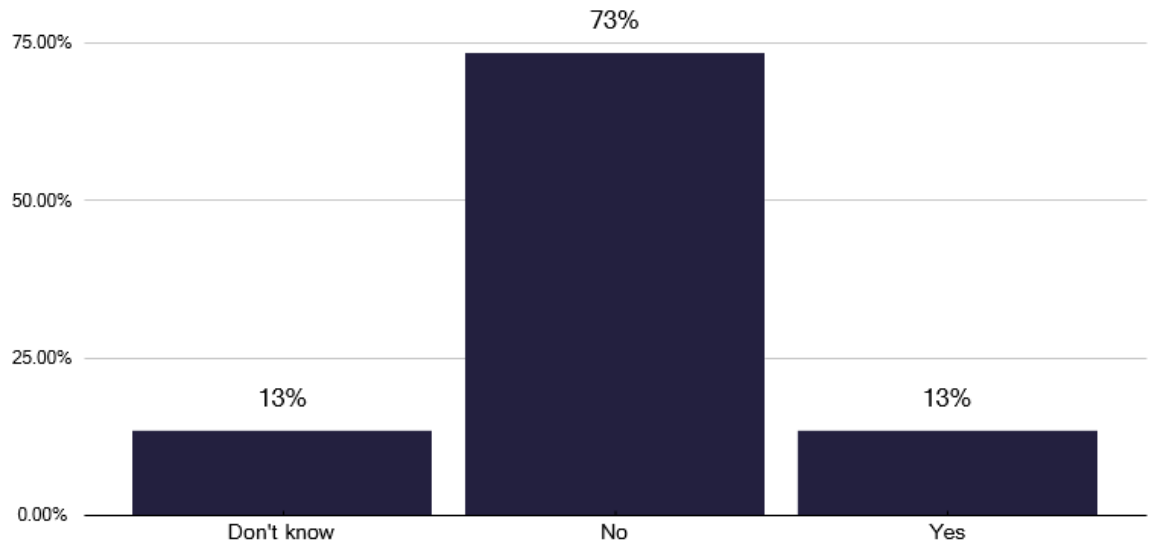
How many hours does the respiratory nursing lead have for managing the service per week?



Data from the survey did show several pressure areas, with insufficient staff to deliver a TB service during times of short-term sickness or annual leave. **Figure 6** highlights the capacity issues within the nursing workforce. We did note the inherent flexibility of the larger team to fill any gaps, with nurses in Glasgow working as a team and when Health Protection teams were involved in the TB services.

Figure 6: Nursing workforce capacity during absences

Is the TB nurse workforce capacity and/or establishment sufficient to deliver the service during times of short term sickness or annual leave?



Surprisingly only 27% of services ran ‘nurse-led’ clinics, as in **Figure 7**, though we found excellent examples during the deep dives of nurse-led clinics, where they would order radiographs and prescribe medications. The good practice via the link in Annex E has examples of these services with their standard operating procedures and protocols. We noted from the survey, in **Figure 8,** that over half of nurses could order X-rays and many could prescribe medication, though we did hear that some nurses did not think this was needed. The role of TB nursing staff during inpatient management is commented on in section 10.2.

Figure 7: Nurse-led clinics

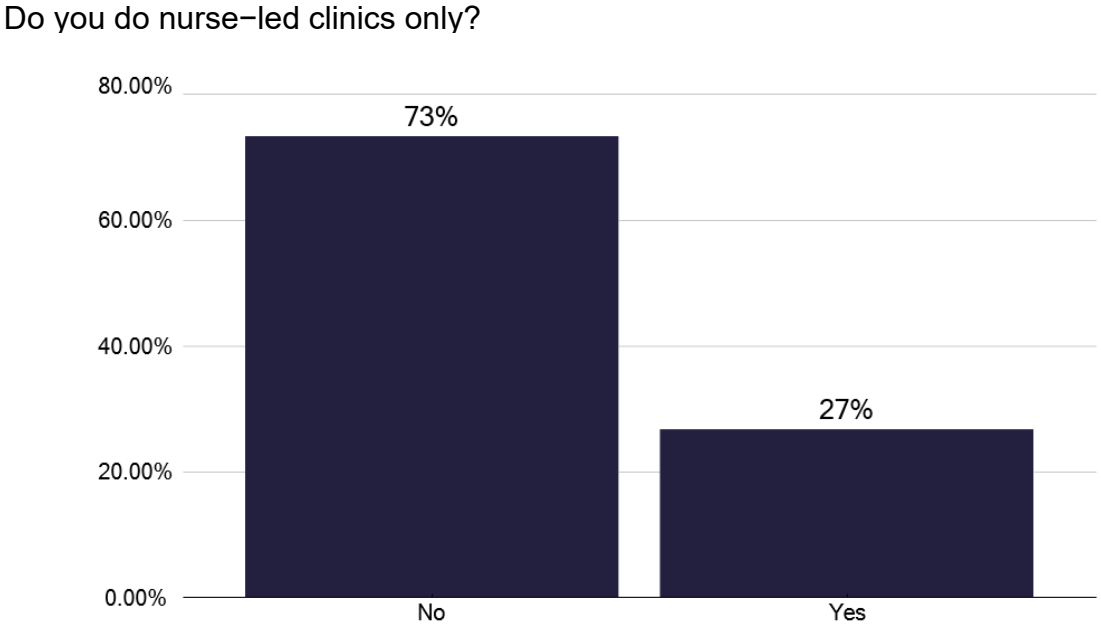
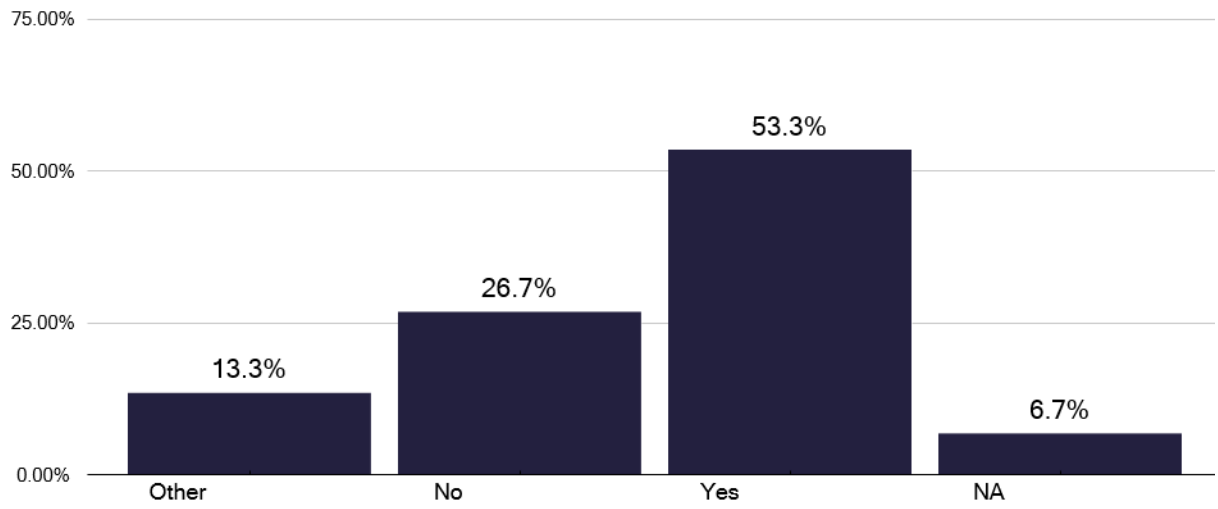


Figure 8: Chest X-rays

Can nurses request chest X−rays?



The practices who responded 'Other' provided a range of reasons including: Only certain nurses at the service could request chest X−rays, nurses that are currently undergoing training, and N/A is due to not having a respiratory nursing team.

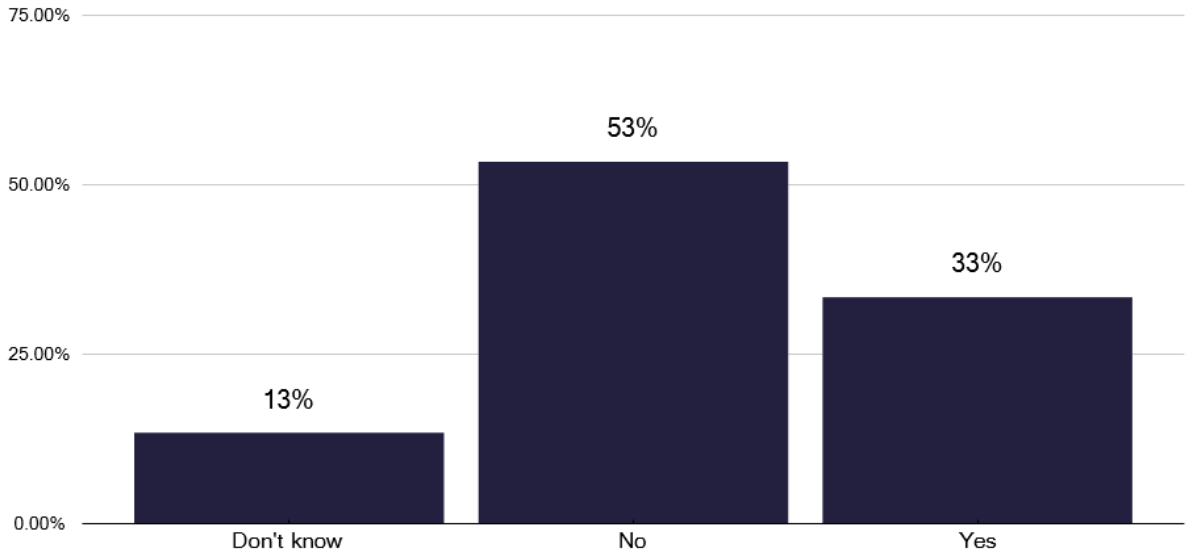
Education and training are important and we noted that only one third of services had access to training budgets for nursing staff, as shown in **Figure 9**. Education is a key aspect of continuing professional development and given how the management of TB is continuing to change, time for education, both internal and on recognised external courses, is essential in 'nursing job plans' with access to appropriate funds to support this.

A specific issue in the low volume services was having sufficient CYP infrastructure, not only for managing the relatively few notifications, but also for the large number of contacts that may occur.

Often the volume of work is insufficient for dedicated CYP TB nursing teams and so a flexible approach, with Health Protection and liaising with other services is important unless there is specific children's' nurse training within the team.

Figure 9: Nursing workforce training budget

Does your TB service have access to training budgets for nurses?



Recommendations: Nursing Workforce

9.	Services should review their nursing workforce to ensure they are not doing tasks which could be done by lower banded staff i.e. ensuring senior qualified staff are working at 'top of licence'.	P, HB
10.	There are excellent examples of nurses where they run their own clinics and prescribe and request radiographs. These nursing options should be explored in each TB service.	P, HB
11.	There should be sufficient senior nursing time to manage the TB service.	P, HB
12.	All nurses, as part of their re-validation process, should ensure they are up to date with current TB practices and where training is required should have access to funds for such education, at whatever level is appropriate.	P, HB

8.3 Administration & Clerical Support

Throughout the deep dives, we found a scarcity of formal administrative staff dedicated to the TB services. This is listed in **Table 2** and leads to senior nursing staff undertaking inappropriate tasks, such as routine chasing, and calls with patients and carers, which are very time consuming.

While booking clerks can help free up clinic management time, they are often unaware of some of the important issues of infection prevention for patients who may have active TB, with the risk of transmission to other potentially immunocompromised patients in an open clinic waiting area.

While medical secretaries have taken on some activity for consultants, nurses are often unsupported and need to do clinic letters, chase results etc., which are duties that can be undertaken by administrative and clerical staff, freeing up qualified nurse time to work at top of licence.

Additionally, there is a considerable burden of work in updating data sets such as ESMI that also sits with nursing staff, a duty that can readily be performed by admin and clerical staff, freeing up clinical time. A further duty that will be required with the establishment of cohort reviews is the need to organise the notes and collate results, a very time consuming activity that with training can be delegated.

Table 2: Administrative and clerical staffing per service

TB Service	Specific Admin/Nursing Support	Notifications by service
Service A	Supporting staff (Band 3): 0.8 WTE	<20
	Admin (Band 4): 0.4 WTE	
Service B	Supporting staff (Band 4): 0.1 WTE	<10
	Admin (Band 3): 0.1 WTE	
Service D	Admin (Band 3): 0.22 WTE	>20
Service E	Admin (Band 4): 2 WTE	<10
Service F	Admin (Band 4): 0.13 WTE	>20
Service I	Admin (Band 4): 0.1 WTE	>20
Service J	Admin (Band 4): 0.25 WTE	<10
Service K	Admin (Band 4): 0.14 WTE	<10
Service L	Admin (Band 3): 0.1 WTE	<10

Recommendations: Admin and clerical workforce

13.	On a pro rata basis, Admin & Clerical support at Band 3 or Band 4 should be available in a dedicated role to support the TB service, acting as the focus for the service. This role would develop reports, collate information for MDTs and cohort reviews and facilitate data entry and general communication, informing all parties involved in TB care of decisions and outcomes.	P, HB

9 Organisational support and infrastructure: Policy and Planning

As part of the survey, which was enhanced by information gathered in the deep dives; we explored the underlying policies for managing TB. We noted that 60% of services did not have a local TB policy or specification and when such a policy did exist it was more commonly developed by the acute provider, with only a third of such policies being developed between acute and community, as shown in **Figure 10**.

A similar question on whether there was a formal specification as in **Figure 11,** showed that 62% of services had a policy which was often developed by the Health Board, suggesting there is some inconsistency in the nature of existing policies. Unfortunately, 80% of services did not meet regularly with the management service to discuss service development and funding, and we made recommendations for this to commence during several deep dives. This aspect is important, as the majority of services were split between not having a view on funding or disagreeing that funding was adequate as shown in **Figure 12**.

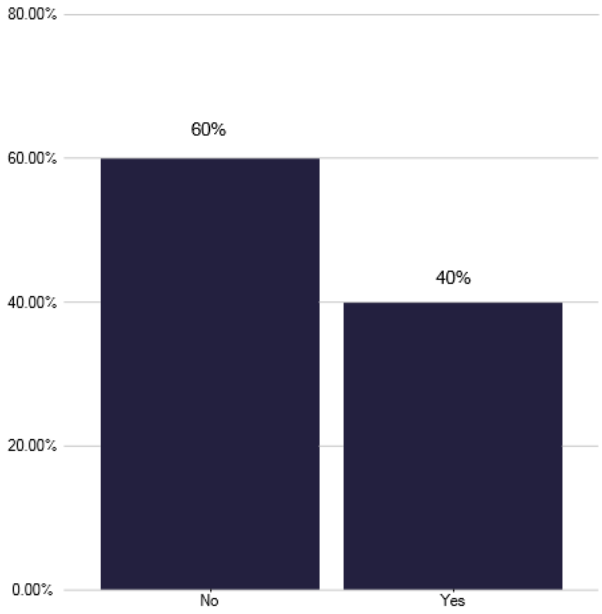
Policies for DOT, based upon good practice, were only present in 38% of services but this may reflect the relatively low volume services or those based in urban areas, where patient adherence may not be an issue, and so DOT is not required. We did however identify good practice for DOT using community pharmacists.

Surprisingly 38% of providers said that there was no internal MDT to discuss clinical issues, through this may reflect the services where there are few notifications.

A preventative strategy does not formally exist in Scotland, where 80% of providers said that they did not have a standard operating procedure for several areas. With regard to oversight and supporting services, 87% said that they did not participate in cohort reviews. One service had undertaken a cohort review, which was in fact a local review of the recent increased number of notifications and they did not formally review results from genome sequencing, as shown previously in **Figure 4.**

Figure 10: Local TB policy or specification

Does the service have a local TB policy or service specification that has been agreed between the service provider and / or the NHS Health Board?



Which organisation 'hosts' the TB service?

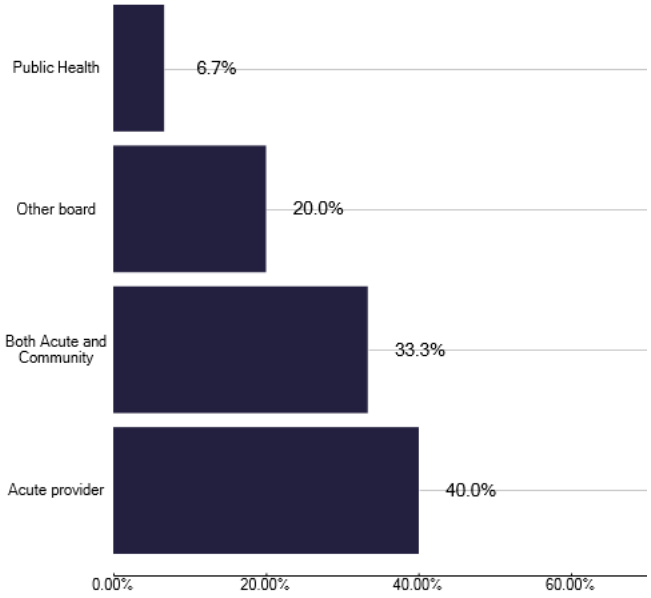
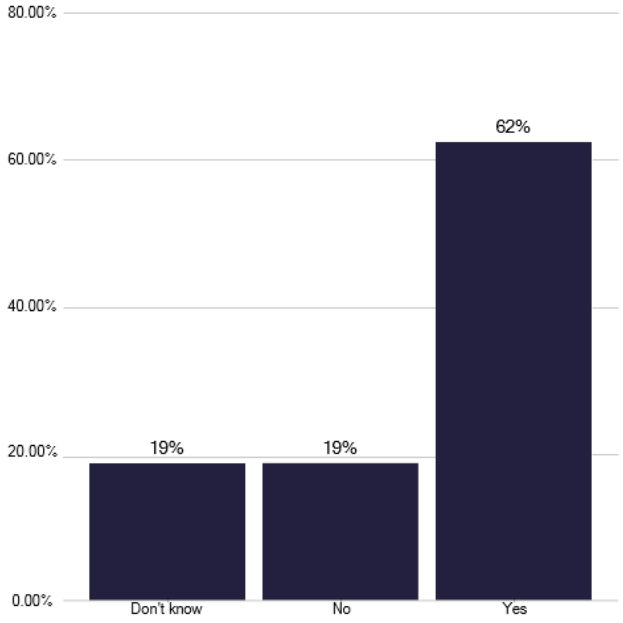
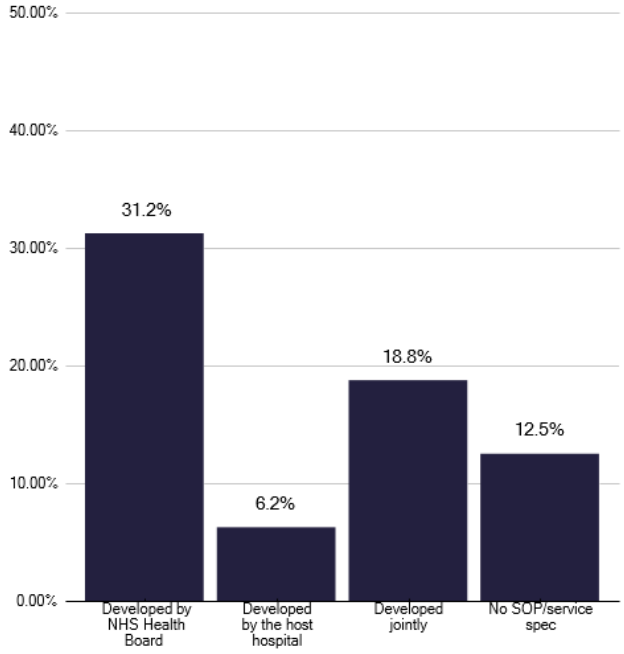


Figure 11: TB services specification/standard operating procedure (SOP)

Do you have an SOP or work to a TB service specification?



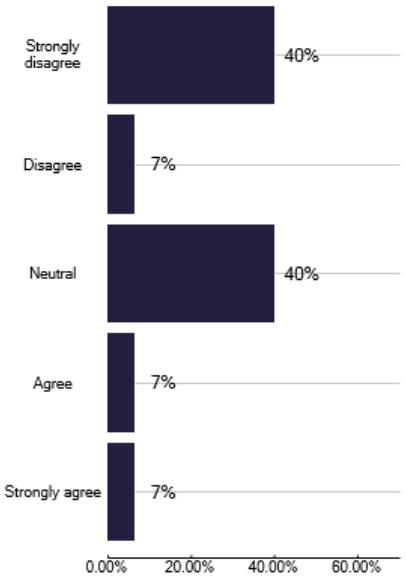
If yes, who was the TB service specification developed by? (Select all that apply)



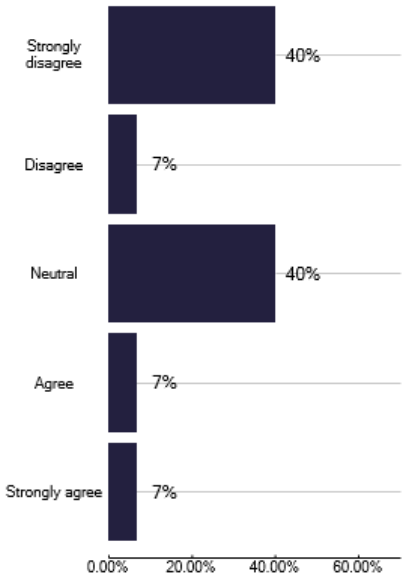
Note: total percentage of responses can be over the percentage of 'Yes' answers from the question on the left as multiple options can be selected for this question.

Figure 12: Funding

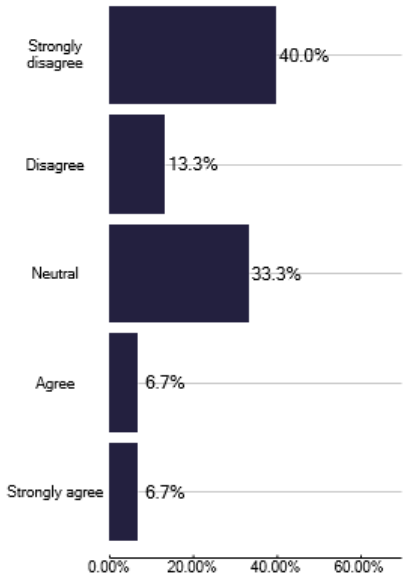
The service is sufficiently funded to deliver to NICE guidance.



The service is sufficiently funded to deliver to TB Action Plan for Scotland.



The service is sufficiently funded to deliver a TB service that delivers to a local or national TB service specifications.



Recommendations: Policy

14.	Regular meetings between management in acute providers, which would also include Health Protection, Public Health and the Health Board, are an important way of maintaining the profile and supporting funding. Based upon the number of notifications and preventative therapy, these meetings should take place at least on a quarterly basis.	P, HB
15.	TB services should meet internally with their management team to discuss practical service delivery issues, the frequency dictated by activity. This time should be built into job plans.	P, HB

9.1 Data Management

Understanding real time issues within TB services is a key aspect of running an efficient service. While surveillance tools such as ESMI and the planned migration to NTBS are helpful, they do not provide 'real time' information for managing patients. A more robust clinical management system that can help manage patient flow through the service, generates letters to clinicians and pulls information into national surveillance datasets like ESMI and NTBS, needs to be developed.

The migration of ESMI into NTBS, which has additional data fields, is helpful but gaps may remain in data completion and absence of some fields, as noted in the England TB report. As noted in the workforce section 7, there is a scarcity of administrative staff in TB services to enable this data entry to occur, which may result in data gaps or the need for higher banded Health Protection nurses or TB nurses to spend even more time inputting data. This is a poor use of an expensive and skilled workforce.

Despite the limited resources, we noted one Health Board had invested in a data manager to produce reports for the TB service and the Health Board, informing and raising the profile of tuberculosis management.

Recommendations: Data Management

16.	National Services Scotland should consider the development of other data platforms, which would be helpful for in patient management and communication and would feed into national surveillance databases.	N
17.	Inputting data into such databases is an essential part of surveillance work and this needs to be appropriately resourced with administrative staff, of which there seems to be few in Scotland, as noted in the workforce section 7. This needs to be reviewed and properly resourced for each service, noting the benefits of accurate data entry and freeing up clinical staff.	P, HB
18.	Development of TB Service Analysis Reports, which can influence and support TB development at Health Board level, should be considered and developed by all TB services for Health Board level use.	P, HB

9.2 Diagnostics

For diagnostics, few services had immediate availability of smears but all had access within a timely period and this was not seen as a specific issue. Following developments a few years ago, all but one service had access to GeneXpert Mycobacterium tuberculosis complex (MTBC) and resistance to rifampin (RIF) (MTB/RIF) tests, with one third having the service at regional or Health Board level and 40% by the acute provider, with most services stating there was little issue in accessing the test.

Most, but not all services had access to negative pressure rooms if needed for induced sputum, although we noted from the deep dive meetings this procedure is infrequently used (**Figure 13)**. Most services use fibre optic bronchoscopy for obtaining samples for suspected pulmonary disease, with most having a protocol or SOP (Standard Operating Procedure) for the procedure. An example is included in good practice via the link in Annex E.

IGRA testing (Interferon-gamma release assay) is key in determining the need for preventative therapy and we noted this was undertaken by the acute provider in 40% of services and by regional services in a further 40%, with one being provided by a

commercial company and a further two were uncertain, as shown in **Figure 14.** There was an adequate turnaround time of the tests of a maximum of 7 days for most services as shown in **Figure 15.**

We heard from some pathology representatives during the deep dives about who pays for the IGRA testing, as this is an increasing cost burden for pathology. A discussion should take place between departments and services who are requesting IGRAs as a precursor to initiating biological therapies, and with pathology departments about appropriate recognition and cross charging for these tests.

We heard excellent examples where the pathology department sent the results of all, or just the positive IGRA results, to TB clinical leads to ensure that no positive IGRA results were missed. This is excellent practice and should be considered as the norm, as documented in good practice via the link in Annex E.

One feature that became apparent is that not all TB services were aware of the number of IGRAs being performed for different groups of patients as shown in **Figure 16** recognising that IGRA is the preferred test prior to preventative action. We heard of wide variation in the reasons for testing, which in part may reflect the size of the service, the nature of any specialised services within that provider and knowledge by the service of the number of tests done. The outlier with 5200 tests, most for biologics, reflects the knowledge of that service of IGRA activity but highlights the significant cost pressure on departments performing IGRA testing.

Figure 13: Availability of negative pressure facilities

How many negative pressure ventilation rooms exist within your organisations rooms?

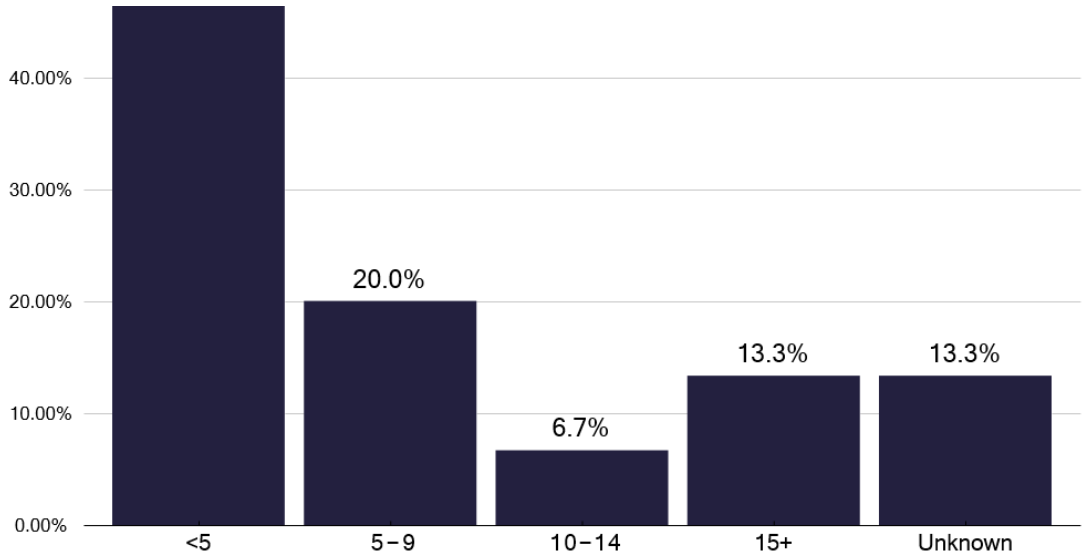


Figure 14: IGRA testing

Who does IGRA testing?

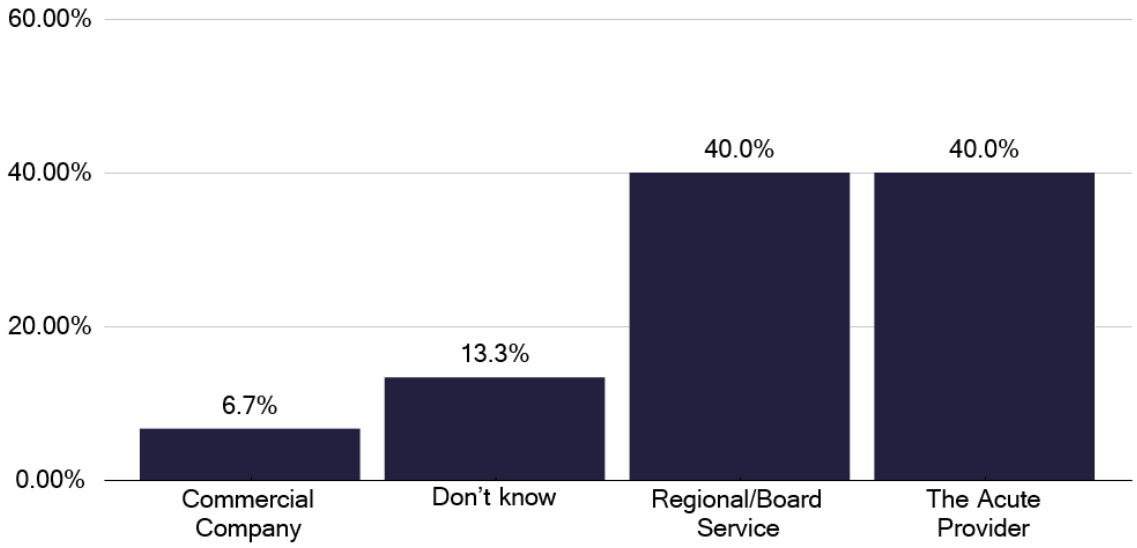
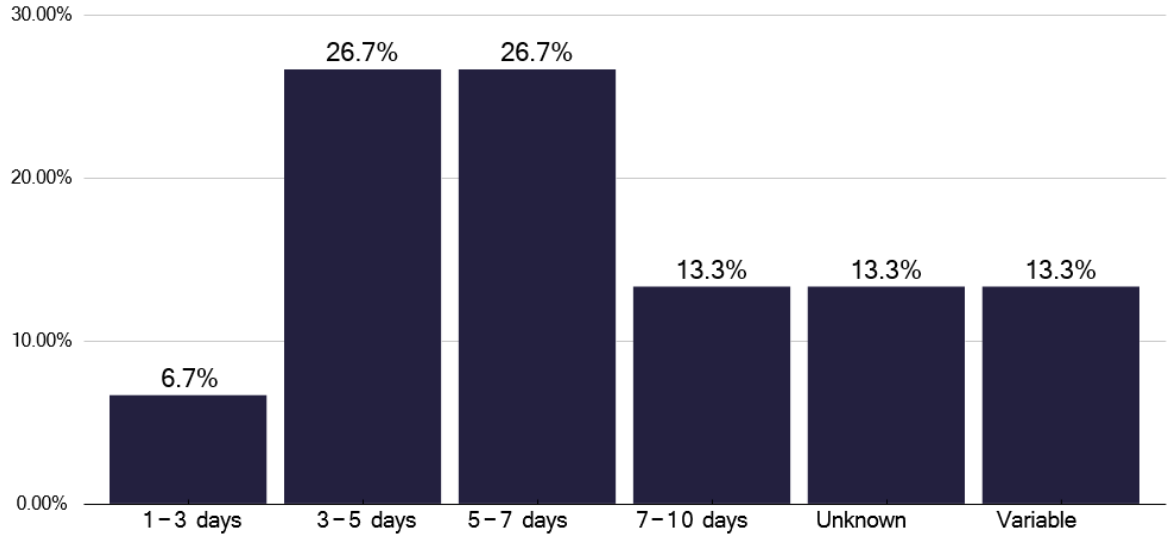


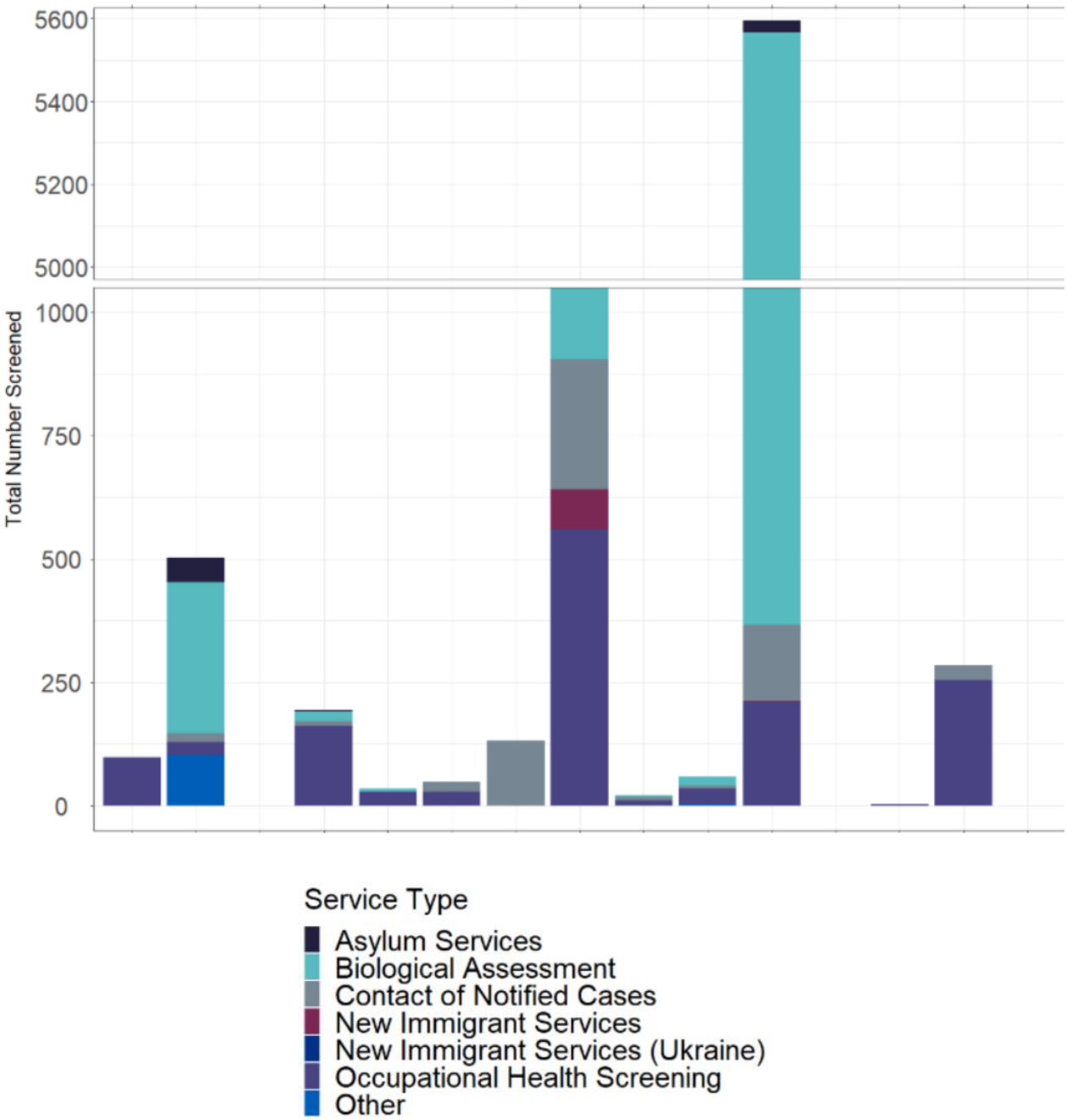
Figure 15: Turnaround time for IGRAs



Note: Most responses were given as time ranges. The mean of these time ranges is taken.

Figure 16: IGRAs & patient groups

Comparison of the number of LTBI patients screened across services (from survey submissions)



Recommendations: Diagnostics

19.	Services should have both protocols and the option for negative pressure facilities if they feel induced sputum is a technique they wish to use for obtaining respiratory samples.	P, HB
20.	All IGRA results (or just positives, depending on the service) should be notified to the TB lead, with the opportunity to ensure no positives are missed. This also gives an opportunity, working with pathology, to ensure there are not excessive and inappropriate requests from some speciality services.	P, HB
21.	Discussion between speciality services requesting IGRA and pathology departments should take place to ensure appropriate funding.	P, HB

10 Management of TB

This section includes the bulk of clinical activities related to TB management. The scene is set by looking at the infrastructure and activity of outpatient and inpatient work, recognising that the bulk of TB care is as an outpatient or in the community. A proportion of patients will receive inpatient care either as an admission that leads to a diagnosis or when admitted, potentially as a day case or short length of stay as part of a diagnostic pathway, e.g. fibre optic bronchoscopy.

The subsequent section looks at the important aspect of delays in management, while identifying patients for supportive treatment using enhanced case management tools is discussed in the context of directly (DOT) and video observed therapies (VOT). The key aspect of management is to ensure effective treatment and that issues of drug resistance are actively managed. This section is followed by one on medicines management that includes aspects of pharmacist staffing. The management section concludes by looking at the increasing pressures of non-tuberculous mycobacteria, aspects of inclusion health, and we have pulled the bulk of information generated into a specific children and young person's (CYP) section, 10.12.

10.1 Outpatient Setting

In the pre-visit TB survey, some of the questions were designed to help us understand the outpatient department (OPD) clinic structures. There were few nurse led clinics undertaken weekly, as per **Figure 17,** with 27% being nurse-led as per **Figure 7.** It is worth noting that 67% of CYP services do not have nurse support, as shown in **Figure 18.**

There were more medical clinics, as per **Figure 19,** but with a greater distribution, reflecting the size of the service. A key aspect, especially in larger services, is the facility to review patients at short notice for either assessment of side effects or to initiate treatment. Unfortunately, as shown in **Figure 20,** only one provider had this level of flexibility, and we heard from colleagues in the deep dives that they would add extra patients onto ordinary clinics or attempt to see patients whenever and wherever a clinic room could be found. This added to the administrative burden and was not always at a time when the TB nurse could be present.

While additional clinics could be established at times of an outbreak, there were no routine weekend and evening clinics for the TB population in Scotland.

Figure 17: Nurse-led clinic numbers

How many nurse-led clinics are there per week?

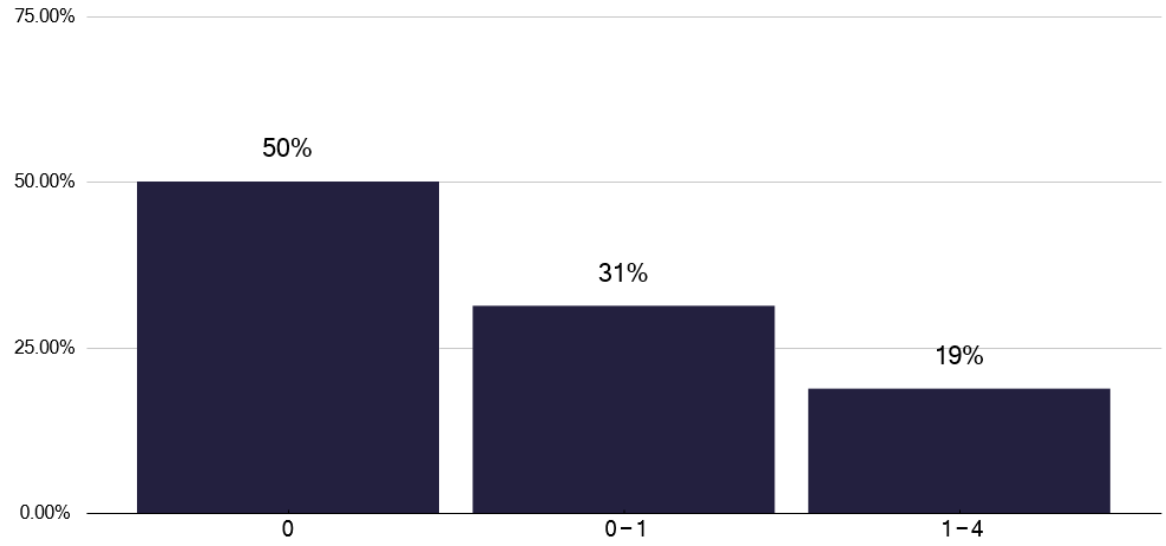


Figure 18: CYP nursing support

What proportion (%) of CYP have TB nurse support?

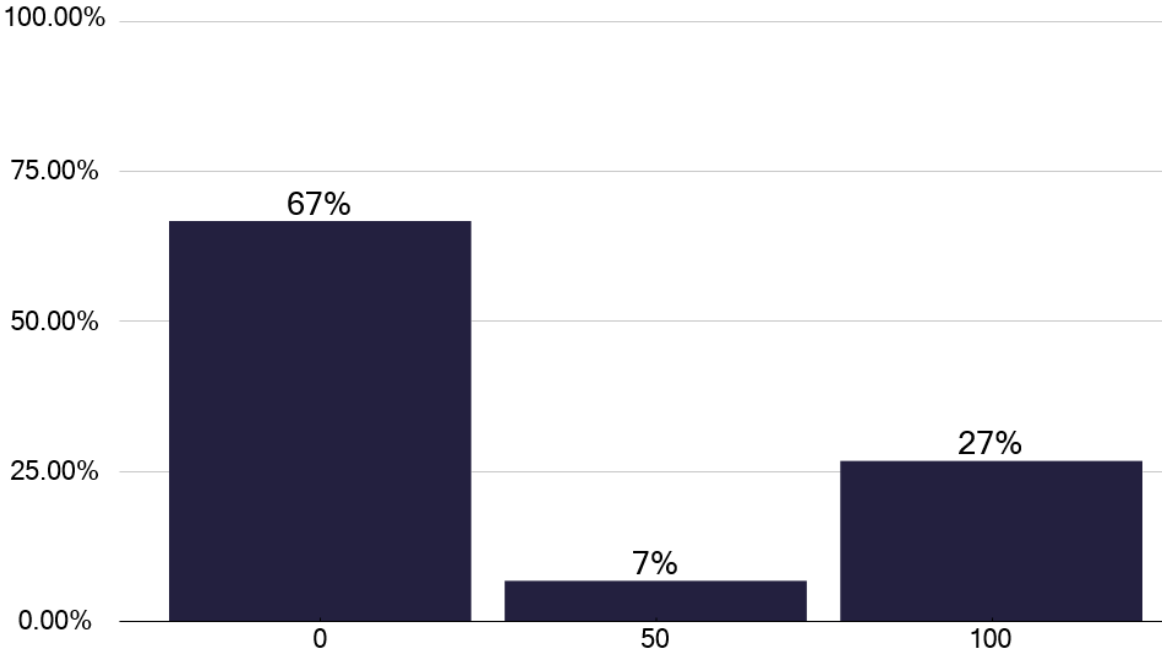
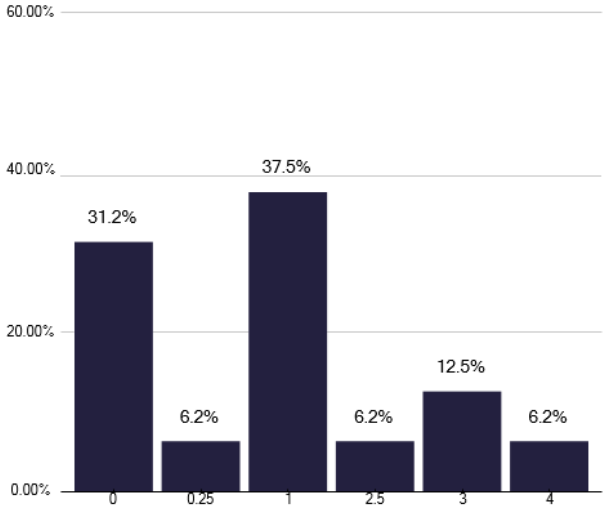
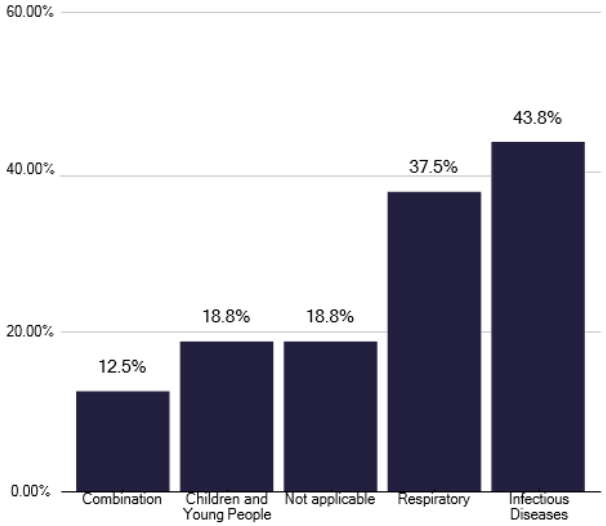


Figure 19: Medical-led clinics

How many medical led clinics are there per week?



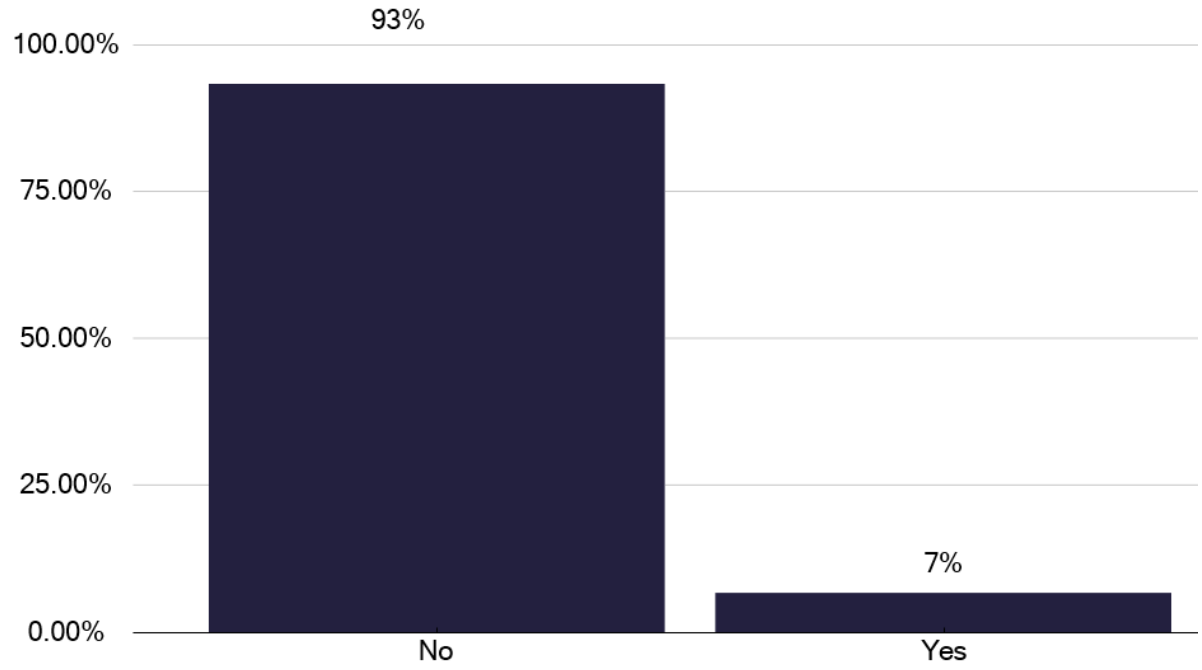
Please specify what type of medical led clinics you have? (Select all that apply)



Note: total percentage of responses can be over 100% as multiple options can be selected for this question

Figure 20: Clinic space/access

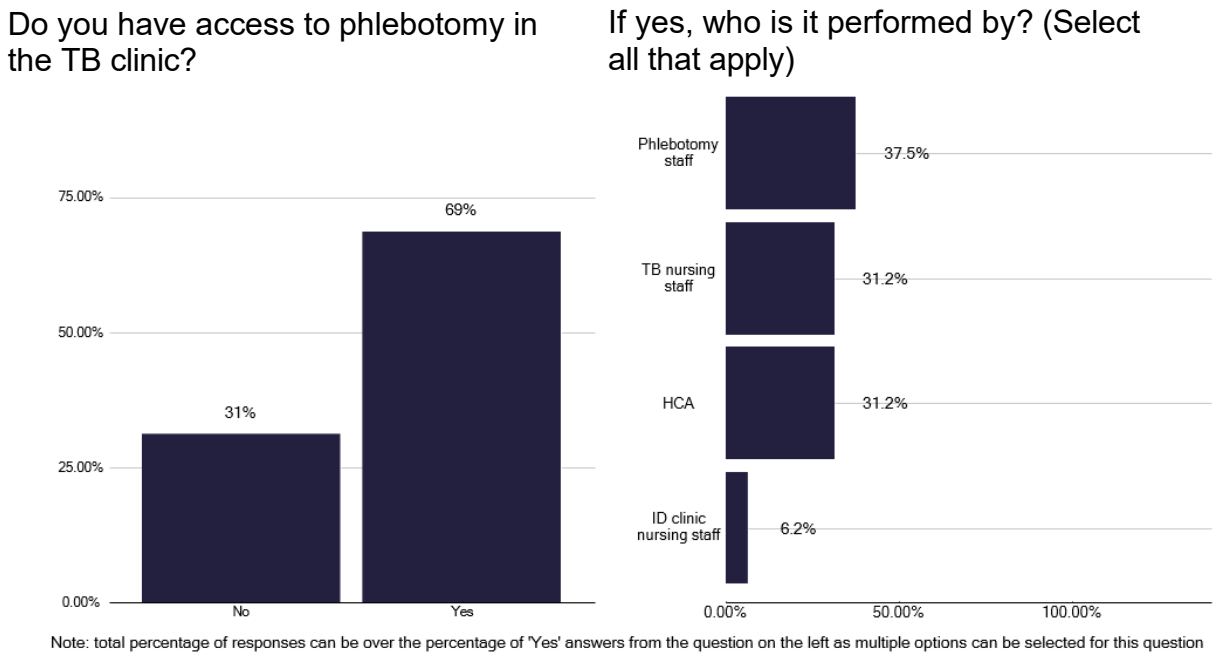
Do you have a dedicated TB clinic space that you can access at any time (i.e. that is not part of the general OPD service?)



Access to phlebotomy is important for checking HIV status and monitoring liver function tests (LFTS). Within the actual clinic, as shown in **Figure 21,** 69% of services could access phlebotomy, but in one third of services, this was done by the TB nursing staff, which is not a good use of senior nursing time. Regarding checking for HIV, we noted in **Figure 22** that there was a high percentage of tests done in notified patients and that the number of notifications did not make a difference to the number of tests performed. Likewise, there was good coverage for blood borne viruses as in **Figure 23**.

Checking the liver function tests is an important part of surveillance for potential side effects. As seen in **Figure 24,** there was some variability in when LFTs were checked and for some services a more standard approach should be considered, with a formal review to understand what resources are needed and available. We heard examples of good practice during the deep dive meetings where bloods were checked in community phlebotomy services and the patient phoned the nurse to say they had been done, and the nurse would check the results. This is a very effective way of monitoring to reduce patients attending the TB clinic, though much of this routine work could be undertaken by lower banded staff, to free up the more senior TB nurses.

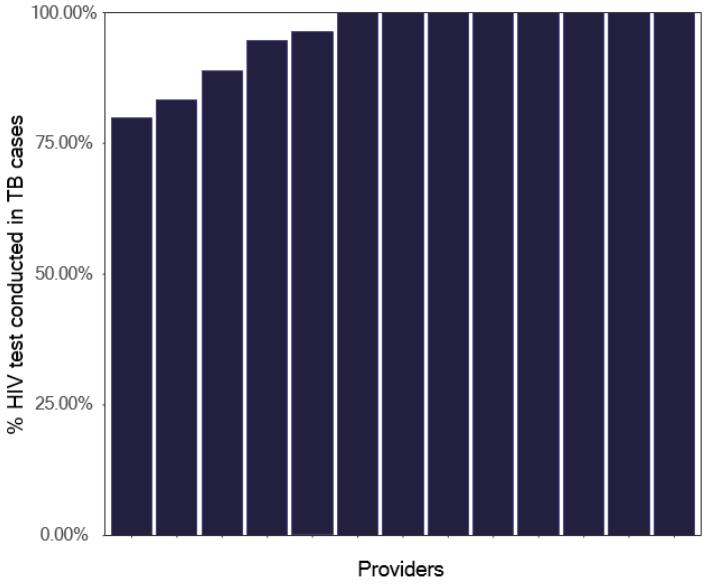
Figure 21: **Phlebotomy services**



Note: total percentage of responses can be over the percentage of 'Yes' answers from the question on the left as multiple options can be selected for this question.

Figure 22: HIV testing activity

Percentage of HIV tests done in notified TB cases in 2022

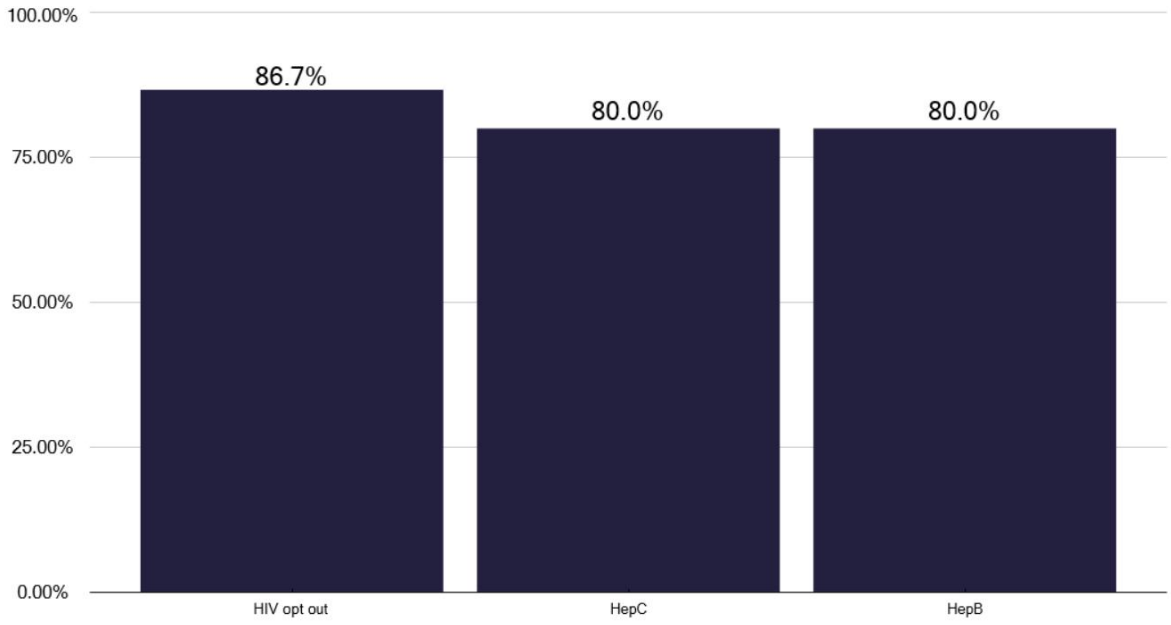


Service Size	% HIV test done
1 case	100.0%
2-5 cases	78.9%
6-20 cases	81.0%
>20 cases	82.9%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is Enhanced Surveillance of Mycrobacterial Infections (ESMI) system.

Figure 23: Blood borne viruses (BBV) screening activity

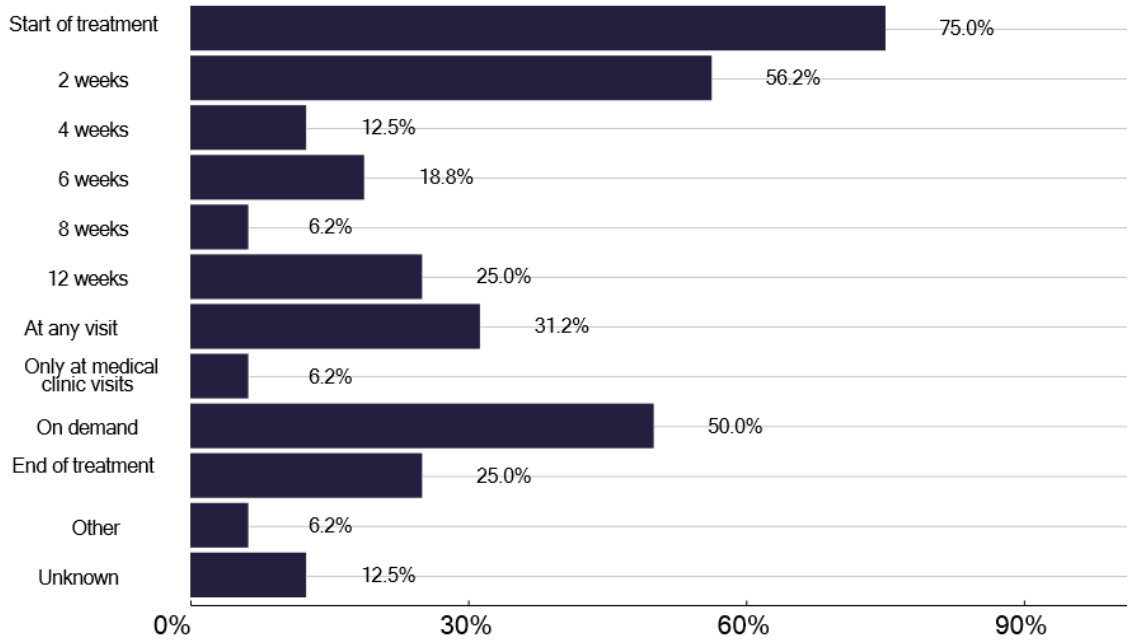
Does your service routinely offer BBV testing? Please indicate what are offered below.



Note: Total percentage of responses can be over 100% as multiple options could be selected for this question.

Figure 24 Frequency of checking liver function tests

How often are liver function tests performed? (Select all that apply)

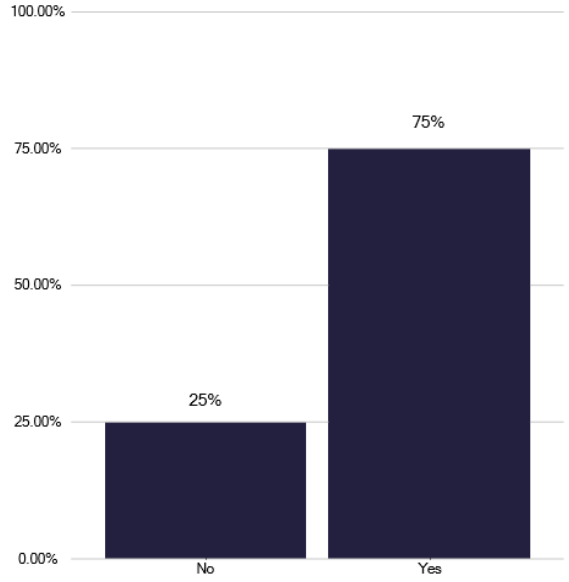


Note: Total percentage of responses could be over 100% as multiple options could be selected for this question.

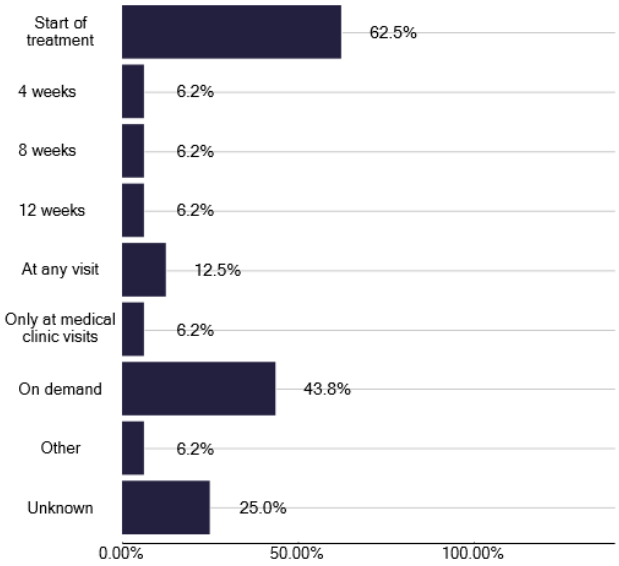
We also asked about the frequency of eye checks, recognising the difficulty in some Health Boards with the geography and limitation of patients needing to re-attend for regular eye checks. Three quarters of services undertook some eye checks at different time points, as in **Figure 25.** Some services did the eye check in clinic, while other services referred patients to hospital-based ophthalmology services, potentially adding to the clinic wait for the patient, increasing the risk of infection transmission or creating a need to attend at a later time, adding to the patient burden of clinic visits. Whether opticians local to the patient could consider undertaking eye checks for those patients who live remote from the TB clinic was not discussed during deep dives.

Figure 25: Eye check procedures

Do you use either Snellen charts or Ishihara plates?



How often is an eye check performed? (Select all that apply)



Note: Total percentage of responses could be over 100% as multiple options could be selected for this question.

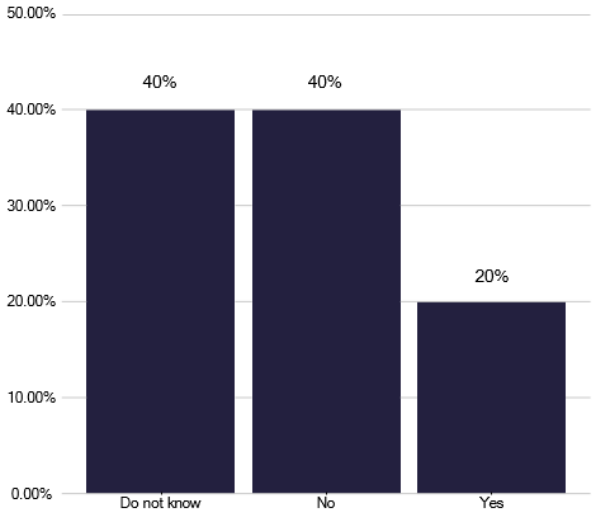
We heard of good practice during several deep dives about alternative ways of managing patients with infectious disease, without attending clinics minimising risk to others. When patients did need to attend, attempts were made to minimise contacts with other patients, though this was not enshrined in SOPs. Unfortunately, not all services had dedicated TB clinics, where all the patients were seen and we heard that patients with TB could attend general respiratory and ID clinics, waiting in the same room as potentially immunocompromised patients, with the risk of disease transmission. To explore this further, we asked about the number of air exchanges in clinic, as seen in **Figure 26**. Only 20% knew if there was appropriate ventilation for potentially infectious patients and only one third of those who answered had sufficient air exchanges, highlighting the need for both understanding the potential air exchanges and the risks to patient and colleagues.

We welcome the ongoing work by the Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) team that is part of NHS National Services Scotland, who are carrying out a literature review of transmission of respiratory infections, including reviewing the current classification of 'airborne' and 'droplet' transmission. They will recommend new definitions for modes of transmission along with considerations for infection prevention and control in healthcare settings. These will form the basis of

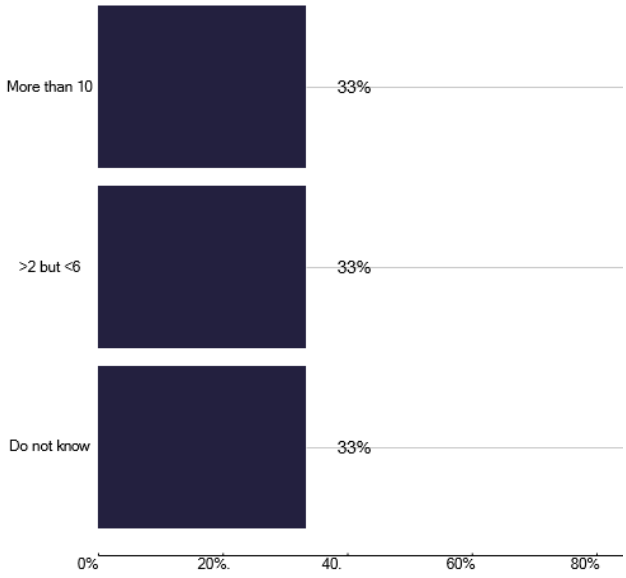
recommendations for the National Infection Prevention and Control Manual which will include TB in their recommendations.

Figure 26: Adequacy of ventilation in clinics

Is there appropriate ventilation in the cliic area where smear positive patients are seen based on air exchanges per hour?



If answering 'Yes' to the previous question, how many air exchanges per hour?



Clinic activity by doctors or nurses is not readily captured, and in contrast to England where some procedures may be coded and therefore lead to payment via a specific Health Resource Group, no such activity coding takes place for procedures such as DOT, BCG administration in Scotland. It is therefore difficult to identify clear funding for any activity undertaken as an outpatient activity.

Recommendations: Outpatient settings

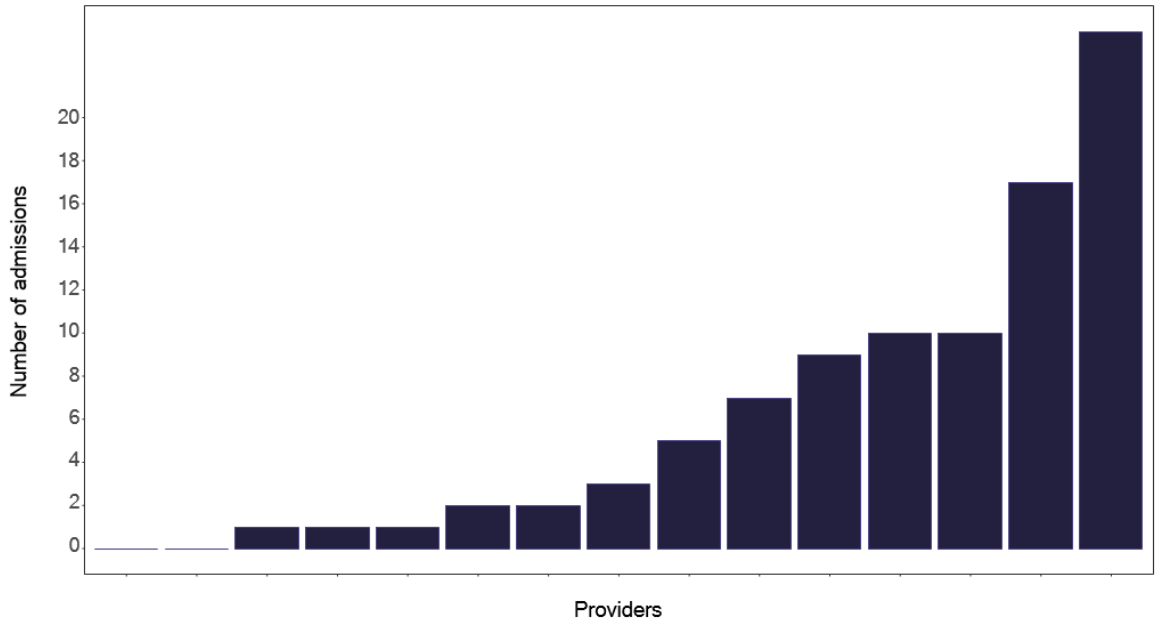
22.	Ideally nurses and medical staff should run joint clinics, with nurses also having their own nurse-led clinics. For CYP services, nursing time should be made available.	P, HB
23.	Infrastructure needs to be in place for efficient running of clinics which includes ready access to clinic rooms when needed, supported by clinic booking staff or ideally TB administration staff to contact the patient.	P, HB
24.	Phlebotomy services in clinics should be available without the need for qualified nursing staff to be involved.	P, HB
25.	For patients living at a distance from the TB service, alternative models of Liver Function Tests (LFT) surveillance should be explored.	P, HB
26.	Infection prevention issues should be explored for Outpatient Departments (OPDs) in all TB services to minimise the risk to all	P, HB

	parties. This should include a clear understanding of clinic air exchanges per hour and mitigation of potential risks, documented in a formal protocol or SOP. The output from the review above will help inform discussion.	
27.	To understand clinic activity and the procedures undertaken, data collection should be considered at a national level, possibly linked to a payment process.	P, HB, N

10.2 Inpatient Activity

We explored admitted patient activity using SMR01 and survey data where tuberculosis was the main reason for admission. Some patients may be admitted following an acute presentation while for others it may be for diagnostic tests such as bronchoscopy or induced sputum. **Figure 27** shows the absolute number of admissions in the 12-month study period, but, recognising the marked variation in notifications, **Figure 28** shows the proportions admitted. This information is complex but each site specific data pack provided the granularity required for further review. Surprisingly, **Figure 29** shows that there were few pulmonary cases, but in almost all deep dives, where there were sufficient admitted numbers, the attendees disagreed with this finding, suggesting that discharge letters or coding is not as accurate as it should be. This may be important if such data is used to map requirements for negative pressure facilities, see **Figure 13** in the Diagnostics section 9.2 or for side rooms that are really needed if pulmonary disease is suggested.

Figure 27: TB admissions with a primary ICD -10 code



Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is the Scottish Morbidity Record (SMR01) dataset.

Figure 28: Admissions with TB code by case type: pulmonary or not

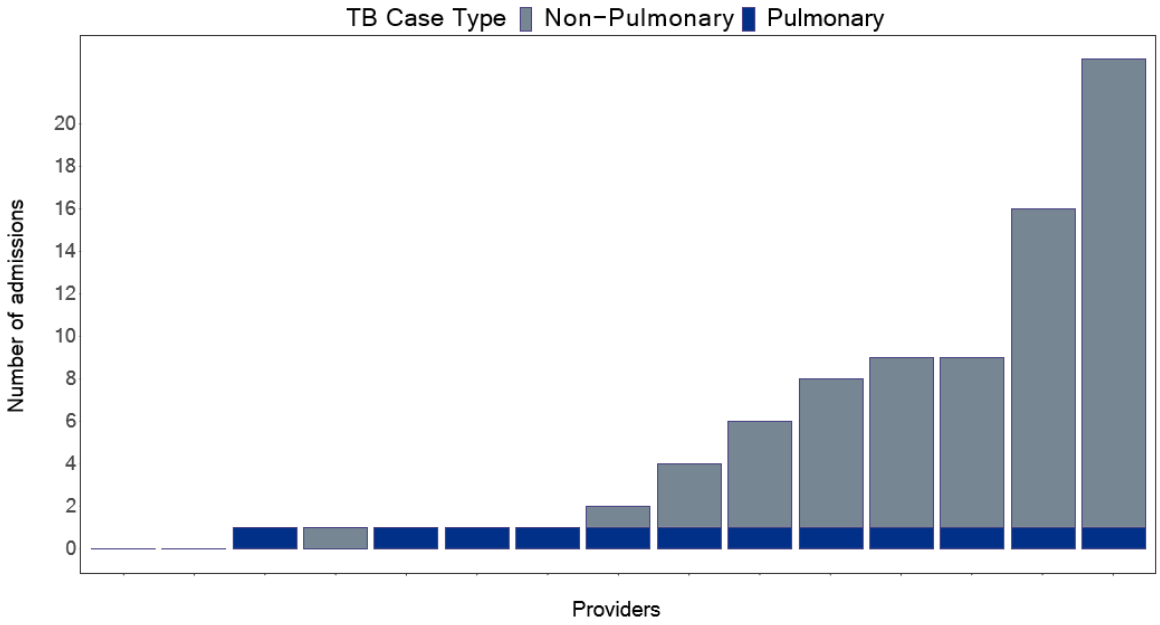
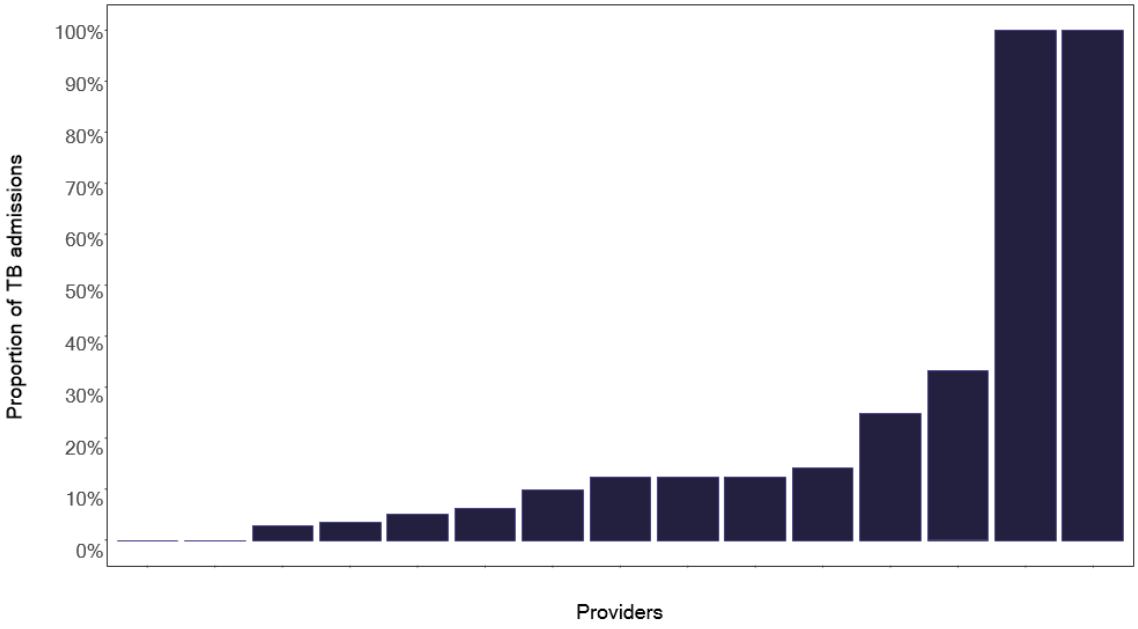


Figure 29: Proportion of pulmonary TB cases



Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is the Scottish Morbidity Record (SMR01) dataset.

The average length of stay of patients with tuberculosis for each service is shown in **Figure 30.** We did identify outliers where individuals appear to have a long length of stay, as in **Figure 31,** which may distort this information.

Services and Health Boards should review their information to see if this is a data recording issue or whether some patients are hospitalised for greater than 28 days. If the information is confirmed as correct, the issues leading to the long delay should be addressed and form part of a cohort review discussion. We wondered if there were also patients with a short length of stay, who may have been attending for an investigative procedure. There was some variation, as in **Figure 32,** but generally, given the small numbers of notifications and subsequent admissions, it is difficult to draw too many conclusions.

Figure 30: Average inpatient length of stay

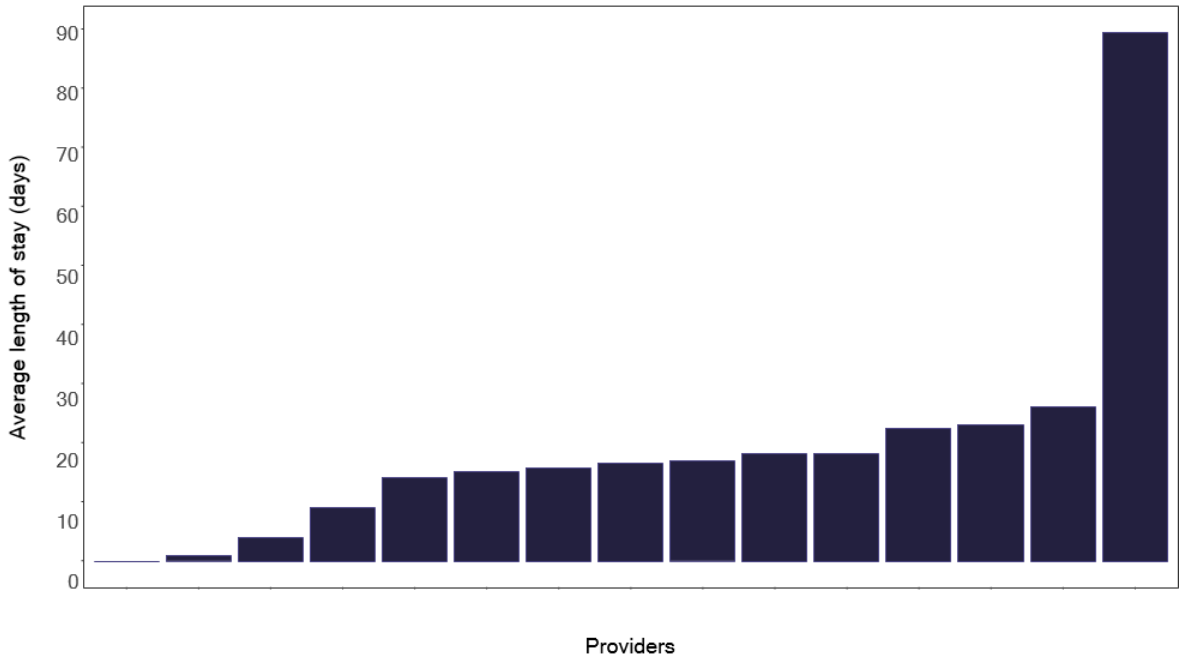
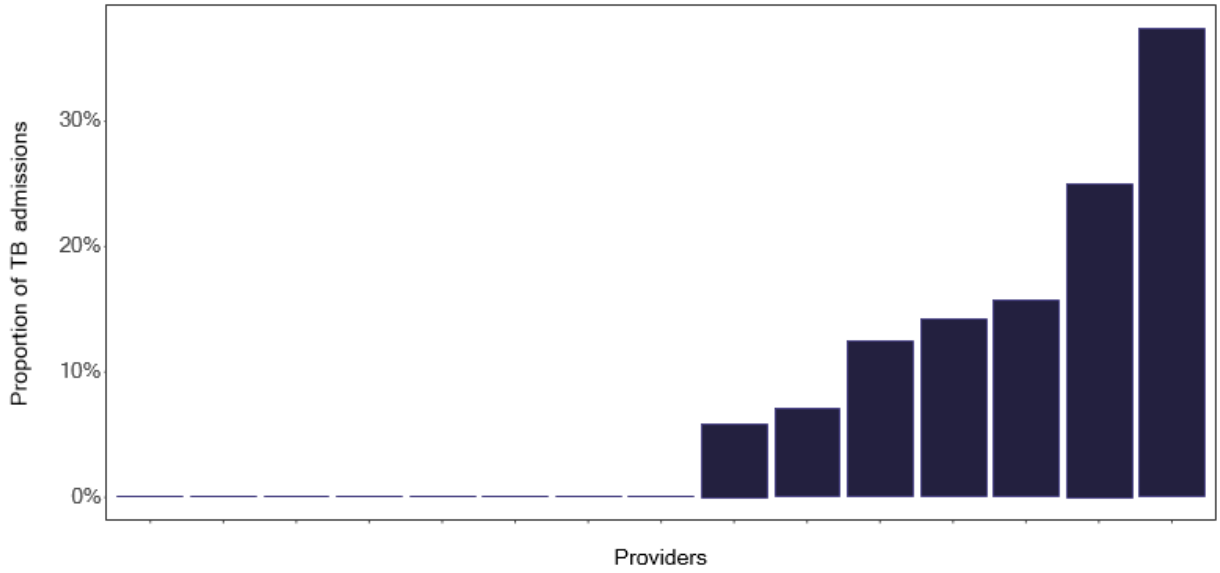


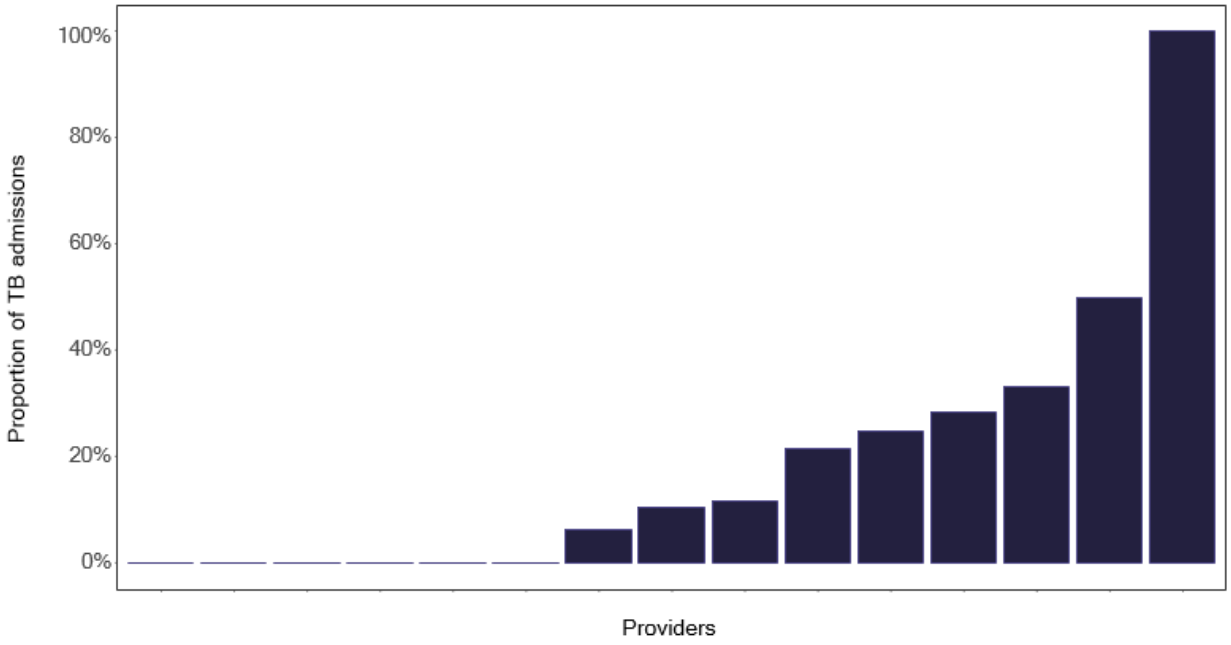
Figure 31: Proportion of patients defined as long stay



Notes: (1) A long stay admission is defined as a non-paediatric (17+ years) admission with a primary TB diagnosis lasting more than 28 days.

(2) Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is Scottish Morbidity Records (SMR01) dataset.

Figure 32: Proportion of patients defined as short stay (less than 1 day).



Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is Scottish Morbidity Records (SMR01) dataset.

Perhaps the greatest cause for concern was which clinician patients were admitted under. While the activity for outpatients was acceptable with 88% of patients being under a TB clinician.

For those admitted, only half were under the care of a named TB physician, see **Figure 33,** a finding likely to have implications for management. Nursing input to admitted patients likewise was far from ideal, as shown in **Figure 34** given that TB patients are hospitalised for a reasonable period as described in graph 277 in the data pack in Annex E.

At best only 50% of inpatients, under respiratory care, saw a TB nurse during their stay, recognising that for those with a length of stay <1 day this may not be appropriate. However, for admitted patients this is a missed opportunity to provide much needed explanation of the disease and management plan and to identify potential contacts and to develop rapport between patient and nurse with whom they may have regular contact thereafter. We did not ask the reason for these surprisingly low numbers but lack of TB nursing workforce and their need to deliver care in other settings e.g. community, clinic is the most likely factor.

Figure 33: Care under a named physician

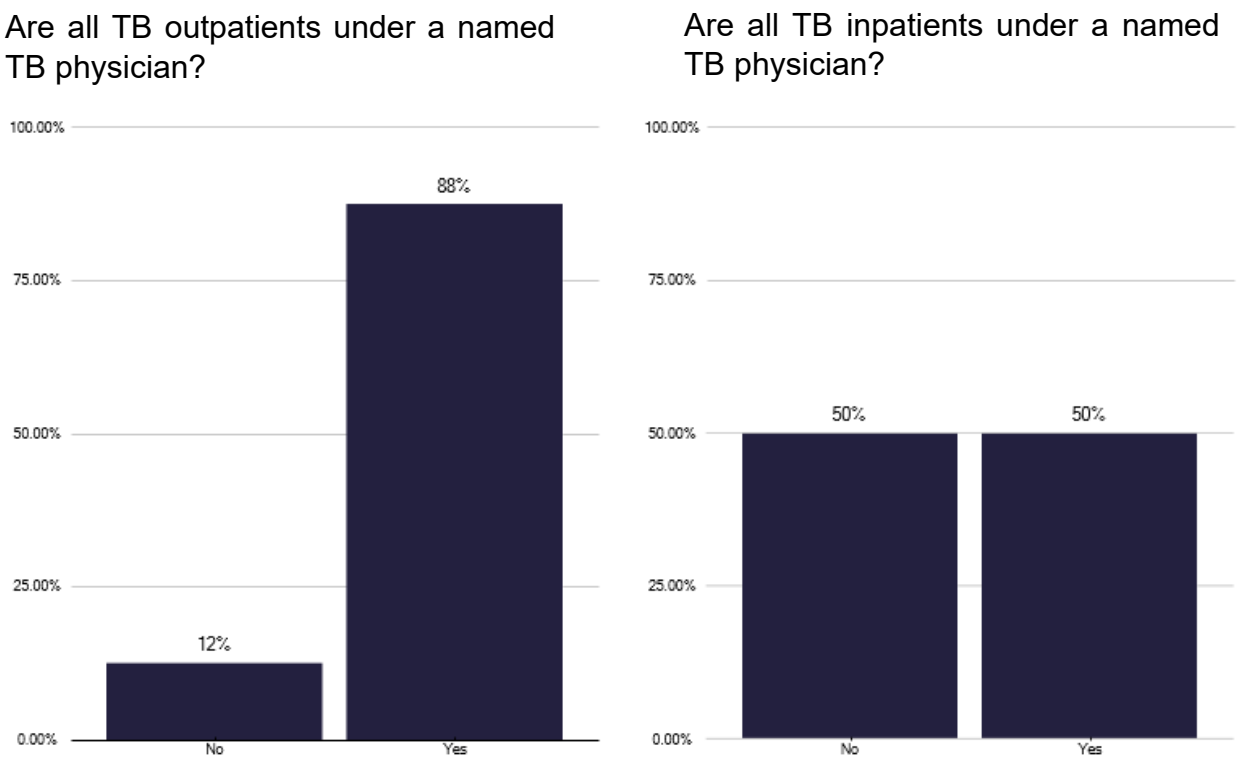
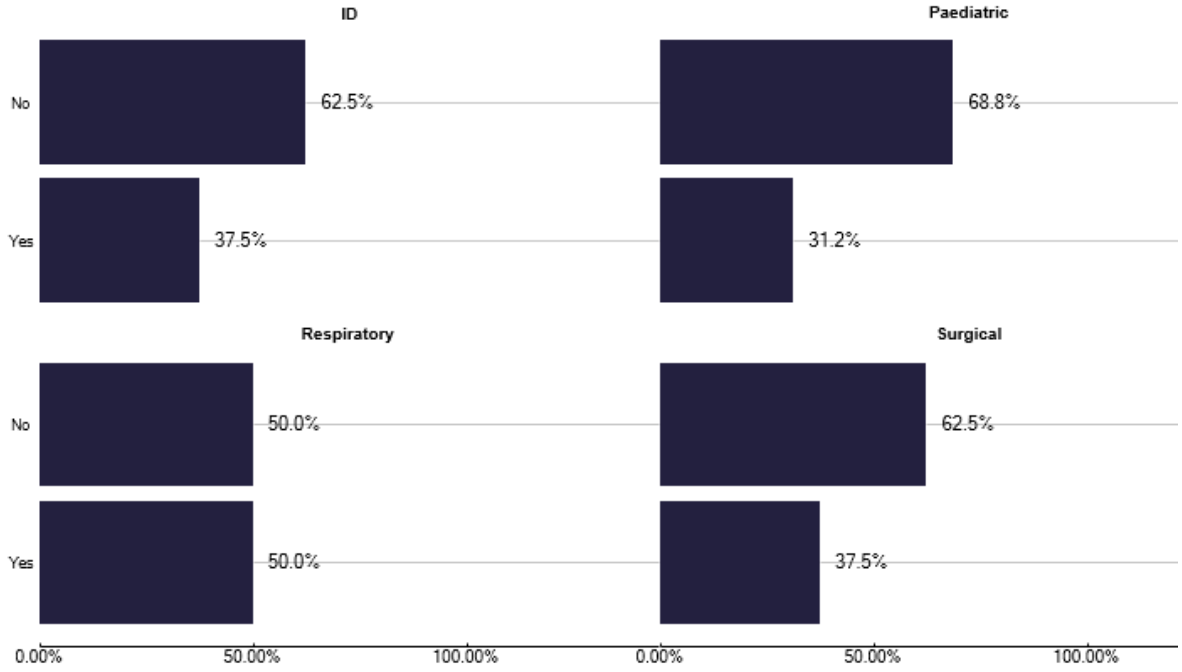


Figure 34: TB nurse input during hospital admission



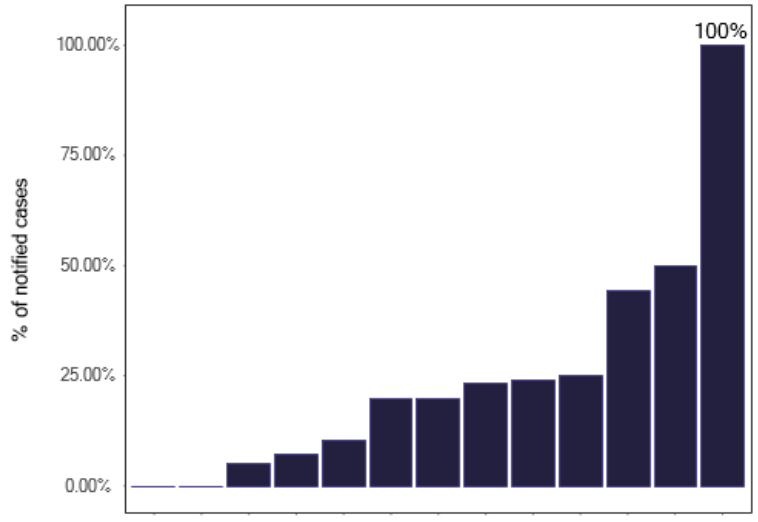
Recommendations: Inpatient activity

28.	Clinical teams should review the patient discharge letters to ensure they are accurate and where relevant discuss with the coding team to ensure that patients are correctly coded.	P, HB
29.	Clinical teams and Health Boards should review the reasons why some patients have a long length of stay, defined as beyond 28 days, to address remediable factors. Such patients should be discussed at cohort reviews.	P, HB
30.	All patients with tuberculosis need to be under a named TB physician if either outpatient or in patient, recognising TB patients may be admitted for other reasons. On such occasions the TB physician should be informed the patient is admitted, review them as an inpatient and provide ongoing advice.	P, HB
31.	Patients admitted with proven TB should be reviewed by a TB nurse during their inpatient stay and ideally an interested pharmacist should review medication during the patients stay and /or prior to discharge.	P, HB

10.3 Delays in management.

Management of tuberculosis involves a high index of suspicion for early diagnosis with appropriate adherence to therapy to obtain a cure. We reviewed the ESMI data which showed a delay between diagnosis and treatment. **Figure 35** shows the proportion of patients who waited more than 2 weeks from diagnosis to start of treatment, with little variation based on the number of cases. If we explore this further for pulmonary **Figure 36** and for non-pulmonary disease in **Figure 37,** we notice that there were considerable delays. Some of this may relate to definitions of symptom onset, so greater clarity in what constitutes 'symptom onset' in ESMI.

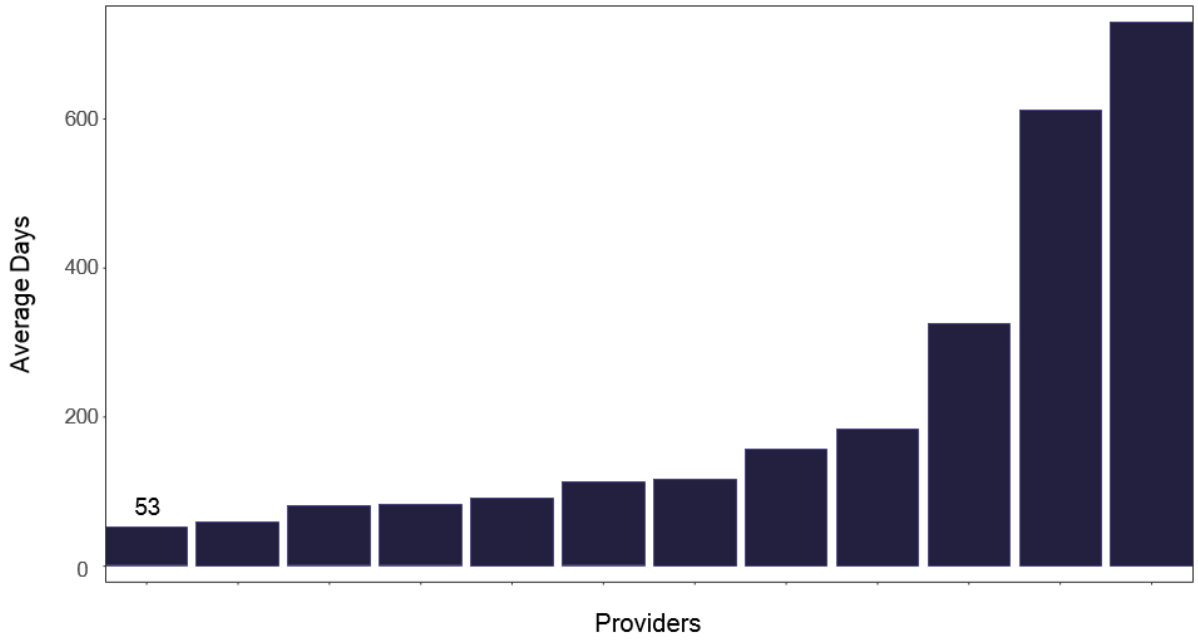
Figure 35: Percentage of notifications that take over 2 weeks to start treatment



Service Size	% >2 weeks from diagnosis to treatment
1 case	0.0%
2-5 cases	21.1%
6-20 cases	22.4%
>20 cases	17.9%

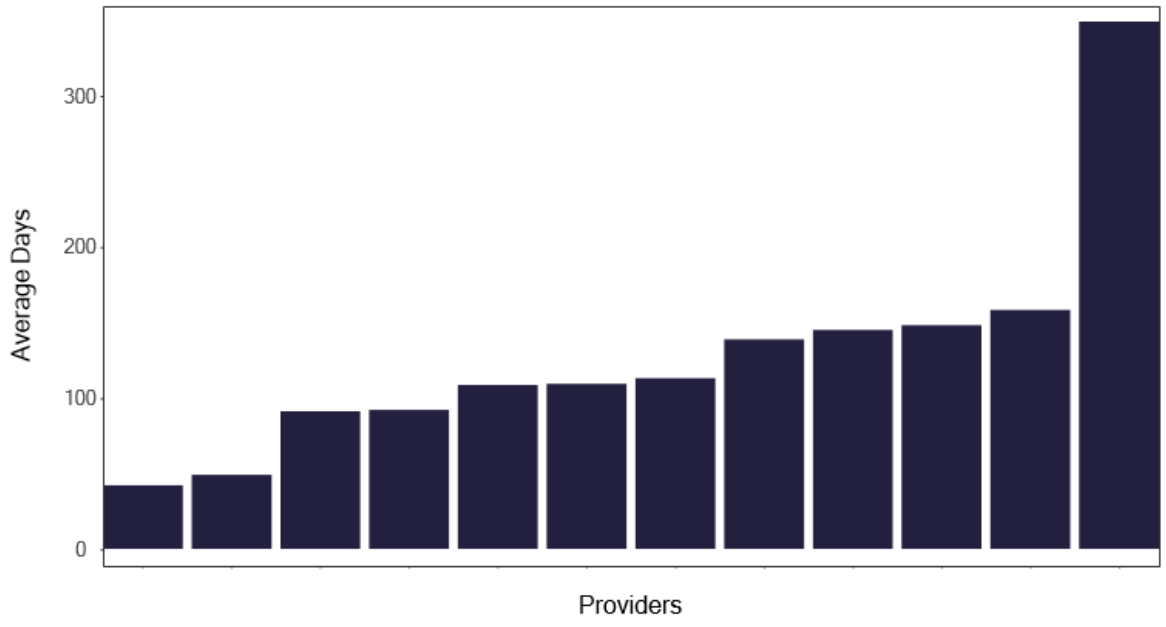
Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is Scottish Morbidity Records (SMR01) dataset.

Figure 36: Symptom onset to treatment for Pulmonary Disease



Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is Scottish Morbidity Records (SMR01) dataset.

Figure 37: Symptom onset to treatment for non-pulmonary disease



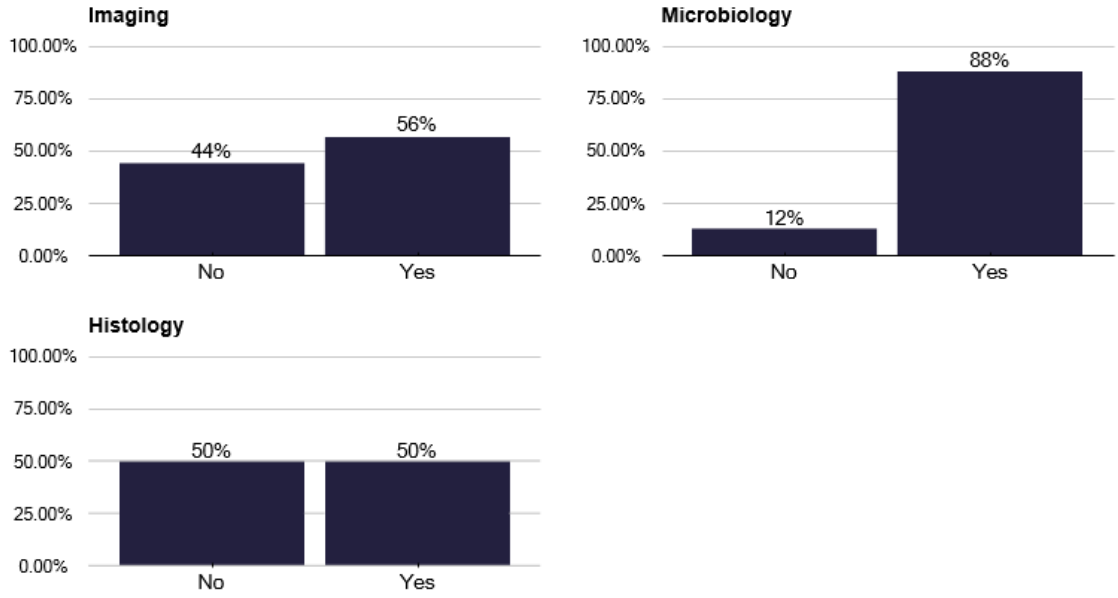
Note: Time period includes inpatient/day case admissions between January 2022 and December 2022. The source is Scottish Morbidity Records (SMR01) dataset.

One factor that may produce delays is communication between services. We can see in **Figure 38** that there is good communication between TB services and microbiology, but less so for imaging where 44% of TB services said they were not informed by imaging if there was potential TB. This is disappointing, as many imaging departments have an 'alert' system for suspected lung cancer.

We made uniform recommendations for this to improve during several deep dives in which it was suggested that software recognition of abnormalities may trigger a response to the TB service, though timelines for this were uncertain. Until such technological solutions are effective, a more manual approach should be developed, learning from services that already have these links.

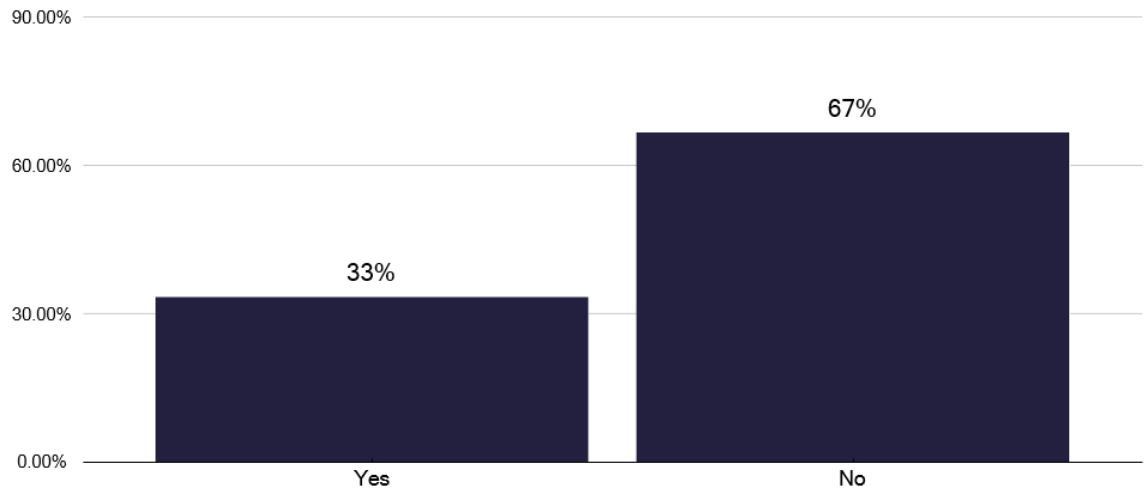
Similarly, we found that potential TB identified in histological samples, be that granuloma or actual acid alcohol fast bacteria (AAFB), were not communicated to TB teams in 50% of services. This can add considerably to the delay of initiating treatment and TB services must work with their pathology colleagues to address this issue. Where solutions to the information transfer to the TB service is not forthcoming from imaging and histology, it should be resolved at provider Health Board or Medical Director Level.

Figure 38: **Communication between departments and TB services**



Perhaps of greater concern is that 67% of services stated they did not attempt to identify why there were delays in diagnosis, as in **Figure 39,** recognising that for some patients the reason was obvious and so there may have been no need to review.

Figure 39: Attempts to identify factors leading to management delays



We invited services to document the three top reasons for the delay in starting treatment and these are documented in **Table 3**. These have been grouped arbitrarily into:

- Delays or mis-directed presentation
- Healthcare system or provider challenges
- Social determinants of health and inequalities.

The findings tabulated are not surprising but are concerning and highlight several remedial factors.

- Attempts to address these systematic issues include general education to the public about tuberculosis and specific education to health care providers in both primary and hospital care.
- Time to deliver this education needs to be recognised in job plans, as per the workforce sections.
- Raising the profile of TB with acute providers can be aided by having a clear service that is identified with appropriate policies and practices that are recognised at Health Board level.

There are clear capacity issues in delivering care and the rural nature of some services exacerbate these issues.

The recommendations below include aspects for training and education with other areas around diagnosis and infrastructure covered through the report.

Table 3: Delays in patient presentation to healthcare services and late recognition of TB as a possible diagnosis by both patients and healthcare providers.

This includes factors like: • Patients not coming forward for testing or not attending doctor appointments. • Non-engagement or late presentation related to barriers in accessing care including social circumstances. • Failure to recognise TB symptoms, leading to delays in seeking medical input. • Investigations directed towards other medical issues before considering TB. • The slow speed of the investigative pathway once TB is considered. • Delayed confirmation of TB diagnosis. • Issues specific to paediatrics such as lack of TB/PH (Public Health) nurse dedication and lack of dedicated TB space/clinic.
Healthcare System and Provider Challenges Issues within the healthcare system itself and potential gaps in awareness or readiness among providers. This involves: • Lack of TB awareness in primary care and lack of clear pathways in secondary care. • Problems with the referral pathway between healthcare services. • Delays due to waiting time for clinics with TB expertise. • Late seeking of medical input into patient care, exacerbated by clinic availability. • Healthcare professionals' failure to send appropriate microbiology samples or request CXR. • The time to culture when smear-negative and asymptomatic also plays a role.
Social Determinants and Health Inequalities Various socioeconomic factors contributing to health disparities affect prompt access and treatment. These include: • Fear of stigma associated with TB. • Health inequality and access to healthcare, particularly for individuals with language, social, and economic barriers. • Issues related to living in rural areas, including transportation problems. • Financial barriers to attending medical appointments. • Complexities in the administration of paediatric TB medications like tube fitting. • Vulnerabilities in specific groups impacting their access to healthcare.

Recommendations: Delays in management

32.	For individuals, where there are significant delays in both symptom onset to clinical review, and to treatment, a detailed review of the reasons should be undertaken and modifications to the service made to address the issues. These notifications should also be included in cohort reviews	P, HB
33.	Clear policies for managing TB should exist within the Health Board and acute providers, supported by regular multi-professional managerial meetings.	P, HB

34.	There should be regular updates for primary care staff, at least bi-annually to general practitioners and primary care staff as part of their formal CPD program.	P, HB
35.	The updates to Health Protection staff, as part of their training, as noted in the good practice should continue.	P, HB
36.	Awareness of TB in the acute provider is essential in identifying patients promptly and therefore there should be at least an annual grand-round in the acute provider with specific bi-annual education to staff in the acute portals.	P, HB,

10.4 Enhanced case management, DOT & VOT therapy

Adherence to therapy is essential for curing tuberculosis, but some patients may take treatment intermittently or miss some drugs from the regimen, with the potential of failure to cure and emergence of drug-resistant mycobacteria. Minimising this risk is important, and can be achieved by ensuring patients understand the rationale for treatment, but some individuals, noted by using enhanced case management (ECM) tools, are at risk of poor adherence.

To address these issues, it is possible to observe the individuals taking the anti-tuberculosis drugs, either face to face through directly observed therapy (DOT), or by video observed therapy (VOT).

Treatment is given variably for DOTs, as in graph 212 in the data pack (see Annex E), usually between three and five days per week depending on the infrastructure and resources available. These factors are considered in the following sections.

Those individuals who have complex issues with TB, including potential adherence, and those who need additional support (enhanced case management (ECM)) can be identified by using dedicated assessment tools.

Figure 40 highlights that 62% of TB services use such a tool (e.g. The Royal College of Nursing, Case Management Tool RCN tool), though this does not appear to be standardised **Figure 41** shows the number of individuals who needed ECM, noting 38% did not, and in **Figure 42** the number that received ECM, which are broadly similar findings. This is displayed as notifications requiring ECM in **Figure 43** where there seemed a great use of ECM, with increasing case numbers.

Whether this relates to availability of staff, greater awareness of the use of ECM or different case-mixes will depend on local factors, hence looking at site specific information as shown in graph 251 in the data pack in Annex E.

Figure 40: Use of assessment tools to determine need for ECM

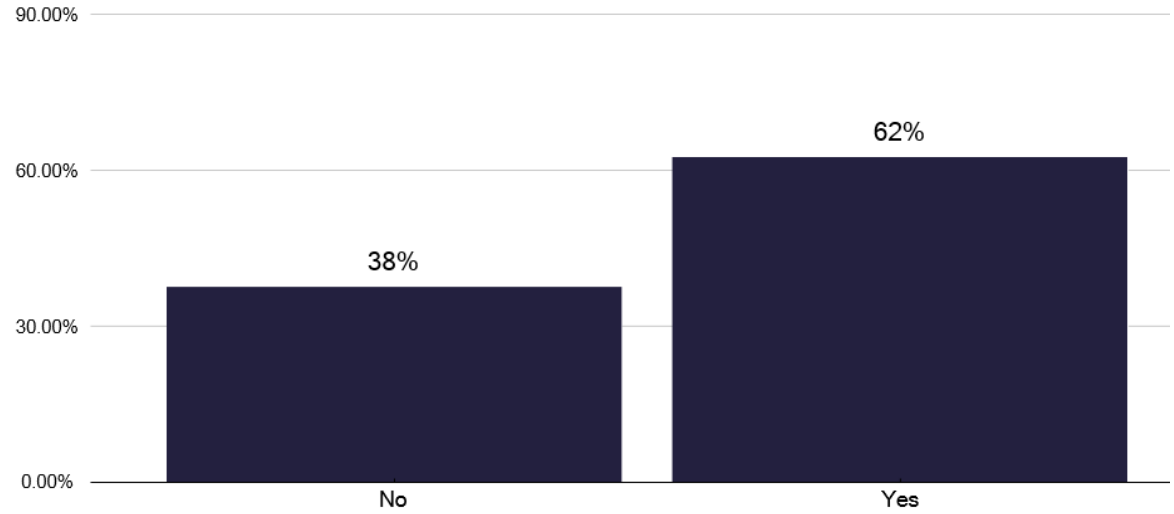


Figure 41: Number of patients needing ECM

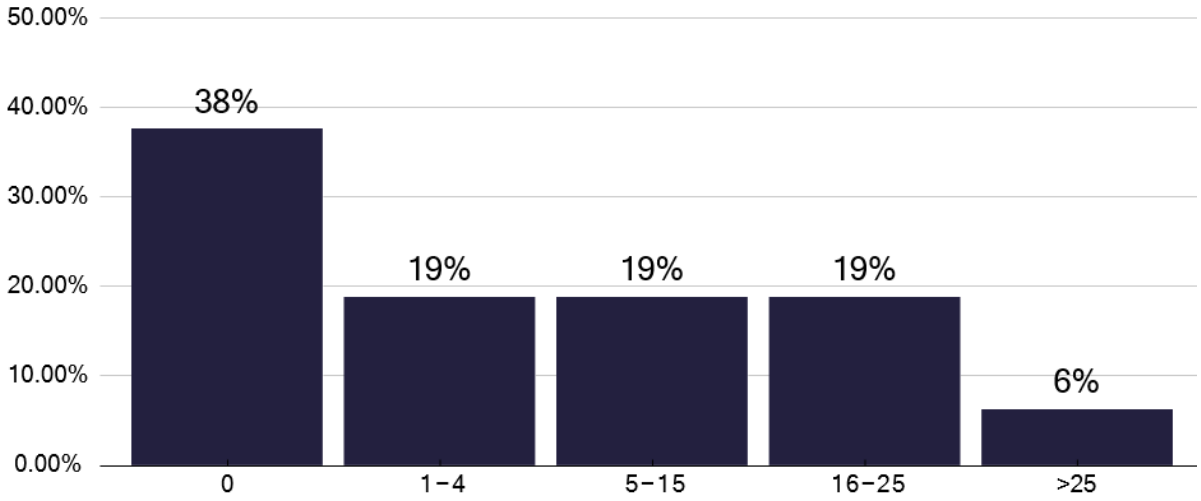


Figure 42: Number of patients who received ECM

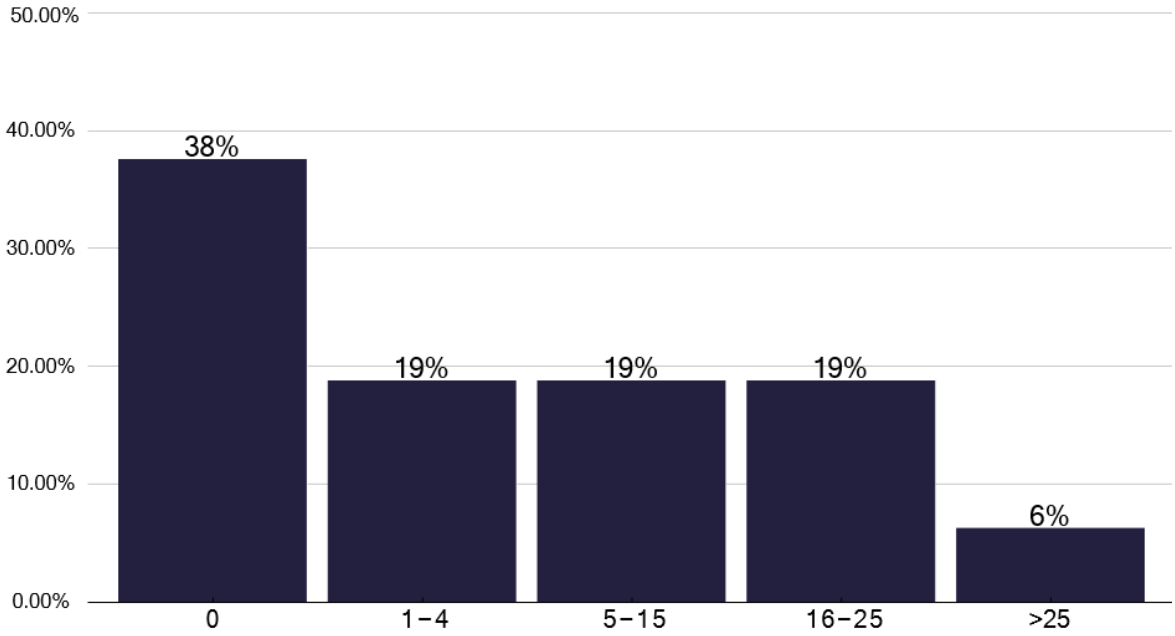
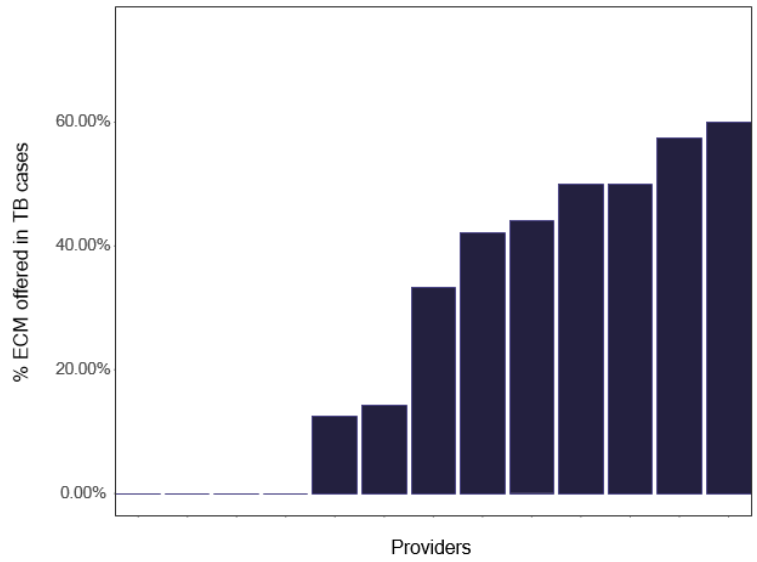


Figure 43: Percentage of ECM received in notified cases



Service Size	% cases with ECM
1 case	0.0%
2-5 cases	21.1%
6-20 cases	31.0%
>20 cases	51.2%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

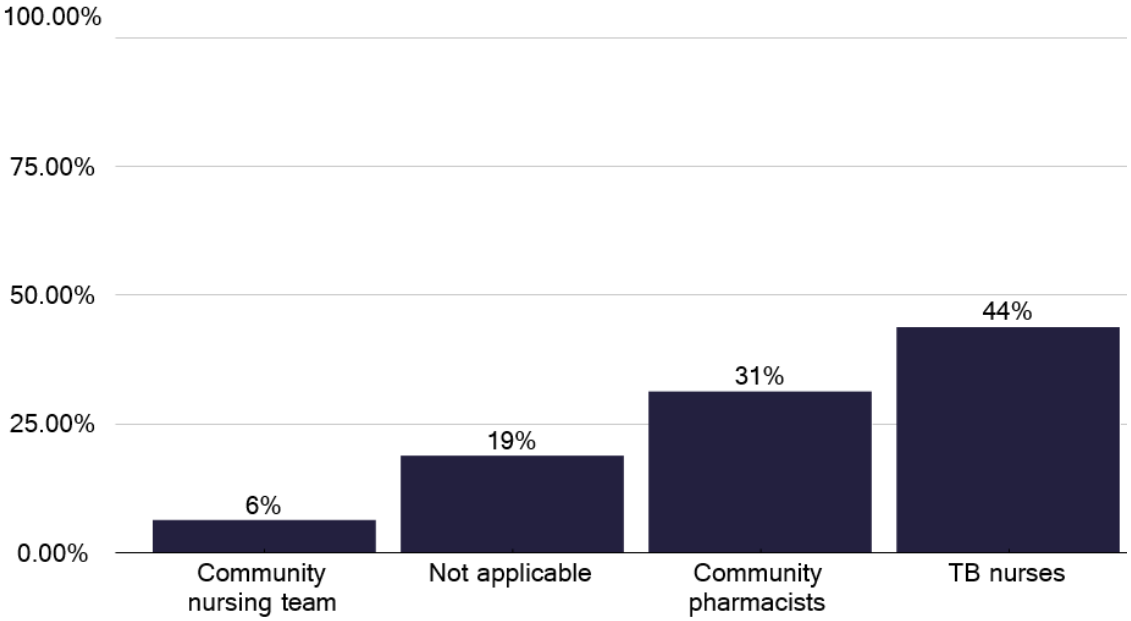
10.5 Directly Observed Therapy (DOT)

DOT can be administered by different personnel as shown in **Figure 44**. A scheme linking it to local pharmacies is helpful in remote areas where it is difficult for nurses to attend and may be linked to other substance misuse programs. During the deep

dives, we found excellent examples where such a scheme had been deployed and these are contained in good practice via the link in Annex E.

An alternative in more urban areas, is for nurses to observe the individual taking the treatment, usually in their own environment or a mutually agreed place. It is important that a risk assessment is made to determine if either one or two nurses need to attend, but worth noting that staff shortages limit availability to deliver DOTs in half of services in graph 214 in the data pack in Annex E; hence, the benefit of considering lower banded staff to support the DOTs service.

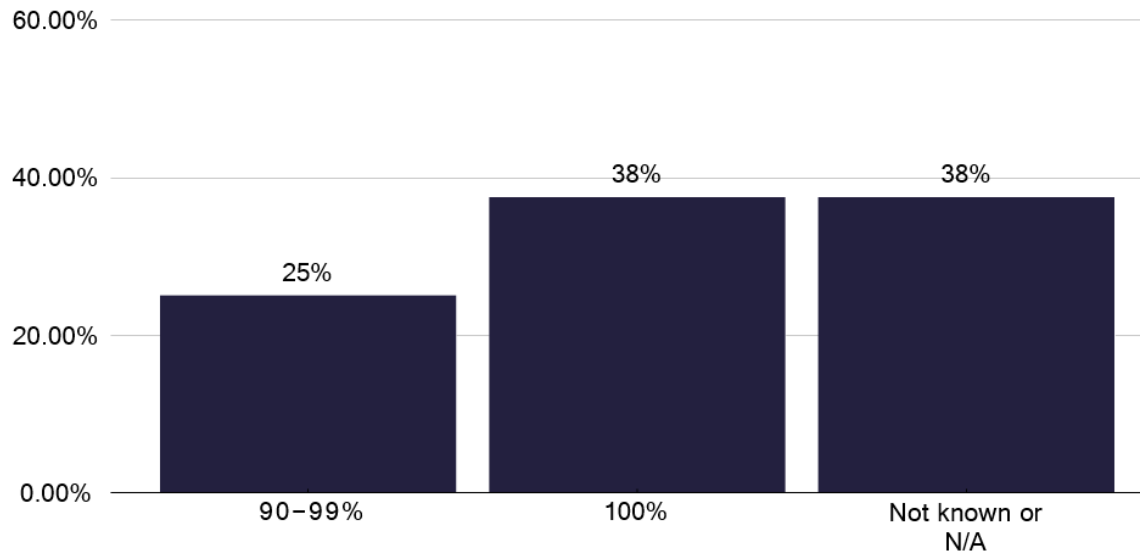
Figure 44: Who delivers of DOT in services



Note: Total percentage of responses can be over 100% as multiple options can be selected for this question.

The numbers of patients, recognising the variation in notifications, who were assessed as needing DOTs, were offered it and accepted it are broadly similar as shown in graphs 207, 208 and 209 in the data pack in Annex E, with the proportions noted in graphs 252, 253 and 254 in the data pack in Annex E. In only just over one third of individuals was treatment completion 100% as shown **in Figure 45**.

Figure 45: Treatment completion rate with DOT



10.6 Video Observed Therapy (VOT)

Video observed therapy has the advantage in the rural areas of not needing staff to travel. However, to deliver this, appropriate technology is required. This may include the availability of mobile phones, which were absent in 62% of responses as in graph 255 in the data pack in Annex E, or another appropriate platform, which was found in only 38% of providers, shown in **Figures 46 & 47**.

Of those with a platform, all but one (from the deep dives) used ‘Near me’, which we heard was a very unsatisfactory tool, due to its inflexibility and is not seen as useful for VOT. One service used a commercial platform, as shown in **Figure 48,** but there were issues around its governance.

Where VOT was delivered, this was by TB nurses, but it is used infrequently, with only two patients being offered and accepting VOTs in the time period of the review, as shown in **Figure 49** and in the data pack graph 218 in Annex E. Whether this low use is due to staff shortages, as in graph 222 in the data pack in Annex E, patient case-mix, lack of infrastructure, or “not deemed as required” are service specific issues. However, in the patients it was used for, it had a high completion rate, as in graph 220 in the data pack in Annex E and was delivered over either 5 or 7 days, as per graph 221 in the data pack in Annex E.

Figure 46: Access to a platform for VOT

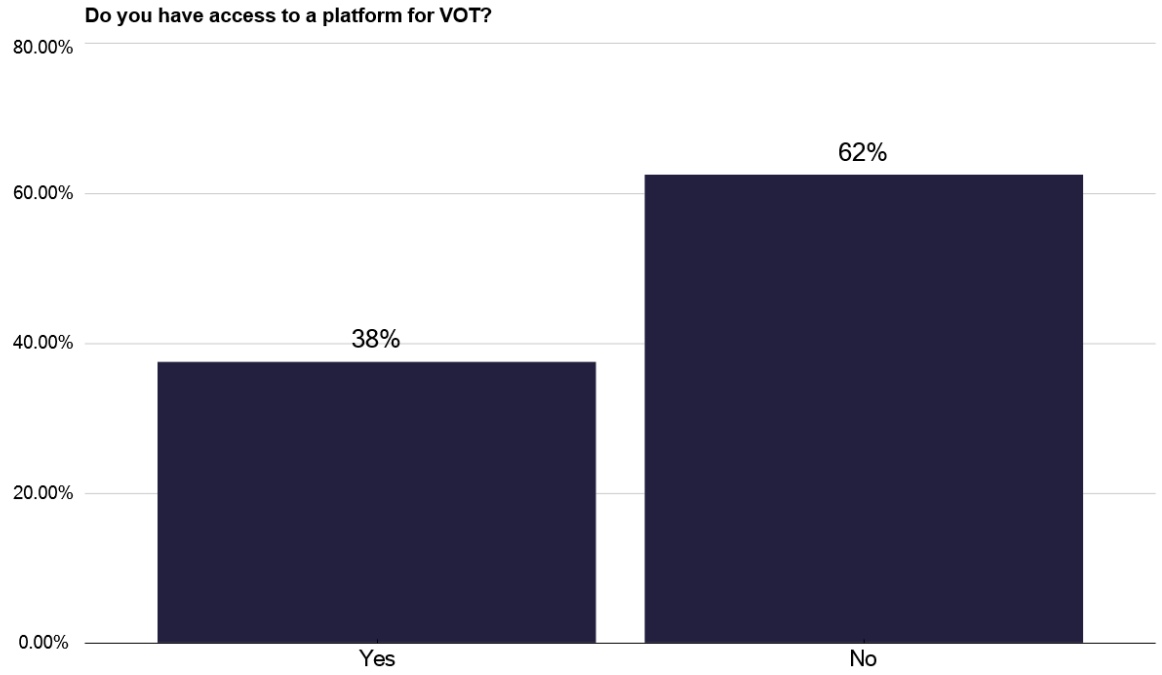


Figure 47: VOT platform 'ownership'

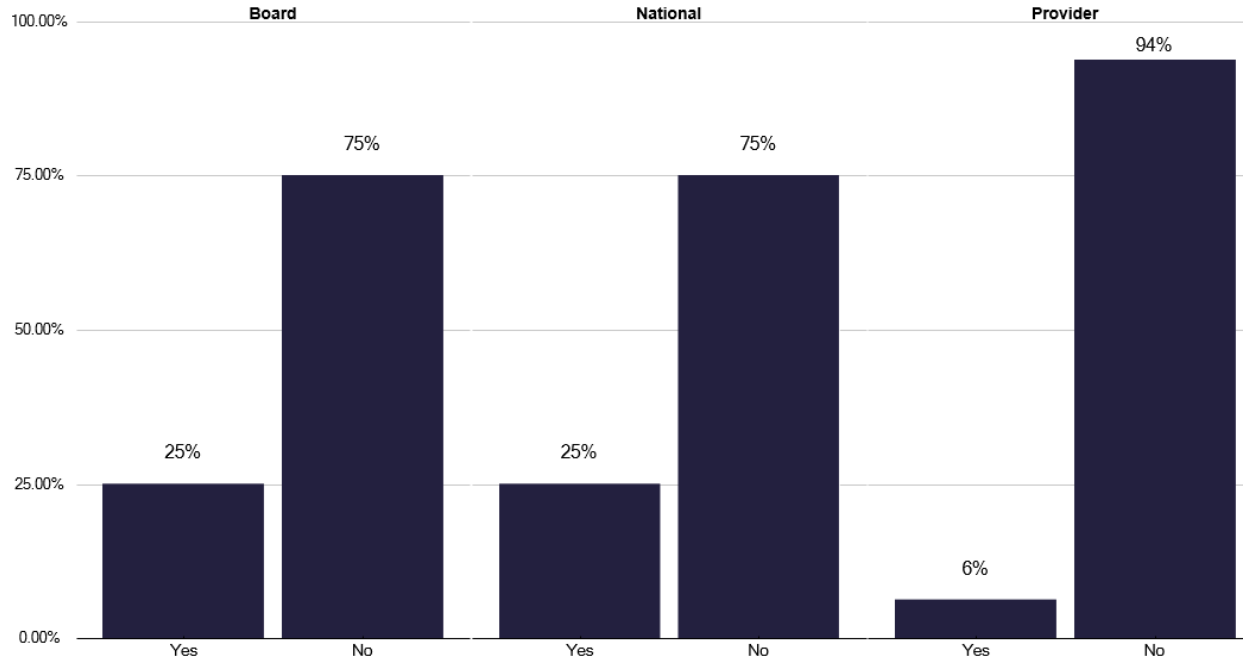
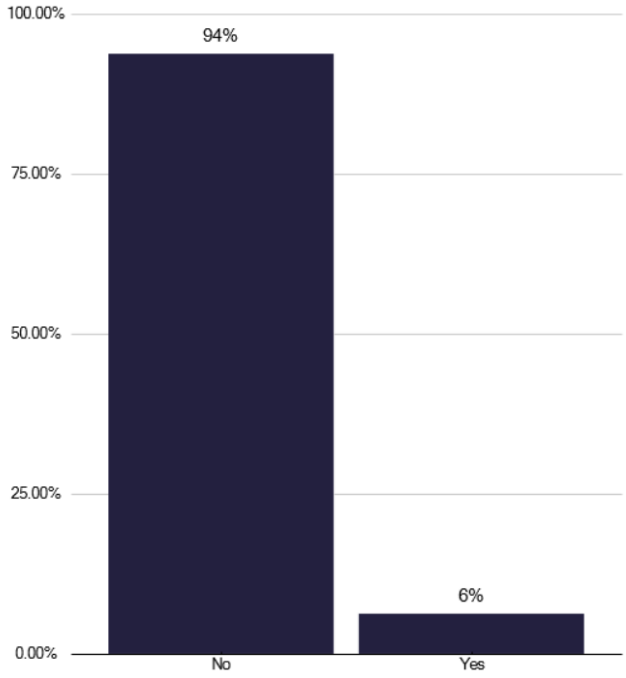


Figure 48: Type of VOT platform

Is the VOT Platform commercial?



If 'yes' is this the London 'Find & Treat' service?

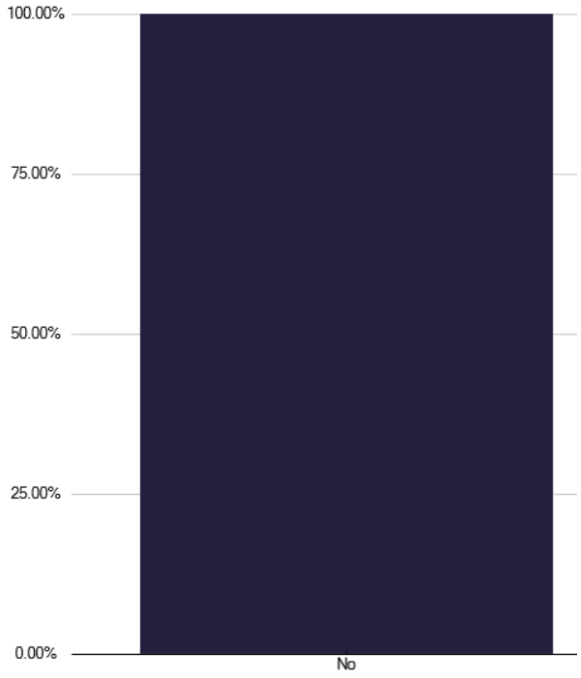
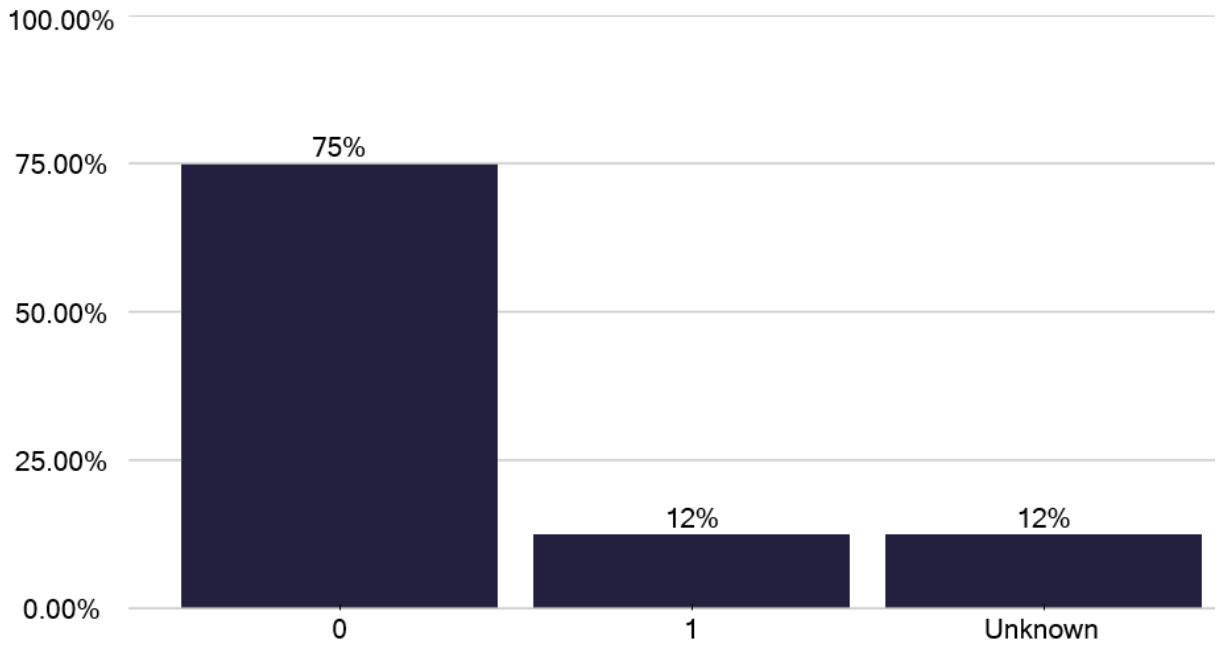


Figure 49: Patients accepting VOT



Recommendations: DOT and VOT

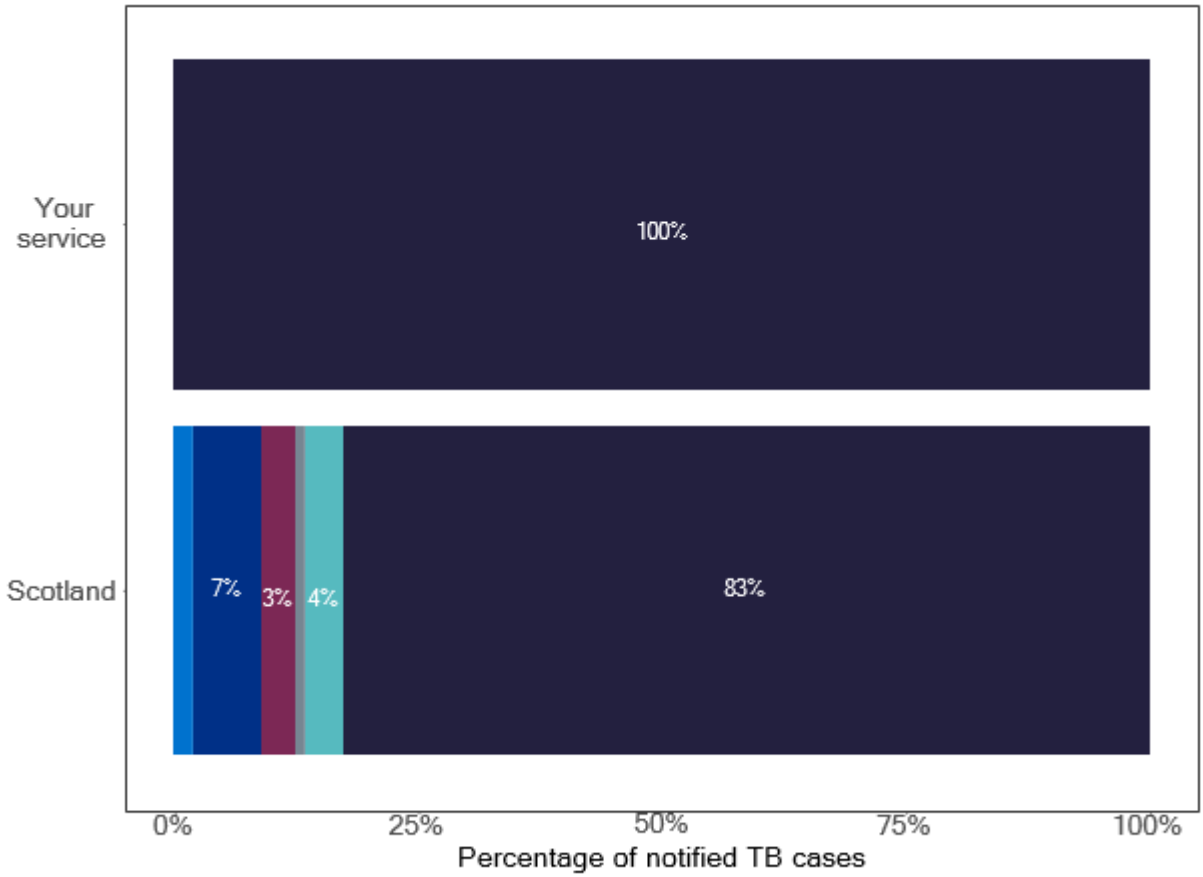
37.	A standardised tool to assess who would benefit from ECM should be used. This will allow consistency if patients move to different Health Boards' TB services.	P, HB
38.	DOT: Where DOT is required, appropriate staffing needs to be available i.e. using potentially lower banded staff. A risk assessment should always be performed to determine the number of staff required.	P, HB
39.	DOT: Community pharmacists, who are appropriately reimbursed are an alternative source of staff, where staffing or travel times limit nurse delivered DOT.	P, HB, N
40.	VOT: A platform should be available throughout Scotland to allow VOT to be delivered. This needs appropriate governance, and must be effective and easy to use for both patients and clinical staff.	N
41.	VOT: VOT seems to have a low use despite its potential advantages in rural areas of minimising staff travel. This may relate to the patient case-mix, lack of staff or availability of infrastructure or a platform. Each service should consider the benefits of VOTs when appropriately supported.	P, HB

10.7 Treatment of Tuberculosis including Multi-Drug-Resistant TB (MDR)

Management of TB is associated with delays, as noted in the previous section, though actual treatment completion is excellent. An 85% threshold is achieved for several services, as in **Figure 50,** though as can be seen from this anonymised service, this is not uniform. An aspect of support for patients who start treatment is the requirement for regular contact but this was not in the form of a home visit for 69% of services, irrespective if this was pulmonary or extra-pulmonary **Figure 51**.

However, this does not acknowledge that for some individuals a home visit is not needed, as they were seen as an inpatient, or the geography would limit such a visit. We were assured during all the deep dives (irrespective of the data shown in graph 202 in the data pack in Annex E) patients are well supported and this is an undoubted factor in the high completion rates.

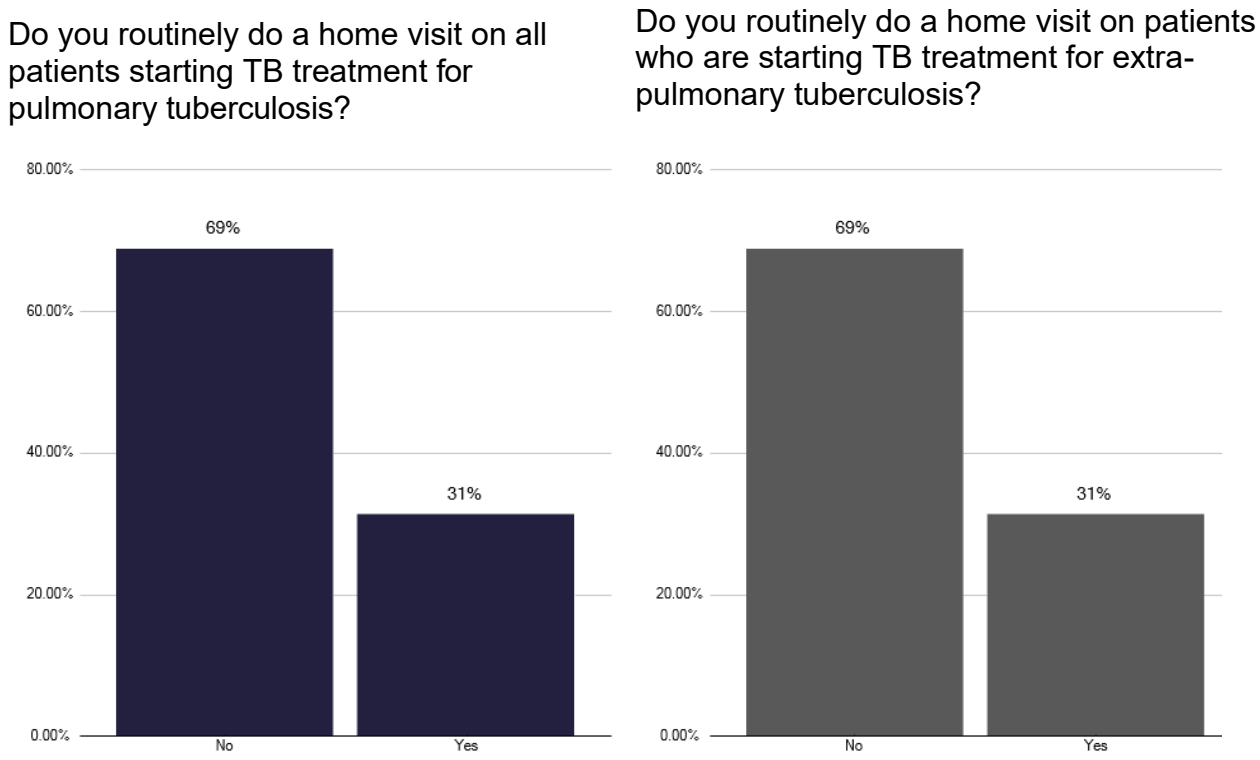
Figure 50: Treatment outcomes



Service Size	% treatment completed
1 case	100.0%
2-5 cases	78.9%
6-20 cases	75.9%
>20 cases	86.2%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

Figure 51: Home visits based on type of notification



Fortunately, there have been only two notifications with MDR in the review period and none for extensively drug resistance (XDR). However, other drug resistance patterns are problematic, as shown in **Figure 52,** and we heard during one deep dive, where isoniazid resistance has been endemic in one locality for several years, complicating the management and workload of the service.

To help manage MDR and to support clinicians, NHS England supported the development of the British Thoracic Society run, MDR service. This has not been used by 56% of services in Scotland, shown in **Figure 53,** and when it was used, it was usually for other reasons, as in **Figure 54**. A quarter of services stated they had used the service for non MDR (Multi drug resistant mycobacteria) / XDR (Extensively drug-resistant tuberculosis) reasons, as shown in graph 263 of the data pack in Annex E.

Figure 52: Management of MDR and XDR

Resistance	Scotland - Number	Scotland - Percent	Your Service - Number	Your Service - Percent
Isoniazid Resistant	13	6.53%	0	0%
Rifampicin Resistant	3	1.51%	0	0%
Ethambutol Resistant	2	1.01%	0	0%
Pyrazinamide Resistant	4	2.01%	0	0%
MDR/XDR	2	1.01%	0	0%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

Figure 53: BTS Clinical advice service usage

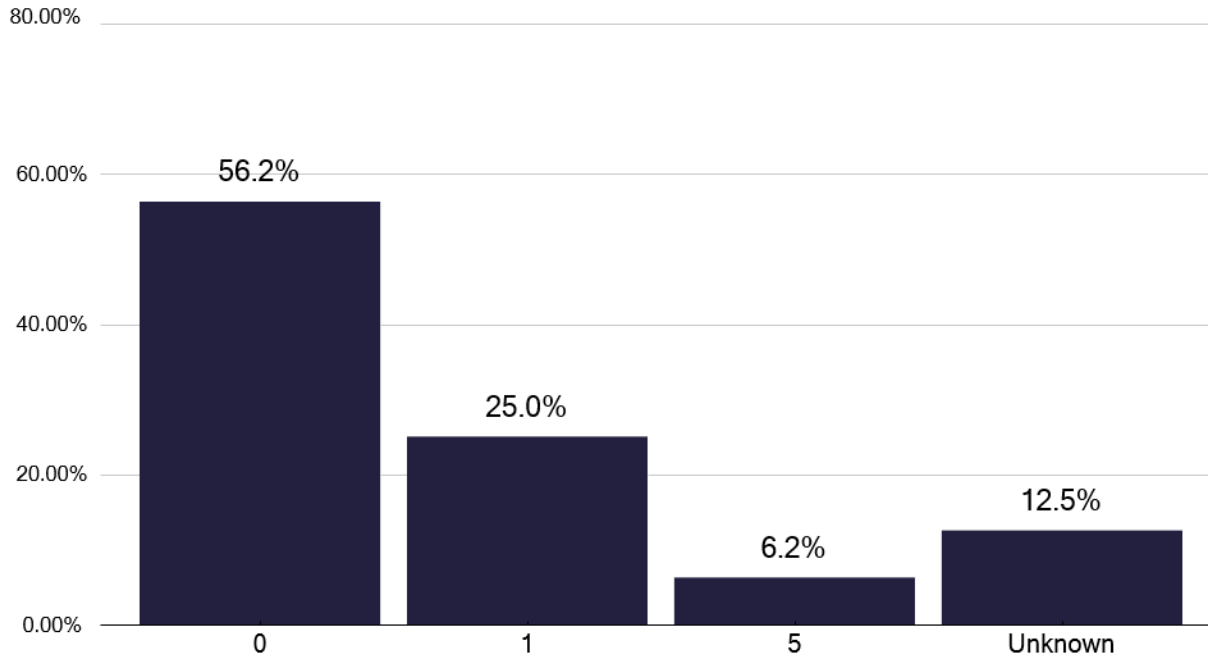
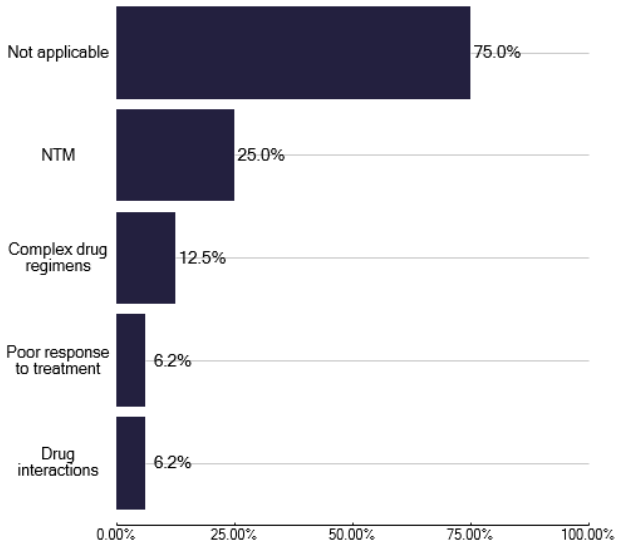
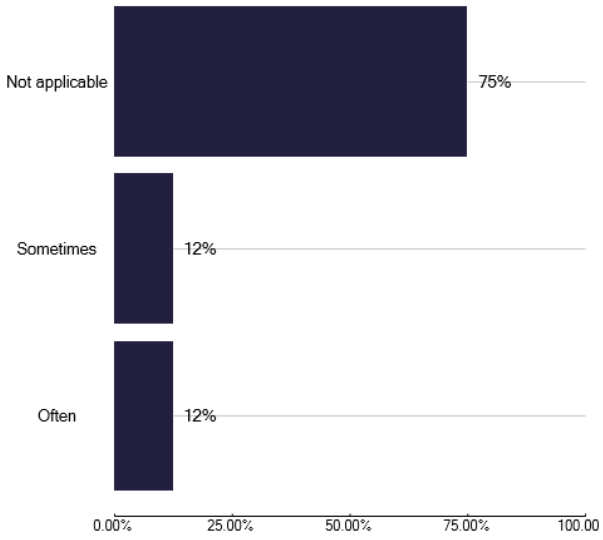


Figure 54: Reasons for using BTS clinical advice service

What did you discuss the non−MDR−TB/XDR−TB cases for? (Select all that apply)



How often was there a change of treatment as a result of the discussion?



Recommendations: Treatment

42.	All services should strive to achieve 12-month treatment outcomes of 'Treatment Success' for over 85% of culture-confirmed pulmonary tuberculosis cases and where they fail to do so, a root cause analysis as part of a cohort review, should take place.	P, HB
43.	Patients on treatment for TB (and those receiving preventative therapy) require ongoing support that is tailored to them. This should include information in different formats (written, spoken) and different languages.	P, HB

10.8 Medicines Management

We note the wide geographical area covered by some TB services and Health Boards and this poses a potential risk for prescribing errors, especially in light of the drug shortages which exist, with the need for drug regimen modification and the infrequent need for primary care to prescribe.

From the deep dives we noted excellent practice by several services to reduce this risk, where the TB clinicians, nurses or pharmacists, would write the prescription for the appropriate therapy and this would be dispensed by the pharmacy in the acute provider. Subsequent prescriptions would follow the above process. For some services with wide geographical issues, the treatment from the hospital dispensary

would be transported to the patient's general practise surgery for collection, minimising the patient's need to travel.

Additionally, we found an individual in the dispensary, overseen by a pharmacist, who maintained a spreadsheet of patients on different regimens and would notify if drugs were running out. Likewise, adherence support, such as blister packs, could be produced, but this was a little more variable in some hospital pharmacies and we noted the key role that pharmacists/dispensary played in providing patient education.

The relationship between primary care, pharmacy, and TB nursing meant if patients fail to collect their treatment, the TB service was usually notified. The above practice is especially applicable to those services where there is a wide geographical footprint.

We also noted excellent practice in two services where the clinical lead in one service, and a senior pharmacist in another, went on to the electronic patient record (EPR) for that patient and updated any changes in therapy, so all parties involved in the patient's care could see what treatment the patient was taking. This minimises the risk of treatment being inadvertently stopped or potential drug interactions.

10.9 Pharmacist workforce

Pharmacist time is essential in supporting TB services for standard TB therapy, preventative therapies and especially the complex interactions in those receiving treatment for non-tuberculous mycobacteria. Unfortunately, only 20% of services had any dedicated pharmacist time for the TB service and, as shown in **Figure 55,** the number of hours was very limited. These internal meetings or MDTs were often not attended by pharmacists. Only two services had senior Band 8a input and they contributed to the good practice noted above and were not in high notification services.

Clearly, pharmacy input is essential to TB services and this needs to be at a sufficiently senior banding to contribute to the service i.e. a minimum of a Band 7 but ideally at a Band 8a. The time should be pro-rata to the workload based on notifications, preventative therapies issues and supporting NTM (Non-tuberculous mycobacteria) care. This must also recognise the need to attend clinical MDTs, as well as the performance of other tasks such as prescribing, supporting education and having oversight of dispensary actions.

Furthermore, drug shortages have a significant impact on services, as shown in graph 258 in Annex E, with 60% of services being impacted in the last 12 months. This included the need to change regimens, prioritise patent care and issue shorter durations of treatment. With changing drug regimens for MDR and XDR, using treatment that clinicians may be less familiar with, as in **Figure 56,** pharmacist input is important to assess potential interactions. Clearly, pharmacists working within providers and across Scotland have a role in supporting these important issues. For low incidence services, this can be delivered by an antimicrobial or a ward based pharmacist with dedicated time, which was seen to be effective during the deep dive engagements.

We understand an excellent pharmacy service was previously provided from Glasgow to many TB services, but that individual has now retired. Consideration should be given for a 'Scottish pharmacy network' to allow pharmacists, prescribers and clinicians access to TB advice around potential interactions, and drug shortages, so the consequences can be mitigated as far as possible. This could be delivered by pharmacy input from the larger services.

Figure 55: Hours of pharmacist support for TB

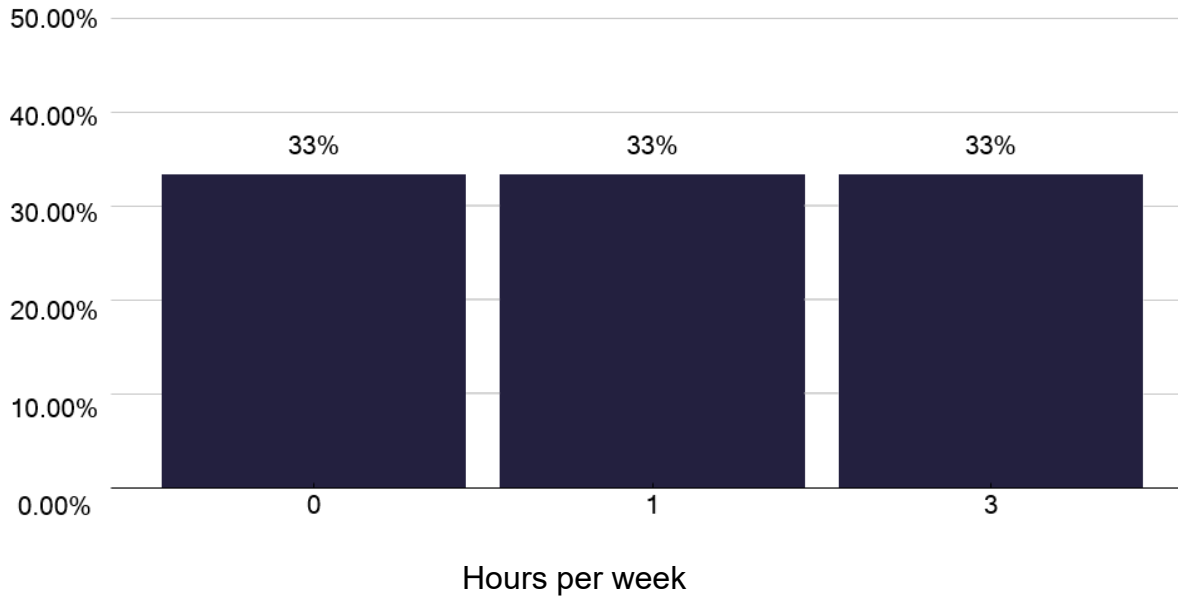
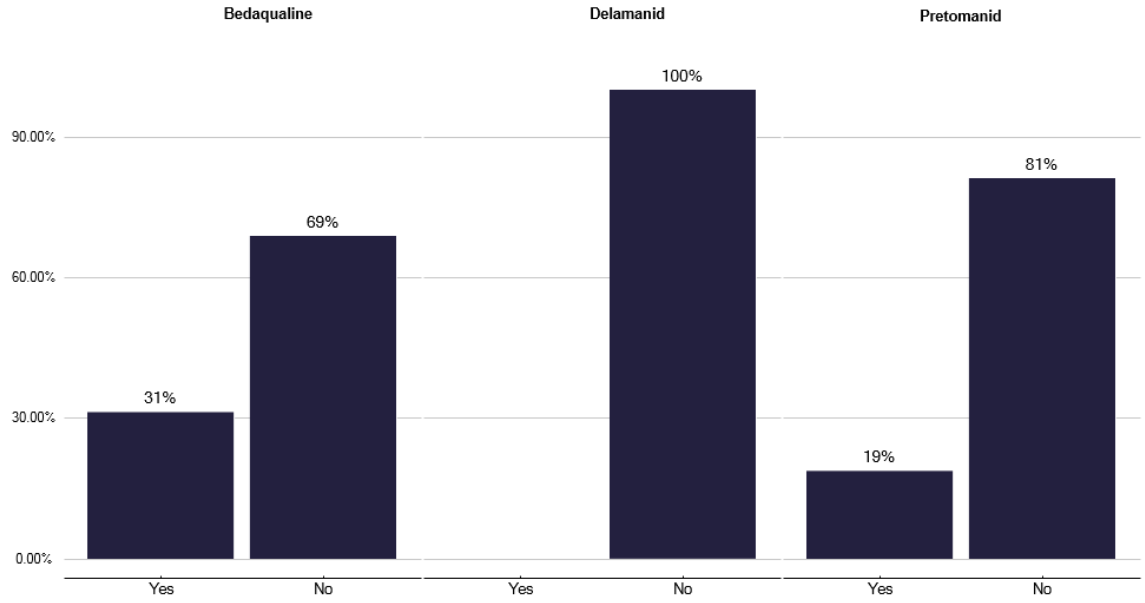


Figure 56: Prescription of drugs for management of MDR/XDR



Recommendations: Medicines Management

44.	All services should have a robust prescribing system to minimise drug errors, especially if prescribing is devolved to primary care.	P, HB
45.	Pharmacist and pharmacy technician time is essential in TB services, providing advice, support to clinicians and patients, tracking medication use and advising around drug shortages. Attendance at TB MDTs and cohort reviews should be part of their job plan. Staff of appropriate seniority and experience / knowledge should support the service on a pro rata basis, depending upon the size of the service. All services should review their pharmacy infrastructure and support as needed.	P, HB
46.	Consider the setting up of a 'Scottish pharmacy network' to support TB, including CYP, and NTM, providing advice and support for the use of less commonly prescribed drugs, potential interactions when patients are taking anti TB drugs for long periods and to help manage TB drug shortages.	P, HB, N

10.10 Non-tuberculous mycobacteria (NTM)

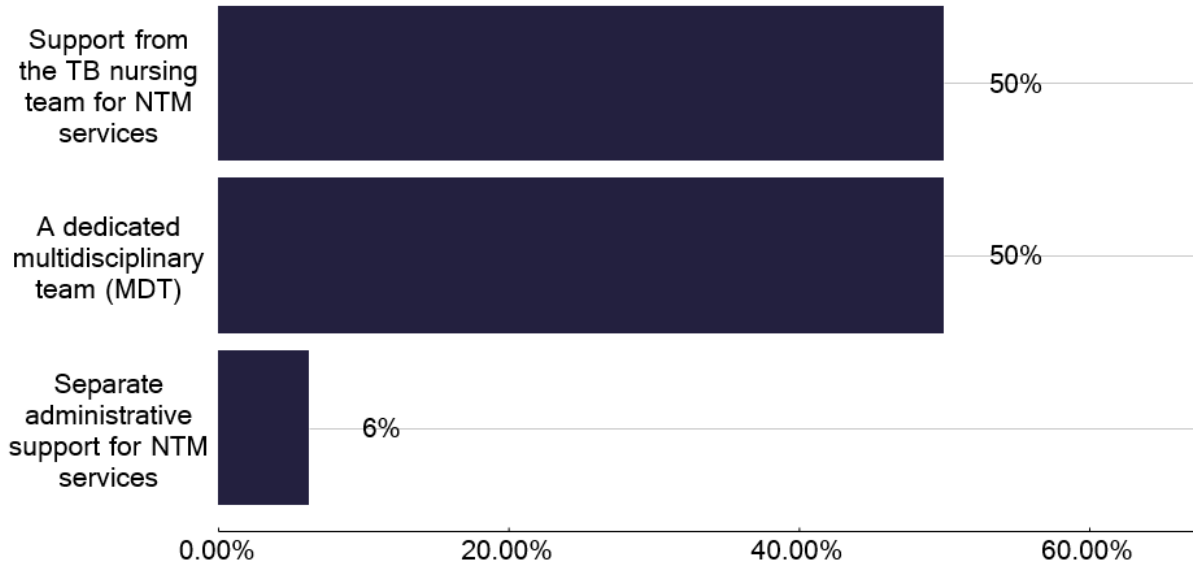
Non-tuberculous mycobacteria, previously considered as 'atypical mycobacteria' are forming an increasing volume of work due to an apparent increase in the number of patients, the availability of new and different treatment regimens and the duration of such treatment. This increasing pressure has led to the development of guidelines which can be accessed here 'management of NTM'.

Whilst NTM can occur in a variety of tissues, including the skin, it is pulmonary disease where the management is often more problematic. This relates usually to an elderly population with multiple comorbidities, including underlying respiratory disease who are already taking polypharmacy for other illnesses and are then invited to take toxic anti-tuberculosis drugs with all their potential drug interactions for a protracted period.

Issues with NTM were apparent during the review with some 38% of TB services, setting up NTM services within the actual TB clinic, to cohort the patients into one service, as shown in graph 264 in the data pack in Annex E. While beneficial, this may have an impact on the capacity to deliver standard TB care, as in half of the NTM services it is the TB nurses who are involved, as shown in **Figure 57.** This is necessary to support patients, but NTM represents a significant volume of work for some services, as shown in **Figure 58**, where two services have seen over 50 NTM patients in the last year, and one third of services are unsure of the number of cases seen.

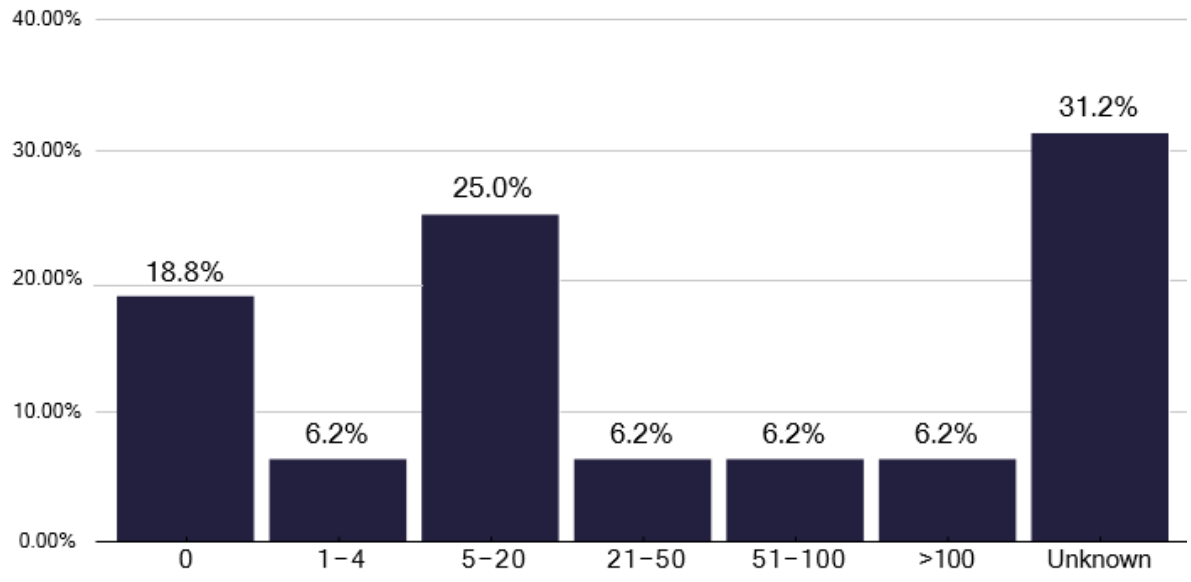
Figure 57: Infrastructure for NTM services

For all NTM services, which of the followng do you have in place? (Select all that apply)



Note: total percentage of responses can be over 100% as multiple options can be selected for this question

Figure 58: Number of NTM cases seen in the preceding 12 months



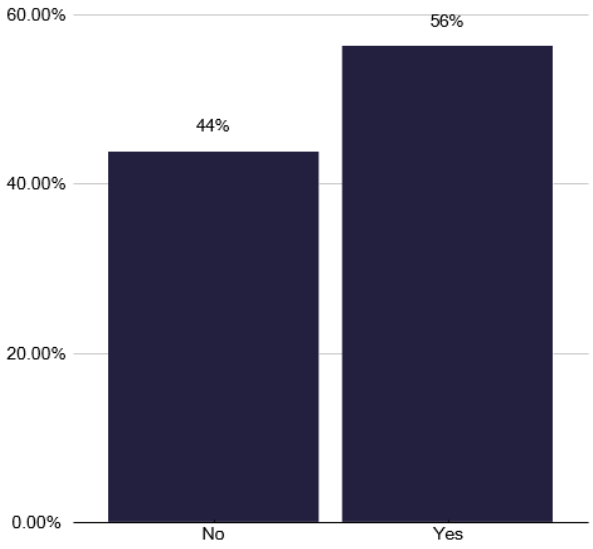
Only one service has funding for medical staff and only a quarter of TB services are looking to develop a business case for additional funding, however, from the deep

dives none seem to have progressed this to approval so far. We made strong recommendation that services should be developing a business case for additional resources that should include medical, nursing, pharmacist time, on a pro-rota basis, together with appropriate administration to support data capture. Depending upon the service, physiotherapy support should be available for high sputum producers and access to dietetic advice for those who are underweight or malnourished.

Management of these patients is difficult and there is often need for external advice. There is no UK NTM service, so some colleagues are using the British Thoracic Society BTS MDR service (as aforementioned) to discuss patients' care. There were comments from the survey that a Board or national NTM advice service existed, but this did not seem to be funded and was purely based upon colleague interest and enthusiasm, as seen in **Figure 59** and **Figure 60.**

Figure 59: NTM board advice

Do you have access to board advice for managing NTM?



If 'yes' how many cases per annum?

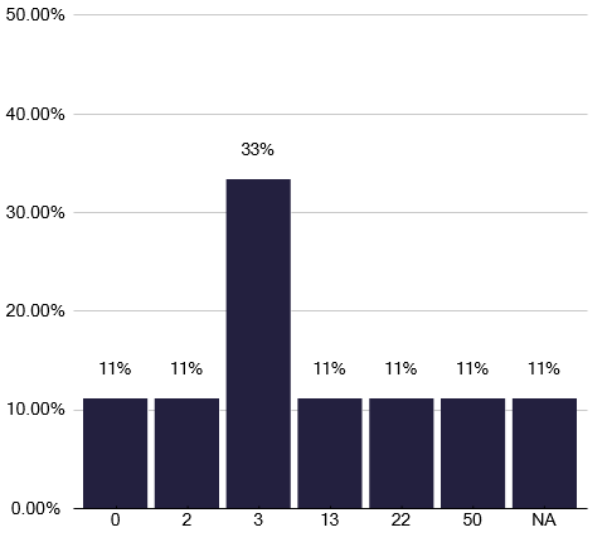
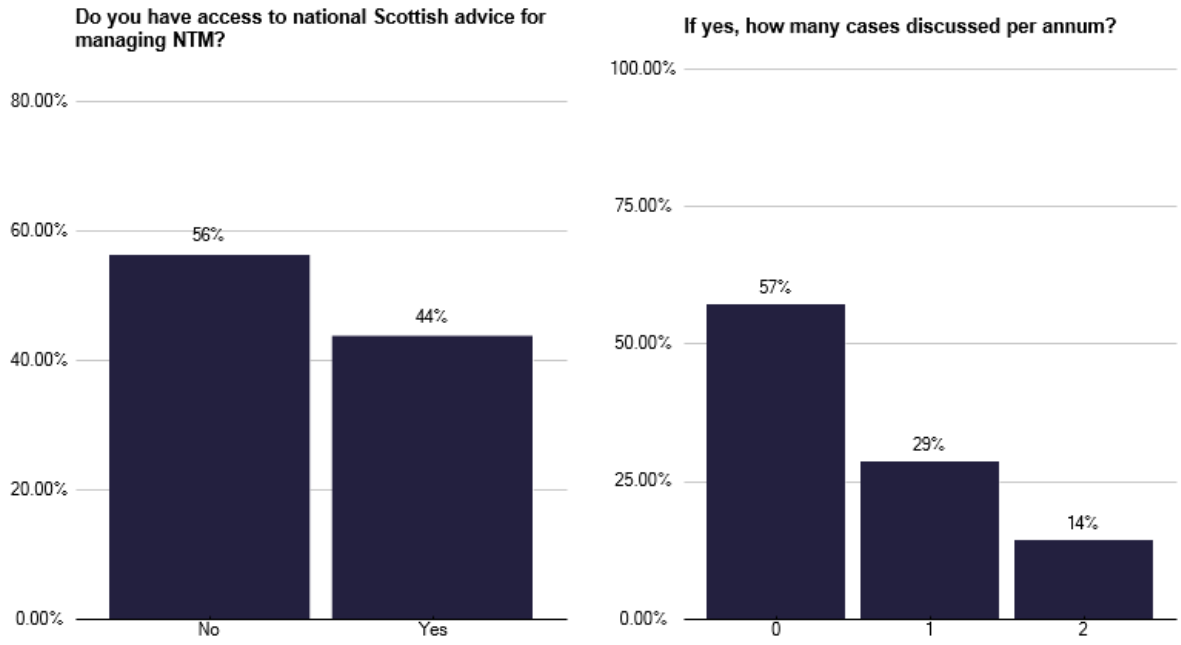


Figure 60: NTM advice service



Recommendations: NTM

47.	Infrastructure should be developed to comply with the national NTM guidelines.	P, HB
48.	Services should be developing a business case, as noted above, to support these patients.	P, HB
49.	A funded national NTM advice service which is multi-professional and includes pharmacist and administration time should be developed with a fortnightly MDT that individuals can refer into along the lines of the BTS MDR service.	N

10.11 Inclusion Health

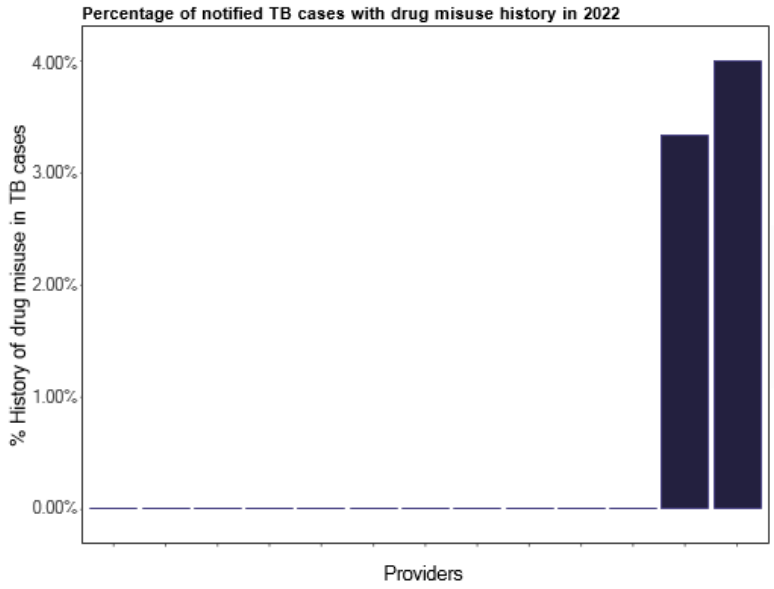
Inclusion health is an important consideration that covers a range of aspects that can impact on clinical care. Surprisingly, given the issues of drug misuse in areas of Scotland, only two services in ESMI data recorded such issues, as in **Figure 61,** and neither of these were in low notification services. However, we did hear during our deep dives that this is a changing scenario. The number of individuals where alcohol misuse featured was greater and seems to be distributed across all the notifications as shown in **Figure 62**.

We asked specifically about outreach services which were available to support patients with inclusion health issues, as shown in **Figure 63,** and a quarter of services said they did not have access to holistic care. During the deep dives it was apparent that access for patients for all aspects of inclusion health, as listed, were

available. Unfortunately, there was not often a named individual for contact when needed, leading to the TB nursing staff spending considerable time identifying the correct person to provide help and support for that patient. For some of the services, we noted an excellent infrastructure with a 'safety net' to catch these vulnerable groups.

Although there is no information in ESMI data on prisons, we had only one comment during our deep dives, of a prison within the Health Board catchment, and that access was not an issue as the TB service worked in conjunction with Health Protection nursing staff who had access into the prison environment. Issues of screening for patients with potential TB within this population were not a feature of the review.

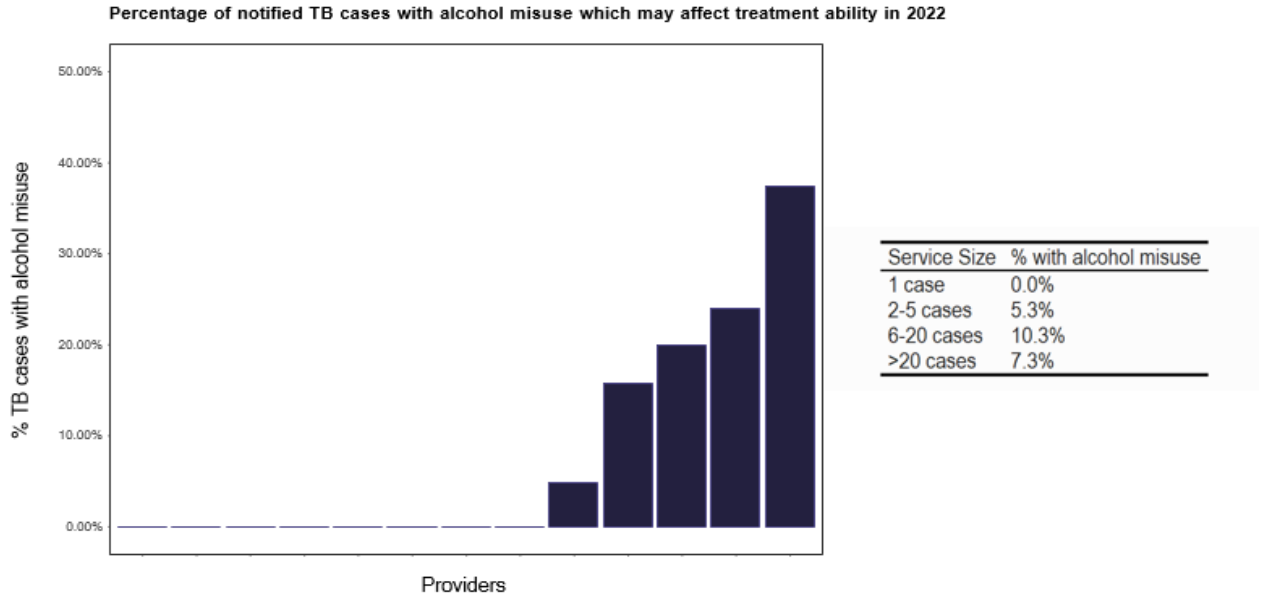
Figure 61: TB services and social risk factors: drug misuse



Service Size	% with drug misuse history
1 case	0.0%
2-5 cases	0.0%
6-20 cases	0.0%
>20 cases	2.4%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) dataset.

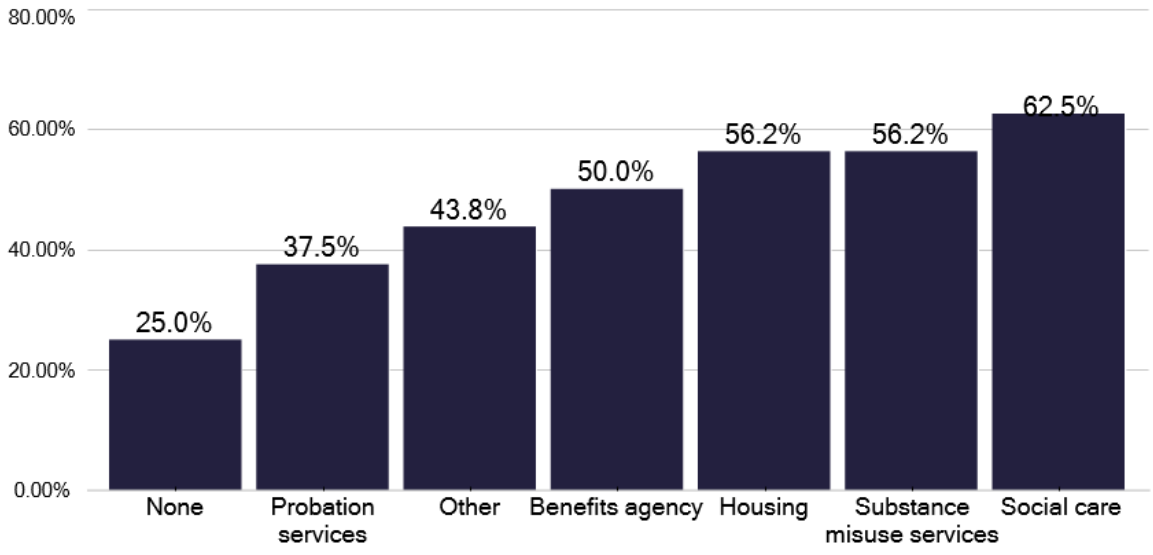
Figure 62: TB services and social risk factors: alcohol use



Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) dataset.

Figure 63: Outreach support services

What mechanisms (if any) does the service have for linking socially complex cases to other servces to help to address needs such as housing, drug use or access to benefits? (Select all that apply)



Note: Total percentage of responses can be over 100% as multiple options can be selected for this question

Recommendation: Inclusion health

50.	It is important to acknowledge the changing epidemiology and patient groups who will have issues of inclusion health, especially around substance misuse and homelessness. Services need to be in place to address these social risk factors.	P, HB

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10.12 Children and young person's (CYP) TB services

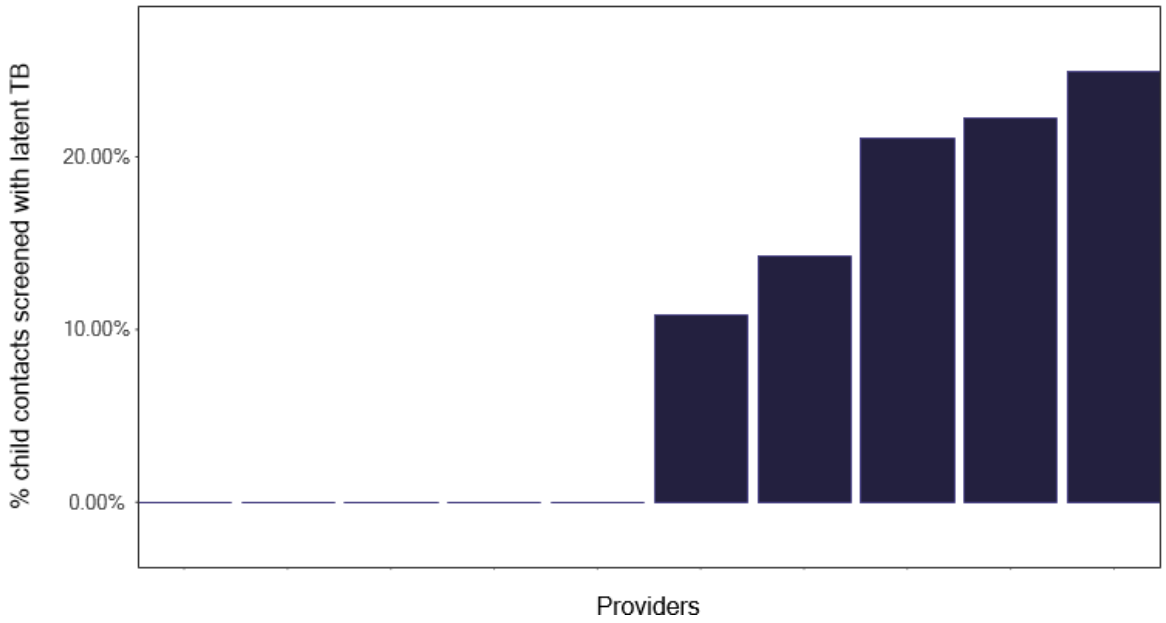
While children and young people contribute a relatively small number of notifications, the contacts generated from adult notifications, together with any preventative work, constitute a variable but significant workload. To highlight CYP, we specifically pulled all such information into graphs 337- 349 in the data pack in Annex E, as a dedicated CYP section of the data pack.

While there is a relatively low volume of TB inpatient work, there is a considerable amount of work from contact tracing, with **Figure 64** highlighting the number of contacts with latent TB and **Figures 65** and **66** showing the procedures followed for contacts who fail to attend or decline treatment.

We noted that there were few sessions for both SPA and DCC time in CYP and the recommendations we made in the medical section for appropriate time are also true for CYP medical staff. Over half of CYP TB services do not have specific paediatrician input, as show in **Figure 67**, which is inadequate for the delivery of effective CYP. Depending on the activity, nursing time to support CYP care is important. This may be dedicated CYP clinic staff, dedicated CYP TB nursing, community health protection nurses, or form part of the TB nurse duties. Ideally the TB nurses should be trained in child health care.

In smaller volume services where experience may be limited, support for both nurses and medical staff is needed, a fact we heard repeatedly during the deep dives. We noted the informal network that the Glasgow paediatricians have established, with a monthly MDT to discuss cases, including management of latent TB. This should be formally established as a Scotland service, with funding, and include colleagues with expertise from other Health Boards e.g. Lothian. It should include dedicated nursing and pharmacist input and be supported by administration to ensure that robust communication of discussed outcomes are shared with referring teams. The frequency of these meetings should be every 2 weeks and be open to all clinicians.

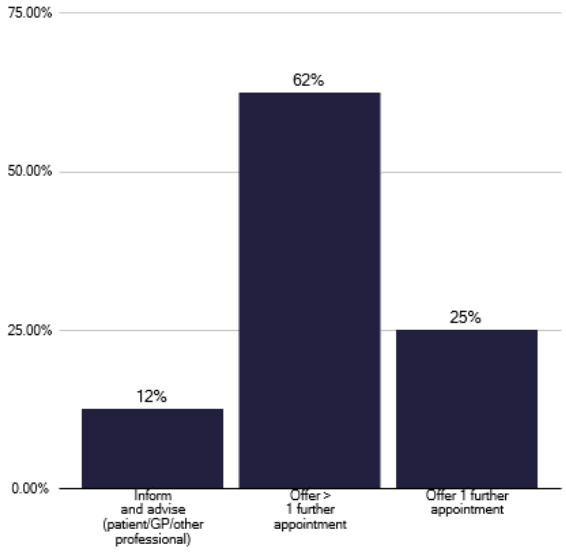
Figure 64: CYP screened with latent TB



Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) dataset.

Figure 65: Screening and treating contacts – Did not attend processess

What processes do you routinely follow to manage contacts that do not attend for screening − adults



What processes do you routinely follow to manage contacts that do not attend for screening − CYP

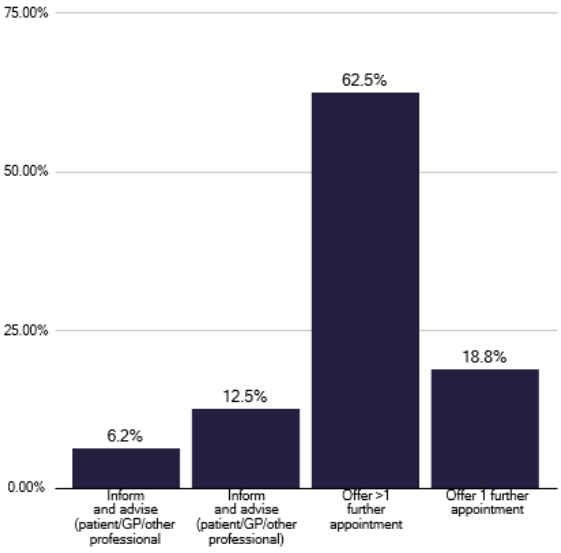
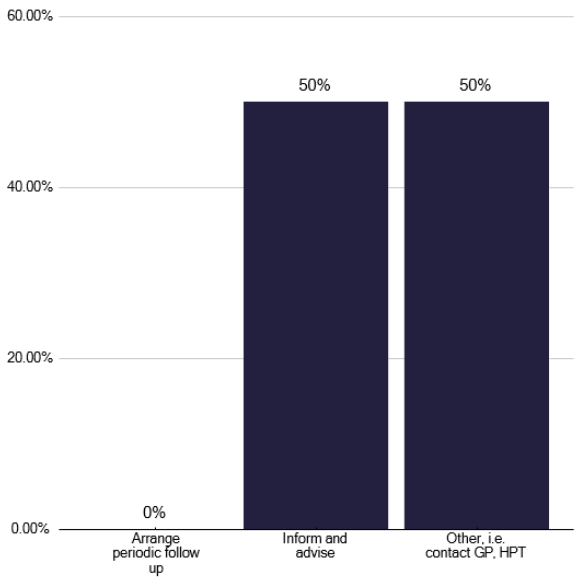


Figure 66: Screening and treating contacts – Declined intervention processes

What processes do you follow to manage contacts that decline treatment − adults?



What processes do you follow to manage contacts that decline treatment − CYP?

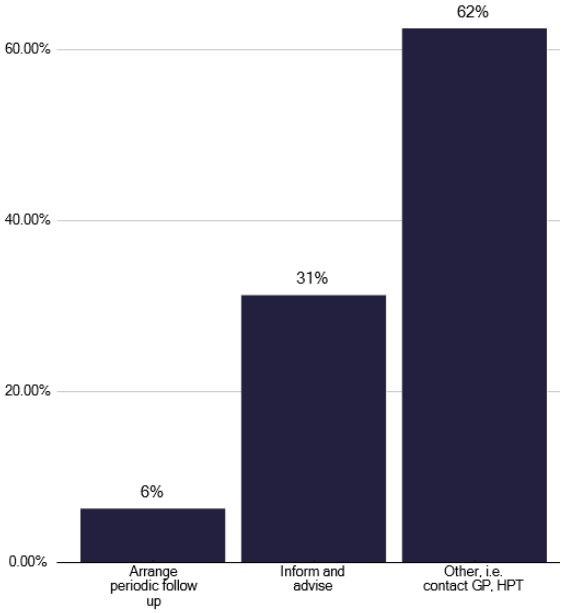
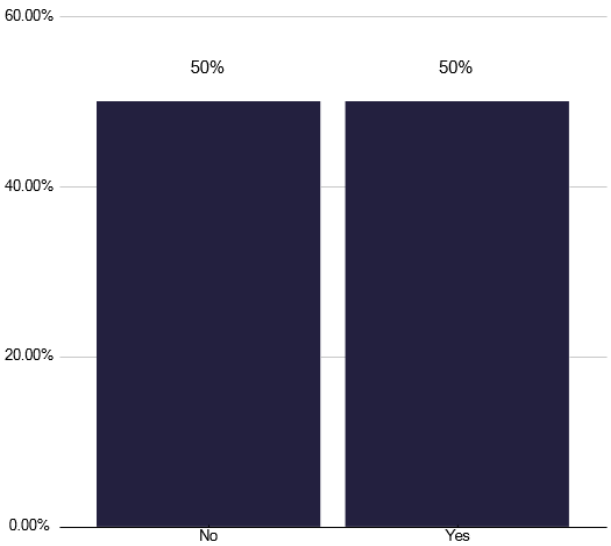
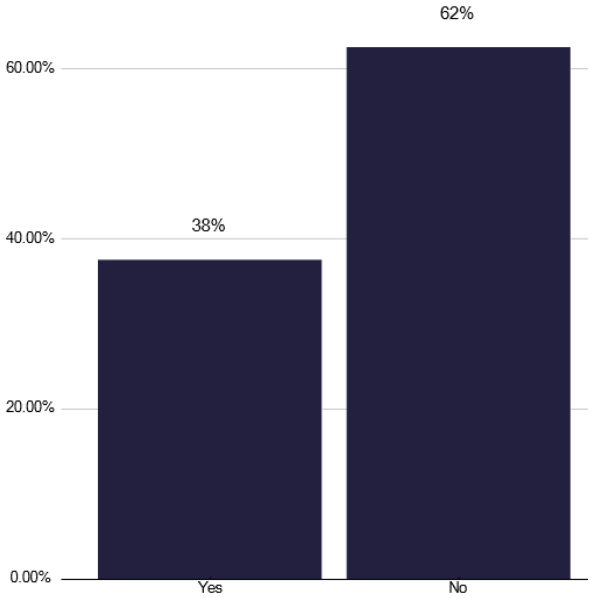


Figure 67: Paediatric nursing for TB

Do you have an embedded paediatrician or paediatric trained nurse within the service?



Is CYP TB managed by general paediatricians?



Recommendations: CYP

51.	Health Boards should recognise the need for appropriate staff numbers, with time in their job plans, and access to training for managing CYP TB and any associated preventative treatments that occur after contact tracing.	P, HB
52.	A multi-professional Scotland CYP TB network needs to be established and funded.	P, HB, N
53.	If Scotland Government decides to develop a preventive strategy for latent TB, a specific infrastructure needs to be in place for CYP and unaccompanied adults.	N

11 Preventative Strategies

Preventative strategies for managing tuberculosis cover a range of different populations, and interventions are based on the knowledge that individuals exposed to tuberculosis can develop active disease later. This principle of identifying individuals who have been exposed to TB and have 'dormant' or 'latent' disease, with the potential risk of developing the disease, is especially relevant to different populations.

The population at risk, beyond those found during contact tracing, may be migrant workers, asylum seekers, those identified through occupational health screening and individuals whose immunity is potentially going to be reduced by using disease-modifying agents. Additionally, identification of individuals through exploring the contacts of a patients with active notified disease, contact tracing, is an important aspect of preventing the spread of active disease.

The preventative strategies employed may be a 'wait and see' administration of BCG or a short course of anti-tuberculosis drugs.

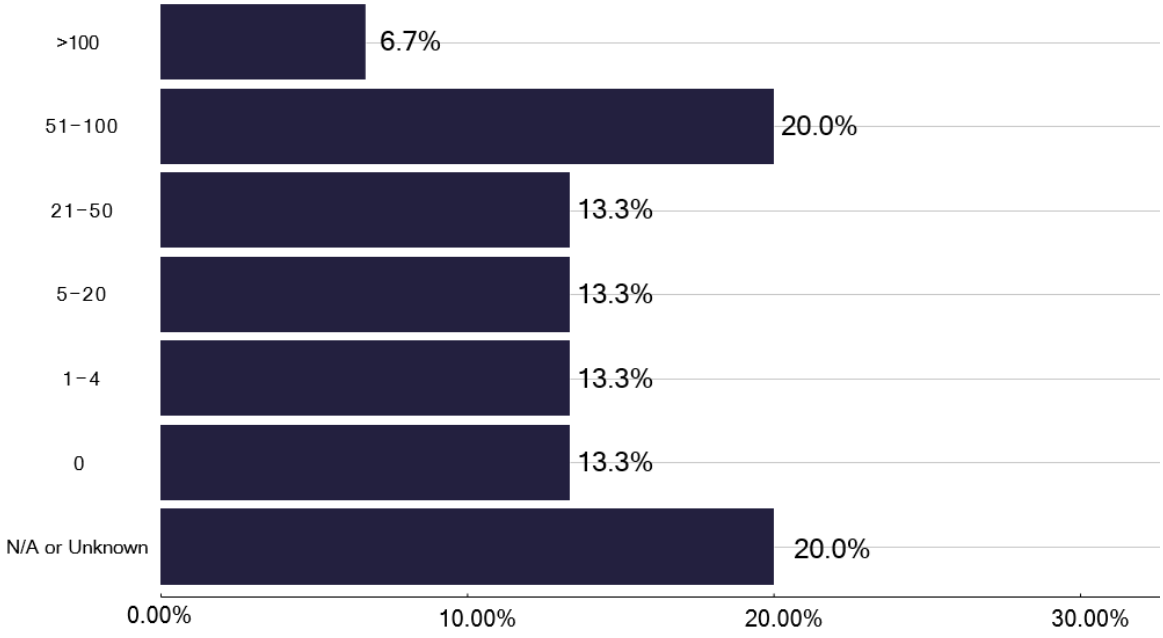
These areas will be considered as: BCG; contact tracing, occupational health screening, disease modifying agents (biological therapies) and migrant/asylum seeker/refugee populations, with recommendations made for each.

An analysis of these different preventative management plans, recognising that they may vary in different populations, shows a significant variation in the number of patients receiving treatment for latent TB, as shown in **Figure 68**. However, this is self-reported, so we are unsure of the populations included. The process of care for these Individuals on commencing treatment varied, see **Figure 69a & 69b**, with some being reviewed within 2-4 weeks of initiating treatment, some after 1 month, and 46% of services gave all the treatment at initial attendance and reviewed at the end of treatment. However, one third of services did not review after the end of treatment, suggesting there is no standard process that is followed. The checking liver function tests (LFTs) was also variable, with 53% checking after 2 weeks, but 20 % stated they never checked LFTs, some reviewing based on age criteria.

The support of these individuals on treatment also varies. **Figure 70** suggests most patients were followed up by a phone call, though this was unknown in one third of responses. For a home visit, a large number were unknown, with four services bringing a variable percentage back to clinic. A similar figure for a face-to-face appointments was noted, as in **Figure 71,** and a significant number did not know about the use of virtual appointments.

While recognising there is some overlap in these questions, and variation in the population needing these interventions, there is considerable inconsistency. This may be of more importance when we consider **Figure 72,** which asks about the number of these LTBI individuals who need enhanced case management (ECM), as over 60% were unknown.

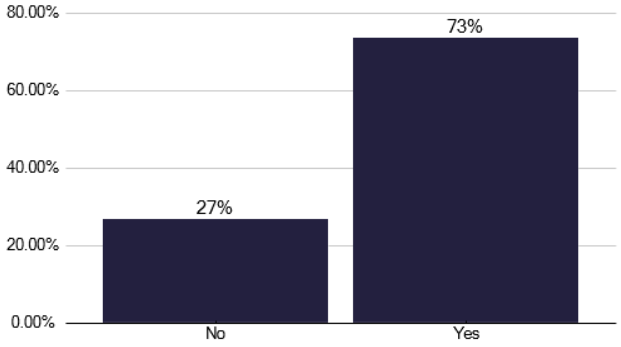
Figure 68: Number of individuals who received LTBI treatment



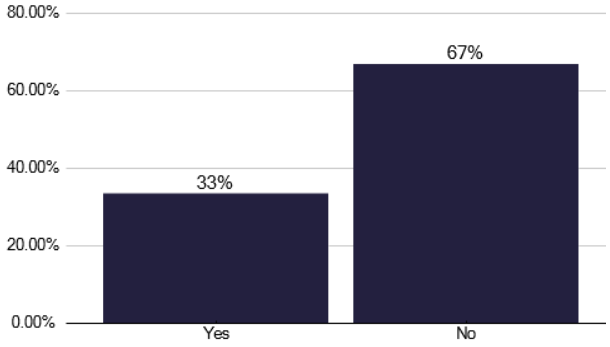
Note: This includes those from national and/or local LTBI testing and treatment programmes and/or contact tracing

Figure 69a & 69b: LTBI treatment review processes

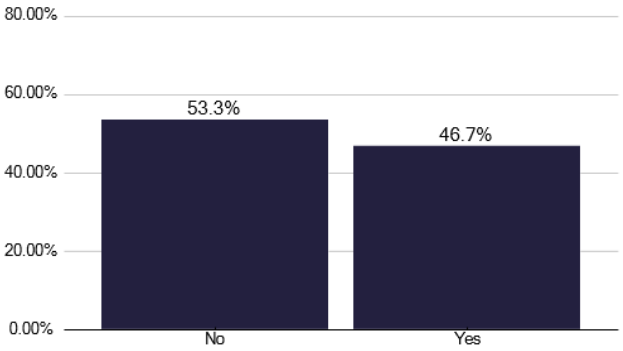
Do you review at the start of LTBI Rx treatment and then assess progress after 2−4 weeks?



Do you give LBTI Rx treatment for 1 month and clinically review?



Do you give LBTI Rx treatment for the whole period then review at the end of Rx?



Do you formally review at end of treatment?

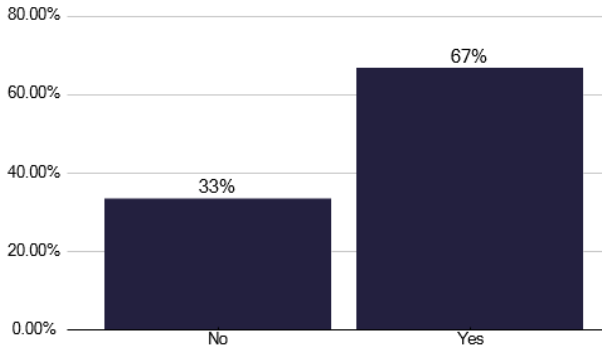
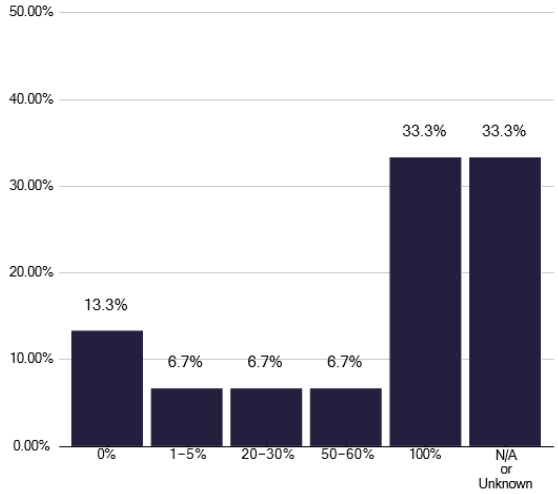


Figure 70: LTBI treatment review processes

Once on treatment, what proportion of patients on LTBI treatment are overseen/reviewed by a phone call?



Once on treatment, what proportion of patients on LTBI treatment are overseen/reviewed by a home visit?

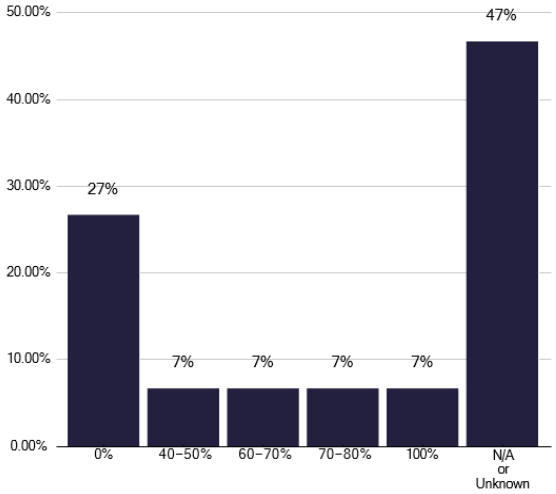
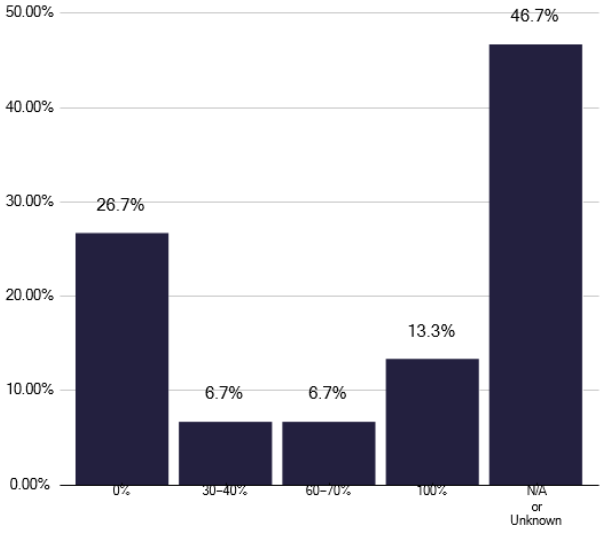


Figure 71: LTBI treatment review process

Once on treatment, what proportion of patients on LTBI treatment are overseen/reviewed by a face to face visit?



Once on treatment, what proportion of patients on LTBI treatment are overseen/reviewed by a virtual clinic visit?

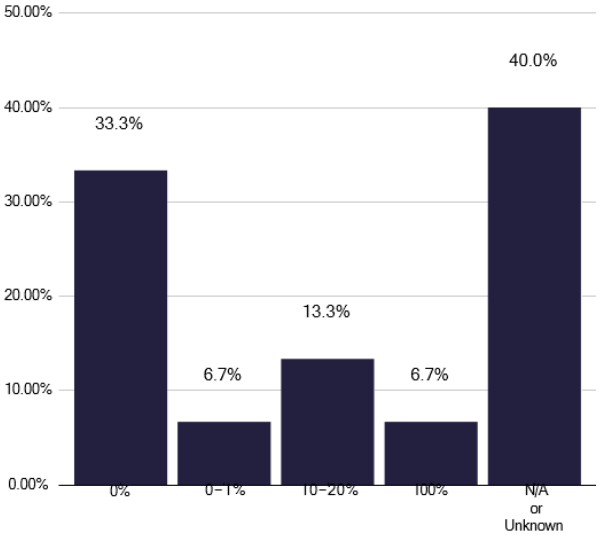
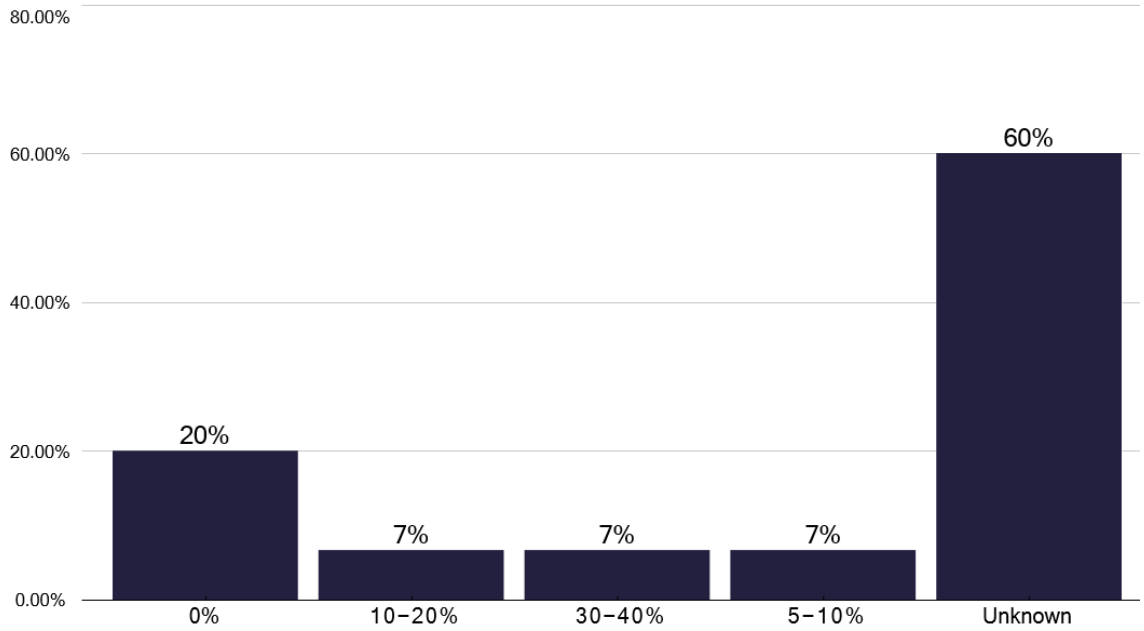


Figure 72: LTBI Patients requiring ECM



Recommendations: Preventative strategies

54.	A formal preventative strategy needs to be developed for Scotland, encompassing all groups who may be eligible, but also recognising that some populations may have more numbers identified from a screening exercise and some may have a greater benefit from preventative therapy.	N
55.	There is wide variation in the practice of initiating and reviewing treatment for latent TB, including checking liver function and the nature of any follow up. TB services should develop a more uniform practice based on best evidence.	N

11.1 Contact Tracing

Contact tracing describes the process of identifying individuals who have been in contact with an individual who has notified tuberculosis. Usually, a nurse from the TB team or, more commonly in Scotland, as seen in **Figure 73,** the Health Protection team, will meet the patient (called the “index case”), and find out who their contacts are, recognising the longer an individual is exposed to the index case, if infectious, the greater the risk of contracting tuberculosis.

We noted variation in several aspects of contact tracing. In **Figure 74,** we see the practice of who is screened if the index case has pulmonary or non-pulmonary, and in **Figures 75** and **76,** the number of contacts identified depending upon the disease site. The practice of follow up arrangements if the contact (adult, child or young person) does not attend, are shown in graphs 306 and 307 in the data pack in Annex E.

Figure 73: Which individuals routinely undertake contact tracing

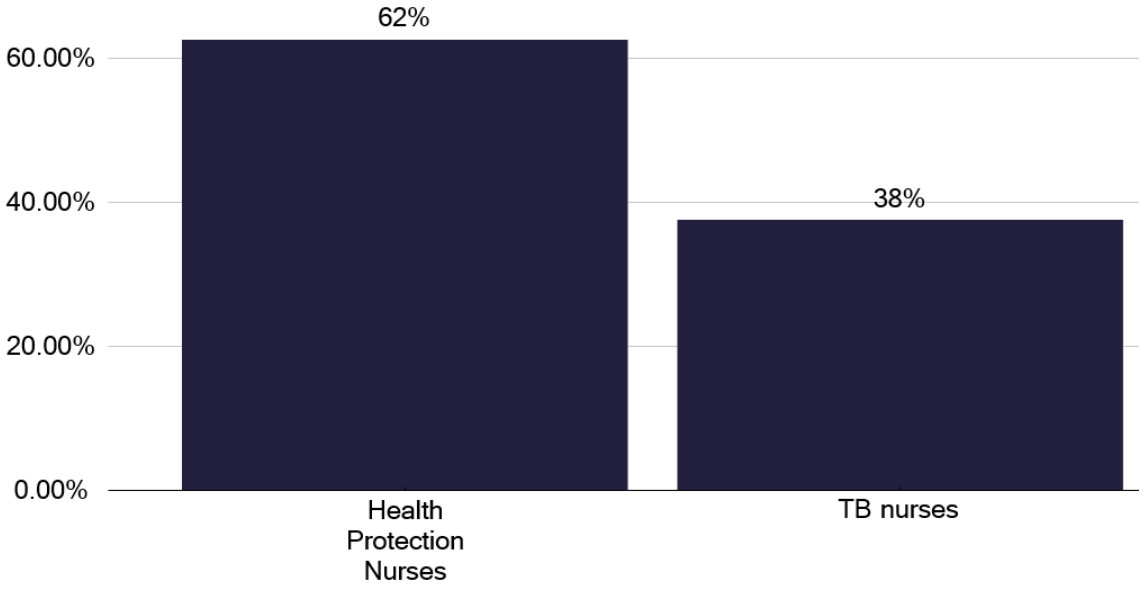
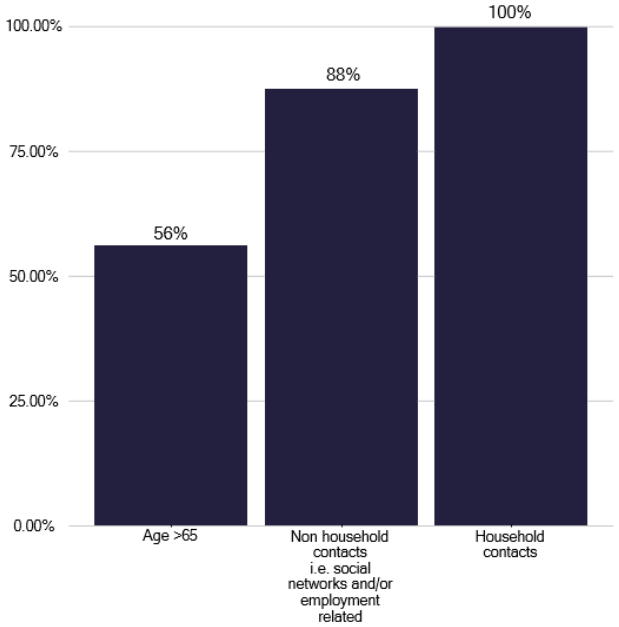


Figure 74: Screening and treating

Which of the following groups are routinely included for contact screening and treatment in pulmonary/laryngeal cases? (Select all that apply)



Which of the following groups are routinely included for contact screening and treatment in extra pulmonary cases? (Select all that apply)

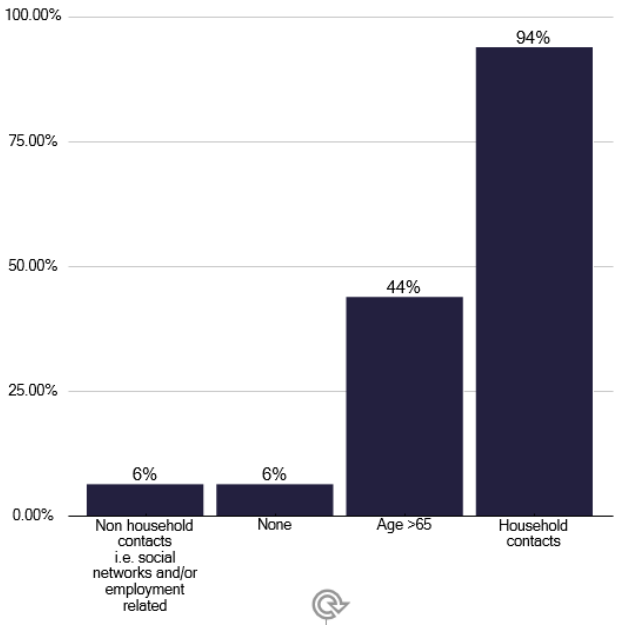
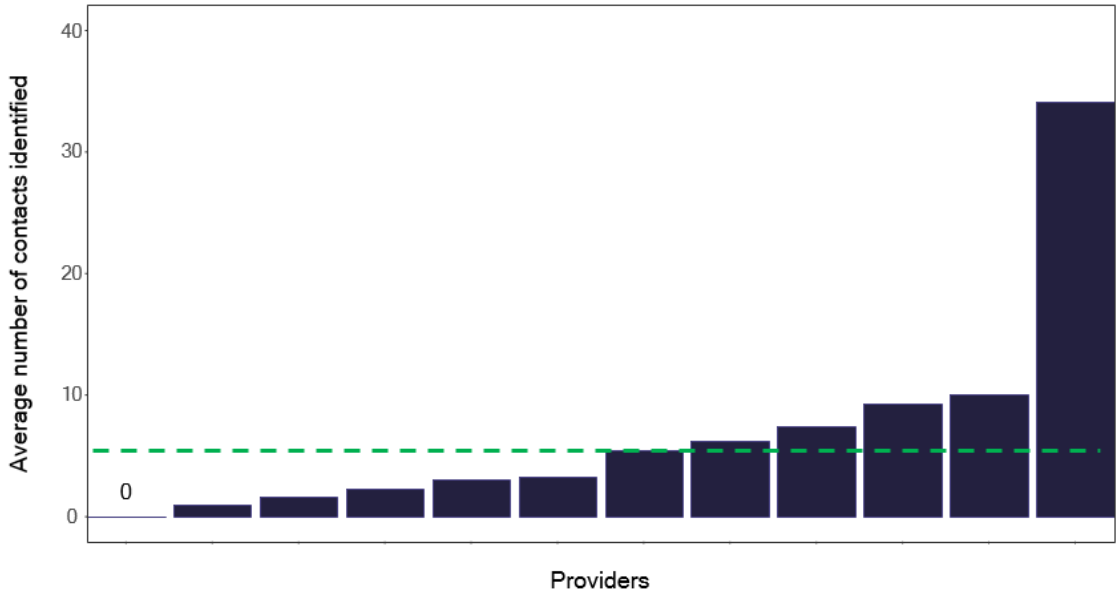


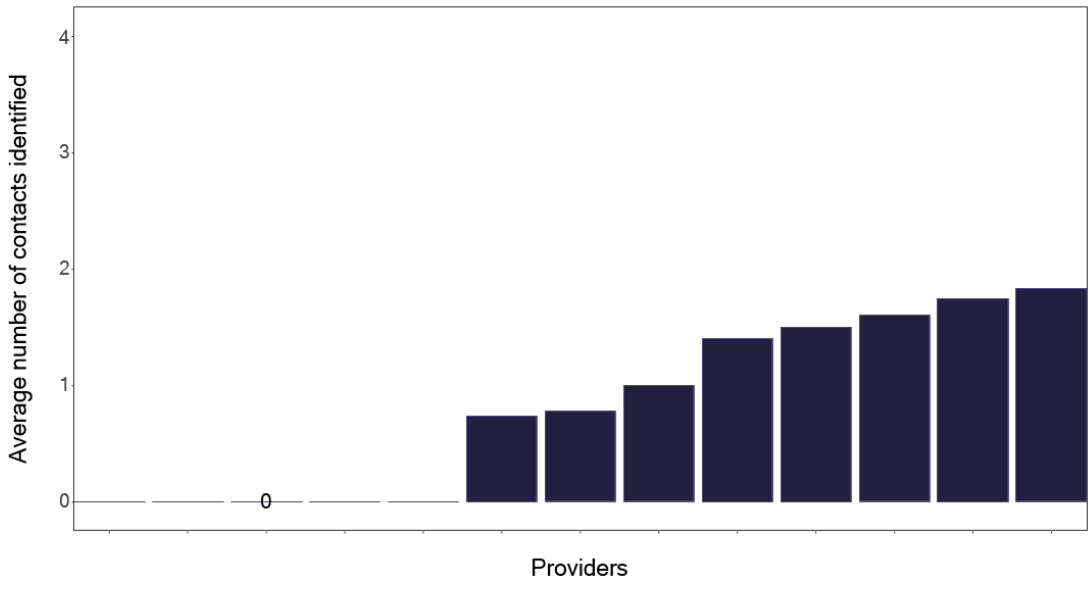
Figure 75: Average number of contacts per notified pulmonary case



Note: total percentage of responses can be over 100% as multiple options can be selected for both questions

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

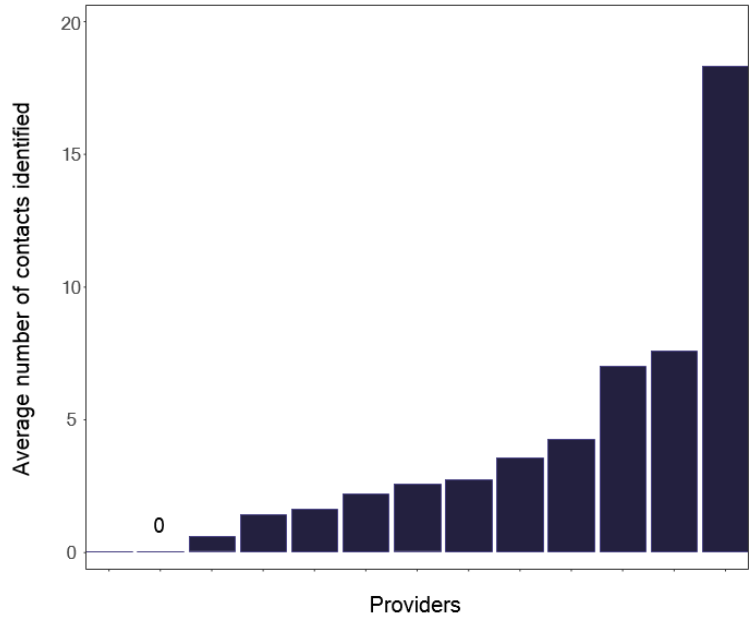
Figure 76: Average number of contacts per notified non-pulmonary cases



Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

The average number of contacts per notification is shown in **Figure 77,** which shows that those services with more than 20 notifications have fewer contacts. The reasons for this are unclear, as the case-mix appears similar to those services with fewer notifications. The practice of the larger services, perhaps merits a review to investigate why there is a lower number of contacts. Of course, the services with 6-20 notifications may be undertaking too many contacts, as detailed below.

Figure 77: Ave number of contacts per notified TB case



Service Size	Average number of contacts
1 case	0.0
2-5 cases	2.7
6-20 cases	8.8
>20 cases	2.9

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Five or more contacts per notification.

A key recommendation is that more than 5 contacts should be identified for each 'infective' index case. The self-reported activity for this, shown in **Figure 78,** and the ESMI data displayed as a proportion, in **Figure 79,** shows considerable variation based on the number of notifications. Similar data is displayed for more than 10 contacts per case, as in **Figures 80** and **81,** and shows smaller numbers, as expected. We explored this data further by looking at greater than 5 contacts per index case for overall notifications, pulmonary notifications and for those with identified smear positive disease (44 out of 201 notifications, 22%). These numbers and the ratios i.e. contacts per case for different services, are shown in **Table 3**. There is marked variation between services in their contacts for different index cases, but the findings appeared consistent in that those who had high screening ratios for smear positive disease had high screening ratios for 'all' notifications. This variation relates to the service, as it is

unlikely to be explained by any outbreaks in different settings, as shown in **Figures 82** and **83,** and therefore merits internal review.

Figure 78: >5 contacts identified

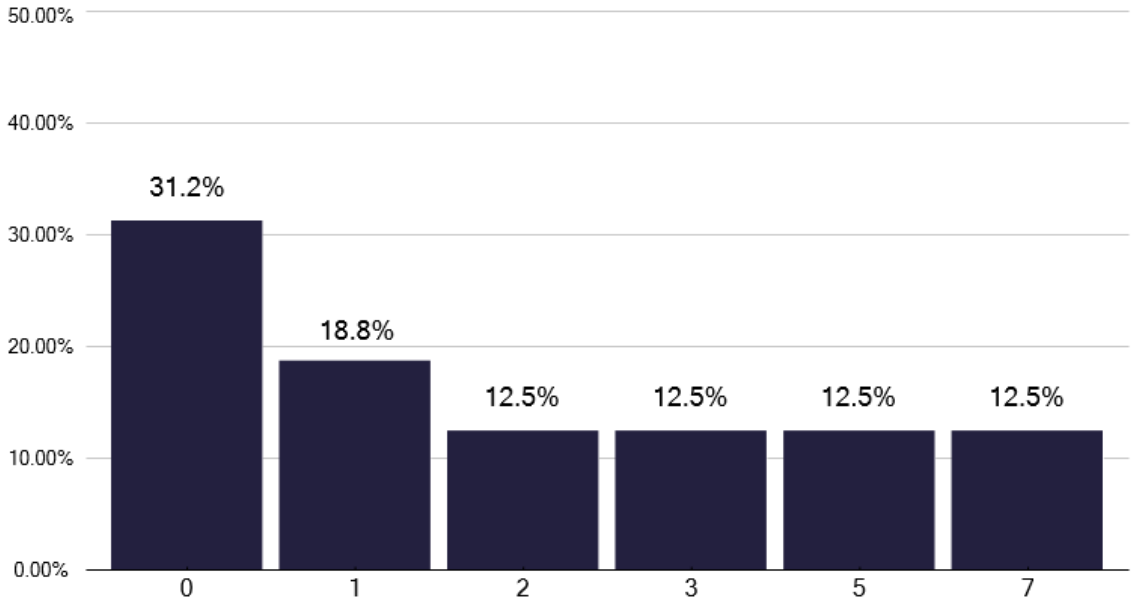
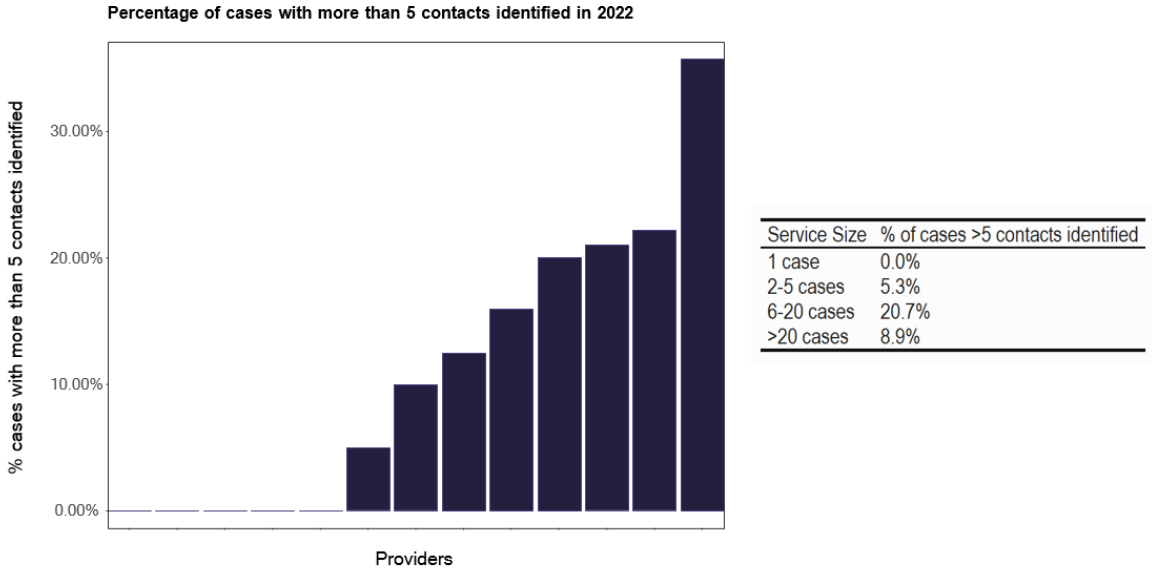


Figure 79: Percentage of cases with >5 contacts identified



Service Size	% of cases >5 contacts identified
1 case	0.0%
2-5 cases	5.3%
6-20 cases	20.7%
>20 cases	8.9%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

Figure 80: >10 contact identified

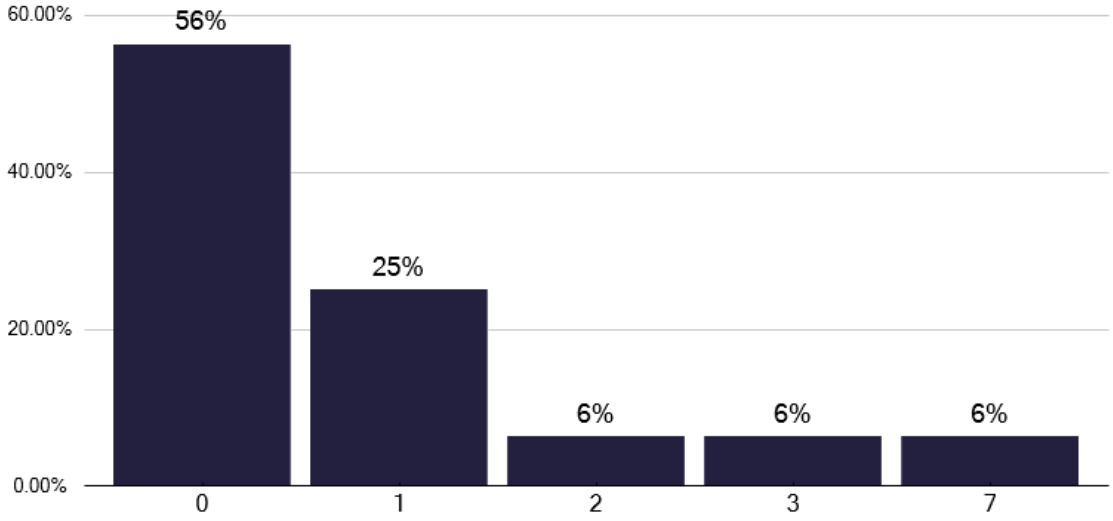
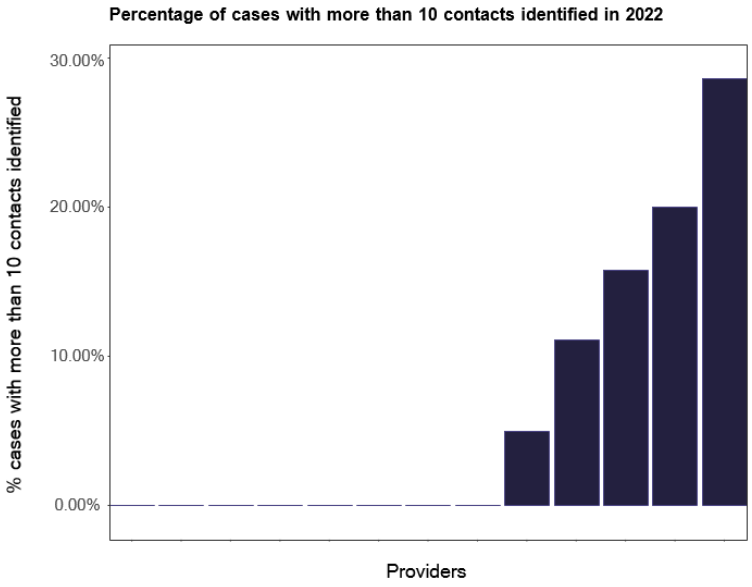


Figure 81: Percentage of cases with >10 contacts identified



Service Size	% of cases >10 contacts identified
1 case	0.0%
2-5 cases	5.3%
6-20 cases	13.8%
>20 cases	1.6%

Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system

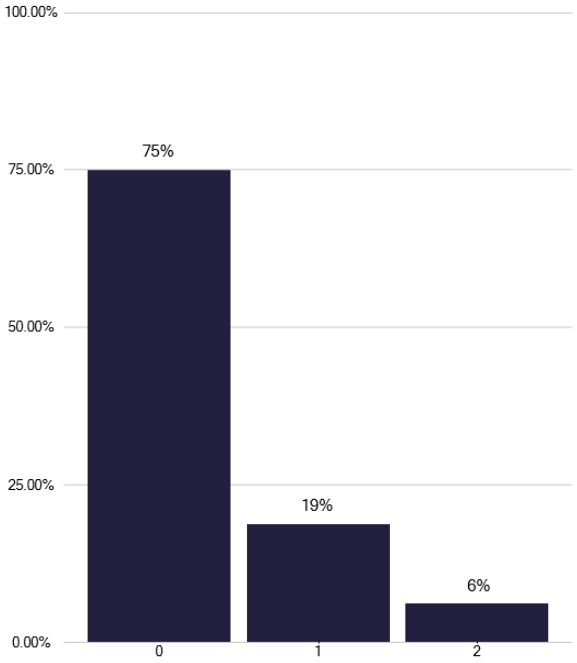
TABLE 4: Contact tracing activity for different types of notifications

TB services	Notifications (ESMI)	Total Contacts Identified	Total Contacts Screened	Average contacts per notification	Average number of contacts per case (self-reported from survey)	Number of pulmonary notifications (ESMI)	Average contacts per pulmonary notification	Total number of cases with sputum smear positive	Average contacts per smear positive notification	Total number of cases without a sputum test	Number of LTBI cases (self-reported from survey)	Total Number of LTBI Patients Screened (from Survey Submissions)
Grampian	19	348	251	18.3	13.0	10	34.8	7	49.7	9	169	2170
Ayrshire & Arran	5	7	6	1.4	1.8	3	2.3	3	2.3	2	2	98
Dumfries	2	0	0	0.0	4.0	2	0.0	1	0.0	0	4	503
Lothian	40	170	149	4.3	2.4	21	8.1	8	21.3	17	2	5596
Forth Valley	8	22	11	2.8	2.0	4	5.5	2	11.0	5	2	193
GGC North	25	64	61	2.6	2.0	13	4.9	5	12.8	13	2	48
GGC Clyde	8	13	13	1.6	1.9	6	2.2	2	6.5	3	2	34
GGC South	60	132	97	2.2	4.0	21	6.3	8	16.5	39	4	132
Lanarkshire	14	98	87	7.0	2.5	9	10.9	5	19.6	3	3	59
Tayside	9	32	27	3.6	3.0	4	8.0	3	10.7	6	3	285
Highlands	5	38	26	7.6	8.0	4	9.5	1	38.0	2	8	21
Fife	6	3	3	0.6	6.0	3	1.0	0	0.0	5	6	0
Borders	*	*	*	*	50	*	*	*	*	*	NA	NA
Orkney	*	*	*	*	0	*	*	*	*	*	0	0
Western Isles	*	*	*	*	0	*	*	*	*	*	0	0
Shetland	*	*	*	*	0	*	*	*	*	*	0	3

* No 2022 ESMI data

Figure 82: Incidents of TB >30 contacts

How many incidents (>30 contacts) have you had in the last 3 years in schools?



How many incidents (>30 contacts) have you had in the last 3 years in prisons?

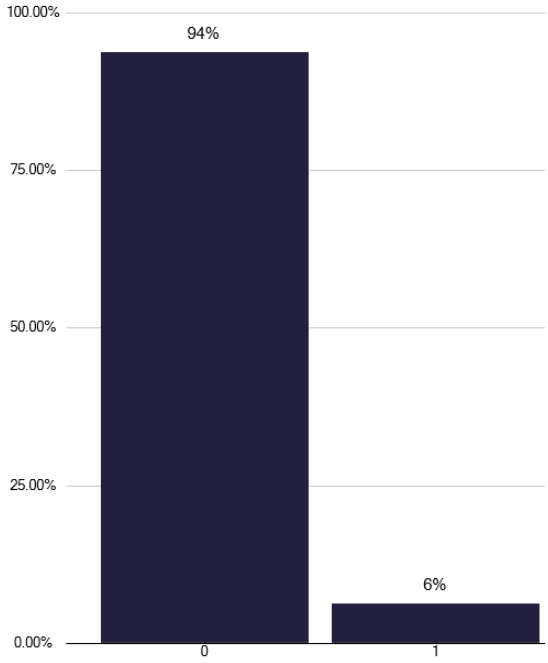
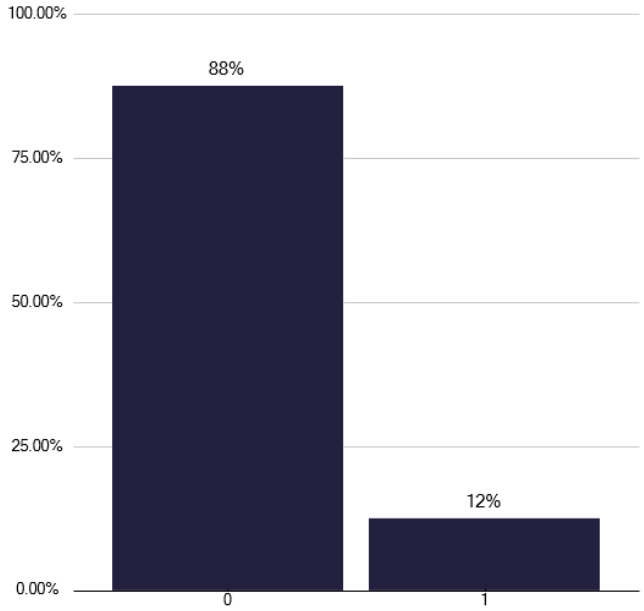
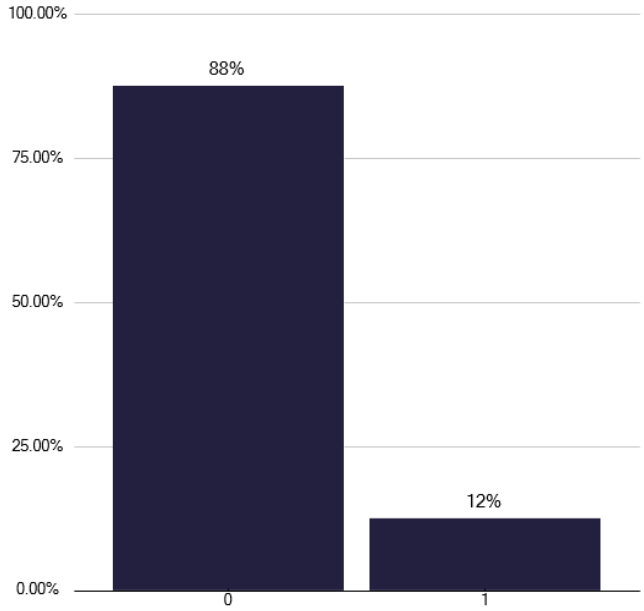


Figure 83: Incidents of TB >30 contacts

How many incidents (>30 contacts) have you had in the last 3 years in multiple asylum seekers/refugees?



How many incidents (>30 contacts) have you had in the last 3 years in multiple asylum hostels?



If we explore the results of contact tracing, we find that the number of individuals who are eligible for screening and who attend, as shown in **Figure 84,** is very variable, with one service having only half of those identified who merit screening, attending. This should be explored within each service to see what is needed to improve attendance rates. **Figure 85** shows the number and **Figure 86,** the proportion of contacts screened who had latent TB, yet a smaller number started treatment as in **Figure 87** and even fewer completed treatment as per **Figure 88**. Services should know this variation and explore why individuals who had latent TB did not start or complete treatment. The initiation and completion of treatment in children appears better than the adult population, as shown in **Figures 89** and **90**. Discussions at cohort reviews should occur in each service to identify if there is systematic variation in practice.

Figure 84: Proportion of contacts eligible for screening who attend testing

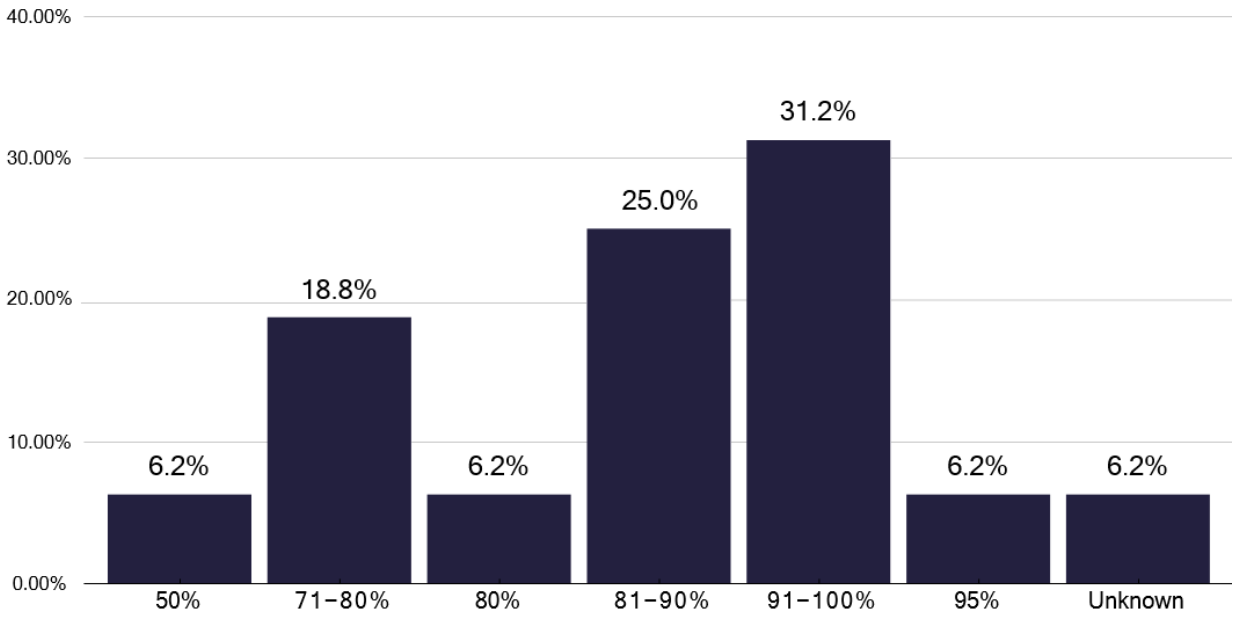
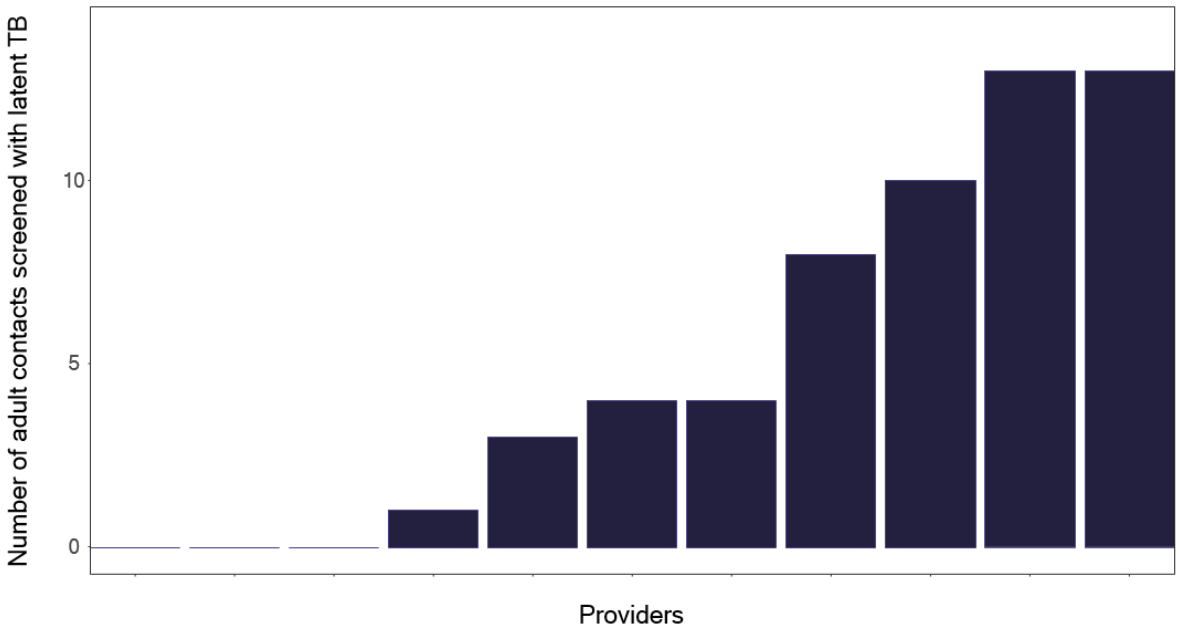
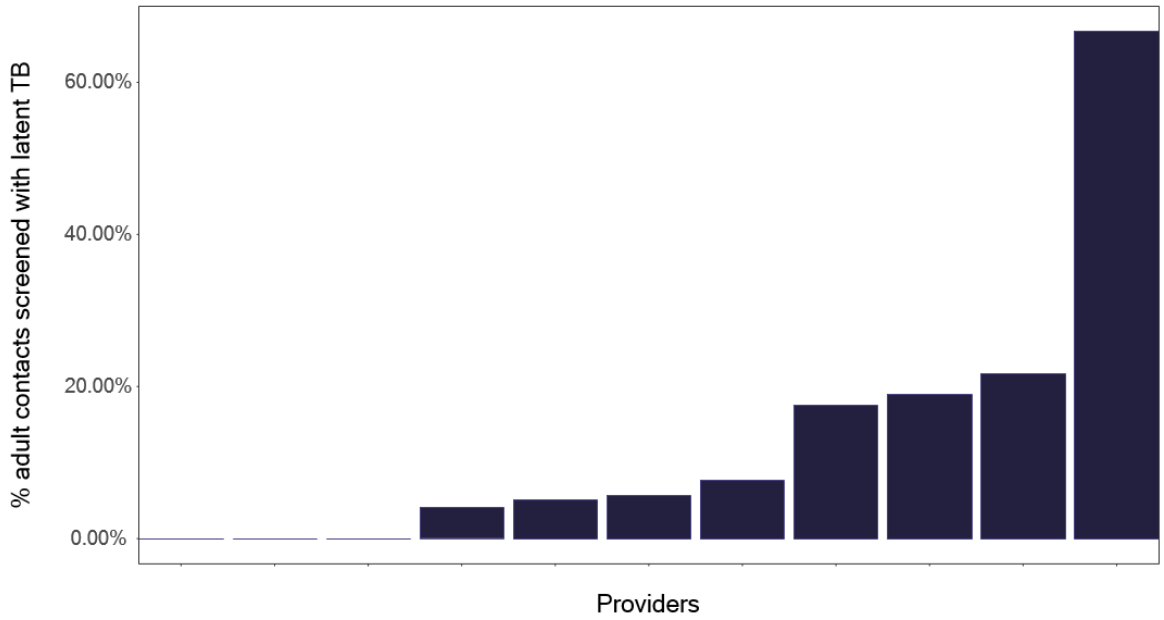


Figure 85: Number of adult contact screened with latent TB



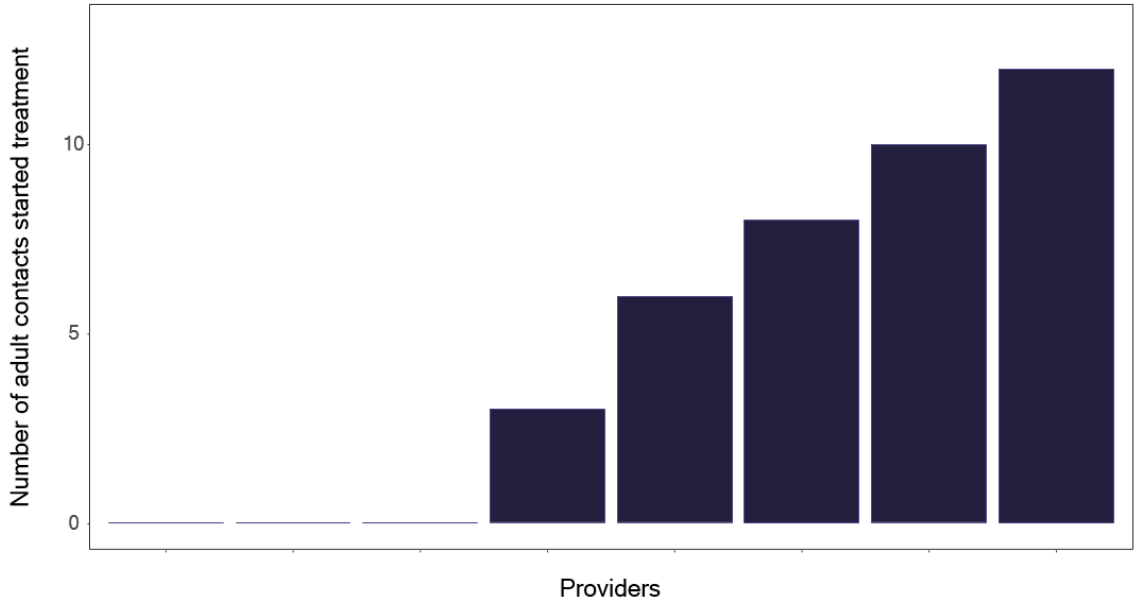
Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Figure 86: **Percentage of adult contacts screened with latent TB**



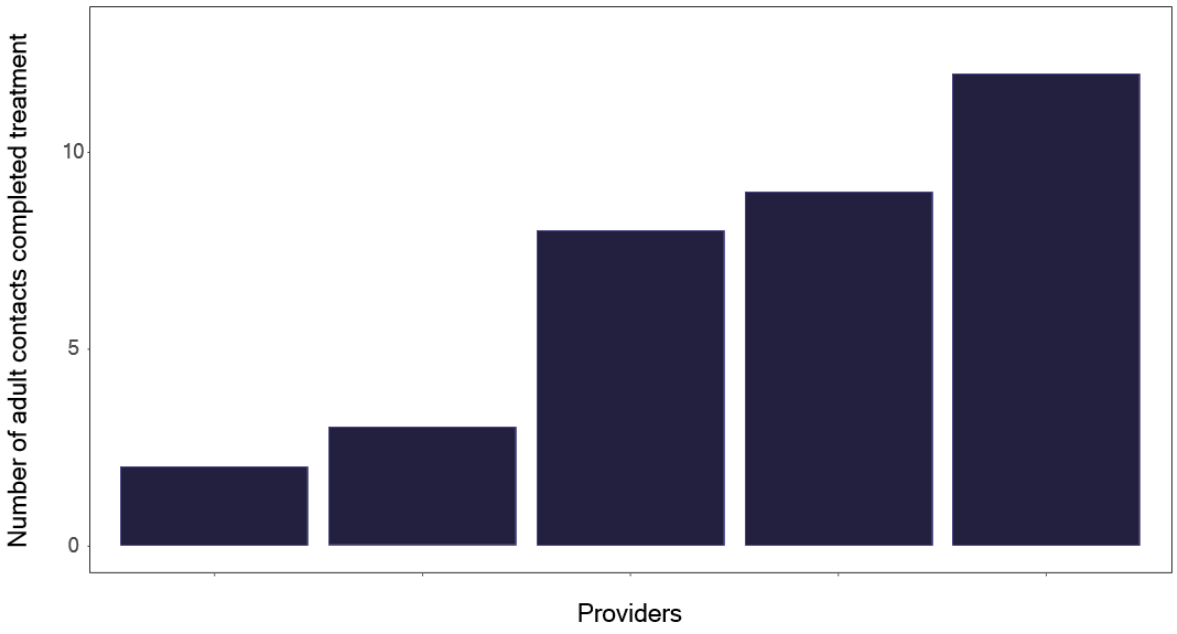
Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Figure 87: Number of adult contacts starting treatment for latent TB



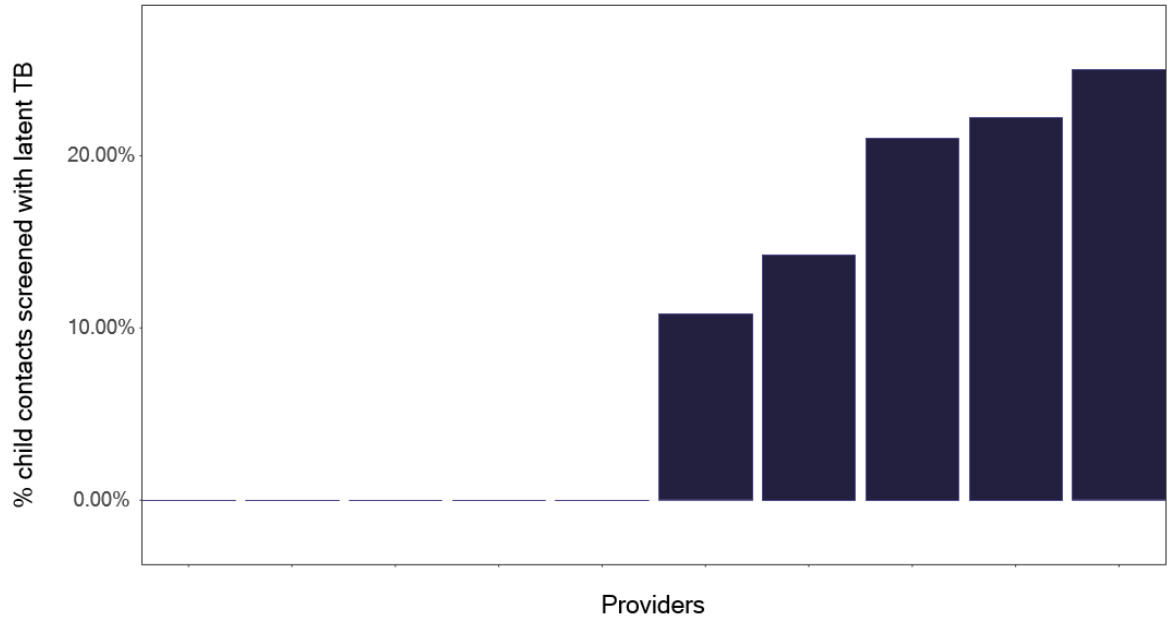
Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Figure 88: Number of adult contacts completing treatment for latent TB



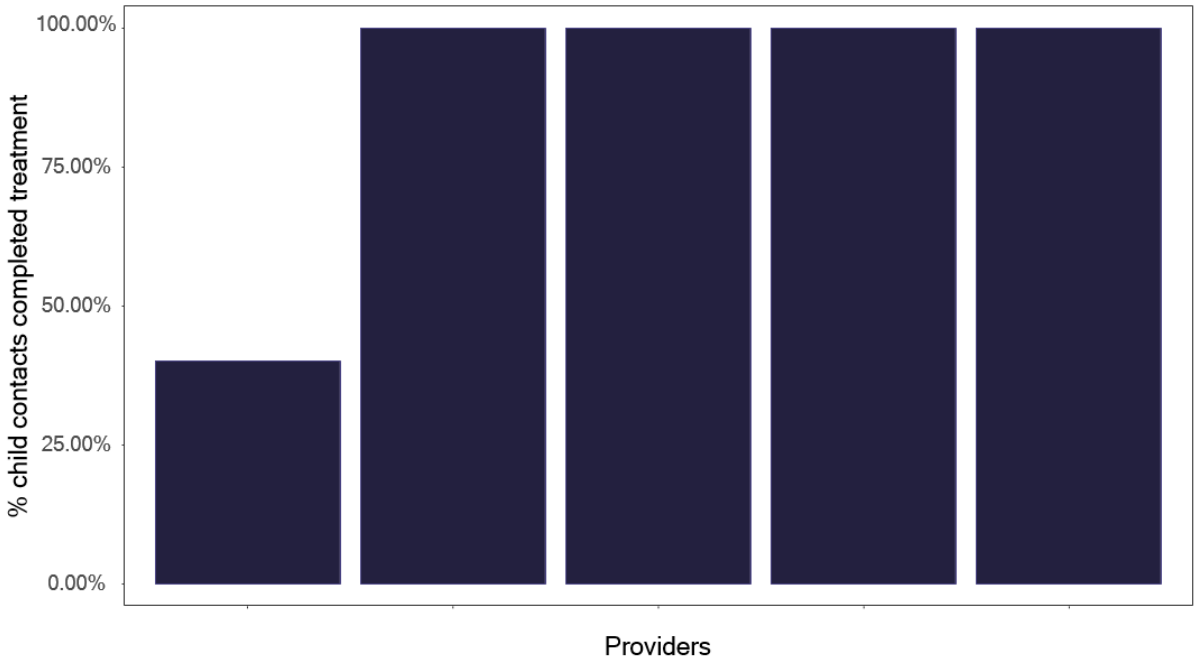
Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Figure 89: Percentage of child contacts screened with latent TB



Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Figure 90: Percentage of child contacts with latent TB who completed treatment



Note: Time period includes notified cases between January 2022 and December 2022. The data source is the Enhanced Surveillance of Mycobacterial Infections (ESMI) system.

Recommendations: Contact Tracing

56.	There is an element of inconsistency regarding who is screened in pulmonary and extra-pulmonary disease, which reflects a lack of current guidance. A standardised approach, based on best practice, may be helpful in maximising the use of resources.	P, N
57.	Services should look to identify 5 or more contacts per index case with active disease, which most services appear to be doing already. However, there is wide variation in the number of individuals screened, which merits a review by the service and a discussion during cohort reviews.	P, HB
58.	The reasons for variation in self-reported attendance of individuals for screening needs to be explored by each service. To address low attendance rates. Services should seek to learn from colleagues who have better attendances.	P, HB
59.	Services should explore why there is variation between the identification of individuals who should start preventative treatment, and those who appear not to do so, or fail to complete treatment. Some of this may relate to contact tracing procedures and support during therapy, as noted previously. Cohort reviews have a role here.	P, HB

11.2 Bacillus Calmette-Guerin (BCG)

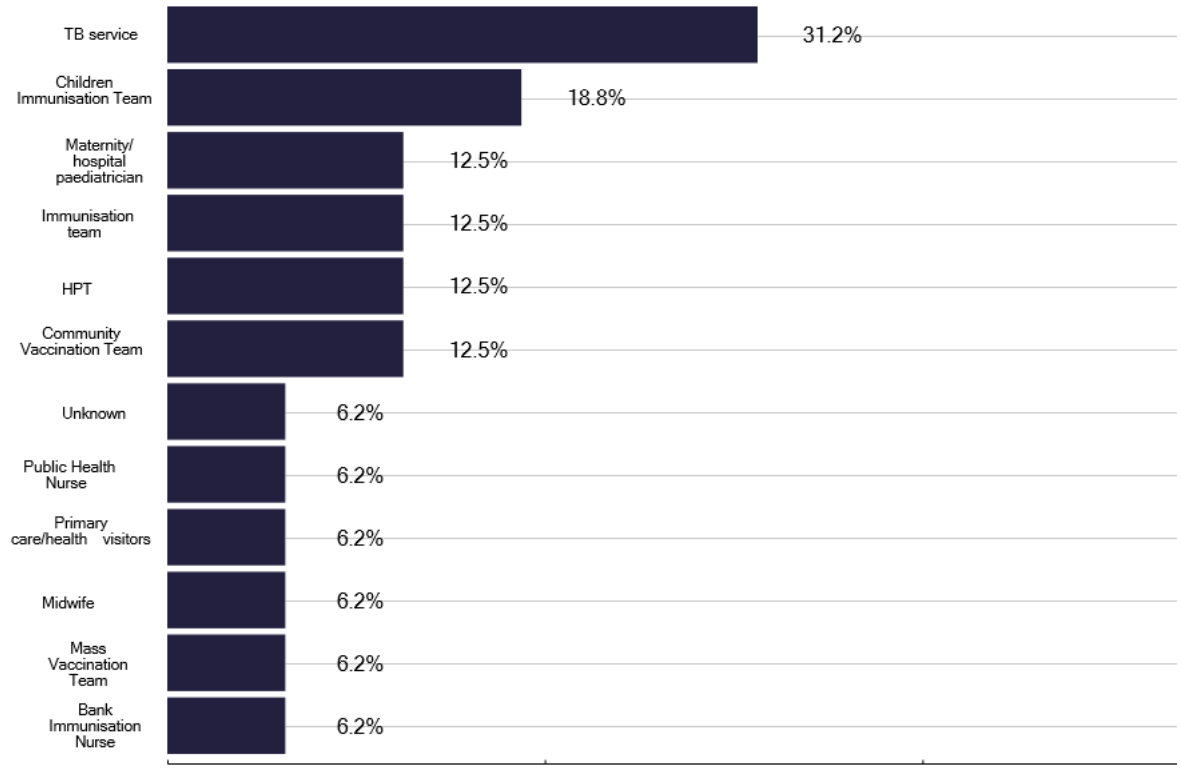
Administration of Bacillus Calmette-Guerin (BCG) is effective at reducing the risk of developing tuberculosis in individuals who are exposed to mycobacteria tuberculosis. BCG is deployed in three broad areas: to prevent tuberculosis in high-risk groups after birth (the neonatal BCG programme), as part of a management strategy in contact tracing and to give protection for individuals travelling to high prevalent areas of tuberculosis.

We explored who was administering BCG to the general eligible population (non neonates) and found several providers, as shown in **Figure 91**, with services having multiple options, creating a significant workload for TB nursing staff. In the neonatal program where BCG is given to individuals who are at risk of being exposed to TB (e.g. parents and grandparents from high prevalence countries), we found marked variability in service provision, with 69% of services having a well-established standard operating procedure, as shown in **Figure 92.** For each TB service there were often multiple answers to who administers BCG, so a site-specific review is needed, but again their seemed a significant burden on TB nursing staff.

Whatever model is used, and it does need to vary given the geography of Scotland, the deep dives confirmed it was generally an efficient process. In urban areas we noted that TB nurses would recall children into a clinic for BCG and this had good attendance, and a similar model occurred in a very rural area which served a predominately UK born

population. However, we also found excellent administration of BCG on maternity units, which seems valid in busy maternity units where staff are trained and in sufficient number to ensure a high vaccination rate. See the example of a good protocol in the good practice via the link in Annex E.

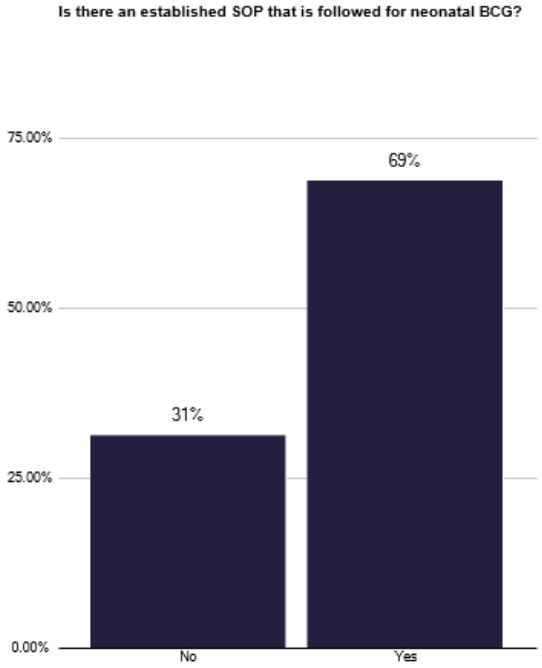
Figure 91: Who delivers BCG to under 16 year olds but not to neonates



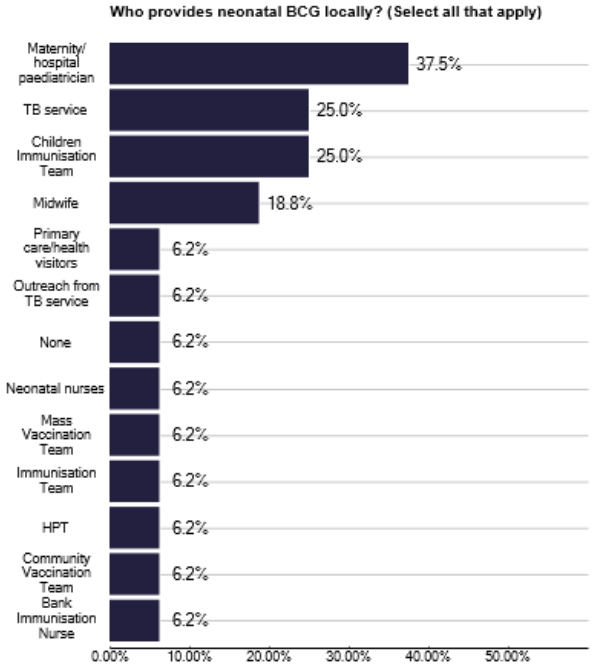
Note: total percentage of responses can be over 100% as multiple options can be selected for this question.

Figure 92: Procedures for delivering neonatal BCG

Is there an established SOP that is followed for neonatal BCG?



Who provides neonatal BCG locally? (Select all that apply)



Note: total percentage of responses can be over 100% as multiple options can be selected for this question

Recommendations: BCG

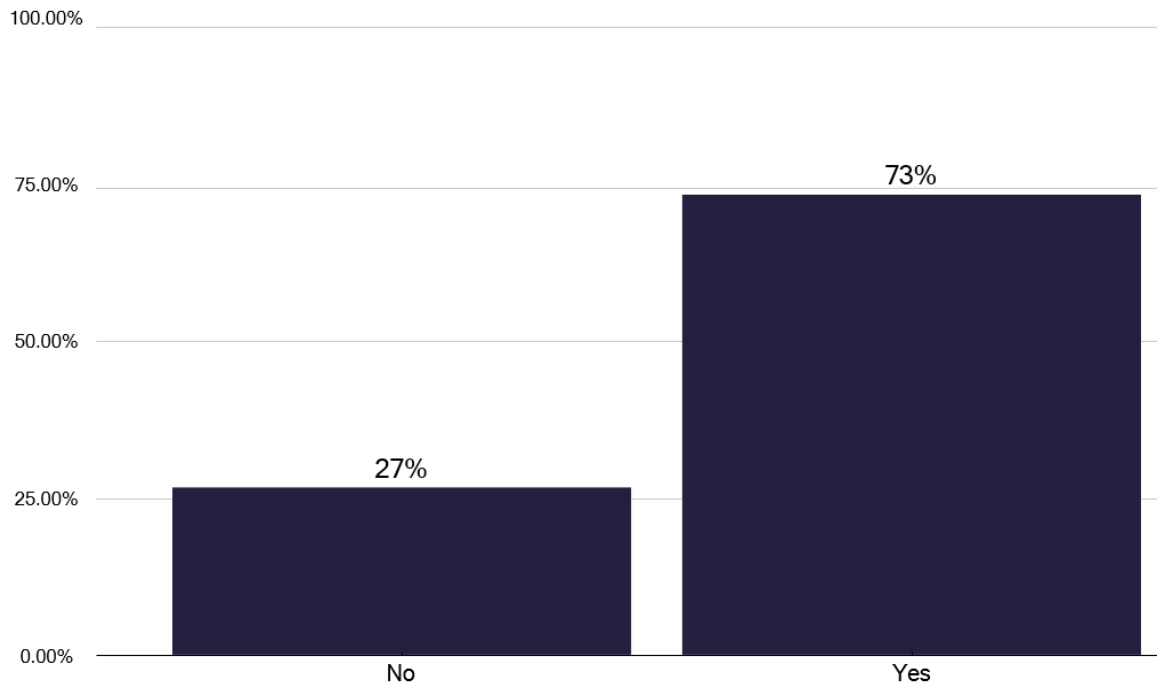
60.	BCG vaccination for neonates is an effective way of reducing the risk of developing TB, so a model that works for each service provider and Health Board is essential. With the potential for more babies to receive BCG, due to the evolving population, sufficient infrastructure needs to be in place. Health Boards need to keep the workload and delivery model under review.	P, HB

11.3 Occupational Health Screening

We asked about screening for newly recruited staff for TB. As shown in **Figure 93,** we found that 73% of providers have a policy for international healthcare workers and of the 27% who do not, the deep dives suggested the policy sat with occupational health. We asked about the volume of work and all colleagues stated that this is significant and increasing. However, when we asked for specific figures on the amount of occupational health screening, we obtained quite marked variation in the activity as shown in graph 100 in the data pack in Annex E).

Some of this may relate to data capture, i.e. the number of individuals with positive IGRAs that the service treated, the size of the organisation and the uncertainty of how many IGRAs had been requested by the occupational health service and were negative.

Figure 93: SOP for occupational health screening

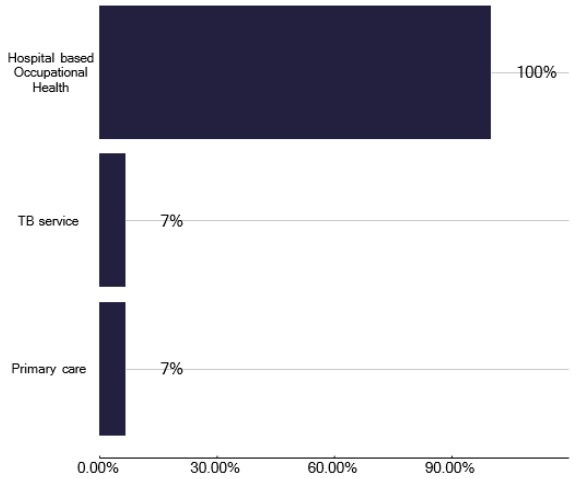


We were fortunate, during one of the deep dives, to be joined by an occupational health physician who had accurate data outlining the activity. For the year of 2024, 157 IGRAS were performed as part of the screening, of which 41 were positive (29%) and required preventative treatment. This workload related to increased numbers of staff being recruited not from the EU, as previously, but from high prevalence areas of the world, specifically Nigeria, Uganda and Kenya. Individuals on preventative therapy were risk assessed for both their infectivity and for the population they would be caring for, to ensure they were in gainful employment while on preventative therapy. Given these continued recruitment patterns, it seems there will be a continued significant volume of work for both occupational health and TB services.

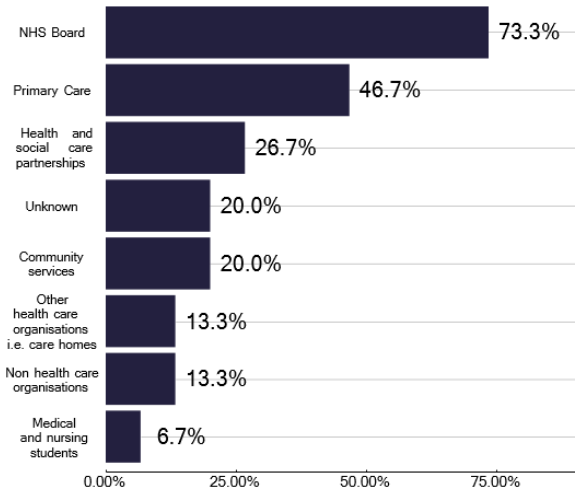
Concern was expressed during several deep dives that the processes for healthcare workers were robust but not for those employed in social care environments. **Figure 94** shows what other populations were screened for TB and that only 13% of staff working in care homes were screened, despite the potential vulnerable population they are looking after. This was highlighted during one of our deep dives when an individual who had been recruited from abroad to work in a care home and had not undergone any occupational health screening was found to have active TB.

Figure 94: Preventative treatment

Who is new NHS staff entrant screening provided by?
(Select all that apply)



If your TB service is the provider for new staff screening for TB, which organisations do you offer services to?
(Select all that apply)



Note: total percentage of responses can be over 100% as multiple options can be selected for both questions.

Recommendations: Occupational health screening

61.	A robust screening process needs to be in place due to staff from high prevalence areas being recruited into delivering health care.	P, HB
62.	There appears to be an increasing volume of work for occupational health services, for pathology services who perform the IGRA, and for TB services involved in delivering preventative therapies. This activity should be reviewed by Health Boards to ensure there is sufficient capacity to deliver a prompt service.	P, HB
63.	Consideration needs to be given to screening for TB in other workers involved in health care beyond acute providers' e.g. social care.	P, HB

11.4 Screening for biological therapies

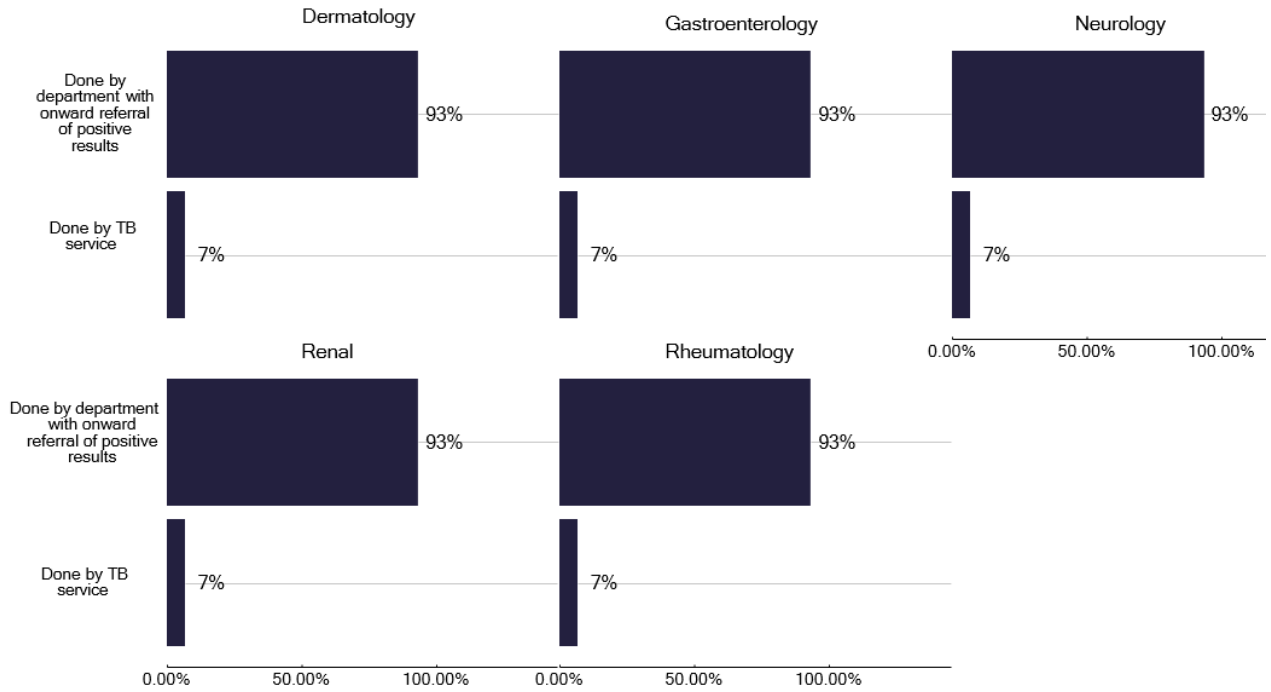
With the marked increase in the availability and variety of biological therapies for a wide range of diseases, most specialist societies have produced documentation about processes for screening for TB before commencing treatment. Most of these protocols involve an IGRA test, though skin testing and chest X-ray are still considered. This reflects a significant increasing workload for TB services, and for pathology departments, who are undertaking the IGRA test which does not appear, from our deep dives, to be paid for by the specialist service.

Positive IGRAs are normally referred into the service but we heard excellent examples, as documented in the good practice via the link in Annex E, where all results or results for positive IGRAs were referred from pathology to the lead clinician as a failsafe practice that should be more widely adopted.

As shown in **Figure 95,** the majority of TB services are only seeing those with a positive IGRA. We did, however, identify one specialist service in a provider that was referring all patients for consideration of a biological therapy into the TB service. This produced a considerable workload for the TB service which was not funded and had limited capacity to undertake other TB activities. Where such specialist services are requesting a formal evaluation by the TB service there should be clear cross charging.

Additionally, the pathology department needs some reimbursement for the IGRA testing, which is a considerable burden. Although we asked for information on the number of IGRA tests done, this was often not possible to determine generally, and certainly not specific biological therapies. While we did tabulate the activity in both IGRAs and individuals for receiving preventative therapy, this is inaccurate, because in many instances the number of IGRAs performed and the reason was unclear. One service was able to produce clear documentation which confirmed the huge workload, with over 4000 IGRAs performed, many of which were for biological therapies see graph 100 in the data pack in Annex E).

Figure 95: Process for screening patients to receive biological agents from different specialities.



Recommendations: Screening for biological therapies

64.	There should be discussion between pathology departments and specialist services regarding the increasing cost burden of IGRA tests (As in the diagnostics section 8.3,) so this is managed appropriately within the Board/service.	P
65.	TB services and pathology departments should be aware of the volume of requests for IGRA before biological therapies and to ensure current guidelines are followed, for example, that there are not unnecessary repeat tests requested.	P

11.5 Preventative therapies: Migrants and asylum seekers

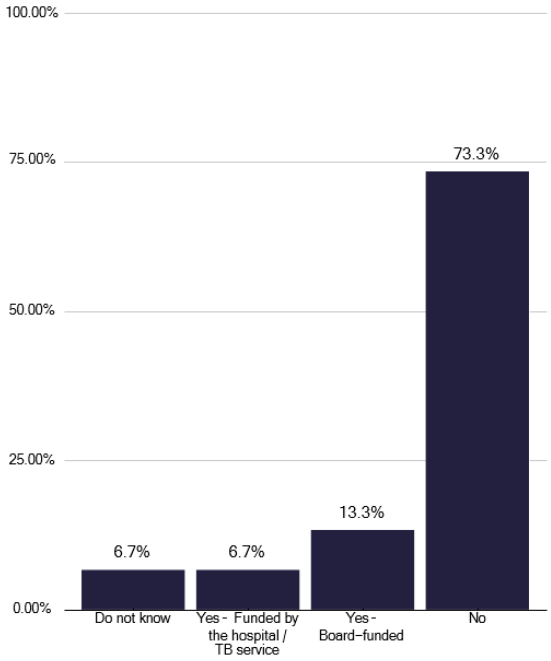
There is no national Scottish commissioned service for preventative therapy for asylum seekers and migrants, as shown in **Figures 96** and **97** respectively. However, we did hear during deep dives of several services attempting to address this issue in the absence of any central funding.

These populations are very different and include unaccompanied children, relocated individuals and asylum seekers. Services had developed different unfunded models to support such individuals, which were affected by service geography and the location of the populations. We identified several smaller services that had taken a holistic approach, as detailed in good practice in Annex E. This included screening for TB and blood born viruses together and addressing mental health issues etc. with asylum seekers in their hostel. Another service had a similar model but also included a 'safety net' to ensure these individuals were not lost in the system.

An area of some concern from two of the deep dives was unaccompanied children. These services had attempted to review these children, who are often over 18 years old when formally assessed. Whilst the numbers are small, in one service we found approximately 18% of these unaccompanied children required preventative therapy while in the other service, which has a much smaller number, it was approximately 15%. This is a concern for the potential breakdown and development of tuberculosis in a young and mobile group which risks infecting others. It would seem appropriate for this population to be specifically targeted in any preventative therapy strategy.

Figures 96: LTBI treatment

Does your TB service undertake a preventative treatment programme for asylum seekers?



If you do not provide a preventative treatment programme for asylum seekers, who provides this programme?

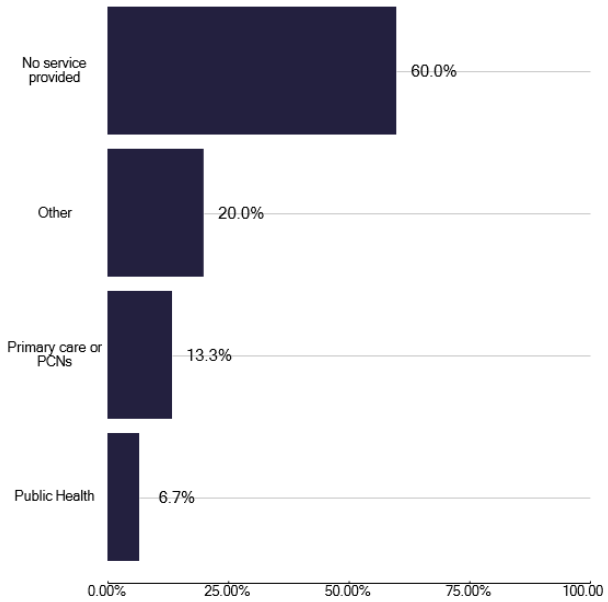
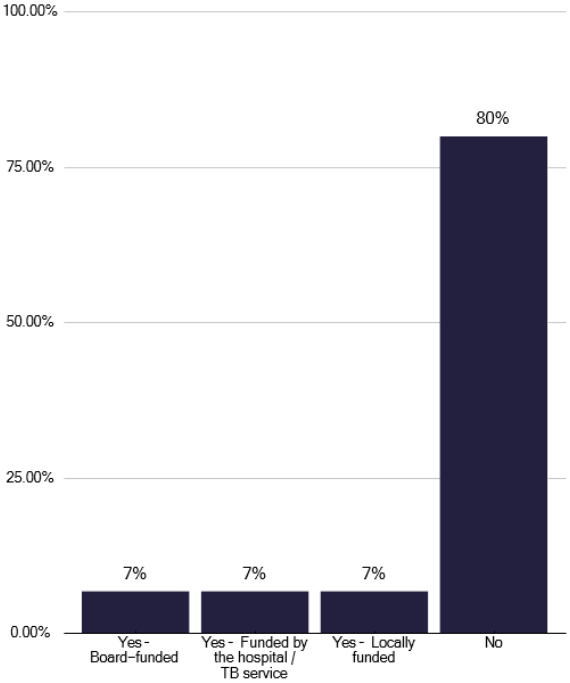
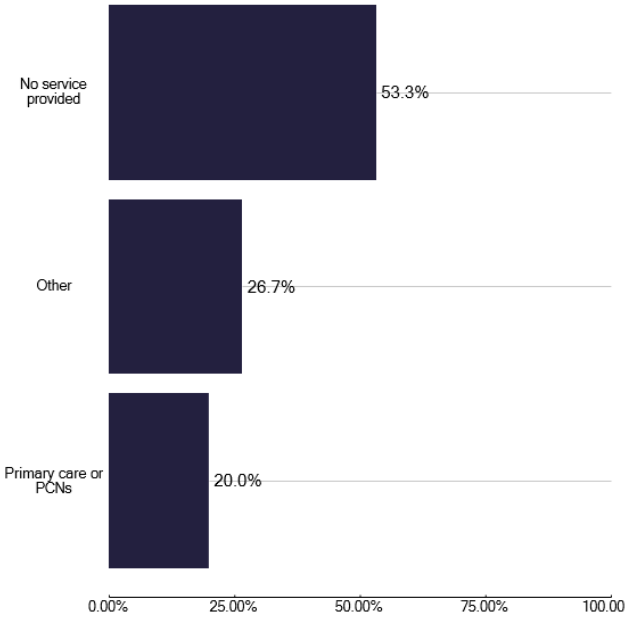


Figure 97: Preventative treatment programme

Does your TB service undertake a preventative treatment programme for migrants?



If you do not provide a preventative treatment programme for migrants, who provides this programme?



Annex A: List of TB Service Survey Participants

NHS Ayrshire and Arran

NHS Lothian

NHS Greater Glasgow & Clyde (3 services)

NHS Tayside

NHS Forth Valley

NHS Grampian

NHS Orkney

NHS Dumfries & Galloway

NHS Highland

NHS Shetland

NHS Fife

NHS Borders

NHS Western Isles

NHS Lanarkshire

Annex B: Biography: Dr Martin Allen, Clinical Lead

Dr Allen GIRFT Respiratory Clinical Lead, Consultant physician at University Hospitals of North Midlands NHS Trust, and NHS National Specialty Adviser for physiological science**.**

Martin is the clinical lead for the NHS England RNOH/GIRFT Tuberculosis review as well as for the Scotland TB review.

Martin trained at Birmingham University and undertook a variety of posts in the midlands before moving to Edinburgh, and then to Yorkshire as a senior registrar. After being appointed as a consultant in Bradford he moved after 3 years to University Hospital of North Midlands where he has developed and led a variety of services in the last 25 years. During this time, he served as clinical director of cardiorespiratory services and head of the medical division. After demitting this management role, he served as the secondary care consultant on a CCG and as honorary secretary for the British Thoracic Society.

His main research has been in Chronic Obstructive Pulmonary Disease (COPD) and sleep, but he also has a major interest in respiratory physiology, currently chairing the joint British Thoracic Society (BTS) and Association for Respiratory, Technology and Physiology (ARTP) board.

He chairs the Respiratory Expert Working Group on coding for NHS Digital and sits on the Royal College of Physicians' commissioning group.

In June 2021, he was awarded an MBE in the Queen's Birthday honours list, for services to the NHS, particularly during COVID-19.

Annex C: List of TB service deep dive meetings

NHS Ayrshire and Arran

NHS Greater Glasgow & Clyde

- NHS GGC North Sector
- NHS GGC South Sector
- NHS GGC Clyde Sector

NHS Lothian

NHS Tayside

NHS Forth Valley

NHS Grampian

NHS Orkney

NHS Dumfries & Galloway

NHS Highland

NHS Lanarkshire (written review supplied due to late submission)

- University Hospital Monklands
- University Hospital Wishaw
- University Hospital Hairmyres

Annex D: Glossary

Abbreviation	Meaning	Definition
A&C	Admin and clerical	Administrative and Clerical workforce
AAFB	Acid alcohol fast bacteria	Mycobacteria have a structure that can be identified by a staining technique using acid and alcohol
BCG	Bacillus Calmette-Guerin	A vaccine primarily used against tuberculosis (TB)
BTS	British Thoracic Society	We improve standards of care for people with respiratory diseases and to support those who provide that care.
BTS MDR	British Thoracic Society MDR Service	The MDR-TB Clinical Advice Service provides advice and support to clinicians across the UK who encounter MDR-TB. The advice is offered by a multidisciplinary panel of Clinical Service Advisers, with expertise in areas such as respiratory medicine, infectious diseases, microbiology, pharmacy and public health. The advice is provided via a secure online case discussion forum and at monthly MDT meetings which are held via Teams.
CPD	Continuing professional development	Continuing Professional Development is a commitment to ongoing lifelong learning.
CYP	Children and Young People	This guidance relates to children and young people from birth until their 18th birthday
DCC	Direct Clinical Care	Sessional system for consultants with one session equating to 4 hours. This reflects direct contact with patients, reviewing their results and communication. It includes MDTs and cohort reviews
DOT	Directly observed therapy	A strategy used to ensure TB patient adherence to and tolerability of the prescribed treatment regimen; a health care worker or another designated person watches the TB patient swallow each dose of the prescribed drugs.

ECM	Enhanced case management	The named case manager co-ordinates ECM and works alongside a specialist multidisciplinary TB team to provide expert clinical and psychosocial care, and where appropriate ensures effective engagement with the client group in the community. The case manager carries out a risk assessment at the beginning of treatment to determine if the patient requires ECM. This assessment should be reviewed throughout the course of treatment.
ENT	Ear, nose and throat	Illnesses, conditions and disorders of the ears, nose and throat.
ESMI	Enhanced Surveillance of Mycobacterial Infections	ESMI is the richest single dataset on the activity, flow, delivery and outcomes from tuberculosis (TB) services in Scotland. This dataset mirrors many of the data fields collected in the National Tuberculosis Surveillance System (NTBS) of the UK Health Security Agency.
Gene-Xpert'	Gene-Xpert'	A CBNAAT (cartridge based nucleic acid amplification test) is a widely accepted diagnostic test for Tuberculosis. This test is a rapid diagnostic test for Tuberculosis detection as well as Rifampicin resistance in direct smear negative cases.
GMC	General Medical Council	The General Medical Council is a public body that maintains the official register of medical practitioners within the United Kingdom.
Granuloma	Granuloma	A granuloma is an area of tightly clustered immune cells, or inflammation, in your body. They form around an infection or foreign object in your body. They can form almost anywhere, but they're most often found in your lungs. Granulomas can be a symptom of a chronic condition or an infection.
HRG	Healthcare Resource Group	Designed to be standard groupings of clinically similar treatments which use common levels of healthcare resource
ICD 10	International classification of disease, edition 10.	WHO listing of diseases used internationally and form the basis of coding in England, being used to derive the HRG for different conditions

ID	Infectious Disease	Infectious diseases are disorders caused by organisms — such as bacteria, viruses, fungi or parasites.
IGRA	Interferon-gamma release assay	TB blood tests (interferon-gamma release assay or IGRA) are methods of determining whether a person is infected with TB bacteria.
MDR	Multi drug resistant mycobacteria	Disease is caused by TB bacteria that are resistant to at least isoniazid and rifampin, the most effective first-line TB treatment drugs.
MDT	Multi-disciplinary team	Teams consisting of individuals drawn from different disciplines who come together to achieve a common goal, whether that be a project to introduce a new role, redesign of a patient pathway or providing care in a different way.
NTBS	National Tuberculosis Surveillance system	NTBS is an enhanced surveillance system for public health use completed by colleagues after a notification of tuberculosis. It exists to provide detailed information on each person with TB and the epidemiology of their disease in England, Wales and Northern Ireland
NTM	Non tuberculous mycobacteria	A group of bacteria that cause rare lung infections.
OPCS	Office of Population Censuses and Surveys	Each category contains a specific set of surgical procedures. Procedures eligible for inclusion in the surveillance are defined by Office of Population Censuses and Surveys (OPCS) surgical procedure codes used by clinical coders.
PCR	Polymerase chain reaction	(TB PCR) is a rapid and reliable method for the diagnosis of both pulmonary and extra pulmonary tuberculosis, with an overall sensitivity of 78.3% and a high specificity
PH	Public Health	Prevents, prepares for and responds to infectious diseases, and environmental hazards, to keep all our communities safe, save lives and protect livelihoods. Provide scientific and operational leadership, working with local, national and international partners to protect the public's health and build the nation's health security capability.

RCN	Royal College of Nursing	The RCN is the world's largest nursing union and professional body.
RCP	Royal College of Physicians	The Royal College of Physicians of London, commonly referred to simply as the Royal College of Physicians, is a British professional membership body dedicated to improving the practice of medicine, chiefly through the accreditation of physicians by examination.
SNOMED		SNOMED CT is a structured clinical vocabulary for use in an electronic health record. It is the most comprehensive and precise clinical health terminology product in the world.
SMR01	Scottish Morbidity Records Inpatient Dataset	Data set covering all health boards in Scotland.
SOP	Standard Operating Procedures	A set of step-by-step instructions for performing a routine activity.
SPA	Supporting Professional Activities	As DCC it is a unit of medical time related to professional development, that may be for an individual for self-learning or for providing education and learning for others
SPR	Specialist registrar	doctor in speciality training on-route to becoming a consultant
TFC	Treatment Function Code	A 'basket' of activity in a particular area, e.g. code 340 reflects activity carried out by respiratory teams
UKHSA	UK Health Security Agency	The UK Health Security Agency is a government agency in the United Kingdom, responsible since April 2021 for England-wide public health protection and infectious disease capability and replacing Public Health England. It is an executive agency of the Department of Health and Social Care.
VOT	Video observed therapy	As with DOT but a virtual strategy used to ensure TB patient adherence to and tolerability of the prescribed treatment regimen; a health care worker or another designated person watches the TB patient virtually swallow each dose of the prescribed drugs.
XDR	Extensively drug-resistant tuberculosis	The new definition of pre-XDR-TB is: TB caused by *Mycobacterium tuberculosis (M. tuberculosis)* strains that fulfil the definition of

		multidrug resistant and rifampicin-resistant TB (MDR/RR-TB) and which are also resistant to any fluoroquinolone. The definition of MDR-TB* remains unchanged. The updated definition of XDR-TB is: TB caused by *Mycobacterium tuberculosis (M. tuberculosis)* strains that fulfil the definition of MDR/RR-TB and which are also resistant to any fluoroquinolone and at least one additional Group A drug (Group A drugs are the most potent group of drugs in the ranking of second-line medicines for the treatment of drug-resistant forms of TB using longer treatment regimens and comprise levofloxacin, moxifloxacin, bedaquiline and linezolid).

Annex E: Links to Supporting Documents

All additional Annex documents referenced within this document (which are too large or too many to attach as Annexes) can be found using the link here.

(Please note you may need to request access to this 'NHS Futures' sight to see all content).

The documents included are;

- Good practice
- The National dataset (anonymised data pack)
- Full set of survey questions
- Key lines of enquiry

You may also wish to view the documents saved in the 'RNOH/GIRFT Tuberculosis National Report' folder which contains documents collated during the England Review and which may also be of use.

Other Useful Links

- TB England Report
- Getting it Right First Time (GIRFT)
- The British Thoracic Society
- Tuberculosis (TB) | NHS inform
- Surveillance reports - Data and surveillance - Tuberculosis - Infectious diseases - Health protection - Population health - Public Health Scotland

This publication is available at **www.gov.scot**

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