Fundamentals of Contact Investigations

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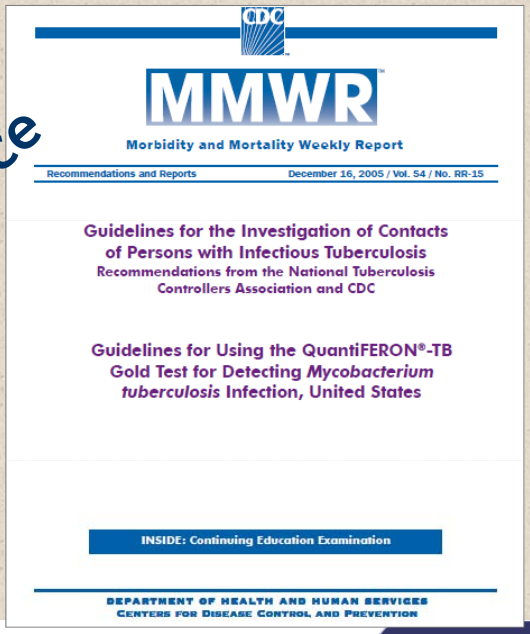
Primary Reference


MMWR
Morbidity and Mortality Weekly Report
Recommendations and Reports December 16, 2005 / Vol. 54 / No. RR-15

Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis
Recommendations from the National Tuberculosis Controllers Association and CDC

Guidelines for Using the QuantiFERON®-TB Gold Test for Detecting *Mycobacterium tuberculosis* Infection, United States

INSIDE: Continuing Education Examination

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

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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 high priority 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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TB Control and Prevention

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A Critical TB Control Strategy Contact Investigation

Most effective strategy for preventing future cases of TB

On average, 10 contacts are identified for each case with infectious TB in the U.S.

30 - 40 % of high quality contacts are expected to be infected

Infected contacts are 5% more likely to progress to active TB disease during the first two years after infection

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Goal and Objectives

To prevent further cases of TB by

- Identifying those who have been infected
- Finding secondary TB cases
- Treating infected contacts to completion

Additional benefits

- Prevent uninfected contacts from becoming infected
- Educate individuals and the community

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Who is Responsible

Your **health department** is legally responsible for:

- ensuring a complete contact investigation is done for the TB cases reported in your district
- follow-up of TB case investigations originating in your district that move to other jurisdictions

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Definitions (1)

Index case:

- The first patient that comes to your attention as a TB Case

Contact:

- Refers to someone who shares air space with a person who has infectious tuberculosis

High Priority (vulnerable) Contact:

- Refers to a contact who has a high risk of progression to disease if infected

Secondary Case of TB:

- Active TB cases identified within an ongoing contact investigation

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Definitions (2)

Infectious period:

- Time period when a person with infectious TB disease is capable of transmitting TB bacilli

Window period:

- 8 - 10 week interval from a contacts last exposure to an infectious TB case

Exposure:

- Length of time a person spends with an infectious TB case

Date of last exposure (Break in exposure):

- Date a contact was last exposed to an infectious TB case

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Definitions (3)

Proxy Interview:

- Interviews with someone other than the index case

Contact Interview:

- Interview which verifies extent of exposure and vulnerability

Site Investigation/interview:

- Investigation occurring at sites identified as potential locations of TB transmission

Source Case Investigation:

- An investigation to locate the source of TB infection. This activity most commonly occurs when young children are involved

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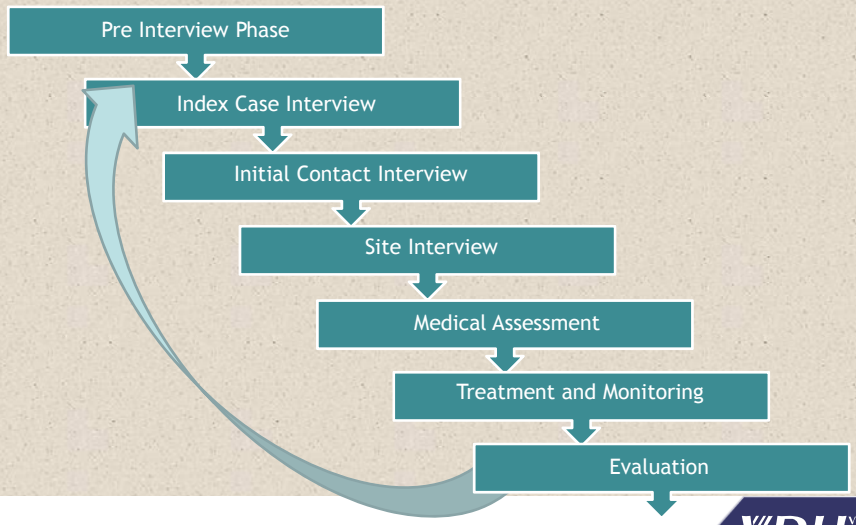
Contact Investigation Process



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Is a contact investigation indicated?

Collect information about the client's TB disease, symptoms, bacteriology, x-ray results, and treatment regimen

Determine whether the client is infectious and, if yes, when did infectious period begin

Gray areas exist

Pit falls

- Jumping in
- Standing still

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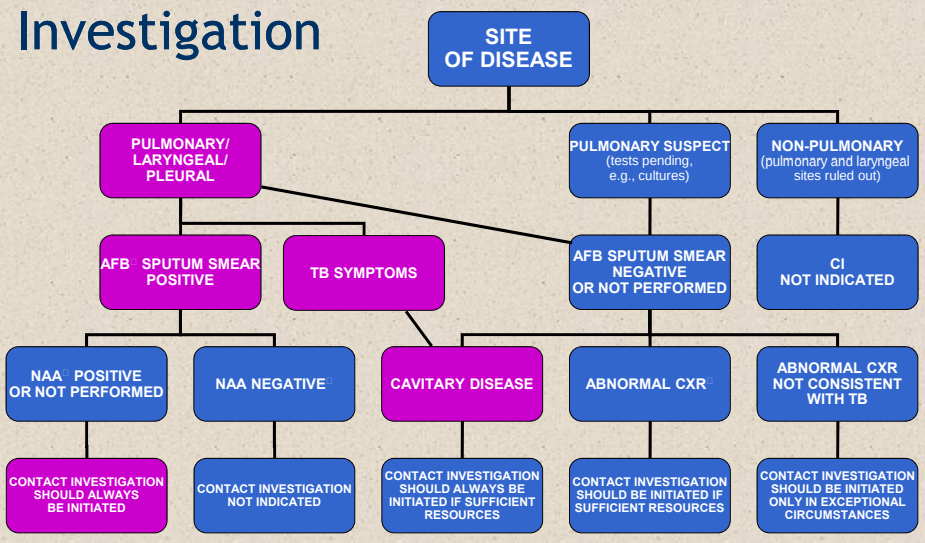
Decision to Initiate a TB Contact Investigation



✱ Acid-fast bacilli ■ Approved indication for NAA

◆ Nucleic acid assay ✚ Chest radiograph

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Index case behavioral characteristics

Engaging in risky behaviors

Sociability

Singing

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Rank the following patients in order of priority for starting a CI

1. Lymph node smear +/-, CXR-abnormal
2. Bone culture +M.tb, sputum smear -/culture pending, CXR-normal
3. Sputum smear +3, culture AFB +, ID pending
4. Sputum smear -, sputum culture -, CXR normal, HIV +, 400 CD4, TST 10mm

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Environmental Factors that Predict Likely Transmission

Exposure exceeding environmental limits

VDH TB Control has suggested the following environmental exposure limits allowing for some nursing discretion to warrant expansion or limitation of Contact Investigations:

Estimated Time	Description	Example
8 Hours	Very Small	Car, small office
24 Hours	Small/Medium	Classroom, meeting room
50 Hours	Medium/Large	Cafeteria, small church
100 Hours	Large/Very large	Gymnasium, auditorium

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Initial Index Case Interview Questions

One day after notification for infectious patients then repeat during course of care

Includes:

- Potential contacts
  - unique identifying characteristics
  - demographics - eg. nicknames
  - relationship/connection
  - known medical risk factors
- Potential exposure sites
  - environmental characteristics
  - Frequency and duration at site

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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:

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

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Guidelines for Estimating the Start of the Infectious Period for TB Cases

Index Case Characteristics

TB Sx	Sputum Smear +	Cavitary	Estimated Start of Infectious Period
Yes	No	No	3 months before symptom onset or first positive finding (e.g., abnormal CXR consistent with TB disease), whichever is longer
Yes	Yes	Yes	3 months before symptom onset or first positive finding consistent with TB disease, whichever is longer
No	No	No	4 weeks before date of suspected diagnosis
No	Yes	Yes	3 months before first positive finding consistent with TB
Yes	No	Yes	No recommendations
No	No	Yes	No recommendations

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Estimate the start of the Infectious period for hospitalized patient

Current symptoms and findings (4/1/13)

hemoptysis, TB symptoms, cavitary CXR

Hospital history obtained prior to interview:

2/14/13 - pt. seen in ER - SOB, cough, fever, chills, night sweats, loss of appetite. Diagnosed with pneumonia, given Levoquin and discharged

CI content - Public health

- Attended party New Years day (1/1/13)
- Told to leave because of sever cough
- Admits to 4 week cough prior to party
- Admits to 4 week cough prior to party
- Also had night sweats, occasional fever, unexplained weight loss in Dec.(Totals 4 months of symptoms)
- *Felt fine on Thanksgiving

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Estimate the start of the infectious period for a patient at home

4/12/13, a pt. went to his PMD for a TST after returning from a trip to Africa. The pt. had no TB symptoms.

4/15/13, the TST was 15mm, a CXR was abnormal, consistent with TB, non-cavitary, and the HD was notified that RIPE began. A sputum sample was collected.

4/16 and 4/17, 2 more sputum samples were collected and all were reported as smear negative on 4/20/13.

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Determining the end of the Infectious Period

Determine the likelihood of resistance.

After a client has received adequate multidrug treatment for at least two to three weeks

If there is a demonstration of adherence

If there is demonstrated evidence of clinical improvement

More stringent criteria if returning to a congregate setting:

- Three negative sputum smears obtained at least 8 hours apart, with no less than one early morning specimen

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Estimate the infectious period

- Cough since Christmas 2012, Hospitalized 1/15/13
- Smear positive/MTD positive 1/16/13
- RIPE started 1/16/13
- Leaves Hospital AMA 1/20/13

1. 1/15/06 – 1/30/06
2. 9/20/05 - ?
3. 8/20/05 – 1/30/06
4. 11/25/05 - ?

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Who do you evaluate first?

Prioritize the contacts with the information you have up to this point and evaluate these groups first.

- Symptomatic Contacts
- Those with certain medical risk factors, e.g.
  - Transplant patients
  - HIV-infected/AIDS
  - TNFα antagonist
  - Diabetes
- Children < 5
- Anyone with extensive exposure

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I. Sputum Smear Positive, Culture Positive and/or Cavitary X-ray

High Priority Contacts

- Household
- Children < 5
- 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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II. Sputum Smear Negative, Culture Positive

High Priority

- Children < 5
- 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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III. Pulmonary Suspects

Smear negative, NAA/culture negative, abnormal chest x-ray not consistent with TB disease

- All medium priority
  - Household
  - Children < 5
  - Medical risk factors
  - Exposure during a medical procedure

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Prioritize these contacts to a sputum smear and culture positive index case

1. 10 y/o middle school student
2. 20 y/o college student with syphilis
3. 30 y/o with insulin dependent diabetes
4. 40 y/o dialysis patient

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Prioritize these contacts to a sputum smear negative, culture positive index case

1. 50 y/o taking TNFα-blockers
2. 40 y/o AIDS patient
3. 30 y/o wife
4. 20 y/o recently released from prison

Initial Contact Interview

Face to face meeting within 3 working days of identification.

Components of a contact interview

- Provide TB education
- Assess for symptoms of TB
- Check for other medical and psychosocial co-morbidities
- Assess extent of exposure to the index case
- Determine TB history/testing
- Collect demographics
- Place the TST at this time if possible
- Perform HIV test if status is unknown

Initial Contact Medical Evaluation

Complete within 1 week for high priority contacts

Draw HIV Testing if not done at initial interview

Place TST if not done at initial interview

Chest X-ray and Medical Exam

- Children ≤4 years old
- HIV + individuals
- TB symptoms
- TST ≥5 mm

Sputum Exam X 3 (early morning specimens)

- TB symptoms
- Suspicious chest x-ray

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Evaluating Contacts with Documented Previous Positive TST

Gather background health/psychosocial information.

Determine current risk for progression to disease.

Assess for symptoms of active TB. If present:

- Medical evaluation
- Chest x-ray
- Sputum for AFB x 3

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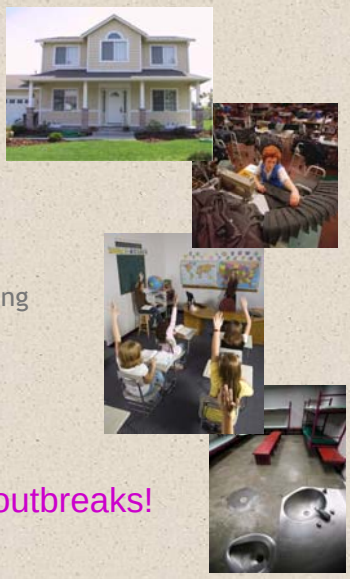
Site Investigation



Site visits augment the interview

- Home
  - 3 days of the initial interview
  - Additional contact information is elicited; especially helpful for finding children
- Work
- Social

Avoiding site visits contributes to TB outbreaks!

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Prioritizing Sites

Infectiousness of the Index Case
Vulnerability of contacts
Site characteristics
Duration of Exposure
Frequency of Exposure

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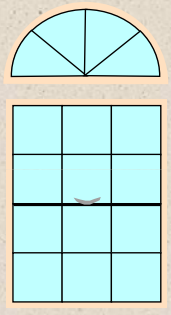
Prioritize these sites for need of follow-up. Case is smear & culture +

1. Daycare
2. Big box store
3. Prison/Jail
4. High school
5. Animal shelter

What is "post exposure" testing?

Repeat (2nd round) TST done at the end of the window period if the initial TST was negative

What is a completely evaluated contact?

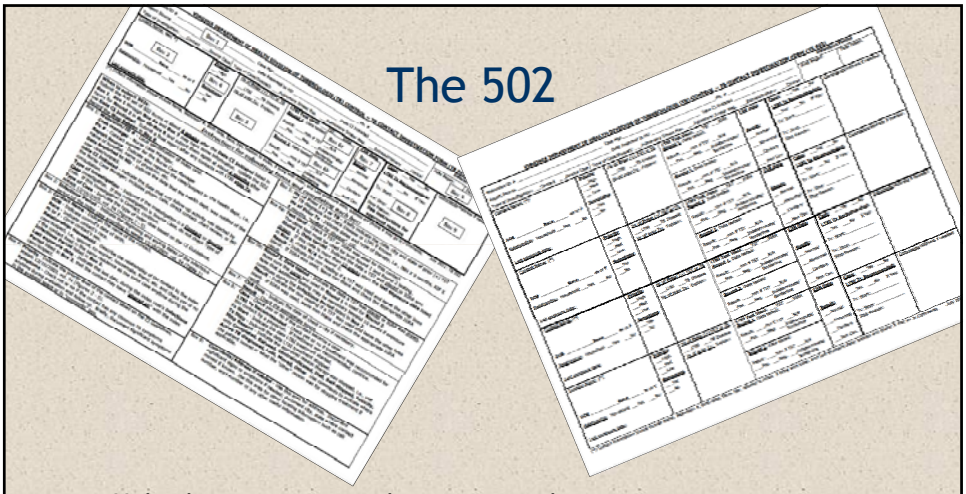


Post exposure testing

CXR

Medical exam if indicated

The 502



Helps keep important data organized
Necessary for collecting reportable data needed by CDC
Useful for keeping track of missing data that leads to closure
Only single place that displays all of the hard work done

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Expanding a Contact Investigation

Based on review of **all available information**

Factors which indicate recent transmission

- Higher than expected infection rate
- Secondary cases identified
- Evidence post exposure infection

Do Not Expand a CI Unless
Data Indicate Recent Transmission

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Contact Investigation Scenarios
Putting it all together
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Both patients are currently hospitalized Who do you visit first? Why?

Patient 1

- 22 y/o
- Sputum smear 4+
- Culture pending
- HIV negative
- CXR: RUL cavitary lesion
- Productive cough for 6 wks
- Blood tinged sputum
- RIPE started

Patient 2

- 35 y/o
- Sputum smear =/-
- Culture pending
- HIV positive
- CXR: bilateral middle lobe infiltrates
- Fatigue, fever, dry cough
- RIPE started

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Which site visits have the highest priority? Why?

Patient 1

- 22 y/o
- Sputum smear 4+
- Culture pending
- HIV negative
- CXR: RUL cavitary lesion
- Productive cough for 6 wks
- Blood tinged sputum
- RIPE started
- *Lives alone/apartment*
- *Work - Landscaping*

Patient 2

- 35 y/o
- Sputum smear =/-
- Culture pending
- HIV positive
- CXR: bilateral middle lobe infiltrates
- Fatigue, fever, dry cough
- RIPE started
- *Lives in a Ryan White facility*
- *Work – Manages R.W. facility*

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Do priorities change? Why or why not?

Patient 1

- 22 y/o
- Sputum smear 4+
- Culture pending
- HIV negative
- CXR: RUL cavitary lesion
- Productive cough for 6 wks
- Blood tinged sputum
- RIPE started
- Lives alone/apartment
- Work – Landscaping
- *Symptoms improving*
- *DNA probe +M.tb*

Patient 2

- 35 y/o
- Sputum smear =/-
- Culture pending
- HIV positive
- CXR: bilateral middle lobe infiltrates
- Fatigue, fever, dry cough
- RIPE started
- Lives in a Ryan White facility
- Work – Manages R.W. facility
- *cough worsening*
- *DNA probe +MAC*

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Next Investigation!

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PCP reports 24 y/o from Mexico in her first trimester of pregnancy with c/o:

Symptoms

- Productive cough for 4 weeks
- Chest pain – predominatley on the upper left side
- Hyperhidrosis

Procedures performed

CXR: bilateral upper lung fibronodular infiltrates

TST: 0 mm

Lab: IGRA pending

Patient sent home with no further instructions. PCP after thought: important to report as a potential suspect

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What would your next step be?

PCP reports 24 y/o from Mexico in her first trimester of pregnancy with c/o:

Symptoms

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Procedures performed:

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Patient sent home with no further instructions. PCP thought is was important to report potential suspect

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Discuss questions you would ask to elicit contacts and sites of transmission

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Symptoms

- Productive cough for 4 weeks
- Chest pain – predominatley on the upper left side
- Hyperhidrosis

Procedures performed:

CXR: bilateral upper lung fibronodular infiltrates

TST: 0 mm

Lab: IGRA pending

HIV status: pending

Patient sent home with no further instructions. PCP thought is was important to report potential suspect

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Next Investigation!

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High School exposure – 11th grade/17 y/o

Index case characteristics

- Diagnosed with pneumonia 2x, past 7 months
- Cough, fever, SOB
- Smear negative/culture positive M.*tb*
- CXR: cavitary infiltrates in the RUL
- HIV pending
- Intermittent fever
- TST – 20 mm
- Arrived in the US 13 months ago from Ahmedbabad, India
- Attends ESOL classes
- Member of the IT club
- Plays soccer

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Data collection drives decisions

School

- Total student population **551**
  - 12th grade - 99
  - 11th grade - **121**
    - **ESOL classes - 28**
  - 10th grade - 132
  - 9th grade - 199
- Total educator population – 45
- **IT club – 7**
- **Soccer team 31, all grades**

Household – mother, father, grandmother

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- Total student population **551**
  - 12th grade - 99
  - 11th grade - **101**
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  - 10th grade - 132
  - 9th grade - 199
- Total educator population - 45
- IT club - 7
- Soccer team 31, all grades

Household - mother, father, grandmother

School
- ESOL class - 28
- IT club - 7
- Soccer team 31, all grades
- Educators/Coach - 4

Household - 3

Identifying highest exposure areas and people in them = 73

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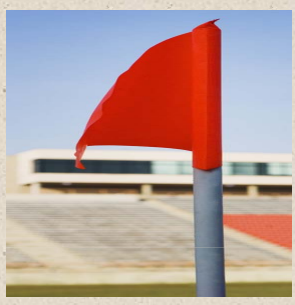
Household contacts – next steps

Mother – IGRA positive
- 41 y/o - from India
- no identified medical risk factors
- CXR neg - LTBI

Father – TST 13 mm
- 44 y/o - US born
- no identified medical risk factors
- CXR neg - LTBI

Maternal Grandmother – IGRA positive
- 68 y/o - from India
- Cough, weight loss 23 #, fatigue, night sweats, fevers



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Grandmas the trouble maker!

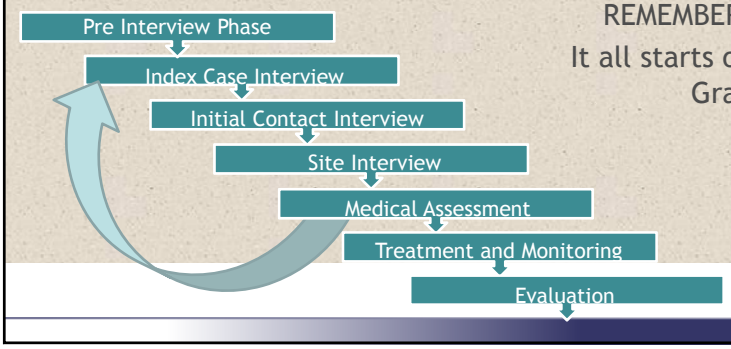
IGRA positive

Cough, weight loss 23 #, fatigue, night sweats, fevers, for 18 mths

CXR – multiple upper lobe cavities bilaterally

RIPE started

NEW CASE OF TB – SECONDARY CASE OF TB – SOURCE ??????



REMEMBER SLIDE 11!

It all starts over again for Grandma!

Don't forget the School -

School

ESOL class – 28
- All foreign born
- All BCG in past

IT club – 7
- 5 American born
- 2 foreign born, BCG in past

Soccer team 31, all grades
- 25 foreign born all BCG in past (20 from ESOL)
- 6 American born (1 from IT club)

Educators/Coach – 4 American born

ESOL – 28 IGRA

IT club – 7
- 5 TST, 2 IGRA

Soccer Team – ~~31~~ 10
- 5 IGRA, 5 TST

Teachers – 4 TST

Total for evaluation at school = 49

Initial Reactor Rate (1st Round)

Groups to be Tested	Group Results
• ESOL – 28 • IT club – 7 • Soccer Team - 10 • Teachers – 4 school evaluation = 49 home evaluation = 3 Total CI contacts = 52	ESOL - **43%** 12 positive IGRA 16 Negative IGRA IT – **0%** 7 negative TST/IGRA Soccer Team – **50%** IGRA 4 positive, 1 negative TST 1 positive, 4 negative Teachers – **0%** 4 negative TST

Overall Initial Reactor Rate 20/52 x100 = 38.4%

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Post Exposure Testing(2nd Round)

Group Results	Group Results
ESOL - **43%** 12 Positive 16 Negative IT – 0% 7 Negative Soccer Team – **50%** 5 Positive 5 Negative Teachers – **0%** 4 Negative	ESOL (12+4) 4 Positive 12 Negative IT (0+7) 7 Positive Soccer Team (5+2) 2 Positive 3 Negative Teachers (0+1) 1 Positive 3 Negative

Overall Conversion Rate 14/32x100 = 43.7%

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School Infection Rate overall of CI

Entire group of contacts = 49
Entire group of positives = 32

Positives	/	contacts (N)			=	Infection Rate
32	/	49	x	100	=	65.3%

Do you Expand or Limit? Data tells all!

Breakdown population to estimate background rate
Number of Foreign born – 35
Number US born – 14 (9 were positive 64%)

Consider expansion at school
- Talk to key players
- Consider help from state health office
- Prepare media statement (contact COC)
- Plan for worried well (concern since the beginning)

Prioritize and discuss plan of action for each contact investigation

1. Mother with pulmonary TB living with her three year-old daughter
2. Grandfather with pulmonary TB going to dialysis 3X week
3. Teen with Lymphatic TB making monthly visits to the HIV clinic pulmonary TB ruled out
4. Laryngeal TB in your local prison

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Questions?

Remember!

Every TB case started out as a contact

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