



# Contact Investigations

**Denise Dodge, RN**  
Training Specialist/Nurse Consultant

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## TB Control and Prevention

- **Priority 1 – Index patient**
  - Promptly detect, report and treat with effective drug regimens all persons who have, or are suspected of having, active TB disease
- **Priority 2 – Contact investigation**
  - Identify close contacts of patients with contagious TB and completely treat those who are found to be infected
- **Priority 3 – Targeted testing**
  - Prevent TB among populations infected with LTBI who are at greatest risk for progressing to disease
- **Priority 4 – Infection control**
  - Prevent transmission in settings at high risk for transmission through effective infection control measures




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## Contact Investigation A Critical TB Control Strategy

- On average, 10 contacts are identified for each person with infectious TB in the U.S.
- 20-30% of contacts will become infected and will progress to disease
- Of those who ultimately will have disease, approximately 50% will do so within one year after exposure

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## Goals and Objectives

- **Prevent further cases of TB by**
  - Finding secondary TB cases
  - Identifying those who have been infected
  - Treating to completion
- **Additional Benefits**
  - Prevent TB infection in those contacts not already infected.
  - Educate individuals and the community.
  - When possible – identify the source of transmission for the index case.

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## Who is Responsible?

- The **health department is . . .**
  - legally responsible for ensuring that a complete contact investigation is done for the TB cases reported in its area
- **Multidisciplinary Case Management Team**
  - who assigns priorities to investigations
  - who decide which contacts to evaluate first
  - who must use limited resources wisely



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## The Program Manager's Role in Contact Investigations

- Administrative
  - Ensure employees have up-to-date knowledge
  - Evaluate availability of resources (staff)
  - Assure necessary tools are provided
  - Request guidance from state office as needed
  - Provoke team action
  - Make certain a data collection instrument is used for evaluation
- Functional
  - Provide leadership
  - Assist with field team formation
  - Provide **direct** assistance
  - Remain informed
  - Allow for flexibility in work hours and overtime if needed
  - Provide frequent feedback
  - Fill in the gaps



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## Definitions

- **Index Case**
  - The first patient that comes to your attention as a TB Case
- **Contact**
  - Refers to someone who has been exposed to tuberculosis by sharing air space with a person who is infectious
- **Infectious Period**
  - When a person with infectious TB disease is capable of transmitting TB bacilli



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## Definitions

- **Exposure / Date of Last Exposure**
  - Length of time spent with a person with active infectious TB / last date the contact was exposed to an infectious case
- **Window Period**
  - The 8-10 week interval between the date of last exposure and a detectable skin test reaction
- **Source Investigation**
  - An investigation done to find the Infectious case of TB who has caused infection and/or disease in children



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## Contact Investigation Process




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Pre-interview phase begins when medical report is received

- Is a contact investigation necessary?
- Estimate when the infectious period begin
  - Index case characteristics
    - Site of Disease
    - Symptoms
    - Bacteriology
    - Radiology
    - Social Behaviors

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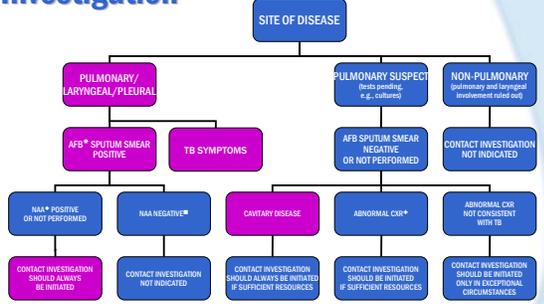
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## Determining the Need for a Contact Investigation




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## Index Case Characteristics, Select the three most infectious cases

- High school student, symptomatic, Smear -, NAA +, TST 13 mm
- 8 week old Infant, failure to thrive, fever of unknown origin, poor eater, daycare
- 35 year old short order cook, weight loss, chronic cough, HIV +, sputum smear and NAA -, TST 0 mm
- 56 year old homeless woman, symptomatic, cavitory chest xray
- 81 year old Filipino man, nursing home, weakness, loss of appetite, fatigue, back pain, Spine CT - vertebral abscess, disc space destruction

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## Determining the Infectious Period

There is no **scientific method** to determine the period of infectiousness.

Determine (estimate) the infectious period using these:

- Symptoms - cough, weight loss, fever, fatigue
- Bacteriology - smear: negative, rare, 1+, 2+, 3+ or 4+
- Chest X-ray - cavities present?



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## Determining the Infectious Period

- In **Symptomatic** Patients
  - Infectious period = **3 months** before symptom onset.
- In **Asymptomatic** Patients with **Positive Smear**
  - Infectious period = **3 months** before positive finding consistent with TB.
- In **Asymptomatic** Patients with **Negative Smear**
  - Infectious period = **4 weeks** before positive findings consistent with TB.



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## Determining the End of the Infectious Period

- Reduction in TB symptoms
- Appropriate treatment
- Bacteriology improvement
- Addressing potential drug resistance
- Congregate settings

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## Index case interview

- Within one day of the initial report
- Introduce yourself
- Review medical history
- Review psychosocial history
- Address barriers to care
- Provide education
- Elicit site and contact information
- Review plan of care



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## Organizing your investigation?



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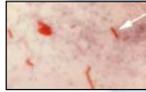
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## Prioritization of Contacts



- Consider the priority of index case
  - Infectious potential
  - Exposure potential – environmental and frequency
- Determine the priority status of the contact
  - What is the contact's risk for exposure/infection?
  - What is the contact's risk for progression to active TB disease?



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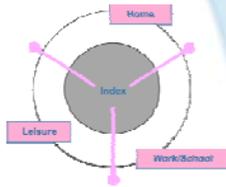
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## Priority level vs. Concentric Circle

- Current surrogates for estimating exposure do not predict chance of infection
- The vulnerability of the contacts are not accommodated
- Estimates for community prevalence are not known
- When prevalence is known, but high, end-point for the investigation is obscured.



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## High Priority Contacts

- Secondary cases of TB disease
- Those exposed to MDR/XDR/CDR
- Contacts most likely to become ill with TB disease if infected
  - Children  $\leq 4$
  - Transplant patients
  - HIV-infected/AIDS
  - TNF $\alpha$  antagonist
  - Other immune compromising conditions
  - Recent TST conversion

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## Sputum Smear Positive, Culture Positive with or without cavitation

- **High Priority Contacts**
  - Household
  - Children  $\leq 4$
  - Medical risk factors
  - Exposure during medical procedures
  - Congregate setting
  - Exceeds duration of exposure limits
- **Medium Priority**
  - Children aged 5-15
  - Exceeds duration of exposure limits for medium priority contacts



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## Sputum Smear Negative, Culture Positive

- **High Priority**
  - Children  $\leq 4$
  - Medical risk factors
  - Exposure during medical procedures smear negative, culture positive
- **Medium Priority**
  - Household
  - Congregate settings
  - Exceeds duration of exposure limits for medium priority contacts



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## Other Pulmonary Suspects

- Smear negative, NAA/culture negative, abnormal chest x-ray not consistent with TB disease
  - All medium priority
    - Household
    - Children  $\leq 4$
    - Medical risk factors
    - Exposure during a medical procedure



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### Initial field investigations and contact interviews

- Within three days of identification
  - Gather background health & psychosocial information
    - Assess extent of exposure to the index case
    - Previous TB disease/testing?
    - Other medical co-morbidities (abnormal CXR, immune compromising disease, medications, mental health)
    - Symptoms of TB?
    - Place the TST at this time if possible
    - Perform HIV test if status is unknown
    - TB Education



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### Potential Sites of Transmission

- Size
- Crowding
  - Congregate settings, correctional facilities, workplaces, schools
- Ventilation
  - Windows, walls, ceilings
  - Fans, air exchange



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### Select the two highest priority contact investigations

1. Stay at home mother, pulmonary TB, living with her three year-old daughter
2. 66 year old man, pulmonary TB, sharing weekly meals with his family
3. HIV positive teen, lymphatic TB, making monthly visits to the HIV clinic
4. Correctional officer, laryngeal TB, employed in your local jail

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Medical assessment of high and medium priority contacts

- Nursing Assessment
- HIV testing
- TST, if not done at initial encounter
- Chest x-ray and medical exam for
  - TB symptoms
    - Sputum exam X 3 (early morning specimens)
  - Immune compromised individuals
  - Children  $\leq$  4 years old
  - TST  $>$  5 mm



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### Treatment of TST Positive ( $\geq$ 5mm) Contacts

- Acceptable regimens
  - Preferred:
    - Nine months: daily (270 doses - 12 months)
    - Intermittent DOT (76 doses - 12 months)
  - Acceptable:
    - INH 6 months
    - Rifampin:
      - Four months daily (120 doses)
      - Pediatrics - six months daily

**A decision to test is a decision to treat to completion.**

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### Evaluation and Treatment of Contacts with Documented Previous Positive TST

- R/O active TB
- Gather background health/psychosocial information
- Determine current risk for progression to disease
- Provide education
- Individual treatment recommendations



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## Contacts of MDR/XDR Cases

- **Seek expert consultation**
  - Your State Health Office –
- Prioritization strategy is the same as for those who are contacts to pan sensitive cases.
- There are no **proven** effective treatment regimens for contact exposed to MDR/XDR
- Monitoring protocol: individualized

CDC. Management of persons exposed to multidrug-resistant tuberculosis. MMWR 1992;41(No. RR-11):59-71



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## Window Period: Testing and Treatment

- A **second TST** is done at the end of the window period (8-10 wks) to evaluate all previous contacts who tested negative.
  - If found to be negative they are considered not infected
  - A previously negative contact is not considered fully evaluated unless this final test is done.
- Immune suppressed contacts often benefit from **window period treatment** regardless of TST results:
  - Treat with INH until second TST is performed
    - HIV-infected
    - Children  $\leq 4$
    - Prednisone > 15 mgs/day
    - Transplant patients
    - TNF $\alpha$  antagonists



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## Individualized Investigation Plan

- Must be documented
  - Infectious period
  - Priorities
  - Strategy
- Protected TB information
  - Specific contact information



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## Time to Stretch – Take 5!



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## Expanding Contact Investigations



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## An Outbreak Implies

- A TB patient was contagious
- There was potential for extensive transmission
- Substantial exposure to infectious TB has occurred
- The interval since exposure has been sufficient for infection to progress to disease

## An Outbreak Investigation Will

- Involve several overlapping contact investigations
- Place greater emphasis on active case finding
- Require increased efforts to ensure completion of LTBI therapy

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## Local Program Considerations

- In the absence of evidence for recent transmission, an investigation should not be expanded to lower priority contacts.
- If program-evaluated objectives are **NOT** being met a CI should be expanded only in exceptional circumstances
- Expanding the CI must be accompanied by efforts to ensure completion of therapy



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## Outbreak Investigations: Stories to Tell

- In 2005, missed opportunities for identifying tuberculosis led to an outbreak in a Florida Prison
- The impact of an expanded contact investigation among agricultural workers in Florida, 2004
- During 2002-2003, a large outbreak of tuberculosis in Washington occurred among persons using multiple homeless facilities

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## Congregate Facility: Florida Prison

- 4/05 - 39-year-old B/F seeks care at a Florida Emergency Room.
  - Cough, chest pain, laryngitis and fatigue
  - Chest x-ray
    - Extensive areas of alveolar consolidation within the right lung and left upper lobe.
  - Medical History
    - Substance abuse
    - NiDDM
    - HIV negative
    - Asthma
    - PPD 30 mm
  - 4+ sputum smears, culture positive, pan-sensitive

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### Planning: Missed Opportunities

- Assessment of the infectiousness and transmission risk was determined with faulty or incomplete information
- Chart review was inadequate and untimely.

### Operational Difficulties

- Protocol required intervention by workers compensation
- Field visits did not occur at the onset



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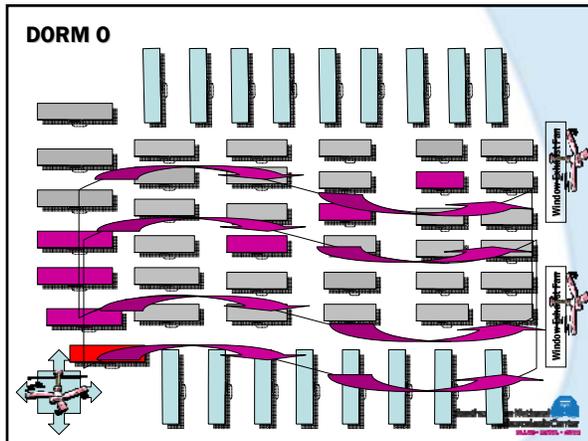
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### Summary of Contact Investigation

- 33 cases
  - 19 pulmonary
  - 5 pleural
  - 2 miliary
  - 7 extrapulmonary
- 1210, inmates tested
  - Over 40 local health departments involved
- 230 custodial and medical staff tested
  - 38 positive



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## Matching the Risk with the Effort

- Contagious TB undiagnosed or untreated for an extended period, or an extremely contagious case
- Source patient visiting multiple sites
- Patient and contacts in close or prolonged company
- Environment promoting transmission
- Contacts very susceptible to disease after tuberculosis infection
- Gaps in contact investigations and follow-up
- Extra virulent strain of tuberculosis



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## Agricultural Plant – Florida

- 53-year-old HF diagnosed with pulmonary TB, 1+ smear, culture positive, RUL infiltrates, slight cough.
- Contact investigation at the worksite uncovered a second case, 48 year old HM, diagnosed with pulmonary TB, 4+ smear, culture positive, extensive bilateral cavities, hemoptysis, weight loss, night sweats, fever.
- Tomato packing plant open on four sides, 20-foot ceilings. Assembly line work
- Majority of workers transitory from Latin America



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## Planning: Evaluating Resources

- New program manager
- One Nurse – New to TB (3 vacancies)
- Field staff was downsized.
- Surveillance position was vacant.
- Administrative personnel were not included in discussions.
- Data collection was an afterthought.
- Decision to extend contact investigation and to initiate a company wide testing project for 400+ employees



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## What happened?!

- Positive
  - CDC funded temporary field worker of Mexican decent.
  - Hired clerical assistant of Mexican decent.
  - Trusting relationship with plant management.
  - Organizational support was strong.
  - Epi links were weak, other than worksite.
  - DOH Van used for onsite DOT
- Negative
  - **Miscommunication of program needs and current capabilities**
  - Treatment of contacts were "lost" in the targeted testing project.
  - Data collection disorganized
  - Clinical evaluations were not done regularly.
  - Experienced field staff did not get involved.
  - Genotyping took a long time.
  - Migrant season ended.

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## Matching the Risk with the Effort

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## Was expanding the right thing to do?

RISK	IDENTIFIED	EVALUATED (%)	POSITIVE (%)	TREATED TO COMPLETION (%) (IDENTIFIED %)
Contacts	145	35 (24)	34 (97.1)	22 (64.7) (15.1)
TT Project	424	393 (92.6)	161 (40.9)	63 (39.1) (25)

The surge capacity of a large targeted testing project can critically strain available resources and adversely affect the ability of your program to carry out higher priority core activities.

**If the risk is high enough, get the right HELP!**




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## Washington - Homeless Shelter Planning - Data

- The number of homeless persons identified with active TB increased from 12-15 to 30 in one year
- Between 1998 and 2002 the number of homeless persons ↑ by 45%.
- Healthcare disparities among the homeless
  - Incarceration 9% (compared to non-homeless 3%)
  - HIV + 34% (20%)
  - Alcohol abuse 54% (12)
  - Socioeconomic factors: shelters, weakened immune systems, mental illness



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## Strategy

- Summarized the CI, then moved forward
  - Recognized the outbreak
- Consulted with CDC
  - Epi-aid: four investigators were sent and interviews were intensified
- Genotyping
  - Elicited the help of a local biomedical research center
- Nurse case management model implemented
  - improve follow-up and adherence
- Community Partnerships
  - Mobilized stakeholders and combined expertise available



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## Summary

- Strategies for screening contacts.
  - Symptoms review, sputum collection, CXR, HIV testing, TST
  - If therapy is refused, continue intensive screening for those who stay in congregate settings every six months.
- Building community partnerships
  - Three locations were the primary sites of transmission.
  - Heightened awareness in the community led to TB screening of high risk contacts during ER visits and incarcerations.
  - Provide more sites to deliver therapy
- Total of 75 cases of TB have been identified
  - Largest known TB outbreak to date.
  - Continue genotyping isolates



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## Matching the Risk with the Circumstance

- Contagious TB undiagnosed or untreated for an extended period, or an extremely contagious case
- Source patient visiting multiple sites
- Patient and contacts in close or prolonged company
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- Contacts very susceptible to disease after tuberculosis infection
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## Questions?

**Remember!**  
**Every TB case**  
**started out as a contact**



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