

Recommendations for Investigating
Contacts of Persons with Infectious Tuberculosis
in Low- and Middle-income Countries

Adaptation & Implementation Guide



2015

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Perhaps the most important lesson learned is that there is no substitute for in-country experience.

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List of Abbreviations

AFB	Acid fast bacilli
ART	Antiretroviral therapy
ATS	American Thoracic Society
CI	Contact investigation
CITC	Curry International Tuberculosis Center
COPD	Chronic obstructive pulmonary disease
CXR	Chest x-ray
DOT	Directly observed treatment
DOTS	The internationally recommended tuberculosis control strategy
GIS	Geographic information system
HIV/AIDS	Human immunodeficiency virus/Acquired immune deficiency syndrome
IGRA	Interferon gamma release assay
IPT	Isoniazid preventive therapy
ISTC	<i>International Standards for Tuberculosis Care</i>
LTBI	Latent tuberculosis infection
M+E	Monitoring and evaluation
M/XDR-TB	Multi-drug resistant / Extensively-drug resistant tuberculosis
NAAT	Nucleic acid amplification test
NTP	National tuberculosis program
NTLP	National tuberculosis and leprosy program
PLHIV	Persons living with HIV
PTB	Pulmonary tuberculosis
SOP	Standard operating procedure
SS	Sputum smear
TB	Tuberculosis
TB/HIV	Tuberculosis combined with HIV infection
TST	Tuberculin skin test
USAID	United States Agency for International Development
WHO	World Health Organization



Nurse and community health worker training for MDR-TB contact investigation activities in Jakarta, Indonesia

Introduction

Contact investigation may result in earlier identification of cases, possibly leading to decreased disease severity and reduction in transmission of M.tb.

Rationale for Contact Investigation

The systematic evaluation of persons who have been exposed to potentially infectious cases of tuberculosis (tuberculosis contact investigation) can be an efficient, targeted approach to intensified tuberculosis case finding that is most effectively conducted by tuberculosis control programs. Systematic reviews of published studies from low- and middle-income countries showed that a pooled average of 3.5%-5.5% of people in the household of, or in other close contact situations with a person who has infectious tuberculosis, are themselves found to have previously undiagnosed active tuberculosis.^{1,2} These findings suggest that contact investigation (CI) may result in earlier identification of cases, possibly leading to decreased disease severity and reduction in transmission of *Mycobacterium tuberculosis* (*M.tb*). Despite this potential benefit, there are only a few high to medium tuberculosis incidence countries that routinely perform CI.

In addition to finding previously undiagnosed cases, CI may also identify persons with latent tuberculosis infection (LTBI) who are high priority candidates for isoniazid preventive therapy (IPT).³

Objectives of the Guide

This *Adaptation and Implementation Guide* is intended to provide general guidance and present examples of experiences in implementation of CI in low- and middle-income settings. The World Health Organization (WHO) policy document *Recommendations for Investigating Contacts of Persons with Infectious Tuberculosis in Low- and Middle-Income Countries*⁴ presents definitions and recommendations for what **should** be done; this document presents suggestions and examples of **how** the recommendations can be put into operation.

An important lesson learned in implementing CI in a variety of settings (both across and within countries) is the “one size fits none” concept. Presented here are many examples and models, yet, it is important to recognize that each setting is unique and will present

its own circumstances. Thus, adjustments and adaptations must be made to accommodate to local conditions. Contact investigation is a simple public health concept, but implementation requires a series of complicated processes that commonly differ from place to place. For this reason adaptation to the local context is essential. The criteria by which index cases and their contacts are prioritized for evaluation, the model of CI to utilize, and the number and type of staff to involve, will all depend on local circumstances. These include the local epidemiology of tuberculosis, the prevalence of risk factors for tuberculosis, and the numbers and distribution of cases within the area. Most important is the availability of resources to support the program.

Throughout this *Guide* we offer a menu of the key programmatic, procedural, and monitoring and evaluation steps to consider when designing and implementing contact investigation activities. This menu is not exhaustive but includes key elements that must be taken into account in designing CI programs.

Process for Developing the Guide

The information on which the *Guide* is based was derived from three sources: 1) Four international workshops on tuberculosis CI were held in 2013-14; 2) descriptions of experience with CI implementation were solicited from workshop participants and others; and 3) personal experience of the authors in CI implementation. The workshops focused on the requirements and processes to implement appropriate CI based on the WHO recommendations. A key recommendation from these workshops was to develop regional experts on CI to provide technical assistance to national tuberculosis programs (NTPs). In line with this recommendation a meeting was held in June 2014 to conduct an expert consultant training on tuberculosis CI for technical experts from 13 countries.

This *Guide* is intended be a living document. We encourage interested NTPs and individuals or programs implementing CI to share their findings and build the evidence base on the feasibility, yield, and cost-effectiveness of CI.

An important companion to this document is the WHO's, *Systematic screening for active tuberculosis: principles and recommendations*⁵, and the associated operational guide. This set of recommendations includes a number of examples of algorithms that may be used in evaluating contacts. In addition, the *Systematic screening* recommendations present data on other active case-finding activities and target groups, thus putting CI in a broader context.



Participants of expert consultant training on contact investigation, The Hague, The Netherlands, June 2014.

Photo taken by Jeroen van Gorkom.

Recommendations for Contact Investigation

Table 1 presents the WHO recommendations for conducting CI, together with the strength of the recommendation and the quality of the supporting evidence. The reviews of the literature conducted in support of the recommendations provided limited information on the approaches to and benefits of contact investigation in high-burden, low-resource settings. Thus, most of the recommendations are based on very low-quality evidence.

TABLE 1. **Recommendations for Contact Investigation**

RECOMMENDATION 1	<p>It is recommended that contact investigation be conducted for household and close contacts when the index case has any of the following characteristics:</p> <ul style="list-style-type: none"> • sputum smear-positive pulmonary TB • MDR-TB or XDR-TB (proven or suspected) • is a PLHIV • is a child <5 years of age <p>Strong recommendation, very low-quality evidence</p>
RECOMMENDATION 2	<p>It is suggested that contact investigation be conducted for household and close contacts of all other index cases with pulmonary TB, in addition to the index cases covered in Recommendation 1.</p> <p>Conditional recommendation, very low-quality evidence</p>
RECOMMENDATION 3	<p>Clinical evaluation of household and close contacts for active TB is recommended as a priority on the basis of their risk for having or developing active TB or for the potential consequences of the disease if it develops. Priority should be given to:</p> <ul style="list-style-type: none"> • people of all ages with symptoms suggestive of TB • children <5 years of age • people with known or suspected immunocompromising conditions (especially PLHIV) and contacts of index cases with MDR-TB or XDR-TB (proven or suspected) <p>Strong recommendation, very low-quality evidence</p>
RECOMMENDATION 4	<p>In settings of high HIV prevalence it is recommended that all household and close contacts be counseled and tested for HIV.</p> <p>Strong recommendation, very low-quality evidence</p>
RECOMMENDATION 5	<p>It is recommended that all household contacts of an index case who is a PLHIV should be counseled and tested for HIV.</p> <p>Strong recommendation, very low-quality evidence</p>
RECOMMENDATION 6	<p>It is recommended that all household and close contacts of people with TB who have symptoms compatible with active TB should receive counseling and testing for HIV as part of their clinical evaluation.</p> <p>Conditional recommendation, very low-quality evidence</p>
RECOMMENDATION 7	<p>PLHIV who are household or close contacts of people with TB and who, after an appropriate clinical evaluation, are found not to have active TB should be treated for presumed LTBI as per WHO guidelines.</p> <p>Strong recommendation, high-quality evidence</p>
RECOMMENDATION 8	<p>Children <5 years of age who are household or close contacts of people with TB and who, after an appropriate clinical evaluation, are found not to have active TB should be treated for presumed LTBI as per WHO guidelines.</p> <p>Strong recommendation, high-quality evidence</p>

Standard Definitions Used in Contact Investigation

An important effort in the creation of the WHO CI recommendations was developing consensus on a set of standard definitions, both to be used in the recommendations themselves as well as in future studies of CI. Use of these standard definitions will enable more uniform approaches to monitoring and evaluation of CI as a tuberculosis control intervention when implemented by tuberculosis control programs. Programs implementing CI should apply the standardized definitions in monitoring and evaluating not only the yield and cost-effectiveness of the activity, but also the longer-term impact on tuberculosis incidence in order to provide future guidance based on stronger evidence. The definitions are listed in Table 2.

TABLE 2. **Definitions for Contact Investigation**

TERM / CONCEPT	DEFINITION
<p>Index case (index patient)</p>	<p>The initially identified case of new or recurrent TB in a person of any age in a specific household or other comparable setting in which others may have been exposed.</p> <p>Remark: An index case is the case around which a contact investigation is centered. Because the investigation generally focuses on a defined group of potentially exposed persons in which other (secondary) cases may be found, the index case is generally the case identified initially, although she or he may not be the source case. Contact investigation may center on secondary cases if the exposed group differs from that exposed to the original index case.</p>
<p>Contact</p>	<p>Any person who has been exposed to an index case.</p> <p>Remark: Exposure may be intense or casual, easily identified or obscure. Close exposure, such as sharing a living or working space, is generally easily identified and quantified, whereas casual exposure, such as on public transport or in social situations, may be unidentifiable.</p>
<p>Household contact</p>	<p>A person who shared the same enclosed living space for one or more nights or for frequent or extended periods during the day with the index case during the 3 months before commencement of the current treatment episode.</p> <p>Remark: Definitions of ‘household’ vary considerably and must be adapted to the local context. Within households there is a gradation of exposure, ranging from sharing the same bed as the index case to living in the same compound but not in the same enclosed space. Quantification of the amount of exposure, estimated as the time spent with the index case, is likely to be highly subjective. For this reason, the infectious period for the index case is set somewhat arbitrarily at 3 months before initiation of treatment rather than relying on recall by the index case of the time symptoms began. The 3 month period is a general guideline; the actual period of infectiousness may be longer or shorter. For example, prolonged infectiousness may be associated with non-adherence (if directly observed treatment is not being used) or with unrecognized or untreated MDR-TB or XDR-TB.</p>
<p>Close contact</p>	<p>A person who is not in the household but shared an enclosed space, such as a social gathering place, workplace or facility, for extended time periods during the day with the index case during the 3 months before commencement of the current treatment episode.</p> <p>Remark: Out-of-household exposure is as likely to result in transmission as household exposure in many situations. Molecular epidemiological studies showed that transmission was likely to occur in social settings such as informal bars in Mexico and South Africa and in facilities such as correctional institutions and hospitals.^{6,7} Such sites (particularly social settings) are difficult to identify and require knowledge of the culture and of behavioral patterns in order to focus contact investigations.</p>

TABLE 2. [CONTINUED]

TERM / CONCEPT	DEFINITION
<p>Contact investigation</p>	<p>A systematic process intended to identify previously undiagnosed cases of TB among the contacts of an index case. In some settings, the goal also includes testing for LTBI to identify possible candidates for preventive treatment. Contact investigation consists of two components: contact identification and prioritization, and clinical evaluation.</p> <p>Remark: The rationale for contact investigation is that people who were recently infected with <i>Mycobacterium tuberculosis</i> are at increased risk for the development of active TB within 1-2 years after acquisition of the infection. It is assumed that people exposed to a person with infectious TB might recently have been infected and are thus at increased risk for currently having TB or for development of the disease in the near future.</p>
<p>Contact identification and prioritization</p>	<p>A systematic process to identify contacts with or at increased risk for development of TB. For purposes of these recommendations, the definition of contact identification and prioritization includes an interview with the index case to obtain the names and ages of contacts and an assessment of contacts' risk for having (generally based on the presence of symptoms compatible with TB) or developing TB, to determine those for whom clinical evaluation (defined below) is indicated.</p> <p>Remark: At a minimum, all index cases should be assessed with the above criteria, to determine whether contact investigation should be undertaken. For example, contact investigation would not usually be conducted for an index case with only extrapulmonary TB, except children <5 years of age, in whom investigations would be undertaken in an attempt to identify the source case.</p>
<p>Contact clinical evaluation</p>	<p>A systematic process for the diagnosis or exclusion active TB among contacts. Clinical evaluation is undertaken if the results of contact identification and prioritization indicate a risk for having or developing TB. For the purposes of these recommendations, the definition of contact clinical evaluation includes, at a minimum, a more extensive assessment of symptoms compatible with TB. Additional components may include:</p> <ul style="list-style-type: none"> • a more detailed medical history • a physical examination • microbiological assessment of specimens from sites of suspected involvement • radiographic examinations • invasive diagnostic tests <p>Implementation of these components will depend on the clinical circumstances and the available resources. In addition, depending on the epidemiological circumstances and resources, a tuberculin skin test or interferon gamma release assay for LTBI may be part of the clinical evaluation.</p> <p>Remark: The goal of contact investigation is to find previously undiagnosed cases of active TB. The goal of clinical evaluation is to diagnose or exclude TB and, in some situations, to identify and possibly treat LTBI. The approaches used depend on resources and circumstances; however, in all situations, contacts should be interviewed to determine whether they have symptoms consistent with TB, and they should be further evaluated if symptoms are present.⁸⁻¹⁰</p>

TB = tuberculosis; **DOT** = directly observed therapy; **M/XDR-TB** = multiple/extensive drug resistant tuberculosis; **LTBI** = latent tuberculosis infection; **TST** = tuberculin skin test; **IGRA** = interferon gamma release assay

General Operational Considerations

National and local tuberculosis control programs should determine the level of emphasis placed on CI based on local tuberculosis epidemiology, operational capacity, and resources.

These operational considerations were included in the *Recommendations for Investigating Contacts of Persons with Infectious Tuberculosis in Low- and Middle-Income Countries*⁴ and are repeated here to maintain continuity with the parent document. These considerations should be addressed in all CI planning, regardless of the situation.

Written Guidelines

All tuberculosis control programs should have written guidelines for the use of and approaches to CI. Contact investigation is an acknowledged standard component of tuberculosis control programs and, thus, should be included in program manuals. At a minimum the discussion should include the level of emphasis placed on CI, priorities for evaluation and roles and responsibilities of program personnel in conducting investigations, and collecting and recording of relevant data. If CI is to be undertaken, written standardized protocols and procedures should be developed and followed. Having such standardized protocols improves the efficiency and uniformity of the investigation and enables ongoing evaluation of the activity.

Determining the Level of Emphasis for Contact Investigation

National and local tuberculosis control programs should determine the level of emphasis placed on CI based on local tuberculosis epidemiology, operational capacity, and resources. In general, CI should be assigned a lower priority in countries or areas in which treatment success is less than 85%. However, in countries or areas in which there is a high prevalence of HIV or M/XDR tuberculosis, both of which reduce treatment success rates, CI may be a valuable intervention. Moreover, within countries there may be cities or regions where the local program is performing adequately, even though national rates for treatment success are below the goal; such localized areas may consider adopting additional case detection strategies such as CI.

Adaptation of Recommendations

The recommendations must be adapted to the local epidemiologic context and programmatic circumstances. Programs at national or local levels should examine the potential value and feasibility of CI in their particular setting and determine the extent to which CI should be undertaken and of the scope of the activity. Approaches will vary based on program factors such as availability of staff and resources, and definitions will vary based on diagnostic methods used and living customs and circumstances of the population. Contact investigation, with all the adaptations to the local context deemed necessary, should be tested in demonstration areas first and then scaled up. This approach would serve to inform local guideline development, determine the diagnostic yield in the local setting, and assess factors that influence the feasibility of full implementation.



“Households” can vary greatly across and within countries. Both dense populations (left) and very remote populations (right) present different kinds of barriers and challenges to conducting the household investigation.

A sense of urgency should be conveyed in conducting CI. Prompt interviewing of the index case is consistent with this sense of urgency.

Timing of the Interview and Identification of Contacts

When CI is initiated the index case should be interviewed as soon as possible after the diagnosis (generally within one week) to elicit the names of household members and other close contacts. The focus should be on household members, but persons in work-place and social settings in which there is a similar degree of exposure should not be ignored. Moreover, contacts in congregate living settings (residential care facilities, long term care facilities, jails and prisons) and acute medical care facilities, especially when the exposure has been via a cough-inducing procedure, should be evaluated. Ideally, the interview should be conducted by a person who speaks the same language as the index patient and is familiar with the social and cultural context. For patients who have died, investigation should still be conducted if information can be gathered from family members.

A sense of urgency should be conveyed in conducting CI. Prompt interviewing of the index case is consistent with this sense of urgency. Occasionally, however, a re-interview after the initial interview is useful to elicit additional contacts. Generally, more accurate and complete information can be obtained if the interview is conducted by a person who is familiar with the social and cultural context of the index case. Information from the interview should be recorded on standardized forms. The focus should be on household members, where the yield is potentially highest, but work-place and social contacts should not be ignored.

Conduct of the Investigation

If the human resources are available, the person conducting the CI should visit the home of the index patient to ensure that all contacts are interviewed and referred for evaluation when indicated. A home visit will serve to underscore the importance of the process. In addition, the visit can enable a more accurate view of the actual circumstances of the exposure. The home visitor can provide an environmental assessment of the residence, as well as family counseling and education regarding the symptoms that should prompt the contacts to seek medical attention. This is especially true for children and persons with HIV infection because of the rapidity with which tuberculosis can progress in these



Contact investigator conducting an interview with family members in rural Tanzania.

persons. The home visit may also provide an opportunity for identification of needed social support, and for education regarding tuberculosis and infection control measures that may be taken.

Monitoring and Evaluation

Data on CI should be collected in a standardized format. A sample form that may be used is shown in the Appendices. Tuberculosis control programs should routinely evaluate the effectiveness of the CI process and develop interventions to improve performance. On-going evaluation of the yield of active cases and of persons with LTBI should be conducted to determine if the intervention is yielding the desired results. At minimum the following information should be collected:

- number of investigations carried out
- number, age (especially children <5 years of age, sex and HIV status) of contacts identified
- number who complete medical evaluation and relevant investigations
- number with active tuberculosis
- number of children <5 years of age
- number of PLHIV given treatment for LTBI

Data collection for CI has multiple purposes. Systematic collection of the data will enable analyses of the yield of CI overall and for specific groups and specific epidemiologic settings. In addition, data collected in the form of indicators of care are useful for the evaluation of program performance objectives. Data collection and storage require significant work; an investment in developing data collection tools and setting up protocols for the collection, entry, and analysis of the data is required. If data are collected but not analyzed or used to inform the program, then the effort is wasted.

A more detailed description of potential indicators to collect and evaluate, including process indicators, are described in Section 8.

Confidentiality and Consent

Maintaining confidentiality during CI is a challenge due to the social connections between/ among the index case and his/her contacts. Index cases and their contacts should be treated with respect and confidentiality should be maintained. Existing program guidelines should be adhered to regarding confidentiality and consent.

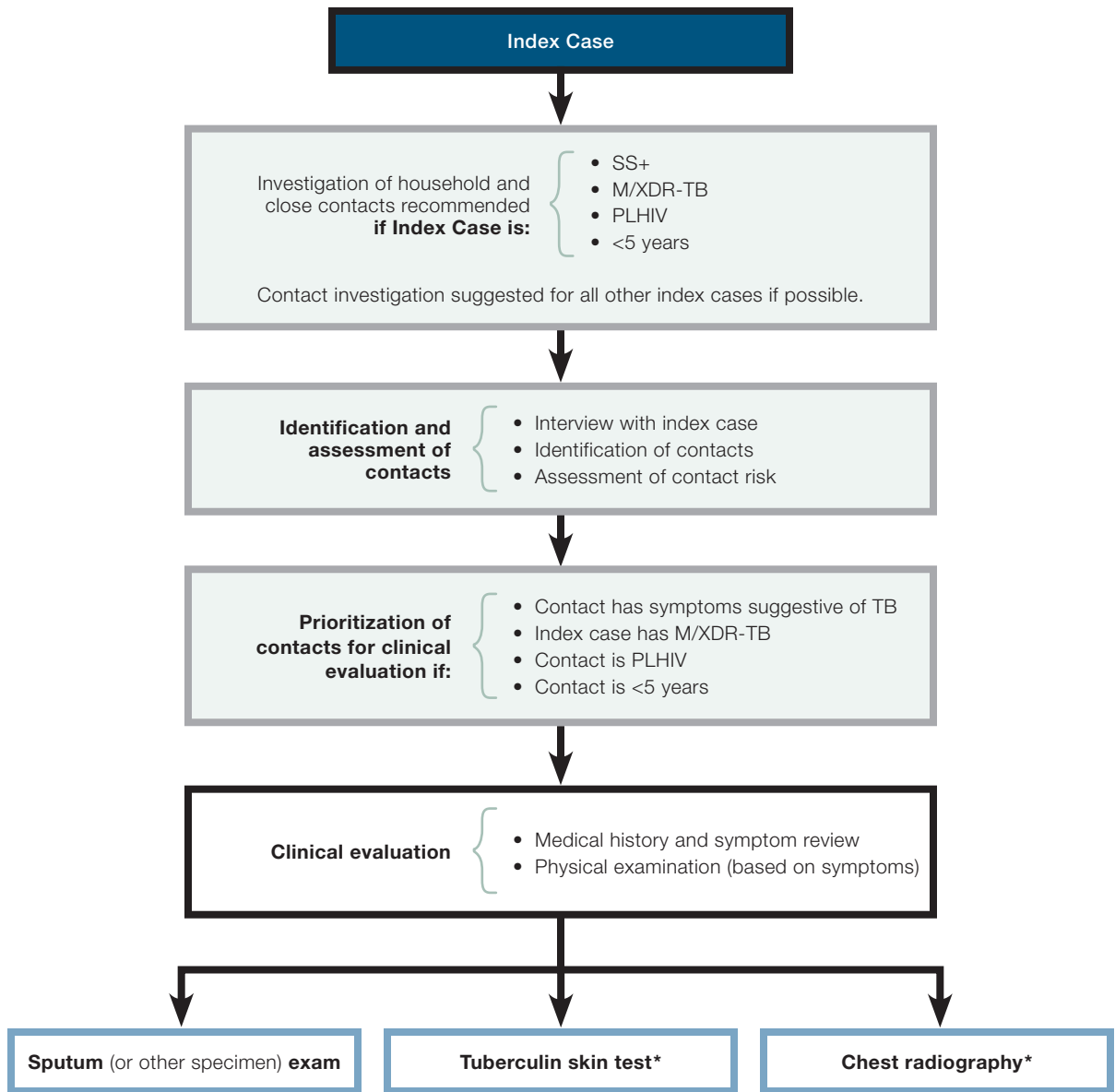
Staffing and Training

Contact investigation should be included in the routine activities of tuberculosis control programs. In settings where CI has never been done, having dedicated staff to carry out this function, if at all possible, will greatly facilitate the process. Depending on resources, the persons conducting the CI, if trained properly, may be community volunteers, former tuberculosis patients, or another alternative cadre of health care provider. Regardless of their backgrounds, the health care workers who screen the index case and who conduct the CI should speak the language of the cases and contacts and be familiar with the social and cultural milieu of the communities in which they work. They should be trained on the importance of CI in tuberculosis control and on interviewing skills, data collection, and the importance of follow-up and reporting.

Treatment for LTBI Among Contacts

The decision as to which test to use for detecting LTBI, the tuberculin skin test (TST) or an interferon gamma release assay (IGRA), should be based on national guidelines. These tests may be used to identify persons who are at increased risk of developing active tuberculosis and who, therefore, are possible candidates for treatment of LTBI other than children <5 years of age and PLHIV for whom preventive treatment is recommended as a programmatic intervention without testing for LTBI,^{11,12} once active tuberculosis is excluded. Because the value of treatment for LTBI as a public health intervention provided by tuberculosis control programs in low and middle income countries is not proven, it is not recommended as a broad programmatic approach. However, in caring for individual patients exposed to an infectious index case and who are at increased risk of developing tuberculosis if infected, clinicians may wish to test for LTBI and treat if LTBI is present. It is anticipated that, as the risks and benefits of treating LTBI associated with other diseases (such as diabetes mellitus) and conditions are quantified, indications for treatment may be broadened. Unless there is a plan that includes implementing policies and procedures for treating LTBI, testing for LTBI should not be undertaken.

FIGURE 1. **TB Contact Investigation at a Glance**



SS+ = Sputum smear positive; **M/XDR-TB** = multiple/extensive drug resistant tuberculosis; **PLHIV** = persons living with HIV

* Depends on policy and availability

Situation Assessment

Setting-Specific Factors Influencing the Design and Implementation of CI

Tuberculosis occurring in young children is evidence of ongoing transmission of M. tb in the community and should prompt more intensive CI.

The feasibility of and approaches to CI should be guided by an assessment of national and local circumstances and resources. Ideally such an assessment should be part of a larger situation assessment undertaken to develop overall strategies for active case finding, as described in *Systematic screening for active tuberculosis: principles and recommendations* and the associated implementation guide.⁵ However, investigation of household contacts of index cases is strongly recommended in all settings, therefore the situation assessment for CI should focus on the magnitude of the effort required and how to overcome potential barriers to implementation.

Epidemiology and Risk Factors for Tuberculosis

The incidence of tuberculosis in a given area and the distribution of cases will be major determinants of the approach to CI. In some situations the absolute number of cases will be such that the clinic staff is fully occupied with routine case detection and management. In other areas there may be relatively few cases but they are widely dispersed making home visits impractical. Similarly, programs should be aware of the prevalence and distribution of important tuberculosis risk factors and co-morbidities, especially HIV infection. A high community prevalence of HIV infections would elevate the priority for CI to be undertaken no matter what the number of cases. Tuberculosis occurring in young children is evidence of ongoing transmission of *Mycobacterium tuberculosis* in the community and should prompt more intensive CI.

Environment, Social Patterns, and Cultural Context

Knowledge of living circumstances, social patterns and cultural context is essential for a CI program to be successful. Such information would include, for example, the typical physical and social structure of households:

- Are houses open and well-ventilated or closed and poorly ventilated?
- Are the living and sleeping spaces shared or separate?
- What is the size of the shared space?
- Are the residents of the house stable or changing frequently?
- What is the extent of the “family”?

These and many other features of the household determine the number of persons to be considered as “household” contacts and their closeness and duration of exposure. These factors also influence the prioritization of exposed persons.

Important social patterns to be aware of would include knowledge of places in the community where persons frequently gather, for example, places of worship, social clubs, formal or informal drinking establishments, gaming places, and entertainment venues, among others.

In order for CI to be effective it must be designed and conducted in a way that is acceptable within the local culture. Stigma and discrimination related to tuberculosis are important concerns in conducting CI. The risk of stigmatization to index cases as well as their contacts will depend on the local culture and on how CI is conducted. Taking care to ensure that the activity is carried out in a manner that minimizes discrimination by including those who will conduct the investigations as well as members of the general community in the program planning process will help ensure acceptability of the program.

CASE STUDY

1

Results from focus group discussion post-contact investigation training and implementation phase in Dar es Salaam, Tanzania

During the implementation phase of the contact investigation project, we conducted focus group discussions with the health workers conducting the contact investigation. The goal was to better understand how contact investigation was working for all participants, and what the challenges and barriers were for the contact investigators and clinical managers. Valuable insights were gained through these focus group discussions, informing the implementation of contact investigation in this setting.

KEY LESSONS LEARNED:

The contact investigators unanimously reported enthusiasm for the job they were performing in their communities and the positive impact they felt it was having. They emphasized the benefits of contact investigation for community members that they observed as a result of performing contact investigation, including:

- delivery of health education to household members improves level of knowledge about TB
- improved knowledge helps reduce stigma felt and expressed towards family and community members with TB
- contact investigator's visit to the household helps ensure that the index patient understands the importance of completing their TB treatment
- contact investigator's relationship formed with the household creates a connection to the health system for a group that is at increased risk of many health challenges

The contact investigators expressed some needs and desires they had for continuing to deliver contact investigation:

- desire for more training on all aspects of TB and on how to deliver health education
- desire for continued support and interaction with each other and the clinical officers, in order to support each other in their work and to be fully integrated with the clinic health system
- need for continued financial support for transport to patients' households

The contact investigators identified some key barriers and challenges they faced in performing contact investigation:

- concern about infection control and protecting themselves from illness
- concern about how to deliver the intervention in a way that reduces stigma related to TB and does not cause any negative social consequences to the households
- challenge in the amount of time and money required to travel to patient households

The possible economic consequences of CI both for the index patient and his/her contacts also must be considered. It should be national policy that, at least in government facilities, clinical evaluation of contacts should be free of charge.

Legal and Economic Considerations

The potential legal and economic consequences of CI both for index patients and their contacts need to be understood and mitigated. Contact investigation focused on the place of employment of an index patient could cause the person to lose his/her job. In some instances immigrants could face potential deportation or other legal action. Ideally there should be legal or regulatory protections against these potential consequences of illness and public health interventions such as CI.

The possible economic consequences of CI both for the index patient and his/her contacts also must be considered. Travel to a health facility may entail transportation costs and loss of a day's wages or productivity. In some instances, unless the contact being evaluated is found to have tuberculosis, there are charges for clinic visits and examinations such as chest radiography. It should be national policy that, at least in government facilities, clinical evaluation of contacts should be free of charge.

Control Program Preparedness

Contact investigation is the only active case finding intervention that falls within the scope of work of the national or local tuberculosis control program, and, thus, is best situated within the program at the national as well as the local level. For this reason the program's infrastructure and resources need to be taken into account in assessing its preparedness for undertaking contact investigation. In general, basic tuberculosis services such as high quality diagnosis and treatment need to be in place before embarking on CI. In addition, the program will need to assess its capacity to manage additional cases detected through CI.

Laws, policies, and guidelines

Contact investigation should be governed and guided by international guidelines, national laws, policies and guidelines, and local implementation plans and procedures. The situation assessment may find that some (or all) of these elements are not in place and must be developed.

Capacity of staff

The situation assessment must include current staffing levels and the ability of existing staff to take on additional responsibilities. This consideration includes both numbers of staff and their training (discussed below). If available, country level data can be used to estimate the number of contacts to be evaluated and the staff time that will be required. Training needs should be assessed and appropriate plans made for specific CI focused training programs for existing or new staff.

Financial resources

The financial assessment will determine the adequacy of existing funding levels to accommodate new staff or other additional expenses. Adequate program planning and budgeting is crucial if the activity is to be successful and sustainable. If resources are not available, potential additional funding sources will need to be considered.



Typical household compound in Dar es Salaam Tanzania. Households often consist of smaller houses around a central communal area. What a household looks like may vary depending on setting but a consistent definitions of household should be used.

Formulating National Policy for Contact Investigation

National policies for CI must be consistent with and integrated into other relevant international, national, or local policies and guidelines.

Based on the results of the situation analysis, a national CI policy can be formulated. The policy should address many of the same areas as the situation analysis and attempt to fill the gaps identified. The WHO *Recommendations for investigating contacts of persons with infectious tuberculosis in low- and middle-income countries*⁴ should be used as the basis for the policy.

Legal and Regulatory Framework

As noted previously, an appropriate legal and regulatory framework will facilitate developing an effective national policy. The legal framework to support CI should include mandatory case notification to ensure that public health authorities are aware of all new and retreatment cases. Ideally, laws should be in place to prevent discrimination, especially in employment, because of illness or the need for clinical evaluation. In addition, there should be national laws or regulations that enable NTPs to provide services to patients of private physicians.

Integrated National Policies and Guidelines

National policies for CI must be consistent with and integrated into other relevant international, national, or local policies and guidelines. Local guidelines must align with other national and local tuberculosis control policies.

While national policies and guidelines are essential, they should allow flexibility in the approaches to implementation at the local level. Each clinic in which CI is done may have its own implementation plan and SOPs that adapt international and national policies and guidelines to the local context. Monitoring and evaluation is a critical part of local implementation. Thus, to enable uniform evaluation of CI, national policies should specify methods for monitoring and evaluation using internationally-recommended standardized definitions and indicators.

Objectives of Contact Investigation

The objectives of CI need to be stated clearly in the policy document because they have a major bearing on the structure of the program. The primary objective is to identify co-prevalent cases of tuberculosis, the assumption being that diagnoses can be established earlier, thereby minimizing transmission in the community and disease progression in the newly discovered cases. In addition, CI sometimes identifies candidates for treatment of LTBI; thus, national policies should also address the diagnosis and treatment of LTBI as recommended for those with certain risk factors by WHO.^{4,11,12}

There may be other objectives as well. For example, contact investigators may serve as the main liaison between the clinic and the patient, or, in some situations, with the community more generally. They also may identify other issues that may interfere with the patient's treatment adherence, as well as the need for specific sorts of social support.

Prioritization and Evaluation of Index Cases and Contacts

National policies should specify:

- prioritization of index cases and contacts for investigation
- algorithms for clinical evaluation

Priorities for CI should be clearly defined. Prioritization should reflect the objectives of the CI program, and, thus, will usually focus on index cases who are more likely to transmit the infection or circumstances in which persons at risk of developing tuberculosis have been exposed.

Suggested factors to consider in prioritizing index cases are detailed in *Recommendations for investigating contacts of persons with infectious tuberculosis in low- and middle-income countries*.⁴ Briefly, prioritization for CI is recommended for index patients who have the following characteristics:

- sputum smear-positive pulmonary tuberculosis
- MDR-TB or XDR-TB (proven or suspected)
- PLHIV
- children <5 years of age

Other factors may also be considered depending on the setting, such as geography, social or economic standing of the patient, and presence of other co-morbidities or risk factors.

Suggested prioritization of household contacts for clinical evaluation is also detailed in the *Recommendations*. Briefly, prioritization for clinical evaluation is recommended for contacts who have the following characteristics:

- symptoms suggestive for tuberculosis
- children <5 years of age
- people with known or suspected immunocompromising conditions (especially PLHIV)
- contacts of index cases with MDR-TB or XDR-TB (proven or suspected)

As with index cases, prioritization of contacts may also include other considerations, depending on the context and the model of CI used.

National policies should also specify algorithms to be used in evaluations and address the microbiological tests to be used for specific situations. These policies should be consistent with WHO recommendations for use of rapid molecular testing.¹³ Implementation of these policies will be dependent on the distribution of rapid molecular testing units within the country. The use of radiography in the evaluations should also be specified in national policies. National policy should specify that clinical evaluations for contacts should be free of charge.

Determining Screening and Clinical Evaluation Algorithms

An appropriate algorithm for screening of contacts and diagnosis of tuberculosis (and LTBI if applicable) should be established. Screening tests distinguish people with a high likelihood of active tuberculosis from those unlikely to have active disease. Those with a positive screening test will go on to undergo clinical evaluation and diagnostic testing to confirm or rule out tuberculosis. For a further description of common screening tests and algorithms, including their accuracy, yield, and costs, see the WHO's "*Systematic screening for active tuberculosis: Principles and recommendations*" and the associated implementation guide.⁵

Common screening tests used include:

- screening for cough lasting for longer than 2 weeks
- screening for any symptom compatible with tuberculosis, including:
 - cough of any duration
 - haemoptysis
 - weight loss
 - fever
 - night sweats
- chest radiography

Common diagnostic tests include:

- sputum-smear microscopy
- sputum culture
- rapid molecular test, such as Xpert MTB/RIF

The choice of screening algorithm for CI will likely be influenced by the following factors:

Objectives of contact investigation:

Diagnosis of active disease only, versus identification of both active disease and LTBI, will require different screening approaches.

Model of contact investigation used:

The availability and feasibility of screening tests will be largely determined by where the screening is to take place, for example screening done by health workers in the field (i.e. the index patient's home or workplace) will most likely involve symptom screening,

whereas screening done in a health facility may involve chest radiography or other tests. Similarly, the diagnostic test done will largely be determined by the diagnostic capabilities of the local health facilities, be they radiography, microscopy, rapid molecular tests, etc.

Costs of tests:

This includes costs of the test themselves (equipment, supplies, staff) as well as operational costs of conducting the screening.

Accuracy and yield of the algorithm:

Consideration should be given to the sensitivity of the screening and diagnostic tests used (i.e. their ability to detect tuberculosis in patients with the disease), and specificity (i.e. their ability to rule out tuberculosis in patients without the disease). These test characteristics will determine the proportion of prevalent cases that will be detected and the proportion of false positive results either in the screening or the clinical evaluation and, thus, will have an important impact on the costs of CI.

Tools are available that can assist with modeling the estimated costs and yield of CI according to the screening algorithm used.⁵

Budgeting

Once national policies are in place the NTP should, depending on the health financing system, either develop a comprehensive budget for CI or provide a standard template for local budgeting. The costs of various elements will depend on the approaches taken and the staffing required.

Implementation at the Local Level

Although considerable guidance for CI is provided by national policies, implementation takes place locally. Within a country there are considerable differences and a variety of circumstances that influence the way CI is most effectively conducted.

Effective implementation of a local CI strategy requires careful preparation, planning, monitoring, evaluation, and feedback. This section outlines the practical steps involved in implementing a successful and sustainable CI program at the local level. In this section, it is assumed that a situation analysis has been done, the objectives and prioritization have been determined, and funding has been established (as described in Section 6 above). Once a plan has been developed, budgets been approved, materials been prepared, local staff have been trained and materials distributed then implementation can begin.

Tuberculosis programs should pilot test CI by implementing it in a small number of districts to begin with, before expanding to a whole city, province, or country. This will provide time to observe early barriers to screening, and for program managers to visit local sites to support and advise local staff. Where possible, reporting of CI should be incorporated into routine reporting processes at the time the activity is initiated.

CASE STUDY

2

Piloting contact investigation procedures in Tanzania: Simple concept, complex implementation

Contact investigation under program conditions was designed, operationalized and pilot tested in one district of Dar es Salaam, Tanzania. After 6 months of pilot testing, the activities were assessed and modified.

A number of challenges to implementing the CI project as it was originally designed were identified:

- **Coordination:** Managing the project at a large number of diagnostic sites was difficult with the limited project staff, as it included supervising all district clinicians and contact investigators, tracking the delivery of sputum samples to the Central Reference Laboratory and results back to the project, and overseeing the overall flow of the case report forms and data for monitoring and evaluation.
- **Data management:** The pilot project was understaffed to manage the entry, tracking, and cleaning of all the data collected, resulting in delays in entering and organizing data, and difficulties completing the originally planned analyses due to missing data.
- **Infrastructure:** There were challenges encountered during the study that were beyond the jurisdiction of the study that also impacted TB services throughout the country. These included shortages of laboratory supplies (sputum cups, falcon tubes, reagents, etc.), TB medication, and HIV kits.

With these challenges identified, the operating procedures were revised. The number of diagnostic sites were reduced, the data management was overhauled, and a refresher training course was conducted to update the staff on new approaches and procedures.

Effective implementation of a local CI strategy requires careful preparation, planning, monitoring, evaluation, and feedback.

Developing a Manual of Procedures

The first step of implementation at the local level is to develop a clear and detailed manual of procedures. This is vital because it compels the program planners to think through the details of the activity, and provides a clear and comprehensive reference on how all parts of CI will be carried out. The manual of procedures should be discussed with and made available to all personnel involved in the activities.

The manual of procedures should address the following:

Detailed assignment of roles & responsibilities of all personnel including:

- supervision and coordination
- initiating CI for index cases
- conducting investigations of contacts
- clinical evaluation of prioritized contacts
- collecting and recording data
- analyzing data
- evaluating program performance and impact
- providing feedback

How and when to conduct the following activities:

- initiate a contact investigation
- interview the index patient
- conduct an investigation of the contacts
- refer relevant contacts for evaluation
- evaluate referred contacts and initiate treatment as necessary
- record and report data
- analyze data

Reporting and quality control processes:

- forms for collecting relevant data and instructions for use
- database system for compiling data
- monitoring and evaluation plan and schedule

Performance indicators to be measured and reported (process and outcome)

Engaging Local Stakeholders

There are considerable financial, administrative and human resource requirements to implement CI effectively and sustainably. Consequently, strong political commitment at a high level and buy-in among local leadership is required. Local leaders should understand the rationale for CI, the proposed model of the intervention and the requirements. Key financial decision-makers should also be engaged in the process. In addition, involvement of community leaders can generate community-wide support for and understanding of the activity and may serve to minimize stigma.

Engaging tuberculosis program staff in contact investigation

In Vietnam, the National Tuberculosis Program has implemented contact investigation for adult and child contacts of patients with smear positive TB. Staff at district TB clinics within the National Tuberculosis Program enrolled more than 10,000 contacts to a CI study in eight provinces between 2010 and 2013. Enrollment and screening predominantly occurs at the clinics, with symptoms and chest X-ray as the primary screening modalities. In addition, isoniazid preventive therapy is also being offered to child contacts, in accordance with national guidelines.

Key elements contributing to the success of the program include:

- strong leadership by the Vietnam National Tuberculosis Program and the Pham Ngoc Thach Lung Hospital, in overseeing training, monitoring and evaluation of the program
- monthly reporting of recruitment and outcomes of screening
- non-monetary incentives for Districts that achieve high recruitment targets
- refresher workshops for staff each year, in order to train new staff and provide advice about common barriers to care
- integration of the program with the routine treatment program of the NTP

Selecting an Appropriate Model for Contact Investigation

There are multiple possible ways of conducting CI:

Active contact investigation—Household visitation

The WHO guidelines and this implementation guide strongly suggest “household visitation” (active contact investigation) as the most useful approach. A household visit provides a check on the information obtained from the index case regarding the numbers of persons residing in the household and the physical and social structure of the house. It also serves to forge a stronger connection between the clinic staff, the family, and the community.

In this approach the person conducting the CI should visit the home of the index patient to identify the household contacts, conduct interviews, and develop a priority list of contacts for clinical evaluation. At a minimum all persons with symptoms, persons with known HIV infection or who are at increased risk for HIV, and children less than 5 years of age should be referred for evaluation. If detection and treatment of LTBI is an objective of CI, all household members should be referred for evaluation.

A home visit will underscore the importance of identifying and evaluating contacts and can ensure a more accurate view of the circumstances of exposure. The home visitor can make an environmental assessment of the residence and provide family counseling and



Nurse and community health worker training for MDR-TB contact investigation activities in Jakarta, Indonesia

A household visit serves to forge a stronger connection between the clinic staff, the family, and the community.

education on the symptoms that should prompt contacts to seek medical attention. Home visits may also provide an opportunity for identifying a need for social support and for education on tuberculosis and infection control measures.

Passive contact investigation—Contact invitation

If household visits are not possible, a less-desirable approach is “contact invitation,” (passive contact investigation) in which contacts are invited to visit the clinic by the index case for evaluation. A modification of this approach is to instruct the index case to tell household members to visit the clinic if they have symptoms compatible with tuberculosis.

It should be noted that in the household visitation model the costs are, to a greater extent, borne by the facility and the information gained more likely to be accurate. In the contact invitation model, a relatively greater proportion of the costs in transportation and time are borne by the household members; thus, the former approach is a more “pro-poor” strategy.

Selecting, Training, and Motivating Staff

Selecting staff

The human resource requirements for CI will depend on the number of investigations to be conducted, the model to be used to conduct the activity, and the screening and diagnostic tests employed. A key consideration for program managers is aligning drivers of staff behavior with the objectives of the CI program. For example, staff in a busy tuberculosis clinic may have insufficient time to perform screening, or may be unwilling to take on additional responsibilities. In this situation, it may be necessary to employ additional clinic staff or community health workers, to support CI activities. In nearly all instances additional training and supervision will be required.

Volunteer?

Community health workers are often engaged in activities such as CI on a volunteer basis. While this can sometimes be successful due to the volunteers’ ties to their community and sense of social responsibility, it can also result in high dropout and turnover of staff, and understandably so. Contact investigation activities require time to complete and doc-

ument, and should be compensated accordingly. Additionally, the training required of staff conducting CI represents an investment in the health worker that is worth protecting. It is often unreasonable and unsustainable to ask volunteers to bear the brunt of the work required without fair payment.

Training staff

Training workshops (see Table 4) should be held for all staff members who will have a role in CI. Staff members with previous experience in CI can contribute to discussions, and make suggestions about how to improve the process. The training will be more effective if it has a practical focus, providing opportunities for role-play and familiarization with the

TABLE 3. Roles of staff

STAFF TITLE	DESCRIPTION OF ROLES
Tuberculosis program managers	<ul style="list-style-type: none"> • engagement of clinical staff and administrators to support the program • establishment of administrative processes for a 'one stop shop' model of care (for clinic-based screening) • development of adequate budget • development of reporting framework and data-management processes • development of a local health promotion strategy for enrolling contacts • performance of monitoring and evaluation of program effectiveness
Local clinic staff or community health workers	<ul style="list-style-type: none"> • household visits to screen contacts of TB patients • persuasion of patients to bring contacts for screening • registration of contacts and complete contact registry • performance of clinical assessments • ordering and interpreting of diagnostic tests (including chest X-ray, sputum samples) • treatment of contacts for TB as required • if IPT is offered: <ul style="list-style-type: none"> • performance and reading of TST • prescription of IPT • monitoring for adverse events
General administrative staff	<ul style="list-style-type: none"> • arranging appointments for screening • completing regular reporting • ensuring supply chain for tuberculin and IPT (if required) • transport sputum samples to the central laboratory for testing • follow up contacts not attending follow-up
Laboratory staff	<ul style="list-style-type: none"> • performance of sputum testing (e.g. sputum smear, NAAT, sputum culture) and other microbiological testing
Radiology staff	<ul style="list-style-type: none"> • performance of chest radiographs, if indicated • development of skills in interpreting early disease
Pediatric clinical staff	<ul style="list-style-type: none"> • assistance with the diagnosis of TB in children, including extra-pulmonary TB • initiation and supervision of treatment for active TB • oversight of IPT administration, if required

TST = tuberculin skin test; IPT = isoniazid preventive therapy; NAAT = nucleic acid amplification test

activities and documentation relating to the CI program. In general, nurse-to-nurse and physician-to-physician training are more effective than training in mixed groups. Table 3 summarizes staff roles in implementing CI.

Repeated or “refresher” trainings, or ongoing trainings, are often requested by those conducting CI. These can offer a good opportunity for investigators to share successes, challenges, and tools for overcoming them with each other.

The names of all staff completing training should be recorded, and kept at a central level. Staff administering tuberculin skin testing may require accreditation to perform the test. Pre and post-workshop surveys can also be used to evaluate the effectiveness of training workshops.

TABLE 4. **Contents of a training workshop might include:**

- **Background and rationale for contact investigation**
- **Description of the local strategy for contact investigation:**
 - overview of the model of contact investigation, and algorithm for screening
 - discuss strategies for identifying high-risk contacts, based on clinical risk factors
 - discuss strategies for home visits, persuading contacts to accept screening, including role-plays and case discussions
 - selected algorithm for follow-up and treatment of contacts with abnormal results
 - discuss how to overcome common barriers to participation in screening
 - presentation of health promotion material that will assist staff to persuade contacts to participate in screening
- **Practical approaches to successful contact investigation:**
 - present lessons learned from pilot studies conducted in the country
 - present case studies from other countries, if applicable
- **Monitoring and evaluation:**
 - describe reporting and monitoring procedures
- **Financial issues in contact investigation**

Motivating staff

One barrier to staff motivation can be a low yield in the early start-up phase. If the prevalence of tuberculosis among contacts is low, say 2%, then on average 50 contacts need to be screened to identify one case. If recruitment to CI is slow at the beginning, the negative results may discourage staff from enrolling further subjects. This perception can be addressed in part by providing feedback details on the yield of screening from across a whole province or region. Health staff from districts that have identified cases with tuberculosis may also be able to share their success stories.

Local success stories of CI in a region or neighboring country can be used to positive effect throughout the country. Newsletters which share success stories or presentations at training workshops by staff from clinics where CI has good results can be very useful in building and maintaining momentum.

Interviewing the Index Case

The index case should be interviewed as soon as possible after diagnosis (generally within one week) to elicit the names of household and other close contacts. The focus should be on household members, but persons in the workplace and other settings in which there is exposure should not be ignored. Moreover, contacts in residential care settings, long-term care facilities, correctional institutions and acute care facilities, should be evaluated.

Ideally, the interview should be conducted by a person who speaks the same language as the index patient and is familiar with his or her social and cultural context. Investigations should be conducted for patients who have died, if information can be gathered from family members. A sense of urgency should be conveyed in CIs, including prompt interviewing of the index case. Occasionally, a second interview is useful to elicit additional contacts.

Information from the interview should be recorded on standardized forms (see Appendices for example). If resources permit, more than one household visit may be necessary. The protocols for how many visits should be made should be laid out clearly in the procedures.

Conducting a Household Visit

As noted above, household visits are highly desirable. As with the index case interview, the visit should be conducted as soon after the index case is identified as possible, ideally within one week. Insofar as possible the visit should be scheduled and take place at a time when the largest number of household members will be present. Also ideally, if persons with symptoms are identified they should be brought to the clinic immediately, accompanied by the health worker.

As noted above, there is also urgency in evaluating children under 5 years of age and persons with or at risk of HIV infection because of the potential for rapid progression of tuberculosis if infection has occurred. Occasionally a second or third visit may be required to evaluate all household members.

Diagnosing and Treating LTBI

As noted previously, the tuberculin skin test and interferon-gamma release assays can be used to identify people at increased risk for developing active tuberculosis and who are therefore candidates for treatment of LTBI. Treatment for presumed LTBI is currently recommended for children <5 years of age and PLHIV who have been exposed to persons with infectious tuberculosis once active tuberculosis has been excluded. Because the value of providing treatment for LTBI in low- and middle-income countries is not proven, it is not recommended as a broad programmatic intervention. In caring for patients exposed to an infectious index case who are at increased risk for developing tuberculosis if infected, clinicians may test for LTBI and treat with isoniazid or another WHO approved regimen if LTBI is present. However, testing for LTBI should not be undertaken unless treatment is planned.



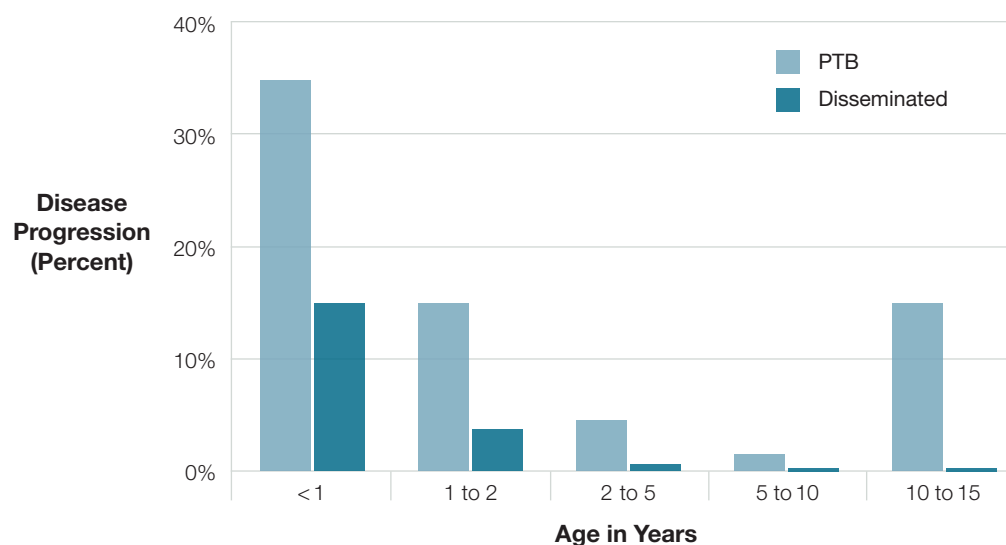
Mother and child with MDR-TB in Tanzania

Special Populations

Children

Young children are especially vulnerable to tuberculosis, and are at increased risk of having severe forms of the disease. Children should be given a high priority in all CI in order to identify those with active disease so they can be started on appropriate therapy. In addition it is important to identify children less than 5 years of age in a contact setting so IPT can be given.^{11,14} In addition, if a child presents with active tuberculosis, it is important to conduct what is often referred to as “reverse contact tracing.” Most sick children contracted tuberculosis from an adult with the disease with whom they have had close contact. With reverse contact tracing, attempts are made to identify the adult who is the source of the infection.

FIGURE 2. Risk of tuberculosis according to the age of the child



From: Marais, B., Gie, R., Hesselning, A., et al. The natural history of childhood intra-thoracic tuberculosis: a critical review of the literature from the pre-chemotherapy era. *International Journal of Tuberculosis and Lung Disease* 8: 392-402, 2004

Contacts of MDR-TB patients

Contacts of patients with MDR-TB present a special problem. Generally, index cases with MDR-TB have been infectious for a longer time than index cases with fully susceptible tuberculosis, thus, CI is more urgent in this circumstance and must take into account the longer infectious period.

Any persons with signs or symptoms of active disease should undergo evaluation, including culture and DST or rapid molecular testing to assess for the presence of drug-resistant disease.¹⁵ Although there have been observational studies showing that different preventive regimens may be effective for MDR-TB, currently, there is no recommendation on the use of preventive therapy in this population.

Persons living with HIV

Because of the risk of rapid progression from infection to active tuberculosis in persons with HIV infection, CI should be undertaken more urgently in this group.¹²



A village in rural Tanzania with houses in close proximity to one another

CASE STUDY

4

Contact investigation as a tool to address childhood tuberculosis in francophone Africa

The International Union Against Tuberculosis and Lung Disease (The Union) is providing technical assistance to NTPs of francophone Africa. In 2013, The Union decided to focus on how to best help NTPs to improve childhood TB prevention, diagnosis and treatment. Contact investigation was selected as a key intervention during an inter-country workshop, which was organized by The Union in January 2014. Contact investigation is recommended for children under five years old in most francophone African countries but in reality is not well implemented and almost never documented.

In order to address this, The Union is developing an operational research initiative to be implemented within the NTPs of five countries (Benin, Burkina-Faso, Niger, Côte d'Ivoire and Cameroon). The focus will be on CI for children less than five years of age. A short questionnaire will be administered to all patients diagnosed with smear-positive pulmonary TB at the health center to gather information on their length of residence in the area and the number of children under five years living in their homes. Then a home visit will be done during which more information will be collected about the index case and the children under five, and a tuberculin skin test will be administered to all contact children. Finally, children will be seen at the health center for more clinical examinations. Children diagnosed with active TB will receive treatment according to the protocol of each country, and all other children will receive IPT. Children receiving IPT will be regularly evaluated during the treatment and for twelve months following treatment.

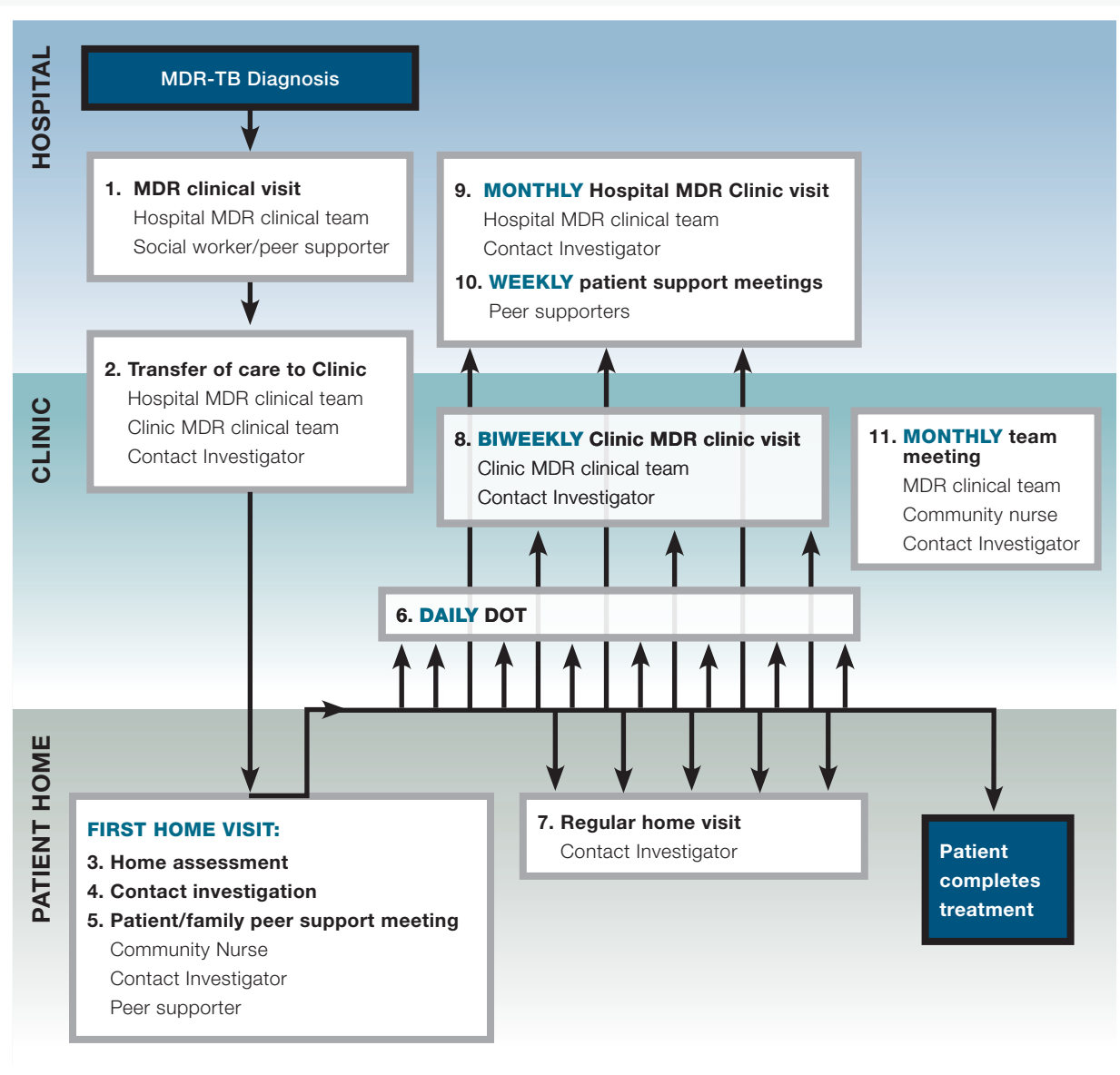
In parallel, The Union is pushing NTPs to include CI (with clear prioritization of children under five) in their National Strategic Plans, which are currently under revision in many countries. One of the difficulties is to estimate the cost and the human resources needed for the different activities related to CI. Operational research such as this initiative can help answer such questions.

CASE STUDY

5

Indonesia focusing on contact investigation of MDR-TB patients and defaulter prevention

Indonesia has a high number of MDR-TB patients as well as a challenge with patients defaulting from treatment. A model intervention was designed focusing on CI of MDR-TB patients that would also better link them to various points within the healthcare system with the hypothesis that this would improve defaulter rates. The below diagram shows an example of how the patient and provider flow may look and highlights the need for multiple check in visits, ideally regularly in the household.



The numbers in above table correspond to the specific activities. Each one of these activities should have a clear and detailed set of Standard Operating Procedures (SOP).

Monitoring, Evaluation, and Feedback

Early and frequent monitoring and evaluation of CI is critical to its success. As described previously, monitoring enables program managers and clinic staff to both:

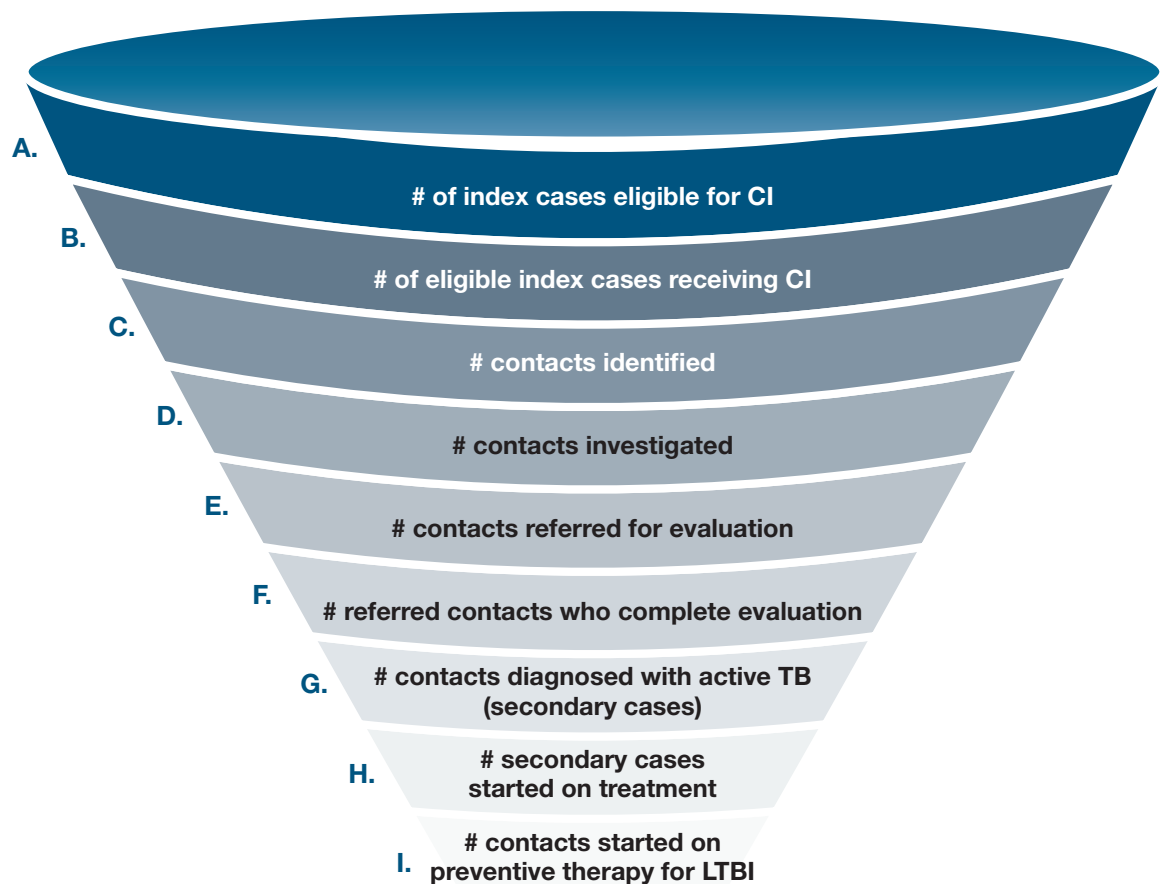
- understand if the program is being implemented as intended, or if not, where the gaps are occurring
- quantify the impact the activity has had on tuberculosis case finding, and ultimately on incidence

Monitoring

Monitoring generally consists of two activities:

- structured monitoring visits to review clinic or program records to determine the completeness of documentation and confirm follow-up of participants
- regular recording and reporting of program indicators

The below figure shows the description and cascade of data that should be collected during routine contact investigation activities:



Where possible, counting children <5 years of age and PLHIV as sub-categories both for index cases and contacts will yield informative and useful data.

Once CI activities have begun, regular review and basic analysis of certain indicators will provide a measure of how well the program is being implemented.

The indicators are collected in several different locations – indicators A-C can be collected at the health facility where the index case is diagnosed, indicators D-E should be collected in the index case’s household, and indicators F-I are again collected at the health center. However, it can be difficult to track how many identified contacts return to the health center for evaluation and treatment initiation. Extra attention may be required to ensure adequate capture of these indicators.

Process Indicators

Once CI activities have begun, regular review and basic analysis of certain indicators will provide a measure of how well the program is being implemented. Specifically, process indicators can quantify how successfully certain activities are being completed. The following are examples of key process indicators to report and how to calculate them:

$$\text{Proportion of eligible index cases receiving CI} = \frac{\text{\# eligible index cases receiving CI (B)}}{\text{\# index cases eligible for CI (A)}}$$

Indicates how often CI is being done when it is indicated. If this is low, efforts must be made to ensure that the activity is initiated and carried out when it should be.

$$\text{Proportion of identified contacts investigated} = \frac{\text{\# contacts investigated (D)}}{\text{\# contacts identified (C)}}$$

Indicates how effective the contact investigators and the protocols are at reaching the targeted contacts of an index case. If this is low, protocols should be revised or contact investigators should be re-trained to ensure they reach contacts.

$$\text{Proportion of referred contacts who complete evaluation} = \frac{\text{\# referred contacts who complete evaluation (F)}}{\text{\# contacts referred for evaluation (E)}}$$

Indicates how often those contacts identified as needing further clinical evaluation are going to the health center to be evaluated. If this is low, extra efforts might be needed to connect contacts with the health center, such as transport assistance or escorting the contact to the clinic.

$$\text{Proportion of secondary cases started on treatment} = \frac{\text{\# secondary cases started on treatment (H)}}{\text{\# contacts diagnosed with active TB (G)}}$$

Indicates how successful the activity is at ensuring treatment initiation for additional cases identified. If this is low, efforts must be made to retain additional cases in care (for both active disease and LTBI treatment).

If the activity is not having success at reaching the contacts of index cases, connecting contacts to the health center for evaluation, or initiating diagnosed cases on treatment or designated contacts on preventive therapy, the protocol needs to be refined immediately. Contact investigation is a complex activity involving multiple actions, all of which must be carried out successfully in order for the activity to have the intended effect. If all steps are not implemented effectively, the effort may be wasted.

Evaluation

Regular review should also be done of the impact indicators, to understand how effective the program is at achieving the intended goals and objectives. One of the primary indicators of effectiveness of CI is the yield of secondary cases identified among the contacts identified and evaluated. There are multiple ways of measuring this, including:

$$\text{Proportion of identified contacts diagnosed as secondary cases} = \frac{\text{\# contacts diagnosed with active TB (G)}}{\text{\# contacts identified (C)}}$$

$$\text{Proportion of referred contacts diagnosed as secondary cases} = \frac{\text{\# contacts diagnosed with active TB (G)}}{\text{\# contacts referred for evaluation (E)}}$$

$$\text{Proportion of evaluated contacts diagnosed as secondary cases} = \frac{\text{\# contacts diagnosed with active TB (G)}}{\text{\# contacts who complete evaluation (F)}}$$

The most commonly reported yield is the number of cases out of all identified contacts, usually reported as a percentage. This is a rough estimate of the yield of cases in proportion to the overall effort. However yield is reported, it is essential to clearly define how it is calculated (ie which numerator and denominator is used).

In addition to overall yield, there are additional measures that are important to calculate and consider in order to understand how effective and cost-effective CI is:

- contribution of CI to overall case detection—The proportion of notified cases identified through CI, either locally or nationally
- overall program cost for CI
- basic cost-effectiveness analysis for CI—This can be calculated as the cost per case detected

More advanced evaluations may be valuable but will require more data and expertise. Such further analyses include:

- full cost effectiveness analysis, including comparison of CI to other passive and active case-finding activities
- analysis of characteristics of patients who are most likely to transmit
- analysis of characteristics of contacts who have the highest risk of active disease or latent infection

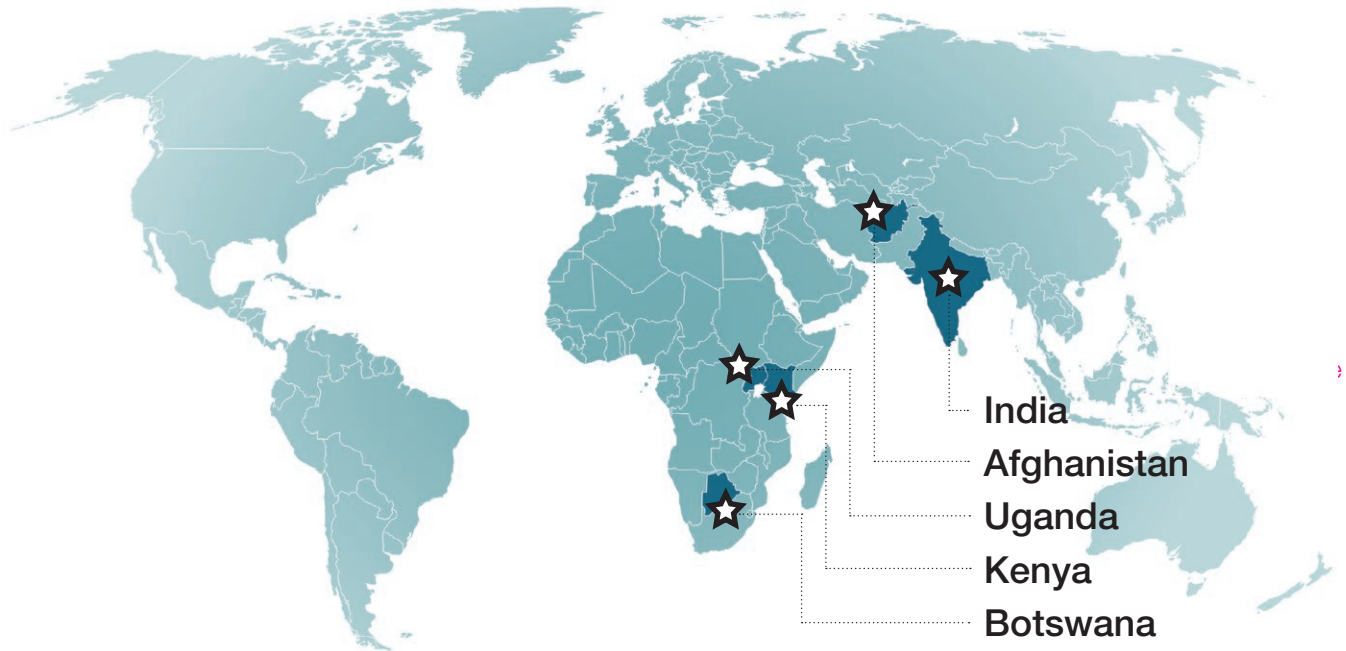
Modification and streamlining of activities can and should be a continual process built in with the monitoring and evaluation. If additional questions cannot be answered by routine reporting and review, additional research tools such as focus group discussions or small cohort studies may be employed to evaluate areas of weakness in the program.

Feedback

Feedback from the evaluation is crucial. Presenting data on the strengths and weaknesses of the program likely will serve to motivate staff. In addition, the information should go from the local level to the regional and national leadership. In areas where performance is poor, additional monitoring and training may be required.

Appendices

Case Studies and Lessons Learned



The following section includes examples from a variety of countries with high burdens of tuberculosis who have planned, piloted, or fully implemented CI activities.

Kenya

Kenya Association for the Prevention of Tuberculosis and Lung Disease (KAPTLD): Contact Investigation for Tuberculosis

Background/Context

Tuberculosis remains a major public health problem in Kenya. Kenya is among the 22 high burden countries that collectively contribute 80% of the global burden of tuberculosis. Among the Kenyan population are groups of people with increased vulnerability to tuberculosis, including HIV infected individuals and slum dwellers.

Between September 2010 and December 2012, KAPTLD implemented a project to enhance tuberculosis case finding in an urban slum population that is at a high risk of both tuberculosis and HIV. The project focused on early tuberculosis and HIV case detection, placement of patients on appropriate treatment, and thus reduction of tuberculosis transmission, morbidity, and mortality.

One of the objectives was to enhance tuberculosis case finding through the use of home-based screening of contacts of smear positive pulmonary tuberculosis.

Design

The plan was to follow up index cases of pulmonary tuberculosis to their homes to screen all household contacts for tuberculosis. The total project target was to visit 8,000 index cases in 4 urban districts, resulting in ~32,000 contacts of index cases screened for tuberculosis (assuming 4 contacts per household), with an estimated yield of 1600 cases of pulmonary tuberculosis identified among household contacts (assuming 5% prevalence). Community Health Care Workers were hired and trained in tuberculosis symptom identification, collection of sputum, referral of those with symptoms, and follow-up for tuberculosis patients including provision of DOT. They were provided with a standard symptom-based tuberculosis screening questionnaire, community referral forms for tuberculosis suspects, and contact registers.

Results —Year 1

Using the CI initiative, 2,170 sputum smear-positive tuberculosis patients (index cases) were visited at home, with 4,868 of their household contacts screened and referred for tuberculosis testing. Of the 4,868 suspects identified and referred, 3,271 (67%) arrived at diagnostic facilities and were tested for tuberculosis, of whom 98 (3%) were found to have tuberculosis, including 68 with pulmonary tuberculosis.

Yield for TB suspects, all forms of TB and SS+ TB

Contact investigation	Target	Achieved
Number of index cases	8,000	2,170 (27%)
Number TB suspects (contacts of SS+ TB patients) referred to public sector health facilities for evaluation	32,000	4,868 (15%)
Number of TB suspects arrived and tested (AFB microscopy)	32,000	3,271 (10%)
Number of diagnosed TB cases (All forms)	1,600	98 (6%)
Number of SS+ cases (AFB microscopy)		68
Number of SS+ started on TB treatment		68

Modification and Results—Year 2

Based on the results of year 1 and the desires of the community for broader screening for many diseases, the project was modified and expanded into an integrated multi-disease screening program. In addition to tuberculosis, the Community Health Care Workers were tasked to screen for non-communicable diseases, including diabetes mellitus, hypertension, asthma/COPD, and malnutrition. The tools used for the projects were revised accordingly to incorporate other diseases.

The results for the year 2 project implementation period are described below. Briefly, a total of 7,874 household contacts were screened for tuberculosis, resulting in the diagnosis of 60 cases of tuberculosis, including 38 cases of smear-positive pulmonary tuberculosis.

Contact investigation	Target	Achieved
Index cases visited in their homes	7,000	3,283
Number of contacts screened	14,000	7,874
Number identified with symptoms of TB	7,000	3,306 (42%)
Number tested (AFB Microscopy)	7,000	2,639 (80%)
Number testing positive (SS+)	420	38 (1.4%)
All forms of TB	-	60 (2.3%)

Additionally, a total of 3,385 were screened for non-communicable diseases resulting in the confirmation of 14 cases of diabetes, 39 cases of hypertension, 10 cases of asthma/COPD and 20 cases of malnutrition.

KEY POINTS

- The number of cases diagnosed was lower than the target, yet the yield was ~2% in the first year. This yield is consistent with what is estimated from systematic reviews, and can translate to a significant increase in case finding.
- It can be challenging to find and screen contacts in the home of the index patient, sometimes resulting in a lower than expected baseline number of contacts to screen.
- After the first year the protocols were revised based on feedback from the community and additional disease screening was incorporated into the protocol. Contact investigation, like other approaches to tuberculosis screening, can provide a valuable opportunity for screening of other diseases and conditions.

India

The Union South-East Asia Office — Contact Investigation Efforts of Project Axshya

Background

The Global Tuberculosis Report 2013 estimates 2.9 million cases are missed every year (out of the estimated 9 million incident cases) and 31% of these missing cases (~1 million) are in India. A recent study in India found 8.7% of household contacts were diagnosed with tuberculosis.¹⁶ As per India's current Revised National Tuberculosis Control Program (RNTCP) policy, contacts of tuberculosis cases should be screened for symptoms and referred for microscopy if symptomatic. However, implementation of the policy is not a systematic practice across the country.

Project Axshya

'Project Axshya' focuses on engaging all sectors to strengthen tuberculosis care and control in 300 districts across 21 states of India. This project is implemented by The Union with support from the Global Fund. Project activities are implemented in partnership with 8 sub-recipient partners, over 1,000 local NGOs and nearly 15,000 community volunteers and 25,000 health care providers. The project focuses on adopting innovative approaches to intensifying outreach to those with the greatest difficulty in accessing tuberculosis diagnosis and treatment; strengthening the engagement of community groups and healthcare providers; and establishing sputum collection/transportation and directly observed treatment (DOT) services in vulnerable and marginalized areas. In order to facilitate early diagnosis, CI intervention was designed and implemented in 60 project districts.

Contact Investigation under Project Axshya

OBJECTIVE

To provide tuberculosis services to tuberculosis contacts, including information about tuberculosis, identification of symptomatics, referral, sputum collection and transportation (SCT), and initiation of DOT.

CONTACT INVESTIGATION

The project planned to provide CI services to family members and close contacts of smear positive tuberculosis patients registered from July to December 2013 in selected Tuberculosis Unit (TU) in project districts. Trained Community Volunteers (CVs) were involved in doing CI. Community Volunteers were trained on basic tuberculosis, project guidelines and CI procedures including reporting.

SERVICES OFFERED DURING CONTACT INVESTIGATION

- home visitation by trained Community Volunteers
- sharing information about tuberculosis to family members (lay counseling session)
- symptomatic screening of contacts
- referral of patients with presumptive tuberculosis to designated microscopy centre (DMC) by Community Volunteers
- sputum collection and transport by trained Community Volunteers if referral is not possible
- initiation of IPT for children <6 years after active tuberculosis is ruled out

INFORMATION, EDUCATION, AND COMMUNICATION (IEC)

Project Axshya has developed and used a community friendly Interpersonal Communication (IPC) toolkit including leaflets as part of awareness generation on tuberculosis, importance of screening family members and close contacts of tuberculosis patients, and sputum collection and transportation guidelines.

DOCUMENTATION OF CONTACT INVESTIGATION

Form 1: Line list of smear positive tuberculosis patients registered in project districts

Form 2: List of tuberculosis patients households visited as part of CI

Form 3: List of household contacts identified with symptoms

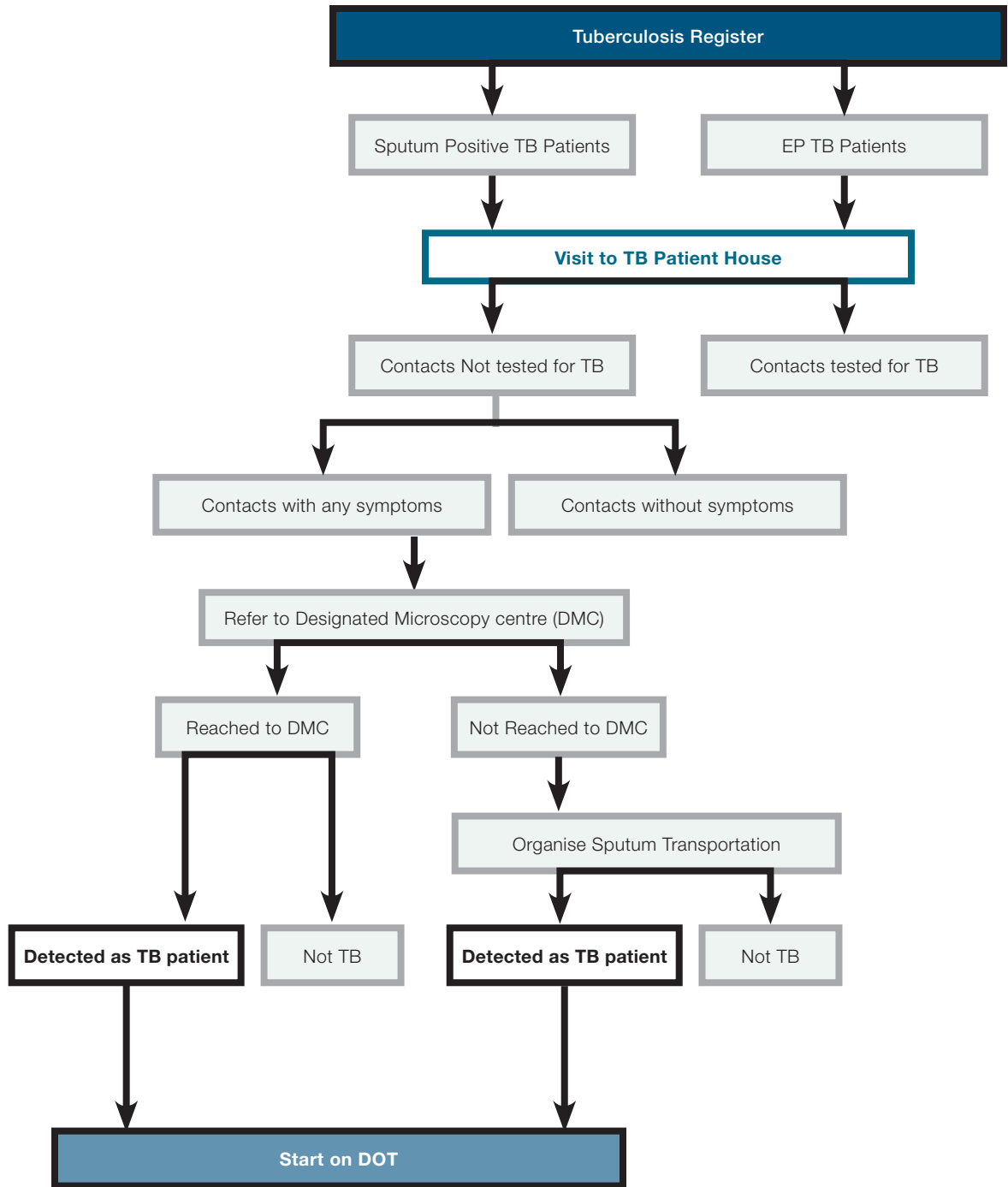
Form 4: List of sputum collected and transported from household contacts with symptoms

Form 5: Summary report of CI

COST FOR CONTACT INVESTIGATION ACTIVITIES

Services Offered	Cost in US Dollars (covering travel and honorarium)
<ul style="list-style-type: none">visit to TB patient householdcreating awareness on TBpreparing symptomatics for TB diagnosis	<ul style="list-style-type: none">\$1 (within 20 kilometer) per household\$2 (beyond 20 km) per household
<ul style="list-style-type: none">sputum collection and transportation from symptomatic persons to designated microscopy center (DMC)sharing of lab reports with symptomaticsrefer 'Not TB' patients to health facilitieslinkage of identified TB patients with treatment centers	<ul style="list-style-type: none">\$2 (within 10 km) per symptomatic\$3 (beyond 10 km) per symptomatic

FIGURE 1. **Contact Investigation Activities—Project Axshya**



OUTCOMES AND CHALLENGES

- 12,916 smear positive tuberculosis patients (out of 19,330 all types of tuberculosis patients) registered in 120 Tuberculosis Units in 60 districts from July – December 2013.
- 82% of households were covered under CI during from April – September 2014 but the remaining could not be reached due to various operational issues.
- 40,546 contacts were listed as households visited/intervention completed.
- ~9% tuberculosis cases were identified out of symptomatic contacts screened for tuberculosis.

KEY POINTS

- Contact investigation is included in the national guidelines but implementation of policy is not a systematic practice across the country.
- A clear set of forms to collect process and outcome indicators were developed and used.
- Sputum collection and transport for contacts who did not reach clinic for evaluation was included in the design, to overcome patient barriers to accessing the health center.
- Even on large scale projects, protocols can be adapted. This highlights the need for continual monitoring and evaluation to ensure activities meeting expected targets.
- 18% of households could not be completed due to operational issues.

Afghanistan

Tuberculosis Contact Management in Afghanistan

Currently in Afghanistan, only passive contact investigation is conducted, in which index tuberculosis cases are asked to bring symptomatic family members to health facilities. The prevalence of all forms of tuberculosis among household contacts invited to health facilities has been about 5%.

During 2011, with support from TB REACH wave 1, active household contact management was implemented in selected areas. In this intervention, health facility staff visited the home of index smear positive tuberculosis cases and directly screened all family members. As the result, 16,145 household contacts were screened and 822 cases of tuberculosis, including 606 sputum smear positive cases, were found. This result indicates that the prevalence of all forms of tuberculosis among household contacts from active investigation was about 5%. Thereafter, this intervention was not implemented due to lack of budget support. However, the NTP is planning to introduce active household contacts investigation for all forms of tuberculosis cases into all provinces, including hard-to-reach areas. On the average, there are 6 family members per index case. Thus, it is expected that screening 40% of household contacts of all tuberculosis cases will lead to an additional 3,600 tuberculosis cases.

Budgeting Considerations

The proposed budget includes per-diem and transportation cost for health facility staffs to visit home of index cases. For management in hard-to-reach areas, several days are needed to conduct one trip to visit homes and different budget scales are applied.

Missed Cases in Private Sectors

Contact investigation will also be implemented by the private sector in the future to enhance the tuberculosis case finding among household of tuberculosis SS+ cases.

Other strategies to be applied in future:

- strengthen tuberculosis case diagnosis and treatment among tuberculosis patients (all forms) and household contacts
- early detection of tuberculosis female patients during pregnancy and post-partum and screen their contacts
- expand contact management of tuberculosis among women all over the country
- active case findings in household contacts
- active case findings in household contact in hard-to-reach area

KEY POINTS

- Contact “invitation” found similar yield as contact “investigation” (both about 5%). This is often seen in the initial stages as CI is being implemented.
- Careful budget considerations and planning are required to ensure feasibility of CI, in particular transportation costs to conduct investigations in the households.
- Clearly defined risk groups will be targeted through CI—specifically TB cases being managed in the private sector.

Botswana

The National TB Program in Botswana has a focal person for community tuberculosis care including CI, referred to as “contact tracing” in the country guidelines. Contact tracing has been included in Botswana’s national guidelines since 2011, as an important intervention to identify tuberculosis cases and interrupt tuberculosis transmission within the community.

During the Botswana National TB Program (BNTP) Review in 2009, CI was identified as a program weakness. Contact investigation activities were found to be largely passive, limited to asking tuberculosis patients to bring their close contacts to the health facility for evaluation. Contact investigation was rarely performed in the home, resulting in follow-up and evaluation of less than 1/3 of potential close and high-risk contacts. The review recommended strengthening CI through active follow up, systematic symptom screening, and further evaluation of symptomatic contacts for tuberculosis as appropriate. In response, the BNTP revised national tuberculosis guidelines, Community TB Care (CTBC) guidelines, and accompanying monitoring and evaluation tools on CI in 2011 included engaging CTBC volunteers in CI activities. Following the launch of the guidelines, a CI training module was developed that included three contact screening forms: two for use by the health facility staff and one for use by the tuberculosis focal persons and CTBC volunteers.

However, according the latest program review from 2013, the implementation of CI activities still remains weak and is not uniformly done across the country.

Additionally, the NTP conducted a national CTBC program evaluation of the 2012 cohort from 9 out of 28 districts to determine the effectiveness of contact tracing. Patients enrolled in CTBC had 50% higher chances than those who continue care in the facility of having their contacts screened, independent of their age, sex, characteristics of tuberculosis disease or treatment and HIV status.

Qualitative data of the evaluation cited that Health Care Workers recognize the potential for community volunteers to assist with contact tracing, though systems and roles and responsibilities are not clear or clearly executed. Health Care Workers are also overwhelmed and struggle to execute contact tracing. In some cases patients are highly mobile and live in temporary housing conditions making identification and locating contacts difficult. And most importantly, late (post 2 weeks from diagnosis) and/or unsuccessful efforts were commonly mentioned.

Next Steps

The focal person for the NTP participated in the Expert Training for CI (The Hague, June 2014) and since the training is leading a project to develop and evaluate revised pilot CI recording and reporting tools and systems in the context of routine tuberculosis program activities to document the feasibility of implementation in accordance with WHO guidance and BNTP policy. Revised tools will also enable aggregation and analysis of data on a program level to better monitor and evaluate CI activities and contribution to tuberculosis and HIV case-finding. These tools ultimately could be scaled-up for national introduction to potentially reduce and improve early detection of tuberculosis and HIV disease.

SPECIFIC OBJECTIVES

- Harmonize and simplify contact screening forms for community volunteers and health facility staff in line with WHO guidance and BNTP guidelines on CI.
- Develop a tuberculosis CI register for routine use in programmatic settings that is acceptable to stakeholders and limits recording and reporting burden.
- Field test the tuberculosis CI register in a program setting to assess the utility of the register to support contact investigation activities and the associated recording burden.
- Revise and document a simple M&E system for implementation of CI using the CI register that aligns with and leverages the national Community TB Care policy guidelines.
- After 6 months of pilot implementation of the revised CI implementation tools used within the existing CTBC and health facility structure, assess uptake and completeness of CI reporting and recording.

KEY POINTS

- A dedicated focal person working on CI activities within the NTP helps focus the activity and move it forward.
- Utilization and training of existing Community TB Care (CTBC) volunteers takes advantage of their links to the community and their on-the-ground knowledge and experience.
- Quantitative analysis of the odds of receiving CI by patients in CTBC and in facility DOT indicates that the use of CTBC volunteers is more effective at implementing and following up CI.
- Qualitative analysis identified specific barriers to conducting CI by health care workers, including roles and responsibilities that are not clear, an overwhelming workload, and highly mobile/temporarily housed patients.
- Developing and field-testing new forms is important and requires some thought (TB Contact Screening Form and TB Contact Examination Form).
- A clear assessment of what is not working and what are attainable objectives and next steps in piloting a new CI program is key in implementation.

Uganda

TRACK TB Project—Experience and Implementation of TB Contact Investigation

Introduction

Track Tuberculosis Activity (TRACK TB) project is a USAID funded project implemented by Management Sciences for Health (MSH) and its partners: the Makerere University School of Public Health (MakSPH); the AIDS Information Centre/Uganda (AIC); and the University of California, San Francisco, Curry International Tuberculosis Center (UCSF/CITC). The TRACK TB project works with the National TB and Leprosy Program Central Unit and provides direct support to Kampala Capital City Authority (KCCA) including 56 health facilities that provide TB services and six MDR-TB treatment sites. One of the projects goals is to expand urban directly observed treatment, short course (DOTS), including community-based DOTS in Kampala.

TB Contact Tracing and Investigation in Kampala District

As part of the implementation of the Urban DOTS model, TRACK TB engaged 40 health workers called Community Linkage Facilitators (CLFs) at the 20 health facilities that register 80% of the tuberculosis patients within Kampala district. The CLFs are trained and facilitated to conduct home visits for all newly notified bacteriologically confirmed patients to provide patient education, adherence support (including identifying and educating a treatment supporter) and to perform contact screening and referral to the nearest diagnostic and treatment facility. Referral forms are tracked to determine the number of symptomatic contacts identified and referred for diagnosis, and CLF activity reports indicate the coverage of contact tracing activities. Contact tracing activities are supposed to be conducted on a quarterly basis for one year for patients with drug sensitive tuberculosis and for 2 years for patients with drug resistant tuberculosis.

CHALLENGES

- The project initially aimed to conduct home visits for all notified cases but, due to the high patient numbers within the district, had to prioritize and focus on the most infectious patients.
- The patients registered for treatment in Kampala are highly mobile, with frequent change of address; sometimes the patient and/or their contacts are not found.
- Sometimes the symptomatic contacts (presumptive tuberculosis patients) do not reach the referral health facility for investigation due to lack of transport, but also there is a lack of a clear mechanism for tracking referrals.

PLANNED INTERVENTIONS

- Using GIS maps, the project has identified tuberculosis hot spots within the city that will be prioritized for the contact tracing activities for priority patients.
- The project will facilitate sputum sample referral and return of results by the CLFs and strengthen the hub system for referral of sputum samples to the diagnostic units.
- The project will revise and roll out a revised contact tracing form to provide more information on the contacts screened and investigated.
- The project will share lessons learned to enable scale up to other parts of the country by the implementing partners.

Contact Investigation Activities for Patients with Drug Resistant Tuberculosis

The project facilitates frontline providers to conduct initial home visits, contact screening and investigation for all newly diagnosed MDR-TB patients at treatment initiation, and there after contact tracing and investigation is done for all MDR-TB patients on treatment. Symptomatic contacts are either referred or have samples transferred to health facilities with GeneXpert equipment to test for MTB and rifampicin resistance. Out of 1,003 MDR-TB patients that were screened and investigated from 6 MDR-TB treatment initiation hospitals, 2 Rifampicin resistant and 1 Rifampicin sensitive tuberculosis patients were diagnosed and initiated on appropriate treatment.

CHALLENGES

- Inconsistent recording and reporting of CI activities. The recording and reporting tools do not aggregate the entire cascade of CI activities as well as the flow of CI activities. The NTLP has revised the tools and now awaits approval by the Ministry of Health.
- The MDR-TB treatment facility situated within the country capital registers a high caseload that gets transferred to the countryside once stable on treatment. The health workers available may only be able to conduct the contact screening and investigation at the start of treatment but not follow through with subsequent screening services.

PLANNED INTERVENTIONS

- Continue to promote quarterly contact screening and reporting for all MDR-TB patients.
- Engage more CLFs to conduct contact tracing activities for MDR-TB patients treated within Kampala (urban setting).
- In collaboration with the NTLP, review the recording and reporting tools to emphasize CI.

KEY POINTS

- Contact investigation can be a complementary part of a comprehensive approach to strengthening tuberculosis services, including DOTS and including PMDT approaches.
- Prioritizing CI for the most infectious or at-risk patients is a common approach to reducing an overwhelming workload.
- Ensuring referred contacts reach the health facility is challenging.
- Collecting adequate data on the entire cascade of CI activities can be very difficult, as many of the activities take place at different times and places.
- Conducting CI for patients with drug resistant tuberculosis requires a more thorough investigation, and therefore usually separate forms and protocols.

Resources for Contact Investigation

SAMPLE CONTACT INVESTIGATION REPORTING FORM

TUBERCULOSIS HOUSEHOLD CONTACT INVESTIGATION FORM

Index Case Study ID _____ Index Case TB Type: SS+ SS- EPT Index Case HIV: R NR UNKNOWN/NOT TESTED

Index Case Name _____ Date of Index Case Diagnosis: ___/___/___ D M Y Y Y Y

Clinic / District where Index Case was Diagnosed: _____ Date of household visit: ___/___/___ D M Y Y Y Y

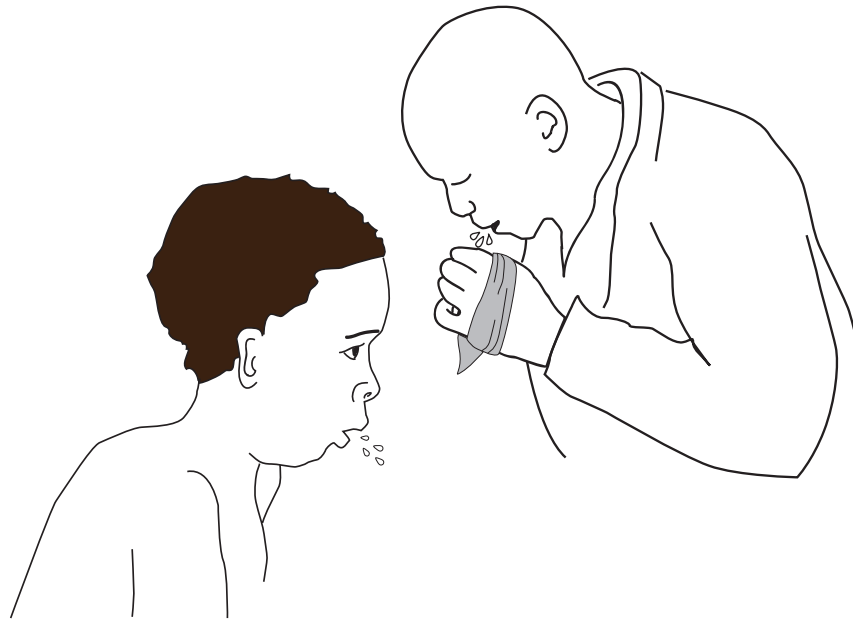
TB Contact Investigator (TBCI) Name: _____

Contact Number	Contact name (First name, Surname)	Age	Sex (M, F)	Contact Found? Date contact screened (DD/MM/YYYY)	Cough? (circle)	If YES to Cough: How long? <input type="checkbox"/> <1 wk <input type="checkbox"/> 1-3 wks <input type="checkbox"/> 3 wks - 1 yr <input type="checkbox"/> >1 yr Coughing blood? YES NO	Fever? YES NO If fever, how long? ___ days	Weight loss? (>3kgs/mth)	Abnormal night sweats? (past 4 wks)	Swelling or lumps? (neck, arm pits, groin)	Prior TB?	HIV? (Reactive, Non-reactive, Unknown, not tested)	Contact referred for evaluation?	Contact sought evaluation?	Contact positive for TB? TB Registry Number
1			M F	Contact found? YES NO Date screened? ___/___/___	YES NO	How long? <input type="checkbox"/> <1 wk <input type="checkbox"/> 1-3 wks <input type="checkbox"/> 3 wks - 1 yr <input type="checkbox"/> >1 yr Coughing blood? YES NO	YES NO If fever, how long? ___ days	YES NO	YES NO	YES NO	YES NO	R NR UNK NT	YES NO	YES NO	YES NO Registry #: _____ Date diagnosed? ___/___/___
2			M F	Contact found? YES NO Date screened? ___/___/___	YES NO	How long? <input type="checkbox"/> <1 wk <input type="checkbox"/> 1-3 wks <input type="checkbox"/> 3 wks - 1 yr <input type="checkbox"/> >1 yr Coughing blood? YES NO	YES NO If fever, how long? ___ days	YES NO	YES NO	YES NO	YES NO	R NR UNK NT	YES NO	YES NO	YES NO Registry #: _____ Date diagnosed? ___/___/___
3			M F	Contact found? YES NO Date screened? ___/___/___	YES NO	How long? <input type="checkbox"/> <1 wk <input type="checkbox"/> 1-3 wks <input type="checkbox"/> 3 wks - 1 yr <input type="checkbox"/> >1 yr Coughing blood? YES NO	YES NO If fever, how long? ___ days	YES NO	YES NO	YES NO	YES NO	R NR UNK NT	YES NO	YES NO	YES NO Registry #: _____ Date diagnosed? ___/___/___
4			M F	Contact found? YES NO Date screened? ___/___/___	YES NO	How long? <input type="checkbox"/> <1 wk <input type="checkbox"/> 1-3 wks <input type="checkbox"/> 3 wks - 1 yr <input type="checkbox"/> >1 yr Coughing blood? YES NO	YES NO If fever, how long? ___ days	YES NO	YES NO	YES NO	YES NO	R NR UNK NT	YES NO	YES NO	YES NO Registry #: _____ Date diagnosed? ___/___/___

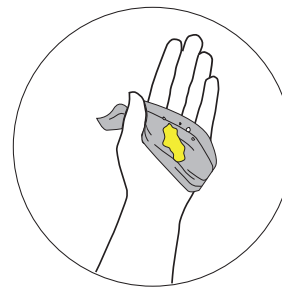
Resources for Contact Investigation

SAMPLE JOB AIDES

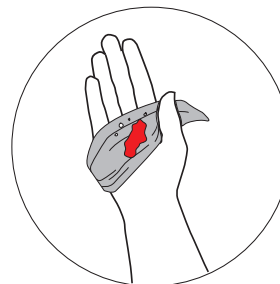
Have you had a cough?



Are you coughing up blood or blood-stained sputum?



Sputum

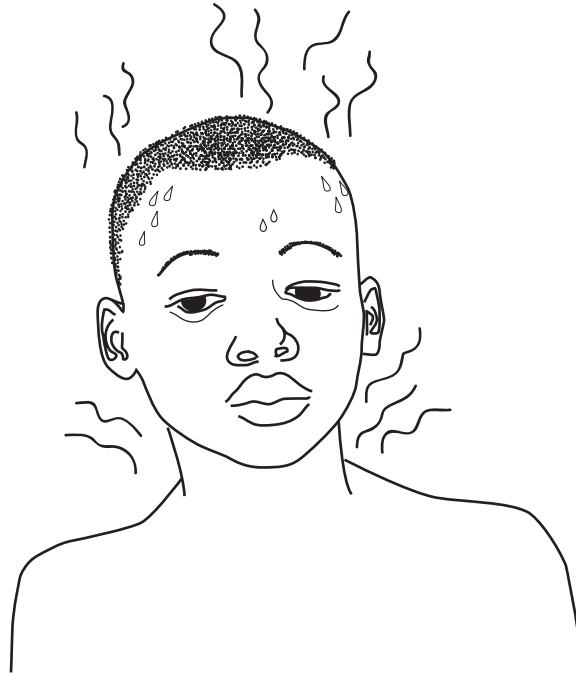


Blood-stained

Resources for Contact Investigation

SAMPLE JOB AIDES

Have you had a fever?

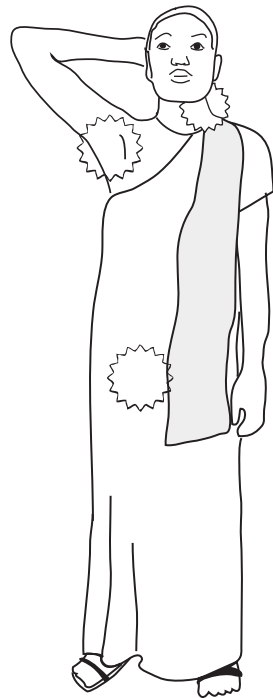


Have you been sweating at night for 3 or more weeks
in the last 4 weeks?

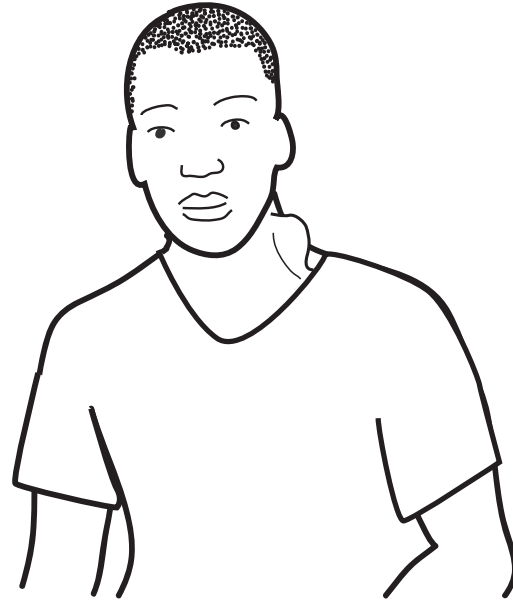


Resources for Contact Investigation

SAMPLE JOB AIDES



Have you noticed any swelling and/or lumps on your neck, armpit or groin?



Do you share a bed with the tuberculosis patient?

How much time in one day do you spend in the same room as the tuberculosis patient?



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