Tuberculosis Contact Investigations

Summary These guidelines outline the steps for conducting tuberculosis (TB) contact investigations in New South Wales (NSW).

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NSW GOVERNMENT Health

GUIDELINE SUMMARY

TUBERCULOSIS CONTACT INVESTIGATIONS

PURPOSE

Contact investigation is an essential component of tuberculosis (TB) prevention. The rationale for contact investigation is that people who were recently exposed to patients with TB may have become infected and will have an increased risk of developing TB disease, particularly within the first two years after acquisition of the infection.

Decisions about the extent of contact investigation need to be guided by sound clinical and epidemiological indications. The aims of contact investigation are to:

- Identify and treat cases of TB disease among those in contact with the index case including identification of a possible source case;
- Identify persons who have latent TB infection (LTBI) and offer treatment for LTBI or monitoring by chest radiography (CXR);
- Provide timely treatment, education and support for persons identified with evidence of disease or infection, and;
- Provide education and support for all persons identified as having exposure risk.

KEY PRINCIPLES

Individuals have a right to be informed about significant risks to their health and recommended courses of action to manage these risks.

The priorities for TB contact investigation are determined by:

- The likely infectiousness of the index case;
- The risk of exposure of contacts to the index case, and;
- The vulnerability of contacts to disease progression.

Contacts should be prioritised according to their risk of exposure to an infectious TB case and their level of risk for disease progression; screening should be conducted in a stepwise fashion using the concentric circles model until no evidence of transmission is found.

Typically, household contacts are highest priority but consideration must be given to close non-household contacts and vulnerable contacts, regardless of their level of exposure.

Treating clinicians are responsible for individual case management with NSW TB services to support adherence to the prescribed treatment therapy or chest radiograph surveillance.

USE OF THE GUIDELINE

TB contact investigations are an important public health activity that should be carried out by the LHD TB Service as part of routine management of a patient diagnosed with TB.

LHD TB Services should:

- Undertake contact investigations for all TB cases
- Notify the NSW TB Program and their local PHU Director of contact investigations where:
    - Screening involves a healthcare facility or educational institution;
    - Screening that may attract media interest or may cause large scale public concern;
    - Large screenings (where more than 25 contacts at high risk of exposure are identified); and
    - Situations where a high or medium infectiousness index case spent greater than eight hours on an aircraft, and
    - Contact investigations that cross state and/or international jurisdictional borders.
- Communicate with representatives of all relevant jurisdictions (including interstate TB services where relevant) where contact investigations cross jurisdictional boundaries
- Provide sufficient information to ensure appropriate screening of contacts, and ongoing management for those identified as having LTBI or TB disease
- Complete summary contact investigation data on the Notifiable Conditions Information Management System (NCIMS)
- Undertake a routine review process of the quality and completeness of contact investigations.

LHD Public Health Units should:

- Provide assistance including surge capacity, data management, public communication support and assistance with decision making around the investigation where requested by the LHD TB Service
- Facilitate public health inquiries under section 106 of the *Public Health Act.*

The NSW TB Program should:

- Provide advice on large and/or complex contact investigations as requested
- Convene an expert panel where required to support the contact investigation for large and/or complex situations
- Report on contact investigation indicators.

REVISION HISTORY

Version	Approved by	Amendment notes
March-2019 (GL2019_003)	Dr Kerry Chant Chief Health Officer Deputy Secretary Population and Public Health	N/A initial document

ATTACHMENTS

1. Tuberculosis Contact Investigations

Tuberculosis Contact Investigations

NSW GOVERNMENT Health

GUIDELINE

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1 BACKGROUND

1.1 About this document

These guidelines outline the steps for conducting tuberculosis (TB) contact investigations in New South Wales (NSW). The priorities for contact investigation are determined by:

- The likely infectiousness of the index case;
- The risk of exposure of contacts to the index case, and;
- The vulnerability of contacts to disease progression.

Contacts should be prioritised according to their risk of exposure to an infectious TB case and their level of risk for disease progression; screening should be conducted in a stepwise fashion using the concentric circles model until no evidence of transmission is found. Typically, household contacts are highest priority but consideration must be given to close non-household contacts and vulnerable contacts, regardless of their level of exposure.

1.2 Key definitions

Acid fast bacilli (AFB) – a rod-shaped bacterium which can be seen on microscopic examination of a stained clinical specimen using Ziehl-Neelsen technique or fluorescent microscopy.

Baseline screening – the TB screening performed within two weeks of index case diagnosis.

Break of contact screening – the TB screening performed at least eight weeks (ideally 8-12 weeks) after the date of most recent contact with the index case during the infectious period.

Chest x-ray (CXR) surveillance – a series of chest radiographs (x-rays) at six month intervals, usually for two years, to monitor for radiological changes indicating TB disease.

Countries with a high incidence of TB – countries with an incidence ≥40 cases per 100,000 population. A list of high incidence countries is located on the NSW Health website at: https://www.health.nsw.gov.au/Infectious/tuberculosis/Pages/high-incidence-countries.aspx

Effective treatment – a course of anti-tuberculosis medications appropriate for the drug susceptibility profile and site of disease.

High TB transmission risk procedures – procedures usually attended in health facilities that induce coughing or aerosol generation: e.g., bronchoscopy, post-mortem examination, laboratory procedures, sputum induction, nebuliser therapy, endotracheal intubation and extubation, airway suctioning, irrigation/dressing or other aerosolizing procedures on infected wound, or surgical exposure of an infected site.

Index case – the initial TB case that prompts a contact investigation.

Interferon Gamma Release Immunoassay (IGRA) – an in-vitro TB screening technique that uses whole blood to identify people likely to be infected with *M. tuberculosis* (e.g. QuantiFERON-TB Gold Plus).

Multi-drug resistant TB (MDR-TB) – TB disease caused by *M. tuberculosis* bacilli that are resistant to both isoniazid and rifampicin, with or without resistance to other anti-tuberculous agents.

NSW TB Program – the Health Protection NSW unit responsible for state wide oversight of TB management and prevention in NSW.

Polymerase Chain Reaction (PCR**)** – a molecular amplification of DNA sequences specific to Mycobacterium tuberculosis to allow for rapid detection and identification in a clinical specimen or bacterial isolate.

Preventive therapy (also known as LTBI treatment or chemoprophylaxis) – a course of TB medication to prevent progression of TB infection to TB disease.

QuantiFERON-TB Gold Plus (QFT-Plus®) – the brand name of the only available IGRA test in NSW.

Source case – the TB case that infected the index case.

Tuberculin Skin Test (TST) (also known as Mantoux test) – a skin test to measure cell mediated immune responsiveness to Tuberculin purified protein derivative (PPD) used to identify people likely infected with *M. tuberculosis* - definitions of negative and positive TST results can be obtained from the *Tuberculin Skin Testing (TST) Policy Directive* (PD2009_005).

Tuberculosis (TB) – disease (illness) caused by *Mycobacterium tuberculosis complex*, also referred to as active TB or TB disease - patients infected with non-tuberculous mycobacteria do not have TB.

TB clinical review – assessment by a clinician experienced in TB (usually at a TB Service) to determine TB status (confirm or exclude TB disease and/or LTBI following screening).

TB infection – *M. tuberculosis* infection without disease; also referred to as latent TB infection (LTBI).

TB screening – performing relevant clinical assessment (including symptom screening, medical history regarding recent TB exposure, known LTBI, previous TB disease or treatment, immunosuppressive conditions) and tests to exclude TB disease and TB infection. Tests used for detecting TB infection include the Tuberculin Skin Test (TST) and/or Interferon Gamma Release Assay (IGRA), while tests for TB disease include a chest radiograph (CXR) and sputum sampling for AFB, PCR and mycobacterial culture.

Whole genome sequencing (WGS) – a laboratory technique to determine the complete nucleic acid sequence of an organism's genome enabling the detailed and high-resolution molecular comparison between individual strains of a microbe and genome-wide screening for markers of resistance to first and second line anti-tuberculous drugs.

Window (period) prophylaxis – preventive therapy prescribed as an interim measure in vulnerable contacts (e.g. children under five years of age; severely immune-compromised adults) to prevent rapid progression to TB disease while final determination of TB infection is awaited. Once break of contact screening tests confirm no conversion (thus no evidence of recent TB infection), window prophylaxis can be ceased. A full LTBI treatment course may be completed despite negative TB infection tests in an immunocompromised patient with extensive TB exposure (in whom test results are less reliable).

1.3 Legal and legislative framework

TB is a notifiable condition under the NSW *Public Health Act 2010*, with doctors required to notify all persons they reasonably suspect to have TB, and laboratories required to notify all pathology tests undertaken to determine whether a person has TB that have a positive result. Under the *Principles for the Management of Tuberculosis in New South Wales* policy directive (PD2014_050), all patients with suspected or confirmed TB should be referred to their local TB service. The TB service should review the case, develop a management plan with the treating physician, and initiate appropriate public health actions. Contact investigations are a required public health action.

Constant attention is required during contact investigations to maintain confidentiality of the index case and contacts. The identity of the index case should not be revealed to contacts without the documented consent of the index case, or without other lawful excuse. All staff working in the NSW public health system, including doctors, nurses, and other staff are bound by the *Health Records and Information Privacy Act 2002*, the NSW Health Privacy Manual for Health Information, and by a strict code of conduct to maintain confidentiality of patient information.

On occasion, it may be necessary to conduct a formal inquiry to determine whether, or how, transmission of TB infection has occurred and the impacts on public health risk. Section 106 of the *Public Health Act* allows the Secretary of the NSW Ministry of Health (or duly appointed delegates including Public Health Unit Directors) to undertake an inquiry into a matter relating to public health. If such an inquiry is conducted, the Secretary, or delegate, can authorise a person(s) to exercise functions to assist the inquiry. This can include authorising a person to exercise functions of an authorised officer under the Act, including to enter premises and inspect records relevant to the inquiry, or to request the provision of records, names and contact details from those premises for the purposes of determining whether a public health risk has occurred (sections 108-111). TB services should liaise with their respective local health district (LHD) public health unit (PHU) Director and the NSW TB Program when a public health inquiry may be required. Advice can be sought from the Ministry in relation to the establishing of an inquiry.

TB is also a Category 4 medical condition under Schedule 1 of the *Public Health Act 2010*. If there is a concern that a person may have a Category 4 condition and may be a risk to public health, the Secretary can direct a person to undergo a medical examination to determine if the person has the condition. In addition, the Chief Health Officer can issue a public health order in respect of a person with Category 4 condition who is

behaving in a way that is, or may be, a risk to public health. A public health order can direct the person to undergo treatment or counselling or to be detained. Note that the issuing of a public health order is generally an intervention of last resort when other methods have failed to control the public health risk and should be considered only in consultation with the NSW TB Program.

2 INTRODUCTION

Contact investigation and screening are essential components of TB prevention. People who were recently exposed to an infectious TB case may be infected and have an increased risk of developing TB disease, particularly in the first two years following infection (1).

Individuals have a right to be informed about significant risks to their health and recommended courses of action to manage these risks. However, advising people of their potential exposure to TB may also cause individual, organisational and community concern.

Decisions about the extent of contact investigation need to be guided by sound clinical and epidemiological indications. The aims of contact investigation are to:

- Identify and treat cases of TB disease among contacts, including possible identification of a source case;
- Provide education and support for all persons identified as having exposure risk;
- Identify persons with latent TB infection (LTBI); and
- Provide preventive treatment, or where treatment is not indicated, chest x-ray (CXR) surveillance, for contacts found to have LTBI or those highly vulnerable to progression to TB disease.

Culturally and linguistically diverse groups experience a disproportionate burden of TB disease and different approaches that take into account cultural and linguistic needs may be required to support the contact screening process. An accredited interpreter should be used whenever language poses a barrier to an effective contact investigation.

All services related to TB screening, care and management are available at no charge to patients within the NSW Public Health system as per the *Principles for the Management of Tuberculosis in New South Wales* (PD2014_050) or subsequent iterations. These services include contact tracing assessments (testing for LTBI, pathology, radiology and clinical evaluation), and education related to TB disease and exposure.

2.1 Governance

Contact investigations are an important public health activity that should be carried out by the LHD TB services as part of routine management of a patient diagnosed with TB. Primary oversight is the responsibility of the LHD TB coordinator and/or TB director managing the index case. Where contact investigations cross jurisdictional boundaries, representatives of all relevant jurisdictions (including interstate TB services where relevant) should be included in the decision making process regarding the extent and conduct of contact screening.

Where congregate setting (e.g. schools or workplaces) screening in a different LHD is required, the managing TB coordinator should refer to the relevant LHD TB coordinator as soon as possible. The LHD TB service where the facility is geographically located is responsible for managing the contact screening. Individual contacts may be referred for contact screening at another service if it is more convenient to them.

The managing TB coordinator is responsible for ensuring sufficient information on the index case is provided (including relevant laboratory tests, infectious period, and drug susceptibility results when available) to ensure appropriate screening of contacts, and ongoing management for those identified as having LTBI or TB disease.

Screening results for contacts referred to another TB service must be provided back to the TB service managing the index case within four months. However, if contacts are found to have TB disease, or have a tuberculin skin test (TST) or interferon-gamma release assay (IGRA) conversion the results should be immediately provided to the TB service managing the index case.

Summary contact investigation data are required to be entered on the Notifiable Conditions Information Management System (NCIMS) by the TB service managing the index case. Process indicators and outcomes of contact investigations should be reviewed and signed off on a routine basis by a designated person in the LHD who is able to assess the quality and completeness of the investigation. Depending on the LHD governance structure, this may be the TB Director, Public Health Unit (PHU) Director, local TB Advisory Committee or other appropriate clinician or unit.

2.2 Large and/or complex contact investigations

The LHD TB coordinator and/or TB director should notify the NSW TB Program and their local PHU director of contact investigations where:

- Screening involves a healthcare facility or educational institution;
- Screening may attract media interest or may cause large scale public concern;
- Large screenings (where more than 25 contacts at high risk of exposure are identified); and
- Situations where a high or medium infectiousness index case spent greater than eight hours on an aircraft, and
- Contact investigations that cross state and/or international jurisdictional borders.

TB services should consult the NSW TB Program and PHU director for any other contact investigations where there are issues or concerns. These include but are not limited to:

- Situations involving multi-drug resistant (MDR) or extensively drug resistant (XDR) TB index cases; and
- Complex social issues which may impede identification of contacts.

An expert panel to support the contact investigation for large and/or complex situations can be convened at the request of the TB service, PHU and/or NSW TB Program. The expert panel should include the Communicable Diseases Branch Director, NSW TB Program Manager, treating physician, TB coordinator(s), PHU director(s), and other experts as required. Other relevant parties should be briefed as appropriate prior to and following the expert panel meeting.

In large and/or complex investigations, TB services should work in collaboration with their local PHU. Whilst the TB coordinator and/or TB director maintain overall responsibility for the contact investigation, PHUs should provide assistance including surge capacity, data

management, public communication support, and assistance with decision making around the investigation.

2.3 Timing and extent of contact investigations

Contact investigation must be undertaken following a comprehensive, yet timely, risk assessment of the infectivity of the index case and development of a contact screening strategy, according to the timeframes outlined in section 3.5.1 and Attachment 1. The risk of transmission should guide the priority and urgency of the contact investigation. Where it has been determined that a person requires screening, TB service staff should notify the person of their potential exposure, their risk, and offer assessment and screening according to these guidelines.

2.4 Clusters identified by molecular methods

Molecular epidemiological methods such as 24-locus mycobacterial interspersed repetitive-unit (MIRU-24) and whole genome sequencing (WGS) can be used to evaluate transmission between cases and confirm or exclude suspected linkages. The NSW TB Program regularly evaluates clusters identified by WGS analysis and those with links to previous WGS or MIRU-24 clusters; and compares these to available epidemiological evidence. In the event that insufficient epidemiological evidence is available further investigation may be requested by the NSW TB Program. WGS results are managed in a centrally located database within Health Protection NSW, and information related to clusters provided to LHD TB Coordinators as required.

Where transmission is identified through WGS investigations, further investigation for an index case, and/or extension of previous contact investigations may be required.

3 CONDUCTING CONTACT INVESTIGATIONS

TB services should undertake the following steps to identify, prioritise and screen contacts:

1. Define the infectiousness of the index case;
2. Determine the likely infectious period of the index case;
3. Investigate previous known exposure to TB of the index case to identify a potential source of their infection;
4. Identify contacts, and prioritise according to their exposure risk and vulnerability for disease progression, and;
5. Assess and screen contacts.

3.1 Define the infectiousness of the index case

Ultimately, the infectiousness of a case is assessed by how many people develop infection after exposure. While that information is being gathered, the likely degree of infectiousness of the index case can be guided by clinical, radiological, and laboratory findings (Table 1).

Table 1. Classification of infectiousness of index case

Likely infectiousness of the index case	Clinical, radiological and laboratory findings
High	• Smear positive pulmonary disease (detection of acid fast bacilli [AFB]) in sputum and/or bronchial lavage specimen; • Laryngeal involvement, or; • CXR cavitation, or; • Evidence of likely transmission to contacts.
Medium	• Sputum and/or bronchial lavage specimen culture or PCR positive, but smear negative[#].
Low	• Presumptive pulmonary TB but sputum and/or bronchial lavage specimens smear[#] and culture negative, or; • Presumptive pulmonary TB where no specimen could be obtained, or; • Pleural TB (where pulmonary disease has been excluded), or; • Other extrapulmonary disease (where pulmonary disease has been excluded) excluding laryngeal TB.

[#] Negative sputum smear status should be determined based on three separate spontaneous sputum specimens collected 8 to 24 hours apart, with at least one being an early morning collection, or where spontaneous sputum cannot be obtained, a single induced sputum specimen.

Patients found to be AFB smear positive on sputum and/or bronchial lavage should be considered to have TB disease unless:

- The PCR test is negative and clinical suspicion of TB is low, or;

- The culture is negative for *M. tuberculosis* complex and positive for a nontuberculous mycobacteria.

3.2 Determine the infectious period

The start of the infectious period should be considered to be three months before the TB diagnosis, or when symptoms were first recognised by the index case (whichever is the longer duration). In some circumstances, an earlier start date should be used (i.e. in the event of a protracted, symptomatic illness, if the index case has large lung cavities which imply prolonged illness and infectiousness, or where an immunosuppressed index case has symptoms that may have gone unnoticed leading to a longer infectious period).

For the purpose of contact investigation, the index case is no longer considered infectious if effective treatment has been given for two weeks or more and:

- The case is adherent to the prescribed treatment, and;
- Clinical improvement is observed, or the patient continues to be asymptomatic, and;
- There is evidence of a mycobacteriological response (i.e. a decrease in grade of sputum smear positivity detected on microscopy), or negative smears remain negative, and;
- There is no indication of resistance to the prescribed treatment.

Where an index case shows signs of extended infectiousness, such as slow smear and/or culture conversion, or subsequent drug susceptibility results that render initial treatment not effective, TB services should reassess for further contacts following diagnosis.

More stringent criteria for determining the end of the infectious period should be applied for cases who are returning to congregate living settings (i.e. nursing homes, homeless shelters, correctional facilities), or cases in close contact with infants or immunosuppressed individuals. In these circumstances, cases should have at least three consecutive sputum specimens that are smear negative (AFB not detected) and PCR negative, with specimens collected 8 to 24 hours apart. At least one specimen should be an early morning specimen. If the patient is unable to produce a spontaneous sputum specimen, one induced sputum specimen that is smear negative (AFB not detected) and PCR negative should be obtained prior to returning to a congregate setting or to close contact with infants or immunosuppressed individuals.

3.3 Investigate for a potential source case

The index case should be interviewed to determine their TB exposure risks, and asked to identify if they have had contact with anyone that has had TB. Where a potential source case is identified, further details should be obtained to clarify when and where the contact occurred, and any additional information to assist in managing the index case (e.g. whether the presumed source case may have drug resistant TB).

Where a potential source case from NSW is identified, the NSW TB Program should be advised so additional molecular sequencing can be requested to confirm transmission

along with the TB service responsible for the source case as the contact investigation for the source case may need to be extended.

3.4 Identify and prioritise contacts

The index case should be interviewed as soon as possible to obtain the details of contacts, including demographic and contact details. Information should be sought on any contacts the index case knows to have symptoms suggestive of TB, have an immunosuppressive condition, or are children under five years of age as an initial priority. Information regarding settings and locations that the index case attended during the infectious period should be sought.

Locations to be considered include the index case's home, work, school and other educational settings, and places of leisure (e.g. church groups, sporting groups, and bars). Information on environmental factors should be sought and considered including size of enclosed spaces, crowding, and adequacy of ventilation. Air volume, exhaust rate and circulation also predict the likelihood of transmission in an enclosed space. Field investigation of locations may be useful to identify these environmental factors. Information on travel during the infectious period should be obtained, including any aeroplane flights of eight hours or longer duration (see Section 6 Special Circumstances).

Multiple interviews might be required to develop a rapport with the index case to identify all possible contacts. Where cases are unable or unwilling to name specific contacts, a social network analysis method may be more effective than the traditional interview-based approach (2). It may also be useful to visit the home of the index case to conduct interviews and ensure referral of all household contacts for evaluation.

3.4.1 Exposure risk classification of contacts

The exposure risk for individual contacts is determined by the intensity, frequency and cumulative duration of time they spent with the index case during the infectious period. Contacts should be classified into high, medium and low exposure risk to assist prioritisation of screening activities (Table 2). Individual circumstances and risk may vary amongst groups of contacts. Additional information may become available so these classifications should be reassessed throughout the investigation.

Table 2. Contact exposure risk classification

Exposure risk classification	Example groups
High exposure risk Frequent, prolonged and close contact with the index case **(cumulatively ≥8 hours*)** OR	• All people living in the same household or dwelling as the index case (including household-like settings such as patients sharing a hospital room); • Non-household close contacts who shared an enclosed space, such as a social gathering place, workplace or educational setting, for extended periods; • Contact during other high risk social activities such as singing in enclosed settings or sharing smoking implements (e.g. bongs);

Unprotected exposure to high risk medical procedures^	• Contacts exposed during high risk medical procedures without adequate personal protective equipment.
Medium exposure risk Frequent but less intense contact with the index case **(cumulatively 4-8 hours*)**	• Other close relatives, friends, students in the same classroom, work colleagues, and neighbours who are not included in the high risk group.
Low exposure risk Casual contact with the index case **(cumulatively <4 hours*)**	• Other contacts at school, in the workplace, in medical environments, or extended family and friends who were seen occasionally, and others not included in high or medium risk groups.

*Timeframes provide a rough guide to risk. Theoretically, no amount of exposure TB is absolutely without risks, and the threshold for significant risk has not been adequately quantified (3-5).
^Procedures likely to generate aerosolised particles containing *M. tuberculosis* as defined in the Key Definitions.

3.4.2 Contacts with increased vulnerability to TB disease progression

Due to intrinsic and/or acquired conditions, certain contacts may be more vulnerable to primary infection or progressing from LTBI to TB disease. Contacts with high vulnerability to disease progression should be offered screening at a reduced exposure risk. Contacts with other factors conferring increased vulnerability should also be considered for screening at a reduced exposure risk (Table 3).

Table 3. Classification of contacts with high vulnerability to disease progression

Vulnerability classification	Risk groups
High vulnerability	• Children aged less than five years old, especially the very young (<2 years of age); • People with significant immune suppression due to illness; • People receiving immunosuppressive agents; - Cancer chemotherapy agents - Anti-rejection drugs for organ transplantation - Tumour necrosis factor antagonists (anti-TNF α) - At least 15mg of prednisone (or equivalent) daily for more than four weeks, or • Other drugs associated with impairment of the immune response to TB.
Other increased vulnerability	• People with medical conditions such as; - Solid and haematological malignancy - Silicosis - Poorly controlled diabetes mellitus, or - Chronic kidney disease • People that are malnourished or have malabsorption including; - History of gastrectomy or jejunoileal surgery

	• People who have excessive alcohol intake or are injecting drug users (6, 7).

3.4.3 Prioritise contacts for assessment and screening

The infectiousness of the index case and the contact's level of exposure and vulnerability are the most important determinants when prioritising contacts for screening. The investigation must prioritise those most likely to have been infected; that is, those with the highest level of exposure to highly infectious cases, and those with high vulnerability regardless of their exposure risk classification (Table 4).

Screening of all contacts identified for first round assessment should be completed within the timeframes described in section 3.5.1 and Attachment 1.

Table 4. Screening priorities according to exposure risk classification and infectiousness of the index case

<table>
<tr><th rowspan="2">Exposure risk classification</th><th colspan="2">Infectiousness of index case</th></tr>
<tr><th>High/Medium</th><th>Low</th></tr>
<tr><td rowspan="2">High exposure risk</td><td>Screen household and other contacts at baseline and break of contact*</td><td>Evaluate household contacts to identify possible source case (particularly when index case is <5 years of age).
Consider screening of vulnerable contacts at baseline and break of contact*</td></tr>
<tr><td colspan="2">Screen contacts exposed to aerosolising events or procedures at baseline and break of contact*</td></tr>
<tr><td rowspan="2">Medium exposure risk</td><td>Screen vulnerable contacts at baseline and break of contact*</td><td>Consider screening of vulnerable contacts at baseline and break of contact*</td></tr>
<tr><td colspan="2">Contacts without risk factors for disease progression do not require screening unless evidence of transmission in the high risk contacts</td></tr>
<tr><td rowspan="2">Low exposure risk</td><td>Consider screening of vulnerable contacts at baseline and break of contact*</td><td>No screening necessary</td></tr>
<tr><td colspan="2">Contacts do not require screening, unless there is evidence of transmission in the medium risk contacts</td></tr>
</table>

*Where baseline screening is unable to be performed within two weeks of index case diagnosis, break of contact screening should still be performed after eight weeks (preferably 8-12 weeks following most recent exposure).

Following the concentric circles approach, where transmission from the index case to high risk contacts is found to have occurred, the investigation should be widened to include medium risk contacts (8). Where medium risk contacts are found to have been infected, low risk contacts should be assessed. Evidence for transmission could include: TB disease in a contact, TB clusters identified through molecular sequencing, TST or IGRA conversion, or a single positive TST or IGRA result in a person with no known risk factors other than contact with the index case. Where the index case is of high infectiousness and only a few high-risk contacts are identified with no evidence of transmission, if there are insufficient data on which to conclude likely infectiousness, a sample of the next risk group should be screened to enable conclusions to be drawn..

3.5 Contact assessment, screening and management

Contacts requiring screening should be notified via phone, email and/or letter, and all communication attempts should be recorded in the patient's medical record. This communication should tell the recipient that they have been identified as being in contact with a person with infectious TB, their potential level of risk, and offer free assessment

and screening. The confidentiality of the index case must be protected in correspondence and communication with the contact unless the index case has provided consent for the release of their identity.

If a contact does not respond to the initial notification, all available methods of contact should be attempted. If a contact phone number is available, at least three attempts to call should be made on different days, and preferably different times. Short Message Service (SMS) may be considered if there has been no response to phone calls or voicemail. If a mailing address is recorded, at least one letter should be sent by registered post if no other method of contact has been successful. Where known, provisions need to be made for individuals who are of non-English speaking background to have this written communication translated into their preferred language. The TB/ service director must be informed where a contact cannot be contacted within the timeframes specified in section 3.5.1 and Attachment 1, or refuses screening.

3.5.1 Baseline and break of contact assessments

Contacts should be assessed at baseline (within two weeks following most recent exposure during the infectious period) and at break of contact (at least eight weeks [ideally 8-12 weeks] after the date of most recent contact with the index case during the infectious period) as per the contact screening and management flow chart (Attachment 1).

Contacts should be provided with education on TB symptoms and transmission, and the need to adhere to the prescribed follow up plan and treatment for LTBI (where appropriate). Contacts should be counselled to seek medical attention if they develop signs and symptoms of TB disease.

A clinical and risk exposure history should be taken to:

- Check for symptoms of TB disease (prolonged cough, prolonged sputum production, any haemoptysis, unexpected weight loss, fevers and/or night sweats, fatigue, etc.);
- Where possible, clarify the contact's level of exposure to the person with TB disease (while maintaining index case confidentiality);
- Check previous TB exposure risk (e.g. high risk travel);
- Check for presence of coexisting medical conditions or therapy which may increase the risk of progression from LTBI to TB disease, and;
- Check for previous history of TB or LTBI, previous screening for TB and LTBI and previous BCG vaccination.

Screening for LTBI can be performed using TST or IGRA, in accordance with existing guidelines (9, 10). IGRA should be considered for contacts with a history of BCG vaccination, or a past TST reaction. The break of contact test should use the same test type as the baseline test. If the second TST/IGRA is also negative and the contact is well, no further follow-up is required.

Contacts with a positive TST/IGRA result at baseline or break of contact should be requested to undertake a CXR and review by a TB clinician to assess for TB disease or

offer treatment for LTBI. Women who are pregnant at the time of screening should be assessed by a TB clinician before a CXR is performed, to assess the need for the test. The online lifetime risk of TB progression/reactivation (11), available at http://www.tstin3d.com/en/calc.html, may be a useful tool to guide management. Treating clinicians are responsible for individual case management with TB services to support adherence to the prescribed treatment therapy and/or CXR surveillance.

3.5.2 Screening of children aged less than five years

All child contacts aged less than five years should be screened. In settings with low rates of BCG immunisation, such as Australia, both IGRA and TST are acceptable options for LTBI diagnosis, but neither is 100% sensitive or specific. IGRA has increased specificity especially during the first 2-5 years of life (if vaccinated at birth), whilst TST has increased sensitivity in this age group (10, 12, 13).

Children aged less than five years that have been in close contact with a case of infectious TB should be screened for active disease (perform a CXR if any suspicious symptoms or signs) and be commenced on preventive therapy (window prophylaxis) irrespective of the baseline TST/IGRA result, until break of contact screening is completed.

3.5.3 Screening of immunosuppressed contacts

Both TST and IGRA are acceptable for LTBI testing in immunocompromised patients, however both should be performed if the risk of LTBI is considered high; a diagnosis of LTBI would be made by a positive result in either test (10). Contacts with severe immunosuppressive conditions that reduce the sensitivity of TST and/or IGRA should have a CXR and be referred for clinical review, irrespective of the TST/IGRA result.

3.5.4 Clinical management of pregnant women

Pregnant women found to have symptoms consistent with TB disease or a positive TST/IGRA result should be referred for urgent clinical assessment by a TB clinician. The treating team, in consultation with the woman's maternity team, should determine management of active TB, or whether treatment of LTBI should be given or deferred until after delivery if active TB is excluded.

3.5.5 Clinical management of contacts of multi-drug resistant TB cases

The management of contacts with LTBI attributed to an index case with multi-drug resistant TB (MDR-TB) must be discussed at an expert panel. The contact should be monitored by CXR at baseline, 6, 12, 18, and 24 months. The contact should also be counselled about the signs and symptoms of TB disease and the importance of timely presentation to health facilities if TB symptoms occur. There is limited evidence on the use of preventive therapy in contacts of MDR-TB however randomised studies to evaluate the effectiveness of regimens to prevent MDR-TB are currently in progress (14).

4 SPECIAL SITUATIONS

4.1 Contact investigation in hospital settings

The TB service should liaise with hospital Infection Control and/or Staff Health to support the contact investigation process. Depending on the size and complexity of the investigation and the structure of local services, Infection Control and Staff Health units may be best placed to coordinate the process.

Contacts should be classified and managed as per Section 3.4.1. Room co-habitants of the index case should be considered household-like contacts if there was more than eight hours exposure and therefore be categorised as high exposure risk contacts. Staff performing/assisting in high TB transmission risk procedures without appropriate personal protective equipment should be classified as high exposure risk contacts regardless of the duration of exposure.

4.2 Contact investigation in NSW correctional facilities

Justice Health and Forensic Mental Health Network (JH&FMN) are responsible for coordinating contact investigations in NSW correctional centres in consultation with the NSW TB Program. Individual arrangements will need to be made for contact investigations involving NSW privately operated correctional facilities.

A risk assessment should be made for inmates/custodial patients, JH&FMN staff, and Corrective Services NSW staff, based on the environment and the structural functioning of the correctional centre, and the likelihood of contact with the index case of more than eight hours. Cell co-habitants of the index case should be considered household-like contacts if there was more than eight hours exposure. JH&FMN clinical staff performing/assisting in high TB transmission risk procedures without appropriate personal protective equipment should be classified as high exposure risk contacts regardless of the duration of exposure. Contact details for released inmates/custodial patients and Corrective Services NSW staff can be obtained from Corrective Services NSW following consultation with JH&FMN and the NSW TB Program.

Screening for inmates/custodial patients in NSW correctional centres that are contacts of a non-custodial index case can be requested through the Justice Health and Forensic Mental Health Network TB coordinator.

4.3 Contact investigation in aged care facilities

The primary objective of screening elderly people in aged care facilities is to identify and treat contacts with TB disease, rather than LTBI. Where contacts are identified in residential care facilities, the facility and the resident's general practitioner should be informed of the TB exposure, the signs and symptoms of TB, and be asked to notify the TB service should any signs or symptoms of TB arise.

Contact screening using symptom assessment and CXR is preferred for evaluating the likelihood for TB disease amongst elderly contacts. Residents with a normal baseline

CXR should have a follow up CXR at 6 months, 12 months, and 24 months after the baseline CXR.

4.4 Contact investigation for cases that travelled on international flights whilst infectious

Aeroplane travellers with infectious TB can pass the infection to other passengers in the same aeroplane however, recent evidence suggests this is uncommon (15). The Australian national guidelines advise that contact investigation of airline passengers is more likely to be necessary if:

- The case was symptomatic at the time of travel;
- Sputum specimens are found to be direct smear positive for AFB;
- The flight had a duration of eight hours or more;
- The time elapsed between flight and notification of case is within three months (16).

According to international guidelines, screening is only recommended for flights of eight hours or more (including time on the ground), and for passengers who travelled in the same row and two rows fore and aft of the index case (17-19). Contact investigation for passengers exposed to an infectious crew member is generally not required due to the limited exposure time of passengers to crew members.

TB services should advise the NSW TB Program of cases that travelled on an international flight during their infectious period and meet the Australian guidelines for contact investigation of airline passengers above. The case's name and date of birth, (as per their passport), flight details (date, airline, flight number, origin, destination and seat number if known), and clinical presentation/diagnosis information (symptoms, laboratory results including smear status and drug susceptibility testing if available). The NSW TB Program notifies the Commonwealth Department of Health National Incident Room (NIR).

The NIR liaises with the airline and the Department of Home Affairs to identify passengers sitting in close proximity to the infectious case. The NIR provides airline passenger cards for NSW contacts, which are distributed to the relevant TB services for assessment and screening. Passenger information provided by the airline is to be treated as highly confidential and not to be unlawfully disclosed.

4.5 Contact investigation with Aboriginal people and communities

Respect for the socio-cultural environment for Aboriginal people is essential to identify, screen and treat contacts of TB cases who are Aboriginal and/or Aboriginal TB contacts. Building trust and rapport with the index case and family is essential along with a flexible approach to service delivery that focuses on the families and communities being supported.

With respect for the case/family preference for who is their health-based associate(s), and care with confidentiality, partnerships with local Aboriginal staff and services working closely with Aboriginal peoples should be developed. Two-way sharing of knowledge

between TB services and Aboriginal staff and services will reveal local enablers and barriers to contact investigation, assist design of culturally appropriate services, and promote ownership by Aboriginal people. The approach needs to be repeated for each case of TB that occurs.

The people at higher risk of TB may not be effectively engaged if the regular methods of risk assessment are used. For example ‘household contacts’ may be a different understanding to the Aboriginal families involved to what the understanding is of the TB Services. The best method of contact investigation with Aboriginal peoples is a method that is co-developed each time with the families and people involved.

5 MONITORING AND EVALUATION

Data collection for monitoring and evaluation has three broad purposes:

1) Management of care and follow-up for individual index cases and contacts;
2) Monitoring progress of individual contact investigations; and
3) Evaluate investigations to assess performance against program objectives.

5.1 Data for reporting

Aggregated data on the process and outcomes of a contact investigation should be entered into NCIMS for each notified case (Table 5).

Table 5. NCIMS contact investigation data

Field	Data field description	Definition
1	Number of contacts identified	Total number of contacts (all ages) identified as requiring screening
2	Number of contacts that completed screening	Total number of contacts (all ages) that completed screening (either a positive baseline screening; or break of contact screening using TST, IGRA, or CXR)
3	Number of contacts with active TB	The number of contacts (all ages) identified as having active TB disease through contact screening
4	Number of contacts with TST/IGRA conversion	The number of contacts (all ages) who had a TST or IGRA conversion
5	Number of contacts with a single positive TST/IGRA	Number of contacts (all ages) with a single positive TST or IGRA on either baseline or break of contact screening - excluding TST or IGRA conversion
6	Number of contacts commenced on preventive treatment	Number of contacts (all ages) commenced on preventive treatment
7	Number of contacts commenced on CXR surveillance	Number of contacts (all ages) commenced on CXR surveillance
8	Number of contacts that completed preventive treatment	Number of contacts (all ages) that completed preventive treatment
9	Number of contacts that completed CXR surveillance	Number of contacts (all ages) that completed CXR surveillance
10	Number of household contacts <5 years of age identified	Number of household contacts <5 years of age identified as requiring screening
11	Number of household contacts <5 years of age that completed screening	Total number of household contacts <5 years of age that completed screening (either a positive baseline screening or a break of contact screening using TST, IGRA, or CXR)
12	Number of household contacts <5 years of age that tested TST/IGRA positive	Number of household contacts <5 years of age that tested TST/IGRA positive on baseline or break of contact screen, regardless of evidence of conversion
13	Number of household contacts <5 years of age commenced on preventive treatment	Number of household contacts <5 years of age that tested TST/IGRA positive on either an initial or break of contact screen commenced on or continued on preventive treatment

14	Number of household contacts <5 years of age that completed preventive treatment	Number of household contacts <5 years of age that completed preventive treatment (excluding window prophylaxis ceased after a negative break of contact screen)

5.2 Contact investigation indicators

The effectiveness of contact investigations should be evaluated using key indicators (Table 6). Evaluation activities should assess processes and outcomes, and be used both during and after the contact investigation. Contact investigations can be evaluated for individual index cases; and aggregated to evaluate effectiveness of TB services, LHDs, and at a state wide level. For NSW TB Program reporting, indicators will be assessed for laboratory confirmed pulmonary cases only.

Table 6. Contact investigation indicators

Indicator	Definition
Initial processes - evaluated during or up to six months post diagnosis of the index case	
Proportion of cases who had a contact investigation carried out	The number of cases where the number of contacts was not blank, divided by the number of TB cases
Proportion of contacts that completed screening	The number of contacts that completed screening, divided by the number of contacts identified
Proportion of household contacts <5 years of age that completed screening	The number of household contacts <5 years of age that completed screening, divided by the number of household contacts < 5 years of age identified
Short-term processes – evaluated during or up to six months post diagnosis of the index case	
Proportion of contacts with LTBI commenced on preventive treatment	The number of contacts commenced on preventive treatment, divided by the sum of the number of contacts with TST/IGRA conversion and the number of contacts with a single positive TST/IGRA
Proportion of household contacts < 5 years of age with LTBI commenced on preventive treatment	The number of household contacts < 5 years of age commenced on preventive treatment, divided by the number of household contacts <5 years of age that tested TST/IGRA positive
Long-term outcomes - evaluated 24 months post diagnosis of the index case	
Proportion of contacts who completed preventive treatment	The number of contacts that completed preventive treatment, divided by the number of contacts commenced on preventive treatment
Proportion of household contacts <5 years of age that completed preventive treatment	The number of household contacts <5 years of age that completed preventive treatment, divided by the number of household contacts <5 years of age commenced on preventive treatment
Proportion of contacts that completed CXR surveillance	Number of contacts that completed CXR surveillance, divided by the number of contacts commenced on CXR surveillance
TB disease in contacts not evaluated during contact investigation	Number of cases with TB disease that were not evaluated during contact investigation, identified by whole genome sequencing or subsequent epidemiological links

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LIST OF ATTACHMENTS

1. Contact screening and management flow chart

Attachment 1: Contact screening and management flow chart