

PEDIATRIC TUBERCULOSIS (TB) CONTACT INVESTIGATION IN AN ELEMENTARY SCHOOL SETTING: A CASE STUDY

Nnenna Wachuku, MSN, RN

Lukas Ayers, BS, MPH

*Wayne County Dept. of Health, Human & Veterans
Services*

DISCLOSURES

- ◉ Nnenna Wachuku & Lukas Ayers have the following disclosures to make:
 - No conflicts of interest
 - No relevant financial relationships with any commercial companies pertaining to this educational activity/conference

INTRODUCTION

- The following is an overview of a complex pediatric tuberculosis (TB) contact investigation that occurred from October 2018-April 2019 in a public elementary school setting within Wayne County, Michigan

OBJECTIVES

- ◉ Outline processes used for a complex pediatric TB contact investigation
- ◉ Revisit discussion on infectiousness of TB in children
- ◉ Highlight the importance of multi-organizational partnerships and collaboration during complex TB contact investigations
- ◉ Discuss challenges and strengths of this contact investigation

PEDIATRIC TB IN THE U.S.

- Defined as TB disease in a person <15 yrs. of age
- 9,025 total *new* TB cases reported in 2018
 - 372 cases in children under 15 yrs. of age (4.1%)

In Michigan...

- 108 total *new* TB cases reported in 2018
 - 8 cases in children under 15 yrs. of age (7.4%)

TB IN CHILDREN

- ◉ Manifests differently than in adults and/or adolescents
- ◉ Considered a marker for *recent* transmission
- ◉ Young children diagnosed are typically asymptomatic with fewer tubercle bacilli in lungs
- ◉ Lack physical force to produce airborne bacilli while coughing
- ◉ Rarely considered to be infectious
 - However, more likely to develop life-threatening forms of TB disease

INFECTIOUSNESS OF YOUNG CHILDREN WITH PULMONARY TB

- ◉ Presumed low risk of transmission by young children
- ◉ Most likely infected by adult contacts
- ◉ Determine source of the child's infection
- ◉ Limited contact investigation surrounding the child
- ◉ Few studies available focused on TB contact investigations in school-aged children

INDEX CASE



OCTOBER 29, 2018

- ◉ Ten-year old female presented to an urgent care facility and is diagnosed with pneumonia
- ◉ Immigrated to U.S. from Vietnam in March 2018
- ◉ Referred to area hospital for possible TB
- ◉ Patient was admitted and placed in Airborne Infection Isolation (AII)
- ◉ Wayne Co. notified of potential TB case
- ◉ Treatment initiated: Community Acquired Pneumonia (CAP)

ADDITIONAL INFO.

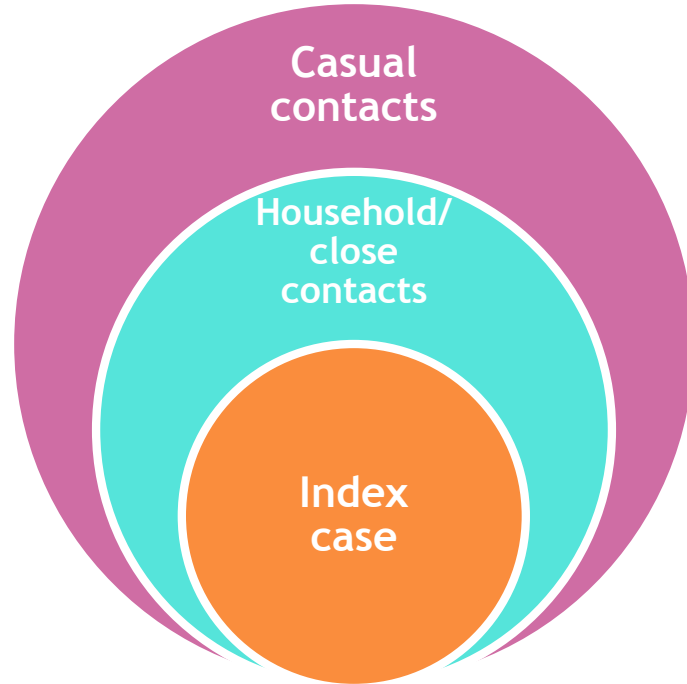
- ◉ Evaluated overseas prior to immigrating per CDC guidelines
 - Had a negative TB skin test
- ◉ Third-grade student at a local public elementary school
- ◉ Rides school bus to & from school

DIAGNOSIS (OCTOBER 31, 2018)

- ◉ Acid-fast bacillus (AFB) smear of 4++
- ◉ QuantiFERON Gold (QFT) **positive**
- ◉ *M. tuberculosis* DNA **detected** by PCR
- ◉ TB treatment initiated:
 - Isoniazid (INH)
 - Rifampin
 - Pyrazinamide (PZA)
 - Ethambutol
 - Pyridoxine (B6)

TB CONTACT INVESTIGATION BEGINS

November 01, 2018



HOSPITAL VISIT

- ◉ Wayne Co. conducted a hospital visit to interview patient and patient's family
- ◉ Dual-handset phone (“blue-phone”) utilized due to language barrier
- ◉ **Four** household contacts identified as having prolonged exposure to the patient



TESTING OF INDEX CASE'S FAMILY

- All contacts were born abroad in Vietnam
 - Likely received Bacillus Calmette-Guérin (BCG) vaccine as children
- All contacts had negative TB skin tests prior to immigrating to U.S.
- QFT blood tests administered to each contact
- All four QFT tests were **positive** with **normal** chest x-rays
- Latent TB Infection (LTBI) treatment initiated at Beaumont/Wayne Co. TB Clinic

ELEMENTARY SCHOOL SITE VISIT

- Wayne Co. conducted a site visit at index case's elementary school
 - Met with school administrators and staff
 - Determined physical layout of the building
 - Airflow, ventilation
 - Set up of classrooms by grade & location
 - Learned class schedules and activities (index case)
- Conference call held with Michigan Dept. of Health & Human Services (MDHHS) TB program

NOVEMBER 02, 2018

- ◉ Wayne Co. hosted an in-service for the elementary school administrators, teachers & auxiliary staff
 - Education on TB disease
 - Explained active TB disease vs. LTBI
 - Outlined plan for contact investigation
 - Answered questions/concerns
- ◉ Wayne Co. provided school administrators with testing consent forms & informational letters to be distributed to students' parents/guardians

AND THEN...



NEWS

Public Health Department confirms tuberculosis case at [REDACTED] school

By Priya Mann • Reporter, Dane Sager Kelly • Web Producer

FEATURED

[REDACTED] student hospitalized after tuberculosis diagnosis

By Colin Maloney cmaloney@digitalfirstmedia.com @colinabm on Twitter Nov 5, 2018 Comments



Tuberculosis Confirmed In Wayne County Elementary School Student

The child is not attending classes, so other children will not be exposed.



► **Breaking
NEWS**

Tuberculosis being investigated at [REDACTED] school



NEWS



Case of tuberculosis confirmed at metro Detroit elementary school

CONTACT INVESTIGATION TIMELINE

10/29/18

- Index case presents to urgent care facility

11/01/18

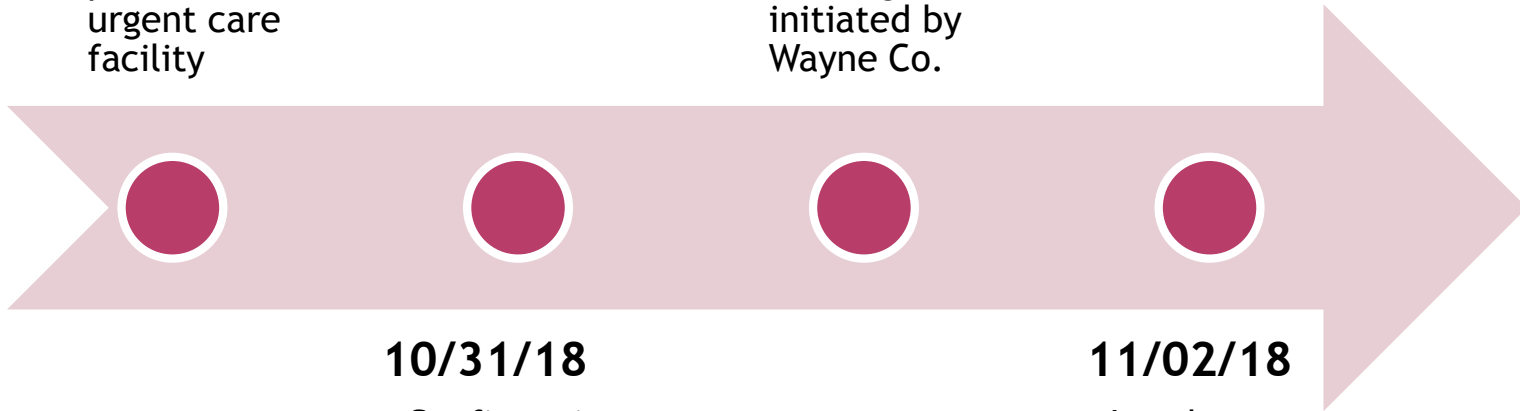
- Contact investigation initiated by Wayne Co.

10/31/18

- Confirmation of TB diagnosis

11/02/18

- Local news media breaks story of confirmed TB case in local elementary school



SECONDARY CASE

...also on November 02, 2018



- ◉ 5-yr. old girl presented to her pediatrician's office with worsening cough for 3-days
- ◉ Due to respiratory distress & pale skin presentation, patient referred to area hospital
- ◉ Admitted & initiated treatment for CAP
- ◉ Parent contacted school officials to report illness
- ◉ School staff realized this child lives near the index case and rides the same school bus
- ◉ School principal contacted Wayne Co.

DIAGNOSIS: SECONDARY CASE

- ◉ Wayne Co. informed patient's pediatrician of potential TB exposure
- ◉ Pediatrician contacted the hospital's ID team
- ◉ **Patient placed in All**
- ◉ **Positive AFB smear**
- ◉ Negative QFT
- ◉ Negative skin test
- ◉ Negative PCR (?)
 - However, gastric aspirate specimen was not neutralized within 4-hrs according to protocol, it was neutralized over 24-hrs later

HOUSEHOLD CONTACTS OF SECONDARY CASE

- ◉ **Four** household contacts identified as having prolonged exposure to secondary case
- ◉ Due to all contacts being U.S.-born, each contact was administered a TB skin test
- ◉ All results were negative

NOVEMBER 05, 2018

- ◉ Wayne Co. hosted conference call with MDHHS TB program to provide updates and discuss need for additional resources
- ◉ Wayne Co. hosted conference call with school administrators to finalize logistics of on-site testing/contact investigation
- ◉ School distributed informational letters and testing consent forms to students' parents/guardians

FIRST-STEP SKIN TESTING AT THE SCHOOL



IDENTIFIED CONTACTS

- ◉ All kindergarten (secondary case's grade) & third grade (index case's grade) students
- ◉ All students who rode the same school bus as the index/secondary cases
- ◉ All students whose classrooms were 'split' or 'shared' with a kindergarten or third grade class
- ◉ 5th and 4th grade students who acted as "reading buddies" with index or secondary case's classrooms
- ◉ Teachers, auxiliary staff
 - Lunch room staff
 - Bus drivers who drove the case's bus
 - Janitorial staff

FIRST-STEP SKIN TESTING AT THE SCHOOL

11/07/18

- Tests administered

11/12/18

- Tests read from 11/09

11/16/18

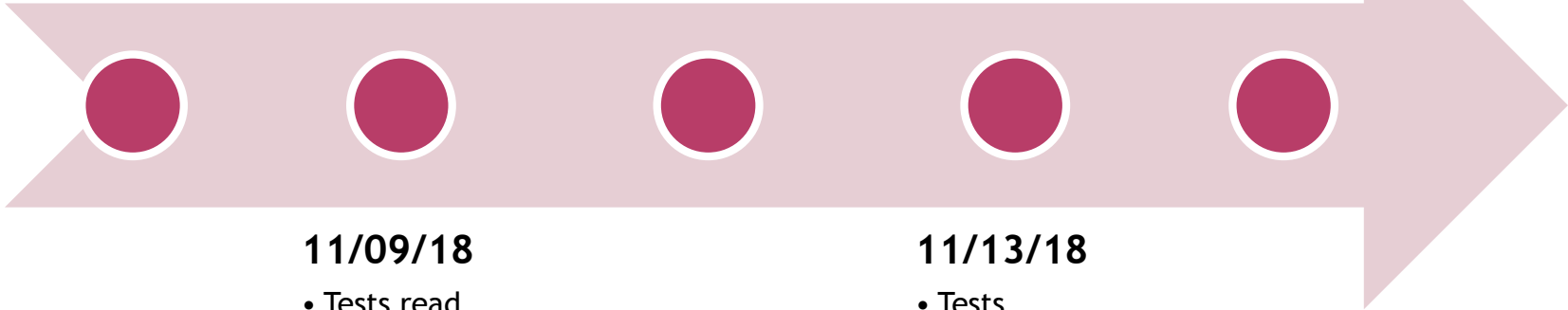
- Tests read from 11/13

11/09/18

- Tests read from 11/07
- Tests administered to those absent on 11/07

11/13/18

- Tests administered to those absent on 11/07 or 11/09



NO. OF FIRST-STEP TESTS ADMINISTERED BY CONTACT TYPE

Contact type	No. of first-step tests administered
Students	224
Teachers, Auxiliary Staff	41
Total First-Step Tests Administered	265

NO. OF FIRST-STEP TESTS ADMINISTERED TO STUDENTS BY GRADE

Grade	No. of first-step tests administered
Kindergarten	56
1 st grade	7
2 nd grade	22
3 rd grade	73
4 th grade	26
5 th grade	40

RESULTS FROM FIRST-STEP TESTING

- 3 POS (+) skin tests
 - One 3rd grade male student
 - Same classroom as index case
 - One kindergarten female student
 - Same grade as secondary case, but different classroom
 - One 1st grade male student
 - Classroom 'split' with secondary case's class
- Four children of staff contacts referred to TB clinic for window prophylaxis due to age (under 5 yrs.)

DRUG RESISTANCE

- ◉ November 29, 2018

- Initial susceptibility testing indicated resistance to INH
- Index case discontinued INH
- Replaced with moxifloxacin



- ◉ December 05, 2018

- MDHHS lab confirmed resistance to INH

ADDITIONAL CONTACTS IDENTIFIED

- School principal contacted Wayne Co. to inform that the secondary case participates in a bible study group hosted on-site at the school by external church volunteers
- Wayne Co. coordinated skin testing of the external volunteers with the school principal
- Wayne Co. returned to the school on **12/04/18** to administer tests to 8 identified volunteers
- Tests read **12/07/18** and all results were **negative**

FIRST-STEP SKIN TESTING CONCLUDES

Contact type	No. of first-step tests administered
Students	224
Teachers, auxiliary staff	41
Bible study volunteers	8
Total first-step tests administered	273

TIMELINE REVISITED

10/29/18

- Index case presents to urgent care facility

11/07/18

- First-step skin testing initiated on-site at school

11/16/18

- 2 POS (+) tests; 1 kindergarten student and 1 1st-grade student

12/04/18

- First-step tests administered to bible study volunteers

11/02/18

- Local news media break story of confirmed pediatric TB case
- Secondary case presents to pediatrician's office

11/09/18

- 1 POS (+) test in a 3rd grade student

11/29/18

- Index case resistant to INH, started on moxifloxacin

12/07/18

- Tests read from 12/04
- First-step skin testing concludes

SECOND-STEP SKIN TESTING

Step 2

SECOND-STEP SKIN TESTING AT THE SCHOOL

02/05/19

- Tests administered

02/19/19

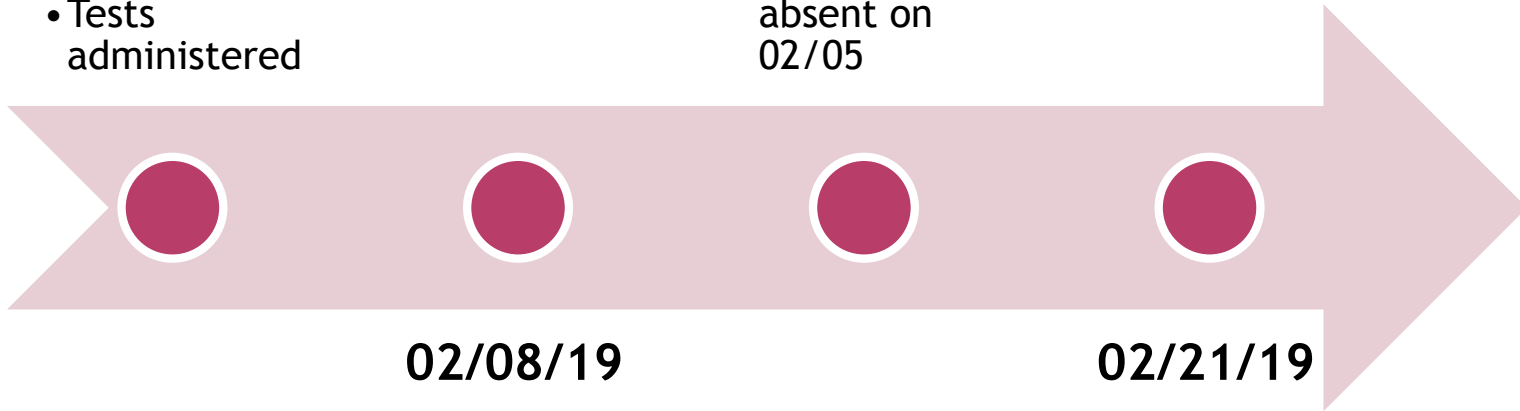
- Tests administered to those absent on 02/05

02/08/19

- Tests read from 02/05

02/21/19

- Tests read from 02/19



NO. OF SECOND-STEP TESTS ADMINISTERED BY CONTACT TYPE

Contact type	No. of second-step tests administered
Students	275
Teachers, Auxiliary Staff	45
Bible Study Group Volunteers	8
Total Second-Step Tests Administered	328

NO. OF SECOND-STEP TESTS ADMINISTERED TO STUDENTS BY GRADE

Grade	No. of second-step tests administered
Kindergarten	75
1 st grade	11
2 nd grade	22
3 rd grade	85
4 th grade	31
5 th grade	49
Special Education	2

RESULTS FROM SECOND-STEP SKIN TESTING

- **22 POS (+) skin tests**

- 1 male kindergarten student
 - “Reading buddy” in index case’s classroom
- 1 female kindergarten student
 - Same classroom as secondary case
- 19 3rd grade students
 - 1 later diagnosed as active TB
- 1 female 5th grade student



TIMELINE

10/29/18

- Index case presents to urgent care

11/07/18

- First-step skin testing begins on-site at the school

11/16/18

- 2 POS (+) tests

02/05/19

- Second-step skin testing begins

02/21/19

- Second-step skin testing concludes
- No additional POS (+) results

11/02/18

- Secondary case presents to pediatrician office

11/09/18

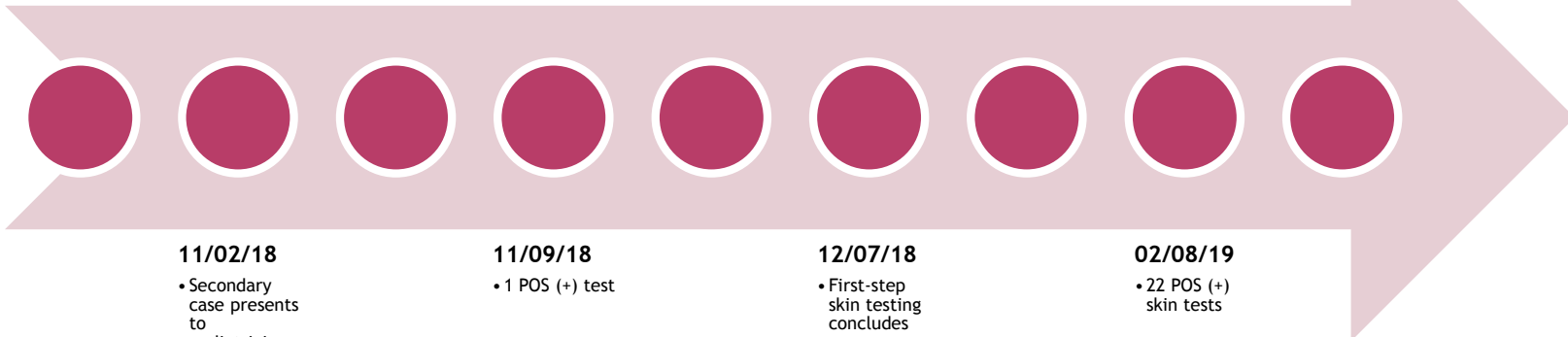
- 1 POS (+) test

12/07/18

- First-step skin testing concludes

02/08/19

- 22 POS (+) skin tests



2nd secondary-case

THIRD ACTIVE CASE

MARCH 06, 2019

- ◉ Female 3rd-grade student with a POS (+) skin test
- ◉ Both preliminary and confirmatory chest x-rays
abnormal
- ◉ Wayne Co., MDHHS and pediatric ID specialist
determined to treat patient as active TB case
- ◉ TB treatment initiated

HOUSEHOLD CONTACTS OF THIRD ACTIVE CASE

- ◉ **Five** household contacts identified as having prolonged exposure to case
- ◉ Due to all contacts being U.S.-born, each contact was administered a TB skin test
- ◉ All results were negative

ADDITIONAL CONTACTS



- ◉ Wayne Co. informed by the school principal that the third case participates in an external cheerleading group
- ◉ Wayne Co. worked with the school to obtain contact information for cheerleading group
- ◉ Wayne Co. notified parents/guardians of exposure
- ◉ Contacts referred to TB clinic for skin testing

April 15, 2019

CONTACT INVESTIGATION CONCLUDES

“EXIT” MEETING

- ◉ Wayne Co. hosts informational “exit” meeting on-site at the school for students’ parents/guardians, school administrators, teachers and other staff
- ◉ Provide conclusion of contact investigation, as well as additional information/resources on TB
- ◉ Answer questions or concerns parents or staff may have

CHALLENGES

CHALLENGE ACCEPTED



- ◉ Language barrier
- ◉ Cultural beliefs, attitudes about TB
- ◉ Relocation of identified contacts
- ◉ News media
- ◉ Staffing
 - DOT coverage
- ◉ Contact investigation involving minors
 - Parent/guardian consent required
 - Needle/shot anxiety
- ◉ Absenteeism
 - Students, staff
- ◉ School organization
 - Shared or 'split' classes
- ◉ Treatment compliance/adherence
- ◉ Drug resistance
- ◉ Socioeconomic status of cases
 - Use of incentives
 - Housing
- ◉ Inclement weather
 - Investigation during winter months
 - Forced to reschedule on-site testing dates due to school district closures

STRENGTHS



MULTI-ORGANIZATIONAL COLLABORATION

- ◉ MI Dept. of Health & Human Services (MDHHS) TB Program
- ◉ Beaumont/Wayne Co. TB Clinic
- ◉ Administrators and teachers from the school and district
- ◉ Area hospital infection control, infectious disease teams
- ◉ Wayne Co. Public Information Officer (PIO) and senior administration

STRENGTHS CONT'D.

- ◉ School principal's rapport w/ staff, parents/guardians & students
- ◉ Providing honest, direct information to school staff & parents/guardians on TB contact investigation
- ◉ Offering the opportunity for school staff & parents/guardians to ask questions
- ◉ Knowledge and dedication of Wayne Co. CD/DOT nurses and staff
- ◉ Additional nursing support from MDHHS & TB clinic staff

LESSONS LEARNED

- Pediatric TB *can* be infectious & should not be overlooked
- Establishing a working partnership w/ school district administrators & staff is paramount
- Have policies in place for responding to news media
 - Know your PIO
- Always collaborate w/ state & local partners
 - MDHHS TB program, Beaumont TB clinic, hospital ICPs, local physicians

LESSONS LEARNED CONT'D.

- ◉ Ask for help or additional resources when (or before) needed
- ◉ Allow space & time for parents/guardians to ask questions
- ◉ Always be prepared & equipped for any type of contact investigation

QUESTIONS?

